

# **Western Connecticut Council of Governments Multi-Jurisdiction Hazard Mitigation Plan Update 2026-2031**



***Prepared for:***  
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# Table of Contents

|                                                                                                |            |
|------------------------------------------------------------------------------------------------|------------|
| PROJECT STAFF FOR PLAN UPDATE .....                                                            | I          |
| MUNICIPAL COORDINATORS FOR PLAN UPDATE.....                                                    | II         |
| TABLE OF CONTENTS .....                                                                        | IV         |
| <b>1.0 INTRODUCTION.....</b>                                                                   | <b>1-1</b> |
| 1.1 Background, Authority, and Purpose.....                                                    | 1-1        |
| 1.2 Hazard Mitigation Vision, Goals, Objectives, and Strategies.....                           | 1-2        |
| 1.3 Document Overview .....                                                                    | 1-3        |
| 1.4 Updates from Previous Plans .....                                                          | 1-3        |
| 1.5 Planning Process for Plan Update.....                                                      | 1-3        |
| 1.5.1 Plan Maintenance .....                                                                   | 1-4        |
| 1.5.2 Local Planning Coordination.....                                                         | 1-5        |
| 1.5.3 Regional Planning Meetings .....                                                         | 1-6        |
| 1.5.4 Public Outreach .....                                                                    | 1-6        |
| 1.5.5 Outreach to Neighboring Communities.....                                                 | 1-8        |
| 1.5.6 Outreach to the Connecticut Institute for Resilience and Climate Adaptation (CIRCA)..... | 1-9        |
| 1.5.7 Review of Draft Plan .....                                                               | 1-9        |
| <b>2.0 REGIONAL PROFILE .....</b>                                                              | <b>2-2</b> |
| 2.1 Geographic Setting .....                                                                   | 2-2        |
| 2.1.1 Physical Setting.....                                                                    | 2-2        |
| 2.1.2 Geology .....                                                                            | 2-4        |
| 2.1.3 Climate and Climate Change.....                                                          | 2-4        |
| 2.1.4 Hydrology .....                                                                          | 2-8        |
| 2.2 Cultural Setting.....                                                                      | 2-10       |
| 2.2.1 Demographic Setting and Trends .....                                                     | 2-10       |
| 2.2.2 Economic Profile and Trends .....                                                        | 2-17       |
| 2.2.3 Development Trends .....                                                                 | 2-19       |
| 2.2.4 Land Cover and Land Use.....                                                             | 2-25       |
| 2.2.5 Historic and Cultural Resources .....                                                    | 2-25       |
| 2.3 Planning and Regulatory Capabilities.....                                                  | 2-28       |
| 2.3.1 Governmental Structure.....                                                              | 2-28       |
| 2.3.2 Regional and Local Plans .....                                                           | 2-30       |
| 2.3.3 Public Information .....                                                                 | 2-32       |
| 2.4 Critical Facilities .....                                                                  | 2-32       |
| 2.4.1 Essential Facilities.....                                                                | 2-33       |
| 2.4.2 Transportation Systems.....                                                              | 2-33       |
| 2.4.3 Lifeline Utility Systems .....                                                           | 2-34       |
| 2.4.4 High Potential Loss Facilities.....                                                      | 2-34       |
| 2.4.5 Hazardous Materials Facilities .....                                                     | 2-35       |
| <b>3.0 HAZARD IDENTIFICATION AND RISK ASSESSMENT.....</b>                                      | <b>3-1</b> |
| 3.1 Natural Hazards Impacting the Region .....                                                 | 3-1        |
| 3.1.1 Disaster Declarations.....                                                               | 3-1        |

|        |                                                                        |       |
|--------|------------------------------------------------------------------------|-------|
| 3.1.2  | FEMA Public Assistance Reimbursements .....                            | 3-2   |
| 3.2    | Risk Assessment .....                                                  | 3-3   |
| 3.2.1  | Exposure Analysis .....                                                | 3-4   |
| 3.2.2  | Flooding.....                                                          | 3-7   |
| 3.2.3  | Winter Storms .....                                                    | 3-34  |
| 3.2.4  | Tropical Cyclones and Hurricanes.....                                  | 3-47  |
| 3.2.5  | Tornadoes .....                                                        | 3-58  |
| 3.2.6  | Thunderstorms.....                                                     | 3-66  |
| 3.2.7  | Forest and Wildland Fires.....                                         | 3-82  |
| 3.2.8  | Drought .....                                                          | 3-91  |
| 3.2.9  | Earthquakes.....                                                       | 3-98  |
| 3.2.10 | Dam Overtopping and Failure Events.....                                | 3-108 |
| 3.2.11 | Extreme Temperatures.....                                              | 3-115 |
| 3.3    | Overall Hazard Risk .....                                              | 3-125 |
| 4.0    | EXISTING CAPABILITIES.....                                             | 4-1   |
| 4.1    | Federal.....                                                           | 4-1   |
| 4.1.1  | Flood Mitigation.....                                                  | 4-1   |
| 4.1.2  | Winter Storms .....                                                    | 4-6   |
| 4.1.3  | Tropical Cyclones and Hurricanes.....                                  | 4-6   |
| 4.1.4  | Tornadoes and Thunderstorms.....                                       | 4-6   |
| 4.1.5  | Wildfires.....                                                         | 4-7   |
| 4.1.6  | Drought .....                                                          | 4-8   |
| 4.1.7  | Earthquakes.....                                                       | 4-8   |
| 4.1.8  | Dam Failure .....                                                      | 4-8   |
| 4.1.9  | Extreme Temperatures.....                                              | 4-8   |
| 4.2    | State .....                                                            | 4-8   |
| 4.2.1  | Multiple Hazards.....                                                  | 4-8   |
| 4.2.2  | Flooding.....                                                          | 4-13  |
| 4.2.3  | Winter Storms .....                                                    | 4-14  |
| 4.2.4  | Tropical Cyclones and Hurricanes.....                                  | 4-15  |
| 4.2.5  | Tornadoes and Thunderstorms.....                                       | 4-15  |
| 4.2.6  | Wildfires.....                                                         | 4-15  |
| 4.2.7  | Drought .....                                                          | 4-16  |
| 4.2.8  | Earthquakes.....                                                       | 4-16  |
| 4.2.9  | Dam Failure .....                                                      | 4-17  |
| 4.3    | Regional.....                                                          | 4-18  |
| 4.3.1  | Regional Hazard Mitigation Planning.....                               | 4-18  |
| 4.3.2  | Regional Emergency Planning Team and Emergency Support Functions ..... | 4-18  |
| 4.3.3  | Unified Planning Work Program.....                                     | 4-18  |
| 4.3.4  | Regional Viewer.....                                                   | 4-18  |
| 4.3.5  | Regional Stormwater Management Planning .....                          | 4-18  |
| 4.3.6  | Regional Plan of Conservation and Development.....                     | 4-19  |
| 4.3.7  | Regional CRS Support.....                                              | 4-19  |
| 4.3.8  | Road-Stream Crossing Survey Program .....                              | 4-21  |
| 4.3.9  | WestCOG Economic Development Strategy.....                             | 4-21  |
| 4.3.10 | WestCOG HMA Grant Assistance Program .....                             | 4-21  |
| 4.3.11 | WestCOG Climate and Stormwater Assessment.....                         | 4-22  |

|       |                                                          |            |
|-------|----------------------------------------------------------|------------|
| 4.4   | Municipal.....                                           | 4-22       |
| 4.4.1 | Prevention.....                                          | 4-22       |
| 4.4.2 | Property Protection.....                                 | 4-24       |
| 4.4.3 | Emergency Services .....                                 | 4-26       |
| 4.4.4 | Public Education and Awareness.....                      | 4-28       |
| 4.4.5 | Natural Resource Protection .....                        | 4-28       |
| 4.4.6 | Structural Projects .....                                | 4-31       |
| 5.0   | <b>MITIGATION STRATEGIES .....</b>                       | <b>5-1</b> |
| 5.1   | Types of Mitigation Strategies .....                     | 5-1        |
| 5.1.1 | Prevention.....                                          | 5-1        |
| 5.1.2 | Property Protection.....                                 | 5-1        |
| 5.1.3 | Emergency Services .....                                 | 5-2        |
| 5.1.4 | Public Education and Awareness.....                      | 5-2        |
| 5.1.5 | Natural Resource Protection .....                        | 5-2        |
| 5.1.6 | Structural Projects .....                                | 5-3        |
| 5.2   | Mitigation Challenges.....                               | 5-4        |
| 5.2.1 | Limited Resources.....                                   | 5-4        |
| 5.2.2 | Multiple Jurisdictions .....                             | 5-4        |
| 5.2.3 | State Infrastructure .....                               | 5-5        |
| 5.2.4 | Vulnerability to Power Outages .....                     | 5-5        |
| 5.3   | Ranking of Mitigation Strategies.....                    | 5-5        |
| 5.4   | Regional Mitigation Strategies.....                      | 5-7        |
| 6.0   | <b>PLAN IMPLEMENTATION .....</b>                         | <b>6-1</b> |
| 6.1   | Plan Adoption .....                                      | 6-1        |
| 6.2   | Plan Implementation .....                                | 6-1        |
| 6.3   | Plan Monitoring.....                                     | 6-2        |
| 6.3.1 | Plan Maintenance Oversight .....                         | 6-2        |
| 6.3.2 | Site Reconnaissance for Specific Suggested Actions ..... | 6-2        |
| 6.3.3 | Annual Reporting and Meeting .....                       | 6-3        |
| 6.3.4 | Post-Disaster Reporting and Meeting.....                 | 6-3        |
| 6.3.5 | Continued Public Involvement .....                       | 6-3        |
| 6.4   | Plan Amendments .....                                    | 6-4        |
| 6.5   | Five-Year Plan Updates.....                              | 6-4        |
| 6.6   | Summary of Local Coordinator Responsibilities .....      | 6-5        |
| 7.0   | <b>RESOURCES AND REFERENCES.....</b>                     | <b>7-1</b> |
| 7.1   | HMA Grant Programs.....                                  | 7-1        |
| 7.1.1 | Hazard Mitigation Grant Program .....                    | 7-1        |
| 7.1.2 | Flood Mitigation Assistance (FMA) Program.....           | 7-1        |
| 7.1.3 | Building Resilient Infrastructure and Communities.....   | 7-1        |
| 7.1.4 | Eligible Activities .....                                | 7-1        |
| 7.1.5 | Benefit-Cost Analysis.....                               | 7-2        |
| 7.2   | Technical and Financial Resources.....                   | 7-3        |
| 7.2.1 | Federal Resources.....                                   | 7-3        |
| 7.2.2 | State Resources .....                                    | 7-7        |

|       |                                  |      |
|-------|----------------------------------|------|
| 7.2.3 | Private and Other Resources..... | 7-9  |
| 7.3   | References .....                 | 7-13 |

## List of Figures

|                                                                                                |       |
|------------------------------------------------------------------------------------------------|-------|
| Figure 1-1: Since 2020, which of the following impacts have you personally experienced? .....  | 1-8   |
| Figure 2-1: Region Map .....                                                                   | 2-3   |
| Figure 2-2: Bedrock Geology Map .....                                                          | 2-5   |
| Figure 2-3: Surficial Geology .....                                                            | 2-6   |
| Figure 2-4: Hydrology .....                                                                    | 2-9   |
| Figure 2-5: Population Density .....                                                           | 2-11  |
| Figure 2-6: Social Vulnerability Rating by Census Tract in WestCOG .....                       | 2-16  |
| Figure 2-7: Land Cover.....                                                                    | 2-26  |
| Figure 2-8: Historic Sites .....                                                               | 2-27  |
| Figure 3-1: Sea Level Rise .....                                                               | 3-19  |
| Figure 3-2: National Risk Index Rating for Riverine Flood (census tract level) .....           | 3-29  |
| Figure 3-3: National Risk Index Rating for Coastal Flood (census tract level) .....            | 3-30  |
| Figure 3-4: NRI Riverine Flood Expected Annual Loss Rating .....                               | 3-32  |
| Figure 3-5: NRI Coastal Flood Expected Annual Loss Rating .....                                | 3-33  |
| Figure 3-6: Risk Rating for Winter Weather, shown at the census tract level.....               | 3-44  |
| Figure 3-7: NRI Winter Weather Expected Annual Loss Rating.....                                | 3-46  |
| Figure 3-8: Hurricane Historical Tracks.....                                                   | 3-48  |
| Figure 3-9: Risk Rating for Hurricanes, shown at the census tract level .....                  | 3-55  |
| Figure 3-10: NRI Hurricane Expected Annual Loss Rating .....                                   | 3-57  |
| Figure 3-11: Anatomy of a Tornado .....                                                        | 3-59  |
| Figure 3-12: Risk Rating for Tornadoes, shown at the census tract level .....                  | 3-64  |
| Figure 3-13: NRI Tornado Expected Annual Loss Rating .....                                     | 3-65  |
| Figure 3-14: Risk Rating for Lightning, shown at the census tract level .....                  | 3-74  |
| Figure 3-15: NRI Lightning Expected Annual Loss Rating .....                                   | 3-75  |
| Figure 3-16: Risk Rating for hail shown at the census tract level .....                        | 3-76  |
| Figure 3-17: NRI Hail Expected Annual Loss Rating.....                                         | 3-78  |
| Figure 3-18: Risk Rating for strong wind shown at the census tract level .....                 | 3-80  |
| Figure 3-19: NRI Strong Wind Expected Annual Loss Rating .....                                 | 3-81  |
| Figure 3-20: The Fire Tetrahedron.....                                                         | 3-82  |
| Figure 3-21: Wildland Urban Interface .....                                                    | 3-86  |
| Figure 3-22: Risk Rating for Wildfires, shown at the census tract level.....                   | 3-89  |
| Figure 3-23: NRI Wildfire Expected Annual Loss Rating.....                                     | 3-90  |
| Figure 3-24: Five Drought Stages Defined in the Connecticut State Drought Plan .....           | 3-92  |
| Figure 3-25: Risk Rating for Drought, shown at the census tract level.....                     | 3-95  |
| Figure 3-26: NRI Drought Expected Annual Loss Rating.....                                      | 3-97  |
| Figure 3-27: Risk Rating for Earthquake, shown at the census tract level.....                  | 3-106 |
| Figure 3-28: NRI Earthquake Expected Annual Loss Rating.....                                   | 3-107 |
| Figure 3-29: Engraving of the Ruins of the Upper Dam of the Kohanza Reservoir in Danbury ..... | 3-110 |
| Figure 3-30: Rogers Pond Dam Breach in Sherman.....                                            | 3-111 |
| Figure 3-31: Map of Dams in WestCOG.....                                                       | 3-113 |
| Figure 3-32: NWS Heat Index Chart .....                                                        | 3-116 |

|                                                                              |       |
|------------------------------------------------------------------------------|-------|
| Figure 3-33: NWS Wind Chill Chart .....                                      | 3-117 |
| Figure 3-34: Risk Rating for cold wave shown at the census tract level ..... | 3-120 |
| Figure 3-35: NRI Cold Wave Expected Annual Loss Rating.....                  | 3-121 |
| Figure 3-36: Risk Rating for heat wave shown at the census tract level ..... | 3-123 |
| Figure 3-37: NRI Heat Wave Expected Annual Loss Rating .....                 | 3-124 |

## List of Tables

|                                                                                                         |      |
|---------------------------------------------------------------------------------------------------------|------|
| Table 1-1: Hazard Mitigation Plan Approval Dates .....                                                  | 1-1  |
| Table 1-2: Municipal Local Coordinators.....                                                            | 1-4  |
| Table 1-3: Plan Maintenance Activities, 2021-2026 .....                                                 | 1-5  |
| Table 1-4: Local Planning Meeting Dates.....                                                            | 1-5  |
| Table 1-5: In Which Community Do You Live or Own Property?.....                                         | 1-7  |
| Table 1-6: Describe your property. ....                                                                 | 1-7  |
| Table 1-7: Keyword Frequency .....                                                                      | 1-8  |
| Table 2-1: Census Population and Density 2020 Figures and 2024 Estimates .....                          | 2-10 |
| Table 2-2: Population Growth.....                                                                       | 2-12 |
| Table 2-3: Population Aged 65 and Above, 2020 .....                                                     | 2-13 |
| Table 2-4: Percent of Population (over 5) that Speaks a Language other than English at Home .....       | 2-14 |
| Table 2-5: Income Statistics .....                                                                      | 2-14 |
| Table 2-6: Social Vulnerability Rating by Community .....                                               | 2-17 |
| Table 2-7: 2023 Grand List Data by Municipality .....                                                   | 2-19 |
| Table 2-8: Housing Stock (2022).....                                                                    | 2-20 |
| Table 2-9: Change in Housing Units.....                                                                 | 2-20 |
| Table 2-10: Average Household Size .....                                                                | 2-21 |
| Table 2-11: Notable Developments or Redevelopments .....                                                | 2-22 |
| Table 2-12: Change in Land Cover, 1985 - 2015 .....                                                     | 2-25 |
| Table 2-13: Municipal Government Structure .....                                                        | 2-28 |
| Table 2-14: Local Administrative and Technical Resources.....                                           | 2-29 |
| Table 2-15: Types of Codes, Ordinances, and Requirements.....                                           | 2-30 |
| Table 2-16: Types of Local Planning Documents .....                                                     | 2-31 |
| Table 2-17: Municipal Plan of Conservation and Development Status .....                                 | 2-31 |
| Table 3-1: Federal Disaster and Emergency Declarations.....                                             | 3-1  |
| Table 3-2: Damages Since 1998 Based on FEMA Public Assistance Reimbursements.....                       | 3-2  |
| Table 3-3: Exposure Summary for the Region (Number, or Value in Billions of Dollars) .....              | 3-5  |
| Table 3-4: Description of Flooding Terminology .....                                                    | 3-8  |
| Table 3-5: Recurrence Interval vs. Annual Percent Chance .....                                          | 3-9  |
| Table 3-6: Flood Insurance Rate Map Zone Descriptions.....                                              | 3-9  |
| Table 3-7: National Flood Insurance Program Policies and Insurance in Force.....                        | 3-10 |
| Table 3-8: Increase in Total Rainfall (inches) for 24-Hour Storm.....                                   | 3-15 |
| Table 3-9: Payments to Repetitive Loss Properties .....                                                 | 3-22 |
| Table 3-10: Rep. Loss Properties as of December 2020 .....                                              | 3-23 |
| Table 3-11: Building Damage from Flood .....                                                            | 3-25 |
| Table 3-12: Economic Loss Due to Flood (in Millions of 2026 Dollars) .....                              | 3-25 |
| Table 3-13: Annualized Loss Due to Flood (in Millions of 2026 Dollars) .....                            | 3-26 |
| Table 3-14: Annualized Flood Loss from NFIP and FEMA Public Assistance Reimbursements (as of 2026)..... | 3-26 |

|                                                                                                       |       |
|-------------------------------------------------------------------------------------------------------|-------|
| Table 3-15: Annualized Flood Loss Estimates from NCEI.....                                            | 3-27  |
| Table 3-16: Annualized Flood Loss Estimates by Flood Type from NCEI .....                             | 3-28  |
| Table 3-17: National Risk Index Rating for Riverine Flood by Community (census tract level).....      | 3-28  |
| Table 3-18: National Risk Index Rating for Coastal Flood by Community (census tract level) .....      | 3-31  |
| Table 3-19: Breakdown of NRI expected annual losses from riverine flood by community.....             | 3-31  |
| Table 3-20: Breakdown of NRI expected annual losses from coastal flood by community.....              | 3-34  |
| Table 3-21: Regional Snowfall Index Categories .....                                                  | 3-35  |
| Table 3-22: Weight of Snow on a Roof .....                                                            | 3-40  |
| Table 3-23: Annualized Winter Storm Loss from FEMA Based on Public Assistance Reimbursements .....    | 3-42  |
| Table 3-24: Annualized Winter Weather Loss Estimates from NCEI .....                                  | 3-43  |
| Table 3-25: Annualized Winter Weather Loss Estimates by Weather Type from NCEI .....                  | 3-43  |
| Table 3-26: Community risk ratings for winter weather, breakdown by census tracts .....               | 3-45  |
| Table 3-27: Breakdown of NRI expected annual losses from winter weather by community.....             | 3-45  |
| Table 3-28: Number of Buildings Damaged in Region Due to Wind.....                                    | 3-51  |
| Table 3-29: Average Percent Damage of Essential Facilities.....                                       | 3-51  |
| Table 3-30: Debris Generation Due to Wind (Tons).....                                                 | 3-52  |
| Table 3-31: Shelter Requirements Due to Wind .....                                                    | 3-52  |
| Table 3-32: Economic Losses in Region Due to Wind (Thousands of 2026 Dollars).....                    | 3-52  |
| Table 3-33: Annualized Economic Loss in Region Due to Wind (Thousands of 2026 Dollars) .....          | 3-53  |
| Table 3-34: Annualized Tropical Cyclone Loss Estimates from NCEI.....                                 | 3-54  |
| Table 3-35: Community risk ratings for hurricane, breakdown by census tracts .....                    | 3-56  |
| Table 3-36: Breakdown of NRI expected annual losses from hurricane by community.....                  | 3-58  |
| Table 3-37: Enhanced Fujita Scale.....                                                                | 3-59  |
| Table 3-38: Annualized Tornado Loss Estimates from NCEI.....                                          | 3-62  |
| Table 3-39: Community risk ratings for tornado, breakdown by census tracts .....                      | 3-62  |
| Table 3-40: Breakdown of NRI expected annual losses from tornadoes by community .....                 | 3-63  |
| Table 3-41: Lightning and Hail Threat Level Criteria.....                                             | 3-66  |
| Table 3-42: Annualized Thunderstorm Loss Estimates from NCEI .....                                    | 3-71  |
| Table 3-43: Annualized Thunderstorm Loss Estimates by Storm Component from NCEI .....                 | 3-72  |
| Table 3-44: Community risk ratings for lightning, breakdown by census tracts .....                    | 3-72  |
| Table 3-45: Breakdown of NRI expected annual losses from lightning by community.....                  | 3-73  |
| Table 3-46: Community risk ratings for hail, breakdown by census tracts .....                         | 3-77  |
| Table 3-47: Breakdown of NRI expected annual losses from hail by community.....                       | 3-77  |
| Table 3-48: Community risk ratings for strong wind, breakdown by census tracts .....                  | 3-79  |
| Table 3-49: Breakdown of NRI expected annual losses from strong wind by community.....                | 3-79  |
| Table 3-50: Wildland Fire Statistics for Connecticut .....                                            | 3-84  |
| Table 3-51: Community risk ratings for wildfire, breakdown by census tracts.....                      | 3-87  |
| Table 3-52: Breakdown of NRI expected annual losses from wildfire by community .....                  | 3-88  |
| Table 3-53: Community risk ratings for drought, breakdown by census tracts .....                      | 3-96  |
| Table 3-54: Breakdown of NRI expected annual losses from drought by community .....                   | 3-96  |
| Table 3-55: Comparison of Earthquake Magnitude and Intensity.....                                     | 3-99  |
| Table 3-56: Number of Buildings Damaged in Region by Earthquake Scenario.....                         | 3-102 |
| Table 3-57: Average Percent Functionality of Essential Facilities on Day 1 Following Earthquake ..... | 3-102 |
| Table 3-58: Shelter Requirements by Earthquake Scenario .....                                         | 3-103 |
| Table 3-59: Economic Loss in Region by Earthquake Scenario (Millions of 2026 Dollars) .....           | 3-103 |
| Table 3-60: Annualized Economic Loss in Region Due to Earthquake (Thousands) .....                    | 3-104 |
| Table 3-61: Community risk ratings for earthquake, breakdown by census tracts.....                    | 3-104 |
| Table 3-62: Breakdown of NRI expected annual losses from earthquake by community .....                | 3-105 |

|                                                                                      |         |
|--------------------------------------------------------------------------------------|---------|
| Table 3-63: Connecticut DEEP Dam Classifications .....                               | 3-108   |
| Table 3-64: Significant and High Hazard Dams .....                                   | 3-112   |
| Table 3-65: Annualized Dam Failure Loss Estimates .....                              | 3-114   |
| Table 3-66: Community risk ratings for cold wave, breakdown by census tracts .....   | 3-119   |
| Table 3-67: Breakdown of NRI expected annual losses from cold wave by community..... | 3-119   |
| Table 3-68: Community risk ratings for heat wave, breakdown by census tracts .....   | 3-122   |
| Table 3-69: Breakdown of NRI expected annual losses from heat wave by community..... | 3-122   |
| Table 3-70: Hazard Event Ranking .....                                               | 3-125   |
| Table 3-71: Hazard Effect Ranking .....                                              | 3-126   |
| Table 3-72: Qualitative Summary of Hazard Risk.....                                  | 3-126   |
| <br>Table 4-1: NFIP Status .....                                                     | <br>4-2 |
| Table 4-2: NOAA Watches and Warnings .....                                           | 4-7     |
| <br>Table 5-1: STAPLEE Benefit-Cost Overview.....                                    | <br>5-6 |
| Table 5-2: Status of WestCOG Mitigation Strategies from 2021 Update.....             | 5-8     |
| Table 5-3 WestCOG Mitigation Strategies for 2026 – 2031.....                         | 5-11    |
| <br>Table 7-1: HMA Eligible Activities.....                                          | <br>7-2 |

## List of Fact Sheets

|                                                                |          |
|----------------------------------------------------------------|----------|
| Fact Sheet #1: Intense Precipitation .....                     | 3-16     |
| Fact Sheet #2: Coastal Flooding.....                           | 3-20     |
| Fact Sheet #3: Ice Jams .....                                  | 3-21     |
| Fact Sheet #4: Repetitive Loss Properties.....                 | 3-24     |
| Fact Sheet #5: Power Outages.....                              | 3-41     |
| Fact Sheet #6: Climate Change and Droughts .....               | 3-93     |
| Fact Sheet #7: Dam Hazards.....                                | 3-109    |
| <br>Fact Sheet #8: Flood Studies in Darien.....                | <br>4-20 |
| Fact Sheet #9: Aquarion Drought Planning.....                  | 4-23     |
| Fact Sheet #10: Home Elevations in Greenwich.....              | 4-25     |
| Fact Sheet #11: Resilient Power Systems in New Canaan.....     | 4-27     |
| Fact Sheet #12: Stamford Flood Brochure .....                  | 4-29     |
| Fact Sheet #13: Mill River Park .....                          | 4-30     |
| Fact Sheet #14: Brookfield Drainage Project.....               | 4-32     |
| Fact Sheet #15: Road Drainage Improvements in New Milford..... | 4-33     |

## List of Appendices

|            |                                                                            |
|------------|----------------------------------------------------------------------------|
| Appendix A | Municipal Planning Process                                                 |
| Appendix B | Regional Meetings and Workshops                                            |
| Appendix C | Stakeholder and Public Outreach                                            |
| Appendix D | STAPLEE Matrix                                                             |
| Appendix E | Adoption Resolutions                                                       |
| Appendix F | Mitigation Action Monitoring Form and Worksheet for Documenting Amendments |

## List of Municipal Annexes

|             |                       |
|-------------|-----------------------|
| Annex I     | Town of Bethel        |
| Annex II    | Town of Bridgewater   |
| Annex III   | Town of Brookfield    |
| Annex IV    | City of Danbury       |
| Annex V     | Town of Darien        |
| Annex VI    | Town of Greenwich     |
| Annex VII   | Town of New Canaan    |
| Annex VIII  | Town of New Fairfield |
| Annex IX    | Town of New Milford   |
| Annex X     | Town of Newtown       |
| Annex XI    | City of Norwalk       |
| Annex XII   | Town of Redding       |
| Annex XIII  | Town of Ridgefield    |
| Annex XIV   | Town of Sherman       |
| Annex XV    | City of Stamford      |
| Annex XVI   | Town of Weston        |
| Annex XVII  | Town of Westport      |
| Annex XVIII | Town of Wilton        |

## List of Acronyms

|         |                                                               |
|---------|---------------------------------------------------------------|
| ARC     | American Red Cross                                            |
| BCA     | Benefit-Cost Analysis                                         |
| BCR     | Benefit-Cost Ratio                                            |
| BFE     | Base Flood Elevation                                          |
| BRIC    | Building Resilient Infrastructure and Communities             |
| CDC     | Center for Disease Control and Prevention                     |
| CEDS    | Comprehensive Economic Development Strategy                   |
| CEQ     | Council on Environmental Quality                              |
| CIRCA   | Connecticut Institute for Resilience and Climate Adaptation   |
| CLEAR   | Center for Land Use Education and Research                    |
| cm      | Centimeter                                                    |
| CT NHMP | Connecticut Natural Hazards Mitigation Plan                   |
| CRS     | Community Rating System                                       |
| CTSDC   | Connecticut State Data Center                                 |
| CTDOT   | Connecticut Department of Transportation                      |
| DEEP    | Connecticut Department of Energy and Environmental Protection |
| DEMHS   | Division of Emergency Management & Homeland Security          |
| DESPP   | Department of Emergency Services and Public Protection        |
| DMA     | Disaster Mitigation Act                                       |
| DVE     | Domestic Violent Extremist                                    |
| EF      | Enhanced Fujita                                               |
| EAP     | Emergency Action Plan                                         |
| EOP     | Emergency Operations Plan                                     |
| EWP     | Emergency Watershed Protection                                |
| F       | Fujita                                                        |

|          |                                                 |
|----------|-------------------------------------------------|
| FEMA     | Federal Emergency Management Agency             |
| FIRM     | Flood Insurance Rate Map                        |
| FIS      | Flood Insurance Study                           |
| FMA      | Flood Mitigation Assistance                     |
| GIS      | Geographic Information System                   |
| HMA      | Hazard Mitigation Assistance                    |
| HMGP     | Hazard Mitigation Grant Program                 |
| HMP      | Hazard Mitigation Plan                          |
| HVA      | Housatonic Valley Association                   |
| LID      | Low Impact Development                          |
| m/s      | Meters per second                               |
| MetroCOG | Metropolitan Council of Governments             |
| mph      | Miles per hour                                  |
| NCDC     | National Climatic Data Center                   |
| NCEI     | National Centers for Environmental Information  |
| NFIP     | National Flood Insurance Program                |
| NHCOG    | Northwest Hills Council of Governments          |
| NIFC     | National Interagency Fire Center                |
| NOAA     | National Oceanic & Atmospheric Administration   |
| NPDP     | National Performance of Dams Program            |
| NRCC     | Northeast Regional Climate Center               |
| NRCS     | National Resource Conservation Service          |
| NVCOG    | Naugatuck Valley Council of Governments         |
| NWS      | National Weather Service                        |
| POCD     | Plan of Conservation and Development            |
| psf      | Pounds per square foot                          |
| PURA     | Public Utility Regulatory Authority             |
| RLP      | Repetitive Loss Property                        |
| RSI      | Regional Snowfall Index                         |
| RWIS     | Roadway Weather Information System              |
| SFHA     | Special Flood Hazard Area                       |
| SHPO     | State Historic Preservation Office              |
| SRLP     | Severe Repetitive Loss Property                 |
| STEAP    | Small Town Economic Assistance Program          |
| SWRPA    | Southwestern Connecticut Regional Planning Area |
| SVI      | Social Vulnerability Index                      |
| USACE    | United States Army Corps of Engineers           |
| USDA     | United States Department of Agriculture         |
| USGS     | United States Geological Survey                 |
| WestCOG  | Western Connecticut Council of Governments      |
| WUI      | Wildland Urban Interface                        |

## 1.0 Introduction

The Western Connecticut Council of Governments (WestCOG) provides regional services to 18 municipalities in western Connecticut (the Region). The purpose of the hazard mitigation planning process is to encourage assessment of natural hazard risks at the regional and local levels, as well as the completion of mitigation actions that will reduce risks related to natural hazards.

Natural hazard events and disasters can and do inflict damage on the same communities year after year, requiring repeated reconstruction efforts that become increasingly expensive over time. Hazard mitigation breaks this expensive cycle of recurrent damage and escalating reconstruction costs by preventing damage up front and taking a long-term view of rebuilding and recovery following natural disasters. This requires long-term strategies, including planning, policymaking, programs, projects, and other activities.

According to the Federal Emergency Management Agency (FEMA) March 2013 Local Mitigation Planning Handbook, “a mitigation action is a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps to achieve the Plan’s missions and goals. The actions to reduce vulnerability to threats and hazards form the core of the Plan and are a key outcome of the planning process. Types of mitigation actions to reduce long-term vulnerability include local plans and regulations, structure and infrastructure projects, natural systems protection, and education and awareness programs.”

### 1.1 Background, Authority, and Purpose

The Federal Disaster Mitigation Act of 2000 (DMA 2000) amended Section 322, "Mitigation Planning" and other sections of the Robert T. Stafford Disaster Relief and Emergency Assistance Act to promote natural hazard mitigation planning. The DMA 2000 requires that local governments have an approved HMP to be eligible to receive Hazard Mitigation Assistance (HMA) project funding. Once approved by FEMA and adopted locally, this multi-jurisdictional plan will fulfill that requirement.

Hazard mitigation planning in the region began in the early 2000s prior to the existence of WestCOG. Table 1-1 presents the years that each previous HMP was developed. FEMA requires that local HMPs be updated every 5 years to ensure they remain current.

**Table 1-1: Hazard Mitigation Plan Approval Dates**

| Municipality  | Initial Plan | Next Update | Next Update | Next Update | Current Update |
|---------------|--------------|-------------|-------------|-------------|----------------|
| Bethel        | 2015         |             |             | 2021        | 2026           |
| Bridgewater   | 2015         |             |             | 2021        | 2026           |
| Brookfield    | 2014         |             |             | 2021        | 2026           |
| Danbury       | 2011         | 2016        |             | 2021        | 2026           |
| Darien        | 2005         | 2011        | 2016        | 2021        | 2026           |
| Greenwich     | 2005         | 2011        | 2016        | 2021        | 2026           |
| New Canaan    | 2005         | 2011        | 2016        | 2021        | 2026           |
| New Fairfield | 2011         | 2016        |             | 2021        | 2026           |
| New Milford   | 2015         |             |             | 2021        | 2026           |
| Newtown       | 2015         |             |             | 2021        | 2026           |
| Norwalk       | 2005         | 2011        | 2016        | 2021        | 2026           |

| Municipality | Initial Plan | Next Update | Next Update | Next Update | Current Update |
|--------------|--------------|-------------|-------------|-------------|----------------|
| Redding      | 2015         |             |             | 2021        | 2026           |
| Ridgefield   | 2015         |             |             | 2021        | 2026           |
| Sherman      | 2011         | 2017        |             | 2021        | 2026           |
| Stamford     | 2005         | 2011        | 2016        | 2021        | 2026           |
| Weston       | 2005         | 2011        | 2016        | 2021        | 2026           |
| Westport     | 2005         | 2011        | 2016        | 2021        | 2026           |
| Wilton       | 2005         | 2011        | 2016        | 2021        | 2026           |

The purpose of this HMP is to identify natural hazards likely to affect the Region, assess the region's vulnerabilities to these hazards, review existing mitigation strategies and capabilities, and set forth new mitigation strategies that will reduce the loss of life and property, economic disruptions, and the cost of post-disaster recovery for the region's communities. Unlike emergency management plans already adopted in the region, this HMP focuses on reducing or eliminating the impacts of natural hazards.

This HMP evaluates the risk of the region for damage due to flooding, winter storms, tropical cyclones, tornadoes, thunderstorms, wildfires, drought, earthquakes, dam overtopping or failure events, and extreme temperatures. This does not preclude the possibility that other natural hazards will affect the region. However, in general, any other potential natural hazards are of overall low or negligible risk, so they need not be considered in detail for the Region. For example, certain WestCOG communities have concerns regarding tsunamis and mudslides, both of which are discussed herein as potential hazard effects under flooding.

The WestCOG communities recognize their responsibility to protect the health, safety, and welfare of their citizens and will strive to implement the mitigation strategies they propose. However, while this Plan provides a blueprint for local and regional efforts to reduce or eliminate risk to life and property from natural hazards, it does not constitute a mandate, specification, or regulation. Mitigation strategies will be enacted as staff time, budgets, property availability, property owner permission, and the availability of grant funding allow.

## 1.2 Hazard Mitigation Vision, Goals, Objectives, and Strategies

Each of the 18 WestCOG municipalities had similar goals in their previous HMPs. In general, each municipal goal was to reduce the loss of life and property, as well as the economic and cultural consequences resulting from natural disasters. Several communities had additional goals which were generally consistent with the above but directed towards one or more specific hazard such as flooding or drought.

When WestCOG was formed in 2014, its member municipalities were either part of a multi-jurisdictional HMP or had single-jurisdiction plans prepared or in progress. In preparing this HMP Update, one of WestCOG's objectives is to standardize the hazard mitigation planning process and plan maintenance schedule for each of its 18 member municipalities.

WestCOG's goal for this planning process is presented below.

WestCOG's goal for this HMP is to reduce loss of life, damage to property and infrastructure, costs to residents and businesses, and municipal service costs due to the effects of natural hazards and disasters. Education of residents and policymakers and the connection of hazard mitigation planning to other community planning efforts are key to achieving this goal, as is the enhancement and preservation of natural resource systems in each member community.

## 1.3 Document Overview

---

This plan update builds on the existing *Western Connecticut Council of Governments Multi-Jurisdictional Hazard Mitigation Plan Update 2021-2026*.

This introductory section contains a brief overview of the plan's purpose and discusses the planning process used to develop the HMP. Section 2 introduces the region, its current conditions, and emergency response capabilities. Section 3 profiles and evaluates the natural hazards that affect the Region. Section 4 discusses federal, state, regional, and municipal capabilities related to hazard mitigation. Section 5 presents the types of potential mitigation strategies, challenges for implementation, and presents the ranking methodology used to prioritize strategies and actions for implementation. Regional mitigation strategies that are for WestCOG's consideration over the next five years are also presented in Section 5. Section 6 presents the plan implementation process necessary to keep the HMP current. Section 7 presents a variety of technical and financial resources to assist with implementation, as well as documenting the references used in preparation of this HMP. Finally, the appendices provide further details on the planning process, critical facilities, historic and cultural resources, and loss estimates.

Annexes were developed for each of the 18 WestCOG municipalities. The annexes present detailed information for each member municipality, including capabilities, vulnerabilities, progress on previous mitigation actions, and new objectives, strategies, and actions to be undertaken over the next five years. Local adoption information is appended to each annex.

## 1.4 Updates from Previous Plans

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Since the adoption of the previous WestCOG HMP, the planning process has been updated to reflect current FEMA guidance, incorporate new data sources, and improve the methodology used to evaluate hazard risk across the WestCOG region.

The risk assessment has been updated to align with the 2023 FEMA Local Mitigation Planning Handbook and other new policy guidance from 2023, incorporating current terminology and analytical approaches related to hazard characteristics, community assets, vulnerability, and community lifelines. Updated guidance from 2025 has also been referenced to inform this plan. The assessment uses new datasets and reference materials, including:

- FEMA National Risk Index
- FEMA National Risk Index Social Vulnerability Index (superseding the EPA's Social Vulnerability Index)
- 2023 Connecticut Natural Hazard Mitigation Plan
- The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) Climate Change Vulnerability Index (CCVI)
- Updated state and national climate projections
- More recent federal and state hazard information, including the flood events in 2021 and 2024 that resulted in disaster declarations

The HAZUS loss estimates included in the 2021 HMP were adjusted to account for inflation since the plan's adoption. New HAZUS estimates were not developed. A new hazard section was included to address extreme temperatures (heat and cold), while the section in the previous plan addressing terrorism and sabotage was removed.

## 1.5 Planning Process for Plan Update

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WestCOG determined that the planning area for this multi-jurisdictional HMP would be the 18 municipalities that comprise the Region. WestCOG identified Local Coordinators for each municipality to assist in coordinating the planning process for each municipality. Table 1-2 presents the local coordinators.

**Table 1-2: Municipal Local Coordinators**

| <b>Municipality</b>  | <b>Local Coordinator(s)</b> | <b>Title</b>                                       |
|----------------------|-----------------------------|----------------------------------------------------|
| <b>Bethel</b>        | Thomas Galliford            | Emergency Management Director                      |
| <b>Bridgewater</b>   | Eric Gsell                  | First Selectman                                    |
| <b>Brookfield</b>    | Ralph Tedesco               | Public Works Director                              |
| <b>Danbury</b>       | Tim Nolan                   | Public Services Supt.                              |
| <b>Darien</b>        | Jon Zagrodsky               | First Selectman                                    |
| <b>Greenwich</b>     | Joe Laucella                | Emergency Management Director                      |
| <b>New Canaan</b>    | Russ Kimes                  | Emergency Management Director                      |
| <b>New Fairfield</b> | Melissa Lindsey             | First Selectman                                    |
| <b>New Milford</b>   | Jack Healy                  | Public Works Director                              |
| <b>Newtown</b>       | Donna Culbert               | Emergency Management Director                      |
| <b>Norwalk</b>       | Michele Deluca              | Deputy Director Emergency Management               |
| <b>Redding</b>       | Julia Pemberton             | First Selectman                                    |
| <b>Ridgefield</b>    | Rudy Marconi                | First Selectman                                    |
| <b>Sherman</b>       | Jim Reilly                  | Emergency Management Director                      |
| <b>Stamford</b>      | Robert Clausi               | Executive Director, Environmental Protection Board |
| <b>Weston</b>        | Joe Miceli                  | Emergency Management Officer                       |
| <b>Westport</b>      | Michelle Perillie           | Planning and Zoning Director                       |
| <b>Wilton</b>        | Thomas Conlan               | Chief of Police                                    |

The local coordinators serve as municipal liaisons to ensure that municipal needs and objectives continue to be identified throughout the 5-year HMP timeframe. Local coordinators provided key input for plan development via local planning discussions, workshops, the local public meetings, and throughout the process in general. In addition to the local coordinators, other municipal staff played a vital role in the development of this HMP. Such individuals were invited to participate in meetings and workshops throughout the planning process to provide input on municipal capabilities and vulnerabilities.

### 1.5.1 Plan Maintenance

Plan maintenance over the last five years has occurred through the deployment of the WestCOG HMA grant development program. *Refer to the Capability Assessment for more information about the grant development program.* The program commenced in 2022, and its successful implementation necessitated ongoing, sustained engagement with grant-related staff in each municipality. For example, all hazard mitigation actions were reviewed with the municipal planning teams in 2022 and 2023 to continuously screen for potential BRIC, FMA, and HMGP project applications.

In 2024, WestCOG met with all municipal planning teams to review all mitigation actions and discuss changes in priorities, if any occurred. These meetings were held virtually and included as many of the local planning team members as possible from 2020-2021. Outcomes of the meetings were entered into an Excel matrix, and the information was carried forward to the local planning meetings held in November 2025, December 2025, and January 2026 as part of the formal plan update process.

Table 1-3 summarizes plan maintenance activities completed over each of the past five years.

**Table 1-3: Plan Maintenance Activities, 2021-2026**

| Year        | WestCOG Actions                                                                                                                                | Local Planning Team Actions                                                                                                                                                                                                                            | Actions Reviewed? | Priority Changes Identified? |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------|
| <b>2021</b> | <ul style="list-style-type: none"> <li>Coordinated adoptions</li> </ul>                                                                        | <ul style="list-style-type: none"> <li>Coordinated adoptions</li> </ul>                                                                                                                                                                                | N/A               | N/A                          |
| <b>2022</b> | <ul style="list-style-type: none"> <li>Initiated the HMA grant development support program</li> </ul>                                          | <ul style="list-style-type: none"> <li>Local coordinator or grant writer reviewed list of actions for potential fit with HMA opportunities</li> </ul>                                                                                                  | Yes               | No                           |
| <b>2023</b> | <ul style="list-style-type: none"> <li>Continued the HMA grant development support program</li> </ul>                                          | <ul style="list-style-type: none"> <li>Local coordinator or grant writer reviewed list of actions for potential fit with HMA opportunities</li> </ul>                                                                                                  | Yes               | No                           |
| <b>2024</b> | <ul style="list-style-type: none"> <li>Continued the HMA grant development support program</li> </ul>                                          | <ul style="list-style-type: none"> <li>Local planning team members from 2020-2021 met to review all actions and changes in priorities</li> </ul>                                                                                                       | Yes               | Yes                          |
| <b>2025</b> | <ul style="list-style-type: none"> <li>Continued the HMA grant development support program</li> <li>Kicked off plan update process</li> </ul>  | <ul style="list-style-type: none"> <li>Local coordinator or grant writer reviewed list of actions for potential fit with HMA opportunities; <i>and</i></li> <li>New local planning teams convened in late 2025 to begin the update process.</li> </ul> | Yes               | Yes                          |
| <b>2026</b> | <ul style="list-style-type: none"> <li>Continued the HMA grant development support program</li> <li>Coordinated plan update process</li> </ul> | <ul style="list-style-type: none"> <li>Local coordinator or grant writer reviewed list of actions for potential fit with HMA opportunities; <i>and</i></li> <li>Local planning teams participated in plan update process.</li> </ul>                   | Yes               | Yes                          |

### 1.5.2 Local Planning Coordination

To begin the plan update process for each municipality, a local planning discussion was held to discuss several topics with both the local coordinator and other municipal staff. Project Staff gave a brief presentation on the importance and need for hazard mitigation planning, changes to the HMA grant programs, types of hazard mitigation strategies and actions, and recent mitigation successes in the region. Next, Project Staff led a discussion geared toward collecting pertinent information regarding past natural hazards and their impacts, changes in emergency response capabilities and critical facilities, progress on previous hazard mitigation plan actions, and potential strategies the municipality would like to pursue by way of mitigation. Table 1-4 identifies the dates for each of the local planning discussions conducted.

**Table 1-4: Local Planning Meeting Dates**

| Municipality  | Date       | Municipal Attendees                                                                                                                                        |
|---------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bethel        | 12/3/25    | Dan Carter (FS), Tom Galliford (EMD), David McCollum (Planning), Eric Swenson (DPW), Kathy Galbis (DPW)                                                    |
| Bridgewater   | 1/12/26    | Eric Gsell (FS)                                                                                                                                            |
| Brookfield    | 12/3/25    | Ralph Tedesco (DPW), Sarah Palmer (EMD), Greg Dembowski (Development), Laura Barkowski (Land Use), Laura Palmer (Parks)                                    |
| Danbury       | 11/17/25   | Tim Nolan (Public Services), Matt Cassavechia (EMD), Veera Karukonda (Traffic), Kara Prunty (Finance)                                                      |
| Darien        | 11/13/2025 | Jon Zagrodsky, First Selectman; Marc McEwan, EMD; Ed Gentile, Director DPW; Jeremy Ginsberg, Director LU; Fred Doneit, Asst. Director of Planning          |
| Greenwich     | 12/1/2025  | Joe Laucella, EMD; Jim Michel, PW Commissioner; Sarah Coccoaro Asst. Director Env. Affairs; Tracy Kulikowski, Deputy Director of Planning;                 |
| New Canaan    | 11/13/2025 | Greg Reilly, Grant Writer; Russ Kimes, EMD; Maria Coplit, Public Works                                                                                     |
| New Fairfield | 11/12/25   | Melissa Lindsey (FS), Lori-Ann Beninson (EMD), Russ Loudon (DPW)                                                                                           |
| New Milford   | 11/24/25   | Jack Healy (DPW), Victoria Carvalho (Grants), Laura Regan (Planning), Paul Bauer (Land Use), James Ferlow (Wetlands)                                       |
| Newtown       | 11/14/2025 | John Curtis, Town Engineer; Donna Culbert, EMD                                                                                                             |
| Norwalk       | 11/14/2025 | Michele DeLuca, Deputy Director EM; Vanessa Valadares, Chief of Operations and PW; Steven Kleppin, Director P&Z; Chris Torre, Superintendent of Operations |
| Redding       | 1/22/25    | Julia Pemberton, First Selectman; James Gracy, DPW; Michael Moran, Land Use Director                                                                       |
| Ridgefield    | 12/4/25    | Rudy Marconi (FS), Jacob Muller (DPW)                                                                                                                      |

| Municipality | Date       | Municipal Attendees                                                                                                                       |
|--------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Sherman      | 11/12/25   | Jim Reilly (EMD), Kris Fazzone (DPW)                                                                                                      |
| Stamford     | 12/5/2025  | Erin McKenna, Associate Planner/Senior Parks Planner; Anita Carpenter, Grants Officer; Louis Casolo City Engineer                         |
| Weston       | 11/18/2025 | Joe Miceli, EM Officer                                                                                                                    |
| Westport     | 11/25/25   | Nick Marson, Fire Chief; Tom Kiely, Operations Director; Michelle Perillie, P&Z Director; Colin Kelly, Dir. Conservation                  |
| Wilton       | 11/17/2025 | Tom Conlan, Chief of Police; Michael Wrinn, Director of PZ and LU; Frank Smeriglio, Director of PW; James Blanchfield, EMD (met on 12/10) |

The presentation and minutes of these discussions can be found in Appendix A.

### 1.5.3 Regional Planning Meetings

In addition to municipal-level meetings and data collection, three HMP planning meetings were held with COG staff, municipal officials, and personnel from across the Region:

- A regional workshop was held on April 16, 2026, with chief elected officials from WestCOG-member municipalities. This meeting included an overview of background information on the hazard mitigation planning process, as well as preliminary information on how the HMP update would reflect changes in risk and capabilities throughout the region, the effects of climate change on natural hazards, and potential new actions.
- A regional meeting was held on June 9, 2026, with the WestCOG HMP Technical Advisory Group (TAG), consisting of municipal engineers and public works staff. This meeting consisted of a progress update on the HMP development, a review of parallel hazard mitigation activities underway, and notes on next steps and municipal staff responsibilities.
- A regional progress update meeting was held during the WestCOG Planners' quarterly meeting on July 21, 2026, with municipal planning staff in attendance. This meeting again reviewed the planning process, highlighted Plan features to help municipal staff more effectively review and use the final document, and noted that the next step will be municipal review of the full document draft, including municipal Annexes.

Appendix B includes documentation from these regional meetings, including presentations, a list of attendees, and notes as appropriate.

### 1.5.4 Public Outreach

There were a number of ways the public was able to participate in the planning process. First, all COG meetings are open to the public, therefore any member of the public from any community may participate. The HMP was discussed as multiple COG meetings throughout 2026 as discussed above.

A public survey was made available to residents and businesses in the Region from April 7, 2026 through July 23, 2026. WestCOG issued a press release and shared it, along with the survey link, with all local media and social media points of contact. The primary goal of the survey was to educate local officials and the general public about natural hazards, with the secondary goal of collecting information that may inform potential mitigation strategies. A total of 116 people participated in the survey. The responses provide an indication of the public perception regarding the level of risk, awareness of natural hazard mitigation planning, and emergency response in the WestCOG municipalities.

Question 1 asked in which community survey respondents live, work, or own property. Results are presented in Table 1-5. The majority of respondents identified with the communities of Darien and Westport.

**Table 1-5: In Which Community Do You Live or Own Property?**

| Municipality  | Response Count | Response Percentage |
|---------------|----------------|---------------------|
| Bethel        | 4              | 3%                  |
| Brookfield    | 4              | 3%                  |
| Danbury       | 1              | 1%                  |
| Darien        | 26             | 22%                 |
| Greenwich     | 2              | 2%                  |
| New Fairfield | 6              | 5%                  |
| Newtown       | 3              | 3%                  |
| Norwalk       | 4              | 3%                  |
| Redding       | 6              | 5%                  |
| Sherman       | 3              | 3%                  |
| Westport      | 57             | 49%                 |
| Total         | 116            |                     |

Question 2 was asked to determine the type of property that respondents lived or worked in. The vast majority of respondents indicated that they lived in single-family homes. Only four respondents were business owners. Responses are summarized in Table 1-6.

**Table 1-6: Describe your property.**

| Property Type      | Count | Percent |
|--------------------|-------|---------|
| Single Family Home | 102   | 88%     |
| Apartment Condo    | 8     | 7%      |
| Business Owner     | 4     | 3%      |
| Other              | 2     | 2%      |

Question 3 asked, "Since 2020, which of the following impacts have you personally experienced?" Responses are summarized in Figure 1-1 on the next page. The impacts with the highest response rates were flooding near homes, power outages, property damage from falling trees, and flooding impacting properties. Nearly 30% of respondents indicated that they had experienced none of the listed hazard impacts.

Question 4 asked respondents to share more details about specific past hazard impacts, as well as thoughts on how future negative impacts could be mitigated. 68 people responded to this open-ended question. Responses tended to focus on flooding, power outages, and tree damage, with many reporting that these problems are becoming worse over time. Respondents described impacts to their own properties as well as issues with transportation, public infrastructure, and municipal planning.

Suggested solutions included stormwater improvements, power grid hardening, improved and more aggressive maintenance activities (tree trimming, drainage clearing, etc.), and conservation efforts. These suggestions were incorporated into the selected mitigation actions for applicable municipalities.

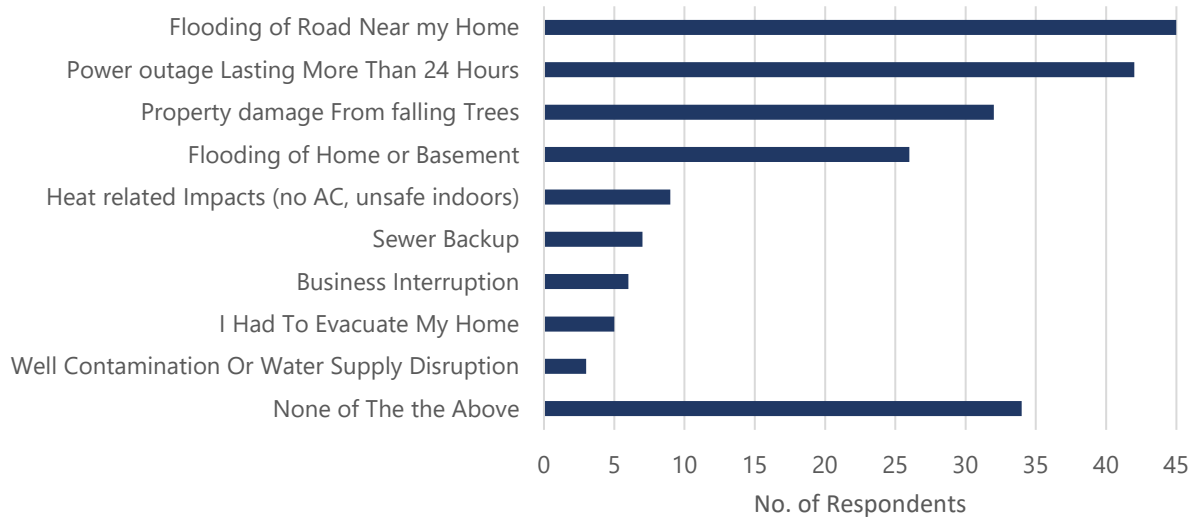


**Figure 1-1: Since 2020, which of the following impacts have you personally experienced?**

Table 1-7, below, lists a suite of keywords identified in the responses, and the number of respondents who included each keyword in their response. Some keywords have been combined for clarity (for example, "power lines" and "wires").

**Table 1-7: Keyword Frequency**

| Keyword    | # Mentioning | Keyword        | # Mentioning |
|------------|--------------|----------------|--------------|
| Flood      | 32           | Eversource     | 4            |
| Tree       | 28           | Culvert/Bridge | 3            |
| Power      | 20           | Pump           | 3            |
| Storm      | 20           | Sewer          | 3            |
| Rain       | 17           | Tide           | 3            |
| Water      | 15           | Batteries      | 2            |
| Outage     | 10           | Development    | 2            |
| Road       | 10           | Runoff         | 2            |
| Drain      | 8            | Tornado        | 2            |
| Power Line | 8            | Erosion        | 1            |
| Close      | 6            |                |              |

Finally, Questions 5 and 6 asked respondents if they would like to receive updates regarding the status of this planning effort, and to provide their email address if so. A total of 56 respondents provided their email addresses. These members of the public were included in announcements related to the Plan update.

### 1.5.5 Outreach to Neighboring Communities

In addition to the opportunity provided to the general public to participate in the online survey for this planning process, communities adjacent to the Region were directly invited to provide comment on this process via letters dated May 26, 2026. These letters were addressed to adjacent county governments in New York State and regional councils of government in Connecticut. Copies are provided in Appendix C. None of the recipients provided comments.

### 1.5.6 Outreach to the Connecticut Institute for Resilience and Climate Adaptation (CIRCA)

CIRCA (an institute of the University of Connecticut) was consulted several times during the development of the update to ensure that its cornerstone program ("*Resilient Connecticut*") resulted in appropriate hazard mitigation actions for all communities. CIRCA collaborated on the wording related to each municipality's action related to *Resilient Connecticut*.

### 1.5.7 Outreach to Water and Wastewater Utilities

Water utilities were invited to provide input during the development of the plan update. Municipal water utilities such as Danbury Water Department and Bethel Water Department were provided this opportunity through the local planning team members (e.g., the local coordinators and other municipal staff) whereas Aquarion Water Company's planning managers were directly contacted in May 2026. The Town of Newtown provided an action related to the Aquarion water supply wellfield; and the Town of Wilton provided an action related to road salt use impacts to the Norwalk First Taxing District Water Department and South Norwalk Electric & Water (SNEW) water supplies. Furthermore, the Norwalk First Taxing District Water Department provided information about potential projects to be funded by FEMA HMA programs. Additionally, note that many of the municipal actions related to drought will require ongoing participation of water utilities.

Municipal wastewater utilities and water pollution control authorities were invited to provide input through their local planning team members. Brookfield, Darien, Greenwich, and Norwalk provided suggested actions to address risks to wastewater treatment plants and/or sewer pumping stations.

### 1.5.8 Review of Draft Plan

The initial draft HMP and municipal annexes were made available to local coordinators for review and comment in September 2026. Comments were provided through the month of September and addressed for the final draft HMP.

A draft HMP including all municipal annexes was made available for public review and comment in October 2026 with comments due by the end of the month. The HMP was publicly posted on the WestCOG website. Member municipalities were requested to provide a link to the WestCOG site from their home page to encourage public review. Reviewers were requested to submit comments through a dedicated link on the WestCOG site.

A public meeting to review the draft plan was held on October 22, 2026.

During the meeting, residents from Fresenius Road in Westport requested that an action be added to address severe flooding along the stream that runs parallel to Fresenius Road. A resident of Sue Terrace raised a similar concern about the stream that runs parallel to Sue Terrace, located just west of Fresenius Road. A new action was developed for both streams, and given the ID WPT-14. During the same meeting, the Westport Town Engineer requested that one of the draft actions (regarding Dead Man Brook) be divided into two actions to more accurately reflect the needs. The revised actions are WPT-11 and WPT-12. Overall, the public review increased the number of actions in Westport from 18 to 20.



Following incorporation of public comments, the HMP was submitted to Connecticut DEMHS for review and comment in November 2026. Following review by Connecticut DEMHS, that agency submitted the HMP to FEMA for review and comment. Once the document is approved by FEMA pending adoption, WestCOG coordinates adoption by local governing bodies (Section 6.1). Copies of local adoption resolutions are appended to each municipal annex. As required by FEMA, Plan submission and approval dates are included on the cover of this HMP.

## 2.0 Regional Profile

The Region is comprised of 18 municipalities which extend from the southwest “panhandle” of Fairfield County north along the western Connecticut border to include towns in southern Litchfield County as shown on Figure 2-1. This region is a compilation of the former South Western Regional Planning Agency (SWRPA) and the Housatonic Valley Council of Elected Officials regions. The WestCOG member municipalities include:

|                       |                    |
|-----------------------|--------------------|
| Town of Bethel        | Town of Newtown    |
| Town of Bridgewater   | City of Norwalk    |
| Town of Brookfield    | Town of Redding    |
| City of Danbury       | Town of Ridgefield |
| Town of Darien        | Town of Sherman    |
| Town of Greenwich     | City of Stamford   |
| Town of New Canaan    | Town of Weston     |
| Town of New Fairfield | Town of Westport   |
| Town of New Milford   | Town of Wilton     |

These 18 municipalities are diverse in many ways, ranging from urban to rural, from hilly to flat, and from densely to sparsely populated. They have differing levels of economic activity, educational attainment, and ethnic diversity. They enjoy varying levels of accessibility via highways, rail lines, and bus routes. However, they share many common goals, including a strong commitment to protecting their economic interests and businesses from the ravages of natural hazards.

Five of these municipalities have direct coastal frontage on Long Island Sound. Several other municipalities are located less than 10 miles from the coast, while others are located farther inland. The geographic setting has an influence on the frequency and types of natural hazards that can affect the region, as discussed in the next section.

### 2.1 Geographic Setting

#### 2.1.1 Physical Setting

The region is located in the northeastern portion of the Greater New York City metropolitan area and is a gateway region into Connecticut. It is bounded to the west by Westchester County, Putnam County, and Dutchess County, New York; to the north by the Northwest Hills Council of Governments (NHCOG), and to the east by the Naugatuck Valley Council of Governments (NVCOG) and the Connecticut Metropolitan Council of Governments (MetroCOG) communities.

Many municipalities in the region have hilly topography and forested slopes. Other towns are relatively flat, with higher concentrations of prime and statewide-important farmland soils. Topography in the region ranges from sea level along the coastline to over more than 1,000 feet in some parts of Sherman and New Milford. The change in topography means that inland communities can experience significantly different weather and hazard event impacts.

Major transportation routes in the region include Interstate 95 and the Merritt Parkway, which traverse southern Connecticut and connect to Interstate 91 in New Haven and Wallingford, respectively; Route 7 running north from Interstate 95 into New Milford, and Interstate 84 connecting Interstate 684 in New York to Hartford (Interstate 91) and Worcester, Massachusetts. All municipalities in the region access these major routes through local and state highways.

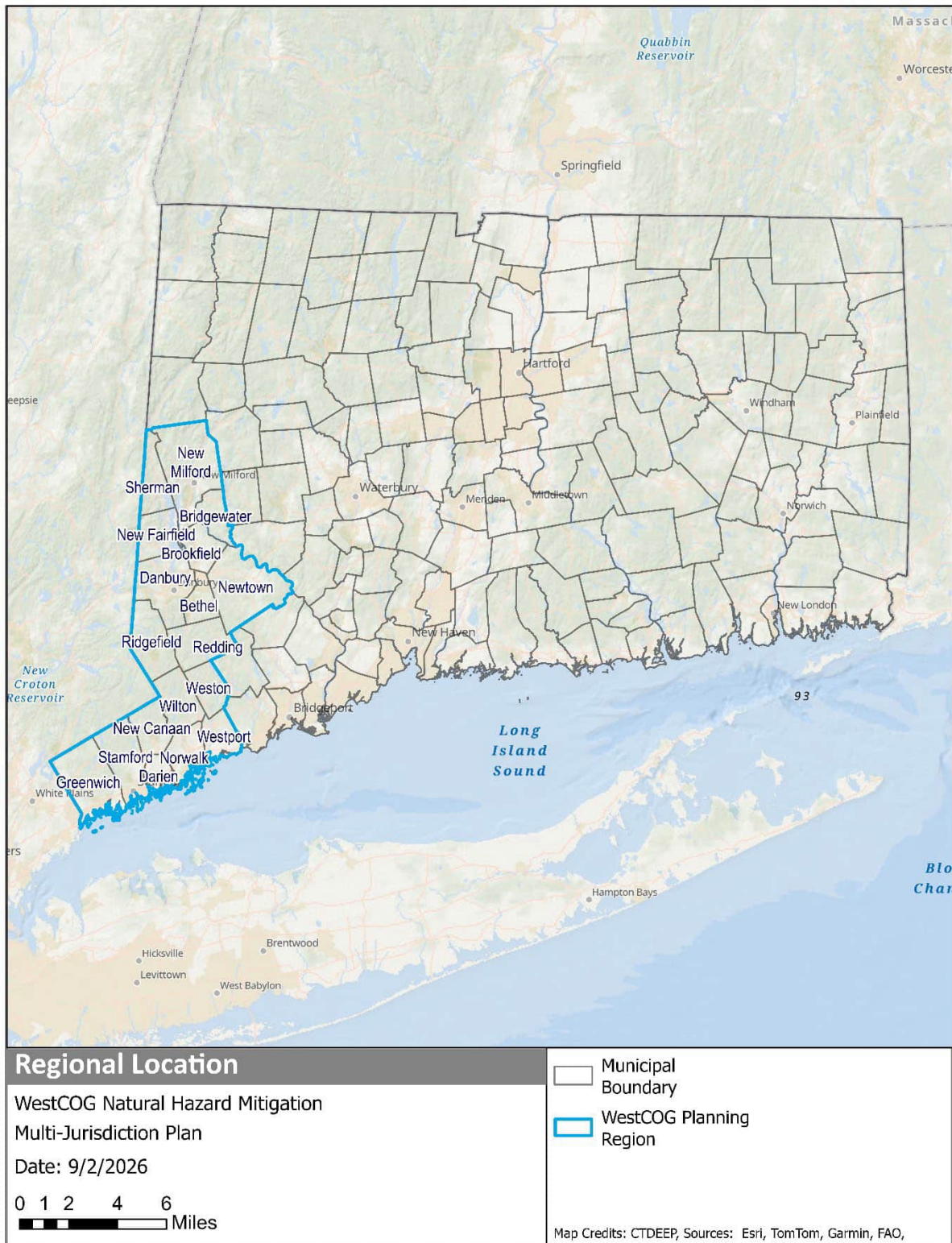


Figure 2-1: Region Map

### 2.1.2 **Geology**

Geology is important to the occurrence and relative effects of natural hazards such as floods and earthquakes. Thus, it is important to understand the geologic setting and variation of bedrock and surficial formations in the Region. Geologic information discussed in the following section was acquired in Geographic Information System (GIS) format from the United States Geological Survey and the Connecticut Department of Energy and Environmental Protection (DEEP).

#### **Bedrock Geology**

The Region is located in the northeastern part of the Appalachian Orogenic Belt, or the "Appalachian Highlands." Bedrock is generally characterized by deformed sedimentary rocks cut through by numerous thrust faults. The most significant thrust fault is Cameron's Line, which runs from New Jersey into Greenwich and along the western portion of the region into Ridgefield. In general, these faults are no longer active and are believed to pose little earthquake hazard. Figure 2-2 presents bedrock geology in the region.

#### **Surficial Geology**

Continental ice sheets moved across Connecticut at least twice in the late Pleistocene era. As a result, the regional surficial geology is characteristic of the depositional environments that occurred during glacial and postglacial periods.

The Region is covered primarily by glacial till (Figure 2-3). Glacial till contains an unsorted mixture of clay, silt, sand, gravel, and boulders deposited by glaciers as a ground moraine. The deposits are generally less than 50 feet thick, although deeper deposits of till are scattered across the region, such as in New Milford. Stratified glaciofluvial deposits generally coincide with stream corridors in each community.

#### **Stratified Glacial Meltwater Deposits**

Stratified glacial meltwater deposits generally coincide with riverine floodplains. These materials were deposited in valleys by glacial streams, and these valleys were later inherited by the larger of our present-day streams and rivers. Large deposits are often associated with public water supply aquifers or wetland areas that provide significant floodplain storage. The smaller glacial till watercourses throughout the region can also cause flooding.

The amount of stratified drift also has bearing on the relative intensity of earthquakes.

#### **Soil Types**

The type of soil present affects how precipitation infiltrates the ground, which in turn affects the timing and magnitude of flooding. According to the United States Department of Agriculture (USDA), soils in the region primarily range from being well-drained to excessively drained, with poorly drained and very poorly drained wetland soils occupying low-lying areas. The ability of soils to encourage infiltration is reduced by impervious surfaces that restrict or prevent it.

### 2.1.3 **Climate and Climate Change**

The region's climate, like the state's, is dominated by a relatively even distribution of precipitation across four seasons, a significant range in temperatures both seasonally and daily, and significant variability in weather over brief time spans as well as across years. Generally, the region has a moderate climate with maximum temperatures ranging from 35° to 40° in winter to 80° to 85° in summer. Average annual precipitation is about 46 inches, although this can vary widely, and the amount of precipitation may be changing as the climate changes. About 40 inches of snow can be expected per year, with wide variation across the region's hills and valleys from year to year.

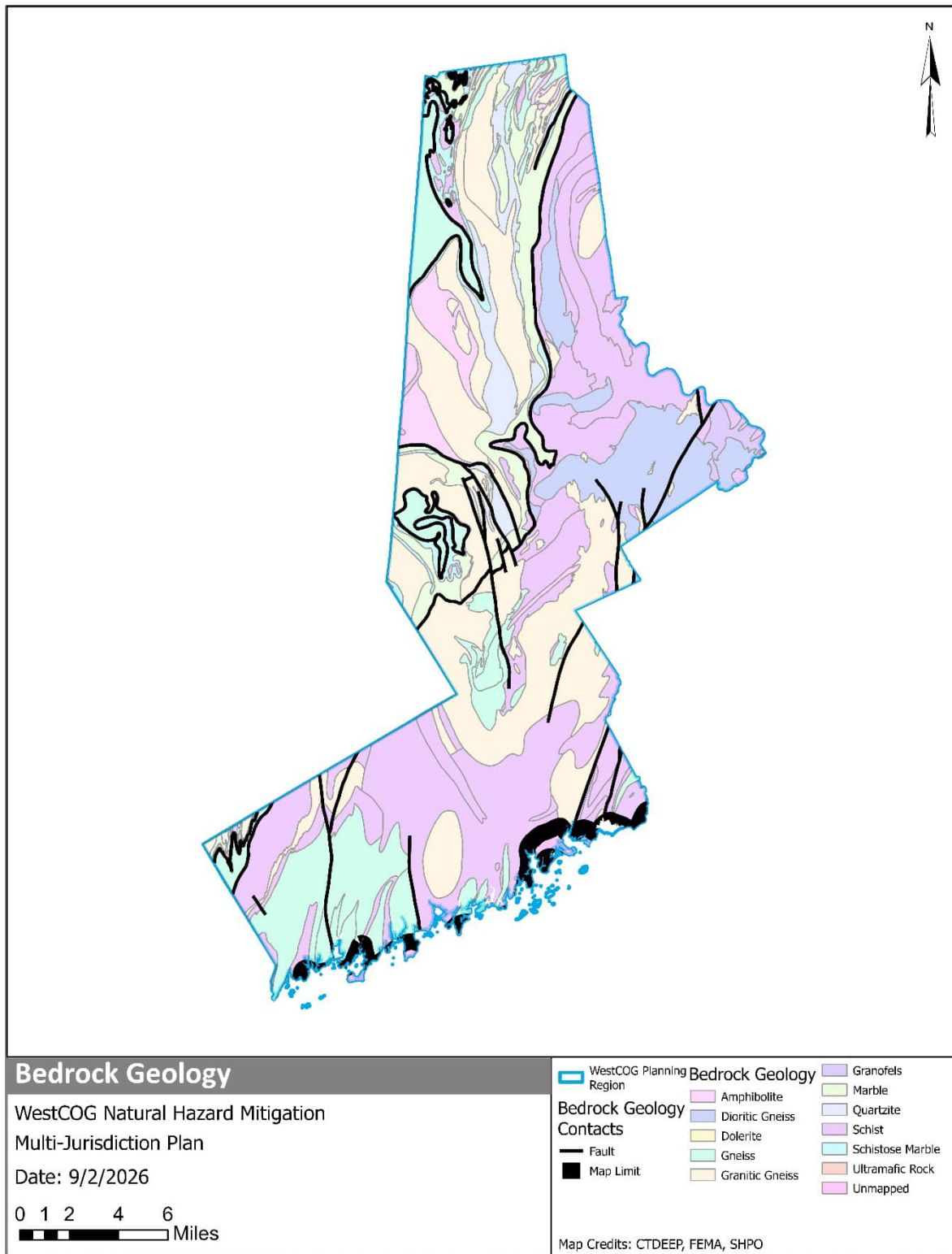


Figure 2-2: Bedrock Geology Map

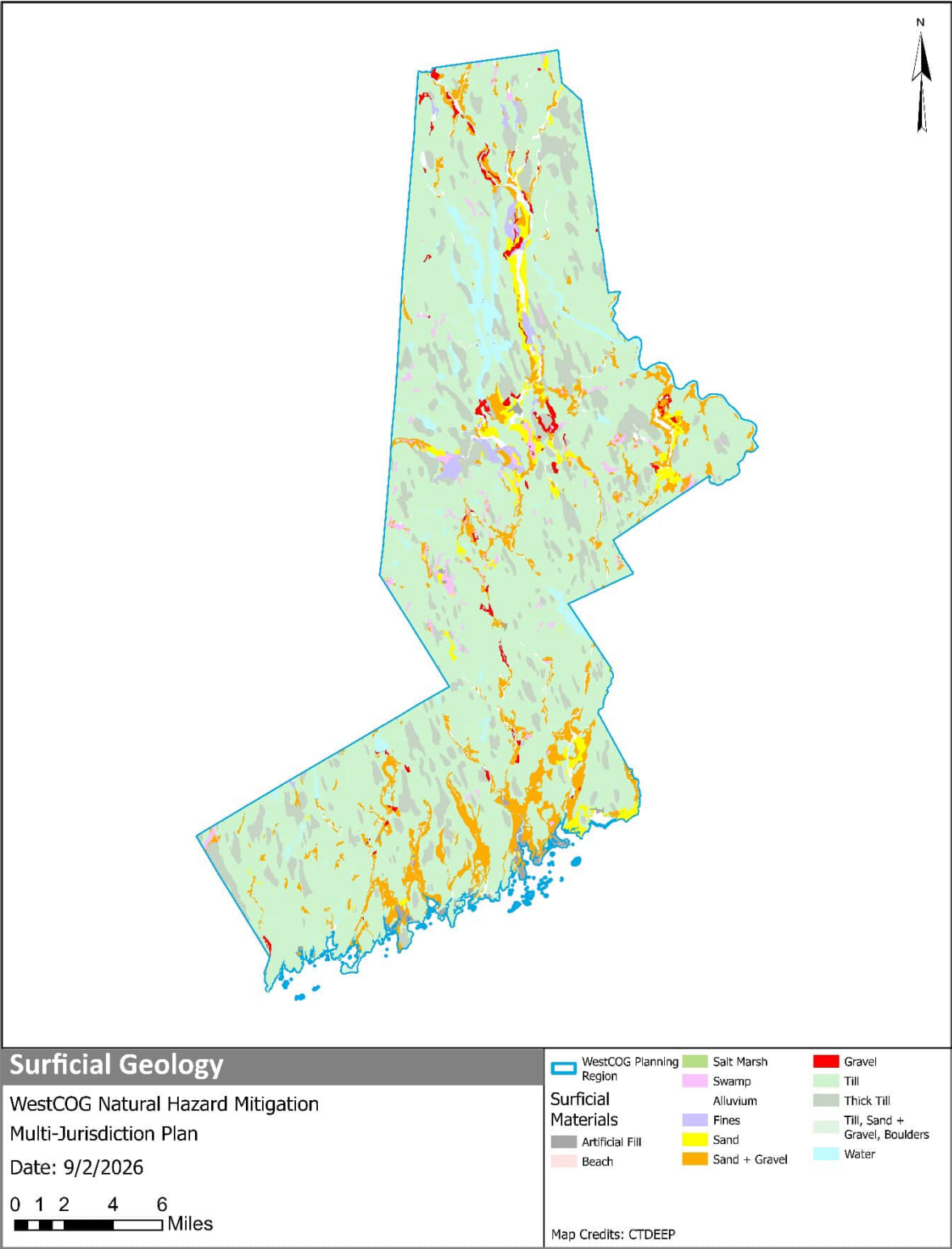


Figure 2-3: Surficial Geology

Climate change is expected to impact temperature, precipitation, and wind patterns and could cause a change in the frequency or intensity of natural hazards such as floods, droughts, winter storms, and damaging rainstorms. Climate change is projected to accelerate observed rates of relative sea level rise. The 2023 Connecticut Natural Hazard Mitigation Plan Update identifies sea level rise as a hazard affecting the state. The state plan evaluated the impact of rises in sea level ranging from 0.5 to 5.0 feet relative to mean sea level. The state analysis determined that a number of state-owned facilities and other critical facilities, such as fire stations, EMS and law enforcement structures, and storage tank farms in Fairfield, New Haven, and New London counties, could be exposed to the risks associated with sea level rise.

Connecticut's lawmakers adopted Public Act No. 18-82, "An Act Concerning Climate Change Planning and Resiliency" in 2018. This Act mandates that sea level rise be considered during planning projects and requires municipalities to consider sea level rise scenarios when preparing hazard mitigation plans.

Many researchers have shown that average annual precipitation in Connecticut has been increasing by 0.95 inches per decade since the end of the 19th century (Miller et al., 1997; NCDC, 2005). In recent years, much of this increase is attributed to extreme storms. Winter has also produced extreme storms in recent years, such as the winter of 2010-2011, which saw upwards of 80 inches of snowfall in parts of Connecticut. The increase in precipitation, along with sea level rise and the potential for increased heavy snowfall during the winter months, must be accounted for in regional planning.

The State Water Plan (2018) notes that there is general consensus in the climate models for a hotter and wetter future. Mean annual temperature changes for the 2080 planning horizon, compared to historical baseline, range from approximately +0.5 °C to + 6.5 °C. Mean annual precipitation changes range from approximately -5% to +30%, with most of the projections predicting an increase in mean annual precipitation.

According to the Connecticut *State Water Plan* (2018) climate change analysis, climate models project a year-round increase in temperature. Projected temperature changes appear relatively consistent across calendar months and percentile levels for each scenario. In other words, both summer and winter temperatures are projected to increase by similar amounts, and a similar shift is observed for both extreme cold and extreme hot months. Precipitation projections are more variable, although consistently projecting a generally wetter future for all four scenarios. The largest precipitation increases

are projected for the wetter months, including extreme wet months. It follows, then, that the seasonality plots show that winter and spring precipitation changes are projected to be larger than those in summer and autumn. Drier months are generally projected to remain about the same in both frequency and rainfall. Small decreases in extreme dry month precipitation are projected for the "hot/dry" scenario.

As the climate continues to change, the Region must consider not just the past and present but also potential future conditions. As the magnitude of precipitation associated with smaller, more frequent storms is expected to increase, design standards will likely need to continue to rise to compensate. Furthermore, as the magnitude of precipitation associated with larger, less frequent storms is expected to increase, more efficient and effective stormwater management controls will be necessary to mitigate flash and poor-drainage flooding.

The Connecticut Institute for Resilience & Climate Adaptation (CIRCA) has conducted a number of key studies over the last few years related to climate change including the Connecticut Physical Climate Science Assessment Report (CT-PCSAR) (2019). The PCSAR notes that according to extreme precipitation observations since 1980, precipitation event intensity has increased in the state, while the number of wet days has decreased. The PCSAR projects an annual average precipitation event increase of 8.5% and 9.5% by mid and late century, respectively, a larger increase in winter and spring seasons. Despite this observed and projected increase in precipitation, the PCSAR also indicates an increase of drought severity and frequency in the coming decades. Increased temperatures are expected to exacerbate evapotranspiration rates, ultimately driving an increased drought risk. Regardless of more intense precipitation events and an increase in annual precipitation, projections suggest a 22% decrease in water availability by late century.

Beyond addressing phenomena such as sea level rise that predominantly impact coastal areas, CIRCA's efforts encompass climatic changes relevant to inland communities, including changes to precipitation, drought, temperature, and inland flooding. CIRCA also funds climate adaptation planning in Connecticut's inland communities; for example, by contributing funding to local hazard mitigation planning. Some of CIRCA's research relevant to the Region is highlighted on Fact Sheets in the appropriate risk sections. These pages are designed to be removed as needed by the Region's community leaders and used to support initiatives related to climate change.

The WestCOG Regional Climate and Stormwater Hazard Assessment (2026) was developed to provide all member municipalities with baseline regional climate data that can be leveraged during the local POCD planning process and beyond. The Assessment provides details on the natural hazard driven by climate change, the impacts of these hazards, and an understanding of how patterns are projected to change in the future. The Assessment analyzes several resources, including some of those discussed above, to understand regional impacts from climate driven events. Overall, the Assessment finds that:

- Extreme storm frequency may not drastically change in the future; however, severity may increase including stronger winds and heavier rainfall.
- Projected precipitation increases can influence natural and built drainage systems, potentially increasing the impacts from pluvial and riverine flooding.
- Coastal flooding is projected to increase both during coastal storm events and during sunny day events; planning thresholds have been established to help communities plan.
- Temperatures are expected to rise by approximately 5°F by 2050 in a high emission scenario; risk may be higher in urbanized areas of the region.

#### 2.1.4 **Hydrology**

One concern raised by continued development in the region is its impact on natural systems, particularly hydrologic systems. Due to its geographic location and topographic variability, actions in the region can affect distant areas, and actions in upstream communities can affect downstream communities.

Several rivers run through the region, including the Housatonic, Still, Saugatuck, Norwalk, Fivemile, Mianus, and Byram. These rivers, along with myriad streams and brooks, feed into and flow from several lakes, ponds, and reservoirs. Candlewood Lake in Sherman, New Milford, New Fairfield, Brookfield, and Danbury is by far the largest lake in the Region. Stream corridors are presented in Figure 2-4.

The concentration of development next to bodies of water introduced an increased risk of flooding and erosion. Flooding from rivers already has dramatic impacts on the region's municipalities, rendering roads impassable and flooding homes and businesses. Flooding is discussed in more detail in Section 3.3.1.

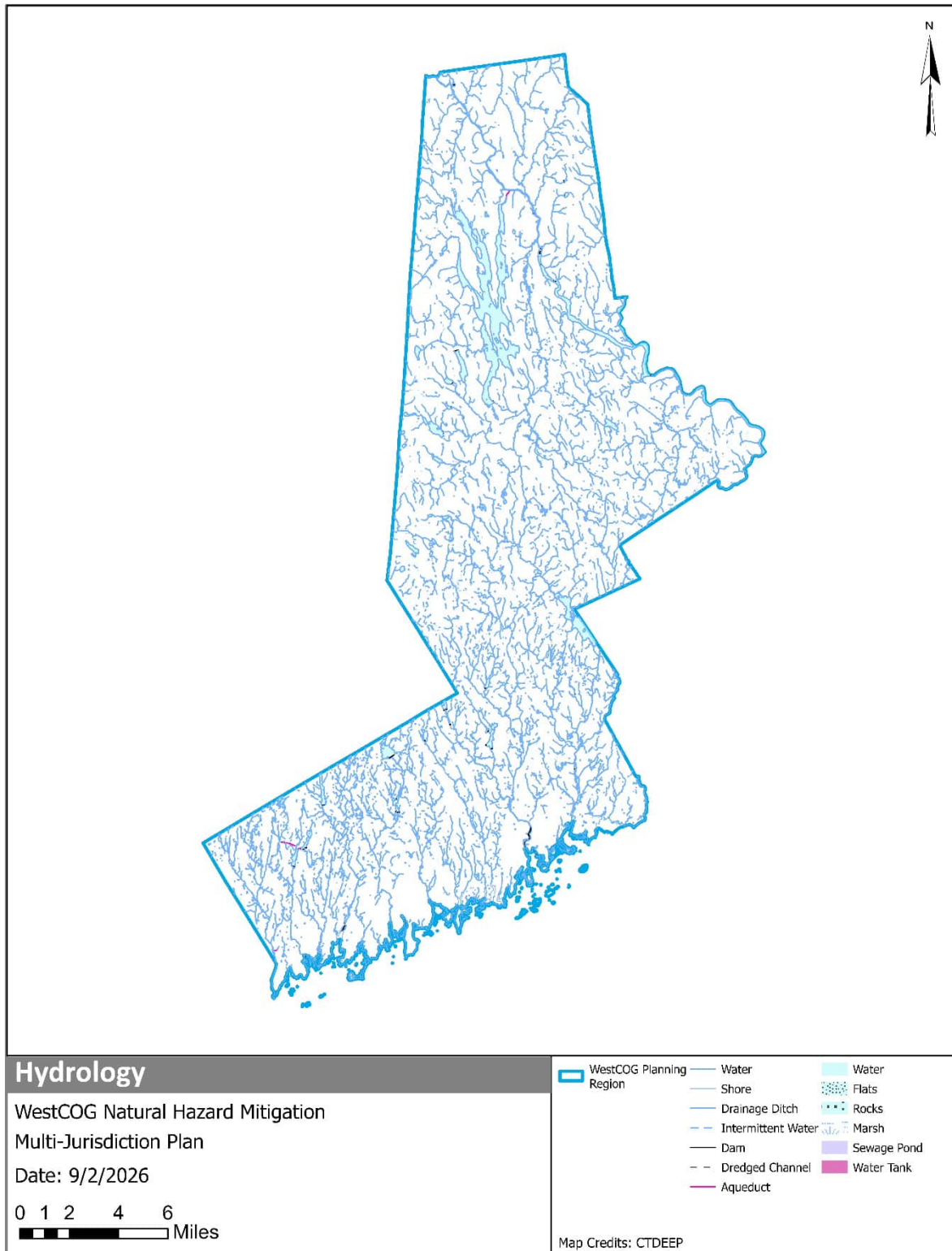


Figure 2-4: Hydrology

## 2.2 Cultural Setting

Many municipalities in the Region exhibit a typical New England development pattern: dense population centers (often more than one per municipality) clustered around rivers or the shoreline, where mills and other businesses were once located. These population centers may have a rich mix of uses, with additional residential development spiraling outward, creating relatively compact villages. While this historic pattern can result in picturesque community centers, it has also, in many cases, increased the potential for flood damage. Development in recent decades has largely abandoned the traditional centralized pattern and adopted a more sprawling one, with new development radiating ever farther from traditional population centers and filling in the open space and former agricultural fields that once separated village centers.

### 2.2.1 Demographic Setting and Trends

#### Population

The Region is considered one of the most heavily populated and densely developed areas in Connecticut. According to the 2020 U.S. Census, the total population for the Region was 620,549 or 17.2% of the State's total population. The U.S. Census Population Estimates Program estimated the Region's population at 637,013 – an increase of over 16,000 – in 2024. Table 2-1 presents the population and population density for each WestCOG municipality in 2020 and 2024. Figure 2-5 presents 2020 population density by Census tract.

**Table 2-1: Census Population and Density 2020 Figures and 2024 Estimates**

| Municipality       | Land Area*<br>(sq. mi.) | 2020<br>Population | 2020<br>Density | 2024 Population<br>Estimate | 2024<br>Density |
|--------------------|-------------------------|--------------------|-----------------|-----------------------------|-----------------|
| Bethel             | 16.9                    | 20,358             | 1,204.6         | 21,490                      | 1,271.6         |
| Bridgewater        | 16.4                    | 1,662              | 96.1            | 1,671                       | 96.6            |
| Brookfield         | 19.8                    | 17,528             | 859.2           | 18,186                      | 891.5           |
| Danbury            | 41.9                    | 86,518             | 1,957.9         | 88,692                      | 2,007.1         |
| Darien             | 12.7                    | 21,499             | 918.8           | 22,528                      | 962.7           |
| Greenwich          | 47.6                    | 63,518             | 1,331.1         | 64,594                      | 1,353.6         |
| New Canaan         | 22.2                    | 20,622             | 916.1           | 21,160                      | 940.0           |
| New Fairfield      | 20.4                    | 13,579             | 541.0           | 13,651                      | 543.9           |
| New Milford        | 61.6                    | 28,115             | 441.4           | 28,745                      | 451.3           |
| Newtown            | 57.7                    | 27,173             | 450.0           | 28,029                      | 464.2           |
| Norwalk            | 22.9                    | 91,184             | 2,507.1         | 93,661                      | 2,575.2         |
| Redding            | 31.5                    | 8,765              | 273.1           | 8,830                       | 275.1           |
| Ridgefield         | 34.5                    | 25,033             | 715.2           | 25,300                      | 722.9           |
| Sherman            | 21.9                    | 3,527              | 150.7           | 3,601                       | 153.9           |
| Stamford           | 37.6                    | 135,470            | 2,603.7         | 139,134                     | 2,674.1         |
| Weston             | 19.8                    | 10,354             | 500.2           | 10,490                      | 506.8           |
| Westport           | 20.0                    | 27,141             | 811.4           | 27,996                      | 837.0           |
| Wilton             | 26.8                    | 18,503             | 675.3           | 19,255                      | 702.7           |
| <b>WestCOG</b>     | <b>532.1</b>            | <b>620,549</b>     | <b>1,030.7</b>  | <b>637,013</b>              | <b>1,058.1</b>  |
| <b>State of CT</b> | <b>4,842.4</b>          | <b>3,605,944</b>   | <b>744.7</b>    | <b>3,674,449</b>            | <b>758.8</b>    |

\*Source: U.S. Census Bureau 2010 Land Area

Source: U.S. Census Bureau

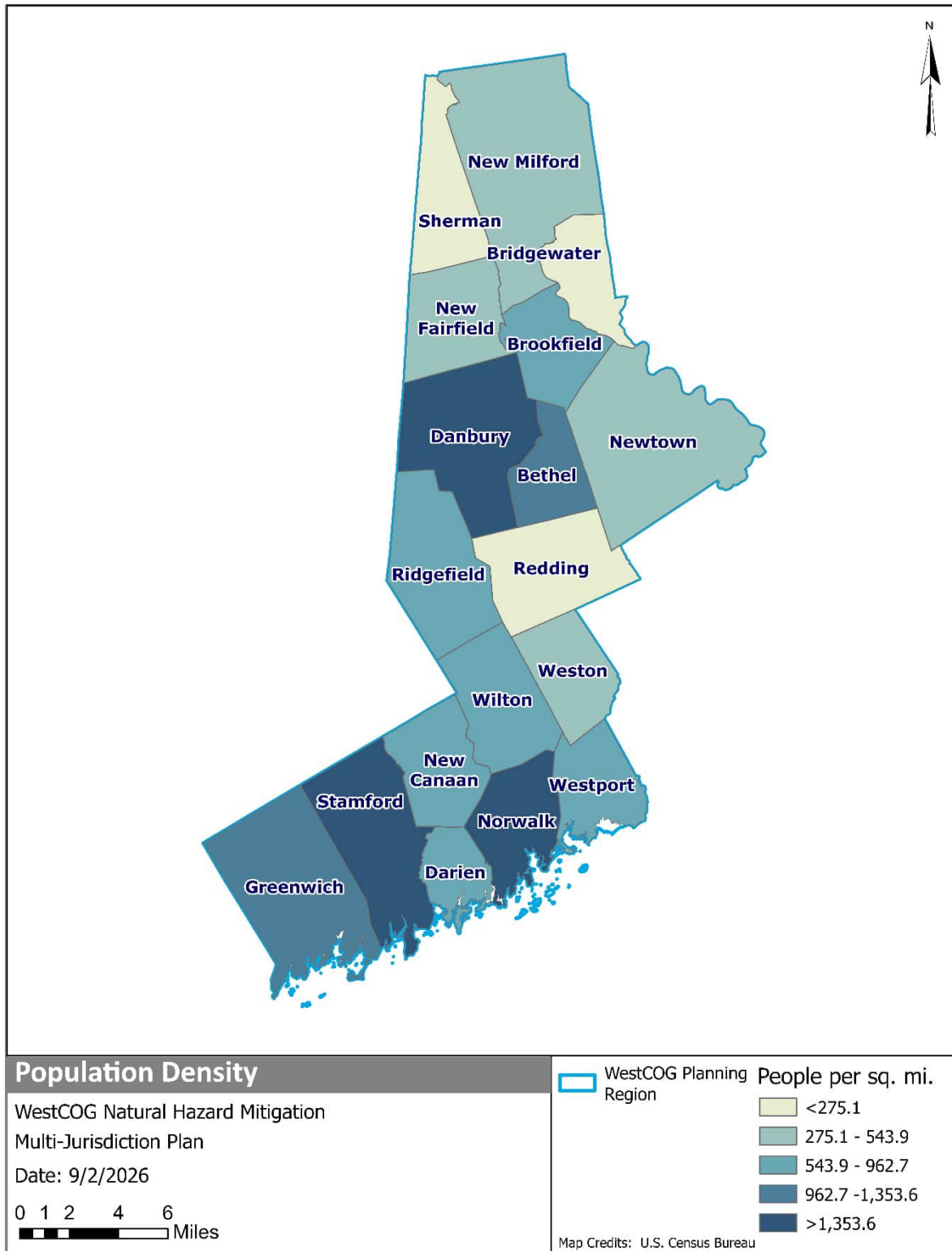


Figure 2-5: Population Density

Between 2010 and 2020, the population of the region grew by about 5.3% according to the 2020 U.S. Census (Table 2-2). The fastest growth was seen in Stamford (10.5% increase). The slowest growth was in Redding (4.3% decrease in its population). Populations grew across all municipalities between 2020 and 2024, according to U.S. Census 2024 estimates, with regional growth at 2.7% and local growth between 0.5% (Bridgewater and New Fairfield) and 5.6% (Bethel). According to projections developed by the Connecticut State Data Center (CTSDC) in 2017 (prior to the release of the 2020 Census figures), the population in the Region may significantly contract over the next 20 years. Given more recent data, it is highly unlikely that future populations will match these projections, but it is worth noting a general, longer-term of population loss in the region.

Table 2-2: Population Growth

| Municipality       | 2010             | 2020             | 2024             | 2040             | 2010-2020   | 2020-2024   | 2024-2040        |
|--------------------|------------------|------------------|------------------|------------------|-------------|-------------|------------------|
|                    | Population       | Population       | Estimate*        | Projection**     | Change      | Change      | Projected Change |
| Bethel             | 18,584           | 20,358           | 21,490           | 15,006           | 9.6%        | 5.6%        | -30.2%           |
| Bridgewater        | 1,727            | 1,662            | 1,671            | 935              | -3.8%       | 0.5%        | -44.0%           |
| Brookfield         | 16,452           | 17,528           | 18,186           | 14,513           | 6.5%        | 3.8%        | -20.2%           |
| Danbury            | 80,890           | 86,518           | 88,692           | 94,604           | 7.0%        | 2.5%        | 6.7%             |
| Darien             | 20,732           | 21,499           | 22,528           | 22,251           | 3.7%        | 4.8%        | -1.2%            |
| Greenwich          | 61,171           | 63,518           | 64,594           | 47,129           | 3.8%        | 1.7%        | -27.0%           |
| New Canaan         | 19,738           | 20,622           | 21,160           | 18,563           | 4.5%        | 2.6%        | -12.3%           |
| New Fairfield      | 13,881           | 13,579           | 13,651           | 7,325            | -2.2%       | 0.5%        | -46.3%           |
| New Milford        | 28,142           | 28,115           | 28,745           | 22,720           | -0.1%       | 2.2%        | -21.0%           |
| Newtown            | 27,560           | 27,173           | 28,029           | 28,220           | -1.4%       | 3.2%        | 0.7%             |
| Norwalk            | 85,603           | 91,184           | 93,661           | 90,248           | 6.5%        | 2.7%        | -3.6%            |
| Redding            | 9,158            | 8,765            | 8,830            | 9,007            | -4.3%       | 0.7%        | 2.0%             |
| Ridgefield         | 24,638           | 25,033           | 25,300           | 22,188           | 1.6%        | 1.7%        | -12.3%           |
| Sherman            | 3,581            | 3,527            | 3,601            | 1,803            | -1.5%       | 2.1%        | -49.9%           |
| Stamford           | 122,643          | 135,470          | 139,134          | 128,829          | 10.5%       | 2.7%        | -7.4%            |
| Weston             | 10,179           | 10,354           | 10,490           | 7,006            | 1.7%        | 1.3%        | -33.2%           |
| Westport           | 26,391           | 27,141           | 27,996           | 21,690           | 2.8%        | 3.2%        | -22.5%           |
| Wilton             | 18,062           | 18,503           | 19,255           | 14,645           | 2.4%        | 4.1%        | -23.9%           |
| <b>WestCOG</b>     | <b>589,135</b>   | <b>620,549</b>   | <b>637,013</b>   | <b>566,682</b>   | <b>5.3%</b> | <b>2.7%</b> | <b>-11.0%</b>    |
| <b>State of CT</b> | <b>3,574,097</b> | <b>3,605,944</b> | <b>3,674,449</b> | <b>3,653,954</b> | <b>0.9%</b> | <b>1.9%</b> | <b>-0.6%</b>     |

Source: U.S. Census Bureau

\*Source: US Census Bureau, Population Estimates Program, Vintage 2024 Estimates

\*\*Source: Connecticut State Data Center Population Projections (2017)

Overall, the WestCOG region has been experiencing modest growth in recent years. Most planners believe that the population will remain flat or increase at a similar modest rate over the next few years.

According to the U.S. Census, approximately 17% of the region's total population is 65 years old or older. The CTSDC projects that the population aged 60 and older in every WestCOG municipality will decrease over the next 20 years. The WestCOG Regional Plan of Conservation and Development (POCD) anticipates an increase in the region's senior population. According to Connecticut's State Plan on Aging (2024), the statewide population over 65 years was 17.4% of the total population in 2018, is expected to be 20% of the total population by 2030, and may increase to be 27% of the total population by 2040. While recent population changes and demographic shifts have not been fully accounted for in these projections, there is general agreement in the literature that the region's population will likely continue to become older, on average.

This demographic shift presents potential difficulties in mitigating and responding to hazardous conditions. Older populations may be less mobile, more dependent on neighbors and family, and less able to evacuate or survive in isolation. They may also be unable to endure extended periods without heat or electricity. Facilities caring for the older populations need to be equipped with supplies that can allow residents to shelter in place. Municipalities must consider the added need for medical sheltering. Therefore, resilience plans for an aging population must address protection of critical facilities and vulnerable populations to ensure that all residents are able to weather natural hazard events. However, the projected reduction in population (and by extension, potential municipal revenue) may reduce community capabilities to assist these populations.

**Table 2-3: Population Aged 65 and Above, 2020**

| <b>Municipality</b> | <b>2020 Estimate</b> | <b>Population Percentage</b> |
|---------------------|----------------------|------------------------------|
| Bethel              | 3,339                | 16.4%                        |
| Bridgewater         | 648                  | 39.0%                        |
| Brookfield          | 3,295                | 18.8%                        |
| Danbury             | 14,881               | 17.2%                        |
| Darien              | 2,945                | 13.7%                        |
| Greenwich           | 11,878               | 18.7%                        |
| New Canaan          | 3,196                | 15.5%                        |
| New Fairfield       | 2,729                | 20.1%                        |
| New Milford         | 4,976                | 17.7%                        |
| Newtown             | 4,973                | 18.3%                        |
| Norwalk             | 15,501               | 17.0%                        |
| Redding             | 2,314                | 26.4%                        |
| Ridgefield          | 4,681                | 18.7%                        |
| Sherman             | 1,164                | 33.0%                        |
| Stamford            | 21,946               | 16.2%                        |
| Weston              | 1,791                | 17.3%                        |
| Westport            | 5,021                | 18.5%                        |
| Wilton              | 2,960                | 16.0%                        |
| <b>WestCOG</b>      | <b>108,241</b>       | <b>17.4%</b>                 |
| <b>State of CT*</b> | <b>627,434</b>       | <b>17.4%</b>                 |

Source: U.S. Census Bureau

\*Source: Connecticut's State Plan on Aging, 2024-2027

### Vulnerable Populations

Vulnerable populations may include not only senior citizens and persons who are less mobile, but also low-income and minority populations, some of whom may have difficulty evacuating or protecting their homes or may miss critical information due to limited ability to speak and understand English. According to the 2020 U.S. Census, more than 29% of the Region's population speak a language other than English at home (Table 2-4). Public education efforts must consider each municipality's particular language groups and make sure that information is made available to them, so that mitigation planning efforts do not systematically discriminate against non-English speaking communities.

**Table 2-4: Percent of Population (over 5) that Speaks a Language other than English at Home**

| Municipality  | Speak English<br>"Very Well" | Speak English<br>Less Than "Very<br>Well" |
|---------------|------------------------------|-------------------------------------------|
| Bethel        | 94.8%                        | 5.2%                                      |
| Bridgewater   | 99.6%                        | 0.4%                                      |
| Brookfield    | 95.4%                        | 4.6%                                      |
| Danbury       | 78.8%                        | 21.2%                                     |
| Darien        | 97.1%                        | 2.9%                                      |
| Greenwich     | 91.3%                        | 8.7%                                      |
| New Canaan    | 96.2%                        | 3.8%                                      |
| New Fairfield | 98.1%                        | 1.9%                                      |
| New Milford   | 96.6%                        | 3.4%                                      |
| Newtown       | 97.4%                        | 2.6%                                      |
| Norwalk       | 83.2%                        | 16.8%                                     |
| Redding       | 98.2%                        | 1.8%                                      |
| Ridgefield    | 98.1%                        | 1.9%                                      |
| Sherman       | 99.2%                        | 0.8%                                      |
| Stamford      | 81.5%                        | 18.5%                                     |
| Weston        | 98.6%                        | 1.4%                                      |
| Westport      | 97.2%                        | 2.8%                                      |
| Wilton        | 96.8%                        | 3.2%                                      |

Source: U.S. Census Bureau

Low-income households and individuals may be at greater risk to natural hazards than more affluent neighbors. These populations are more likely to rely on transit for transportation (which can be problematic when a disaster hits), have fewer resources to devote to disaster preparation, and have fewer resources to draw on to aid in recovery. According to the U.S. Bureau of Labor Statistics, the per capita income for the United States was \$56,514. In Connecticut it was \$76,832, but according to the 2020 U.S. Census, eight WestCOG communities have per capita incomes below that state average (Table 2-5). The percentage of people below the poverty level is significantly lower than the state average in most WestCOG municipalities, with only Danbury, Norwalk, and Stamford near the state average of 10%.

**Table 2-5: Income Statistics**

| Municipality  | Median<br>Household<br>Income | Per<br>Capita<br>Income | Percent of<br>People Below<br>Poverty Level |
|---------------|-------------------------------|-------------------------|---------------------------------------------|
| Bethel        | \$116,541                     | \$58,019                | 5.80%                                       |
| Bridgewater   | \$140,833                     | \$82,248                | 2.30%                                       |
| Brookfield    | \$148,360                     | \$71,355                | 4.10%                                       |
| Danbury       | \$83,393                      | \$45,585                | 11.70%                                      |
| Darien        | \$250,000+                    | \$152,454               | 5.80%                                       |
| Greenwich     | \$206,130                     | \$137,685               | 6.1%                                        |
| New Canaan    | \$250,000+                    | \$143,695               | 3.70%                                       |
| New Fairfield | \$137,647                     | \$61,068                | 3.60%                                       |
| New Milford   | \$106,411                     | \$52,292                | 7.10%                                       |
| Newtown       | \$155,110                     | \$71,818                | 4.50%                                       |
| Norwalk       | \$107,616                     | \$61,397                | 9.10%                                       |

| Municipality        | Median Household Income | Per Capita Income | Percent of People Below Poverty Level |
|---------------------|-------------------------|-------------------|---------------------------------------|
| Redding             | \$186,060               | \$96,415          | 4.00%                                 |
| Ridgefield          | \$179,219               | \$92,891          | 3.50%                                 |
| Sherman             | \$107,375               | \$105,733         | 2.20%                                 |
| Stamford            | \$111,586               | \$67,068          | 10.10%                                |
| Weston              | \$250,000+              | \$127,002         | 1.80%                                 |
| Westport            | \$250,000+              | \$134,276         | 3.2%                                  |
| Wilton              | \$242,199               | \$113,354         | 2.40%                                 |
| <b>State of CT*</b> | <b>\$79,855</b>         | <b>\$76,832</b>   | <b>10.0 – 10.5 %</b>                  |

Source: U.S. Census Bureau

\*Source: U.S. Bureau of Labor Statistics

### Social Vulnerability Index

The demographics of each WestCOG municipality vary, and therefore, the impacts on these populations will also vary. To better understand the potential impacts and societal vulnerability of the Region, Social Vulnerability Index (SOVI) figures were extracted from the FEMA National Risk Index (NRI). The NRI uses ten socioeconomic variables, with values sourced from the Census, to assess how communities may be limited in their capacities to prepare for, respond to, and recover from hazards. These variables are:

1. Income-to-Poverty Ratio
2. Single or zero caregiver household
3. Unit-level crowding
4. Communication barrier
5. Lack of Employment
6. Disability
7. No health insurance coverage
8. Being aged 65 years or older
9. No vehicle access
10. Households without broadband internet access

Additional information about the NRI is provided in Section 3.2.

The breakdown of SOVI values by census tract is presented on the following page.

To get an idea of social vulnerability within each community in the COG, a breakdown of the number of census tracts at each social vulnerability rating is shown below in Table 2-6. The cities of Stamford, Danbury, and Norwalk are the only areas within WestCOG with very high social vulnerability within their boundaries. Additionally, the Town of Greenwich has a few census tracts with relatively high social vulnerability.

Consider the following:

- Communities with a high socioeconomic vulnerability may find it challenging in assisting lower income residents with recovery efforts, dispersing information, or keeping residents and families housed after a large event.

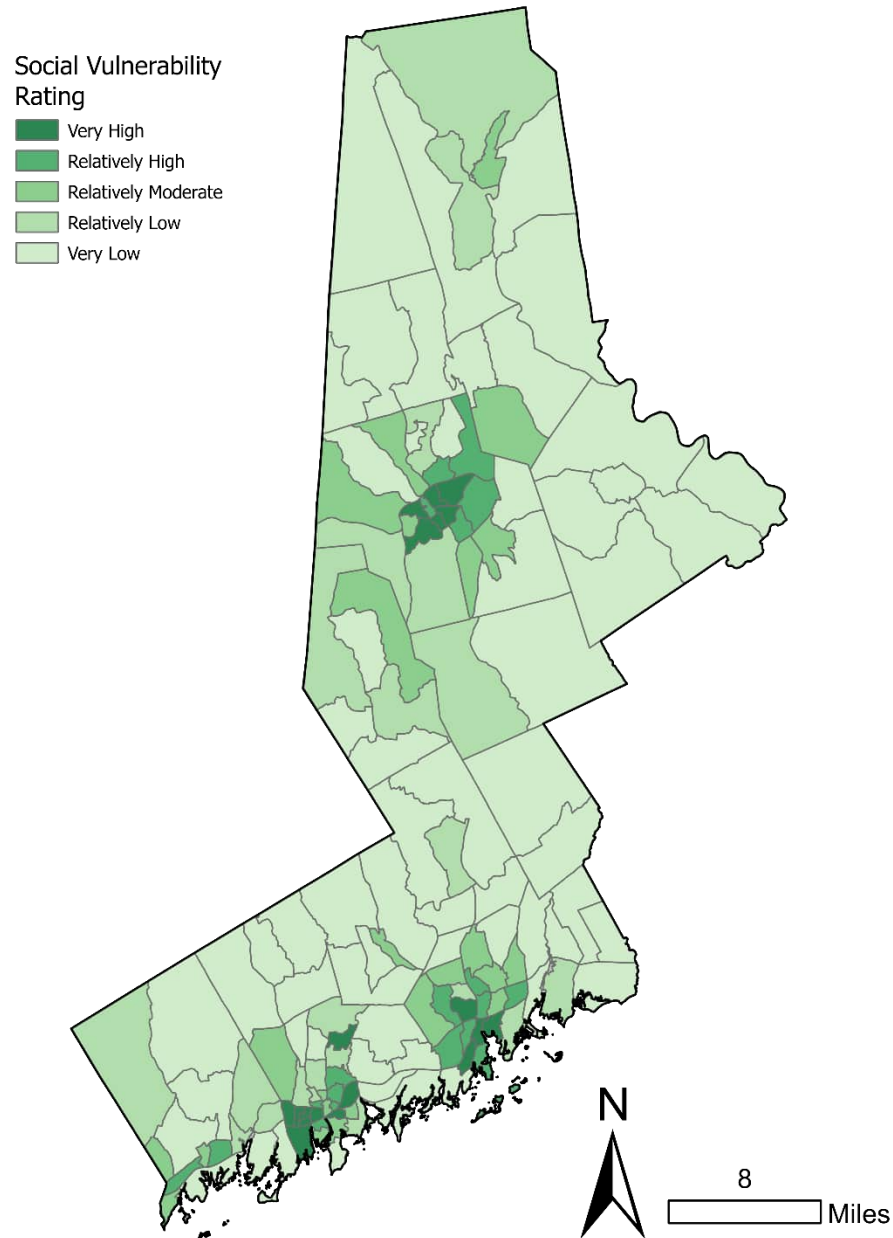


**Figure 2-6: Social Vulnerability Rating by Census Tract in WestCOG**

- Communities with vulnerable populations in relation to composition and disability may find challenges in evacuating populations, maintaining adequate shelters for those with special needs, and ensuring family support services are available for single-parent households during and in the wake of an event.
- Municipalities with vulnerable populations who identify as a minority and speak English “less than well” such as may face the issue of information distribution or access to resources. Multi-language resources and emergency notifications should be developed to disseminate to those communities.

**Table 2-6: Social Vulnerability Rating by Community**

| Community      | Total Census Tracts | Number of Census Tracts with Very Low SOVI | Number of Census Tracts with Relatively Low SOVI | Number of Census Tracts with Relatively Moderate SOVI | Number of Census Tracts with Relatively High SOVI | Number of Census Tracts with Very High SOVI |
|----------------|---------------------|--------------------------------------------|--------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|---------------------------------------------|
| Bethel         | 4                   | 2                                          | -                                                | 2                                                     | -                                                 | -                                           |
| Bridgewater    | 1                   | 1                                          | -                                                | -                                                     | -                                                 | -                                           |
| Brookfield     | 3                   | 2                                          | -                                                | 1                                                     | -                                                 | -                                           |
| Danbury        | 20                  | 3                                          | 3                                                | 3                                                     | 5                                                 | 6                                           |
| Darien         | 5                   | 5                                          | -                                                | -                                                     | -                                                 | -                                           |
| Greenwich      | 15                  | 6                                          | 4                                                | 3                                                     | 2                                                 | -                                           |
| New Canaan     | 5                   | 4                                          | -                                                | 1                                                     | -                                                 | -                                           |
| New Fairfield  | 3                   | 3                                          | -                                                | -                                                     | -                                                 | -                                           |
| New Milford    | 5                   | 2                                          | 2                                                | 1                                                     | -                                                 | -                                           |
| Newtown        | 6                   | 6                                          | -                                                | -                                                     | -                                                 | -                                           |
| Norwalk        | 22                  | 3                                          | 2                                                | 6                                                     | 7                                                 | 4                                           |
| Redding        | 2                   | 1                                          | 1                                                | -                                                     | -                                                 | -                                           |
| Ridgefield     | 6                   | 3                                          | 2                                                | 1                                                     | -                                                 | -                                           |
| Sherman        | 1                   | 1                                          | -                                                | -                                                     | -                                                 | -                                           |
| Stamford       | 33                  | 7                                          | 6                                                | 6                                                     | 5                                                 | 9                                           |
| Weston         | 2                   | 2                                          | -                                                | -                                                     | -                                                 | -                                           |
| Westport       | 7                   | 6                                          | 1                                                | -                                                     | -                                                 | -                                           |
| Wilton         | 5                   | 4                                          | 1                                                | -                                                     | -                                                 | -                                           |
| <b>WestCOG</b> | <b>145</b>          | <b>61</b>                                  | <b>22</b>                                        | <b>24</b>                                             | <b>19</b>                                         | <b>19</b>                                   |

- In addition, some minority populations may also face other socioeconomic issues which ultimately results in challenges such as access to evacuation transportation, safe sheltering during an event, and the financial means for property recovery and repairs.
- Vulnerabilities associated with housing type and transportation capabilities can present challenges due to high density housing and evacuation efforts or emergency response, lack of transportation for preparation and evacuation, or vulnerability in constructions type such as mobile homes.

It is important for municipalities to identify and locate these populations to ensure they are aware of hazards and are able to access the necessary resources for response and recovery.

### 2.2.2 Economic Profile and Trends

Many WestCOG municipalities have roots dating back to the pre-Revolutionary War era. Agricultural settlements formed near a village or parish center, typically located near a major waterway to support a mill. As the industrial revolution took hold, factories were built, watercourses were dammed to supply water, and housing developments were constructed to support workers. Along the shoreline, ports provided commercial access for goods, with railroads eventually built to facilitate the transport of goods and materials to and from inland areas. Textile industries (such as the hat industry in Danbury), which employed significant percentages of the region's workforce in the 19th century, eventually gave way to today's economic profile.

### Economic Advantages

The Region is currently endowed with many economic assets and competitive advantages and is home to the headquarters and branches of many large national enterprises that bring recognition to the region. The primary economic strength of the region is its proximity to the major metropolitan markets of New York and Boston (Greenwich is 35 miles and Danbury is 68 miles from New York City). The region's cities are well-positioned to support major employers, while the region's larger corporate office parks in Brookfield, Danbury, Darien, Greenwich, Newtown, Redding, Westport, and Wilton provide vital professional and managerial services, as well as serving as corporate headquarters for many employers.

WestCOG's Comprehensive Economic Development Strategy (CEDS) identifies the Region's strong mix of industry sectors, large number of Fortune 500 companies, and diverse, educated workforce as key economic advantages. According to the Regional POCD, the five major industries in the region in terms of percent of estimated employment include educational services and health care (21%); professional, scientific and management and administrative services (17%); finance, insurance, and real estate (14%); retail trade (10%); and arts, entertainment, recreation, and accommodation and food services (8%). Major employers employing more than 1,000 employees include Pitney Bowes, Gartner Inc., Deloitte, and Stamford Hospital in Stamford, Boehringer Ingelheim and Danbury Hospital in Danbury, Norwalk Hospital, and Greenwich Hospital. The 63 largest employees account for approximately 85,000 jobs or nearly a third of all employment in the region. The greatest concentrations of employment are in Danbury, Greenwich, Norwalk, and Stamford.

Commerce and industry both provide employment and heavily support local government services, which enable municipalities to reduce the burden of property taxes on homeowners. According to the Regional POCD, in 2017 commercial and industrial landowners accounted for 15% of the region's net grand list, with higher percentages in the cities. Over the last 10 years only Danbury, Norwalk, and Stamford have seen an appreciable increase in their labor force. This trend is likely to continue based on the range of public services, transportation systems, and access these urban centers offer to the regional labor market.

According to the Regional POCD, 67% of residents worked in the region in 2002, dropping to 61% in 2015. In 2015, 26% of the region's residents traveled 25 or more miles to reach work, up from 22% in 2002. Based on the overall success many industries had with employees working from home during the COVID-19 pandemic in 2020, it is unclear at this point what percentage of workers will continue to commute in the region and what percentage will work primarily from home in the future.

### Economic Challenges

Regional challenges related to employment include highway congestion along the Merritt Parkway and Interstate 95, and the occurrence of jobs either distant from, or requiring more skills than, the unemployed population presently has acquired.

WestCOG municipalities are either part of the Danbury labor market or the Bridgeport-Stamford labor market. According to the Connecticut Department of Labor, the unemployment rates in these markets were 5.1% and 6.2%, respectively, an improvement over the 10-11% rates in the spring of 2020. In general, unemployment in Connecticut tends to be equal to or less than the nationwide unemployment rate. Additional economic challenges identified within the CEDS include a self-perpetuated negative image of Connecticut as unfriendly to business, the high cost of living and salary demands, high taxes, and challenges in obtaining business loans.

Highways and electric power, the lifeblood of modern production, can be shut down by an extreme weather event, thereby halting economic activity. If a business is forced to close because of weather, physical damage, or any other emergency event, the forfeited production and forgone wages often represent a permanent economic loss. Anecdotal evidence from local chambers of commerce and business leaders indicates that for a small or medium sized business even a couple of days

of lost production can be enough to lead to closure. The proportion of local enterprises and jobs that are located in flood zones represents an easily identifiable economic risk.

While the region is well connected with a variety of transportation routes traversing its seven municipalities, it is essential that these routes remain passable during and following a disaster to allow residents to access shelters and also provide efficient and timely recovery of the region's businesses. Evacuation assistance for critical and special needs populations in the 18 municipalities is handled differently in each community.

WestCOG's CEDS provides a plan to remedy employment challenges in the region. The six major goals for the strategy include regional planning and coordination, an improved business climate, an inclusive workforce, an improved and maintained transportation and public infrastructure, a more sustainable and resilient region, and a positive regional identity. Priority projects associated with the strategy invest in the region's economic future, with selections made based on the ability to create and retain jobs, protect the environment, and have a positive regional economic impact.

### 2.2.3 Development Trends

The Region hosts significant commercial, industrial, and public properties, including regional employment centers, airports and ports, commercial and industrial parks and areas, and major retail developments. According to 2023 equalized net grand list data, the region contains \$274.6 billion in taxable real, personal, and motor vehicle property (see table below).

**Table 2-7: 2023 Grand List Data by Municipality**

| Municipality   | Total Equalized Net Grand List | R          | CIU        | PP        | O         |
|----------------|--------------------------------|------------|------------|-----------|-----------|
| Bethel         | \$4,831,196,799                | 76%        | 11%        | 12%       | 1%        |
| Bridgewater    | \$819,224,616                  | 89%        | 1%         | 6%        | 4%        |
| Brookfield     | \$5,413,506,577                | 74%        | 14%        | 11%       | 1%        |
| Danbury        | \$18,097,167,140               | 67%        | 20%        | 11%       | 1%        |
| Darien         | \$15,878,088,806               | 86%        | 8%         | 5%        | 1%        |
| Greenwich      | \$70,216,415,096               | 83%        | 13%        | 4%        | 0%        |
| New Canaan     | \$14,147,485,908               | 90%        | 5%         | 5%        | 1%        |
| New Fairfield  | \$3,978,836,495                | 89%        | 3%         | 7%        | 1%        |
| New Milford    | \$6,656,543,875                | 77%        | 8%         | 11%       | 4%        |
| Newtown        | \$7,869,933,491                | 82%        | 8%         | 9%        | 1%        |
| Norwalk        | \$29,661,296,147               | 72%        | 18%        | 9%        | 1%        |
| Redding        | \$3,403,084,620                | 86%        | 5%         | 8%        | 1%        |
| Ridgefield     | \$10,439,958,414               | 83%        | 10%        | 7%        | 1%        |
| Sherman        | \$1,239,964,810                | 91%        | 0%         | 7%        | 1%        |
| Stamford       | \$44,589,865,734               | 71%        | 19%        | 9%        | 1%        |
| Weston         | \$4,620,651,677                | 92%        | 1%         | 6%        | 1%        |
| Westport       | \$24,601,750,524               | 84%        | 10%        | 5%        | 1%        |
| Wilton         | \$8,139,405,197                | 78%        | 11%        | 10%       | 1%        |
| <b>WestCOG</b> | <b>\$274,604,375,926</b>       | <b>79%</b> | <b>13%</b> | <b>7%</b> | <b>1%</b> |

Source: Connecticut Office of Policy and Management

Not all properties are equally vulnerable to any given natural hazard, as location and building materials influence vulnerability; nevertheless, the region risks substantial financial losses from catastrophic natural hazards affecting not only property but also business and government operations.

According to the 2025 Population and Housing Unit Estimates, 248,939 housing units are in the Region. Of those, the vast majority are single unit detached buildings (Table 2-8). The percentage of single-unit detached buildings varies considerably from town to town, with a low of 32.9% in Stamford and a high of 97.2% in Bridgewater and Weston.

**Table 2-8: Housing Stock (2022)**

| Municipality  | 1 Unit Attached | 1 Unit Detached | 2 Units     | 3+ Units     | Mobile or Other | Housing Units  | Number of Households |
|---------------|-----------------|-----------------|-------------|--------------|-----------------|----------------|----------------------|
| Bethel        | 10.3%           | 64.9%           | 10.7%       | 14.1%        | 0.0%            | 7,772          | 7,390                |
| Bridgewater   | 0.9%            | 97.2%           | 0.4%        | 1.5%         | 0.0%            | 850            | 696                  |
| Brookfield    | 8.0%            | 71.9%           | 2.7%        | 17.4%        | 0.0%            | 7,069          | 6,584                |
| Danbury       | 12.3%           | 42.1%           | 9.4%        | 34.8%        | 1.4%            | 34,016         | 31,692               |
| Darien        | 3.0%            | 85.9%           | 2.4%        | 8.8%         | 0.0%            | 7,524          | 7,116                |
| Greenwich     | 8.1%            | 62.8%           | 9.7%        | 19.3%        | 0.1%            | 25,207         | 22,662               |
| New Canaan    | 10.4%           | 74.1%           | 3.6%        | 11.7%        | 0.0%            | 7,707          | 7,025                |
| New Fairfield | 2.4%            | 96.9%           | 0.0%        | 0.2%         | 0.5%            | 5,304          | 4,590                |
| New Milford   | 4.6%            | 74.9%           | 3.2%        | 16.3%        | 1.0%            | 11,822         | 10,775               |
| Newtown       | 4.4%            | 87.9%           | 1.3%        | 5.6%         | 0.8%            | 10,052         | 9,563                |
| Norwalk       | 6.0%            | 46.6%           | 10.6%       | 36.7%        | 0.1%            | 38,068         | 35,272               |
| Redding       | 2.1%            | 88.3%           | 0.7%        | 8.4%         | 0.5%            | 3,668          | 3,374                |
| Ridgefield    | 3.3%            | 80.3%           | 2.0%        | 14.4%        | 0.0%            | 9,826          | 9,191                |
| Sherman       | 2.4%            | 95.1%           | 1.1%        | 0.0%         | 1.4%            | 1,925          | 1,573                |
| Stamford      | 7.5%            | 32.9%           | 8.7%        | 50.7%        | 0.1%            | 57,319         | 53,520               |
| Weston        | 2.6%            | 97.2%           | 0.0%        | 0.0%         | 0.0%            | 3,878          | 3,549                |
| Westport      | 5.2%            | 87.3%           | 2.2%        | 5.1%         | 0.2%            | 10,342         | 9,725                |
| Wilton        | 4.5%            | 83.0%           | 1.3%        | 11.1%        | 0.2%            | 6,590          | 6,210                |
| <b>Region</b> | <b>7.1%</b>     | <b>57.8%</b>    | <b>6.9%</b> | <b>27.8%</b> | <b>0.4%</b>     | <b>248,939</b> | <b>230,507</b>       |

\*\*Source: US Census Bureau, Population Estimates Program, Vintage 2024 Estimates, available at <https://www.census.gov/programs-surveys/popest/data/tables.html>.

The number of housing units in the region has grown at a slower pace than the population. From 2010 to 2018, the number of housing units increased by 2.6% (Table 2-9).

**Table 2-9: Change in Housing Units**

| Community     | Housing Units 2028 | Housing Units 2022 | Change in Housing Units |
|---------------|--------------------|--------------------|-------------------------|
| Bethel        | 7,706              | 7,772              | 0.9%                    |
| Bridgewater   | 864                | 850                | -1.6%                   |
| Brookfield    | 6,593              | 7,069              | 7.2%                    |
| Danbury       | 32,493             | 34,016             | 4.7%                    |
| Darien        | 7,195              | 7,524              | 4.6%                    |
| Greenwich     | 24,234             | 25,207             | 4.0%                    |
| New Canaan    | 7,582              | 7,707              | 1.6%                    |
| New Fairfield | 5,967              | 5,304              | -11.1%                  |
| New Milford   | 11,899             | 11,822             | -0.6%                   |

| Community      | Housing Units 2028 | Housing Units 2022 | Change in Housing Units |
|----------------|--------------------|--------------------|-------------------------|
| Newtown        | 10,514             | 10,052             | -4.4%                   |
| Norwalk        | 36,051             | 38,068             | 5.6%                    |
| Redding        | 3,909              | 3,668              | -6.2%                   |
| Ridgefield     | 9,602              | 9,826              | 2.3%                    |
| Sherman        | 1,760              | 1,925              | 9.4%                    |
| Stamford       | 53,660             | 57,319             | 6.8%                    |
| Weston         | 3,938              | 3,878              | -1.5%                   |
| Westport       | 10,830             | 10,342             | -4.5%                   |
| Wilton         | 6,589              | 6,590              | 0.0%                    |
| <b>WestCOG</b> | <b>241,386</b>     | <b>248,939</b>     | <b>3.1%</b>             |

Source: U.S. Census Bureau (2018)

The fastest growth occurred in Sherman, which saw an increase of 9.4%. Bridgewater, New Fairfield, New Milford, Newtown, Redding, Weston, and Westport have fewer housing units, although this may be within the survey's margin of error. Meanwhile, as noted above, the region's population grew by 2.7%.

The household structure is changing in many WestCOG communities (Table 2-10). Smaller households, including singles, non-cohabitating couples, single parents, families with fewer children, and empty nesters are becoming more common. Overall, household sizes in the Region were fairly stable from 2010 to 2018. However, from 2000 to 2018, the average household shrank by more than 0.5 persons in Bridgewater, New Fairfield, Redding, and Sherman.

**Table 2-10: Average Household Size**

| Municipality   | 2010        | 2020        | 2018 Estimate | 2024 Estimate |
|----------------|-------------|-------------|---------------|---------------|
| Bethel         | 2.54        | 2.71        | 2.57          | 2.64          |
| Bridgewater    | 1.96        | 2.51        | 1.97          | 2.33          |
| Brookfield     | 2.51        | 2.73        | 2.57          | 2.67          |
| Danbury        | 2.60        | 2.61        | 2.61          | 2.46          |
| Darien         | 2.93        | 3.13        | 3.02          | 3.02          |
| Greenwich      | 2.39        | 2.77        | 2.59          | 2.74          |
| New Canaan     | 2.61        | 2.94        | 2.67          | 2.91          |
| New Fairfield  | 2.48        | 2.96        | 2.33          | 2.97          |
| New Milford    | 2.40        | 2.61        | 2.25          | 2.64          |
| Newtown        | 2.74        | 2.74        | 2.65          | 2.82          |
| Norwalk        | 2.42        | 2.56        | 2.46          | 2.63          |
| Redding        | 2.40        | 2.62        | 2.33          | 2.54          |
| Ridgefield     | 2.62        | 2.69        | 2.60          | 2.72          |
| Sherman        | 1.96        | 2.29        | 2.07          | 2.25          |
| Stamford       | 2.43        | 2.53        | 2.42          | 2.49          |
| Weston         | 2.77        | 2.91        | 2.60          | 2.91          |
| Westport       | 2.54        | 2.79        | 2.63          | 2.80          |
| Wilton         | 2.79        | 2.95        | 2.78          | 3.03          |
| <b>WestCOG</b> | <b>2.51</b> | <b>2.73</b> | <b>2.53</b>   | <b>2.55</b>   |

Source: U.S. Census Bureau

As households get smaller, more units are needed to house the same total population. Not only does this increase the amount of land that is needed for housing, but it also spreads the population over a greater area, potentially impacting emergency response times. Such a shift in household formation dynamics impacts the way the WestCOG communities respond to disasters. A greater number of households generally equates to a greater amount of impervious surface cover, which can have negative repercussions for flooding. More households mean more structures that can be damaged during hurricanes or which contribute to runoff. Furthermore, the population is now spread among a greater number of structures, potentially making rescue operations more difficult. Of note, New Canaan and Ridgefield have adopted regulations that link impervious coverage to lot size rather than impose a maximum lot coverage requirement.

To provide a narrative characterization of development trends in the Region, each municipality was provided an opportunity during the planning process to comment on development within its borders. Some of the more significant developments noted by communities are presented in Table 2-11. Almost every community reported small subdivisions and at least a few nominal single-parcel, nonresidential developments and/or redevelopments. Many WestCOG communities also reported renovations or replacements of schools and other municipally owned facilities.

**Table 2-11: Notable Developments or Redevelopments**

| Municipality       | Development or Redevelopment Reported in 2021                                                                                                                                                                          | Development or Redevelopment Priorities in 2026                                | Are Changes in Development Leading to Changes in Risk?                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bethel</b>      | More than 450 new housing units over the past decade; potential for transit-oriented development (TOD).                                                                                                                | Multi-family homes and complexes, and new and redeveloped commercial activity. | No; a majority of new and redevelopment projects tend to be outside of flood risk areas. Commercial areas tend to be concentrated in the wildland interface, but this has not changed.                            |
| <b>Bridgewater</b> | Single-family homes and some redevelopment.                                                                                                                                                                            | Very few single-family homes, leading to an increased school age population    | No; the town encourages development outside of the flood zones, with no recent construction in these areas. Residential areas are primarily within the wildland intermix areas, but this has not changed.         |
| <b>Brookfield</b>  | Town Center District development and redevelopment; potential for TOD.                                                                                                                                                 | Multi-family housing and a small number of larger commercial projects          | No; most development occurs outside of flood zones. Recent projects have required hillside stabilization and stormwater retention. Future projects will be prioritized outside of flood zones.                    |
| <b>Danbury</b>     | "Reserve" residential development; Matrix Corporate Center mixed-use renovation; several hundred new residential units through multiple projects; and other TOD and non-TOD mixed-use developments and redevelopments. | Continued revitalization and redevelopment in downtown Danbury, including TOD. | No; the State Building Code and local flood regulations will continue to reduce flood risks in Danbury. Some moderate wildland interface risks are present in Danbury, but development is slowing in these areas. |

| Municipality         | Development or Redevelopment Reported in 2021                                   | Development or Redevelopment Priorities in 2026                                                                                            | Are Changes in Development Leading to Changes in Risk?                                                                                                                                                                                                   |
|----------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Darien</b>        | Three mixed-use developments; some TOD potential.                               | Combination of residential and commercial projects, with some mixed-use projects.                                                          | No; no major projects have occurred in high hazard areas and the town has worked to revise and update regulations to limit and mitigation hazard impacts.                                                                                                |
| <b>Greenwich</b>     | Continued residential growth; some TOD potential.                               | The POCD encourages village districts and affordable housing; the town has observed strong redevelopment.                                  | No; there is little interest in developing in high flood risk areas, though some low-lying areas have been developed which could be at risk of pluvial flooding. Development has been at a manageable pace and meets or exceeds all standards.           |
| <b>New Canaan</b>    | Small residential developments; some TOD potential.                             | Limited new development                                                                                                                    | No; there is limited development pressure therefore risks are not increased.                                                                                                                                                                             |
| <b>New Fairfield</b> | Barn Brook Estates subdivision (23 homes).                                      | Few single-family and small subdivision projects, commercial redevelopment.                                                                | No; projects are small and limited, therefore minimal occurring in high-risk areas. One proposed project is being evaluated for downstream impacts; the town will enforce all flood and stormwater regulations.                                          |
| <b>New Milford</b>   | Bleachery residential project.                                                  | Single-family or small subdivision projects; some new and expanding commercial businesses.                                                 | No; although the town understands that some development projects will increase exposure, the overall risk is not changing due to codes and regulations.                                                                                                  |
| <b>Newtown</b>       | Single-family homes and condominium / townhouse style developments.             | Primarily multi-family/ residential development.                                                                                           | No; the town has substantial freeboard requirements (the greatest in the State) and there is sufficient space outside of high hazard areas to continue to develop without increasing risk.                                                               |
| <b>Norwalk</b>       | New indoor mall opened in South Norwalk in 2019; significant TOD redevelopment. | Commercial and residential redevelopment projects throughout the city.                                                                     | No; the city is working to actively evaluate and reduce risks, and for opportunities for stringent redevelopment. Projects in high flood risk areas have recently exceeded building code standards.                                                      |
| <b>Redding</b>       | Former Schlumberger site redevelopment; some TOD potential.                     | Leveraging West Redding's commercial presence and transportation infrastructure, and the Wire Mill and downtown redevelopment master plan. | No; most of Redding remains rural with no new large development projects expected. The Wire Mill/downtown redevelopment includes areas in the flood zone; however, the master plan is considering this to guide development and ensure no risk increase. |

| Municipality      | Development or Redevelopment Reported in 2021                                                                                                                                                                                                            | Development or Redevelopment Priorities in 2026                                                                                                        | Are Changes in Development Leading to Changes in Risk?                                                                                                                                                                                                                                     |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ridgefield</b> | Branchville TOD.                                                                                                                                                                                                                                         | Multi-family and single-family residential, little commercial development, Branchville TOD.                                                            | No; there have been very few approvals for multi-family projects in recent years and very little commercial activity. Branchville area has specific flood risk concerns; however, the Town is fully aware and these are being addressed and regulated as development discussions progress. |
| <b>Sherman</b>    | None of note.                                                                                                                                                                                                                                            | No major priority, primarily single-family homes in recent years.                                                                                      | No; development is at a slow pace and is not expected to increase risks as it has not in the past.                                                                                                                                                                                         |
| <b>Stamford</b>   | Numerous large mixed-use developments and apartments completed over last decade. 50 three- or four- bedroom homes are planned at Ainslie Square, previously undeveloped land. Additional TOD and non-TOD redevelopment anticipated in the downtown area. | No major priorities, and recent projects have been a balance of redevelopment in urban areas, and new development in northern areas on larger parcels. | No; there are no major projects anticipated for the coming years, particularly in high hazard areas, and the Mill River Corridor Plan is being developed to help reduce riverine risks in the plan's area.                                                                                 |
| <b>Weston</b>     | Periodic single-family homes                                                                                                                                                                                                                             | Primarily single-family homes                                                                                                                          | No; development is at a low pace of infrequent single-family homes. Anything commercial might be in the Town Center which is outside of any high hazard area.                                                                                                                              |
| <b>Westport</b>   | Downtown and commercial redevelopment; some TOD potential.                                                                                                                                                                                               | Saugatuck TOD                                                                                                                                          | No; development is relatively slow in town, and any TOD development will be carefully regulated and designed to not increase risks.                                                                                                                                                        |
| <b>Wilton</b>     | Additional commercial along Route 7, including some TOD.                                                                                                                                                                                                 | Limited development along Route 7 and in TOD areas.                                                                                                    | No; the development opportunities in the commercial and TOD areas are limited. Recent new residential developments have been designed for flood zones, with first floors in the complexes used for parking and not for living space.                                                       |

In summary, based on meetings with local planning teams, the communities of Bethel, Brookfield, Danbury, Darien, Greenwich, Newtown, and Ridgefield have experienced the most significant development and redevelopment in the last few years and have the most noteworthy projects approved or pending approval. The communities of Bridgewater, New Canaan, New Milford, and Redding have experienced a somewhat lesser level of development and redevelopment, although Redding desires redevelopment in the Wire Mill planning area. All remaining communities in the Region have experienced at least nominal development or redevelopment of single properties and parcels.

### 2.2.4 Land Cover and Land Use

Much of the development the Region has seen since 1985 has come mainly at the cost of its agricultural land and deciduous and coniferous forests. Figure 2-7, derived from the UConn Center for Land-Use Education and Research (CLEAR), shows a snapshot of land cover in 2023. Details about land cover at the municipal level are provided in each municipality's Annex.

The rate of land cover change in the Region between 1985 and 2015 can be seen in Table 2-12 below. As the table shows, the most endangered land is agricultural land, with nearly 43% being lost to development over the last 30 years. During that period, the region's developed area increased by 11.4%, turf (lawns) by 13.5%, and agricultural land by 42.8%. Deciduous forests lost 6.5% of their area, and coniferous forests lost 6.2% of their area.

**Table 2-12: Change in Land Cover, 1985 - 2015**

| Category                    | 1985<br>Acreage | 2015<br>Acreage | Percent<br>Change |
|-----------------------------|-----------------|-----------------|-------------------|
| <b>Developed</b>            | 80,887          | 91,344          | 11.4%             |
| <b>Turf</b>                 | 41,024          | 47,405          | 13.5%             |
| <b>Other Grass</b>          | 4,616           | 4,620           | 0.1%              |
| <b>Agriculture</b>          | 16,310          | 11,423          | -42.8%            |
| <b>Deciduous Forest</b>     | 163,500         | 153,566         | -6.5%             |
| <b>Coniferous Forest</b>    | 17,278          | 16,266          | -6.2%             |
| <b>Water</b>                | 15,418          | 14,544          | -6.0%             |
| <b>Non-Forested Wetland</b> | 625             | 620             | -0.8%             |
| <b>Forested Wetland</b>     | 9,750           | 9,580           | -1.8%             |
| <b>Barren</b>               | 381             | 366             | -4.1%             |
| <b>Utility</b>              | 1,569           | 1,572           | 0.2%              |

Source: UConn CLEAR

As development in the region increases, the magnitude of the damage caused by the disasters also increases. Total damages increase for two reasons. First, as noted above for population, because there are more homes, businesses, and other assets in a given area, more homes, businesses, and assets are potentially affected by the disaster. Second, impervious surfaces are linked to more severe and rapid flash flooding events. Continued development results in increased impervious surfaces within the region. Therefore, when heavy rain events occur in the region, the resulting stormwater quickly flows through storm drains and across parking lots and lawns and into brooks and rivers, leading to a higher peak elevation flood surge. This phenomenon, created by development, has likely increased the risk of damage associated with severe weather conditions.

### 2.2.5 Historic and Cultural Resources

The Region is rich in historic and cultural assets. Efforts have been made by many to recognize, preserve, and protect these assets. In particular, in 2015, the State of Connecticut launched an initiative aimed at protecting historic resources from natural hazards and climate change. Historic and cultural assets should be considered in mitigation planning, whether in efforts to further protect the assets from the impacts of natural disasters or to minimize potential adverse impacts that may affect these assets. Figure 2-8 displays sites designated as National Historic Landmarks or properties listed on the National Register of Historic Places, the State Register of Historic Places, or local historic districts/local historic properties.

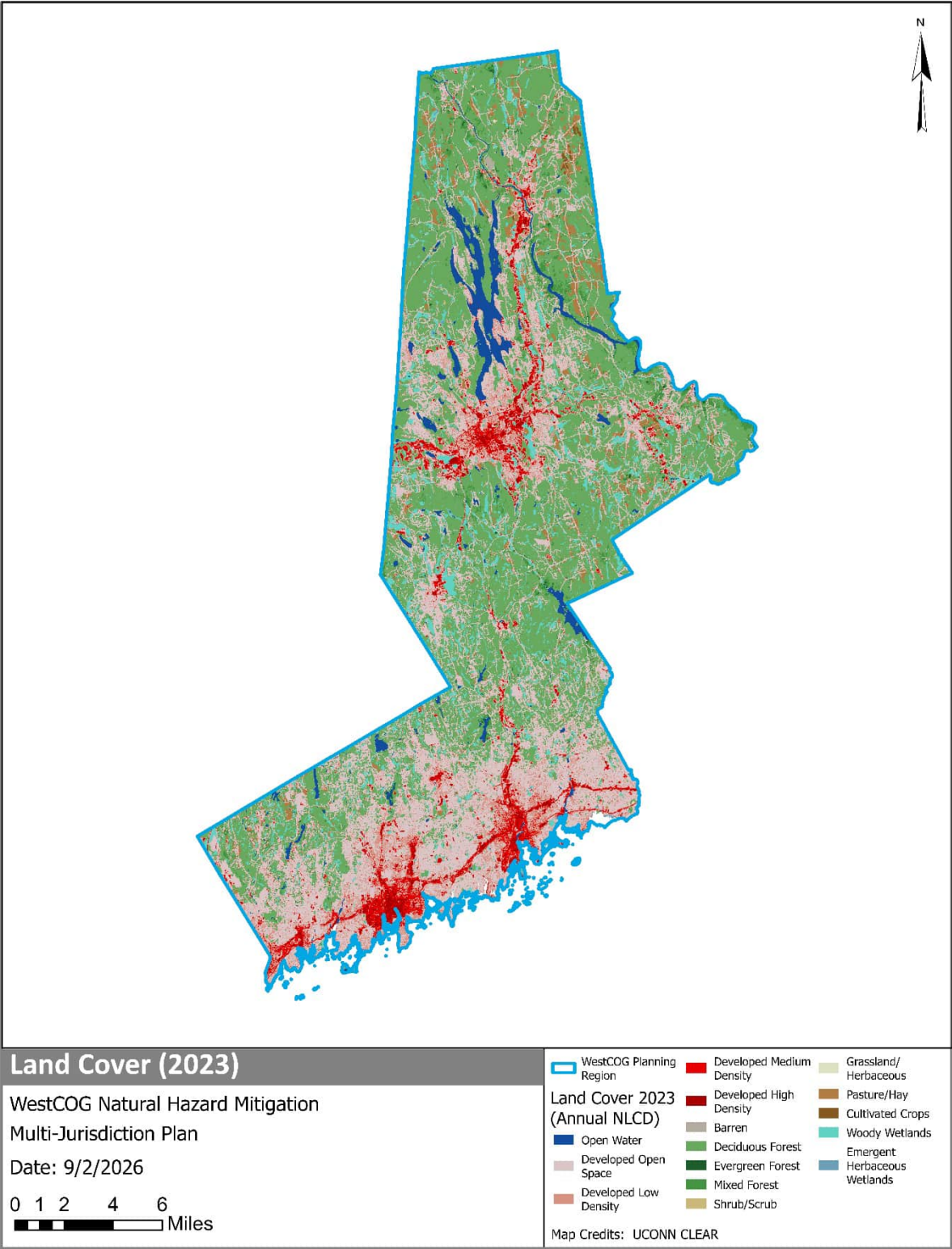


Figure 2-7: Land Cover

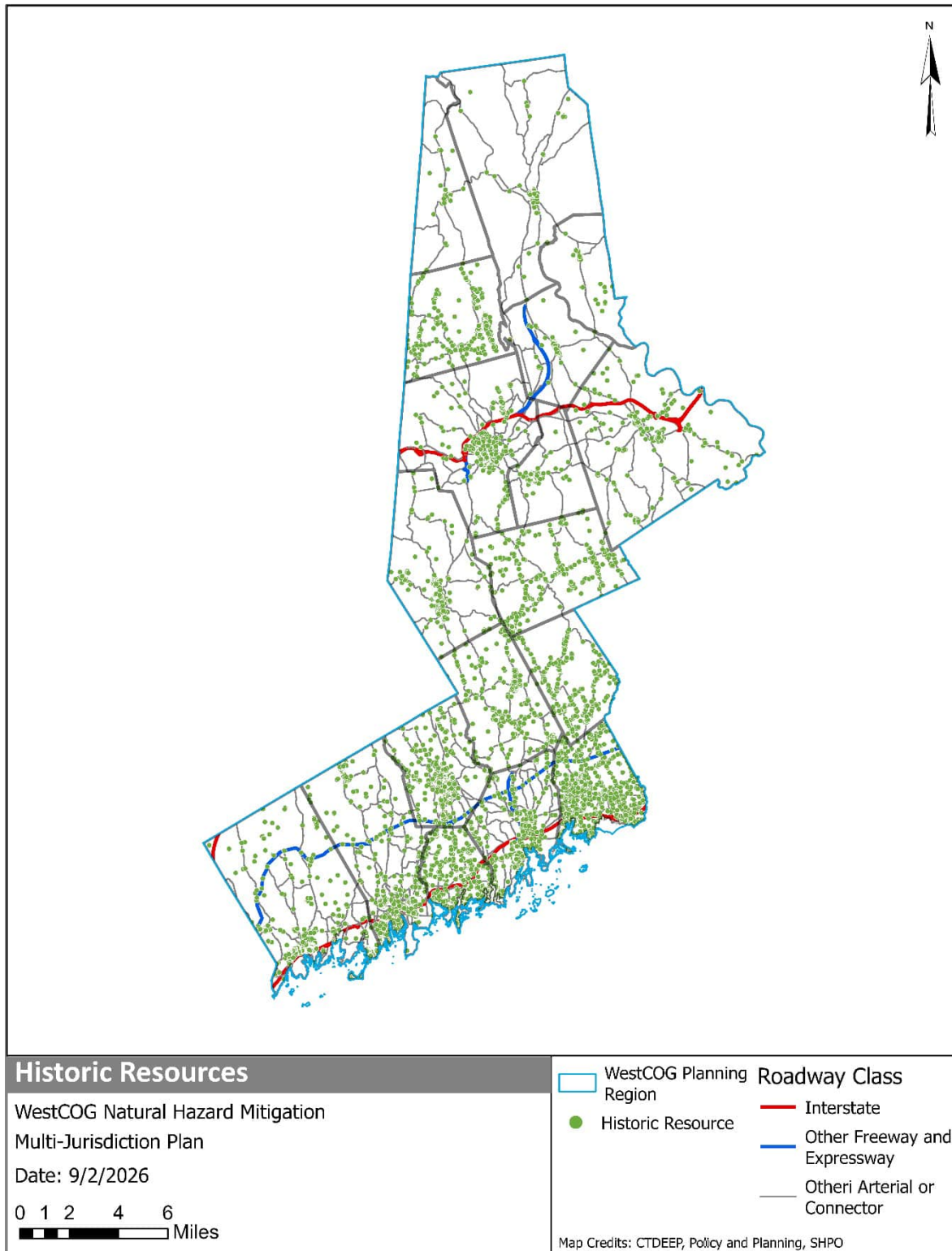


Figure 2-8: Historic Sites

The numerous structures, sites, and districts listed on the State and National Registers of Historic Places in the Region attest to the importance of historic preservation to our communities. Sites on the Registers are significant to our culture.

The State Historic Preservation Office (SHPO) also maintains a list of State Archaeological Preserves. The Archaeological Preserves in the Region include:

- Putnam Memorial State Park, Redding and Bethel
- Bridgeport Wood Finishing Company, New Milford
- Fort Stamford, Stamford
- West Parish Meeting House, Westport
- Middle Encampment, Redding

SHPO should be consulted regarding any mitigation projects that could affect buildings or sites on the Registers. Risks to historic and cultural resources are further discussed in Section 3.

## 2.3 Planning and Regulatory Capabilities

### 2.3.1 Governmental Structure

WestCOG is a regional planning organization established by the Connecticut Office of Policy and Management that represents its 18 member municipalities. WestCOG provides technical and planning assistance and expertise and provides a forum for its member municipalities to communicate and collaborate on inter-municipal issues and needs. WestCOG is governed by a council consisting of mayors and first selectman with one vote each. Services and programs are implemented by the Executive Director and staff with funding from the federal government, state government, and local sources. Grants and local contributions are used to fund special projects supported by the council.

Each of the 18 WestCOG municipalities has a broad scope of government authorities and powers including the ability to tax; establish laws, ordinances, and regulations; exercise eminent domain; provide police protection; and establish, construct, and maintain public facilities including roads, water mains, sewers, drainage, and utilities. Table 2-13 presents the government structure for each municipality.

**Table 2-13: Municipal Government Structure**

| Municipality  | Legislative Body    | Chief Executive Officer |
|---------------|---------------------|-------------------------|
| Bethel        | Town Meeting        | First Selectman         |
| Bridgewater   | Town Meeting        | First Selectman         |
| Brookfield    | Town Meeting        | First Selectman         |
| Danbury       | City Council        | Mayor                   |
| Darien        | Town Meeting        | First Selectman         |
| Greenwich     | Town Meeting        | First Selectman         |
| New Canaan    | Town Council        | First Selectman         |
| New Fairfield | Town Meeting        | First Selectman         |
| New Milford   | Town Council        | Mayor                   |
| Newtown       | Legislative Council | First Selectman         |
| Norwalk       | Common Council      | Mayor                   |
| Redding       | Town Meeting        | First Selectman         |
| Ridgefield    | Town Meeting        | First Selectman         |
| Sherman       | Town Meeting        | First Selectman         |

| Municipality | Legislative Body            | Chief Executive Officer |
|--------------|-----------------------------|-------------------------|
| Stamford     | Board of Representatives    | Mayor                   |
| Weston       | Town Meeting                | First Selectman         |
| Westport     | Representative Town Meeting | First Selectman         |
| Wilton       | Town Meeting                | First Selectman         |

Source: Connecticut Secretary of State

Each WestCOG municipality has staff and personnel resources that mitigate and/or respond to the impacts of natural hazards within their professional capacities. Table 2-14 summarizes typical resources and positions.

**Table 2-14: Local Administrative and Technical Resources**

| Skill                                         | Available?  | Position                                                   |
|-----------------------------------------------|-------------|------------------------------------------------------------|
| Land Development and Management               | Yes         | Planning & Zoning, WestCOG                                 |
| Building Construction                         | Yes         | Building Official                                          |
| Infrastructure Construction                   | Yes         | Municipal Engineer, Public Works                           |
| Understanding of Natural Hazards              | Yes         | Emergency Management Director, Municipal Engineer, WestCOG |
| Floodplain Manager                            | Yes         | Planning & Zoning, Municipal Engineer, Building Official   |
| Surveyor                                      | Usually Not | Rarely as part of Public Works                             |
| GIS Applications                              | Yes         | Planning & Zoning, WestCOG                                 |
| Emergency Management                          | Yes         | Emergency Management Director                              |
| Grant Writers                                 | Yes         | Grant Writer, Staff within municipal departments, WestCOG  |
| Benefit-Cost Analysis for FEMA Grant Programs | Usually Not | Typically contracted out                                   |

WestCOG municipalities rely upon a variety of codes, ordinances, and other requirements that help mitigate the potential impacts of natural hazards. Table 2-15 summarizes the typical regulatory requirements of WestCOG communities.

Activities in wetlands areas and watercourses are regulated under Chapter 440 (Sec. 22a-28 – Sec. 22a-45d) of the Connecticut General Statutes. Under this statute, each municipality is required to establish an inland wetlands agency, identify boundaries of inland wetland and watercourse areas, promulgate regulations to protect the inland wetlands and watercourses within its boundaries, and require that no regulated activities shall be conducted without a permit.

All municipalities in the region have established inland wetlands agencies and have enacted inland wetlands and watercourses regulations. According to CEQ, municipal agencies, which issue 95 percent of all inland wetlands permits in the state, have become more responsive to conserving wetlands in recent years. CEQ attributes this increased protectiveness to the completion of wetlands training programs by municipal agency members and staff.

**Table 2-15: Types of Codes, Ordinances, and Requirements**

| Type                                                           | Local Authority | State Mandated | Comment                                                 |
|----------------------------------------------------------------|-----------------|----------------|---------------------------------------------------------|
| Building Code                                                  | Yes             | Yes            | State Building Code                                     |
| Zoning Regulations                                             | Yes             | No             |                                                         |
| Flood Damage Prevention                                        | Yes             | No             | Typically in zoning and/or municipal code of ordinances |
| Subdivision Regulations                                        | Yes             | No             |                                                         |
| Inland Wetland Regulations                                     | Yes             | No             |                                                         |
| Post Disaster Recovery Regulations                             | Yes             | No             |                                                         |
| Real Estate Disclosures                                        | Yes             | Yes            | State Requirement                                       |
| Growth Management                                              | No              | No             |                                                         |
| Site Plan Review                                               | Yes             | No             |                                                         |
| Special Purpose Regulations (Flood Management, Critical Areas) | Yes             | Yes            | State Flood Management Statutes and Regulations         |

Lastly, WestCOG municipalities rely on a variety of funding streams that allow them to operate and perform natural hazard mitigation actions. These may include, but are not necessarily limited to, the following:

- Authority to levy taxes for specific purposes
- User fees for water, sewer, gas, or electric service
- Incur debt through general obligation bonds
- Incur debt through special tax bonds
- Incur debt through private activity bonds
- Capital improvement project funding
- Community development block grants
- State sponsored grant programs
- Federal grant programs
- Withhold public expenditures in hazard prone areas (allowed by the State)
- Development impact fees for homebuyers or developers

### 2.3.2 Regional and Local Plans

WestCOG municipalities rely upon a variety of planning documents that provide guidance related to natural hazard planning. Table 2-16 presents a summary of the typical plans utilized by WestCOG municipalities.

WestCOG recently completed an update to its Regional POCD. This document provides guidance on responsible growth strategies, coordination of water and sewer utilities between municipalities, marketing the region as a coordinated jurisdiction, assisting private investment studies, meeting the mandate for land use and transportation coordination, addressing regional inputs to the State POCD, addressing coordination along boundaries, coordinating various aspects of land use regulation, and establishing the fiscal basis for regional management of collectively shared infrastructure. The Regional POCD addresses current challenges facing the region over the next decade, presenting specific goals and objectives to meet them.

**Table 2-16: Types of Local Planning Documents**

| Type                                        | Local Authority | State Mandated | Comment                         |
|---------------------------------------------|-----------------|----------------|---------------------------------|
| Plan of Conservation and Development        | Yes             | Yes            | POCD Update Every 10 Years      |
| Floodplain or Basin Plan                    | No              | No             |                                 |
| Stormwater Plan                             | Yes             | Yes            | MS4                             |
| Capital Improvement Plan                    | Yes             | No             |                                 |
| Habitat Conservation Plan                   | No              | No             |                                 |
| Economic Development Plan                   | Yes             | No             | GrowSmart (2016)                |
| Emergency Operations Plan                   | Yes             | Yes            | LEOP template provided by DEMHS |
| Shoreline Management Plan                   | No              | No             |                                 |
| Post Disaster Recovery Plan                 | Yes             | Yes            | Templates provided by DEHMS     |
| Comprehensive Economic Development Strategy | Yes             | No             | Update Every 5 Years            |

Regional planning agencies and municipalities are required by state law (Chapter 127, Section 8-35a and Chapter 126, Sec. 8-23, respectively) to update POCDs every 10 years. These plans outline the policies and goals for the physical and economic development of the region or municipality. Table 2-17 lists the status of each municipal POCD for the 18 municipalities in the Region as of the end of October 2020. The 11 municipalities with POCD updates occurring in the next five to six years (by 2026) should incorporate information from this HMP into their analysis and recommendations (Section 6.2).

**Table 2-17: Municipal Plan of Conservation and Development Status**

| Municipality  | POCD Adoption Date | Planning Horizon |
|---------------|--------------------|------------------|
| Bethel        | 12/12/2019         | 2020-2030        |
| Bridgewater   | 11/17/2022         | 2022-2032        |
| Brookfield    | 9/4/2025           | 2025-2035        |
| Danbury       | 12/14/2022         | 2023-2033        |
| Darien        | 5/24/2016          | 2016-2026        |
| Greenwich     | 12/9/2019          | 2019-2029        |
| New Canaan    | 10/10/2024         | 2024-2034        |
| New Fairfield | 12/2/2024          | 2024-2034        |
| New Milford   | 8/23/2021          | 2021-2031        |
| Newtown       | 1/23/2025          | 2025-2035        |
| Norwalk       | 6/18/2025          | 2025-2035        |
| Redding       | 5/26/2020          | 2018-2028        |
| Ridgefield    | 6/16/2020          | 2020-2030        |
| Sherman       | 5/31/2023          | 2023-2033        |
| Stamford      | 9/30/2025          | 2025-2035        |
| Weston        | 6/15/2020          | 2020-2030        |
| Westport      | 9/28/2017          | 2017-2027        |
| Wilton        | 9/23/2019          | 2019-2029        |

Source: Connecticut Office of Policy and Management

WestCOG recently developed a Regional Climate and Stormwater Assessment to support local POCD planning efforts. This Assessment, as further discussed in Section 2.1.3, provides each municipality with a baseline summary of regional climate

and natural hazard impacts and planning considerations. These details have been developed to support a seamless integration into the POCD and other planning efforts as needed.

Many WestCOG municipalities are considered “urbanized areas” that must comply with the US EPA’s stormwater management rules. The MS4 General Permit is used by Connecticut DEEP to track compliance in the region.

### 2.3.3 Public Information

A variety of means are used in the Region to inform the public about natural hazards, areas, and issues of concern, and mitigation measures. These specific outreach efforts are described below.

#### **Reports and Presentations to Local Officials**

Municipal local coordinators and other department heads routinely provide briefings to the local legislative body regarding the impact of natural hazards, areas of concern, and new projects that may be necessary to address related issues. Regional discussions are also held before the WestCOG council. These meetings are public meetings with meeting notices, agendas, and minutes published on the local or regional website.

#### **Web Pages**

WestCOG maintains a Natural Hazard Mitigation Plan page on its website to ensure that all local HMPs are available for download. In addition, many WestCOG communities maintain information on their websites with guidance on preparing for natural disasters and signing up for emergency notifications. Press releases are also posted on most municipal websites that may include information related to natural hazards or mitigation.

#### **Social Media**

Many WestCOG communities have embraced the use of social media to inform their residents. Most municipalities have a Facebook account, and some have Twitter feeds. As many residents now have smartphones, social media is an excellent means of disseminating emergency information such as road closures, shelter locations, and evacuation needs.

#### **Traditional Media**

Press releases, newspaper articles, emergency notification system broadcasts and sirens, and television and radio announcements have been traditionally used to reach a majority of residents before, during, and after emergencies and natural hazard events. All WestCOG communities have these capabilities.

## 2.4 Critical Facilities

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Numerous public and private facilities and infrastructure are critical to assessing risks from natural hazards and to mitigating their potential effects. According to FEMA, critical facilities include essential facilities, transportation systems, lifeline utility systems, high potential loss facilities, and hazardous material facilities. In the Region, critical facilities include facilities that support responses and recovery efforts, such as governmental offices and public works facilities. In addition, facilities that house vulnerable populations are considered in this category. This includes long-term care facilities, as these house populations of individuals that would require special assistance during an emergency.

Critical infrastructure located in areas of flood risk is subject to flooding and, therefore, vulnerable to closure in the event of a natural disaster. Flooding is not the only concern, as infrastructure can be directly damaged by wind, fire, or earthquakes, or impacted by downed power lines, trees, and other debris.

### 2.4.1 Essential Facilities

FEMA defines essential facilities as those necessary for the health and welfare of the whole population. These include hospitals, police stations, fire stations, schools, emergency operations centers, and evacuation shelters. The five hospitals in the region include Danbury Hospital, Greenwich Hospital, New Milford Hospital, Norwalk Hospital, and Stamford Hospital. Furthermore, each WestCOG municipality includes at least one police station, fire station, and emergency operations center.

Places where impacted populations can go before or during a natural hazard event, and while recovery occurs, are essential during an emergency. Most often, schools are used as public shelters as they have gymnasiums that can accommodate large numbers of residents and are structurally capable of withstanding the forces endured during an event. In addition to structural rigidity, schools maintain the necessary facilities such as lavatories, showers, and food service areas as well as other spaces for recreation. Many municipalities also have smaller facilities that are designated as the primary shelter for smaller events that only require sheltering a few people. Backup generators are usually available, but in some instances may not provide sufficient power for the entire building.

The American Red Cross (ARC) has been chartered by the U.S. Congress to respond to all disasters and be the lead agency for mass care and sheltering. It coordinates emergency services at the local level through its regional chapters. Many WestCOG municipalities certify that their shelters comply with ARC guidelines. However, in most cases, municipal staff and volunteers operate local shelters, potentially with or without ARC assistance. During a catastrophic regional event, ARC may provide more oversight and coordination for shelter management, including migrating evacuees from harder hit areas into shelters in other communities.

### 2.4.2 Transportation Systems

The availability of major transportation infrastructure is critical for evacuation and response, and to ensure that emergencies are addressed while day-to-day management of each WestCOG municipality continues. These include highways, railways, airports, and waterways. In general, none of the waterways in the region are used for commercial navigation.

Major highways in the region include Interstate 84, Interstate 95, the Merritt Parkway (Route 15), and Route 7. These are maintained by the Connecticut Department of Transportation. Other numbered routes in the region are also managed by the Connecticut Department of Transportation (CTDOT), and many of these routes are the principal transportation arteries in the WestCOG municipalities. For example, Route 6 links Newtown and Bethel with Danbury. Local roads are also important, and each WestCOG municipality identifies its public works facility as a critical facility, as this facility is needed to ensure that roads are cleared and maintained in a timely manner.

Principal airports in the region include Danbury Municipal Airport, which functions as a reliever airport to reduce congestion at larger commercial airports, and Candlelight Farms Airport in New Milford, which functions as a general aviation airport. The sole private use airport is the Flying Ridge Airstrip in Newtown.

The New Haven Line provides railroad service between Greenwich and New Haven, with branch lines between Stamford and New Canaan and between Norwalk and Danbury. Freight rail lines include a railroad from Derby to Danbury that extends west into New York and north into New Milford, and the Housatonic River line from New Milford to Massachusetts. In addition to providing an essential mode of transportation under normal conditions, the availability of passenger and freight rail in the region is of critical importance for the movement of people and supplies following a disaster.

In terms of evacuation, most WestCOG communities do not have set large-scale evacuation plans. Instead, evacuation parameters and guidelines are provided within Local Emergency Operations Plans. This provides local emergency personnel

the flexibility to respond as situations warrant. For example, along the shoreline, the predicted storm surge may vary based on the timing of the tide, which may affect what roads must be evacuated and what routes will be necessary. Certain facilities, such as schools, typically have evacuation plans to ensure that students are safely transported to another location if an evacuation is needed during the school day.

#### **2.4.3 Lifeline Utility Systems**

Lifeline utility systems may include electric power, potable water, wastewater, oil, natural gas, and communication systems. In general, the Region does not have any oil or fuel transmission mains.

Eversource provides electric power to the entire Region. Natural gas service is also provided by Eversource throughout the region, although natural gas distribution lines are not as extensive as those for electric power. South Norwalk Electric and Water provides electric power to the western and southwestern portion of Norwalk. Both utilities purchase electricity and move it through their distribution network to customers in their service areas.

The Region is served by various public water systems. The most extensive water utility in the region is Aquarion Water Company, which provides service to portions of the entire region, ranging from small subdivisions to extensive developed areas. Aquarion Water Company completed a climate risk screening assessment in 2022-2023 to begin characterizing the risks to its systems. Water system components and assets were screened relative to the following climate-driven hazards: droughts, floods, severe storms, extreme heat events, wildfires, and harmful algal blooms. This effort will help Aquarion work with the WestCOG municipalities to reduce risks over the long term.

Other substantial public water systems include the municipally owned Danbury Water Department, Bethel Water Department in southwestern Bethel, Norwalk First Taxing District in eastern Norwalk-, and South Norwalk Electric and Water in western Norwalk and southern Wilton. Supply sources include extensive reservoir systems, stratified drift wells, and bedrock wells. Areas not served by public water systems are generally served by private wells.

According to the Regional POCD, there are 10 major water pollution control facilities in the Region. These include facilities in New Milford, Danbury, Bethel, Ridgefield, Redding, Greenwich, Stamford, New Canaan, Norwalk, and Westport. Sewer service also extends into Brookfield, Darien, and Wilton, with treatment occurring in a nearby municipality. Pumping stations with backup power supplies are essential to the successful operation of the sewer systems.

Private communication carriers in the region, as well as utilities such as Eversource, rely upon communication towers, which are overseen by the Connecticut Siting Council. These range from rooftop-mounted towers to standalone monopoles. While many towers have battery backups and standby power supplies, loss of power to these facilities can greatly hamper emergency response and restoration activities following a natural disaster, as was seen widely in Connecticut following Tropical Storm Irene and Winter Storm Alfred in 2011.

#### **2.4.4 High Potential Loss Facilities**

High potential loss facilities include nuclear power plants, high hazard dams, and military installations. There are no nuclear power plants or military installations in the Region, although there are various military training and recruitment centers in Danbury, Newtown, Stamford, and Norwalk.

High hazard dams are therefore the primary type of high potential loss facilities in the region. The potential impacts of dam failure are presented in Section 3.2 and in each municipal annex.

#### 2.4.5 Hazardous Materials Facilities

Hazardous materials facilities include producers of corrosives, explosives, flammable materials, radioactive materials, and toxins. Additionally, these facilities may include those industries and businesses that store and use such materials as process chemicals. These facilities are of particular concern for emergency responders in the region. In particular, Danbury emergency personnel maintain lists of all private facilities that house such chemicals in order to be prepared for specialized fire or emergency response. However, as these are typically privately owned facilities, they are not typically listed in the lists of critical facilities provided in each municipal annex.

The Connecticut DEEP has proposed strategies for municipalities to implement in order to recommend best management practices to prevent pollution from chemicals from being released following a flood or disaster.

## 3.0 Hazard Identification and Risk Assessment

### 3.1 Natural Hazards Impacting the Region

The 2023 CT NHMP includes a risk assessment of dam failure, winter weather (blizzards, freezing rain, ice storms, nor'easters, sleet, snow, and winter storms), flood-related hazards (riverine, coastal, flash, and shallow flooding), sea level rise, earthquakes, drought, thunderstorms (wind, hail, and lightning), tornadoes, tropical cyclones (hurricanes and tropical storms), and wildland fires. This HMP addresses each of these hazards as well as the risk of related hazards discussed in previous planning efforts in the region. Note that some hazards are not applicable to all WestCOG municipalities; for example, coastal flooding and storm surge do not affect or damage inland communities.

#### 3.1.1 Disaster Declarations

FEMA defines disasters in its Local Mitigation Planning Handbook (2013) as events that “can cause loss of life; damage buildings and infrastructure; and have devastating consequences for a community’s economic, social, and environmental well-being.” The Region has experienced a range of disasters in recent years. Note that some communities were damaged by disasters even though declarations were not made for Fairfield and Litchfield Counties, as presented below.

**Table 3-1: Federal Disaster and Emergency Declarations**

| Number             | Event Date          | Incident Description                              | Counties Designated   |
|--------------------|---------------------|---------------------------------------------------|-----------------------|
| DR-4820            | 8/18/2024           | Severe Storm, Flooding, and Landslides            | Fairfield, Litchfield |
| DR-4629            | 9/1/2021            | Hurricane Ida                                     | Fairfield, Litchfield |
| EM-3564            | 8/21/2021           | Hurricane Henri                                   | Fairfield, Litchfield |
| DR-4580<br>EM-3535 | 8/4/2020            | Tropical Storm Isaias                             | Fairfield, Litchfield |
| DR-4500<br>EM-3439 | 1/20/2020, ongoing  | COVID-19 Pandemic                                 | Fairfield, Litchfield |
| DR-4385            | 5/15/2018           | Severe Storms, Tornadoes, and Straight-Line Winds | Fairfield             |
| DR-4106<br>EM-3361 | 2/8 to 2/11/2013    | Severe Winter Storm and Snowstorm “Nemo”          | Fairfield, Litchfield |
| DR-4087<br>EM-3353 | 10/27 to 11/8/2012  | Hurricane Sandy                                   | Fairfield, Litchfield |
| DR-4046<br>EM-3342 | 10/29 to 10/30/2011 | Severe Storm “Alfred”                             | Fairfield, Litchfield |
| DR-4023<br>EM-3331 | 8/26 to 9/1/2011    | Hurricane Irene                                   | Fairfield, Litchfield |
| DR-1958            | 1/11 to 1/12/2011   | Snowstorms                                        | Fairfield, Litchfield |
| DR-1904            | 3/12 to 5/17/2010   | Severe Storms and Flooding                        | Fairfield             |

| Number  | Event Date          | Incident Description                                  | Counties Designated   |
|---------|---------------------|-------------------------------------------------------|-----------------------|
| DR-1700 | 4/15 to 4/27/2007   | Severe Storms and Flooding                            | Fairfield, Litchfield |
| EM-3266 | 2/11 to 2/12/2006   | Snow                                                  | Fairfield             |
| DR-1619 | 10/14 to 10/15/2005 | Severe Storms and Flooding                            | Litchfield            |
| EM-3200 | 1/22 to 1/23/2005   | Record Snow                                           | Fairfield, Litchfield |
| EM-3192 | 12/5 to 12/7/2003   | Snow                                                  | Fairfield, Litchfield |
| EM-3176 | 2/17 to 2/18/2003   | Snowstorm                                             | Fairfield, Litchfield |
| DR-1302 | 9/16 to 9/21/1999   | Hurricane Floyd                                       | Fairfield, Litchfield |
| DR-1092 | 1/7 to 1/13/1996    | Blizzard of '96                                       | Fairfield, Litchfield |
| EM-3098 | 3/13 to 3/17/1993   | Severe Winds & Blizzard, Record Snowfall              | Fairfield, Litchfield |
| DR-837  | 7/10/1989           | Severe Storms and Tornadoes                           | Litchfield            |
| DR-747  | 9/27/1985           | Hurricane Gloria                                      | Fairfield, Litchfield |
| DR-711  | 5/27 to 6/2/1984    | Severe Storms & Flooding                              | Fairfield, Litchfield |
| DR-661  | 6/14/1982           | Severe Storms & Flooding                              | Fairfield, Litchfield |
| EM-3060 | 2/7/1978            | Blizzard & Snowstorms                                 | Fairfield, Litchfield |
| DR-42   | 8/20/1955           | Hurricane, Torrential Rain & Floods "Connie" & Diane" | Fairfield, Litchfield |
| DR-25   | 9/17/1954           | Hurricane "Carol"                                     | Fairfield, Litchfield |

Source: FEMA

Severe winter storms, hurricanes and tropical storms, tornadoes, and nor'easters contributed to the disaster declarations.

### 3.1.2 FEMA Public Assistance Reimbursements

Public Assistance reimbursements are maintained by FEMA and are available through the FEMA website. The database contains records of damage reimbursements dating back to August 26, 1998, for municipalities, nonprofit organizations, schools, and state agencies. For Connecticut, the vast majority of losses are from flooding, wind, or other damage related to severe storms, tornadoes, and tropical storms and hurricanes. Total damages from the Public Assistance database are summarized for each community in the table below. The damage reported in the table assumes that the federal reimbursement reported by FEMA represented 75% of the actual damages.

**Table 3-2: Damages Since 1998 Based on FEMA Public Assistance Reimbursements**

| Municipality | Severe Storm(s) | Tornado  | Tropical Storm | Hurricane |
|--------------|-----------------|----------|----------------|-----------|
| Bethel       | \$665,265       | \$46,909 | \$222,479      | \$174,306 |
| Bridgewater  | \$117,034       | \$0      | \$112,999      | \$87,971  |

|                |                    |                    |                    |                    |
|----------------|--------------------|--------------------|--------------------|--------------------|
| Brookfield     | \$1,217,698        | \$2,068,920        | \$367,053          | \$432,164          |
| Danbury        | \$5,809,913        | \$686,771          | \$400,154          | \$1,601,090        |
| Darien         | \$317,830          | \$0                | \$144,983          | \$4,511,589        |
| Greenwich      | \$1,646,848        | \$0                | \$636,566          | \$6,129,407        |
| New Canaan     | \$1,351,621        | \$0                | \$571,808          | \$2,725,434        |
| New Fairfield  | \$482,789          | \$2,778,633        | \$158,344          | \$456,206          |
| New Milford    | \$1,348,808        | \$0                | \$527,589          | \$428,337          |
| Newtown        | \$4,774,394        | \$2,726,156        | \$747,918          | \$993,013          |
| Norwalk        | \$2,424,636        | \$0                | \$693,687          | \$7,068,509        |
| Redding        | \$1,972,007        | \$0                | \$226,087          | \$606,745          |
| Ridgefield     | \$789,105          | \$131,474          | \$306,652          | \$1,671,753        |
| Sherman        | \$154,625          | \$90,429           | \$98,892           | \$225,566          |
| Stamford       | \$1,286,023        | \$0                | \$1,489,275        | \$7,699,252        |
| Weston         | \$1,651,218        | \$0                | \$188,607          | \$842,468          |
| Westport       | \$931,900          | \$0                | \$937,339          | \$2,801,917        |
| Wilton         | \$1,611,662        | \$0                | \$550,734          | \$1,507,948        |
| <b>WestCOG</b> | <b>\$5,738,200</b> | <b>\$6,429,571</b> | <b>\$7,552,540</b> | <b>\$7,095,849</b> |

Source: FEMA

### 3.2 Risk Assessment

The following discussion provides an overview of the types of natural hazards that are likely to impact the Region. The section includes a description of each hazard type, discusses the location that can be affected by each hazard, discusses the potential extent of each hazard, provides an historic look at recent disasters and the effects of hazards on the region, analyzes the probability that the hazard will strike again, and assesses the impact of each. Specific impacts for each WestCOG municipality are presented in the municipal annexes. Emphasis is given to floods, severe winter storms, and tropical cyclones (hurricanes and tropical storms) as these hazards are frequent and/or damaging in the region. Throughout the following sections, all estimates of costs and damages given in dollars are not inflation-adjusted.

According to the 2023 CT NHMP, “climate change is both a present threat and a slow-onset disaster” that “acts as an amplifier of existing hazards.” Extreme weather events have become more frequent over recent years, and this trend is expected to continue. Higher hurricane wind speeds and increased rainfall intensity are expected to increase the impact of wind damage and flooding on the Region. More intense heat waves may cause more heat-related illnesses and cause droughts and wildfires to be intensified or made more frequent. Rising sea levels will exacerbate flood hazards along the coast. The impact of climate change on each hazard is discussed in appropriate sections of this Plan update.

Comprehensive estimates of the losses each community faces from specific natural hazards are generally not available and must be developed as part of this planning process. The costs incurred by local communities as a result of the federal disasters are shown in Table 3-1 provide a partial indication of potential losses, but these costs do not cover all the costs associated with natural disasters, including those experienced by private businesses and citizens.

The equalized net grand list (Table 2-7) provides an estimate of the market value of all taxable property in each community and can give an indication of the total value of property exposed to natural disasters of a town-wide or region-wide scope. County-wide damages developed in the 2023 CT NHMP are applied in many cases herein by population percentage in order to estimate the potential annualized loss in a community due to a particular natural hazard.

### Risk Assessment Terminology

**Community assets:** the people, structures, facilities, and lifelines that have value to the community.

**Community Lifelines:** the integrated network of assets, services and capabilities that are used day to day to support recurring needs, enable the continuous operation of critical government and business, functions and are essential to human health and safety or economic security.

**Extent:** the expected range of intensity for each hazard. Often a scientific scale is used to help define extent.

**Impacts:** the consequences or effects of each hazard on the participant's assets.

**Location:** the geographic area within the planning area that is affected by the hazard.

**Natural hazard:** a source of harm or difficulty created by a meteorological, environmental or geological event.

**Probability of Future Events:** how likely a hazard is to occur or reoccur, and how the future might change the type, location, severity and frequency of hazards.

**Risk:** the potential for damage or loss created by the interaction of natural hazards with assets, such as buildings, infrastructure or natural and cultural resources.

**Vulnerability:** a description of which assets, including structures, systems, populations and other assets as defined by the community, within locations identified to be hazard prone, are at risk from the effects of the identified hazard(s).

Source: FEMA Local Mitigation Handbook, 2025 (paraphrased)

Computer modeling is another means of analyzing risks from natural disasters. When developing the 2021 version of this Plan, FEMA's HAZUS-MH model version 4.2 was used to evaluate risks and estimate losses the region might face to life and property from flooding, earthquakes, and hurricanes. HAZUS-MH is a software program that can be used throughout the United States and provides standard loss estimations and damage assessments based on historical hazard events, Census data, and other federal and nationally based databases. Level 1 (default data) was used for the analysis, as this level of analysis is appropriate for a regional HMP. The HAZUS-MH model uses 2010 Census data and block boundaries as a baseline for analyzing losses, along with 10-meter National Elevation Dataset digital elevation model grids to generate flood depths.

For this 2026 Plan update, the 2021 results were used as a baseline, with values adjusted to account for inflation (according to the U.S. Bureau of Labor Statistics Inflation Calculator, inflation between January 2021 and February 2026 was approximately 25%, so that \$1 is January 2021 had the same buying power in February 2026 as \$1.25). Because of the limitations of the Census and inventory data used in the HAZUS-MH analyses, the loss estimates should at best be considered approximate.

Furthermore, this risk assessment considered the FEMA National Risk Index (NRI), a national dataset that provides relative levels of natural hazard risk across the United States down to the Census Tract level. The NRI identifies risk by combining hazard frequency, exposure, and consequence information with social vulnerability and community resilience metrics. NRI results were used to inform the evaluation of each natural hazard in this plan and are presented within the subsequent hazard sections. More information about the NRI is available on the FEMA website at <https://www.fema.gov/flood-maps/products-tools/national-risk-index>.

#### 3.2.1 Exposure Analysis

Whereas certain hazards, such as hurricanes, may affect the entire Region, other hazards, such as flooding, typically affect defined areas. Thus, the extent of exposure to a particular natural hazard may vary depending on the extent of the hazard.

Vulnerable assets were identified by intersecting GIS-based asset inventories and demographic data with hazard risk boundaries to determine the number of parcels, buildings, critical facilities, historic resources, and populations exposed to

each hazard. This results in an estimation of exposure by hazard. The exposure analysis for each municipality is presented in the subsections that follow. The following inventories were used to conduct the exposure analysis:

- Coastal erosion exposure was mapped using the 2014 publication Analysis of Shoreline Change in Connecticut by DEEP, Sea Grant, and UConn/CLEAR.
- Dam failure exposure was determined based on dam failure inundation mapping available from Connecticut DEEP for the high and significant hazard dams in the planning area. If inundation mapping was not available, exposure was not estimated.
- Flooding exposure was based on existing digital flood insurance rate maps (FIRMs) for each community.
- Historic resources were mapped using spatial point data developed by SHPO in 2015-2017, except for New Milford and Bridgewater, where existing polygons from State data were used.
- Sea level rise extent was mapped using the “bathtub model” methodology, with all land areas below the elevation of Mean Higher High Water plus the 50 cm sea level rise projections developed by CIRCA (see Section 3.3.2 for discussion).
- Storm surge exposure was based on the 2008 Sea, Lake, and Overland Surges from Hurricanes or “SLOSH” analysis prepared by the United States Army Corps of Engineers (USACE). This GIS shapefile is available from Connecticut DEEP.
- Wildfire exposure was determined using recent mapping developed by the USDA Forest Service and University of Wisconsin-Madison that depict the areas (as of 2010) that intermix or interface with wildland vegetation types. The mapping considers varying densities of vegetation and housing development.
- For the remaining hazards (earthquakes, hurricanes, thunderstorms, tornadoes, winter storms), it was assumed that all buildings and populations were at equal risk. The exposure values are equal to the total exposure of the community.

Table 3-3 presents the exposure analysis for the entire Region. The Region contains a total of 186,257 parcels, valuing \$151.2 billion. A significant number of parcels are vulnerable to flooding and storm surge, including at least 46 parcels that contain critical facilities and 1,845 that contain historic assets. Note that drought is not considered in the exposure analysis because this hazard typically does not affect built infrastructure in the same way that other hazards may.

**Table 3-3: Exposure Summary for the Region (Number, or Value in Billions of Dollars)**

| Hazard                     | Number of<br>Parcels | Value of<br>At-Risk Parcels | Number of<br>Critical Facilities | Number of<br>Historic Assets |
|----------------------------|----------------------|-----------------------------|----------------------------------|------------------------------|
| <b>Flooding</b>            |                      |                             |                                  |                              |
| 1% Annual                  | 21,082               | \$31.3                      | 46                               | 1,845                        |
| 0.2% Annual                | 18,000               | \$21.9                      | 49                               | 1,318                        |
| VE                         | 1,922                | \$7.5                       | 0                                | 229                          |
| Category 1 Storm Surge     | 5,605                | \$13.2                      | 6                                | 808                          |
| Category 2 Storm Surge     | 7,857                | \$16.3                      | 6                                | 1,117                        |
| Category 3 Storm Surge     | 11,505               | \$22.3                      | 7                                | 1,842                        |
| Category 4 Storm Surge     | 13,678               | \$25.1                      | 9                                | 2,113                        |
| Sea Level Rise (MHHW)      | 3,047                | \$9.5                       | 3                                | 510                          |
| Sea Level Rise (1% Annual) | 8,198                | \$17.5                      | 4                                | 1,283                        |
| Erosion                    | 8,847                | \$7.0                       | 35                               | 502                          |

| Hazard               | Number of<br>Parcels | Value of<br>At-Risk Parcels | Number of<br>Critical Facilities | Number of<br>Historic Assets |
|----------------------|----------------------|-----------------------------|----------------------------------|------------------------------|
| <b>Other Hazards</b> |                      |                             |                                  |                              |
| Winter Storm         | 186,257              | \$151.2                     | 201                              | 10,662                       |
| Tropical Cyclone     | 186,257              | \$151.2                     | 201                              | 10,662                       |
| Tornado              | 186,257              | \$151.2                     | 201                              | 10,662                       |
| Thunderstorm         | 186,257              | \$151.2                     | 201                              | 10,662                       |
| Wildfire (Interface) | 13,629               | \$7.0                       | 84                               | 1,147                        |
| Wildfire (Intermix)  | 48,772               | \$31.1                      | 201                              | 412                          |
| Earthquake           | 186,257              | \$151.2                     | 201                              | 10,662                       |
| Dam Failure          | 13,978               | \$17.6                      | 0                                | 1,278                        |
| Heat (CCVI)          | 60,523               | \$58.3                      | 144                              | 6,084                        |

The WestCOG Locally Variable Hazard Differentiation assessment (a component of the Climate and Stormwater Assessment completed in 2026) recognizes that WestCOG municipalities face a range of climate hazards that vary meaningfully in type, severity, and planning implications depending on where a community sits within the regional landscape. The Assessment organizes WestCOG's municipalities into five community categories: (1) Coastal-High, (2) Coastal-Moderate, (3) Inland-High, (4) Inland-Moderate, and (5) Inland-Low. For each community, the report evaluates risk across seven hazard categories. The key findings are as follows:

- **Coastal-High communities:** Stamford and Norwalk face the region's most comprehensive and severe climate risk profile. Compounding coastal flood, extreme heat, and rainfall-driven flooding are rated High. This rating is driven by dense development, aging infrastructure, low coastal elevation, and the region's greatest concentration of socially vulnerable populations. Climate adaptation should be a cross-cutting priority across planning functions for these communities.
- **Coastal-Moderate communities:** Darien, Greenwich, and Westport share coastal flood exposure with high-risk storm surge and sea level rise risk. Lower development density and ecologically sensitive tidal wetland systems provide some natural buffering, but high-value coastal property exposure and compound flood dynamics require proactive coastal resilience planning.
- **Inland-High communities:** Danbury faces the region's most significant inland flood and heat risk. Rainfall-driven flooding, riverine flooding along the Still River corridor, and extreme heat are all considered high risk, compounded by aging infrastructure, high impervious surface coverage, and significant social vulnerability.
- **Inland-Moderate communities:** Bethel, Brookfield, New Canaan, New Fairfield, New Milford, Newtown, Ridgefield, Weston, and Wilton – face moderate to moderate-high risk across most hazard categories, with riverine flooding and wildfire as primary planning priorities. Within-category differences between more developed southern towns and more rural northern communities are significant and identified throughout the community's risk profile (see Community Risk Profiles).
- **Inland-Low communities:** Bridgewater, Redding, and Sherman, face the region's highest wildfire risk, compounded by drought, limited suppression capacity, and private well vulnerability. These communities also steward the region's most ecologically valuable landscapes, and their resilience planning carries important downstream impacts beyond their municipal boundaries.

Across all community categories, several findings stand out, such as extreme precipitation intensifying in ways that will stress stormwater infrastructure region-wide, the compounding relationship between drought, heat, and wildfire, and the flood risk and exposure in coastal and urban communities.

### 3.2.2 Flooding

Flooding is the most common natural hazard encountered in the Region. Triggered by a variety of events, floods can occur during any season. Heavy precipitation is common throughout the year, and each season brings its own source of floods: From mid-summer through fall, hurricanes bring wind and torrential rain; winter nor'easters pound the region with snow and rain; in spring, snowmelt inundates local hydrologic systems; and summer thunderstorms can bring flash floods in minutes. Historical development patterns encouraged dense construction of town centers near water bodies; consequently, many areas with chronic flooding problems are in population centers.

#### Location

According to FEMA, most municipalities in the United States have at least one clearly recognizable area at risk of flooding around a river, stream, or large body of water, including the shoreline. Many communities also have localized flooding areas outside the Special Flood Hazard Area (SFHA). These floods tend to be shallower and chronically recur in the same area due to a combination of factors. Such factors can include ponding, poor drainage, inadequate storm sewers, clogged culverts or catch basins, sheet flow, obstructed drainageways, sewer backup, or overbank flooding from minor streams.

#### Extent

The Region is affected by riverine, flash, shallow, nuisance, and coastal flooding.

#### Riverine Flooding

According to FEMA, there are several different types of inland flooding.

- **Riverine Flooding:** Also known as overbank flooding, it occurs when channels receive more rain or snowmelt from their watershed than normal, or the channel becomes blocked by an ice jam or debris. Excess water spills out of the channel and into the channel's floodplain area.
- **Flash Flooding:** A rapid rise of water along a water channel or low-lying urban area, usually a result of an unusually large amount of rain and/or high velocity of water flow (particularly in hilly areas) within a very short period of time. Flash floods can occur with limited warning.
- **Shallow Flooding:** Occurs in flat areas where a lack of a water channel results in water being unable to drain away easily. The three types of shallow flooding include:
  - **Sheet Flow:** Water spreads over a large area at uniform depth.
  - **Ponding:** Runoff collects in depressions with no drainage ability.
  - **Urban Flooding:** Occurs when constructed drainage systems are overloaded by a larger amount of water than the system was designed to accommodate.

While riverine or flash flooding is typically confined to defined channels and adjacent overbank areas, nuisance flooding can occur nearly anywhere due to shallow flooding or clogged or overwhelmed drainage systems. When drainage systems overflow near areas with steep slopes, or when heavy rainfall occurs on steep slopes, mass wasting events (landslides, mudslides) may occur, as has happened in steeper sections of New Milford and Danbury.

#### *WestCOG Climate and Stormwater Hazard Assessment*

##### **Rising Groundwater Levels**

When heavy rain saturates the soil, the water table rises, creating hydrostatic pressure on basement floors and walls. For many structures built in naturally low-lying, saturated areas, rising groundwater can force its way through cracks in foundations or cause floors to buckle upward. Beyond structural impacts, septic systems submerged in groundwater can no longer treat waste, leading to backups into buildings or contaminating the surrounding groundwater.

### Coastal Flooding

Coastal flooding is typically limited to shoreline areas and low-lying areas directly connected to the shoreline. It can occur as a result of astronomically high tide levels along coastal areas and due to storm surge from nor'easters and tropical cyclones. Coastal flooding is also possible from tsunamis as a result of underwater earthquakes or landslides. The effect of wave action poses the greatest threat from coastal flooding as it can damage structures and cause erosion of coastal areas.

The WestCOG Climate and Stormwater Hazard Assessment also highlights the importance of saltwater intrusion as a coastal hazard. Saltwater intrusion is the landward and upward movement of saline water into freshwater aquifers and onto coastal land. Major impacts associated with saltwater intrusion include drinking water contamination, infrastructure corrosion, foundation damage, marsh migration and habitat loss, and agricultural loss.

### Flood Zone Descriptions

In order to provide a national standard without regional discrimination, the 1% annual chance flood has been adopted by FEMA as the base flood for the purposes of floodplain management and to determine the need for insurance. The floods are often described in terms of the annual percentage chance of occurrence. Floodplains have been delineated by FEMA to reflect 1% and 0.2% annual flood events known informally as 100-year and 500-year floods, respectively. The area that has a 1% annual chance to flood each year is delineated as the SFHA for the purposes of the NFIP. The 0.2% annual chance floodplain indicates areas of moderate flood hazard.

**Floodplains** are lands along watercourses that are subject to periodic flooding; **floodways** are those areas within the floodplains that convey the majority of flood discharge. Floodways are subject to water being conveyed at relatively high velocity and force. The **floodway fringe** contains those areas of the 1% annual chance floodplain that are outside the floodway and are subject to inundation but do not convey the floodwaters at a high velocity.

However, because the 1% annual chance floodplain (or any percent annual chance floodplain) reflects the percentage chance that area will be inundated in any given year, it is possible to observe a 1% flood more than once every 100 years. For example, FEMA and the USACE note that a structure located within a 1% annual chance flood zone has a 26% chance of suffering flood damage during the term of a 30-year mortgage. Note that the same home has only a 1% chance of being damaged by fire in the same 30-year period. The USACE has prepared a flood frequency chart (Table 3-4) that demonstrates the percent chance of flooding at various flood frequencies. Note that in many areas, the difference in flood heights between a 10% annual chance event and a 1% annual chance event is less than one foot.

**Table 3-4: Description of Flooding Terminology**

| Flood Frequency (Years) | Chance of Flooding in Any Given Year | Percent Chance of Flooding during 30-Year Mortgage |
|-------------------------|--------------------------------------|----------------------------------------------------|
| 10-Year                 | 10%                                  | 96%                                                |
| 50-Year                 | 2%                                   | 46%                                                |
| 100-Year                | 1%                                   | 26%                                                |
| 500-Year                | 0.2%                                 | 6%                                                 |

Source: USACE Flood Risk Management Program

Furthermore, the 1% flood plain is based on empirical evidence. If more or fewer floods of a certain magnitude are observed, FEMA may restudy the floodplains and update the corresponding insurance maps. This means that there can be a lag between the official risk and the empirical risk. A table of the two terms, x% annual chance flood and their corresponding y-year floods, is found in the table below.

**Table 3-5: Recurrence Interval vs. Annual Percent Chance**

| Recurrence Interval | Annual Percent Chance |
|---------------------|-----------------------|
| 2-Year              | 50%                   |
| 10-Year             | 10%                   |
| 25-Year             | 4%                    |
| 50-Year             | 2%                    |
| 100-Year            | 1%                    |
| 500-Year            | 0.2%                  |

SFHAs in the Region are delineated on a FIRM delineated as part of a Flood Insurance Study (FIS). Major watercourses typically have SFHAs mapped as Zone AE, while smaller tributary streams are mapped as Zone A. Coastal zones include Zone AE, Zone V, and Zone VE. Other small streams have shading as Zone X, and other classifications are also possible. Table 3-6 presents the flood hazard zones mapped on FIRM panels in the Region.

**Table 3-6: Flood Insurance Rate Map Zone Descriptions**

| Zone                | Description                                                                                                                                                                                              |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A</b>            | An area with a 1% chance of flooding in any given year for which no base flood elevations (BFEs) have been determined.                                                                                   |
| <b>AE</b>           | An area with a 1% chance of flooding in any given year for which BFEs have been determined. This area may include a mapped floodway.                                                                     |
| <b>AO</b>           | Flood depths of one to three feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities are also determined.                                |
| <b>VE</b>           | An area with a 1% chance of flooding with wave action in any given year for which BFEs have been determined. The limit of moderate wave action or "LiMWA" separates VE zones from coastal AE zones.      |
| <b>X (Shaded)</b>   | An area with a 0.2% chance of flooding in any given year, for which no base flood elevations have been determined. This designation includes areas protected from the 1% annual chance flood by a levee. |
| <b>X (Unshaded)</b> | An area that is determined to be outside of the 1% and 0.2% annual chance floodplains.                                                                                                                   |

Source: FEMA

During large storms, the recurrence interval level of a flood discharge on a tributary tends to be greater than the recurrence interval level of the flood discharge on the main channel downstream. In other words, a 1% annual chance flood event on a tributary may only contribute to a 2% annual chance flood event downstream. This is due to the distribution of rainfall throughout large watersheds during storms and the greater hydraulic capacity of the downstream channel to convey floodwaters. Dams and other flood control structures can also reduce the magnitude of peak flood flows if pre-storm storage is available.

Thus, the recurrence interval level of a precipitation event also generally differs from the recurrence interval level of the associated flood. An example would be Tropical Storm Floyd in 1999, which caused rainfall on the order of a 0.4% annual chance event while flood frequencies were only slightly greater than a 10% annual chance event on the Naugatuck River in Beacon Falls, Connecticut. Flood events can also be mitigated or exacerbated by in-channel and soil conditions, such as low or high flows, the presence of frozen ground, or a deep or shallow water table, as evidenced by the historical record.

### NFIP Participation

Each WestCOG municipality participates in the NFIP and plans to continue participating. A more detailed description of this program is provided in Section 4.1.1. The number of policies and the insurance in force for each WestCOG municipality is presented in Table 3-7. The average insurance in force per policy in the region is \$290,865.

**Table 3-7: National Flood Insurance Program Policies and Insurance in Force**

| Municipality   | Policies in Force | Sum of Premium & Federal Policy Fees | Insurance in Force     | Average Policy Cost | Average Insurance Per Policy |
|----------------|-------------------|--------------------------------------|------------------------|---------------------|------------------------------|
| Bethel         | 135               | \$158,825                            | \$32,856,200           | \$1,176             | \$243,379                    |
| Bridgewater    | 5                 | \$7,609                              | \$1,146,000            | \$1,522             | \$229,200                    |
| Brookfield     | 52                | \$100,738                            | \$20,659,000           | \$1,937             | \$397,288                    |
| Danbury        | 270               | \$484,151                            | \$90,957,000           | \$1,793             | \$336,878                    |
| Darien         | 555               | \$1,006,405                          | \$172,506,000          | \$1,813             | \$310,822                    |
| Greenwich      | 1,601             | \$2,845,096                          | \$505,531,000          | \$1,777             | \$315,760                    |
| New Canaan     | 155               | \$222,507                            | \$52,720,200           | \$1,436             | \$340,130                    |
| New Fairfield  | 26                | \$29,701                             | \$7,597,000            | \$1,142             | \$292,192                    |
| New Milford    | 79                | \$229,986                            | \$22,101,000           | \$2,911             | \$279,759                    |
| Newtown        | 66                | \$105,101                            | \$20,627,200           | \$1,592             | \$312,533                    |
| Norwalk        | 1,819             | \$3,050,005                          | \$508,756,000          | \$1,677             | \$279,690                    |
| Redding        | 29                | \$23,561                             | \$8,644,000            | \$812               | \$298,069                    |
| Ridgefield     | 91                | \$96,013                             | \$28,502,000           | \$1,055             | \$313,209                    |
| Sherman        | 13                | \$12,218                             | \$3,634,000            | \$940               | \$279,538                    |
| Stamford       | 2,374             | \$2,570,870                          | \$601,510,600          | \$1,083             | \$253,374                    |
| Weston         | 98                | \$169,446                            | \$29,803,800           | \$1,729             | \$304,120                    |
| Westport       | 1,184             | \$2,552,096                          | \$380,665,600          | \$2,155             | \$321,508                    |
| Wilton         | 210               | \$320,657                            | \$60,340,600           | \$1,527             | \$287,336                    |
| <b>WestCOG</b> | <b>8,762</b>      | <b>\$13,984,985</b>                  | <b>\$2,548,557,200</b> | <b>\$1,596</b>      | <b>\$290,865</b>             |

Source: FEMA

### Previous Occurrences

Historically, the region has experienced numerous flooding events. According to the FEMA FIS for Fairfield County, major floods occurred in 1936, 1938, 1948, August 1955, 1960, and April 2007. The October 1955 flood was the most severe in the region. Dozens of residential and commercial properties were flooded in Brookfield, 14 bridges were washed away or severely damaged in New Canaan, and half of the Buttery Mill was washed away on Silvermine Road in New Canaan. Bear Mountain Road was completely washed away in New Fairfield. A portion of the Merritt Parkway was washed out on the Silvermine River in Norwalk, as well as a portion of the main line of the New York, New Haven, and Hartford Railroad on the Five Mile River. Several roads in Sherman were washed out, including Leachhollow Road and Route 37 near Chapel Hill Road. According to the Town of New Milford FIS, the October 1955 flood resulted in \$600,000 in damages in New Milford.

In May of 1964, a series of low-amplitude waves in Long Island Sound was attributed to a submarine landslide. As a result, the Town of Darien identified tsunamis (in the 2016 plan for the former SWRPA region) as a potential hazard effect that causes flooding.

Floods noted in the FEMA FIS for Fairfield County include:

- A 1996 storm damaged several dozen unelevated homes in the Compo Beach area of Westport.
- Tropical Storm Floyd in September 1999 brought 11 inches of rain to Danbury, causing damage to over 300 homes and a bridge.

- In April 2007, a nor'easter dropped 3.6 to 7.8 inches of rainfall throughout Fairfield County, resulting in major flood damage.
- Localized flooding occurred in the Darien and Stamford area on October 11, 2007, due to five inches of rainfall falling in a short period of time. Damage was extensive but not sufficient for a FEMA disaster declaration.
- Tropical Storm Hanna in September 2008 produced 6.5 inches of rain in Bethel and flooded parts of Ridgefield and Danbury. Three buildings were flooded in Danbury in the downtown area. Two feet of water was reported on portions of Sound Beach Avenue and Arcadia Road in Greenwich.
- An unnamed winter storm in March 2011 produced two to four inches of snow and flash flooding that washed out 120 feet of Metro North-Danbury rail line in Danbury, shutting the line down for two weeks. Widespread street and basement flooding were reported in New Milford, with sections of Route 7 closed, and a landslide occurred on Grove Street that prompted the evacuation of several families.
- Tropical Storm Irene on August 28, 2011 hit the coastline at high tide, causing a storm surge that flooded roads and homes. In Greenwich, parts of town experienced major flooding, including Route 1 and the eastern sections. In Old Greenwich, nearly every street on the north side of Shore Road was flooded. In Wilton, the Norwalk River overflowed, flooding two parking lots. In Westport, the combination of streamflow and storm surge on the Saugatuck River caused flooding on Route 1, Riverside Avenue, and Imperial Avenue.
- Connecticut experienced devastating damage due to Superstorm Sandy on October 28, 2012. Surges from Long Island Sound flooded buildings and roads along the shoreline, and, coupled with fallen trees, many roads were impassable.
  - Streets close to the water in Westport and Norwalk remained submerged immediately following the storm, and millions of gallons of untreated sewage were discharged into Long Island Sound across the state.
  - Surging floodwaters and downed powerlines and trees trapped firefighters in Greenwich as they tried to battle a fire that destroyed three homes during the height of the storm.
  - In Westport, the surge reached as high as 12 feet, sending water down Main Street and damaging many high-end retail shops. In shoreline areas along Compo Beach and Saugatuck Island, many roads remained flooded or were blocked by downed trees and power lines, impeding efforts to assess the full extent of the damage.
  - In the Harbor View section of Norwalk, menacing winds and 12-foot waves shredded the sea wall and ripped facades and decks off of homes.

The National Centers for Environmental Information (NCEI) Storm Events Database lists numbers of coastal and flash flood events for Fairfield and Litchfield Counties, with records dating back to 1996. The storms listed in NCEI's database present only notable storm events, but unlisted storms also have a significant impact on the region. According to the database, flood events in Fairfield and Litchfield County have resulted in two deaths and \$12.2 million in reported damages since 1996.

Focusing on the last 10-12 years, the following information characterizes recent floods in the region:

- May 27, 2014: A severe thunderstorm produced high winds and heavy rainfall that resulted in another landslide that closed Grove Street in New Milford.
- July 14, 2014: Several rounds of storms produced heavy rain that resulted in flash flooding in portions of the region. A vehicle was floating in floodwaters on Elm Street at the Interstate 95 overpass in Stamford. Widespread street flooding was reported in Westport with several roads impassable. One car was stranded in high water on Myrtle Avenue.

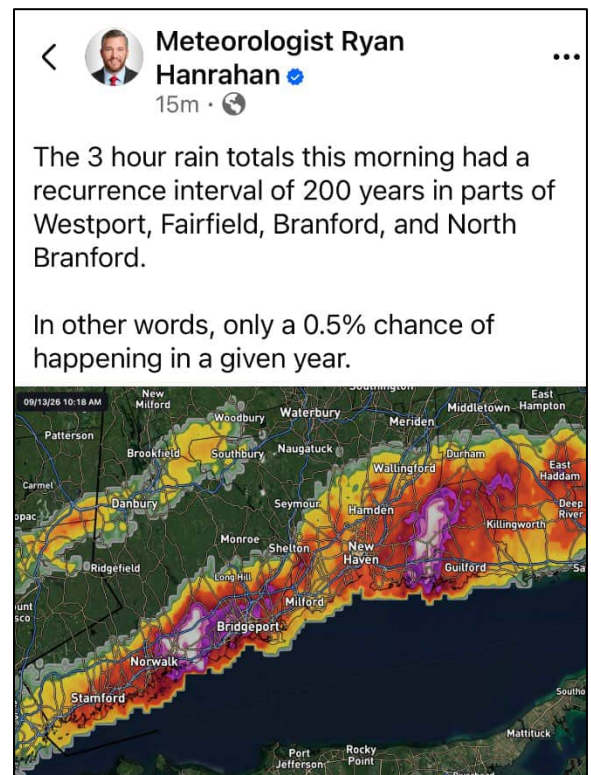
- January 23, 2016: Heavy winds, combined with high astronomical tides, caused areas of minor to moderate localized coastal flooding along western Long Island Sound. Minor to moderate flooding was reported in coastal Westport, Connecticut. The Saugatuck River peaked at 6.39' NAVD88, which was about 3 feet of surge above the tide.
- March 14, 2017: A storm brought gale to storm force winds to the area waters, resulting in 2 to 4 feet of surge during the morning high tidal cycle. This resulted in widespread minor to moderate coastal impacts to the region. Erosion impacts to the beachfront were mainly minor.
- April 16, 2018: Heavy rainfall of 2 to 4 inches in a 3- to 4-hour period produced flash flooding in the region. Elm Street was closed between Cherry Street and South State Street in Stamford due to flooding.
- June 28, 2018: Heavy rainfall of 1 to 1.5 inches fell in a short time, producing isolated flash flooding in the region. Numerous roads closed due to flooding in Darien, including Heights Road, Post Road at Tokeneke Road, Post Road at Thorndal Circle, and Hoyt Street at Briar Brae Road. Interstate 95 was impassible at Exit 16 in Norwalk.
- September 25, 2018: Widespread rainfall amounts of 4 inches or more were reported across southern Connecticut with flash flooding resulting in numerous water rescues. Certain areas, such as Hamden (outside the region), measured up to 8.6 inches of rainfall. Several streets in Old Greenwich, including Lockwood Avenue, Sound Beach Avenue, and Benjamin Street, were flooded with at least two feet of standing water, making roads impassable. Running mud and water over halfway up car tires was reported at the intersection of Davis Avenue and Bruce Park Drive in Old Greenwich. Both Shady Brook Lane and Midbrook Lane were impassable with up to two feet of water in Old Greenwich. Wesskum Wood Road at Sound Beach Avenue and Harding Road at Laddins Rock Road were closed in Old Greenwich due to continued flooding. Severe street flooding was reported at the intersection of Meadow Street and Wilson Avenue in South Norwalk, with a car stranded and submerged halfway. I-95 was closed southbound at Exit 16 (East Avenue) in East Norwalk due to flooding. A car was stuck in the water. A school bus with 31 children was stranded on Dale Street in Stamford due to flooding and had to be rescued. This flood event resulted in a disaster declaration in Connecticut, but the Region was not included.
- December 21, 2018: Heavy rainfall of 1.5 to 4.5 inches produced flash flooding in the region. Route 53 was closed at Sympaug Park Road in Bethel due to flooding.
- August 19, 2019: Showers and thunderstorms produced isolated flash flooding conditions. A car was stuck in flood waters in Westport on Morningside Drive South, just off of Post Road East (Route 1).
- June 10, 2020: Flash flooding in Danbury was caused by slow-moving thunderstorms with over 2 inches of rainfall that closed Clapboard Ridge Road between Farm Street and Ventura Avenue.
- July 2, 2020: Heavy thunderstorms produced 1–4 inches of rain across Fairfield County. Flash flooding resulted in a water rescue on Haig Avenue in Stamford, with vehicles stranded at multiple locations.
- July 8–9, 2021 (Tropical Storm Elsa): Tropical Storm Elsa tracked across southern Connecticut, producing 3–5 inches of rainfall. Widespread flash flooding occurred across Fairfield County, including Darien (Tokeneke Road, Cove Road), Stamford, and Greenwich (Benjamin Street).
- July 16–18, 2021: Scattered thunderstorms caused flash flooding in northwestern Connecticut. In Litchfield County, a house was reportedly inundated with water up to the first floor, streets in New Milford were flooded along the Housatonic River, and roads became impassable near Route 41 and Lambert Road.

- August 31 – September 2, 2021 (Remnants of Hurricane Ida): In a major event, extremely heavy rainfall from the remnants of Hurricane Ida produced 5–8+ inches across the region, with some locations exceeding 8 inches (8.10" near Stamford). This resulted in widespread flash flooding and river flooding. In Fairfield County, water rescues were ongoing in Stamford and Greenwich, and numerous road closures occurred throughout Darien. Uninsured damages totaled over \$5.1 million in Fairfield County alone. In Litchfield County, a Police Sergeant died when his patrol vehicle was swept away by the swollen Weekepeemee River at Jack's Bridge. Multiple roads were closed due to flooding at Route 63, Hill House Road, Cedar Lane, and Marsh Road.
- September 22–24, 2021: Heavy rain of 1–3 inches fell in a 1–2 hour period, causing flash flooding that closed Wild Duck Road in Wilton.
- June 12–13, 2022: Heavy rainfall rates of 1–2 inches per hour caused flash flooding in southern Fairfield County. I-95 Northbound was closed between exits 8 and 9 due to flooding in Stamford.
- July 17–18, 2022: Intense thunderstorms produced 1–4 inches of rainfall. Flash flooding closed Byram Road in Greenwich, and cars were stranded in flood waters on Canal Street and S. State Street in Stamford.
- July 3–4, 2023: Torrential thunderstorms with rainfall rates of 1–2 inches per hour caused flash flooding in Fairfield County. Multiple road closures occurred, including vehicle stalls and a stalled vehicle at the I-95/Fairfield Avenue underpass. Metro North Railroad underpasses became impassable, and Cutspring Road was closed.
- July 15–16, 2023: Torrential thunderstorms with rainfall rates up to 3 inches per hour produced widespread 2–5 inches of rain. Flash flooding caused multiple road closures in Danbury (West Street, Beaverbrook Road, Mill Plain Road, Miry Brook Road, Filmore Avenue), with multiple water rescues ongoing.
- September 7–8, 2023: Street flooding was reported in New Milford (Litchfield County) due to rounds of showers and thunderstorms.
- September 10–11, 2023: Heavy thunderstorms with 1–2 inches per hour rainfall rates caused flash flooding near the Danbury mall with swift moving water. A water rescue was conducted on Mill Plain Road with a person trapped in a car.
- September 12–13, 2023: In a major event, slow-moving thunderstorms with rainfall rates of 1–3 inches per hour caused extensive damage. In Fairfield County, flash flooding closed roads in Danbury (Osbourne Street, White Street, Mill Plain Road) and Brookfield (High Ridge Road), with water beginning to enter homes and water rescues ongoing.
- September 28–29, 2023: Persistent heavy rain over 12–18 hours produced a widespread 4–6 inches of rainfall. Flash flooding in Danbury closed West Street at Montgomery Street, Kenosia Avenue, and the Miry Brook Road area (water rescues ongoing).
- December 17–21, 2023: Heavy rainfall of 3–5 inches caused both widespread and river flooding. The Housatonic River at Gaylordsville rose to moderate flood stage (10.26 feet), flooding portions of West Street, Young's Field Road, Spring Street, and US Route 7 at Bridge Street in New Milford. Estimated damage: \$80,000.
- January 8–10, 2024: Heavy rainfall of 2–4 inches caused moderate to major river flooding in Litchfield County. The Still River at Brookfield rose above major flood stage, flooding roads, parking lots, and some buildings along the river. The Yantic River remained in major flood stage with a reported partial dam break in Fitchville. Estimated damage: \$25,000.

- June 29–30, 2024: Thunderstorms with rainfall rates of 1–2 inches per hour caused localized flash flooding. West Street in Danbury was closed due to flooding. Estimated damage: \$25,000.
- August 18–19, 2024: In a catastrophic event that prompted both Federal Emergency and Major Disaster Declarations, intense storms produced 5–8+ inches of rain (up to 12–13 inches locally) with rainfall rates of 3–4.5 inches per hour. A Flash Flood Emergency was issued, and Governor Lamont declared a State of Civil Preparedness Emergency. Impacts included:
  - Route 6 was closed between I-84 and Old Hawleyville Road in Danbury
  - A mudslide on Shelter Rock Road in Danbury caused a major gas leak and evacuations at the Woodland Hills Complex
  - The Goodwives River in Darien overflowed at Old Kings Market shopping center
  - A man was drowned in his vehicle in the Aspetuck River in Weston near Sawmill Road, with the nearby bridge washed out
  - Route 53 was closed in multiple locations (Glen Road, Valley Forge Road, Diamond Hill Road) in Redding and Weston
  - Five Mile River substantially flooded at River Street in New Canaan
  - Roads impassable with 1–3 feet of water in Ridgefield
  - Bennetts Bridge Road in Sandy Hook was washed out
  - Route 6 was closed at Commerce Road in Newtown due to a washout
  - Dozens of road closures and water rescues throughout Stamford
  - Multiple docks and boats ripped from the shore at Lake Housatonic
  - Route 47 at Hotchkissville was closed due to flooding
  - Route 6 at Woodbury Place was washed out

The Naugatuck, Pomperaug, Housatonic, and Still Rivers all reached major flood stage. Three people lost their lives in Connecticut. Preliminary damage assessment: \$5.8 million for Fairfield County, with 126 catch basins cleaned, 449 shoulders and washouts repaired, 31 culverts and pipes cleared, and 1.2 million pounds of debris removed.

- July 21, 2026: Intense precipitation in southwestern Connecticut caused significant flooding in several WestCOG communities in July 2026. Homes and businesses were damaged in Stamford and Westport.
- September 13, 2026 (see graphic to the right): Intense precipitation in southwestern Connecticut caused significant flooding in several WestCOG communities in September 2026, only two months after a flood event in the same communities. Homes and businesses were damaged in Stamford and Westport. CT DEMHS reported that the total of 7.45 inches of rain in Stamford over three hours was equivalent to a 200-year recurrence interval. The State successfully secured a disaster declaration under SBA, and a formal presidential declaration is pending the collection of damage figures. A bridge over Dead Man Brook was damaged in Westport, leading to the closure of Jessup Road, which remains unresolved as of the end of 2026. The closure has caused an increase in response time from the nearest fire department.



## Probability of Future Events

### Riverine and Flash Flooding

Several recent studies have shown that rainfall in Connecticut is increasing over time. Although annual precipitation in WestCOG is approximately 48 to 52 inches per year (as reported in the WestCOG Climate and Stormwater Hazard Assessment), the average annual precipitation has been increasing by 0.30 inches per decade since the end of the 19th century, according to the NCEI.

Like many areas in the United States, the Region experienced a population boom following World War II. This population increase led to concurrent increases in impervious surfaces and the amount of drainage infrastructure. Many post-war storm drainage systems and culverts were likely designed using rainfall data published in "Technical Paper No. 40" by the U.S. Weather Bureau (now the National Weather Service [NWS]) (Hershfield, 1961). The rainfall data in this document dates from the years 1938 through 1958. These figures were the engineering standard in Connecticut for many years and were still widely used through 2015. This engineering standard was based on the now disproven premise that extreme rainfall series in Connecticut do not change through time such that the older analyses reflect current conditions. This challenge is discussed on the following Fact Sheet.

The Northeast Regional Climate Center (NRCC) has partnered with the Natural Resources Conservation Service (NRCS) to provide a consistent, current regional analysis of rainfall extremes for engineering design (<http://precip.eas.cornell.edu/>). This tool, the NOAA Atlas, has since replaced those figures from the Technical Paper No. 40. The increase in precipitation over time is reflected in the changing rainfall magnitudes published by the NRCC. This effort spurred recent work by the National Oceanic & Atmospheric Administration (NOAA) to update its precipitation recurrence figures as published in NOAA Atlas 14. As shown in Table 3-8, the 24-hour storm has increased in magnitude since the previous figures were published by the National Weather Service (NWS) in 1961, with some variability in the estimates for the more extreme storms. Note that NRCC precipitation figures have not been updated since the 2021 WestCOG HMP.

**Table 3-8: Increase in Total Rainfall (inches) for 24-Hour Storm**

| Total Rainfall by Storm Recurrence Interval | TP-40 (1961) | NRCC (2008) | NOAA (2019) |
|---------------------------------------------|--------------|-------------|-------------|
| 2-Year (50% Annual Chance)                  | 3.3          | 3.4         | 3.5         |
| 10-Year (10% Annual Chance)                 | 5.0          | 5.1         | 5.4         |
| 25-Year (4% Annual Chance)                  | 5.6          | 6.4         | 6.6         |
| 50-Year (2% Annual Chance)                  | 6.4          | 7.6         | 7.5         |
| 100-Year (1% Annual Chance)                 | 7.5          | 9.1         | 8.4         |
| 500-Year (0.2% Annual Chance)               | N/A          | 13.6        | 11.2        |

The Fifth National Climate Assessment estimates 5-20% more annual precipitation will occur for the northeast by the turn of the next century depending on the degree of global warming. The assessment also predicts that extreme precipitation-producing events, such as tropical cyclones, are likely to produce heavier precipitation, with a likely increase of spring and winter extreme precipitation events. Additional intense precipitation, combined with an increase in impervious surfaces and thus an increase in surface runoff, suggests that the potential for flooding will likely increase in the future. Municipalities can improve their resilience to flooding by considering the impacts of locally observed severe weather and, where necessary, by exceeding federal, state, and local requirements to meet local needs.

# REGIONAL CHALLENGES

## INTENSE PRECIPITATION

September 26, 2018 Flooding



Osborne Ave, Norwalk



School Bus Rescue, Stamford



Radar Image showing potent line of thunderstorms which caused the flooding of September 26, 2018

### FOR MORE INFORMATION

Connecticut Institute for Resilience and Climate Adaptation (CRICA)  
University of Connecticut  
Avery Point Campus  
1080 Shennecossett Rd  
Groton, CT 06340  
860-405-9214  
circa@uconn.edu

## WHAT IS THE CHALLENGE?

As the climate changes, the total precipitation received by Connecticut over the course of the year is increasing, as is the number of events with total precipitable moisture over 2 inches. Average 1% annual-chance 24-hour rainfall amounts have increased by 1 to 2 inches in southern New England since the 1960s.

This means that storms are becoming more intense, while aging infrastructure has not been, or can not always be, updated in a timely manner to reduce the rising flood risk. As a result, incidences of flash flooding have become a more common occurrence.

On September 26, 2018, a severe thunderstorm complex lingered over Connecticut, dropping as much as 6 inches of rain in the span of several hours. This led to heavy localized flash flooding in several areas of the state. The images to the left show the floodwaters inundating roads and buildings in the Region.

Many drainage structures have been designed using the U.S. Weather Bureau (now the NWS) "Technical Paper No. 40" (TP-40). The precipitation figures used in this paper are based on historic rainfalls between 1938 and 1958. Both precipitation amounts and the extent of impervious surfaces (which increase runoff) have increased since TP-40 was published.

## REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

This hazard mitigation plan update contains actions that the communities plan to take for reducing losses associated with intense precipitation events. One action recommended for most communities is to consider severe precipitation figures that have been updated since the standard (TP-40) figures were developed. Sources include the Northeast Regional Climate Center (NRCC) and the NOAA Atlas 14.

**24-hour rainfall amounts for a 4% annual-chance storm (a "25-year storm") in each of these sources is presented in the table to the right (in inches).**

| Community     | TP-40 | NRCC | NOAA |
|---------------|-------|------|------|
| Bethel        | 5.7   | 6.4  | 6.8  |
| Bridgewater   | 5.5   | 6.2  | 6.7  |
| Brookfield    | 5.7   | 6.3  | 6.8  |
| Danbury       | 5.7   | 6.4  | 6.8  |
| Darien        | 5.7   | 6.4  | 6.6  |
| Greenwich     | 5.7   | 6.4  | 6.6  |
| New Canaan    | 5.7   | 6.4  | 6.6  |
| New Fairfield | 5.7   | 6.3  | 6.7  |
| New Milford   | 5.5   | 6.2  | 6.7  |
| Newtown       | 5.7   | 6.4  | 6.9  |
| Norwalk       | 5.7   | 6.4  | 6.5  |
| Redding       | 5.7   | 6.4  | 6.7  |
| Ridgefield    | 5.7   | 6.4  | 6.7  |
| Sherman       | 5.7   | 6.1  | 6.7  |
| Stamford      | 5.7   | 6.4  | 6.6  |
| Weston        | 5.7   | 6.4  | 6.6  |
| Westport      | 5.7   | 6.4  | 6.5  |
| Wilton        | 5.7   | 6.4  | 6.6  |

According to the 2023 CT NHMP, flooding events are expected to increase in both frequency and intensity due to climate change. Precipitation events are expected to increase in intensity with seasonal variations due to climate change. With the Northeast Region experiencing a 70% increase in the amount of precipitation falling in very heavy precipitation events, Connecticut can be expected to experience a similar increase in amount of precipitation. More intense rainfall is likely to increase peak flooding, particularly in urban environments. Heavy precipitation events above the 99th percentile of daily values have increased by 55% since 1958.

According to the WestCOG Climate and Stormwater Hazard Assessment, in a high CO<sub>2</sub>-emissions scenario, Representative Concentration Pathway (RCP) 8.5, the annual precipitation across the state is projected to increase by 8.5% (4-5 inches) and 9.5% (4.5-5.5 inches), by mid- and late-century, respectively, with the greatest increase projected in the winter (13.4% and 16.3% by mid- and late-century, respectively) and spring (10% and 16.5% by mid- and late-century, respectively).

Increased precipitation will increase the probability of rain-induced flooding (i.e., pluvial) and riverine flooding events in low-lying areas and in areas with impervious surfaces that do not have adequate mitigation measures in place. The WestCOG Climate and Stormwater Hazard Assessment notes that stormwater systems in much of the Northeast are struggling to keep up with the region's increasingly intense rainfall. Per the 2024 Connecticut Stormwater Quality Manual, new development must now manage the runoff from the 90th percentile rainfall event, or the 1.3-inch storm; however, in 2021, Hurricane Ida dumped 7 to 8 inches of rain across parts of Connecticut in less than 24 hours, and at its peak rainfall intensity in some areas reached roughly 3.5 inches per hour.

The continued increase in precipitation only heightens the need for hazard mitigation planning as the occurrence of floods may change in accordance with the greater precipitation.

#### Coastal Flooding

Sea level rise is anticipated to increase the frequency of coastal flood events, thereby leading to increased risk of coastal flooding in WestCOG's shoreline communities. Global mean sea level is projected to rise between 0.98 and 8.2 feet over the 21st century. Sea level rise is not consistent around the world, and as noted above is affected by local variations in currents, temperature, and changes in land surface elevation. It has long been expected that the rate of sea level rise in Connecticut will be slightly higher than the global projections due to the effects of regional subsidence. However, more recent studies have asserted that changes in ocean circulation will increase the relative sea level rise along the Atlantic coast even more than previously thought.

CIRCA has developed sea level rise projections for Connecticut. CIRCA has established a "planning threshold" of a 0.5-meter (1.64 feet) rise in sea level expected by 2050 and has defined a caution threshold" of 1.0 meters (3.28 feet) in sea level rise expected in the period 2060-2090. According to the NOAA Technical Report OAR CPO-1, the worst-case scenario for sea level rise by 2100 is a global average of 6.6 feet above the 1992 mean sea level. The WestCOG communities located along Long Island Sound are the most likely to be affected by sea level rise.

Rising sea levels will impact both the natural and man-made coastal environments. It could result in the disappearance of a large portion of Connecticut's tidal wetlands, and the conversion of upstream wetlands to saltwater marshland. Beachfront communities will see increased erosion of the sand and dune structures, which potentially will lead to more extreme and frequent flooding. Dikes and sea walls that are in place now could see a rapid decline in their effectiveness, potentially increasing the frequency and extent of flooding in coastal areas.

As sea levels rise, drainage systems will become less effective, leading to the potential for greater flooding from even moderate rain events. Future storm events, especially those with an accompanying strong storm surge, will pose an even greater threat to coastal and low-lying communities. Storm surges from hurricanes and nor'easters will reach further inland, impacting a greater portion of the region. The flooding and inundation expected to occur from a Category 3 hurricane could,

by the end of this century, result from a Category 1 storm. The effects of 4 feet of sea level rise for the region as prepared by NOAA is shown in Figure 3-1.

Of great concern is the influence sea level rise will have on the severity of episodic hazard events such as storm surge and coastal flooding, as well as long term coastal erosion. It can be expected that sea level rise will be an amplifier of the magnitude for these other coastal hazards. This is discussed on the following Fact Sheet.

According to the 2023 CT NHMP, sea level rise impacts on flood risk may include:

- Expanding coastal flood risk locations, including within coastal counties and parts of Hartford County.
- Mean sea level increases as large as 20 inches above the National Tidal Datum Epoch by 2050, and as large as 6 feet by 2100 under high greenhouse gas emissions scenarios.
- With 20 inches of sea level rise, increases in coastal flood frequency by a factor of 5 to 10 with no change in storm conditions.
- Loss of land area as those areas projected to be covered under Mean Higher High-Water conditions will be permanently inundated.

In addition to sea level rise impacts, the 2023 CT NHMP reports that climate change is increasing ocean water temperatures, causing the development of stronger tropical storms that can cause more severe coastal flooding and intensify storm surge, increasing the vulnerability of coastal communities.

#### Ice Jams

Ice jam events are most likely to occur during the late winter and early spring months as temperatures begin to warm and there are periods of thawing. With the warming temperatures and increasing precipitation event intensity expected with climate change, conditions that enable ice jams may occur more frequently. This is noted on the following Fact Sheet.

#### Impacts to Community Assets

Flooding presents several safety hazards to people and property and can cause extensive damage and potential injury or loss of life. The five forces of flooding as described by FEMA include hydrodynamic forces, debris impact, hydrostatic forces, soaking, and sediments and contaminants.

- **Hydrodynamic forces:** These are damages created by moving waters. The three ways these forces can damage a structure include frontal impact (water striking the walls of a structure), drag effect (water running alongside the walls), and eddies or negative pressure (water passing the downstream side of a structure).
- **Debris impact:** These are damages caused by the direct impact of any object that floodwaters can pick up and move to another location.
- **Hydrostatic forces:** This includes the downwards and sideways pressure that standing water exerts on the floor and walls of a structure. Hydrostatic pressure can also cause damage due to buoyancy and floatation which can occur with flood waters.
- **Soaking:** This includes the warping, swelling, and changes to the form of materials and structures as a result of being submerged in floodwaters.
- **Sediments and contaminants:** The sand, sediments, chemicals, and biological contaminants (such as untreated sewage) that floodwaters can move and leave behind after the flood subsides.

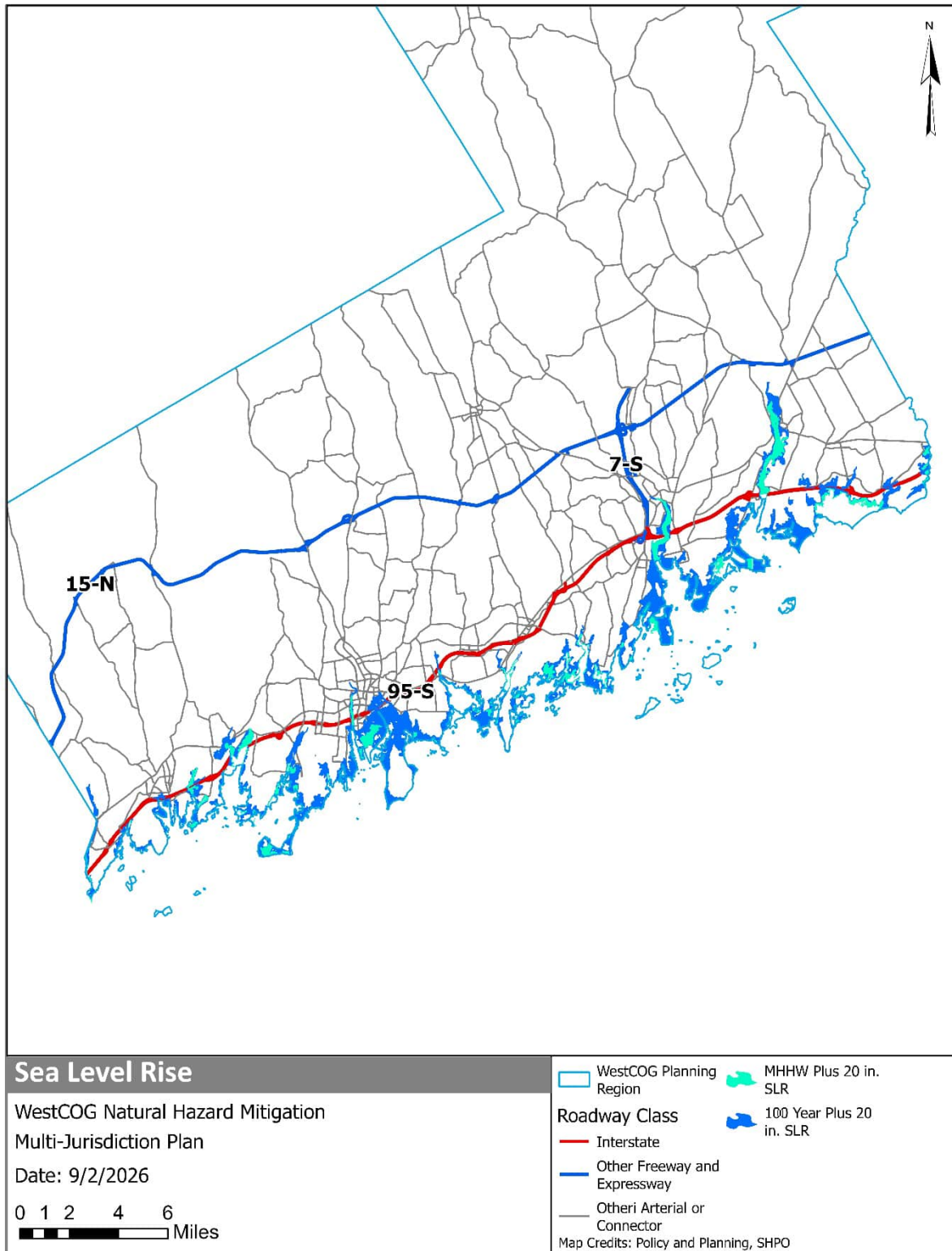


Figure 3-1: Sea Level Rise

# REGIONAL CHALLENGES

## COASTAL FLOODING



*City-data.com*



*Darientimes.com*

### WHAT IS THE CHALLENGE?

Connecticut's coastlines boast a range of economic and recreational benefits for the state. Unfortunately, increasingly strong storms and densely populated shorelines mean that coastal flooding has been an increasingly common, and unwelcome, guest to our shoreline communities.

Coastal flooding occurs during hurricanes and other strong cyclones including nor'easters. The direction and strength of wind play a role in forcing water into Long Island Sound from the open ocean to the east. The effects of flooding are exacerbated during high tide, and especially astronomically high tide.

Estimates from the previous WestCOG hazard mitigation plan report that economic losses in the region could be as high as \$1.1 billion during a 100-year coastal flood event. Clearly coastal flooding has the ability to cause vast economic and commercial destruction in the area if not mitigated. The pictures on the left show coastal flooding in the WestCOG area as a result of storm events

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Coastal flooding is on the rise due to the effects of climate change, so a proactive approach is necessary to ensure the safety and economic security of the region. Historical data is no longer the best way to predict the future extent and ferocity of coastal flood events. The latest modeling and predictions by local and national scientists have been incorporated into the plan in order to better inform WestCOG communities.

This hazard mitigation plan update focuses on a multifaceted approach for mitigating coastal flood impacts. Mitigation is not a one-size-fits-all action. While some buildings may be adequately protected through elevation, other properties may benefit from a FEMA-subsidized buyout.

The hazard mitigation plan's strategies focus on education and outreach, working collectively to initiate change, and looking at past actions to inform future decisions that influence regulations, policies, and enforcement actions that influence behavioral changes to produce tangible results.

### FOR MORE INFORMATION

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# REGIONAL CHALLENGES

## ICE JAMS



*Ice jams in New Milford, 2018  
Photo: reschuster47, reddit*

### WHAT IS THE CHALLENGE?

Ice jams occur when heavy rain, warm temperatures and snow melt causes rivers to rise and break the surface layer of ice that lies on top. This broken ice then floats downstream until obstructions or constrictions such as bridges, bends, and narrow channels cause it to pile up and form a dam.

Ice jams can cause severe flooding upstream. If suddenly breached, flooding, riverbed and riverbank scouring, and damage to roads and bridges can occur downstream. The presence of floating chunks of ice, as well as cold temperatures, can exacerbate the impacts of any flooding.

Ice jam events are most likely to occur during the late winter and early spring months as temperatures begin to warm and there are periods of thawing. With the warming temperatures and increasing precipitation event intensity expected with continued climate change, conditions that enable ice jams may occur more frequently.

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Ice jams can occur along streams and rivers of all sizes. An ice jam formed at Lovers Leap State Park in New Milford in 2018, at the same time a major ice jam was causing flooding upstream in Kent.

Some WestCOG communities are more susceptible to ice jam flooding than others, but all should be aware of the risks and mitigation strategies.

Mitigation strategies can include:

- Identification of locations where ice jams may form (such as bridges, culverts, and stream constrictions).
- Continuous monitoring of streams (particularly ice-jam risk locations as identified above) during early spring months.
- Creation or preservation of open space along streams in areas that may be potentially impacted by ice jam flooding.
- Evaluate options for structural projects such as *tension weirs* or *sloped-block ice control structures*.

### FOR MORE INFORMATION

The Northeast States Emergency Consortium (NESEC)  
1 West Water Street, Suite 205,  
Wakefield MA 01880  
(781) 224-9876  
<http://nsec.org/ice-jams/>

Floodwaters cause massive damage to the lower levels of buildings, destroying business records, furniture, and other sentimental papers and artifacts. In addition, floodwaters can prevent emergency and commercial egress by blocking streets, deteriorating municipal drainage systems, and diverting municipal staff and resources.

Furthermore, damp conditions trigger the growth of mold and mildew in flooded buildings, contributing to allergies, asthma, and respiratory infections. Snakes and rodents are forced out of their natural habitat and into closer contact with people, and ponded water following a flood presents a breeding ground for mosquitoes. Gasoline, pesticides, poorly treated sewage, and other aqueous pollutants can be carried by floodwaters and soak into soil, building components, and furniture.

#### Affected Population

As noted in the above descriptions of past flooding events, the potential impacts extend beyond lost or damaged property and include reduced access to transportation and limited movement of goods and services. All 18 municipalities in the region are impacted by floods on a regular basis. Impacts from flooding vary according to the severity of each flood event but can range from temporary road closures to minor damage of personal property, to dam, septic, and sewer system failure, and even the destruction of homes and businesses and loss of lives.

While populations in floodplains or nuisance flooding areas are directly impacted by flooding, indirect impacts are more widespread. When flooding overtops and closes a roadway or an area is affected by a mudslide, it affects larger traffic patterns. When flooding overwhelms a combined sewer system and the capacity of the downstream wastewater treatment plant, the loss of capacity (and potential water quality impacts) can affect an entire community.

#### Repetitive Loss Properties

Flood damage is often predictable in its location. All but four municipalities in the region have one or more specific properties that are insured and have submitted claims under the NFIP multiple times. These properties are defined by the NFIP (Section 4.1.1) as repetitive loss properties (RLPs) or severe repetitive flood loss properties (SRLPs). A Fact Sheet about RLPs follows.

As of December 31, 2017, and as noted in the 2021 HMP update, the Region had 817 RLPs and 53 SRLPs, with the majority lying within Norwalk and Westport. The number increased to 939 properties as of December 14, 2020. The majority of these properties appear to be residential, while 65 (8.0%) are classified as non-residential. Losses reported to the NFIP as of December 14, 2020, are presented in the table below.

**Table 3-9: Payments to Repetitive Loss Properties**

| Municipality  | Number of Properties | Number of Losses | Total Payments |
|---------------|----------------------|------------------|----------------|
| Bethel        | 5                    | 17               | \$428,184      |
| Bridgewater   | 0                    | 0                | \$0            |
| Brookfield    | 3                    | 6                | \$83,569       |
| Danbury       | 28                   | 83               | \$2,808,537    |
| Darien        | 60                   | 169              | \$8,730,672    |
| Greenwich     | 139                  | 420              | \$14,472,273   |
| New Canaan    | 7                    | 18               | \$261,884      |
| New Fairfield | 0                    | 0                | \$0            |
| New Milford   | 16                   | 50               | \$2,291,317    |
| Newtown       | 3                    | 8                | \$65,046       |
| Norwalk       | 260                  | 767              | \$23,761,778   |
| Redding       | 0                    | 0                | \$0            |

| Municipality   | Number of Properties | Number of Losses | Total Payments      |
|----------------|----------------------|------------------|---------------------|
| Ridgefield     | 6                    | 14               | \$70,790            |
| Sherman        | 0                    | 0                | \$0                 |
| Stamford       | 120                  | 383              | \$14,842,727        |
| Weston         | 15                   | 36               | \$551,430           |
| Westport       | 261                  | 813              | \$26,360,206        |
| Wilton         | 16                   | 45               | \$914,229           |
| <b>WestCOG</b> | <b>939</b>           | <b>2,829</b>     | <b>\$67,272,435</b> |

Source: FEMA

An additional 122 RLPs have been realized in the Region since December 31, 2017, due primarily to coastal flood events in fall 2018. However, a handful of the changes in the numbers are likely due to corrected addresses in the database. The table below presents the status of RLPs in the region as of December 2020.

**Table 3-10: Rep. Loss Properties as of December 2020**

| Municipality  | Number of Properties | Number of Losses | RLP Increase |
|---------------|----------------------|------------------|--------------|
| Bethel        | 5                    | 17               | +2           |
| Bridgewater   | 0                    | 0                | +0           |
| Brookfield    | 3                    | 6                | +0           |
| Danbury       | 28                   | 83               | +3           |
| Darien        | 60                   | 169              | +5           |
| Greenwich     | 139                  | 420              | +22          |
| New Canaan    | 7                    | 18               | +1           |
| New Fairfield | 0                    | 0                | +0           |
| New Milford   | 16                   | 50               | +3           |
| Newtown       | 3                    | 8                | +0           |
| Norwalk       | 260                  | 767              | +33          |
| Redding       | 0                    | 0                | +0           |
| Ridgefield    | 6                    | 14               | +0           |
| Sherman       | 0                    | 0                | +0           |
| Stamford      | 120                  | 383              | +18          |
| Weston        | 15                   | 36               | +0           |
| Westport      | 261                  | 813              | +34          |
| Wilton        | 16                   | 45               | +1           |
| WestCOG       | 939                  | 2,829            | +122         |

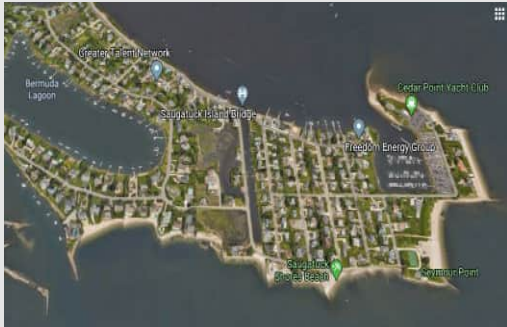
Source: FEMA

#### Loss Estimates from HAZUS-MH

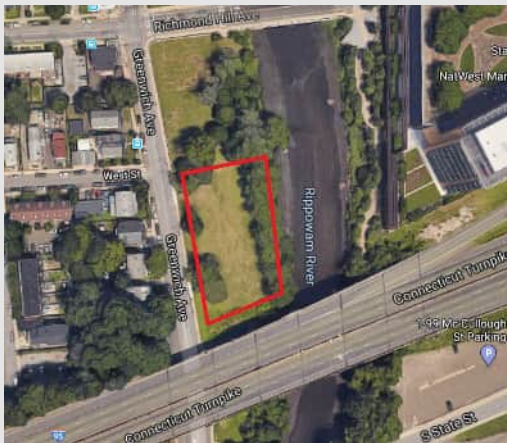
Potential impacts from flooding events were evaluated using FEMA's HAZUS-MH loss estimation program. Table 3-11 presents the results for the region. Local results are presented in each municipal annex.

# REGIONAL CHALLENGES

## REPETITIVE LOSS PROPERTIES



Coastal RL Area in Westport



Property acquisition in Stamford converted to open space

### WHAT IS THE CHALLENGE?

FEMA defines a Repetitive Loss (RL) property as any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A total of 938 RL properties are listed in the municipalities that comprise the eighteen-town region. A breakdown is as follows:

| Community     | Total      | Residential   |            |           |           | Nonresidential |           |
|---------------|------------|---------------|------------|-----------|-----------|----------------|-----------|
|               |            | Single Family | 2-4 Family | Condo     | Other     | Business       | Other     |
| Bethel        | 5          | 4             | 0          | 1         | 0         | 0              | 0         |
| Bridgewater   | 0          | 0             | 0          | 0         | 0         | 0              | 0         |
| Brookfield    | 3          | 2             | 0          | 0         | 0         | 0              | 1         |
| Danbury       | 28         | 9             | 6          | 1         | 2         | 4              | 6         |
| Darien        | 60         | 45            | 0          | 3         | 0         | 5              | 7         |
| Greenwich     | 139        | 122           | 6          | 1         | 3         | 1              | 6         |
| New Canaan    | 7          | 6             | 1          | 0         | 0         | 0              | 0         |
| New Fairfield | 0          | 0             | 0          | 0         | 0         | 0              | 0         |
| New Milford   | 16         | 7             | 2          | 1         | 0         | 2              | 4         |
| Newtown       | 3          | 3             | 0          | 0         | 0         | 0              | 0         |
| Norwalk       | 259        | 215           | 25         | 4         | 2         | 3              | 10        |
| Redding       | 0          | 0             | 0          | 0         | 0         | 0              | 0         |
| Ridgefield    | 6          | 4             | 0          | 0         | 0         | 0              | 2         |
| Sherman       | 0          | 0             | 0          | 0         | 0         | 0              | 0         |
| Stamford      | 119        | 97            | 8          | 2         | 5         | 2              | 5         |
| Weston        | 15         | 15            | 0          | 0         | 0         | 0              | 0         |
| Westport      | 262        | 238           | 1          | 5         | 0         | 4              | 14        |
| Wilton        | 16         | 11            | 0          | 0         | 1         | 2              | 2         |
| <b>Region</b> | <b>938</b> | <b>778</b>    | <b>49</b>  | <b>18</b> | <b>13</b> | <b>23</b>      | <b>57</b> |

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

If a property is not insured against flood losses or is insured but the owner does not submit claims, then the property cannot appear on the RL list. Therefore, the RL list is not an absolute reflection of flood risk in a community. Nevertheless, the RL list can provide a starting point for evaluating flood risk in a community, and it may indicate that flooding is a problem in a specific area even when not obvious upon a cursory review of the setting.

It is important for WestCOG communities to further reduce flood losses, and these efforts must include the RL property losses that strain the NFIP. For a risk evaluation to be effective, each RL list must be accurate. For example, two of the properties located in Norwalk (one listed in other WestCOG communities, and one property in Stratford (outside the region) is listed in Bethel.

Communities must carefully check and offer corrections to their individual RL lists. Misplaced properties must be formally transferred to the correct municipality, duplicates must be cleared, and mitigation status should be updated to ensure that resources are directed to the properties with most risk and highest flood losses. **This plan therefore recommends that municipalities with RL properties should work with DEEP to conduct a list validation, making corrections as needed and removing incorrect listings.**

### FOR MORE INFORMATION

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**Table 3-11: Building Damage from Flood**

| Damage          | 10-Year       | 25-Year       | 50-Year       | 100-Year      | 500-Year      |
|-----------------|---------------|---------------|---------------|---------------|---------------|
| <b>1-10%</b>    | 7,901         | 8,858         | 9,562         | 9,992         | 11,024        |
| <b>11-20%</b>   | 5,757         | 6,764         | 7,793         | 8,667         | 10,617        |
| <b>21-30%</b>   | 1,589         | 1,913         | 2,592         | 3,025         | 4,186         |
| <b>31-40%</b>   | 625           | 781           | 961           | 1,290         | 1,969         |
| <b>41-50%</b>   | 304           | 381           | 633           | 763           | 1,209         |
| <b>&gt; 50%</b> | 610           | 860           | 1,227         | 1,691         | 2,962         |
| <b>Total</b>    | <b>16,786</b> | <b>19,557</b> | <b>22,768</b> | <b>25,428</b> | <b>31,967</b> |

Source: HAZUS-MH

The HAZUS-MH analysis appears to significantly overestimate the number of structures at risk in the region. For example, a 10-year flood event is not expected to result in significant flooding damage to nearly 16,800 properties in the region.

Economic loss was calculated in HAZUS-MH from both direct property damage and business interruption. Table 3-12 summarizes the combined economic loss for each WestCOG municipality. In general, coastal municipalities in the Region have greater potential for flood losses due to a higher concentration of residences and businesses near the shoreline. As explained above, the economic loss is significantly greater than would be expected in the region for the various flood events.

**Table 3-12: Economic Loss Due to Flood (in Millions of 2026 Dollars)**

| Municipality   | 10-Year         | 25-Year         | 50-Year         | 100-Year        | 500-Year        |
|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Bethel         | \$214           | \$365           | \$463           | \$551           | \$876           |
| Bridgewater    | \$13            | \$14            | \$15            | \$18            | \$29            |
| Brookfield     | \$579           | \$708           | \$818           | \$929           | \$1,426         |
| Danbury        | \$1,299         | \$1,688         | \$2,154         | \$2,544         | \$3,764         |
| Darien         | \$236           | \$266           | \$383           | \$450           | \$948           |
| Greenwich      | \$708           | \$920           | \$1,323         | \$1,620         | \$2,338         |
| New Canaan     | \$65            | \$98            | \$115           | \$135           | \$239           |
| New Fairfield  | \$16            | \$29            | \$34            | \$41            | \$66            |
| New Milford    | \$2,095         | \$2,435         | \$2,748         | \$3,063         | \$3,825         |
| Newtown        | \$460           | \$568           | \$676           | \$726           | \$976           |
| Norwalk        | \$2,473         | \$2,945         | \$3,813         | \$4,546         | \$6,181         |
| Redding        | \$96            | \$111           | \$128           | \$145           | \$186           |
| Ridgefield     | \$98            | \$125           | \$151           | \$228           | \$364           |
| Sherman        | \$40            | \$41            | \$49            | \$56            | \$83            |
| Stamford       | \$2,709         | \$3,539         | \$5,066         | \$6,141         | \$8,484         |
| Weston         | \$103           | \$129           | \$150           | \$174           | \$248           |
| Westport       | \$1,633         | \$1,770         | \$2,178         | \$2,469         | \$3,054         |
| Wilton         | \$1,048         | \$1,206         | \$1,340         | \$1,476         | \$1,860         |
| <b>WestCOG</b> | <b>\$13,885</b> | <b>\$16,957</b> | <b>\$21,604</b> | <b>\$25,312</b> | <b>\$34,947</b> |

Source: HAZUS-MH

Finally, the economic losses presented above were used to generate an annualized loss estimate for each WestCOG municipality due to flooding. Annualized loss estimates from HAZUS-MH are presented in Table 3-13. The economic loss

and annualized loss estimates appear to be greater than what would be expected, consistent with the assessment above. As such, reported loss estimates are used to estimate annualized losses as presented in the next section.

**Table 3-13: Annualized Loss Due to Flood (in Millions of 2026 Dollars)**

| <b>Municipality</b> | <b>Building &amp; Contents Loss</b> | <b>Business Disruption</b> | <b>Annualized Loss</b> |
|---------------------|-------------------------------------|----------------------------|------------------------|
| Bethel              | \$10.63                             | \$27.50                    | \$38.13                |
| Bridgewater         | \$0.75                              | \$0.75                     | \$1.50                 |
| Brookfield          | \$26.13                             | \$48.75                    | \$74.88                |
| Danbury             | \$58.38                             | \$125.88                   | \$184.25               |
| Darien              | \$12.25                             | \$20.88                    | \$33.25                |
| Greenwich           | \$47.63                             | \$58.88                    | \$106.50               |
| New Canaan          | \$4.00                              | \$6.25                     | \$10.25                |
| New Fairfield       | \$1.00                              | \$1.88                     | \$2.88                 |
| New Milford         | \$132.75                            | \$119.25                   | \$252.00               |
| Newtown             | \$23.75                             | \$35.25                    | \$59.00                |
| Norwalk             | \$109.50                            | \$217.63                   | \$327.13               |
| Redding             | \$4.25                              | \$7.38                     | \$11.63                |
| Ridgefield          | \$3.88                              | \$10.63                    | \$14.38                |
| Sherman             | \$2.13                              | \$2.38                     | \$4.63                 |
| Stamford            | \$103.88                            | \$301.13                   | \$405.00               |
| Weston              | \$5.63                              | \$7.88                     | \$13.50                |
| Westport            | \$72.00                             | \$121.00                   | \$193.00               |
| Wilton              | \$39.88                             | \$84.38                    | \$124.25               |
| <b>WestCOG</b>      | <b>\$658.38</b>                     | <b>\$1,197.63</b>          | <b>\$1,856.13</b>      |

Source: HAZUS-MH

#### Loss Estimates from FEMA and NFIP

The NFIP losses track damage to individual (usually private) properties since 1978, while the FEMA Public Assistance reimbursements track damage to municipalities and non-profits with records dating back to 1998. These two data sources may be added together to develop an estimated annualized loss to flooding for the region, as presented in Table 3-14. The resulting estimated annualized loss for the Region due to flooding is \$5.4 million; this reflects an increase of \$0.2 million since the previous regional HMP.

**Table 3-14: Annualized Flood Loss from NFIP and FEMA Public Assistance Reimbursements (as of 2026)**

| <b>Municipality</b> | <b>NFIP Losses Paid</b> | <b>PA Losses Paid</b> | <b>Annualized Loss</b> |
|---------------------|-------------------------|-----------------------|------------------------|
| Bethel              | \$738,959               | \$118,953             | \$19,643               |
| Bridgewater         | \$157,080               | \$49,385              | \$5,036                |
| Brookfield          | \$312,146               | \$300,221             | \$17,225               |
| Danbury             | \$7,789,747             | \$2,123,426           | \$238,123              |
| Darien              | \$21,968,154            | \$4,061,089           | \$602,709              |
| Greenwich           | \$38,852,547            | \$5,942,535           | \$1,021,661            |
| New Canaan          | \$1,893,191             | \$643,084             | \$62,409               |
| New Fairfield       | \$41,423                | \$208,097             | \$8,295                |
| New Milford         | \$3,378,403             | \$133,515             | \$75,152               |

| Municipality   | NFIP Losses Paid     | PA Losses Paid      | Annualized Loss    |
|----------------|----------------------|---------------------|--------------------|
| Newtown        | \$455,769            | \$2,381,662         | \$94,555           |
| Norwalk        | \$45,991,122         | \$6,758,905         | \$1,199,538        |
| Redding        | \$154,189            | \$1,295,532         | \$49,481           |
| Ridgefield     | \$488,259            | \$373,636           | \$23,516           |
| Sherman        | \$53,395             | \$241,328           | \$9,731            |
| Stamford       | \$29,964,674         | \$6,586,544         | \$859,498          |
| Weston         | \$1,345,922          | \$1,656,873         | \$87,214           |
| Westport       | \$44,230,229         | \$2,518,519         | \$1,011,410        |
| Wilton         | \$2,536,117          | \$1,070,772         | \$91,078           |
| <b>WestCOG</b> | <b>\$200,351,325</b> | <b>\$36,464,077</b> | <b>\$5,476,274</b> |

Source: Connecticut NFIP Coordinator, FEMA

#### Loss Estimates from NCEI

Historical loss data for floods was extracted from the NCEI Storm Events Database. Table 3-15 below presents the number of flood events, the number of deaths and injuries, and total property loss values (in 2026 dollar equivalents) impacting each WestCOG municipality between 2015 and 2025. Annualized loss estimates for flood damage is calculated by dividing the total property loss figures by the 10-year reporting period.

**Table 3-15: Annualized Flood Loss Estimates from NCEI**

| Municipality   | Event Count* | Death    | Injury   | Property Loss (2026\$) | Annualized Loss  |
|----------------|--------------|----------|----------|------------------------|------------------|
| Bethel         | 1            | 0        | 0        | \$0                    | \$0              |
| Bridgewater    | 0            | 0        | 0        | \$0                    | \$0              |
| Brookfield     | 1            | 0        | 0        | \$0                    | \$0              |
| Danbury        | 19           | 0        | 0        | \$0                    | \$0              |
| Darien         | 7            | 0        | 0        | \$0                    | \$0              |
| Greenwich      | 8            | 0        | 0        | \$6,440,500            | \$644,050        |
| New Canaan     | 1            | 0        | 0        | \$0                    | \$0              |
| New Fairfield  | 0            | 0        | 0        | \$0                    | \$0              |
| New Milford    | 3            | 0        | 0        | \$54,500               | \$5,450          |
| Newtown        | 2            | 0        | 0        | \$106,000              | \$10,600         |
| Norwalk        | 3            | 0        | 0        | \$0                    | \$0              |
| Redding        | 3            | 0        | 0        | \$0                    | \$0              |
| Ridgefield     | 1            | 0        | 0        | \$0                    | \$0              |
| Sherman        | 0            | 0        | 0        | \$0                    | \$0              |
| Stamford       | 13           | 0        | 0        | \$0                    | \$0              |
| Weston         | 2            | 1        | 0        | \$106,000              | \$10,600         |
| Westport       | 2            | 0        | 0        | \$0                    | \$0              |
| Wilton         | 1            | 0        | 0        | \$0                    | \$0              |
| <b>WestCOG</b> | <b>67</b>    | <b>1</b> | <b>0</b> | <b>\$6,707,000</b>     | <b>\$670,700</b> |

Source: NOAA NCEI

\*Note: municipal event counts and WestCOG totals may reflect events that affected multiple municipalities but are counted as individual events within each affected municipality. The total number of events in WestCOG, as shown in the table, may therefore be larger than the true number of events that impacted the region.

Table 3-16 presents regional flood impacts between 2015 and 2025 by flood type, classified as either a coastal flood, riverine flood, or flash flood.

**Table 3-16: Annualized Flood Loss Estimates by Flood Type from NCEI**

| Flood Type     | Event Count* | Death | Injury | Property Loss (2026\$) | Annualized Loss |
|----------------|--------------|-------|--------|------------------------|-----------------|
| Flash Flood    | 57           | 1     | 0      | \$6,652,500            | \$665,250       |
| Riverine Flood | 3            | 0     | 0      | \$54,500               | \$5,450         |
| Coastal Flood  | 6            | 0     | 0      | \$0                    | \$0             |
| All Flood      | 66           | 1     | 0      | \$6,707,000            | \$670,700       |

Source: NOAA NCEI

\*Note: total event counts may differ between Table 3-15 and Table 3-16 because the municipal event counts in Table 3-15 may reflect events that affected multiple municipalities but are counted as individual events within each affected municipality.

### National Risk Index

FEMA's NRI was utilized to obtain information for a risk analysis on riverine flooding and coastal flooding at the census tract level across WestCOG. Figure 3-2 and Figure 3-3 display the risk rating by census tract in the WestCOG region for riverine flooding and coastal flooding, respectively.

Riverine flood risk in the WestCOG region ranges from very low to relatively moderate, with the majority of the COG at a relatively low risk to riverine flood. The census tracts at relatively moderate risk to riverine flood are primarily in the Town of New Milford, with portions of Greenwich and Norwalk also at a relatively moderate risk to riverine flood. The table below shows a breakdown of community risk in WestCOG broken down by census tract.

**Table 3-17: National Risk Index Rating for Riverine Flood by Community (census tract level)**

| Community      | Total Census Tracts | Number of Census Tracts with No Rating | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk | Number of Census Tracts with Relatively Moderate Risk |
|----------------|---------------------|----------------------------------------|--------------------------------------------|--------------------------------------------------|-------------------------------------------------------|
| Bethel         | 4                   | -                                      | 1                                          | 3                                                | -                                                     |
| Bridgewater    | 1                   | -                                      | 1                                          | -                                                | -                                                     |
| Brookfield     | 3                   | -                                      | 1                                          | 2                                                | -                                                     |
| Danbury        | 20                  | 3                                      | 7                                          | 10                                               | -                                                     |
| Darien         | 5                   | -                                      | -                                          | 5                                                | -                                                     |
| Greenwich      | 15                  | -                                      | 2                                          | 12                                               | 1                                                     |
| New Canaan     | 5                   | -                                      | 2                                          | 3                                                | -                                                     |
| New Fairfield  | 3                   | -                                      | 1                                          | 2                                                | -                                                     |
| New Milford    | 5                   | -                                      | -                                          | 2                                                | 3                                                     |
| Newtown        | 6                   | -                                      | 4                                          | 2                                                | -                                                     |
| Norwalk        | 22                  | 4                                      | 4                                          | 12                                               | 2                                                     |
| Redding        | 2                   | -                                      | 1                                          | 1                                                | -                                                     |
| Ridgefield     | 6                   | 1                                      | 4                                          | 1                                                | -                                                     |
| Sherman        | 1                   | -                                      | 1                                          | -                                                | -                                                     |
| Stamford       | 33                  | 8                                      | 9                                          | 16                                               | -                                                     |
| Weston         | 2                   | -                                      | -                                          | 2                                                | -                                                     |
| Westport       | 7                   | -                                      | -                                          | 7                                                | -                                                     |
| Wilton         | 5                   | -                                      | 1                                          | 4                                                | -                                                     |
| <b>WestCOG</b> | <b>145</b>          | <b>16</b>                              | <b>39</b>                                  | <b>84</b>                                        | <b>6</b>                                              |

Riverine Flood Risk

- Relatively Moderate
- Relatively Low
- Very Low
- No Rating

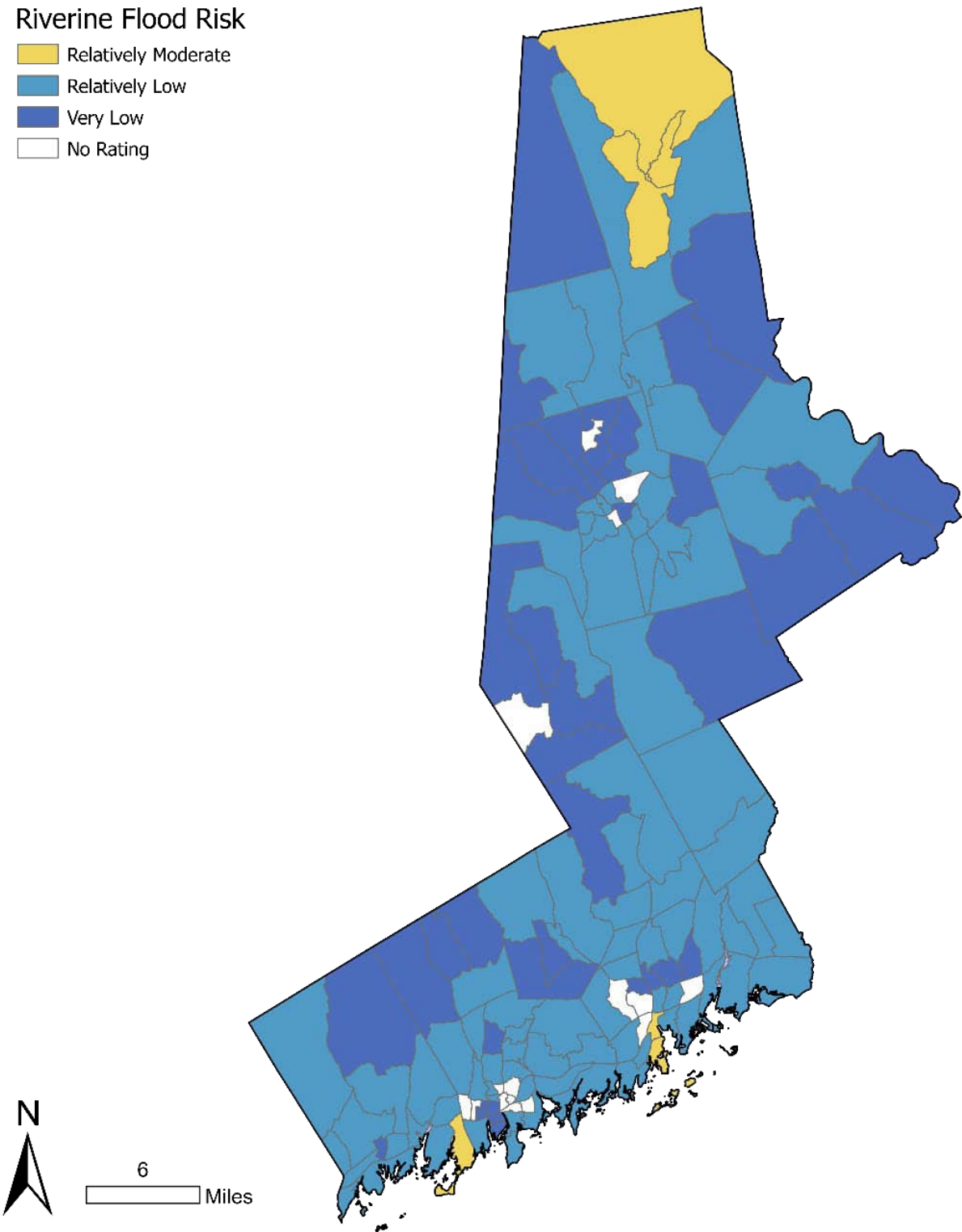


Figure 3-2: National Risk Index Rating for Riverine Flood (census tract level)

### Coastal Flood Risk

- Relatively High
- Relatively Moderate
- Relatively Low
- Very Low
- Not Applicable
- No Rating

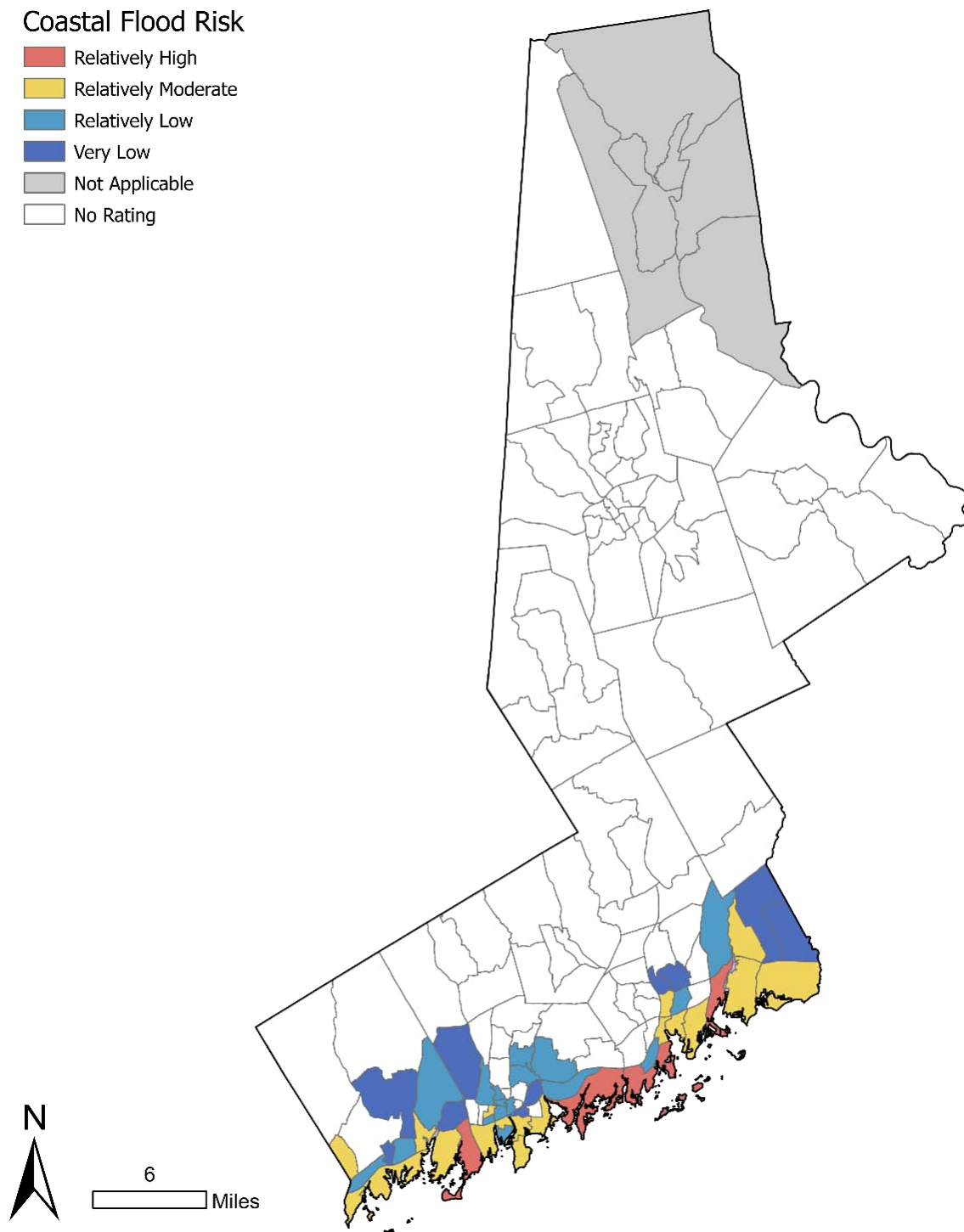


**Figure 3-3: National Risk Index Rating for Coastal Flood (census tract level)**

Coastal flooding affects Greenwich, Stamford, Darien, Norwalk, and Westport. Two census tracts in Norwalk and one in Greenwich, Darien, and Westport have a relatively high risk to coastal flooding. The full breakdown can be found in the table below.

**Table 3-18: National Risk Index Rating for Coastal Flood by Community (census tract level)**

| Community      | Total Census Tracts | Number of Census Tracts with No Rating/Not Applicable | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk | Number of Census Tracts with Relatively Moderate Risk | Number of Census Tracts with Relatively High Risk |
|----------------|---------------------|-------------------------------------------------------|--------------------------------------------|--------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|
| Bethel         | 4                   | 4                                                     | -                                          | -                                                | -                                                     | -                                                 |
| Bridgewater    | 1                   | 1                                                     | -                                          | -                                                | -                                                     | -                                                 |
| Brookfield     | 3                   | 3                                                     | -                                          | -                                                | -                                                     | -                                                 |
| Danbury        | 20                  | 20                                                    | -                                          | -                                                | -                                                     | -                                                 |
| Darien         | 5                   | 2                                                     | -                                          | 2                                                | -                                                     | 1                                                 |
| Greenwich      | 15                  | 3                                                     | 3                                          | 3                                                | 5                                                     | 1                                                 |
| New Canaan     | 5                   | 5                                                     | -                                          | -                                                | -                                                     | -                                                 |
| New Fairfield  | 3                   | 3                                                     | -                                          | -                                                | -                                                     | -                                                 |
| New Milford    | 5                   | 5                                                     | -                                          | -                                                | -                                                     | -                                                 |
| Newtown        | 6                   | 6                                                     | -                                          | -                                                | -                                                     | -                                                 |
| Norwalk        | 22                  | 12                                                    | 2                                          | 2                                                | 4                                                     | 2                                                 |
| Redding        | 2                   | 2                                                     | -                                          | -                                                | -                                                     | -                                                 |
| Ridgefield     | 6                   | 6                                                     | -                                          | -                                                | -                                                     | -                                                 |
| Sherman        | 1                   | 1                                                     | -                                          | -                                                | -                                                     | -                                                 |
| Stamford       | 33                  | 15                                                    | 3                                          | 9                                                | 6                                                     | -                                                 |
| Weston         | 2                   | 2                                                     | -                                          | -                                                | -                                                     | -                                                 |
| Westport       | 7                   | -                                                     | 2                                          | 1                                                | 3                                                     | 1                                                 |
| Wilton         | 5                   | 5                                                     | -                                          | -                                                | -                                                     | -                                                 |
| <b>WestCOG</b> | <b>145</b>          | <b>95</b>                                             | <b>10</b>                                  | <b>17</b>                                        | <b>18</b>                                             | <b>5</b>                                          |

Figure 3-4 shows the expected annual loss ratings throughout the COG based on the NRI for riverine flood. The table below describes the projected annualized losses from riverine flood by community. The highest expected annual losses are found in New Milford, Norwalk, Greenwich, Stamford, and Westport, all of which have over \$100,000 in expected annual losses due to riverine flood. The WestCOG region has a total expected annual loss of approximately \$1.05 million.

**Table 3-19: Breakdown of NRI expected annual losses from riverine flood by community**

| Community     | Expected Annual Loss | Community      | Expected Annual Loss |
|---------------|----------------------|----------------|----------------------|
| Bethel        | \$23,040             | Newtown        | \$12,149             |
| Bridgewater   | \$2,073              | Norwalk        | \$177,575            |
| Brookfield    | \$23,768             | Redding        | \$5,351              |
| Danbury       | \$69,916             | Ridgefield     | \$8,046              |
| Darien        | \$54,523             | Sherman        | \$2,531              |
| Greenwich     | \$140,219            | Stamford       | \$132,096            |
| New Canaan    | \$12,001             | Weston         | \$9,740              |
| New Fairfield | \$4,932              | Westport       | \$111,158            |
| New Milford   | \$241,399            | Wilton         | \$19,539             |
| --            | --                   | <b>WestCOG</b> | <b>\$1,050,056</b>   |

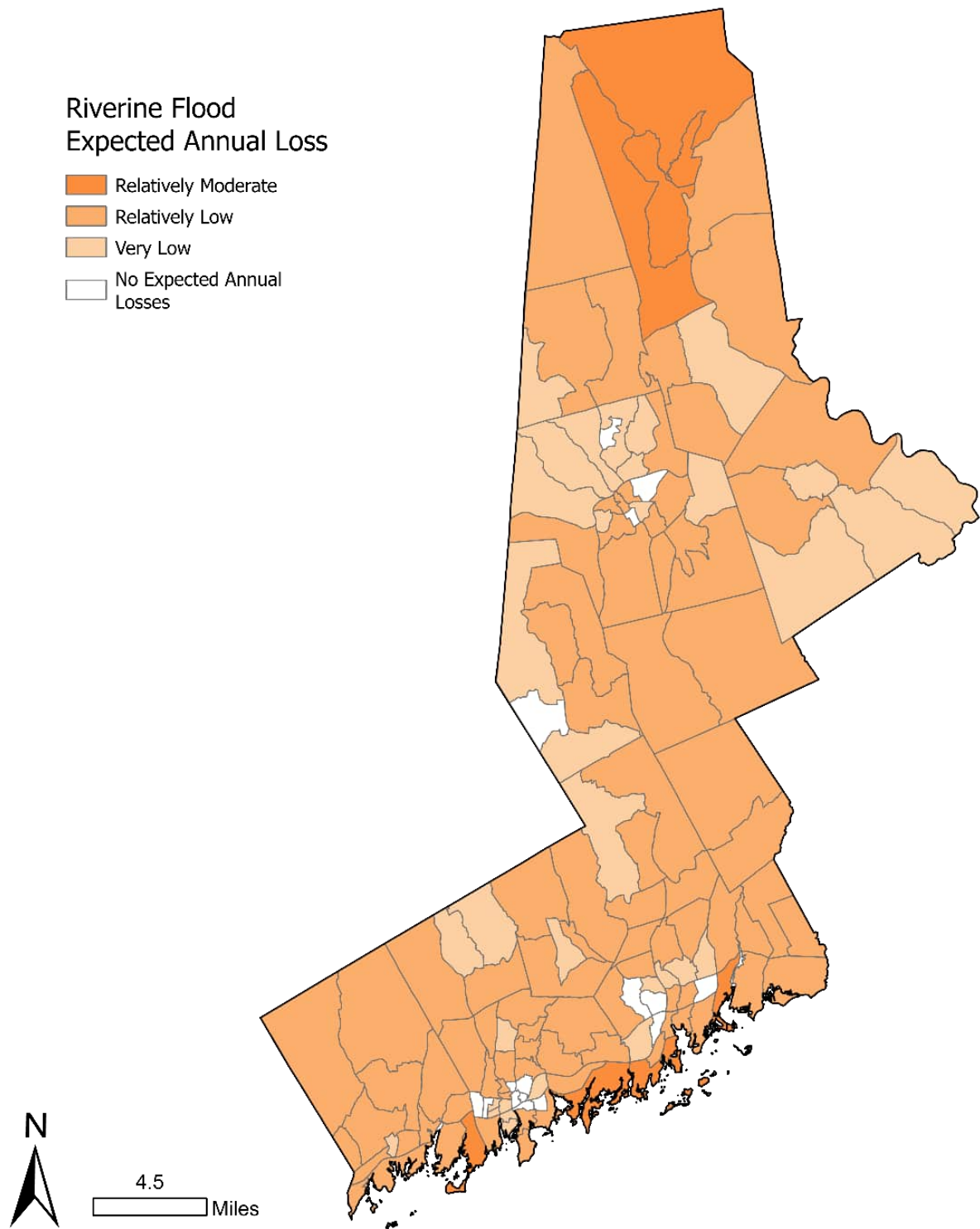


**Figure 3-4: NRI Riverine Flood Expected Annual Loss Rating**

Figure 3-5 shows the expected annual loss ratings throughout the COG based on the NRI for coastal flood.

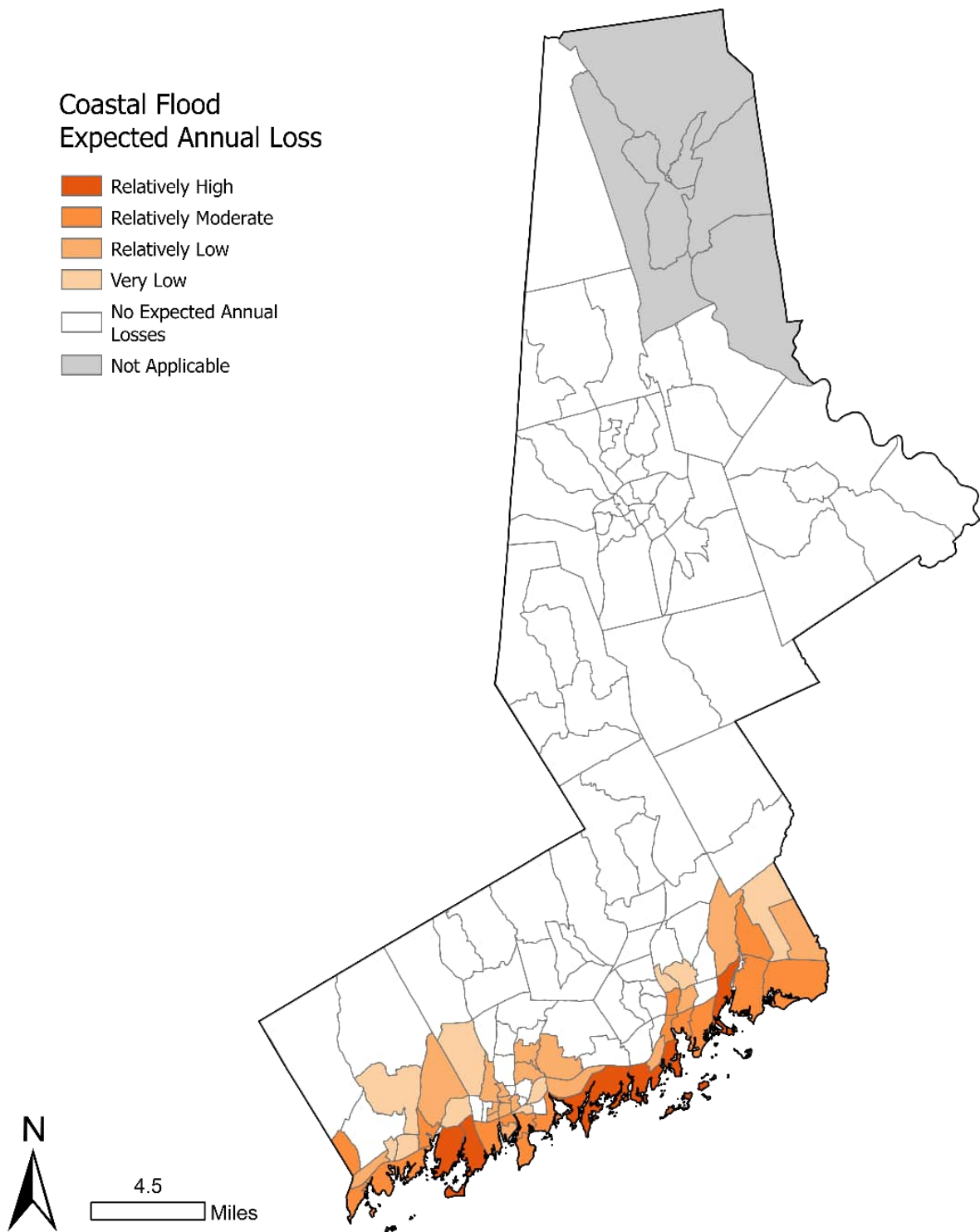


Figure 3-5: NRI Coastal Flood Expected Annual Loss Rating

The table below describes the projected annualized losses from coastal flood by community. Greenwich, Norwalk, Westport, Darien, and Stamford all have expected annual losses due to coastal flooding, with the highest expected annual loss in Greenwich. The WestCOG region has a total expected annual loss of approximately \$4.86 million.

**Table 3-20: Breakdown of NRI expected annual losses from coastal flood by community**

| Community      | Expected Annual Loss |
|----------------|----------------------|
| Bethel         | \$0                  |
| Bridgewater    | \$0                  |
| Brookfield     | \$0                  |
| Danbury        | \$0                  |
| Darien         | \$511,392            |
| Greenwich      | \$1,466,892          |
| New Canaan     | \$0                  |
| New Fairfield  | \$0                  |
| New Milford    | \$0                  |
| Newtown        | \$0                  |
| Norwalk        | \$1,405,468          |
| Redding        | \$0                  |
| Ridgefield     | \$0                  |
| Sherman        | \$0                  |
| Stamford       | \$426,117            |
| Weston         | \$0                  |
| Westport       | \$1,054,228          |
| Wilton         | \$0                  |
| <b>WestCOG</b> | <b>\$4,864,097</b>   |

### 3.2.3 Winter Storms

Winter storms consisting of snow, ice, wind, and other cold weather precipitation are a regular occurrence in Connecticut. Temperatures during the winter months typically drop below freezing at night and occasionally fall below zero degrees Fahrenheit. Some winter storms are mild and of little consequence. However, other winter storms including blizzards, ice storms, and nor'easters cause large scale and regular disruptions by restricting transportation, causing the loss of electricity, and through direct physical damages due to wind, snow, sleet, ice, and bitter cold.

#### **Location**

All areas of the Region are susceptible to winter storms. Areas of the region at higher elevations experience more frequent effects of winter storms than those at lower elevations. In addition, low lying areas (such as floodplains) can experience additional impacts of winter storms such as flooding.

#### **Extent**

According to NOAA, there are several types of winter storms and associated precipitation conditions.

- Blizzards include winter storm conditions of sustained winds or frequent gusts of 35 miles per hour (mph) or greater that cause major blowing and drifting of snow, reducing visibility to less than one-quarter mile for three or more hours. Extremely cold temperatures and/or wind chills are often associated with dangerous blizzard conditions.
- Freezing Rain consists of rain that freezes on objects, such as trees, cars, or roads, and forms a coating or glaze of ice. Temperatures in the mid to upper atmosphere are warm enough for rain to form, but surface temperatures are below the freezing point, causing the rain to freeze on impact.

- Ice Storms are forecast when freezing rain is expected to create ice build-ups of one-quarter inch or more that can cause severe damage.
- Nor'easters are the classic winter storm in New England, caused by a warm, moist, low-pressure system moving up from the south colliding with a cold, dry high-pressure system moving down from the north. The nor'easter derives its name from the northeast winds typically accompanying such storms, and such storms tend to produce a large amount of rain or snow. They usually occur between November 1 and April 1 of any given year, with storms outside this period typically bringing rain rather than snow.
- Sleet occurs when raindrops freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. It can accumulate like snow and cause a hazard to motorists.
- Snow is frozen precipitation composed of ice particles that forms in cold clouds by the direct transfer of water vapor to ice.
- Winter Storms are defined as heavy snow events that have a snow accumulation of more than six inches in 12 hours or more than 12 inches in a 24-hour period.

The Regional Snowfall Index (RSI) is used by NOAA to rank snowstorms that impact the eastern two-thirds of the United States by placing them in one of five categories: Extreme, Crippling, Major, Significant, and Notable. The RSI is based on the spatial extent of the storm, the amount of snowfall, and the juxtaposition of these elements with population. The use of population in evaluating impacts provides a measure of societal impact from the event. Table 3-21 presents the RSI categories, their corresponding RSI values, and a descriptive adjective.

**Table 3-21: Regional Snowfall Index Categories**

| Category | RSI Value | Event Description |
|----------|-----------|-------------------|
| 1        | 1 to 3    | Notable           |
| 2        | 3 to 6    | Significant       |
| 3        | 6 to 10   | Major             |
| 4        | 10 to 18  | Crippling         |
| 5        | 18+       | Extreme           |

Source: NOAA

RSI values are calculated within a GIS. The geographical distribution of snowfall and population information are combined in an equation that calculates the RSI score, which varies from around one for smaller storms to over 18 for extreme storms. The raw score is then converted into one of the five RSI categories. The largest RSI values result from storms producing heavy snowfall over large areas that include major metropolitan centers.

According to some resources, the Sperry-Piltz Ice Accumulation Index (SPIA® Index) is becoming a resource for characterizing ice events. The index is a copyrighted product with controlled distribution, according to its developers (refer to <https://spia-index.com/>). The SPIA® Index is "a forward-looking, ice accumulation and ice damage prediction index that uses an algorithm of researched parameters that, when combined with NWS forecast data, predicts the projected footprint, total ice accumulation, and resulting potential damage from approaching ice storms. It is a tool to be used for risk management and/or winter weather preparedness." The index ranges from 0 ("minimal risk of damage to exposure utility systems") to 5 ("catastrophic damage to entire exposure utility systems").

### Previous Occurrences

According to FEMA's disaster history, five major winter storms in the Region since 1954 have resulted in major disaster declarations. The most severe ice storm in Connecticut on record was Ice Storm Felix on December 18, 1973. This storm resulted in two deaths and widespread power outages throughout the state. The Blizzard of February 1978 brought record snowfall amounts to several areas of Connecticut as heavy snow continued unabated for an unprecedented 33 straight hours. The state was essentially shut down for three days, with all roads ordered closed except for emergency travel. The storm was responsible for over 100 deaths, 4,500 injuries, and \$520 million in damages (1978 United States Dollars, or USD). This storm is rated 4th overall in the RSI as an "Extreme" storm.

Overall, a total of nine extreme, crippling, and major winter storms have occurred in Connecticut during the past 30 years. One is listed for each of the years 1993, 1996, 2003, 2007, 2010, 2013, and 2015. Two are listed in the calendar year 2010 along with two more significant storms, a significant storm in 2011, and a single major storm in 2013 and 2015. Considering nor'easters only, 11 major winter nor'easters have occurred in Connecticut during the past 30 years (in 1988, 1992, 1996, 2003, 2006, 2009, 2010, two in 2011, 2013, and 2015).

The following information from NOAA provides an overview of major winter weather events in recent history:

- March 13-14, 1993: A massive, powerful storm dubbed the "Storm of the Century" caused "whiteout" blizzard conditions stretching from Jacksonville, Florida, into eastern Canada and affected 26 states, producing 24 inches of snow in Hartford and up to 21 inches of snow in New Haven County. A total of 40,000 power outages and \$550,000 in property damage was reported throughout Connecticut, and the state received a federal emergency declaration. The storm had an RSI rating of "Extreme" and is the 2<sup>nd</sup> highest ranking storm recorded by RSI.
- January 15-16, 1994: A Siberian air mass brought record to near-record low temperatures across Connecticut. Strong northwest winds accompanied the cold and drove wind chill values to 30 to 50 degrees below zero.
- December 23, 1994: An unusual snowless late December storm caused gale force winds across the state. The high winds caused widespread power outages affecting up to 130,000 customers statewide. Numerous trees and limbs were blown down, damaging property, vehicles, and power lines to a total of \$5 million in damages. Peak wind gusts of up to 64 mph were reported.
- January 7-8, 1996: Winter Storm Ginger was one of the most significant winter storms to hit southern New England in the past 20 years. Snowfall across the north and northeast portions of the state ranged from 15 to 23 inches. This storm disrupted transportation systems and closed schools and businesses. Connecticut received a federal major disaster declaration. The storm has an RSI rating of "Extreme" and is currently ranked 3<sup>rd</sup> on the RSI.
- December 7, 1996: This storm brought heavy, wet snow and resulted in widespread power outages. A total of 225,000 electric customers lost power statewide. Power remained out for several days despite the efforts of dozens of electric company repair crews, many from out-of-state. Many roads remained unplowed until the utility companies could repair fallen wires. Up to 22 shelters were opened across the region, and many residents left their unheated and darkened homes. Many vehicles and homes were damaged by falling tree limbs, and damage was estimated in the millions of dollars.
- February 17, 2003: A heavy snowstorm caused near-blizzard conditions and produced 24 inches of snow in areas of the state. The storm had an RSI rating of "Crippling" and is the 8<sup>th</sup> ranked winter storm by RSI. Connecticut received a federal emergency declaration.

- February 12-13, 2006: This nor'easter is ranked 35<sup>th</sup> overall as a "Significant" storm on the RSI scale. The storm produced 18 to 24 inches of snow across Connecticut, with 10 to 16 inches accumulating in southern Litchfield County. Five Connecticut counties received a federal emergency declaration.
- December 11, 2008: Freezing rain created treacherous travel conditions for the evening commute across portions of southern Litchfield County, with ice accretions up to 0.2 inches. An estimated 5,000 customers lost power, and many schools and businesses were closed the following day.
- March 13-14, 2010: A nor'easter brought soaking rains and 65 mph winds that caused severe damage across the state. Numerous trees, limbs, and power lines were downed in the region, closing roads, schools, and businesses, and causing one death in Westport. A reported 64,000 were without power, with 70% of the outages in Norwalk, Stamford, and Greenwich. Emergency shelters were opened in Stamford and Norwalk. It took utility crews and tree workers more than a week to restore power and clear local roads. Individual insurance claims in the region were over \$343,000.
- December 2010 through February 2011: A series of significant heavy snow events occurred between December 26, 2010 and February 2, 2011. From February 1<sup>st</sup> through the 2<sup>nd</sup>, a total of 6-11 inches of snow fell across Hartford County, with upwards of a quarter inch of ice accumulation for isolated locations. Across Connecticut, numerous roof collapses due to heavy snow load occurred. Snow for the winter season totaled 86.4 inches.
- October 29, 2011: Winter Storm "Alfred" produced high winds and 12 to 18 inches of heavy wet snow across Connecticut. The combination of heavy snow on tree limbs and on fairly saturated ground caused widespread snapping and uprooting of trees and tree limbs. Over 830,000 customers were without power, with some outages lasting 11 days or more. The storm resulted in ten deaths and caused over \$3 billion in damage in Connecticut. Homes were without electricity for approximately one week or more in many areas, with tree damage and power line damage being the biggest impact in the communities.
- February 7-9, 2013: An historic blizzard deposited tremendous amounts of snow over southern New England. Most locations received 20 to 33 inches of snow. Isolated thunderstorms were common across the region during the height of the storm. During the night, rates of accumulation reaching 2 to 3 inches per hour were common throughout the region. The Connecticut Department of Agriculture reported that more than 140 agricultural structures were damaged or destroyed throughout the state because of the weight of the snow. This event was classified as a "Major" storm and is listed 18<sup>th</sup> in the RSI ranking.
- January 25-26, 2015: A strong nor'easter brought strong winds and deposited tremendous amounts of snow over southern New England. Most locations received at least a foot of snow; some received up to three feet. During the night, rates of accumulation reaching 2 to 3 inches per hour were common throughout the region. Snow removal in parts of Connecticut took two to three days. This event was classified as a "Major" storm and is listed 28<sup>th</sup> in the RSI ranking. This January storm resulted in a federal disaster declaration for the entire state.
- March 14-15, 2017: A very significant snowstorm impacted southern Litchfield County, featuring extremely heavy snowfall and blizzard conditions. Storm total reports of 16 to 20 inches were received. The snow fell at 1 to 4 inches per hour for much of the day. There was a widespread extreme public impact, with many roads severely impacted and schools closed. The governor issued a statewide travel ban on state roads. In addition to the snowfall, gusty winds up to 50 mph resulted in near-zero visibility and blizzard conditions across the county. The winds brought considerable blowing and drifting of snow.

- March 7, 2018: A winter storm produced 6 to 12 inches of snow in southern Fairfield County and up to 27 inches of snow in New Fairfield in northern Fairfield County. Strong winds brought down a tree and wires on Creeping Hemlock Drive in Norwalk. A large tree fell on a truck on the southbound Merritt Parkway in Greenwich. Trees and wires were brought down across the town of Ridgefield due to heavy wet snowfall and strong winds.
- January 19, 2019: A winter storm produced 3 to 5 inches of snow and 0.37 inches of ice in the Danbury area. Multiple road closures occurred in Newtown due to trees and wires down from ice accretion.
- December 16-17, 2020: A significant storm brought 6-14.5 inches of snow across the region. The official NWS observation at Bridgeport recorded 9.4 inches. Danbury received 9-14.5 inches, with the highest amounts (14.5 inches) measured 5 miles north-northwest of Danbury. Wind gusts reached 47 mph at Bridgeport Airport and 43 mph at Danbury Airport. The storm caused hazardous travel conditions throughout the region.
- January 31 – February 3, 2021: A major, slow-moving storm brought 13-19 inches of snow to Danbury and Sherman, with wind gusts up to 47 mph. This was part of a larger system that brought blizzard conditions to parts of New England. Travel was severely impacted throughout the multi-day event.
- February 7, 2021: A band of moderate to heavy snow developed across the region during the late morning hours. Spotters, emergency managers, and the public reported 5-8 inches of snowfall across southern Fairfield, creating hazardous travel conditions.
- January 5, 2022: Freezing rain caused an impactful morning commute in Danbury, where the airport recorded 0.06 inches of ice accretion. Impacts occurred primarily during the early morning commute hours.
- February 24-25, 2022: Mixed precipitation affected multiple WestCOG communities, including Weston, Norwalk, Darien, Danbury, New Fairfield, and Bethel. Ice accretion of 0.05-0.15 inches was reported, with 1-2.3 inches of snow/sleet in some areas before changing to freezing rain. Travel conditions were hazardous.
- March 8-9, 2022: Snow of 3-5 inches fell across northern Fairfield County, including Newtown. A trained spotter reported 5.3 inches at New Fairfield.
- February 14-15, 2025: A significant ice storm affected Danbury, New Fairfield, Newtown, Ridgefield, and Bethel. Snow of 1-2.5 inches fell before changing to freezing rain. Ice accumulation was substantial: 0.48 inches at Danbury Airport, 0.35-0.40 inches in New Fairfield, and 0.25 inches in Newtown. Documented damage included: several downed trees and wires in Newtown, numerous tree limbs down around North Street in Ridgefield, and a tree across Taylor Road in Bethel, which took down wires. Power outages occurred along and south of the I-84 corridor.

### Probability of Future Events

Winter storms of varying levels of severity are fairly common in the region. Data from the weather station in Danbury reveals that in an average year, there are 24 days when it snows 0.1 inches or more. Most of those days are during December through March. During this same time period, there are 13 days where snow totals at least 1 inch, and 0.5 days on average have a snowfall total of 10 inches or higher. Wintry precipitation, such as sleet and freezing rain, occurs on additional days each year. These data demonstrate that the Region should expect several heavy snows per year and therefore its municipalities should be adequately prepared for these storms.

According to the 2023 CT NHMP, climate change will have significant impacts on winter weather patterns and precipitation during the winter months. Rising winter temperatures may reduce the number of major snowstorms. Recent climate change studies have projected winter seasons to be shortened by as much as two weeks for the state, along with reduced duration

of ground cover and snowpack. In addition, climate models indicate that fewer but more intense precipitation events will occur during winter, with more rainfall than snow. This change in winter precipitation could result in less frequent but more intense snowstorms with heavier (denser) snow. At the same time, this rise may lead to more wintertime rain and could create more ice storms.

### Impacts to Community Assets

Impacts from severe winter weather can become dangerous and a threat to people and property. Most winter weather events occur between December and March, although in 2011, Connecticut experienced a significant October snowstorm that left much of the state without power for a week.

While picturesque, snow and ice can create impassable roads, interrupt utility service, knock down trees and power lines, and isolate people in their homes or workplaces, sometimes without electricity or heat. Melting snow and ice can also cause flooding, as can winter rainstorms that hit when the ground is already frozen.

### Transportation Impacts

While the probability of a winter storm occurring is roughly the same in all parts of the region, the risk of damage will vary depending on infrastructure and population density. There is a high probability of traffic accidents and traffic jams during heavy snow and light icing events. Roads may become impassable, inhibiting the ability of emergency equipment to reach trouble spots and the accessibility of medical and shelter facilities.

To a large extent, the areas at greatest risk of damage from winter storms are those with the most development and the most extensive road networks. Larger, more densely populated cities have more miles of road than rural towns. The potential snow-removal burden is, therefore, much lower in the rural town, as is the magnitude of travel-related impacts due to the lower road capacity. Conversely, travelers in rural areas face a potentially greater risk of being affected by the winter storm due to the lower density of roads (which provide fewer alternate routes) as well as the often relatively steep topography.

After a storm, snow piled on the sides of roadways can inhibit sight lines and reflect a blinding amount of sunlight. When coupled with slippery road conditions, poor sightlines and heavy glare create dangerous driving conditions. Stranded motorists, especially senior and/or handicapped citizens, are at particularly high risk of injury or death from exposure during a blizzard.

Like many other types of disasters, winter weather and heavy snowfall can cause localized and widespread road closures. Closures can result from a variety of causes, such as poor driving conditions, heavy snow, and drifts, as well as detritus like fallen trees and power lines. When a blizzard struck on February 8th, 2013, Governor Malloy called for a traffic ban on all vehicles except for those emergency response and recovery vehicles with the capacity to maneuver in heavy snow for the following day. Events with large impacts on transit also have major economic impacts, like preventing employees from reaching work and halting or delaying shipments and deliveries.

### Roof Collapse

Heavy snow and ice accumulation bring the threat of roof collapse and catastrophic damage to the building's occupants. As seen in Table 3-22, snow alone can put a large burden on roofs, however when coupled with rain and sleet, this load per square foot increases.

**Table 3-22: Weight of Snow on a Roof**

| Type        | Equivalent Weight to 1" of Water | Load per Square Foot | Maximum Load for Typical Roof |
|-------------|----------------------------------|----------------------|-------------------------------|
| Fresh Snow  | 10-12"                           | 5 lbs.               | 4 feet                        |
| Packed Snow | 3-5"                             | 5lbs.                | 2 feet                        |

Source: Insurance Institute for Business &amp; Home Safety

Two feet of old snow and two feet of new snow could weigh as much as 60 pounds per square foot (psf) of roof space, which is beyond the typical snow load capacity of most roofs. One inch of ice is equivalent to one foot of fresh snow. A house should be able to support 20 psf of snow (IIBHS, 2020). The winter of 2010-2011 saw many buildings across Connecticut condemned due to snow accumulation, collapsing their roofs in January and February 2011, including many in the Region.

Areas with greater levels of development are also at greater risk of business disruptions, loss of life, and damage to structures. Cities have the greatest level of development and the greatest potential risk. For example, more roofs mean greater potential for roof collapse. There are also simply more sidewalks to clear, more homes to heat, and more people to protect.

#### Burst Pipes

Cold winter weather wreaks havoc not only outside a building but inside as well. Frozen pipes can cause severe damage. A complete ice blockage in a pipe causes freezing and expansion, which in turn causes water pressure to increase to the faucet. The increase in water pressure leads to pipe failure. In 2013, frozen and broken water pipes ranked second to hurricanes in terms of both the number of homes damaged and the total amount of damages claimed in the U.S. (IINC, 2014). While there are few records of burst pipes in the region, a frozen sprinkler pipe burst at the UConn Health Center in nearby Farmington. This caused extensive damage, with water leaking into the main floor, the ground floor, and a storage room, some labor and delivery rooms, as well as the newborn nursery (Lank, 2014).

#### Power Outages

Heavy snow and ice can cause tree limbs to fall, bringing power lines down with them. Winter weather frequently causes significant power outages throughout the state, especially in more rural areas. Urban areas, where a greater percentage of power lines are underground, are impacted to a lesser degree. Not only are power outages an inconvenience, but it can cause damage to property, disrupt business, and threaten lives if heating systems are impacted. A Fact Sheet describing power outage concerns in the region can be found on the following page.

#### Affected Population

Winter storms and cold weather typically affect the entire population of a municipality, although impacts may vary by location. According to NOAA, winter storms were responsible for the death of 25 people per year from 2004 to 2013. Most deaths from winter storms are indirectly related to the storm, such as from traffic accidents on icy roads and hypothermia from prolonged exposure to cold.

According to the NWS, approximately 70% of winter deaths related to snow and ice occur in automobiles, and approximately 25% of deaths occur from people being caught in the cold. In relation to deaths from exposure to cold, 50% are people over 60 years old, 75% are male, and 20% occur in the home.

# REGIONAL CHALLENGES

## POWER OUTAGES

### WHAT IS THE CHALLENGE?

Power loss due to natural hazards is a major concern for communities throughout the state. A power outage may:

- Disrupt communication, water, and transportation infrastructure
- Close retail businesses, grocery stores, gas stations, ATMs, banks and other services
- Cause food spoilage and water contamination
- Prevent use of medical devices

These impacts can disrupt daily life, cause business interruptions, lead to property damage, and even have negative health impacts.

Power outages can be caused by a variety of natural hazards, including:

- High wind events or snow events downing tree limbs onto power lines, or downing power lines themselves
- Flooded soils or erosion undermining utility poles
- Flooding of underground powerlines
- Lightning strikes
- Grid failure during energy use surges in severe heat conditions
- Planned outages during extreme drought to mitigate wildfire risk



*Restoring power after a storm  
Photo: Matthew Brown*



*Sign asking for help in Stamford  
Photo: John Nickerson*

### FOR MORE INFORMATION

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### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Municipalities can mitigate damages and disruption caused by outages by working to increase the resiliency of the power grid, improving outage response, installing emergency generators in critical facilities, developing local power generation and microgrids, and helping residents and businesses prepare for outages.

Some mitigation actions include the following:

- Coordinate with the local energy utility on efforts to improve grid resiliency and outage response.
- Perform public outreach and education about power outage safety and mitigation.
- Maintain public "comfort stations" for residents without power to keep warm or cool, and recharge electronic devices.
- Create a communications plan that considers power loss, and the possible loss of internet and phone capabilities that may result.
- Maintain a list of residents who rely on powered medical devices to facilitate check-ins and response during power outages.
- Install backup power at critical facilities
- Explore development of local power generation (such as solar panels) and microgrids

### Loss Estimates

Snow and ice removal have a tremendous impact on municipal budgets. The impact varies by community; some communities use their own staff to clear roads, which may represent savings but diverts such staff from other municipal projects. Other municipalities hire contractors to remove 100% of the snow and ice. The remainder of towns use a combination of municipal staff and contractors. Regardless of staffing, every community is faced with spending between \$50,000 and \$1 million per year on snow and ice management.

Based on the public assistance reimbursements in Table 3-2, the Region has incurred losses of approximately \$23.7 million since 1998 (21 years) from impacts due to winter storms. Based on this information, the annualized loss due to winter storms in the Region is \$1,128,586. Annualized losses due to winter storms for each WestCOG community are presented below. These annualized loss estimates should be used with caution and as a minimum loss estimate. Nevertheless, these figures provide useful planning numbers when considering the overall vulnerability of the Region to winter storms.

**Table 3-23: Annualized Winter Storm Loss from FEMA Based on Public Assistance Reimbursements**

| Municipality   | PA Losses Paid      | Annualized Loss    |
|----------------|---------------------|--------------------|
| Bethel         | \$813,379           | \$38,732           |
| Bridgewater    | \$181,929           | \$8,663            |
| Brookfield     | \$1,461,428         | \$69,592           |
| Danbury        | \$5,189,183         | \$247,104          |
| Darien         | \$494,648           | \$23,555           |
| Greenwich      | \$1,407,231         | \$67,011           |
| New Canaan     | \$1,196,848         | \$56,993           |
| New Fairfield  | \$595,568           | \$28,360           |
| New Milford    | \$1,677,798         | \$79,895           |
| Newtown        | \$2,188,446         | \$104,212          |
| Norwalk        | \$1,356,155         | \$64,579           |
| Redding        | \$781,113           | \$37,196           |
| Ridgefield     | \$1,198,109         | \$57,053           |
| Sherman        | \$166,310           | \$7,920            |
| Stamford       | \$2,242,463         | \$106,784          |
| Weston         | \$479,388           | \$22,828           |
| Westport       | \$1,115,076         | \$53,099           |
| Wilton         | \$1,155,228         | \$55,011           |
| <b>WestCOG</b> | <b>\$23,700,301</b> | <b>\$1,128,586</b> |

Source: FEMA

Historical loss data for winter weather was extracted from the NCEI Storm Events Database. Table 3-24 below presents the number of winter weather events, the number of deaths and injuries, and total property loss values (in 2026 dollar equivalents) impacting each WestCOG municipality between 2015 and 2025. Annualized loss estimates for winter weather damage is calculated by dividing the total property loss figures by the 10-year reporting period.

**Table 3-24: Annualized Winter Weather Loss Estimates from NCEI**

| Municipality   | Event Count* | Death    | Injury   | Property Loss (2026\$) | Annualized Loss |
|----------------|--------------|----------|----------|------------------------|-----------------|
| Bethel         | 11           | 0        | 0        | \$0                    | \$0             |
| Bridgewater    | 0            | 0        | 0        | \$0                    | \$0             |
| Brookfield     | 5            | 0        | 0        | \$0                    | \$0             |
| Danbury        | 27           | 0        | 0        | \$0                    | \$0             |
| Darien         | 6            | 0        | 0        | \$0                    | \$0             |
| Greenwich      | 4            | 0        | 0        | \$0                    | \$0             |
| New Canaan     | 8            | 0        | 0        | \$0                    | \$0             |
| New Fairfield  | 20           | 0        | 0        | \$0                    | \$0             |
| New Milford    | 0            | 0        | 0        | \$0                    | \$0             |
| Newtown        | 8            | 0        | 0        | \$0                    | \$0             |
| Norwalk        | 8            | 0        | 0        | \$0                    | \$0             |
| Redding        | 3            | 0        | 0        | \$0                    | \$0             |
| Ridgefield     | 7            | 0        | 0        | \$0                    | \$0             |
| Sherman        | 3            | 0        | 0        | \$0                    | \$0             |
| Stamford       | 4            | 0        | 0        | \$0                    | \$0             |
| Weston         | 8            | 0        | 0        | \$0                    | \$0             |
| Westport       | 0            | 0        | 0        | \$0                    | \$0             |
| Wilton         | 3            | 0        | 0        | \$0                    | \$0             |
| <b>WestCOG</b> | <b>125</b>   | <b>0</b> | <b>0</b> | <b>\$0</b>             | <b>\$0</b>      |

Source: NOAA NCEI

*\*Note: municipal event counts and WestCOG totals may reflect events that affected multiple municipalities but are counted as individual events within each affected municipality. The total number of events in WestCOG as shown in the table may therefore be larger than the true number events that impacted the region.*

Table 3-25 presents regional winter weather impacts between 2015 and 2025 by storm type, classified as either a winter storm, winter weather, heavy snow, blizzard, or ice storm.

**Table 3-25: Annualized Winter Weather Loss Estimates by Weather Type from NCEI**

| Flood Type                | Event Count* | Death    | Injury   | Property Loss (2026\$) | Annualized Loss |
|---------------------------|--------------|----------|----------|------------------------|-----------------|
| Winter Storm              | 24           | 0        | 0        | \$0                    | \$0             |
| Winter Weather            | 80           | 0        | 0        | \$0                    | \$0             |
| Heavy Snow                | 25           | 0        | 0        | \$0                    | \$0             |
| Blizzard                  | 1            | 0        | 0        | \$0                    | \$0             |
| Ice Storm                 | 5            | 0        | 0        | \$0                    | \$0             |
| <b>All Winter Weather</b> | <b>135</b>   | <b>0</b> | <b>0</b> | <b>\$0</b>             | <b>\$0</b>      |

Source: NOAA NCEI

*\*Note: total event counts may differ between Table 3-24 and Table 3-25 because the municipal event counts in Table 3-24 may reflect events that affected multiple municipalities but are counted as individual events within each affected municipality.*

## National Risk Index

FEMA's NRI was utilized to obtain information for a risk analysis on winter weather at the census tract level across WestCOG. Figure 3-6 displays the risk rating by census tract in the WestCOG region for winter weather.

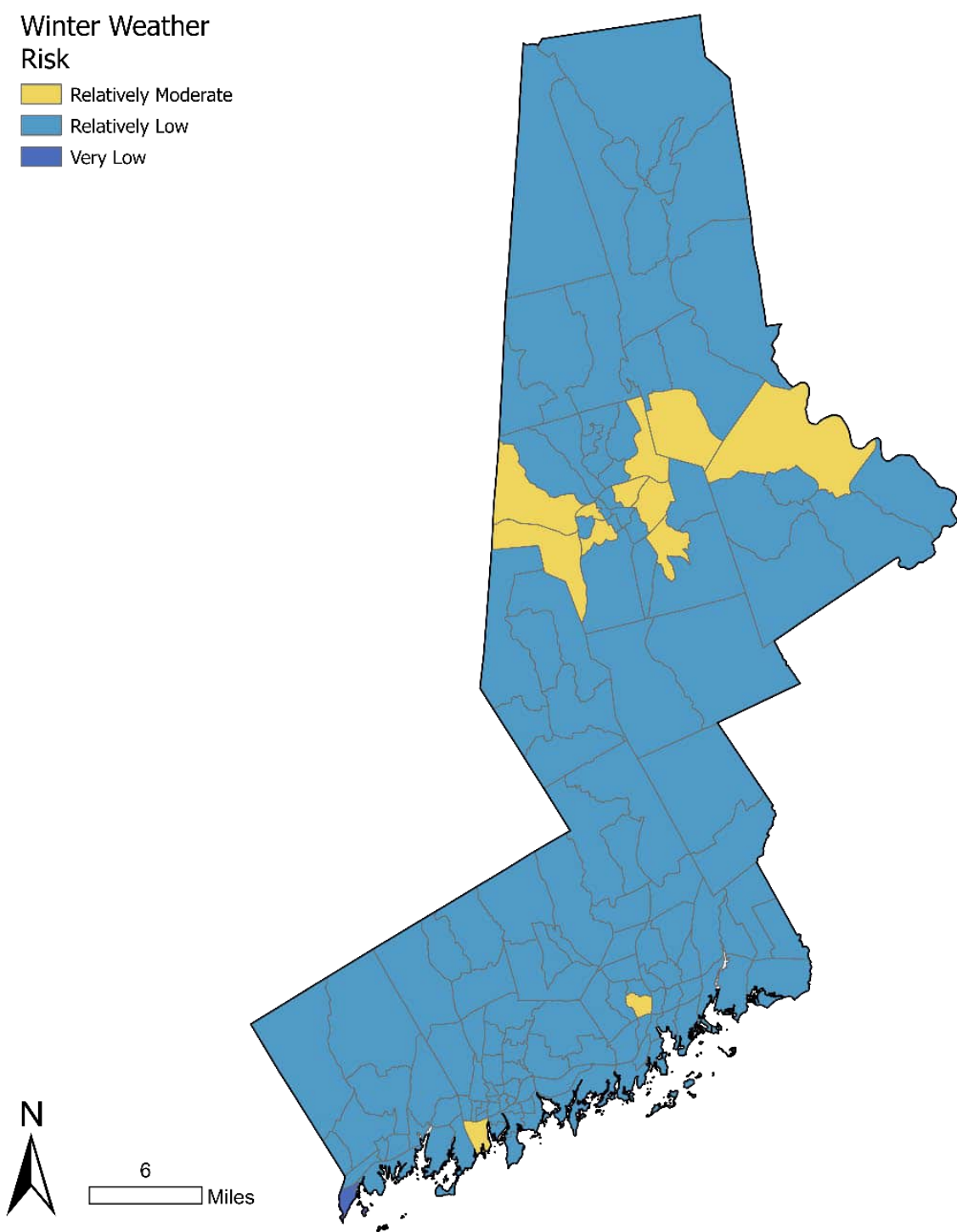


Figure 3-6: Risk Rating for Winter Weather, shown at the census tract level

Winter weather risk in the WestCOG region ranges from very low to relatively moderate, with the majority of the COG at a relatively low risk to winter weather. The census tracts at a relatively moderate risk to winter weather are primarily in the City of Danbury. Portions of Bethel, Brookfield, Newtown, Norwalk, and Stamford are also at a relatively moderate risk to winter weather impacts. The table below shows a breakdown of community risk in WestCOG by census tract.

**Table 3-26: Community risk ratings for winter weather, breakdown by census tracts**

| Community      | Total Census Tracts | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk | Number of Census Tracts with Relatively Moderate Risk |
|----------------|---------------------|--------------------------------------------|--------------------------------------------------|-------------------------------------------------------|
| Bethel         | 4                   | -                                          | 3                                                | 1                                                     |
| Bridgewater    | 1                   | -                                          | 1                                                | -                                                     |
| Brookfield     | 3                   | -                                          | 2                                                | 1                                                     |
| Danbury        | 20                  | -                                          | 13                                               | 7                                                     |
| Darien         | 5                   | -                                          | 5                                                | -                                                     |
| Greenwich      | 15                  | 1                                          | 14                                               | -                                                     |
| New Canaan     | 5                   | -                                          | 5                                                | -                                                     |
| New Fairfield  | 3                   | -                                          | 3                                                | -                                                     |
| New Milford    | 5                   | -                                          | 5                                                | -                                                     |
| Newtown        | 6                   | -                                          | 5                                                | 1                                                     |
| Norwalk        | 22                  | -                                          | 21                                               | 1                                                     |
| Redding        | 2                   | -                                          | 2                                                | -                                                     |
| Ridgefield     | 6                   | -                                          | 6                                                | -                                                     |
| Sherman        | 1                   | -                                          | 1                                                | -                                                     |
| Stamford       | 33                  | -                                          | 32                                               | 1                                                     |
| Weston         | 2                   | -                                          | 2                                                | -                                                     |
| Westport       | 7                   | -                                          | 7                                                | -                                                     |
| Wilton         | 5                   | -                                          | 5                                                | -                                                     |
| <b>WestCOG</b> | <b>145</b>          | <b>1</b>                                   | <b>132</b>                                       | <b>12</b>                                             |

Figure 3-7 shows the expected annual loss ratings throughout the COG based on the NRI for winter weather. The table below describes the projected annualized losses from winter weather by community. The highest expected annual losses are found in Stamford, Danbury, and Norwalk, all of which have over \$25,000 in expected annual losses due to winter weather with the highest in the City of Stamford which has an expected \$37,201 annual loss. The WestCOG region has a total expected annual loss of \$202,734.

**Table 3-27: Breakdown of NRI expected annual losses from winter weather by community**

| Community     | Expected Annual Loss | Community      | Expected Annual Loss |
|---------------|----------------------|----------------|----------------------|
| Bethel        | \$8,133              | Newtown        | \$11,158             |
| Bridgewater   | \$403                | Norwalk        | \$25,155             |
| Brookfield    | \$7,184              | Redding        | \$3,783              |
| Danbury       | \$33,963             | Ridgefield     | \$10,391             |
| Darien        | \$6,566              | Sherman        | \$1,500              |
| Greenwich     | \$18,415             | Stamford       | \$37,201             |
| New Canaan    | \$6,470              | Weston         | \$4,550              |
| New Fairfield | \$5,303              | Westport       | \$8,679              |
| New Milford   | \$5,895              | Wilton         | \$7,985              |
| --            | --                   | <b>WestCOG</b> | <b>\$202,734</b>     |

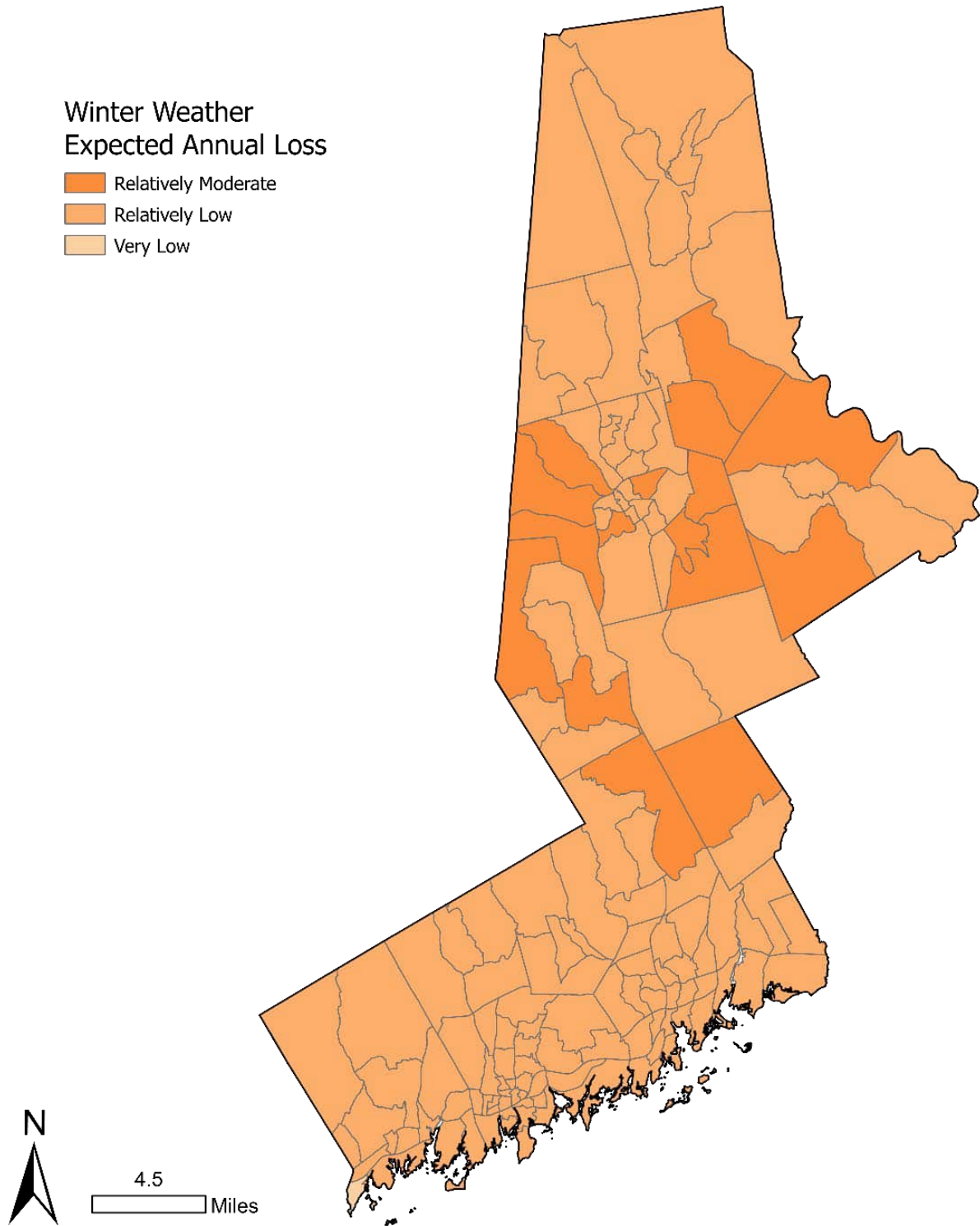


Figure 3-7: NRI Winter Weather Expected Annual Loss Rating

### 3.2.4 Tropical Cyclones and Hurricanes

Tropical cyclones are relatively common in Connecticut, occurring every few years and producing strong winds, heavy rainfall, and flooding. Connecticut typically experiences tropical storms as opposed to hurricanes, but strong hurricanes have caused widespread damage to the state, including flooding, widespread power outages, and damage from falling trees and power lines.

#### Location

The entire Region is susceptible to wind damage from tropical cyclones. Low lying areas (such as floodplains) can experience additional impacts of tropical cyclones such as flooding.

#### Extent

A tropical cyclone is defined by the NWS as a “rotating, organized system of clouds and thunderstorms that originates over tropical or subtropical waters and has a closed low-level circulation.” A tropical cyclone is further classified as a tropical depression, tropical storm, hurricane, or major hurricane, and is most likely to form from June 1 through November 30 each year in the northern Atlantic Ocean.

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes of Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures. The NWS defines the 5 categories as follows:

- Category 1: Winds of 74-95 mph will produce some damage. Well-constructed frame homes could have damage to roof, shingles, vinyl siding, and gutters. Damaged expected to unanchored mobile homes (mainly pre-1994 construction). Some damage to poorly constructed signs. Loose outdoor items become projectiles, and persons struck by windborne debris risk injury and possibly death. Numerous large tree branches will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days. Hurricane Gloria in 1985 was a Category 1 hurricane at landfall.
- Category 2: Strong winds of 96-110 mph will cause widespread damage. Well-constructed frame homes could sustain major roof and siding damage. Considerable damage to mobile homes and loose outdoor items may become airborne. Persons struck by windborne debris risk injury and possibly death. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss expected with outages that could last from several days to weeks. Hurricane Bob in 1991 was a Category 2 hurricane when it made landfall in Rhode Island.
- Category 3: Dangerous winds of 111-130 mph will cause extensive damage. Well-built frame homes may incur major damage or removal of roof decking and gable ends. Mobile homes and poorly constructed signs are likely to be destroyed. Persons struck by windborne debris risk injury and possibly death. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water are unavailable for several days to weeks after the storm passes. The 1938 Hurricane was a Category 3 when it made landfall in Connecticut.
- Category 4: Extremely dangerous winds of 131-155 mph will cause devastating damage. Well-built frame homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls, doors, and windows. Complete destruction of mobile homes. Windborne debris will cause extensive damage and persons struck will be injured or killed. Most trees will be snapped or uprooted, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to months. Most of the area will be uninhabitable for weeks or months.

- **Category 5:** Catastrophic winds greater than 156 mph will cause widespread destruction. A high percentage of framed homes and mobile homes will be destroyed with total roof failure and wall collapse. Severe injury or death likely for persons struck by windborne debris. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months, and most of the area will be uninhabitable for weeks or months.

### Previous Occurrences

Tropical cyclones are the most destructive natural disasters that threaten Connecticut, due principally to their accompanying storm surge. The Region has experienced damaging tropical cyclones 7 times since 1954, according to Table 3-1. According to NOAA, 33 tropical cyclones have passed within 50 miles of Fairfield County from 1851 to 2020, including 2 Category 3 storms (the 1938 Hurricane and Hurricane Carol in 1954), 2 Category 2 storms (the 1944 Hurricane and Hurricane Donna in 1960), and 6 Category 1 hurricanes. Figure 3-8 presents the historical hurricane tracks as presented by NOAA. In general, the tracks trend from the southwest to the northeast across the region.

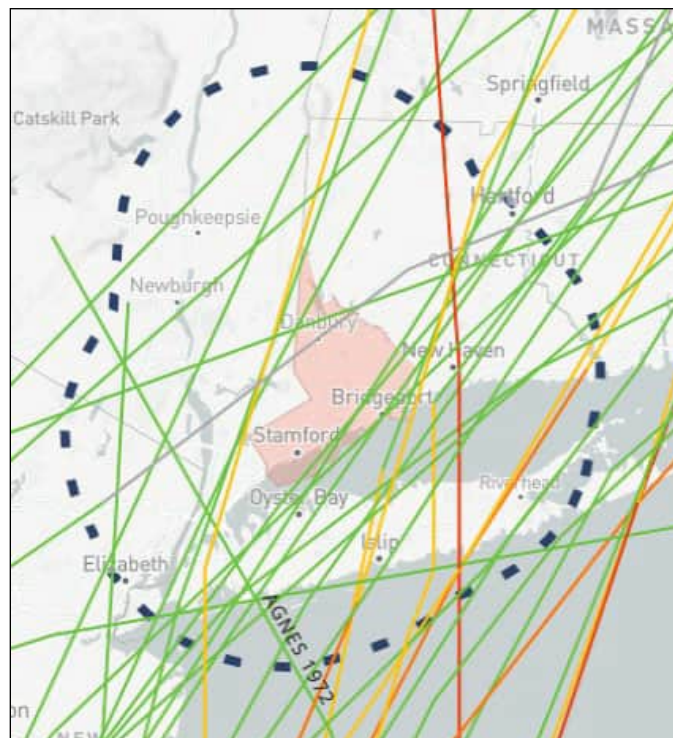


**Figure 3-8: Hurricane Historical Tracks**

Source: NOAA

The wind and rain from historic tropical storms and hurricanes caused flooding, property damage, and power outages, leaving extensive debris and detritus in their wake. The most destructive and powerful recorded hurricane to hit Connecticut struck on September 21, 1938. Named the Great New England Hurricane of 1938, the strongest winds ever recorded in Southern New England occurred during this storm at the Blue Hill Observatory with sustained winds of 121 mph and a peak gust of 186 mph. The worst damage was concentrated on the coast due to massive storm surges of 14 to 18 feet. However, inland communities were not spared. Rainfall of 10 to 17 inches from the hurricane resulted in severe river flooding across Connecticut, washing away roads and sections of the New York, New Haven, and Hartford Railroad lines. The Connecticut River in Hartford reached a level of 35.4 feet, which was 19.4 feet above flood stage. A total of 8,900 homes, cottages, and buildings were destroyed, and over 15,000 were damaged by the hurricane. Across Southern New England, 564 people died, and over 1,700 were injured (NWS Forecast Office, 2005). Because of its destruction, the 1938 hurricane is often used as a benchmark for assessing the worst-case scenario for future hurricanes striking the region.

While no other hurricane has caused the level of destruction in Connecticut as the 1938 hurricane, other storms of significance have hit the region. The following provides an overview of these recent storms:

- September 1985: Hurricane Gloria was a Category Three Hurricane when it made landfall in North Carolina and weakened to a Category 1 Hurricane before its center made landfall near Bridgeport. The hurricane struck at low tide, resulting in low to moderate storm surge along the coast. The storm produced up to six inches of rain in some areas and heavy winds that damaged structures and uprooted thousands of trees. The amount and spread of debris, and the loss of power, were the major impacts of this storm, with over 500,000 people experiencing significant power outages. Many residents in the region evacuated to emergency shelters, and New Canaan, Westport, and other municipalities set up emergency water distribution centers to provide clear water to residents who did not have electricity to pump water from their wells.
- September 16-21, 1999: Tropical Storm Floyd dropped an average of four to eight inches of rain across the State. Sixteen buildings in the state were utterly destroyed by the storm. The storm caused \$2.2 million in damage, widespread power outages throughout New England, and at least one death in Connecticut.
- August 28, 2011: Irene first made landfall in North Carolina as a Category 1 hurricane. By the time it reached the New York area, it was downgraded to a tropical storm. Dropping torrential rain on Connecticut, the storm caused widespread flooding, knocked power out to 754,000 customers, and left many roads impassable. According to the 2019 CT NHMP, "2-3 percent of trees within 50 feet of the centerline of state roads were felled by the storm," and the storm caused over \$10 million in fiscal impacts to State infrastructure. Ten deaths were attributed to the storm in Connecticut. The New Canaan branch of Metro North suffered extensive damage.
- October 29, 2012: "Superstorm" Sandy formed in the Caribbean on October 22. Moving up the coast, hitting New Jersey and New York on October 29, 2012, Storm Sandy caused extensive flooding and damage on Connecticut's coast. The National Hurricane Center Tropical Cyclone Report estimated the death count from Sandy at 147 deaths, including 5 in Connecticut. Sandy was the deadliest hurricane to hit the United States since Hurricane Katrina in 2005. A total of 63% of Stamford was without power following the storm.
- August 3-4, 2020: Tropical Storm Isaias produced wind gusts of up to 70 mph along the coastline and heavy rain to the region, knocking down trees and causing widespread power outages. A tropical storm warning, flash flood watch, and tornado watch were issued by the NWS for the storm. According to the Connecticut Post, numerous trees were blown down in Danbury, and transformers were damaged on Main Street and Mill Plain Road. Numerous roads were closed throughout the region, including Route 25, Stony Hill Road, and North Mountain Road in Brookfield. Wind damage collapsed part of a building in Bethel, resulting in a major gas leak. A 65-foot sailboat came loose and was thrown onto the rocks on the east side of Dolphin Cove in Stamford. Service was temporarily suspended along Metro North due to trees falling on the tracks. This event was a significant recent reminder of the risks posed by tropical storms.
- Storms of 2021: Tropical and Post-Tropical Storms Elsa, Fred, Henri, and Ida caused varying amounts of flood and wind damage in Connecticut from July through September 2021, with storm Ida resulting in a disaster declaration for Connecticut.

### Probability of Future Events

Return periods can be a helpful tool to put risk in perspective. Resident and business leaders should ask themselves, "How often over the course of a 30-year mortgage will a Category 1 hurricane hit Connecticut?" This exercise may help frame these storms as an eventuality to be prepared for rather than a risk that can be avoided.

NOAA has utilized the National Hurricane Center Risk Analysis Program “HURISK” to determine return periods for various hurricane categories at locations throughout the United States. As noted on the NOAA website, hurricane return periods are the frequency at which a certain intensity or category of hurricane can be expected within 75 nautical miles of a given location. For example, a return period of 20 years for a particular category storm means that, on average, during the previous 100 years, a storm of that category passed within 75 nautical miles of that location five times. Thus, it is expected that similar category storms would pass within that radius an additional five times during the next 100 years.

According to NOAA, a Category 1 hurricane can be expected to make landfall in/near Connecticut once every 17 years. A Category 2 hurricane could be expected to make landfall in/near Connecticut once every 39 years, and a Category 3 hurricane has a calculated return period of 68 to 70 years. Based on this, the occurrence of another hurricane to impact the state can be expected within the foreseeable future.

The 2023 CT NHMP notes that while the number of hurricanes that make landfall in or near Connecticut will not necessarily increase in the future, those that do will be of greater intensity and longer duration than in the past. This may mean a potential increase in all categories of hurricanes normally experienced in New England. The amount of rainfall associated with a given storm is also projected to increase. Storm surge impacts are likely to worsen in the future as a result of sea level rise. For example, a storm surge of 3 feet today will have the impact of a surge of 5 feet if sea levels rise 2 feet (3 feet of storm surge + 2 feet of sea level rise = 5 feet of flooding).

### Impacts to Community Assets

According to the 2023 CT NHMP, hurricanes have the greatest destructive potential of any natural disaster in Connecticut due to the potential combination of high winds, storm surge and coastal erosion, heavy rain, and flooding that can accompany the hazard. It is generally believed that New England is long overdue for another major hurricane strike. Factors that influence vulnerability to tropical cyclones in the Region include building codes currently in place, local zoning and development patterns, and the age and number of structures located in highly vulnerable areas of the communities.

In general, as the residents and businesses of Connecticut become more dependent on the internet and mobile communications, the impact of hurricanes on commerce will continue to increase. A major hurricane has the potential of causing complete disruption of power and communications for up to several weeks, rendering electronic devices and those that rely on utility towers and lines inoperative.

Debris such as signs, roofing material, and small items left outside become flying missiles in hurricanes. Extensive damage to trees, towers, aboveground and underground utility lines (from uprooted trees or failed infrastructure), and fallen poles causes considerable disruption for residents. Streets may be flooded or blocked by fallen branches, poles, or trees, preventing egress. Downed power lines from heavy winds can also start fires during hurricanes with limited rainfall. While moving all utilities underground would prevent wind damage to this infrastructure, this activity is too cost-prohibitive to be implemented in a widespread manner.

### Affected Population

The entire region's population is expected to be affected when a tropical cyclone strikes. Furthermore, all areas of growth and development increase the region's vulnerability to natural hazards such as hurricanes, although new development is expected to mitigate potential damage by meeting the standards of the most recent building code.

### Loss Estimates from HAZUS-MH

HAZUS-MH was utilized to perform an analysis of potential wind events in order to calculate potential annualized loss for tropical storm wind damage. HAZUS-MH uses a hazard-load-resistance-damage-loss methodology to produce wind loss estimations. Expected building losses are estimated using wind models and damage probabilities based on building type.

The default building stock in HAZUS-MH was used for the analysis. According to this database, there are 198,753 buildings in the Region. Table 3-28 presents the number of buildings damaged by wind in the region for each probabilistic storm as well as modern recurrences of the 1938 hurricane, 1985's Hurricane Gloria, and 2012's Tropical Storm Sandy.

**Table 3-28: Number of Buildings Damaged in Region Due to Wind**

| Return Period or Storm | Minor Damage | Moderate Damage | Severe Damage | Destruction |
|------------------------|--------------|-----------------|---------------|-------------|
| 10-Year                | 0            | 0               | 0             | 0           |
| 20-Year                | 0            | 0               | 0             | 0           |
| 50-Year                | 175          | 6               | 0             | 0           |
| 100-Year               | 7,224        | 771             | 25            | 2           |
| 200-Year               | 9,498        | 1,126           | 41            | 6           |
| 500-Year               | 10,414       | 1,218           | 42            | 6           |
| 1000-Year              | 47,246       | 13,997          | 1,788         | 759         |
| Sandy                  | 149          | 5               | 0             | 0           |
| Gloria                 | 190          | 7               | 0             | 0           |
| 1938                   | 6,314        | 579             | 17            | 1           |

Source: HAZUS-MH

For the Region, HAZUS-MH did not estimate that any damage would occur for the 10-year and 20-year wind events and generally estimated each of the historic storms as being less than 100-year wind events.

Essential facilities in the region included in HAZUS-MH include 6 hospitals, 7 EOCs, 45 fire stations, 22 police stations, and 223 schools. These facilities are geolocated within the HAZUS-MH database such that they are susceptible to differing levels of wind damage based on their position in the region. Table 3-29 summarizes the percentage of essential facilities damage for each wind event.

**Table 3-29: Average Percent Damage of Essential Facilities**

| Return Period or Storm | EOC | Fire Depts. | Hospitals | Police Depts. | Schools |
|------------------------|-----|-------------|-----------|---------------|---------|
| 10-Year                | 0%  | 0%          | 0%        | 0%            | 0%      |
| 20-Year                | 0%  | 0%          | 0%        | 0%            | 0%      |
| 50-Year                | 0%  | 0%          | 0%        | 0%            | 0%      |
| 100-Year               | 1%  | 1%          | 1%        | 0%            | 1%      |
| 200-Year               | 1%  | 1%          | 1%        | 0%            | 1%      |
| 500-Year               | 1%  | 1%          | 1%        | 0%            | 1%      |
| 1000-Year              | 6%  | 3%          | 3%        | 3%            | 6%      |
| Sandy                  | 0%  | 0%          | 1%        | 0%            | 0%      |
| Gloria                 | 0%  | 0%          | 0%        | 0%            | 0%      |
| 1938                   | 1%  | 1%          | 1%        | 0%            | 1%      |

Source: HAZUS-MH

The estimates for the amount of debris generated from wind damage are presented in Table 3-30. The Region is predicted to experience 1.5 million tons of debris during a 100-year wind event and 5.4 million tons during a 1,000-year wind event.

**Table 3-30: Debris Generation Due to Wind (Tons)**

| Return Period or Storm | Brick / Wood | Reinforced Concrete / Steel | Tree Debris | Total     |
|------------------------|--------------|-----------------------------|-------------|-----------|
| 10-Year                | 0            | 0                           | 0           | 0         |
| 20-Year                | 0            | 0                           | 0           | 0         |
| 50-Year                | 617          | 0                           | 29,903      | 30,520    |
| 100-Year               | 37,780       | 1                           | 1,472,062   | 1,509,843 |
| 200-Year               | 45,872       | 5                           | 1,594,860   | 1,640,740 |
| 500-Year               | 50,004       | 8                           | 1,915,661   | 1,965,670 |
| 1000-Year              | 280,855      | 1,214                       | 5,150,876   | 5,432,945 |
| Sandy                  | 443          | 0                           | 20,909      | 21,352    |
| Gloria                 | 715          | 0                           | 33,178      | 33,893    |
| 1938                   | 29,754       | 0                           | 1,616,766   | 1,646,520 |

Source: HAZUS-MH

The HAZUS-MH simulations suggest that sheltering needs will be relatively modest in the region for all but the 1,000-year wind event. Potential shelter requirements are presented in Table 3-31.

**Table 3-31: Shelter Requirements Due to Wind**

| Return Period or Storm | Number of Displaced Households | People Needing Short-Term Shelter |
|------------------------|--------------------------------|-----------------------------------|
| 10-Year                | 0                              | 0                                 |
| 20-Year                | 0                              | 0                                 |
| 50-Year                | 0                              | 0                                 |
| 100-Year               | 283                            | 180                               |
| 200-Year               | 425                            | 265                               |
| 500-Year               | 381                            | 240                               |
| 1000-Year              | 4,609                          | 2,750                             |
| Sandy                  | 0                              | 0                                 |
| Gloria                 | 0                              | 0                                 |
| 1938                   | 162                            | 108                               |

Source: HAZUS-MH

HAZUS-MH calculated economic loss based on both direct property damage and business interruption. Direct property damage includes the estimated costs to repair or replace damage to buildings and their contents. The business interruption costs are those associated with the inability of a business to function due to the tropical cyclone. Table 3-32 summarizes the economic loss to the region for each scenario.

**Table 3-32: Economic Losses in Region Due to Wind (Thousands of 2026 Dollars)**

| Municipality | Property Loss | Business Interruption (Income) Loss | Total Losses |
|--------------|---------------|-------------------------------------|--------------|
| 10-Year      | \$0           | \$0                                 | \$0          |
| 20-Year      | \$0           | \$0                                 | \$0          |
| 50-Year      | \$20,093      | \$0                                 | \$20,093     |
| 100-Year     | \$643,081     | \$3,273                             | \$646,354    |
| 200-Year     | \$822,248     | \$5,305                             | \$827,553    |
| 500-Year     | \$772,038     | \$4,613                             | \$776,650    |

| Municipality | Property Loss | Business Interruption (Income) Loss | Total Losses |
|--------------|---------------|-------------------------------------|--------------|
| 1000-Year    | \$5,231,404   | \$35,518                            | \$5,266,921  |
| Sandy        | \$13,365      | \$0                                 | \$13,365     |
| Gloria       | \$25,576      | \$0                                 | \$25,576     |
| 1938         | \$537,209     | \$2,269                             | \$539,478    |

Source: HAZUS-MH

The probabilistic tropical cyclone scenarios presented above were used to generate an annualized loss estimate for each municipality in the Region. Results are presented in Table 3-33.

**Table 3-33: Annualized Economic Loss in Region Due to Wind (Thousands of 2026 Dollars)**

| Municipality   | Property Loss   | Business Interruption (Income) Loss | Total Annualized Losses |
|----------------|-----------------|-------------------------------------|-------------------------|
| Bethel         | \$254           | \$1                                 | \$255                   |
| Bridgewater    | \$28            | <\$1                                | \$28                    |
| Brookfield     | \$249           | \$1                                 | \$250                   |
| Danbury        | \$1,028         | \$5                                 | \$1,034                 |
| Darien         | \$954           | \$3                                 | \$956                   |
| Greenwich      | \$2,206         | \$14                                | \$2,220                 |
| New Canaan     | \$531           | \$3                                 | \$533                   |
| New Fairfield  | \$154           | <\$1                                | \$154                   |
| New Milford    | \$315           | \$1                                 | \$316                   |
| Newtown        | \$458           | \$1                                 | \$459                   |
| Norwalk        | \$2,941         | \$21                                | \$2,963                 |
| Redding        | \$158           | <\$1                                | \$159                   |
| Ridgefield     | \$440           | \$1                                 | \$441                   |
| Sherman        | \$40            | <\$1                                | \$40                    |
| Stamford       | \$3,446         | \$30                                | \$3,476                 |
| Weston         | \$209           | \$1                                 | \$210                   |
| Westport       | \$1,643         | \$11                                | \$1,654                 |
| Wilton         | \$370           | \$3                                 | \$373                   |
| <b>WestCOG</b> | <b>\$15,423</b> | <b>\$99</b>                         | <b>\$15,521</b>         |

Source: HAZUS-MH

#### Loss Estimates from NCEI

Historical loss data for tropical cyclones was extracted from the NCEI Storm Events Database. Table 3-34 below presents the number of cyclone events, the number of deaths and injuries, and total property loss values (in 2026 dollar equivalents) impacting each WestCOG municipality between 2015 and 2025. Annualized loss estimates for cyclone damage are calculated by dividing the total property loss figures by the 10-year reporting period.

**Table 3-34: Annualized Tropical Cyclone Loss Estimates from NCEI**

| Municipality   | Event Count* | Death    | Injury   | Property Loss<br>(2026\$) | Annualized Loss    |
|----------------|--------------|----------|----------|---------------------------|--------------------|
| Bethel         | 0            | 0        | 0        | \$0                       | \$0                |
| Bridgewater    | 0            | 0        | 0        | \$0                       | \$0                |
| Brookfield     | 0            | 0        | 0        | \$0                       | \$0                |
| Danbury        | 0            | 0        | 0        | \$0                       | \$0                |
| Darien         | 0            | 0        | 0        | \$0                       | \$0                |
| Greenwich      | 0            | 0        | 0        | \$0                       | \$0                |
| New Canaan     | 0            | 0        | 0        | \$0                       | \$0                |
| New Fairfield  | 0            | 0        | 0        | \$0                       | \$0                |
| New Milford    | 0            | 0        | 0        | \$0                       | \$0                |
| Newtown        | 0            | 0        | 0        | \$0                       | \$0                |
| Norwalk        | 1            | 0        | 0        | \$11,340,000              | \$1,134,000        |
| Redding        | 0            | 0        | 0        | \$0                       | \$0                |
| Ridgefield     | 0            | 0        | 0        | \$0                       | \$0                |
| Sherman        | 0            | 0        | 0        | \$0                       | \$0                |
| Stamford       | 0            | 0        | 0        | \$0                       | \$0                |
| Weston         | 0            | 0        | 0        | \$0                       | \$0                |
| Westport       | 1            | 0        | 0        | \$11,340,000              | \$1,134,000        |
| Wilton         | 0            | 0        | 0        | \$0                       | \$0                |
| <b>WestCOG</b> | <b>2</b>     | <b>0</b> | <b>0</b> | <b>\$22,680,000</b>       | <b>\$2,268,000</b> |

Source: NOAA NCEI

*\*Note: municipal event counts and WestCOG totals may reflect events that affected multiple municipalities but are counted as individual events within each affected municipality. The total number of events in WestCOG as shown in the table may therefore be larger than the true number of events that impacted the region.*

### National Risk Index

FEMA's NRI was utilized to obtain information for a risk analysis on hurricanes at the census tract level across WestCOG. Figure 3-9 displays the risk rating by census tract in the WestCOG region for hurricanes.

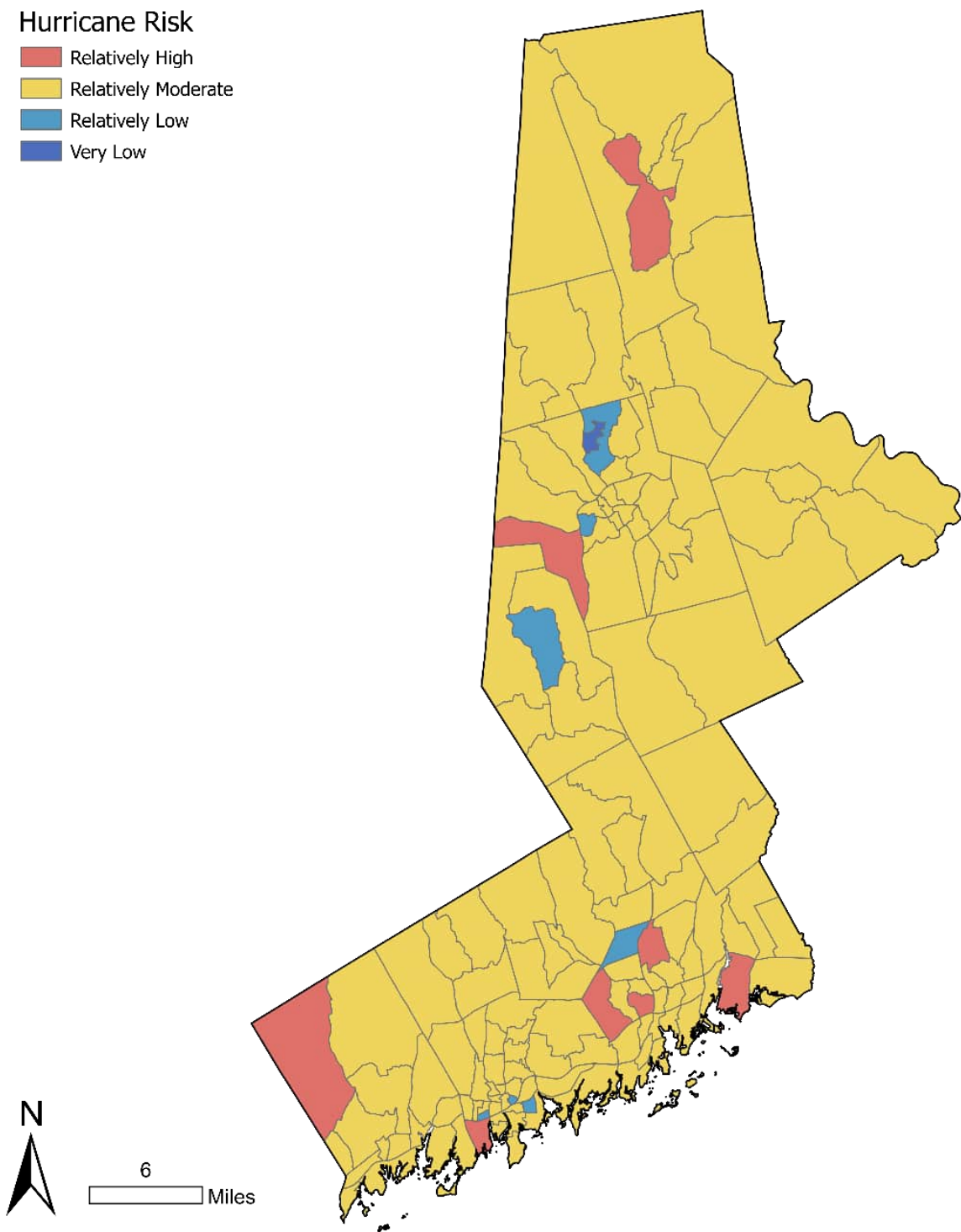


Figure 3-9: Risk Rating for Hurricanes, shown at the census tract level

Hurricane risk in the WestCOG region ranges from very low to relatively high, with the majority of the COG at a relatively moderate risk to hurricane. The census tracts at a relatively high risk to hurricanes are primarily in the City of Norwalk. Portions of Danbury, Greenwich, New Milford, Stamford, and Westport are also at a relatively high risk to hurricane impacts. The table below shows a breakdown of community risk in WestCOG by census tract.

**Table 3-35: Community risk ratings for hurricane, breakdown by census tracts**

| Community      | Total Census Tracts | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk | Number of Census Tracts with Relatively Moderate Risk | Number of Census Tracts with Relatively High Risk |
|----------------|---------------------|--------------------------------------------|--------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|
| Bethel         | 4                   | -                                          | -                                                | 4                                                     | -                                                 |
| Bridgewater    | 1                   | -                                          | -                                                | 1                                                     | -                                                 |
| Brookfield     | 3                   | -                                          | -                                                | 3                                                     | -                                                 |
| Danbury        | 20                  | 1                                          | 2                                                | 16                                                    | 1                                                 |
| Darien         | 5                   | -                                          | -                                                | 5                                                     | -                                                 |
| Greenwich      | 15                  | -                                          | -                                                | 14                                                    | 1                                                 |
| New Canaan     | 5                   | -                                          | -                                                | 5                                                     | -                                                 |
| New Fairfield  | 3                   | -                                          | -                                                | 3                                                     | -                                                 |
| New Milford    | 5                   | -                                          | -                                                | 4                                                     | 1                                                 |
| Newtown        | 6                   | -                                          | -                                                | 6                                                     | -                                                 |
| Norwalk        | 22                  | -                                          | 1                                                | 18                                                    | 3                                                 |
| Redding        | 2                   | -                                          | -                                                | 2                                                     | -                                                 |
| Ridgefield     | 6                   | -                                          | 1                                                | 5                                                     | -                                                 |
| Sherman        | 1                   | -                                          | -                                                | 1                                                     | -                                                 |
| Stamford       | 33                  | -                                          | 3                                                | 29                                                    | 1                                                 |
| Weston         | 2                   | -                                          | -                                                | 2                                                     | -                                                 |
| Westport       | 7                   | -                                          | -                                                | 6                                                     | 1                                                 |
| Wilton         | 5                   | -                                          | -                                                | 5                                                     | -                                                 |
| <b>WestCOG</b> | <b>145</b>          | <b>1</b>                                   | <b>7</b>                                         | <b>129</b>                                            | <b>8</b>                                          |

Figure 3-10 shows the expected annual loss ratings throughout the COG based on the NRI for hurricane.

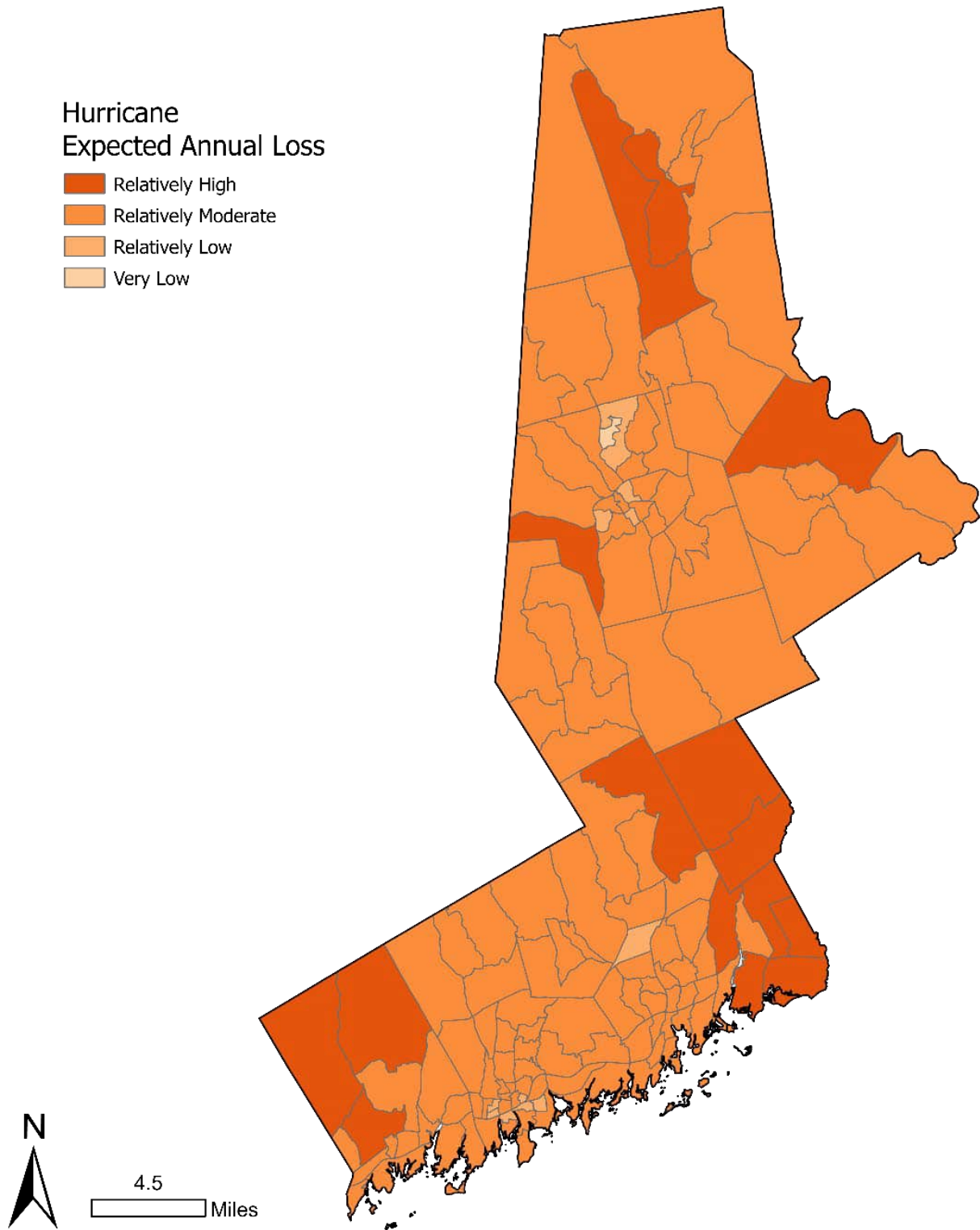


Figure 3-10: NRI Hurricane Expected Annual Loss Rating

The table below describes the projected annualized losses from hurricane by community. The highest expected annual losses are in Stamford, Norwalk, Greenwich, Danbury, and Westport, all of which have over \$4 million in expected annual losses due to hurricanes, with the highest in the City of Stamford, which has an expected annual loss of approximately \$8.05 million due to hurricanes. The WestCOG region has a total expected annual loss of approximately \$51.7 million.

**Table 3-36: Breakdown of NRI expected annual losses from hurricane by community**

| Community      | Expected Annual Loss |
|----------------|----------------------|
| Bethel         | \$1,295,296          |
| Bridgewater    | \$224,798            |
| Brookfield     | \$1,277,848          |
| Danbury        | \$4,951,862          |
| Darien         | \$2,243,127          |
| Greenwich      | \$6,668,148          |
| New Canaan     | \$2,288,390          |
| New Fairfield  | \$755,261            |
| New Milford    | \$2,618,525          |
| Newtown        | \$2,545,117          |
| Norwalk        | \$7,332,365          |
| Redding        | \$919,422            |
| Ridgefield     | \$2,088,440          |
| Sherman        | \$318,759            |
| Stamford       | \$8,050,659          |
| Weston         | \$1,542,101          |
| Westport       | \$4,475,658          |
| Wilton         | \$2,080,303          |
| <b>WestCOG</b> | <b>\$51,676,079</b>  |

### 3.2.5 Tornadoes

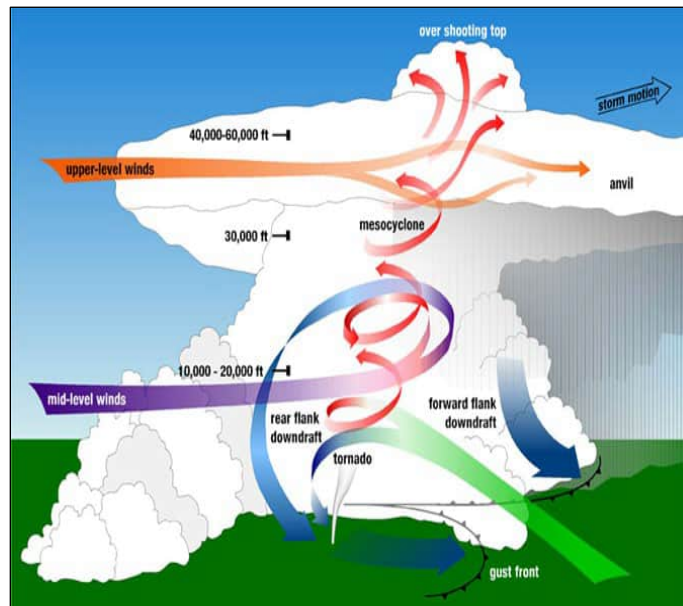
Tornadoes can be very destructive when they occur. While small tornadoes in outlying areas cause little to no damage, larger tornadoes in populated sections of Connecticut have historically caused significant damage, injury, and death through the destruction of trees, buildings, vehicles, and power lines.

#### **Location**

All areas of the Region are susceptible to tornadoes. The likelihood of damage, injury, and death increases dramatically when a tornado occurs in a populated area. Tornadoes typically cause damage in a straight line, although “skipping” tornadoes are also possible, where a tornado can pass over portions of its route without causing damage.

#### **Extent**

A tornado is a violent, destructive whirling wind storm accompanied by a funnel-shape cloud that progresses in a narrow path over the land as shown in Figure 3-11.

**Figure 3-11: Anatomy of a Tornado**

Source: NOAA National Severe Storms Laboratory

The strength of tornadoes is measured based on the Enhanced Fujita scale (EF) released by NOAA in 2007. The EF scale updated the original Fujita (F) scale developed in 1971. The EF scale uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to 28 specific indicators. Table 3-37 links EF classifications to estimated three-second wind gusts.

**Table 3-37: Enhanced Fujita Scale**

| F Scale 3-Second |            | EF Scale 3-Second |            |
|------------------|------------|-------------------|------------|
| F-#              | Gust (mph) | EF-#              | Gust (mph) |
| 0                | 45-78      | 0                 | 65-85      |
| 1                | 79-117     | 1                 | 86-110     |
| 2                | 118-161    | 2                 | 111-135    |
| 3                | 162-209    | 3                 | 136-165    |
| 4                | 210-261    | 4                 | 166-200    |
| 5                | 262-317    | 5                 | Over 200   |

Source: NOAA

### Previous Occurrences

Tornadoes are infrequent occurrences in Connecticut and the Region. Sixteen tornadoes have touched down within the region in the past 70 years. An extensively researched list of tornado activity in Connecticut is available on Wikipedia. This list extends back to 1648, although it is noted that the historical data prior to 1950 is incomplete due to a lack of official records and gaps in populated areas. Tornadoes that have impacted the Region, with none having occurred since the last plan update, are noted below:

- June 19, 1794: A tornado destroyed several structures in New Milford injuring four people, while a separate tornado cut through Branford. A strange incident was recorded where a tree was uprooted and carried, fully upright, along a road in New Milford, along with several other large objects. A barn door was found 10 miles from its source. Some loss of life likely occurred from one or both tornadoes.

- October 8, 1797: A tornado touched down in North Salem, New York, moving into Fairfield County. Six people were injured in Ridgefield, and possible tornado damage continued as far as Long Island Sound in Branford.
- August 1, 1812: A tornado passed from Westchester County, New York, into Greenwich.
- August 14, 1820: A tornado touched down east of Norwalk.
- September 27, 1899: A tornado passed from Norwalk to near Ridgefield, causing damage to trees and roofs in a path 50 to 300 feet wide. Some buildings were completely destroyed.
- August 28, 1911: A tornado cut a 3-mile path through New Milford, uprooting trees and damaging roofs.
- July 14, 1950: An F2 tornado touched down in Ridgefield around 7:30 a.m., tearing the roof off the high school and downing trees through the center of town. Three people were injured, and \$250,000 in property damage was reported.
- August 21, 1951: A long-tracked F2 tornado touched down in New Milford, passing more than 40 miles (64 km) well into Hartford County. Nine people were injured.
- August 9, 1968: An F1 tornado briefly touched down near Danbury.
- July 19, 1971: An F2 tornado touched down near Norwalk.
- September 18, 1973: Three tornadoes briefly touched down in Connecticut, including an F1 tornado in Greenwich.
- July 20, 1975: An F1 touched down near New Milford.
- June 29, 1990: An F0 briefly touched down in Danbury. Seven people were injured by flying glass.
- July 5, 1992: An F0 struck near New Fairfield.
- July 1, 2001: An F0 tracked 10 miles across southern Litchfield County, touching down seven times along its path from New Milford to Roxbury.
- May 31, 2002: An F1 touched down in Brookfield.
- June 16, 2002: An F0 briefly touched down in the Lanesville section of New Milford.
- July 12, 2006: The Westchester tornado that produced F2 damage across the border in New York entered Greenwich at 4:01 PM, producing F1 damage on the north side of town. It may have briefly touched down a second time just north of the Merritt Parkway.
- May 16, 2007: Just three months after the switch to the Enhanced Fujita Scale for rating tornadoes, a skipping tornado, rated EF1, tracked 4 to 5 miles from Bethel to Newtown. Widespread wind damage also affected other parts of the state.
- July 1, 2013: An EF0 tornado with winds up to 80 mph touched down in Greenwich and Stamford, causing extensive tree damage along a 3.7-mile path 150 yards wide.

- May 15, 2018: Numerous severe thunderstorms moved over southern Connecticut, producing two tornadoes in the Lower Hudson Valley, as well as microbursts and macrobursts.
- October 2, 2018: An EF-1 tornado struck New Canaan with winds of around 100 mph. The path was approximately 300 feet wide. A funnel cloud connected to this same storm was also spotted in eastern Norwalk by workers of a local electronics store.
- August 4, 2020: A waterspout came onto shore in Saugatuck Shores in Westport during Tropical Storm Isaias, causing EF1-scale damage to a house and trees.

### Probability of Future Events

According to the 2023 CT NHMP, it is estimated that Connecticut will experience one to two tornadoes every year. Litchfield County has the highest count of past tornado events and so has a higher risk for the occurrence of future tornadoes. Fairfield County has a moderately high risk. This puts WestCOG at slightly higher risk of future tornado incidence than other parts of the state.

Based on the historic record presented above, the Region has likely experienced 5 EF0, 9 EF1, and 3 EF2 tornadoes over the last 100 years. Therefore, it is reasonable for the Region to anticipate the occurrence of a tornado every 6.25 years.

The 2023 CT NHMP notes that there has not been a significant trend in tornado frequency in the Northeast region over the past century, and that there is insufficient scientific data to project future changes in tornado location, frequency, or intensity. Nevertheless, climate change has the potential to increase the frequency and intensity of tornadoes as other weather patterns shift, so the pattern of occurrence in Connecticut could change in the future.

### Impacts to Community Assets

While Connecticut clearly faces some risk from tornadoes, the nature of the storms makes them unpredictable. Tornadoes can strike with very little warning, cause significant to catastrophic damage to homes, vehicles, and businesses, and result in significant injury and death. All towns in the region share equal vulnerability to these events, and although property destruction may be unavoidable, loss of life can be minimized through an efficient, coordinated response.

### Affected Population

Populations in the direct path of a tornado are most likely to experience damage or injury from a tornado. Therefore, more densely populated areas in the Region are more likely to experience damage and casualties than less densely populated communities. Indirect effects may also be felt by the larger population in an affected municipality due to closed roads, power outages, and loss of services.

### Loss Estimates from the NCEI

Although tornadoes affecting Connecticut and the Region are infrequent, those that have struck the area have had devastating impacts. Historical loss data for tornadoes was extracted from the NCEI Storm Events Database. Table 3-38 presents the number of tornado events, the number of deaths and injuries, and total property loss values (in 2026 dollar equivalents) impacting each WestCOG municipality between 2015 and 2025. Annualized loss estimates for tornado damage are calculated by dividing the total property loss figures by the 10-year reporting period. According to the database, between 2015 and 2025, there were zero deaths and zero injuries in the region caused by tornadoes. The total property damage from these events has cost approximately \$100,800 since 2015.

**Table 3-38: Annualized Tornado Loss Estimates from NCEI**

| Municipality   | Event Count | Death    | Injury   | Property Loss (2026\$) | Annualized Loss |
|----------------|-------------|----------|----------|------------------------|-----------------|
| Bethel         | 0           | 0        | 0        | \$0                    | \$0             |
| Bridgewater    | 0           | 0        | 0        | \$0                    | \$0             |
| Brookfield     | 0           | 0        | 0        | \$0                    | \$0             |
| Danbury        | 0           | 0        | 0        | \$0                    | \$0             |
| Darien         | 0           | 0        | 0        | \$0                    | \$0             |
| Greenwich      | 0           | 0        | 0        | \$0                    | \$0             |
| New Canaan     | 1           | 0        | 0        | \$63,000               | \$6,300         |
| New Fairfield  | 0           | 0        | 0        | \$0                    | \$0             |
| New Milford    | 0           | 0        | 0        | \$0                    | \$0             |
| Newtown        | 0           | 0        | 0        | \$0                    | \$0             |
| Norwalk        | 1           | 0        | 0        | \$18,900               | \$1,890         |
| Redding        | 0           | 0        | 0        | \$0                    | \$0             |
| Ridgefield     | 0           | 0        | 0        | \$0                    | \$0             |
| Sherman        | 0           | 0        | 0        | \$0                    | \$0             |
| Stamford       | 0           | 0        | 0        | \$0                    | \$0             |
| Weston         | 0           | 0        | 0        | \$0                    | \$0             |
| Westport       | 1           | 0        | 0        | \$18,900               | \$1,890         |
| Wilton         | 0           | 0        | 0        | \$0                    | \$0             |
| <b>WestCOG</b> | <b>3</b>    | <b>0</b> | <b>0</b> | <b>\$100,800</b>       | <b>\$10,080</b> |

Source: NOAA NCEI

*\*Note: municipal event counts and WestCOG totals may reflect events that affected multiple municipalities but are counted as individual events within each affected municipality. The total number of events in WestCOG, as shown in the table, may therefore be larger than the true number of events that impacted the region.*

### National Risk Index

FEMA's NRI was utilized to obtain information for a risk analysis on tornadoes at the census tract level across WestCOG. Figure 3-12 displays the risk rating by census tract in the WestCOG region for tornadoes.

Tornado risk in the WestCOG region ranges from very low to relatively low. Table 3-39 shows a breakdown of community risk in WestCOG by census tract.

**Table 3-39: Community risk ratings for tornado, breakdown by census tracts**

| Community     | Total Census Tracts | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk |
|---------------|---------------------|--------------------------------------------|--------------------------------------------------|
| Bethel        | 4                   | -                                          | 4                                                |
| Bridgewater   | 1                   | 1                                          | -                                                |
| Brookfield    | 3                   | 1                                          | 2                                                |
| Danbury       | 20                  | 5                                          | 15                                               |
| Darien        | 5                   | 5                                          | -                                                |
| Greenwich     | 15                  | 10                                         | 5                                                |
| New Canaan    | 5                   | 4                                          | 1                                                |
| New Fairfield | 3                   | 3                                          | -                                                |

|                |            |           |           |
|----------------|------------|-----------|-----------|
| New Milford    | 5          | -         | 5         |
| Newtown        | 6          | 3         | 3         |
| Norwalk        | 22         | 19        | 3         |
| Redding        | 2          | -         | 2         |
| Ridgefield     | 6          | 3         | 3         |
| Sherman        | 1          | 1         | -         |
| Stamford       | 33         | 29        | 4         |
| Weston         | 2          | 2         | -         |
| Westport       | 7          | 7         | -         |
| Wilton         | 5          | 5         | -         |
| <b>WestCOG</b> | <b>145</b> | <b>98</b> | <b>47</b> |

Figure 3-13 shows the expected annual loss ratings throughout the COG based on the NRI for tornado.

Table 3-40 describes the projected annualized losses from tornadoes by community. The highest expected annual losses are in Danbury, Stamford, New Milford, Greenwich, and Norwalk, all of which have over \$200,000 in expected annual losses due to tornadoes, with the highest in the City of Danbury, which has an expected annual loss of \$402,794. The WestCOG region has a total expected annual loss of approximately \$2.43 million.

**Table 3-40: Breakdown of NRI expected annual losses from tornadoes by community**

| Community      | Expected Annual Loss |
|----------------|----------------------|
| Bethel         | \$101,651            |
| Bridgewater    | \$19,343             |
| Brookfield     | \$96,724             |
| Danbury        | \$402,794            |
| Darien         | \$82,538             |
| Greenwich      | \$249,081            |
| New Canaan     | \$84,878             |
| New Fairfield  | \$61,778             |
| New Milford    | \$250,634            |
| Newtown        | \$133,831            |
| Norwalk        | \$218,506            |
| Redding        | \$48,475             |
| Ridgefield     | \$104,723            |
| Sherman        | \$22,243             |
| Stamford       | \$331,262            |
| Weston         | \$39,066             |
| Westport       | \$108,790            |
| Wilton         | 70,297               |
| <b>WestCOG</b> | <b>\$2,426,614</b>   |

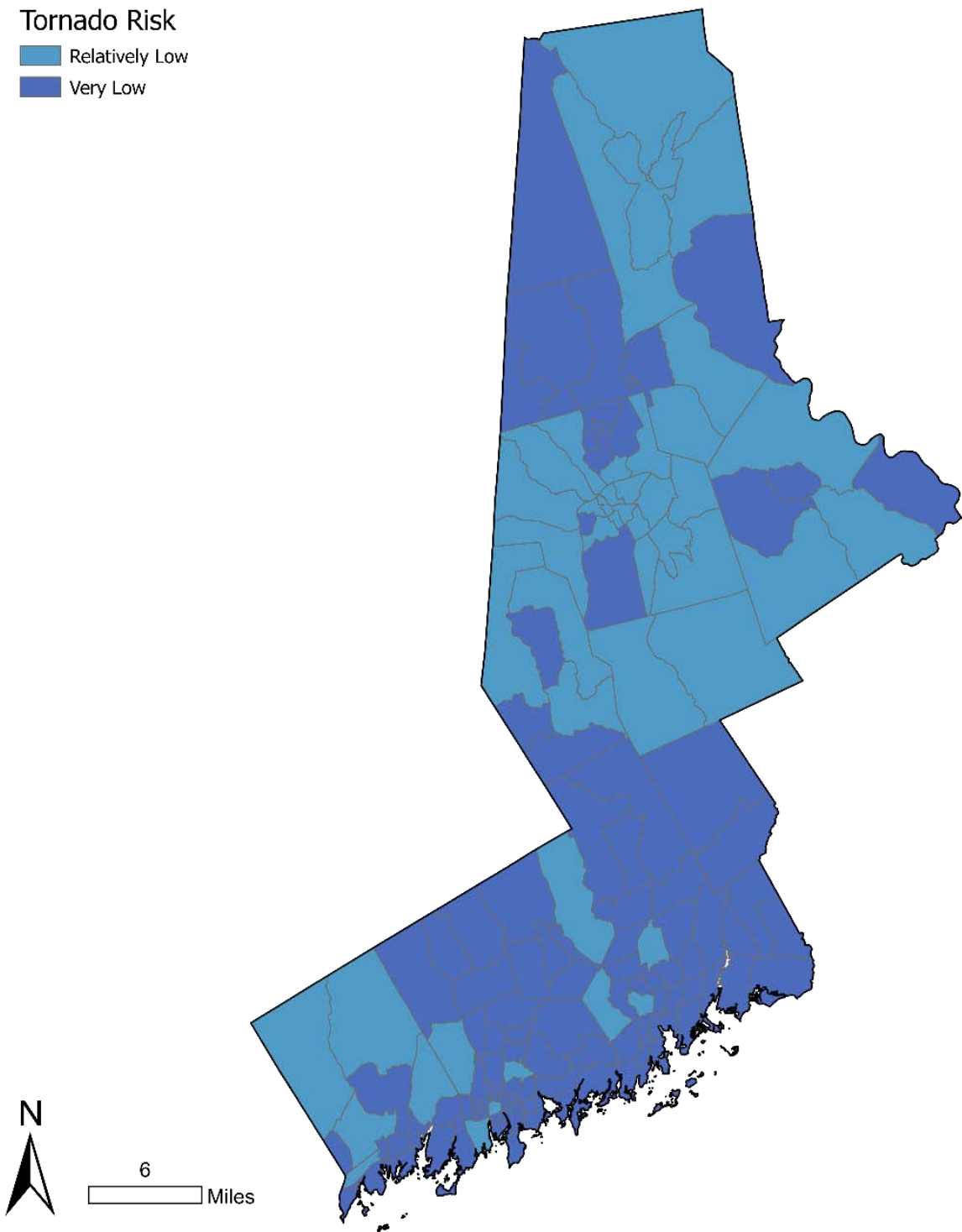


Figure 3-12: Risk Rating for Tornadoes, shown at the census tract level

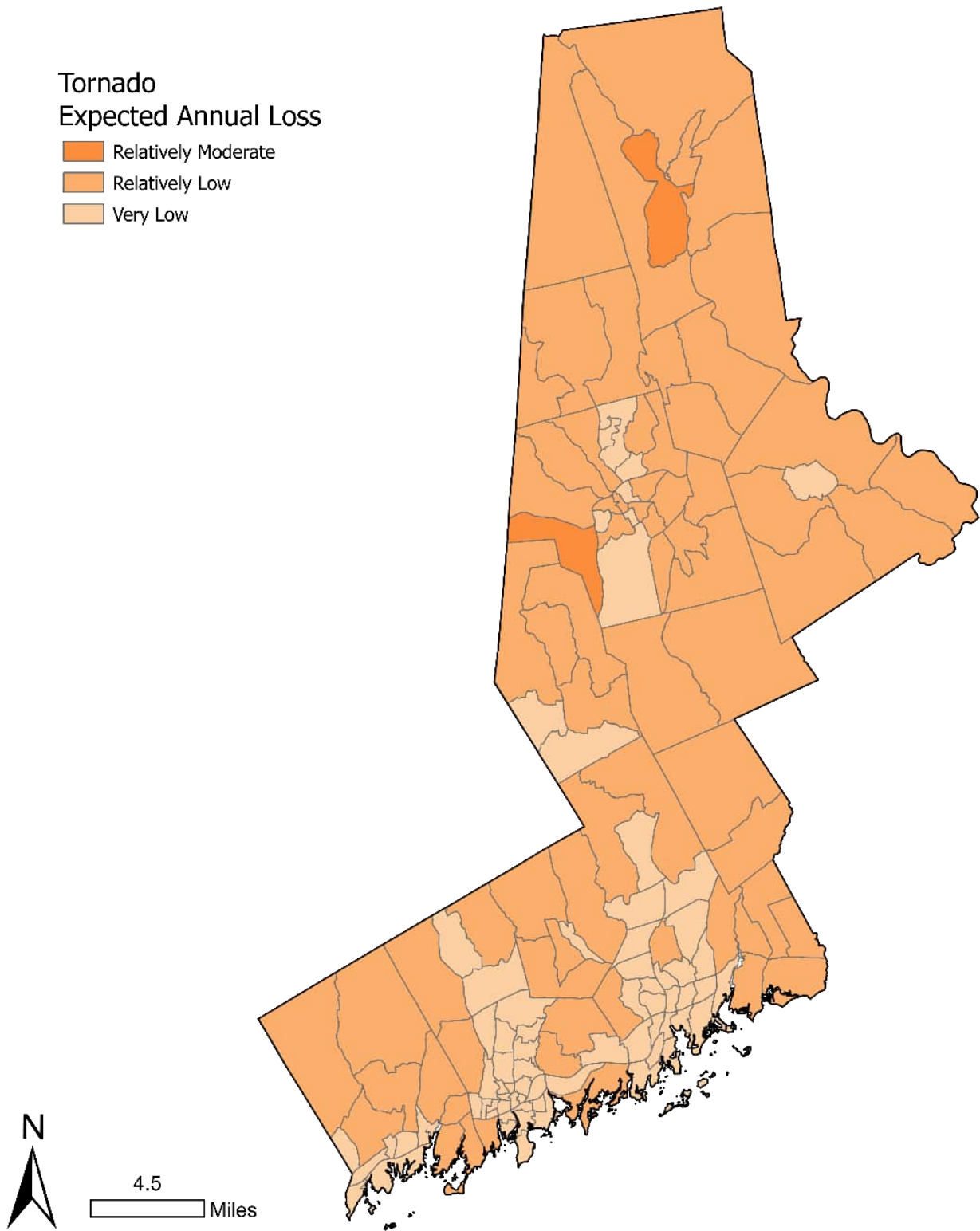


Figure 3-13: NRI Tornado Expected Annual Loss Rating

### 3.2.6 Thunderstorms

Thunderstorms are common in Connecticut, occurring on approximately 20 to 30 days each year. While many thunderstorms produce relatively little damage, stronger “supercell” thunderstorms can produce heavy winds, hail, significant damaging lightning strikes, and even tornadoes. Such storms have historically caused significant damage, injury, and even death through the destruction of trees; damage to buildings, vehicles, and power lines; and direct lightning strikes.

#### Location

All areas of the Region are susceptible to thunderstorms. The likelihood of damage, injury, and death increases dramatically when a supercell thunderstorm occurs in a populated area. While the heavy winds and tornadoes (see Section 3.3.5) associated with strong thunderstorms are more likely to cause measurable damage near populated areas, hail can cause damage in crops in rural areas as well as damage to vehicles and buildings in populated areas, and lightning can cause injuries or fires in any area.

#### Extent

The strength of a thunderstorm is typically measured in terms of its effects, namely the speed of the wind, the presence of significant lightning, and the size of hail. High winds are defined by the NWS as sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or gusts of 50 knots (58 mph) or greater for any duration (NCDC, 2018). A thunderstorm is classified as “severe” when it produces damaging wind gusts in excess of 58 mph (50 knots), hail that is 1 inch in diameter or larger (quarter size), or a tornado (NWS, 2013).

Scales to characterize individual hazards within thunderstorms, such as hail and lightning, are focused on communicating the threat to life and property.

- Past efforts to develop scales for classifying lightning risk have been focused on components of larger risk communication projects. For example, the Lightning Activity Level (LAL) was a tool that was developed in the 1960s in Montana to characterize lightning risk for use as an input into the National Fire Danger Rating System (NFDRS). The LAL had a range of values from 1 through 6: a value of 1 represented no lightning, values from 2 through 5 represented an increasing coverage of wet thunderstorms and corresponding increases in the frequency of lightning strikes, while 6 represented rare dry lightning events with a lightning frequency similar to a LAL of 3. The NWS currently supports public use of mapping lightning threats ranging from “non-threatening” to “extreme.” The scale is based on the likelihood that cloud-to-ground lightning (CG) from thunderstorms will occur, combined with the anticipated flash rate.
- The NWS currently supports public use of mapping hail threats ranging from “non-threatening” to “extreme.” The scale is based on the likelihood that severe hail will occur, combined with the anticipated size (diameter) of the biggest stones. Furthermore, for hail, NOAA provides a range from “bb” (<0.25 inch) to “softball” (4.5 inches), with common sizes ranging from pea to nickel-sized (0.25 inch to 0.875 inch).

**Table 3-41: Lightning and Hail Threat Level Criteria**

| Threat Level | Description (Threat Level to Life and Property)                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Lightning                                                                                                                                                                                                                                                                                                                                                       | Hail                                                                                                                                                                                                                                                                                                                                                                                    |
| Extreme      | <ul style="list-style-type: none"> <li>• Within 12 miles of a location, there is a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of excessive CG lightning.</li> <li>• And/or a high likelihood of CG lightning (or 60% to 70% thunderstorm probability), with storms capable of frequent CG lightning.</li> </ul> | <ul style="list-style-type: none"> <li>• Within 12 miles of a location, a moderate likelihood or greater (16% probability or greater) of severe hail, with storms capable of baseball to softball sized stones. See diameter description below.</li> <li>• And/or a high likelihood or greater (26% probability or greater) of severe hail, with storms capable of golf ball</li> </ul> |

| Threat Level    | Description (Threat Level to Life and Property)                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | Lightning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Hail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                 | <ul style="list-style-type: none"> <li>And/or a very high likelihood of CG lightning (or 80% to 90% thunderstorm probability), with storms capable of occasional CG lightning.</li> </ul>                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>to baseball sized hail stones. See diameter description below.</li> <li>And/or a very high likelihood (36% or greater) of severe hail, with storms capable of quarter to golf ball sized hail stones. See diameter description below.</li> </ul>                                                                                                                                                                                                                                                             |
| High            | <ul style="list-style-type: none"> <li>Within 12 miles of a location, there is a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of excessive CG lightning.</li> <li>And/or a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of frequent CG lightning.</li> <li>And/or a high likelihood of CG lightning (or 60% to 70% thunderstorm probability), with storms capable of occasional CG lightning.</li> </ul> | <ul style="list-style-type: none"> <li>Within 12 miles of a location, a low likelihood (6% to 15% probability) of severe hail, with storms capable of baseball to softball sized stones. See diameter description below.</li> <li>And/or a moderate likelihood (16% to 25% probability) of very large hail (golf ball to baseball sized hail stones). See diameter description below.</li> <li>And/or a high likelihood (26% to 35% probability) of large hail (quarter to golf ball sized hail stones). See diameter description below.</li> </ul> |
| Moderate        | <ul style="list-style-type: none"> <li>Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of excessive CG lightning.</li> <li>And/or a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of frequent CG lightning.</li> <li>And/or a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of occasional CG lightning.</li> </ul>      | <ul style="list-style-type: none"> <li>Within 12 miles of a location, a very low likelihood (2% to 5% probability) of severe hail, with storms capable of baseball to softball sized stones. See description below.</li> <li>And/or a low likelihood (6% to 15% probability) of severe hail, with storms capable of golf ball to baseball sized hail stones. See description below.</li> <li>And/or a moderate likelihood (16% to 25% probability) of severe hail, with storms capable of quarter to golf ball sized hail stones.</li> </ul>        |
| Low             | <ul style="list-style-type: none"> <li>Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of frequent CG lightning.</li> <li>And/or a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of occasional CG lightning.</li> </ul>                                                                                                                                              | <ul style="list-style-type: none"> <li>Within 12 miles of a location, a very low likelihood (2% to 5% probability) of severe hail, with storms capable of golf ball to baseball sized hail stones. See diameter description below.</li> <li>And/or a low likelihood (6% to 15% probability) of severe hail, with storms capable of quarter to golf ball sized hail stones.</li> </ul>                                                                                                                                                               |
| Very Low        | <ul style="list-style-type: none"> <li>Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of occasional CG lightning.</li> </ul>                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Within 12 miles of a location, a very low likelihood (2% to 5% probability) of severe hail, with storms capable of nickel to golf ball sized hail stones. See diameter description below.</li> <li>And/or a low likelihood or greater (6% or greater) of small hail (less than 1 inch).</li> </ul>                                                                                                                                                                                                           |
| Non-Threatening | <ul style="list-style-type: none"> <li>Within 12 miles of a location, environmental conditions do not support CG lightning.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>Within 12 miles of a location, environmental conditions do not support the occurrence of severe hail.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                             |
| Definitions     | <p>The flash rate definitions are:</p> <ul style="list-style-type: none"> <li>Occasional - CG lightning at the rate of 1 to 3 flashes per minute (about 5 to 15 flashes per 5 minutes) associated with a given lightning storm.</li> <li>Frequent - CG lightning at the rate of 4 to 11 flashes per minute (about 20 to 55 flashes per 5 minutes) associated with a given lightning storm.</li> </ul>                                                                                                  | <p>The size definitions are:</p> <ul style="list-style-type: none"> <li>Small Hail - Hail less than 1 inch in diameter (from the size of peas to nickels).</li> <li>Large Hail - Hail from 1 inch to 1 3/4 inch in diameter (from the size of quarters to golf balls) causing minor damage.</li> </ul>                                                                                                                                                                                                                                              |

| Threat Level | Description (Threat Level to Life and Property)                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                     |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Lightning                                                                                                                                                                                                                        | Hail                                                                                                                                                                                                                                                                                                                                |
|              | <ul style="list-style-type: none"> <li>Excessive - CG lightning rate of 12 flashes or more per minute (about 60 flashes or more per 5 minutes); and is nearly continuous and associated with a given lightning storm.</li> </ul> | <ul style="list-style-type: none"> <li>Very Large Hail - Hail from 1 3/4 inch to 2 3/4 inch in diameter (from the size of golf balls to baseballs) causing moderate damage.</li> <li>Giant Hail - Hail larger than 2 3/4 inch (larger than baseballs, such as the size of grapefruit or softballs) causing major damage.</li> </ul> |

### Downbursts

A downburst is a severe localized wind blasting down from a thunderstorm. They are more common than tornadoes in Connecticut. Depending on the size and location of downburst events, the destruction to property may be significant.

Downburst activity is, on occasion, mistaken for tornado activity. Both storms have very damaging winds (downburst wind speeds can exceed 165 miles per hour) and are very loud. These "straight line" winds are distinguishable from tornadic activity by the pattern of destruction and debris, such that the best way to determine the damage source is to fly over the area.

#### Downbursts fall into two categories:

**Microbursts** affect an area less than 2.5 miles in diameter, last five to 15 minutes, and can cause damaging winds up to 168 mph.

**Macrobursts** affect an area at least 2.5 miles in diameter, last five to 30 minutes, and can cause damaging winds up to 134 mph.

### Previous Occurrences

Previous occurrences of thunderstorm damage since 1993 are reported in the NCEI Storm Events database for the Region. Recent highlights of this damage are presented below:

- June 23, 2015: Multiple severe thunderstorms passed through southern Connecticut. Multiple trees were reported down in Ridgefield with several upon cars, resulting in \$25,000 in damage. Widespread tree damage was reported in Newtown.
- July 21, 2015: A line of showers and thunderstorms produced damaging winds in New Milford. A downed tree fell on a car on Still River Drive, injuring the two occupants and closing the road.
- July 18, 2016: A large tree was struck by lightning, bringing down large branches and power lines on Main Street in Westport.
- August 13, 2016: Severe weather impacted southern Connecticut. Numerous trees and wires were reported down throughout the town of Danbury. Numerous trees were reported down throughout Greenwich. A couple of trees were reported down across the town of Stamford. A large tree limb was reported down on a house on Witch Lane just southeast of Westport. A utility pole was reported down on Granite Drive between Wilton and Westport.
- July 13, 2017: Severe thunderstorms produced tree damage throughout Wilton. A tree was reported down along Mountain Road in northern Wilton, and a tree was reported down on a house on September Lane near Cannondale.
- August 2, 2017: Scattered strong to severe thunderstorms knocked down numerous trees and power lines, produced large hail, and caused isolated flash flooding in southern Litchfield County. Trees and wires were reported down in Bridgewater.

- May 15, 2018: A severe supercell thunderstorm caused hail up to two inches in diameter, two confirmed tornadoes, and straight-line wind damage. Numerous power outages and several road closures occurred as a result of the storms. A total of 20 residences in Bridgewater were damaged by falling trees, and one lane of Curtis Road was closed due to fallen wires. Brookfield was hit by a microburst with wind speeds up to 110 mph impacting an area approximately 2.5 miles wide and 5 miles long with significant tree damage reported. A dugout roof collapsed on the baseball field of Henry Abbott Technical High School in Danbury resulting in one serious injury. A man died when a tree fell on a truck in the Candlewood Lake area of Danbury. Numerous trees were damaged near the intersection of Route 37 and Route 39 in New Fairfield, and a tree fell on a car on Brush Hill Road resulting in one death. Several large trees were snapped or uprooted in New Milford, and shingles were torn off of New Milford High School. Numerous trees were reported down in Newtown and power lines were reported down at Gelding Hill Road. A tree fell on cars at the Trader Joe's on Route 1, and wires were reported down at Roseville Road in Westport.
- October 2, 2018: Severe thunderstorms resulted in hail and trees down in New Canaan on the Merritt Parkway near Exit 37. In Norwalk, a large tree fell on West Norwalk Road near Stony Lane, and another tree fell across West Norwalk Road at Ravenwood Road.
- August 3, 2019: Severe thunderstorms damaged trees and power lines throughout the region. Route 202 was closed in New Milford due to a tree down on wires. Wires were downed on Geiger Road in New Milford with people trapped in a car, and nearby Little and Big Bear Roads were also closed due to thunderstorm wind damage.
- August 8, 2019: Severe thunderstorms knocked down multiple trees and wires across the region. A downed tree along with downed tree limbs were reported at the lower boat launch in Squantz Pond State Park in New Fairfield. Fallen trees blocked the intersection at Maplewood Drive and Pleasant View Road, and at Dodd Road and Picket District Road in New Milford.
- December 24, 2020: A widespread high-wind event caused extensive tree failures, damaged utility infrastructure, and prolonged power outages across southwestern Connecticut. The event disrupted transportation, required significant public works response for debris removal and roadway clearing, and created widespread challenges for utility restoration.
- August 27, 2020: Severe thunderstorms caused widespread tree and utility damage throughout the region, including blocked roads, downed power lines, and localized power outages. Municipal staff were required to respond to transportation disruptions, debris management needs, and public safety concerns.
- September 1, 2021: Remnants of Hurricane Ida produced damaging winds that snapped large trees and disrupted neighborhoods across southwestern Connecticut. Impacts included fallen trees, blocked roadways, utility interruptions, and emergency response needs following the storm.
- December 23, 2022: A high-wind event caused widespread downed trees and utility wires across northern Fairfield County, affecting communities including Wilton, Brookfield, and Newtown. The storm disrupted travel, caused power outages, and required municipal coordination for roadway clearance and restoration efforts.
- August 12, 2023: Severe thunderstorms caused widespread tree and wire damage across several WestCOG communities, resulting in power outages, roadway blockages, and property impacts. Municipal response included debris removal, public safety activities, and coordination with utilities.

- December 18, 2023: Strong winds caused scattered but significant tree failures, power outages, and transportation disruptions throughout southwestern Connecticut. Impacts required municipal response related to downed trees, blocked roads, and restoration of public services.
- June 23, 2024: Damaging thunderstorms produced widespread tree and wire damage across multiple communities, resulting in road closures and utility outages. The event created significant disruptions for residents and required coordinated response from municipal departments and utility providers.
- August 3, 2024: Severe thunderstorms caused numerous downed trees and power lines, resulting in significant local damage and service interruptions. Impacts included blocked roadways, damaged infrastructure, and the need for cleanup and emergency response activities.
- August 9, 2024: Strong winds associated with the remnants of Tropical Storm Debby brought down utility wires and caused scattered power outages across the region. Municipal impacts included roadway hazards, utility coordination, and response to storm-related disruptions.
- July 25, 2025: Severe thunderstorms caused numerous trees to fall onto power lines and roadways, blocking travel routes and resulting in utility outages. The event required emergency response, debris removal, and restoration efforts by municipal staff and utility providers.

### Probability of Future Events

According to NOAA's NWS, there is an average of 100,000 thunderstorms per year in the United States. Thunderstorms typically occur on approximately 25 days each year in Connecticut, according to NOAA. According to the 2023 CT NHMP, western Connecticut has historically experienced the greatest number of thunderstorm events; the annualized number of events is 9.1 in Fairfield County and 11.4 in Litchfield County.

NOAA reports that there are 10 downburst reports for every tornado report in the United States. This implies that there are approximately 10,000 downbursts reported in the United States each year and further implies that downbursts occur in approximately 10% of all thunderstorms in the United States annually. This figure suggests that downbursts are a relatively uncommon yet persistent hazard. Finally, hailstorms typically occur in at least one part of Connecticut each year, often during severe thunderstorms.

The 2023 CT NHMP reports that climate change projections show that major clusters of summertime thunderstorms in North America will grow larger, more intense, and more frequent later this century in a changing climate, unleashing far more rain and posing a greater threat of flooding across wide areas. By the end of the century, the number of summertime storms that produce extreme downpours could increase by more than 400% across parts of the United States. In addition, the intensity of individual extreme rainfall events could increase by as much as 70% in some areas. Climate modeling also suggests that the eastern United States will see a greater increase in days favorable to severe thunderstorm formation than the western part of the country.

Overall, the State plan projects that the intensity of individual thunderstorms will increase, with more severe lightning, hail, and potential tornadoes. At the same time, days favorable to severe thunderstorm formation will increase in the Eastern United States, which may cause more frequent thunderstorms.

### Impacts to Community Assets,

All areas of the Region are susceptible to thunderstorms. Fortunately, in Connecticut, injury and death due to thunderstorm winds are relatively uncommon. Although thunderstorm damage is expected each year, the majority of events do not cause

measurable damage. Most thunderstorm damage is associated with downbursts, which typically have a greater effect on elevated areas such as hilltops, ridges, and “wind corridors” within communities. Areas with more trees in close proximity to power lines and structures are more vulnerable to the effects of thunderstorm damage than more urban areas.

While crops are the primary victims of hail, larger hail also poses a hazard to people, vehicles, and property. Lightning strikes are relatively infrequent in Connecticut but can cause permanent damage or death to a person, along with starting fires. Lightning can also occur on any day, even if a thunderstorm is not occurring. In general, the economic impact of thunderstorms is much lower than that of tropical cyclones, but it is still significant because the damage is expected to occur annually.

#### Affected Population

The entire population of the Region is anticipated to experience the effects of thunderstorms each year. Damaging impacts are typically confined to smaller areas by lightning strikes and downbursts. However, an entire community can be affected by impacts from hail, heavy rain, and strong winds, and indirect impacts may also be felt by the entire community if roads or utilities are damaged.

#### Loss Estimates from the NCEI

Historical loss data for thunderstorms was extracted from the NCEI Storm Events Database. Table 3-42 below presents the number of thunderstorm events, the number of deaths and injuries, and total property loss values (in 2026 dollar equivalents) impacting each WestCOG municipality between 2015 and 2025. Annualized loss estimates for thunderstorm damage is calculated by dividing the total property loss figures by the 10-year reporting period.

**Table 3-42: Annualized Thunderstorm Loss Estimates from NCEI**

| Municipality   | Event Count* | Death    | Injury    | Property Loss (2026\$) | Annualized Loss  |
|----------------|--------------|----------|-----------|------------------------|------------------|
| Bethel         | 4            | 0        | 0         | \$80,900               | \$8,090          |
| Bridgewater    | 3            | 0        | 0         | \$183,480              | \$18,348         |
| Brookfield     | 11           | 0        | 0         | \$80,900               | \$8,090          |
| Danbury        | 27           | 1        | 2         | \$265,800              | \$26,580         |
| Darien         | 3            | 0        | 0         | \$5,160                | \$516            |
| Greenwich      | 22           | 1        | 2         | \$845,310              | \$84,531         |
| New Canaan     | 11           | 1        | 2         | \$317,240              | \$31,724         |
| New Fairfield  | 9            | 1        | 0         | \$300,160              | \$30,016         |
| New Milford    | 7            | 0        | 2         | \$277,200              | \$27,720         |
| Newtown        | 14           | 0        | 0         | \$335,695              | \$33,570         |
| Norwalk        | 18           | 0        | 0         | \$263,790              | \$26,379         |
| Redding        | 3            | 0        | 0         | \$269,090              | \$26,909         |
| Ridgefield     | 11           | 0        | 0         | \$280,370              | \$28,037         |
| Sherman        | 2            | 0        | 0         | \$13,560               | \$1,356          |
| Stamford       | 26           | 1        | 2         | \$1,048,130            | \$104,813        |
| Weston         | 6            | 0        | 0         | \$25,070               | \$2,507          |
| Westport       | 15           | 0        | 1         | \$75,880               | \$7,588          |
| Wilton         | 12           | 0        | 0         | \$44,555               | \$4,456          |
| <b>WestCOG</b> | <b>204</b>   | <b>5</b> | <b>11</b> | <b>\$4,712,290</b>     | <b>\$471,229</b> |

Source: NOAA NCEI

*\*Note: municipal event counts and WestCOG totals may reflect events that affected multiple municipalities but are counted as individual events within each affected municipality. The*

*total number of events in WestCOG, as shown in the table, may therefore be larger than the true number of events that impacted the region.*

Table 3-43 presents regional thunderstorm impacts between 2015 and 2025 by thunderstorm component, including lightning, strong wind, thunderstorm wind, high wind, and hail.

**Table 3-43: Annualized Thunderstorm Loss Estimates by Storm Component from NCEI**

| Storm Component         | Event Count* | Death    | Injury    | Property Loss (2026\$) | Annualized Loss  |
|-------------------------|--------------|----------|-----------|------------------------|------------------|
| Lightning               | 6            | 0        | 0         | \$34,020               | \$3,402          |
| Strong Wind             | 17           | 0        | 0         | \$1,057,900            | \$105,790        |
| Thunderstorm Wind       | 138          | 2        | 5         | \$1,173,150            | \$117,315        |
| High Wind               | 40           | 3        | 6         | \$2,529,000            | \$252,900        |
| Hail                    | 5            | 0        | 0         | \$0                    | \$0              |
| <b>All Thunderstorm</b> | <b>206</b>   | <b>5</b> | <b>11</b> | <b>\$4,794,070</b>     | <b>\$479,407</b> |

Source: NOAA NCEI

*\*Note: total event counts may differ between Table 3-42 and Table 3-43 because the municipal event counts in Table 3-42 may reflect events that affected multiple municipalities but are counted as individual events within each affected municipality.*

### National Risk Index

The FEMA NRI does not include a distinct “Thunderstorm” category; instead, it evaluates risks from thunderstorm associated hazards such as lightning, hail, and strong winds. NRI results for those hazards are presented below.

#### Lightning

FEMA’s NRI was utilized to obtain information for a risk analysis on lightning at the census tract level across WestCOG. Figure 3-14 displays the risk rating by census tract in the WestCOG region for lightning.

Lightning risk in the WestCOG region ranges from very low to relatively high. The two census tracts at a relatively high risk to lightning are in the cities of Danbury and Norwalk. Table 3-44 shows a breakdown of community risk in WestCOG by census tract.

**Table 3-44: Community risk ratings for lightning, breakdown by census tracts**

| Community     | Total Census Tracts | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk | Number of Census Tracts with Relatively Moderate Risk | Number of Census Tracts with Relatively High Risk |
|---------------|---------------------|--------------------------------------------|--------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|
| Bethel        | 4                   | -                                          | 1                                                | 3                                                     | -                                                 |
| Bridgewater   | 1                   | -                                          | 1                                                | -                                                     | -                                                 |
| Brookfield    | 3                   | -                                          | 1                                                | 2                                                     | -                                                 |
| Danbury       | 20                  | 1                                          | 4                                                | 14                                                    | 1                                                 |
| Darien        | 5                   | -                                          | 4                                                | 1                                                     | -                                                 |
| Greenwich     | 15                  | -                                          | 7                                                | 8                                                     | -                                                 |
| New Canaan    | 5                   | -                                          | 3                                                | 2                                                     | -                                                 |
| New Fairfield | 3                   | -                                          | 3                                                | -                                                     | -                                                 |
| New Milford   | 5                   | -                                          | -                                                | 5                                                     | -                                                 |
| Newtown       | 6                   | -                                          | 4                                                | 2                                                     | -                                                 |
| Norwalk       | 22                  | -                                          | 8                                                | 13                                                    | 1                                                 |
| Redding       | 2                   | -                                          | 1                                                | 1                                                     | -                                                 |

| Community      | Total Census Tracts | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk | Number of Census Tracts with Relatively Moderate Risk | Number of Census Tracts with Relatively High Risk |
|----------------|---------------------|--------------------------------------------|--------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|
| Ridgefield     | 6                   | -                                          | 3                                                | 3                                                     | -                                                 |
| Sherman        | 1                   | -                                          | 1                                                | -                                                     | -                                                 |
| Stamford       | 33                  | -                                          | 8                                                | 25                                                    | -                                                 |
| Weston         | 2                   | -                                          | 2                                                | -                                                     | -                                                 |
| Westport       | 7                   | -                                          | 7                                                | -                                                     | -                                                 |
| Wilton         | 5                   | -                                          | 4                                                | 1                                                     | -                                                 |
| <b>WestCOG</b> | <b>145</b>          | <b>1</b>                                   | <b>62</b>                                        | <b>80</b>                                             | <b>2</b>                                          |

Figure 3-15 shows the expected annual loss ratings throughout the Region based on the NRI for lightning.

Table 3-45 describes the projected annualized losses from lightning by community. The highest expected annual loss due to lightning is within the cities of Stamford, Norwalk, and Danbury, all of which have over \$100,000 in expected annual loss. The WestCOG region has a total expected annual loss of \$877,046.

**Table 3-45: Breakdown of NRI expected annual losses from lightning by community**

| Community      | Expected Annual Loss |
|----------------|----------------------|
| Bethel         | \$26,824             |
| Bridgewater    | \$2,418              |
| Brookfield     | \$24,244             |
| Danbury        | \$116,572            |
| Darien         | \$30,163             |
| Greenwich      | \$92,297             |
| New Canaan     | \$31,339             |
| New Fairfield  | \$18,181             |
| New Milford    | \$43,980             |
| Newtown        | \$34,730             |
| Norwalk        | \$125,120            |
| Redding        | \$11,455             |
| Ridgefield     | \$37,230             |
| Sherman        | \$4,845              |
| Stamford       | \$204,162            |
| Weston         | \$12,579             |
| Westport       | \$34,244             |
| Wilton         | \$26,663             |
| <b>WestCOG</b> | <b>\$877,046</b>     |

#### Hail

FEMA's NRI was utilized to obtain information for a risk analysis on hail at the census tract level across WestCOG. Figure 3-16 displays the risk rating by census tract in the WestCOG region for hail.

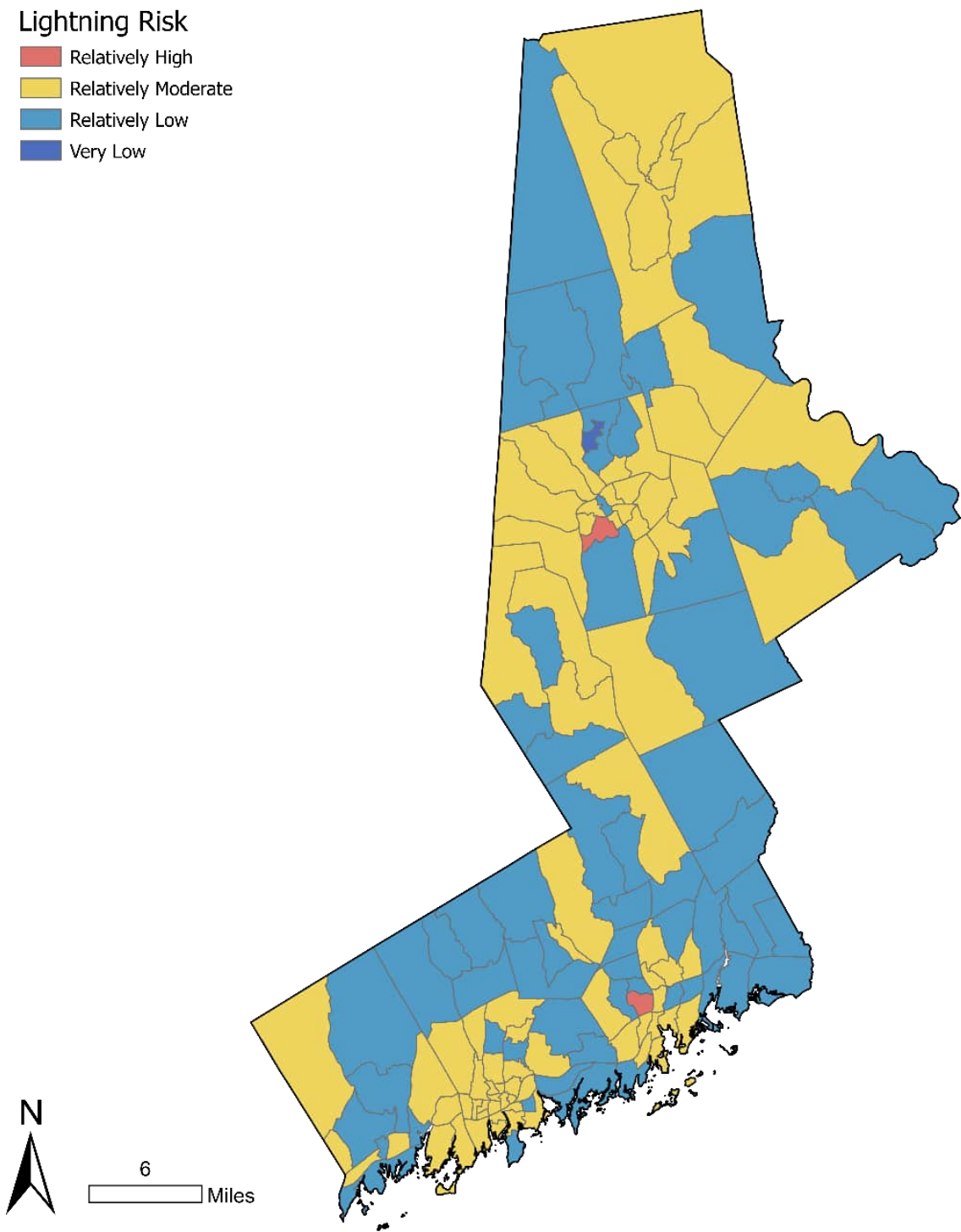


Figure 3-14: Risk Rating for Lightning, shown at the census tract level

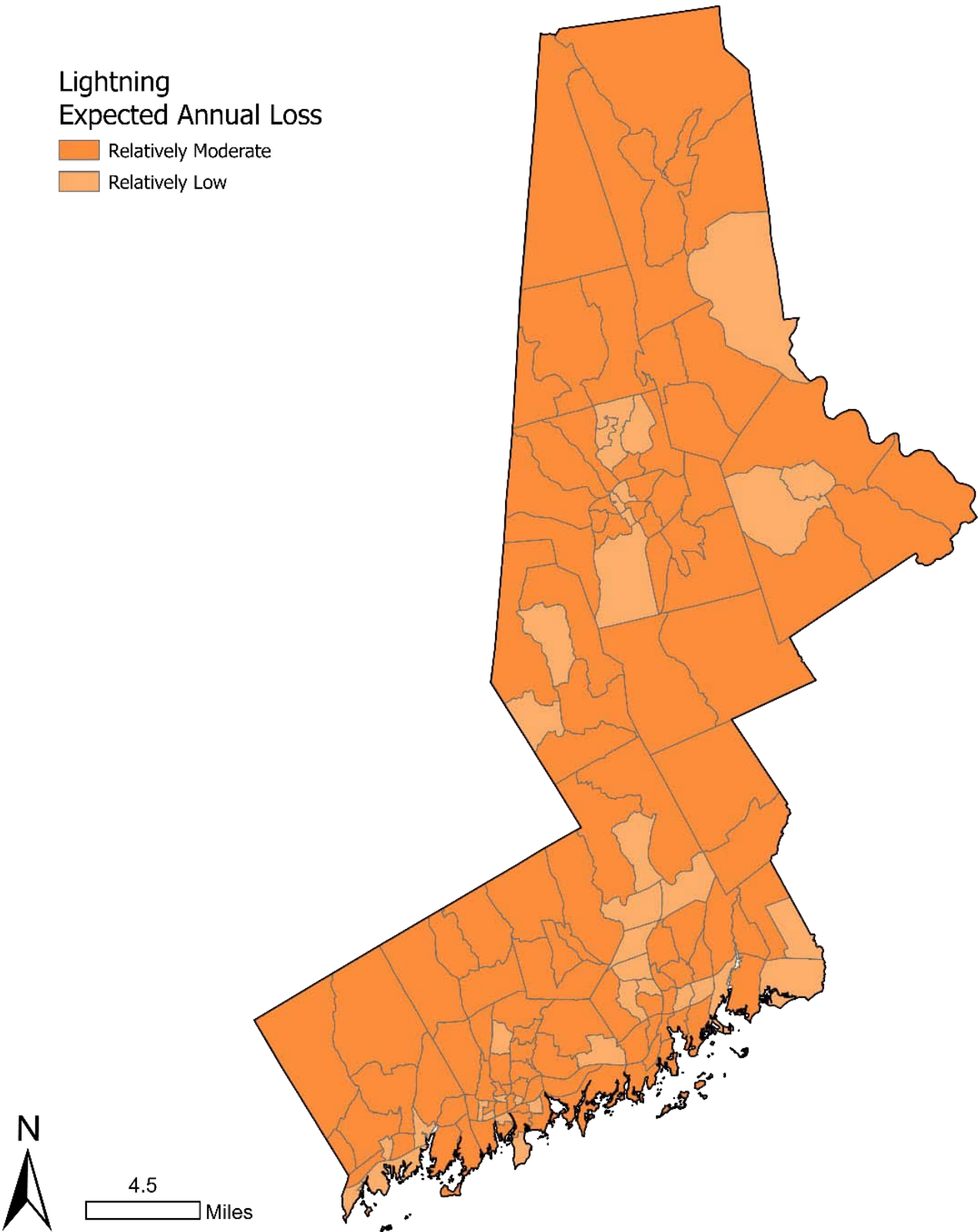


Figure 3-15: NRI Lightning Expected Annual Loss Rating

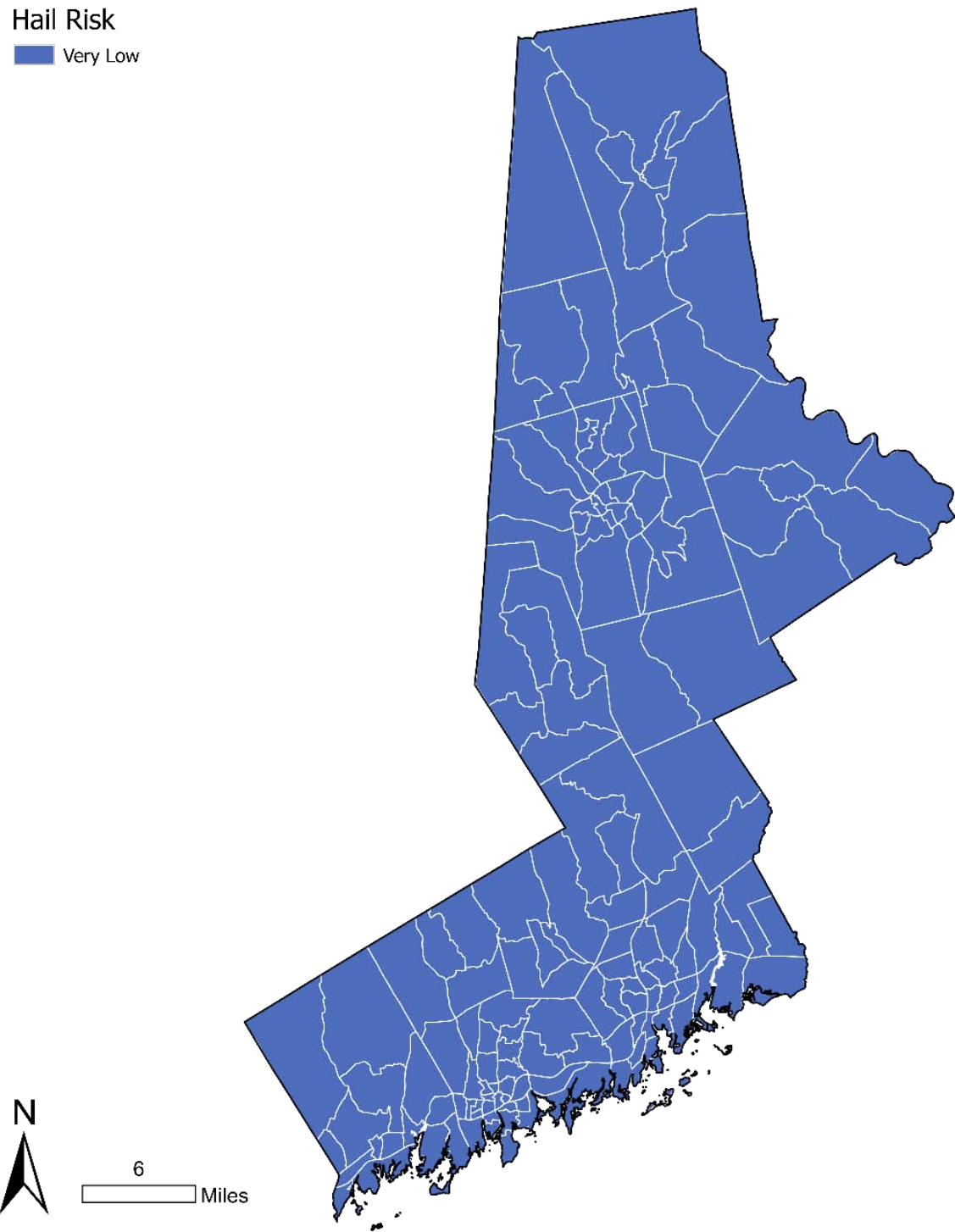


Figure 3-16: Risk Rating for hail shown at the census tract level

Hail risk in the WestCOG region is very low with no variation by census tract within the COG. Table 3-46 shows a breakdown of community risk in WestCOG by census tract.

**Table 3-46: Community risk ratings for hail, breakdown by census tracts**

| Community      | Total Census Tracts | Number of Census Tracts with Very Low Risk |
|----------------|---------------------|--------------------------------------------|
| Bethel         | 4                   | 4                                          |
| Bridgewater    | 1                   | 1                                          |
| Brookfield     | 3                   | 3                                          |
| Danbury        | 20                  | 20                                         |
| Darien         | 5                   | 5                                          |
| Greenwich      | 15                  | 15                                         |
| New Canaan     | 5                   | 5                                          |
| New Fairfield  | 3                   | 3                                          |
| New Milford    | 5                   | 5                                          |
| Newtown        | 6                   | 6                                          |
| Norwalk        | 22                  | 22                                         |
| Redding        | 2                   | 2                                          |
| Ridgefield     | 6                   | 6                                          |
| Sherman        | 1                   | 1                                          |
| Stamford       | 33                  | 33                                         |
| Weston         | 2                   | 2                                          |
| Westport       | 7                   | 7                                          |
| Wilton         | 5                   | 5                                          |
| <b>WestCOG</b> | <b>145</b>          | <b>145</b>                                 |

Figure 3-17 shows the expected annual loss ratings throughout the COG based on the NRI for hail.

Table 3-47 describes the projected annualized losses from hail by community. The highest expected annual loss due to hail is within the cities of Stamford and Danbury, both of which have over \$2,000 in expected annual loss. The WestCOG region has a total expected annual loss of \$13,787.

**Table 3-47: Breakdown of NRI expected annual losses from hail by community**

| Community     | Expected Annual Loss | Community      | Expected Annual Loss |
|---------------|----------------------|----------------|----------------------|
| Bethel        | \$499                | Newtown        | \$614                |
| Bridgewater   | \$224                | Norwalk        | \$1,500              |
| Brookfield    | \$434                | Redding        | \$202                |
| Danbury       | \$2,106              | Ridgefield     | \$539                |
| Darien        | \$429                | Sherman        | \$91                 |
| Greenwich     | \$1,278              | Stamford       | \$2,646              |
| New Canaan    | \$416                | Weston         | \$175                |
| New Fairfield | \$331                | Westport       | \$450                |
| New Milford   | \$1,497              | Wilton         | \$356                |
| --            | --                   | <b>WestCOG</b> | <b>\$13,787</b>      |

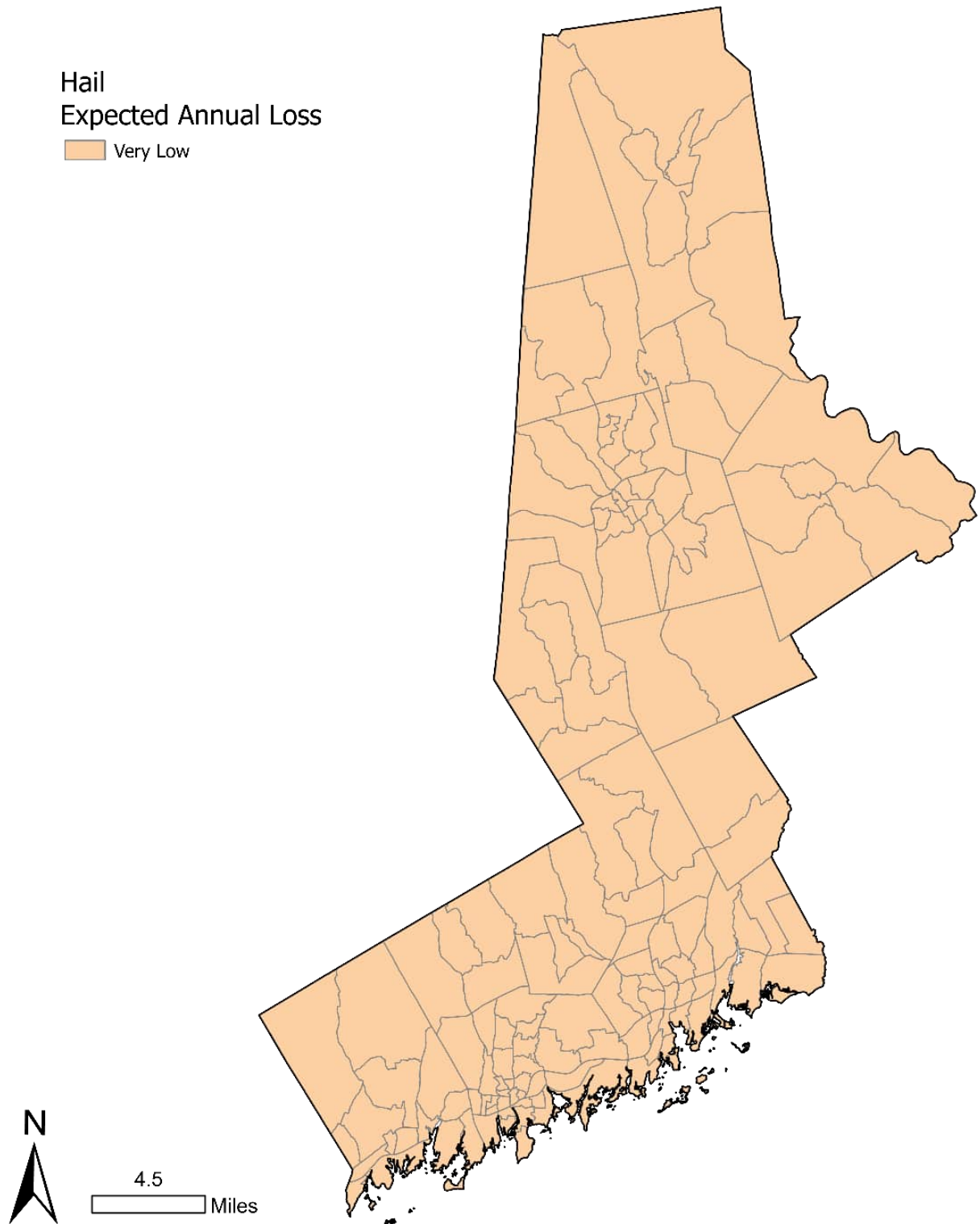


Figure 3-17: NRI Hail Expected Annual Loss Rating

### Strong Wind

FEMA's NRI was utilized to obtain information for a risk analysis on strong wind at the census tract level across WestCOG. Figure 3-18 displays the risk rating by census tract in the WestCOG region for strong wind. Strong wind risk in the WestCOG region ranges from relatively low to relatively high. Table 3-48 shows a breakdown of community risk in WestCOG by census tract.

**Table 3-48: Community risk ratings for strong wind, breakdown by census tracts**

| Community      | Total Census Tracts | Number of Census Tracts with Relatively Low Risk | Number of Census Tracts with Relatively Moderate Risk | Number of Census Tracts with Relatively High Risk |
|----------------|---------------------|--------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|
| Bethel         | 4                   | -                                                | 3                                                     | 1                                                 |
| Bridgewater    | 1                   | 1                                                | -                                                     | -                                                 |
| Brookfield     | 3                   | -                                                | 2                                                     | 1                                                 |
| Danbury        | 20                  | 1                                                | 13                                                    | 6                                                 |
| Darien         | 5                   | -                                                | 5                                                     | -                                                 |
| Greenwich      | 15                  | 1                                                | 11                                                    | 3                                                 |
| New Canaan     | 5                   | -                                                | 5                                                     | -                                                 |
| New Fairfield  | 3                   | -                                                | 3                                                     | -                                                 |
| New Milford    | 5                   | -                                                | 5                                                     | -                                                 |
| Newtown        | 6                   | 1                                                | 5                                                     | -                                                 |
| Norwalk        | 22                  | 1                                                | 16                                                    | 5                                                 |
| Redding        | 2                   | -                                                | 2                                                     | -                                                 |
| Ridgefield     | 6                   | 1                                                | 5                                                     | -                                                 |
| Sherman        | 1                   | -                                                | 1                                                     | -                                                 |
| Stamford       | 33                  | -                                                | 24                                                    | 9                                                 |
| Weston         | 2                   | -                                                | 2                                                     | -                                                 |
| Westport       | 7                   | -                                                | 7                                                     | -                                                 |
| Wilton         | 5                   | -                                                | 5                                                     | -                                                 |
| <b>WestCOG</b> | <b>145</b>          | <b>6</b>                                         | <b>111</b>                                            | <b>24</b>                                         |

Figure 3-19 shows the expected annual loss ratings throughout the COG based on the NRI for strong wind.

Table 3-49 describes the projected annualized losses from strong winds by community. The highest expected annual loss due to strong winds is within the City of Stamford, with over \$1 million in expected annual loss. The WestCOG region has a total expected annual loss of approximately \$4.47 million.

**Table 3-49: Breakdown of NRI expected annual losses from strong wind by community**

| Community     | Expected Annual Loss | Community      | Expected Annual Loss |
|---------------|----------------------|----------------|----------------------|
| Bethel        | \$137,602            | Newtown        | \$165,712            |
| Bridgewater   | \$11,231             | Norwalk        | \$603,989            |
| Brookfield    | \$120,917            | Redding        | \$63,371             |
| Danbury       | \$577,443            | Ridgefield     | \$190,740            |
| Darien        | \$175,233            | Sherman        | \$25,029             |
| Greenwich     | \$522,457            | Stamford       | \$1,019,731          |
| New Canaan    | \$171,520            | Weston         | \$74,988             |
| New Fairfield | \$90,293             | Westport       | \$196,370            |
| New Milford   | \$175,113            | Wilton         | \$146,629            |
| --            | --                   | <b>WestCOG</b> | <b>\$4,468,368</b>   |

### Strong Wind Risk

- Relatively High
- Relatively Moderate
- Relatively Low

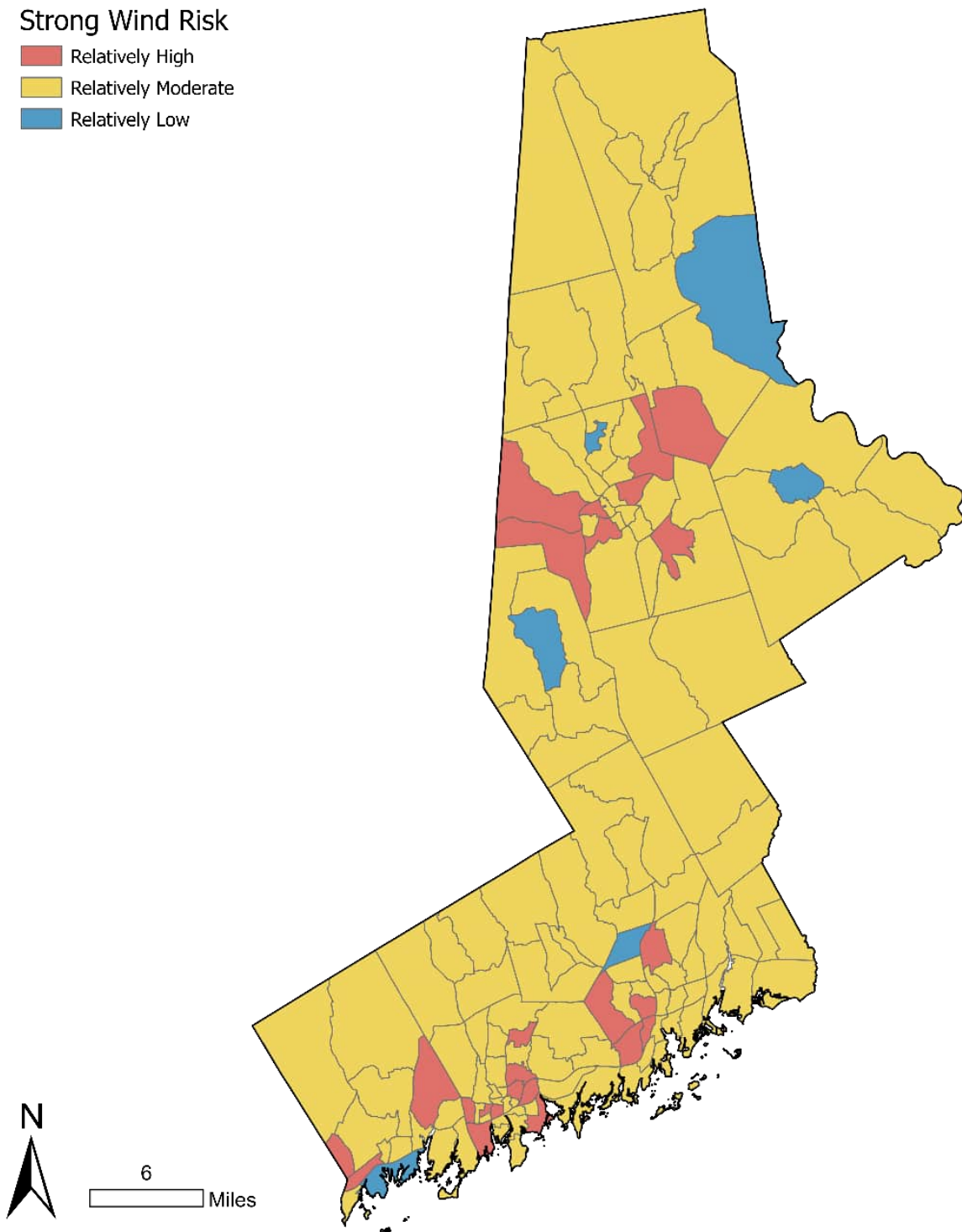


**Figure 3-18: Risk Rating for strong wind shown at the census tract level**

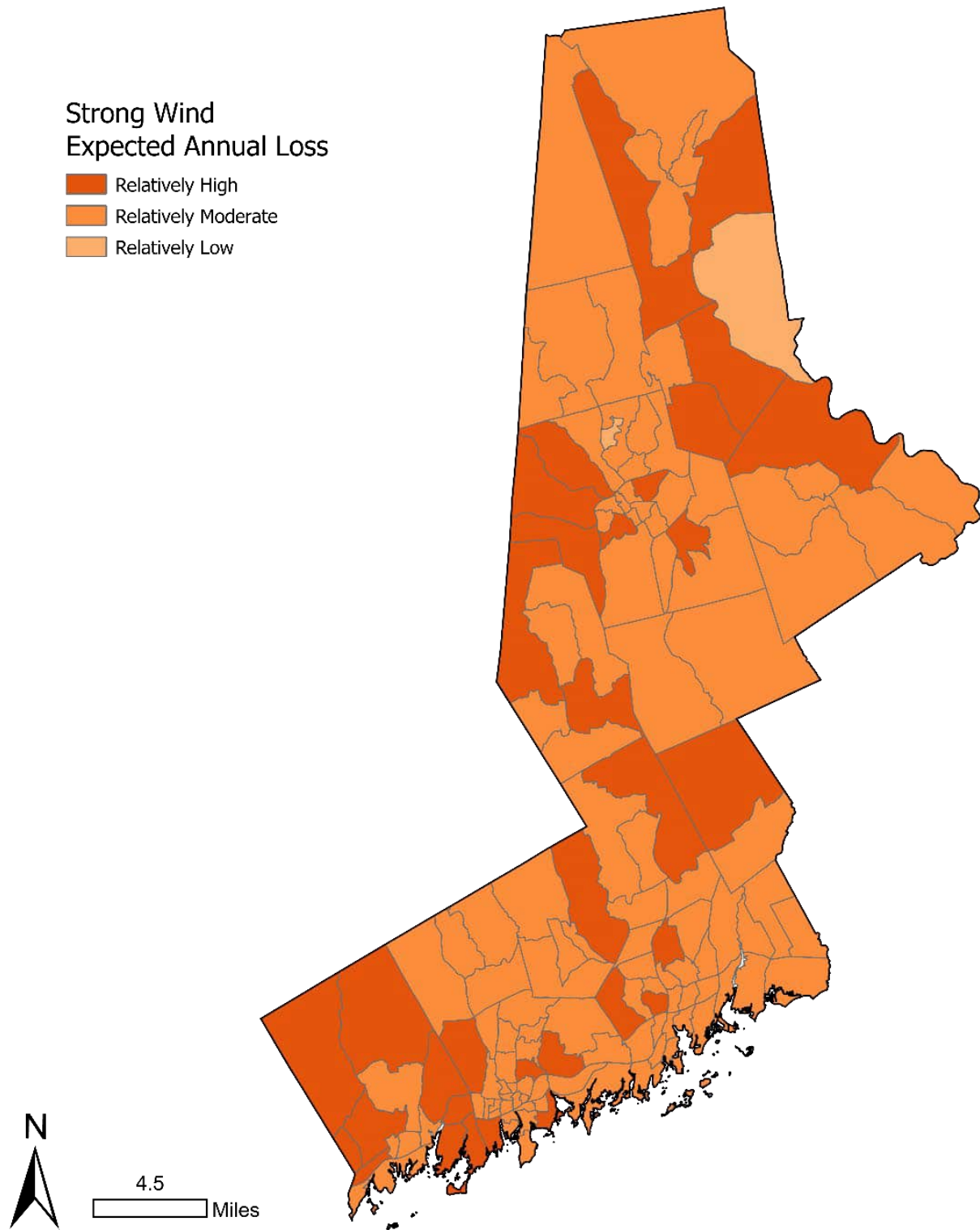


Figure 3-19: NRI Strong Wind Expected Annual Loss Rating

### 3.2.7 Forest and Wildland Fires

Wildfires are a relatively common occurrence in Connecticut but are typically small and cause little to no damage to populated areas. Structural fires in higher-density areas of the region are not considered herein.

#### Location

Wildfires typically occur in undeveloped rural forested areas, although smaller fires can also occur along highway medians. Wildfire damage is typically greatest at the wildland interface, where low-density suburban/rural developed areas border undeveloped wooded and shrubby areas. These are defined as areas with one structure per 40 acres with extensive vegetation. Wildfires are of particular concern for areas with limited firefighting access, such as outlying areas without public water service and large contiguous forest parcels with limited access. All areas of the Region are susceptible to lightning strikes, and all WestCOG municipalities have areas where fires may be set due to arson or may occur when campfires or open burning get out of control. Unlike the other hazards described in this Plan, the likelihood of damage due to wildfires typically decreases with increasing population density, meaning that less developed communities such as Bridgewater have a greater risk than heavily developed communities such as Stamford.

#### Extent

Wildfires are any non-structure fire, other than a prescribed burn, that occurs in undeveloped areas. They are considered to be highly destructive, uncontrollable fires. Although the term brings to mind images of tall trees engulfed in flames, wildfires can occur as brush and shrub fires, especially under dry conditions. Wildfires are also known as "wildland fires."

According to the National Fire Protection Agency, several elements (known as the fire tetrahedron) must be present in order to have any type of fire:

- **Fuel:** Without fuel, a fire will stop. Fuel can be removed naturally (when the fire has consumed all burnable fuel) or manually by mechanically or chemically removing fuel from the fire. In structure fires, removal of fuel is not typically a viable method of fire suppression. Fuel separation is important in wildfire suppression and is the basis for controlling prescribed burns and suppressing other wildfires. The type of fuel present in an area can help determine overall susceptibility to wildfires. According to the Forest Encyclopedia Network, four types of fuel are present in wildfires:
  - Ground Fuels, consisting of organic soils, forest floor duff, stumps, dead roots, and buried fuels
  - Surface Fuels, consisting of the litter layer, downed woody materials, and dead and live plants to two meters in height
  - Ladder Fuels, consisting of vine and draped foliage fuels
  - Canopy Fuels, consisting of tree crowns
- **Heat:** Without sufficient heat, a fire cannot begin or continue. Heat can be removed through the application of a substance, such as water, powder, or certain gases, which reduces the amount of heat available to the fire. Scraping embers from a burning structure also removes the heat source.
- **Oxygen:** Without oxygen, a fire cannot begin or continue. In most wildland fires, this is commonly the most abundant element of the fire tetrahedron and is therefore not a major factor in suppressing wildfires.

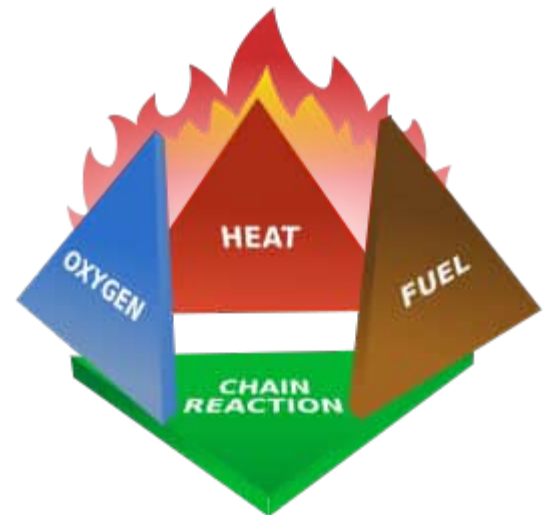


**Figure 3-20: The Fire Tetrahedron**

Image Provided Wikimedia Commons

- **Uninhibited Chain Reaction:** The chain reaction is the feedback of heat to the fuel to produce the gaseous fuel used in the flame. In other words, the chain reaction provides the sustained heat necessary to maintain the fire. Fire suppression techniques, such as dry chemical extinguishers, break up the uninhibited chain reaction of combustion to stop a fire.

The Connecticut DEEP Division of Forestry issues forest fire danger ratings. The ratings are low, moderate, high, very high, and extreme. These are based on an index of how quickly a fire is likely to spread and measures of drought. In addition, the NWS issues "Red Flag" warnings. A Red Flag warning means that if a fire occurs, firefighters can expect it to behave erratically due to weather conditions. Open burning is typically not allowed during Red Flag warnings.

### Previous Occurrences

According to the Connecticut DEEP Forestry Division, much of Connecticut was deforested by settlers and turned into farmland during the colonial period. A variety of factors in the 19th century caused the decline of farming in the state, and forests reclaimed abandoned farm fields. In the early 20th century, deforestation again occurred in Connecticut, this time for raw materials used to ship goods worldwide. Following this deforestation, shipping industries in Connecticut began to look to other states for raw materials, and the deciduous forests of today began to grow in the State.

During the early 20th century, wildfires regularly burned throughout Connecticut. Many of these fires began accidentally by sparks from railroads and industry, while others were deliberately set to clear underbrush in the forest and provide pasture for livestock. A total of 15,000 to 100,000 acres of land was burned annually during this period. This destruction of resources led to the creation of the State Forest Fire Warden position and to a variety of improved coordination measures described in Section 4.2.6.

In the last 20 years, a handful of wildfires have occurred in the Region. Statewide droughts in 1999 and 1995 resulted in fires in the region and in other locations in the state. In 2012, 577 separate fire events occurred throughout Connecticut. Recent large wildfires in Connecticut include:

- The 2016 drought exacerbated wildfire formation, with over 900 acres burned statewide. A 10-acre fire burned for 3 days in Lovers Leap State Park in New Milford in July. A month-long forest fire smoldered across more than 350 acres in a remote section Cornwall that is the Wyantenock State Forest in September and October. Approximately 100 acres were deliberately set aflame as a "backburn" to manage the blaze. Due to the drought, soil conditions were very dry and the fire burned underground, resurfacing several times.
- In eastern Connecticut, a drought in the summer of 2020 caused a September wildfire that burned 94 acres in the Natchaug State Forest. The North Windham Elementary school needed to close due to smoke concerns.

Throughout Connecticut, 1999 was a particularly busy fire year because of drought conditions. The state's 2023 NHMP notes that a recent large wildland fire in Connecticut occurred in September 2016, burning 384 acres, while in 2020 Connecticut experienced 603 separate wildland fire events.

### Probability of Future Events

Nationwide, humans have caused approximately 90% of all wildfires in the last decade. Accidental and negligent acts include unattended campfires, sparks, burning debris, children playing with matches, and irresponsibly discarded cigarettes. The remaining 10% of fires are caused primarily by lightning.

Connecticut experiences three distinct fire seasons: from mid-March to mid-May, prior to leaf-out, when fuels such as grasses, dead leaves, branches, and twigs on the forest floor are dried out by the sun; from mid-May to mid-September,

depending on precipitation; and from October until the first snowfall, when dead leaves collect on the forest floor. Differences in available fuel and conditions lend different characteristics to fires in different seasons: spring and fall fires tend to spread quickly, burning through readily available fuels on the surface of the forest floor and causing little long-term damage; summer fires burn deeper into the ground and tend to spread less quickly and be more difficult to suppress; they are the most destructive to vegetation.

Wildfire risk in the region is believed to be roughly the same as in the rest of the state. According to the USDA Forest Service Annual Wildfire Summary Report for 1994 through 2003, an average of 600 acres per year in Connecticut was burned by wildfires. The National Interagency Fire Center (NIFC) reports that a total of 7,098 acres of land burned in Connecticut from 2002 through 2025 due to 4,926 wildfires, an average of 1.4 acres per fire and 296 acres per year (Table 3-50).

**Table 3-50: Wildland Fire Statistics for Connecticut**

| Year         | Number of Wildland Fires | Acres Burned | Average Acres Per Fire |
|--------------|--------------------------|--------------|------------------------|
| 2025         | 256                      | 548          | 2.1                    |
| 2024         | 356                      | 339          | 1.0                    |
| 2023         | 499                      | 297          | 0.6                    |
| 2022         | 150                      | 347          | 2.3                    |
| 2021         | 60                       | 127          | 2.1                    |
| 2020         | 586                      | 383          | 0.7                    |
| 2019         | 88                       | 72           | 0.8                    |
| 2018         | 52                       | 50           | 1.0                    |
| 2017         | 97                       | 243          | 2.5                    |
| 2016         | 268                      | 778          | 2.9                    |
| 2015         | 76                       | 159          | 2.1                    |
| 2014         | 28                       | 69           | 2.5                    |
| 2013         | 76                       | 238          | 3.1                    |
| 2012         | 180                      | 417          | 2.3                    |
| 2011         | 196                      | 244          | 1.2                    |
| 2010         | 93                       | 262          | 2.8                    |
| 2009         | 264                      | 246          | 0.9                    |
| 2008         | 330                      | 893          | 2.7                    |
| 2007         | 361                      | 288          | 0.8                    |
| 2006         | 322                      | 419          | 1.3                    |
| 2005         | 316                      | 263          | 0.8                    |
| 2004         | 74                       | 94           | 1.3                    |
| 2003         | 97                       | 138          | 1.4                    |
| 2002         | 101                      | 184          | 1.8                    |
| <b>Total</b> | <b>4,926</b>             | <b>7,098</b> | <b>1.4</b>             |

Source: National Interagency Fire Center

The 2023 CT NHMP notes that some small wildland fires that occur in uninhabited areas may go unreported, affecting count accuracy.

In general, the wildland fires in Connecticut are small and detected quickly, with most of the largest wildfires contained to less than 10 acres. While the overall incidence of forest fires is relatively low, wildfires are a hazard each WestCOG community must be prepared for each year.

Based on the historical record, the average wildfire in Connecticut in a very dry year (1999) burned 5 acres per fire, while the average acres burned per fire has been 1.4 acres since 2002. The average number of acres burned statewide between 2002 and 2023 (296) can provide another estimate of 1.75 acres burned per year for each Connecticut municipality. These averages are also reasonable for the WestCOG municipalities, although larger wildfires are expected, particularly in relatively undeveloped areas such as watershed lands.

The 2023 CT NHMP points out that Connecticut's wildland areas are experiencing a shift in composition as more southern and invasive species migrate into the state; this makes it difficult to project the exact wildfire risk in the future. Increased temperatures due to climate change may intensify wildland fire danger by warming and drying out vegetation, creating a longer wildland fire season, and altering fuel loads. Climate change may also increase winds that spread fires.

The WestCOG Climate and Stormwater Hazard Assessment notes that the state has faced a steady rise in brush fires over the past several years, fueled by declining forest health and a warming climate that has brought more frequent drought conditions and higher temperatures. For example, in the fall of 2024, Connecticut saw a record 605 wildfires, which burned more than 500 acres and prompted a statewide emergency declaration, a temporary burn ban, and multi-agency firefighting support.

### Impacts to Community Assets

The technology used to combat wildfires has significantly improved since the early 20th century. An improved transportation network, coupled with advances in firefighting equipment, communication technology, and training, has improved the ability of firefighters to minimize damage due to wildfires in the state. For example, radio and cellular technologies have greatly improved firefighting command capabilities. Existing mitigation for wildland fire control is typically focused on Fire Department training and maintaining an adequate supply of equipment. Firefighters are typically focused on training for either structural fires or wildland fires and maintain a secondary focus on the opposite category.

Today, most of Connecticut's forested areas are secondary growth forests. According to the Connecticut DEEP, forests have reclaimed over 500,000 acres of land that was used for agriculture in 1914. However, that new forest has been fragmented in the past few decades by residential development. The urban/wildland interface is expanding each year as sprawl extends farther from Connecticut's cities. It is at this interface that the most damage to buildings and infrastructure occurs. The "wildland/urban interface" is where many such fires are fought.

The United States Fire Administration has developed several resources to prepare communities and fire departments for wildfire response. One of these tools, the Wildland Urban Interface (WUI), is a mapping tool used to identify areas in communities where infrastructure and facilities are either intermixed or adjacent to (interface) vegetated areas that are prone to wildfire. Recent WUI maps developed by the USDA Forest Service and University of Wisconsin-Madison depict the areas in 2010 that intermix or interface wildland vegetation types. These maps consider varying densities of vegetation and housing development.

The Region is comprised primarily of interface, intermix, and non-vegetated or agricultural areas (Figure 3-21). The suburban and rural areas identified as intermix, which constitute the majority of the region, are communities with more than 50% wildland vegetation distributed throughout residentially developed areas. The areas classified as interface throughout the region are developed communities within 1.5 miles of vegetated areas comprising 75% or more wildland vegetation. The remaining areas throughout the region could be considered a lower risk, as these areas are either non-vegetated or non-WUI vegetated.

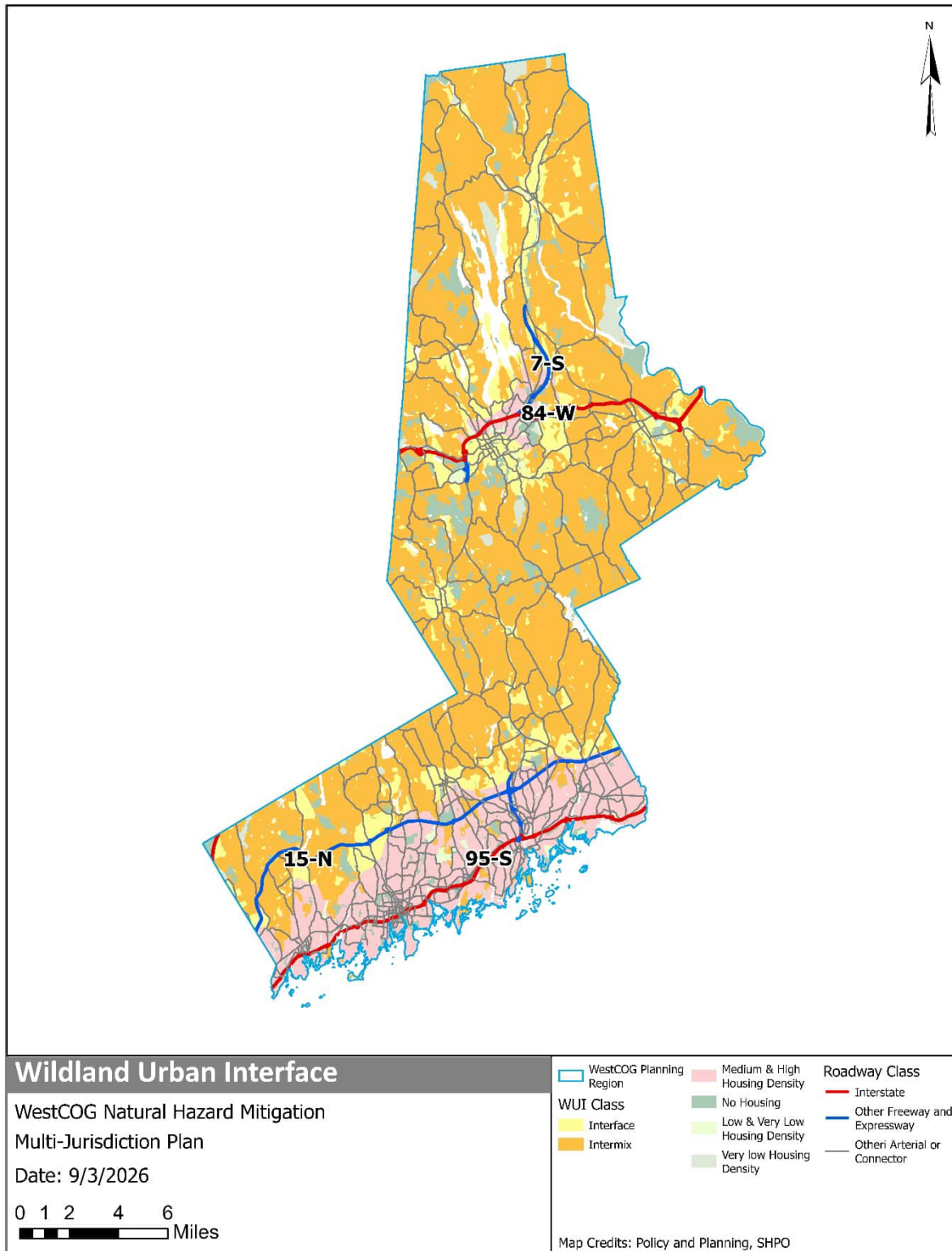


Figure 3-21: Wildland Urban Interface



Wildfires are more common in rural areas than in developed areas, as most fires in populated areas are quickly noticed and contained. The likelihood of a severe wildfire developing is reduced by the state's extensive network of water features, which create natural breaks that can stop the spread of a fire. During prolonged droughts, these natural features may dry up, increasing the state's vulnerability to wildfires.

Wildland areas are prone to fires due to weather conditions and fuel supply. An isolated wildland fire may not pose a threat, but the combined presence of residences, businesses, and lifelines near a wildland area increases the risk to life and property. Thus, a fire that might have been allowed to burn itself out with a minimum of firefighting or containment in the past is now fought to prevent fire damage to surrounding homes and commercial areas, as well as smoke threats to health and safety in these areas.

According to the United States Geological Survey (USGS), wildfires can increase the potential for flooding, debris flows, or landslides; increase pollutants in the air; temporarily destroy timber, foliage, habitats, scenic vistas, and watershed areas; and have long-term impacts such as reduced access to recreational areas, destruction of community infrastructure, and reduction of cultural and economic resources. Nevertheless, wildfires are also a natural process, and their suppression is now recognized to have created a larger fire hazard as live and dead vegetation accumulates in areas where fire has been prevented. In addition, the absence of fire has altered or disrupted the cycle of natural plant succession and wildlife habitat in many areas. Consequently, federal, state, and local agencies are committed to finding ways, such as prescribed burning, to reintroduce fire into natural ecosystems while recognizing that firefighting and suppression are still important.

Affected Population

Within the Region, some towns face a greater risk of wildfire than others due to differences in forest cover from town to town. Many of the region's municipalities are home to large tracts of forested land, such as those owned by water utility companies. Populations along the urban-wildland interface are most likely to be affected by wildfires.

Loss Estimates

The impacts from wildfires on the region have been relatively minimal. According to statistics reported to the NCEI, there have been no deaths or injuries, nor damage to property or crops from wildfires in the region from 1996 to 2025. However, it is likely that the relatively small incidents and statistics have gone unreported.

Based on data from the NIFC, between 1985 and 2023, annual federal firefighting costs averaged nearly \$2.0 billion a year (in 2026 dollars) to suppress nearly 5.5 million acres of wildfire. Using these statistics to assume an average of \$364 per acre of fire and an estimated 1.75 acres impacted by wildfire per each of the 18 WestCOG communities per year, we can estimate an annualized cost for wildfire suppression of \$11,455 for the region, or \$636 per community.

National Risk Index

FEMA's NRI was utilized to obtain information for a risk analysis on wildfire at the census tract level across WestCOG. Figure 3-22 displays the risk rating by census tract in the WestCOG region for wildfire.

Wildfire risk in the WestCOG region ranges from very low to relatively low. Table 3-51 shows a breakdown of community risk in WestCOG by census tract.

Table 3-51: Community risk ratings for wildfire, breakdown by census tracts

| Community | Total Census Tracts | Number of Census Tracts with No Rating | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk |
|-----------|---------------------|----------------------------------------|--------------------------------------------|--------------------------------------------------|
| Bethel    | 4                   | 2                                      | 2                                          | -                                                |

|                |            |           |           |           |
|----------------|------------|-----------|-----------|-----------|
| Bridgewater    | 1          | -         | 1         | -         |
| Brookfield     | 3          | 1         | 2         | -         |
| Danbury        | 20         | 11        | 9         | -         |
| Darien         | 5          | 2         | 2         | 1         |
| Greenwich      | 15         | 4         | 6         | 5         |
| New Canaan     | 5          | 2         | 3         | -         |
| New Fairfield  | 3          | -         | 3         | -         |
| New Milford    | 5          | -         | 4         | 1         |
| Newtown        | 6          | 1         | 2         | 3         |
| Norwalk        | 22         | 13        | 7         | 2         |
| Redding        | 2          | -         | 1         | 1         |
| Ridgefield     | 6          | 1         | 4         | 1         |
| Sherman        | 1          | -         | 1         | -         |
| Stamford       | 33         | 28        | 4         | 1         |
| Weston         | 2          | -         | 1         | 1         |
| Westport       | 7          | -         | 4         | 3         |
| Wilton         | 5          | 1         | 4         | -         |
| <b>WestCOG</b> | <b>145</b> | <b>66</b> | <b>60</b> | <b>19</b> |

Figure 3-23 shows the expected annual loss ratings throughout the COG based on the NRI for wildfire.

Table 3-52 describes the projected annualized losses from wildfire by community. The highest expected annual loss is within the Town of Greenwich with over \$14,000 expected annual loss due to wildfire. The WestCOG region has a total expected annual loss of \$33,273.

**Table 3-52: Breakdown of NRI expected annual losses from wildfire by community**

| Community      | Expected Annual Loss |
|----------------|----------------------|
| Bethel         | \$457                |
| Bridgewater    | \$77                 |
| Brookfield     | \$118                |
| Danbury        | \$752                |
| Darien         | \$2,668              |
| Greenwich      | \$14,143             |
| New Canaan     | \$404                |
| New Fairfield  | \$426                |
| New Milford    | \$1,645              |
| Newtown        | \$2,687              |
| Norwalk        | \$1,387              |
| Redding        | \$1,292              |
| Ridgefield     | \$1,411              |
| Sherman        | \$501                |
| Stamford       | \$1,965              |
| Weston         | \$660                |
| Westport       | \$2,429              |
| Wilton         | \$251                |
| <b>WestCOG</b> | <b>\$33,273</b>      |

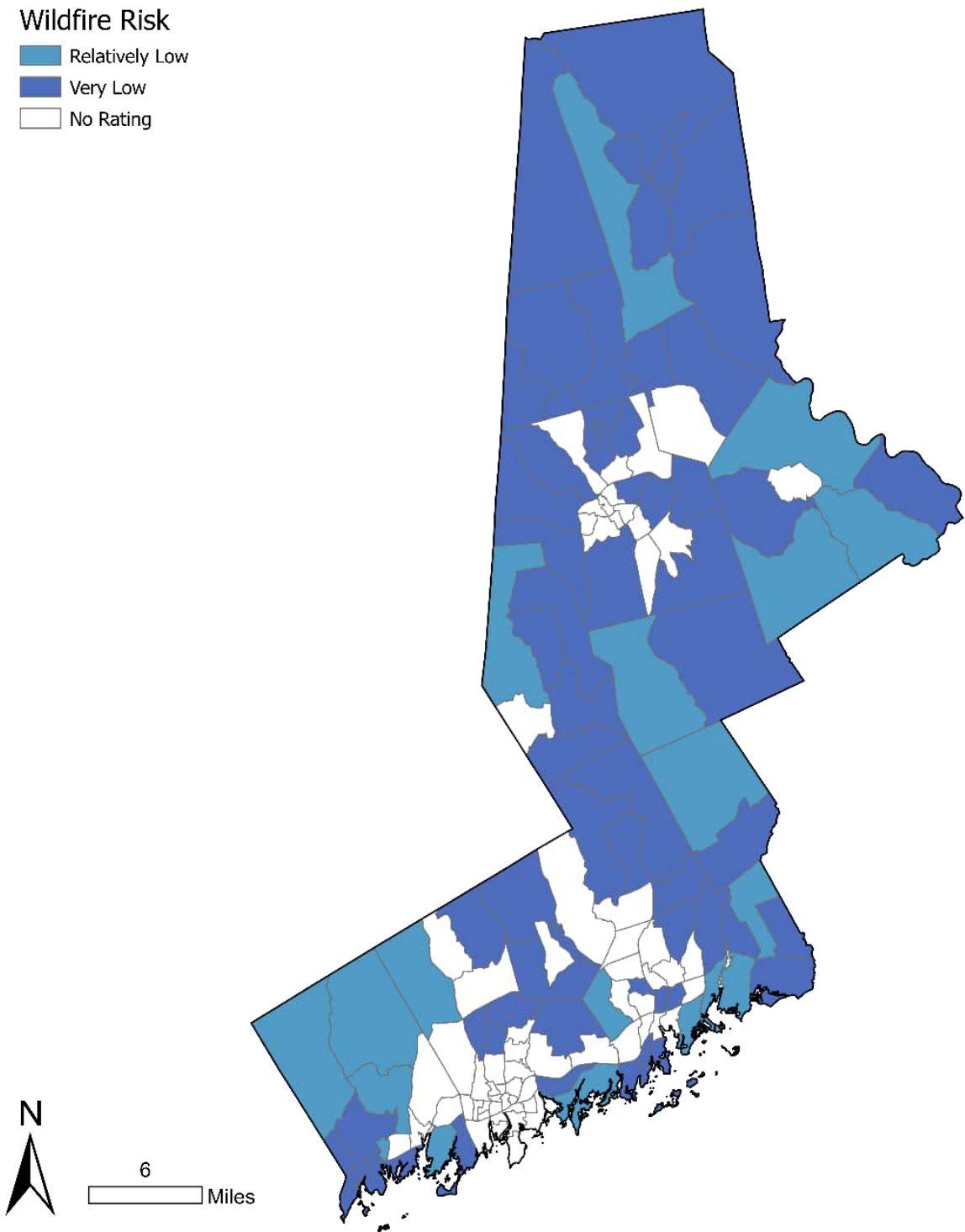


Figure 3-22: Risk Rating for Wildfires, shown at the census tract level

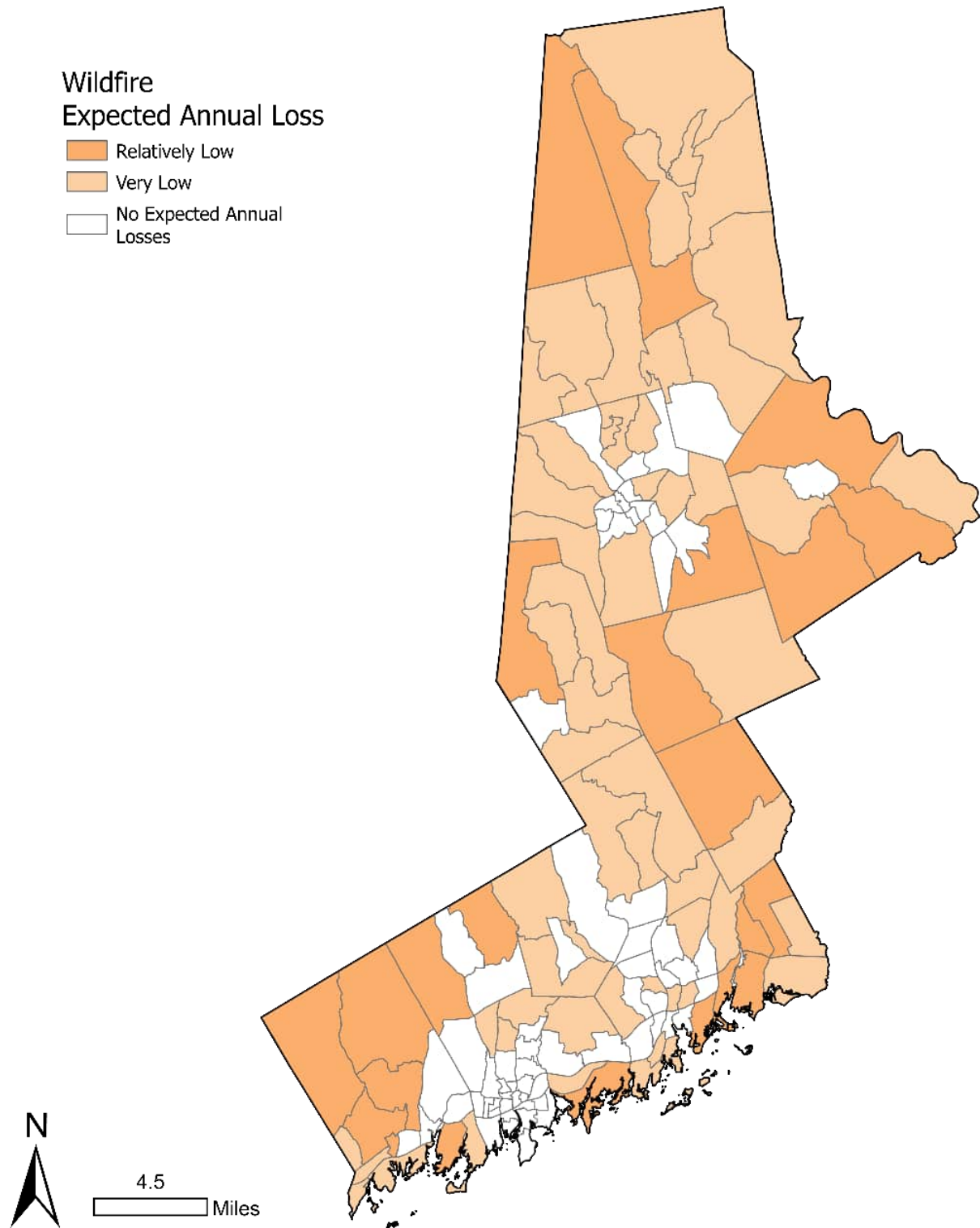


Figure 3-23: NRI Wildfire Expected Annual Loss Rating

### 3.2.8 Drought

Although Connecticut has a relatively even distribution of precipitation throughout the year, both agricultural and meteorological droughts periodically occur. Lack of precipitation in combination with the typical summer temperatures in the high 80s and low 90s can quickly dry out the soil and streams leading to drought conditions.

#### **Location**

All areas of the Region are susceptible to drought, although the likelihood of crop damage and economic loss is generally greater in rural communities. More developed communities are also susceptible to drought, particularly when the drought impacts the availability of public water supply. In general, WestCOG municipalities are likely to be part of a larger regional area affected by drought as opposed to being individually affected.

#### **Extent**

There are two types of drought that are a concern in Connecticut: hydrological and agricultural. Both types of droughts can and often do occur simultaneously.

- **Hydrological Droughts** are characterized by low streamflow, groundwater, and reservoir levels resulting from a lack of precipitation over the course of months. When the presence of rainfall becomes scarce, streams, rivers, and groundwater can suffer, and water utilities may be forced to set restrictions on usage. Wildfires can also be more prevalent during such droughts.
- **Agricultural Droughts** occur during the growing season due to a lack of adequate precipitation and soil moisture to sustain crops. It is determined when the hydration needs of crops are not being sustained by the soil.

The Palmer Drought Severity Index was devised in 1965. It uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for determining drought severity on unirrigated cropland. It primarily reflects long-term drought and has been used extensively to initiate drought relief. The Index ranges from -4.0 (or less) to +4.0 (or more), with an index of 0.0 representing normal conditions. Indexes from -2.0 to -2.9 indicate moderate drought, indexes from -3.0 to -3.9 represent severe drought, and indexes of -4.0 or less indicate extreme drought. Positive indices represent increasing moisture in the soil.

The Connecticut State Drought Plan, adopted in 2022, identifies five stages of drought:

- **Stage 1** – Early preparedness stage signaling abnormally dry conditions and the possibility of a developing drought; primarily meant to re-establish communication among agencies.
- **Stage 2** – Emerging drought with limited or isolated impacts to water supplies, agriculture, or ecosystems; first stage that is publicly announced, with increased monitoring and coordination.
- **Stage 3** – A well-established drought across a significant area, with impacts growing in extent and intensity; public messaging becomes more urgent, and preparations begin for potential emergency response.
- **Stage 4** – Widespread severe impacts to water supplies are imminent or occurring; economic and ecological damage likely, crop losses possible, and mandatory water use restrictions (especially outdoors) are expected; emergency measures may be needed.

- **Stage 5** – A statewide or regional emergency in which public water and firefighting supplies are critically depleted, threatening public health and safety; the Governor is likely to declare a state of emergency and activate the State Emergency Operations Center.

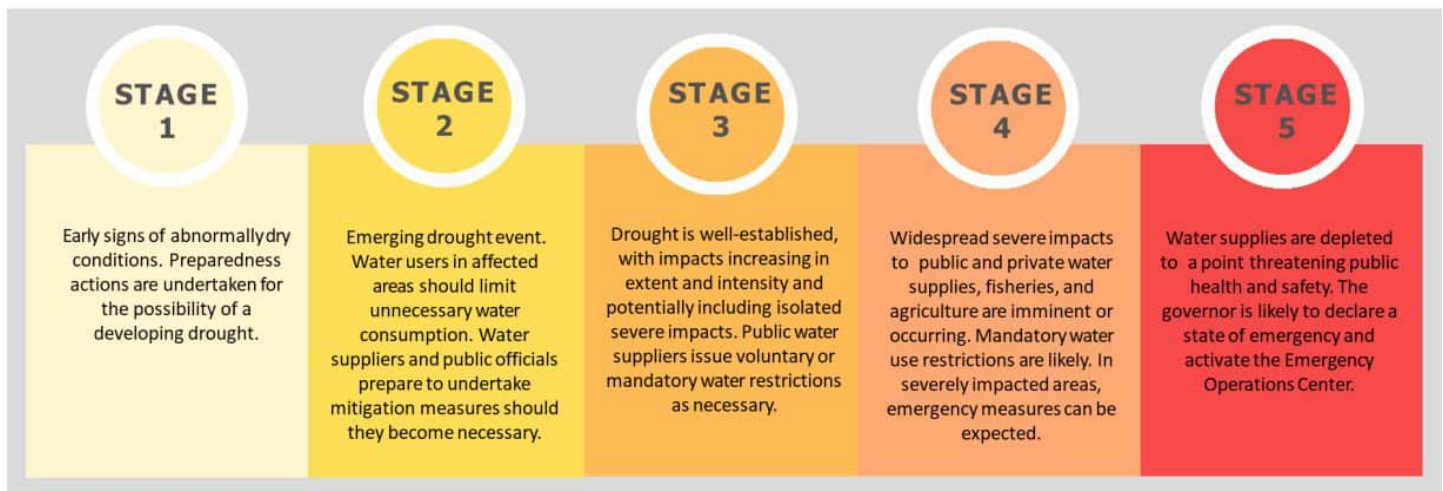


**Figure 3-24: Five Drought Stages Defined in the Connecticut State Drought Plan**

### Previous Occurrences

According to the 2022 Connecticut Drought Preparedness and Response Plan, droughts have occurred periodically in the state. Serious hydrological droughts were recorded from June 1929 through July 1932. The 1957 drought was both hydrological and agricultural, with the largest impact being on crops. Other droughts have occurred in 1964-1968, 1981, 1987, 2002, 2007-2008, 2012, 2015-2016, and 2020. The drought of 2015-2016 caused significant risks for Aquarion Water Company in the WestCOG region, leading to the eventual *permanent* framework for alternating-day landscaping water use in the region.

- In the summer of 2022, the Connecticut Interagency Drought Workgroup declared a Stage 2 Drought to all Connecticut counties, including Fairfield and Litchfield counties.
- A drought hit the state in September 2024 as a rapid-onset “flash drought” that saw the driest two-month period in Connecticut’s history, reaching Stage 2.
- A Stage 2 drought occurred in Fairfield County from September 2025 to January 2026.
- In June 2026, another Stage 2 drought was declared for Fairfield County, although wet conditions returned.

### Probability of Future Events

The 2023 Connecticut NHMP Update indicates that Connecticut is likely to experience a drought every two to three years, though it is also important to note that predicting a future drought is difficult. In the Northeast, short seasonal droughts lasting 1 to 3 months usually occur every 2 or 3 years. Longer droughts, with durations exceeding 3 months, are less frequent and occur every 20 to 30 years.

The 2023 Plan states that average annual dry days are projected to increase by 1.5 days, and days with max temperature >90 °F are projected to increase by 6.8 days in the lower emission scenario and 7.6 days in the high emission scenario (12.6 and 13.4 days annually, respectively). Days with precipitation are projected to decrease by 3.4 days per year in the low emission scenario and by 6.8 days in the high emission scenario. Days per year with maximum temperature >90 °F are projected to increase by 17.5 days in the low emission scenario and 44.2 days in the high emission scenario. According to the WestCOG Climate and Stormwater Hazard Assessment, it is estimated that a “20-year” summer drought in the late 20<sup>th</sup> century may occur every 6 years by 2050 and every 3-4 years by 2100.



Increased temperatures, coupled with more dry days, generally correspond to a greater risk of more frequent and intense periods of drought. Connecticut's small reservoir systems could be highly sensitive to such changes in water availability and could dry out. At the same time, water demand may increase with higher temperatures, with changes tempered slightly by increased rainfall.

Also noted in the State's plan, because human actions can increase the risk of water shortages without any change in meteorological conditions, efforts to conserve water and reduce runoff can protect water resources even in no drought periods.

### **Impacts to Community Assets**

Drought impacts are typically felt through economic and environmental consequences rather than as a direct risk to life and property. As an example, a drought may destroy crops, affecting farmers and businesses that depend on farming. Droughts may also lead to the loss or destruction of fish and wildlife habitat, the loss of wetlands, and lower water levels in reservoirs, lakes, and ponds. The reduction in water levels can also cause private wells to go dry or pumps to fail, and may cause dry hydrants to be unusable for fire protection purposes.

In addition, droughts can increase the severity of flooding as land that has been dry for extended periods of time does not allow water to infiltrate as quickly, which may lead to flash flooding. Droughts also exacerbate the possibility of wildfires due to very dry conditions.

Climate change can bring more intense heat waves, which may result in more droughts. Also, as the state's plan notes, because human actions can increase the risk of water shortages without any change in meteorological conditions, efforts to conserve water and reduce runoff can protect our water resources even in non-drought periods.

### **Affected Population**

Farmers and other growers who depend on rainfall are the most likely populations to be affected by drought. During severe droughts, impacts may become more widespread due to private well failures or the need to enact mandatory water restrictions on end users due to public water supply limitations. Such restrictions are commonplace for the southern portion of the Region due to historically high irrigation demands in the summer months.

### **Loss Estimates**

Based on information reported to the NCEI, drought has not caused any damage in Fairfield and Litchfield Counties. However, this may simply be because drought is a persistent hazard when it occurs, and losses occur gradually over time.

The USDA operates several programs that provide targeted financial assistance to farmers to offset severe production and revenue losses resulting from qualifying natural disasters. Available data shows that in 2020 and 2022, one program – the Emergency Relief Program for specialty crops (fruit, vegetable, and tree nut growers) – paid out \$66,746 to Connecticut farmers to address losses caused by drought.

### **National Risk Index**

FEMA's NRI was utilized to obtain information for a risk analysis on drought at the census tract level across WestCOG. Figure 3-25 displays the risk rating by census tract in the WestCOG region for drought.

Drought Risk

- Relatively Moderate
- Very Low
- Relatively Low
- No Rating

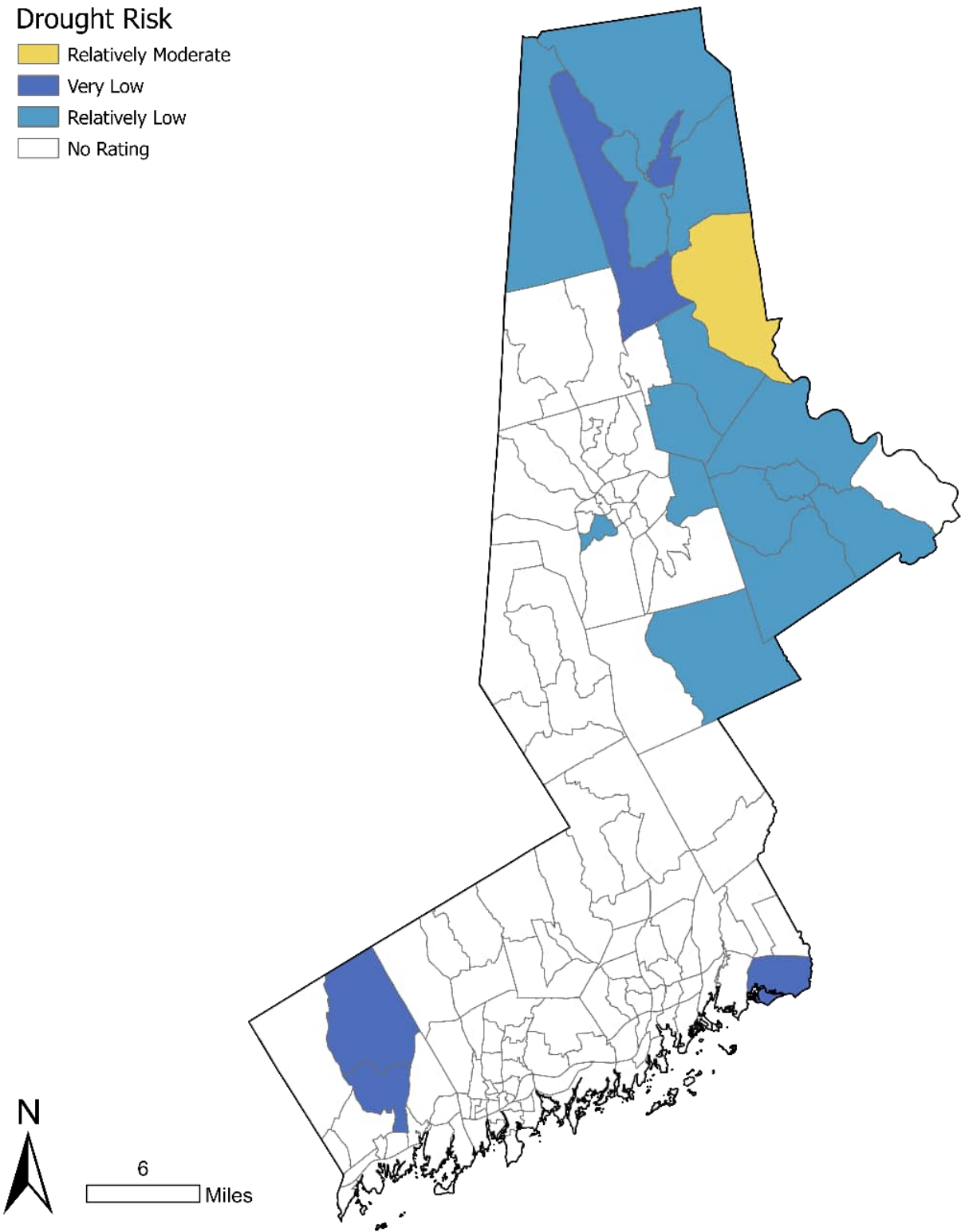


Figure 3-25: Risk Rating for Drought, shown at the census tract level

Drought risk in the WestCOG region ranges from very low to relatively moderate, where data is available. The only community at a relatively moderate risk to drought is the Town of Bridgewater. Table 3-53 shows a breakdown of community risk in WestCOG by census tract.

**Table 3-53: Community risk ratings for drought, breakdown by census tracts**

| Community      | Total Census Tracts | Number of Census Tracts with No Rating | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk | Number of Census Tracts with Relatively Moderate Risk |
|----------------|---------------------|----------------------------------------|--------------------------------------------|--------------------------------------------------|-------------------------------------------------------|
| Bethel         | 4                   | 3                                      | -                                          | 1                                                | -                                                     |
| Bridgewater    | 1                   | -                                      | -                                          | -                                                | 1                                                     |
| Brookfield     | 3                   | 1                                      | -                                          | 2                                                | -                                                     |
| Danbury        | 20                  | 19                                     | -                                          | 1                                                | -                                                     |
| Darien         | 5                   | 5                                      | -                                          | -                                                | -                                                     |
| Greenwich      | 15                  | 13                                     | 2                                          | -                                                | -                                                     |
| New Canaan     | 5                   | 5                                      | -                                          | -                                                | -                                                     |
| New Fairfield  | 3                   | 3                                      | -                                          | -                                                | -                                                     |
| New Milford    | 5                   | -                                      | 2                                          | 3                                                | -                                                     |
| Newtown        | 6                   | 1                                      | -                                          | 5                                                | -                                                     |
| Norwalk        | 22                  | 22                                     | -                                          | -                                                | -                                                     |
| Redding        | 2                   | 1                                      | -                                          | 1                                                | -                                                     |
| Ridgefield     | 6                   | 6                                      | -                                          | -                                                | -                                                     |
| Sherman        | 1                   | -                                      | -                                          | 1                                                | -                                                     |
| Stamford       | 33                  | 33                                     | -                                          | -                                                | -                                                     |
| Weston         | 2                   | 2                                      | -                                          | -                                                | -                                                     |
| Westport       | 7                   | 6                                      | 1                                          | -                                                | -                                                     |
| Wilton         | 5                   | 5                                      | -                                          | -                                                | -                                                     |
| <b>WestCOG</b> | <b>145</b>          | <b>125</b>                             | <b>5</b>                                   | <b>14</b>                                        | <b>1</b>                                              |

Figure 3-26 shows the expected annual loss ratings throughout the COG based on the NRI for drought.

Table 3-54 describes the projected annualized losses from drought by community. The highest expected annual loss due to drought is within the Towns of New Milford, Bridgewater, and Newtown, all of which have over \$20,000 in expected annual loss. The WestCOG region has a total expected annual loss of \$96,295.

**Table 3-54: Breakdown of NRI expected annual losses from drought by community**

| Community     | Expected Annual Loss | Community      | Expected Annual Loss |
|---------------|----------------------|----------------|----------------------|
| Bethel        | \$4,023              | Newtown        | \$21,580             |
| Bridgewater   | \$26,298             | Norwalk        | \$0                  |
| Brookfield    | \$8,819              | Redding        | \$5,189              |
| Danbury       | \$480                | Ridgefield     | \$0                  |
| Darien        | \$0                  | Sherman        | \$2,470              |
| Greenwich     | \$149                | Stamford       | \$0                  |
| New Canaan    | \$0                  | Weston         | \$0                  |
| New Fairfield | \$0                  | Westport       | \$266                |
| New Milford   | \$27,021             | Wilton         | \$0                  |
| --            | --                   | <b>WestCOG</b> | <b>\$96,295</b>      |

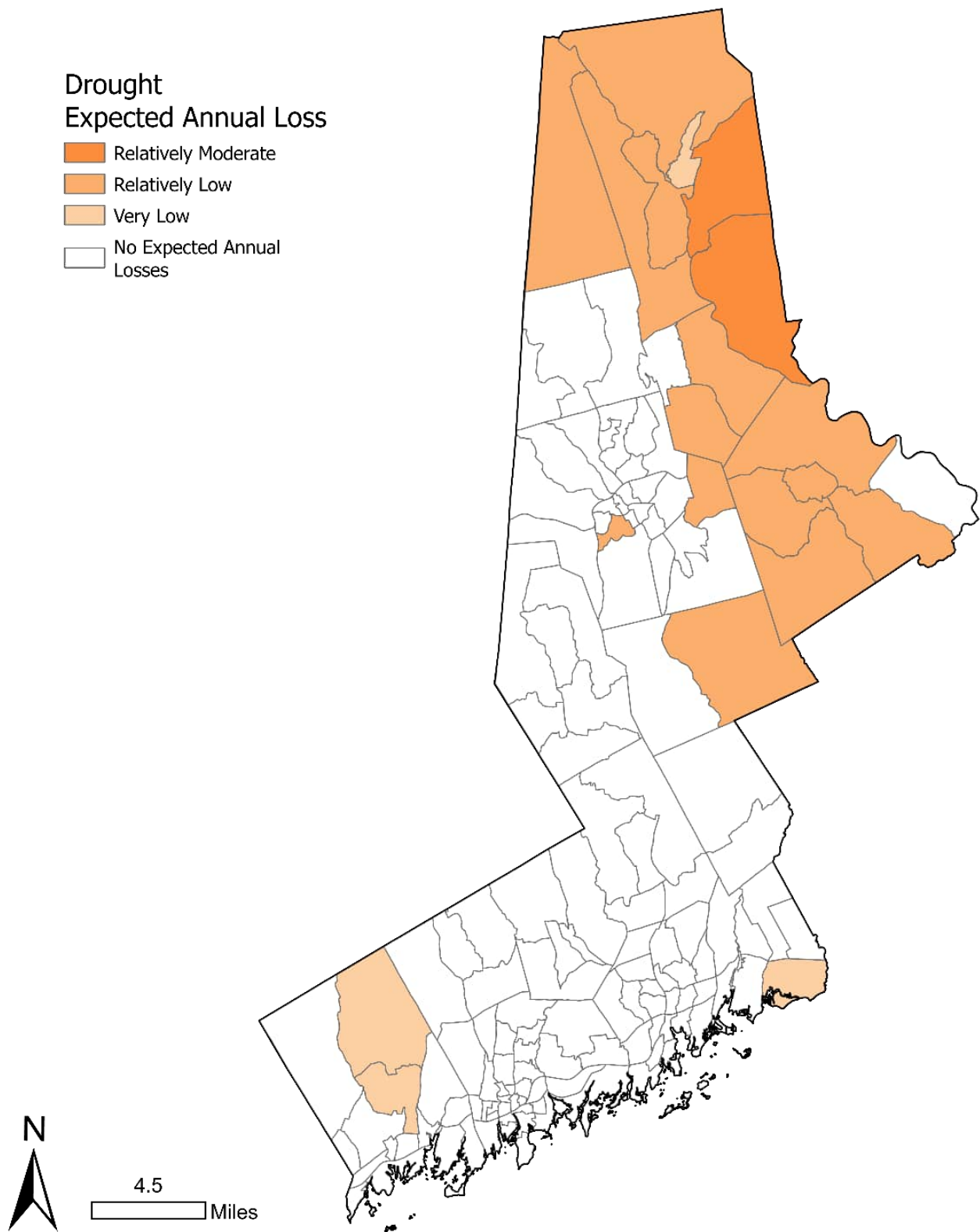


Figure 3-26: NRI Drought Expected Annual Loss Rating

### 3.2.9 Earthquakes

Although damaging earthquakes are rare in Connecticut, low magnitude earthquakes occur regularly in the state. In addition, very strong, damaging earthquakes have occurred in Connecticut, and the state can also feel the effects of earthquakes that occur several hundred miles away.

#### Location

All areas of the Region are susceptible to earthquakes, although the likelihood of a damaging earthquake having its epicenter directly below the region is relatively small. In general, the Region is likely to be part of a larger regional area affected by a damaging earthquake as opposed to individual municipalities being affected.

#### Extent

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse; disrupt gas, electric, and telephone lines; and often cause landslides, flash floods, fires, avalanches, and tsunamis. Earthquakes can occur at any time without warning.

The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake are determined using various descendants of the Richter Scale and the Mercalli scale, respectively.

Magnitude is related to the amount of seismic energy released at the hypocenter of the earthquake. It is based on the amplitudes of earthquake waves recorded by instruments with a common calibration. The magnitude of an earthquake is thus represented by a single instrumentally determined value recorded by a seismograph, which records the varying amplitude of ground oscillations.

The Richter scale was developed in 1395 and was used exclusively until the 1970s. It set the magnitude of an earthquake based on the logarithm of the amplitude of recorded waves. Being logarithmic, each whole number increase in magnitude represents a tenfold increase in measured strength. Earthquakes with a magnitude of about 2.0 or less are usually called "microearthquakes" and are generally only recorded locally. Earthquakes with magnitudes of 4.5 or greater are strong enough to be recorded by seismographs all over the world.

#### Modified Mercalli Intensity

- I. Not felt except by a very few under especially favorable conditions.
- II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
- III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck.
- IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
- V. Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
- VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
- VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
- VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
- IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
- X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
- XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
- XII. Damage total. Lines of sight and level are distorted. Objects thrown in the air.

Source: USGS

As more seismograph stations were installed around the world following the 1930s, it became apparent that the method developed by Richter was valid only for certain frequency and distance ranges, particularly in the southwestern United States. New magnitude scales that are an extension of Richter's original idea were developed for other areas. In particular, the Moment Magnitude Scale was developed in the 1970s to replace the Richter Scale and has been in official use by the USGS since 2002.

According to the USGS, these multiple methods are used to estimate the magnitude of an earthquake because no single method is capable of accurately estimating the size of all earthquakes. Some magnitude types are calculated to provide a consistent comparison to past earthquakes, and these scales are calibrated to the original Richter Scale. However, differences in magnitude of up to 0.5 can be calculated for the same earthquake through different techniques. In general, Moment Magnitude provides an estimate of earthquake size that is valid over the complete range of magnitudes and so is commonly used today.

Although Moment Magnitude is the most common measure of earthquake size for medium and larger earthquakes, the USGS does not calculate Moment Magnitude for earthquakes with a magnitude of less than 3.5. Localized Richter Scales or other scales are used to calculate magnitudes for smaller earthquakes, such as those that typically occur in Connecticut.

Regionally, the Weston Observatory utilizes two scales to track the magnitude of earthquakes. These include the Nuttli Magnitude Scale for North America east of the Rocky Mountains, which is more appropriate for the relatively harder continental crust in Connecticut compared to California. Weston Observatory also utilizes the Coda Duration Magnitude Scale, which is based on the duration of shaking at a particular station. The advantages of the Coda Duration Magnitude Scale is that this method can quickly estimate the magnitude before the exact location of the earthquake is known.

The effect of an earthquake on the earth's surface is called the intensity. The intensity scale currently in use, the Modified Mercalli Intensity Scale, consists of a series of key responses such as people awakening, movement of furniture, damage to chimneys, and total destruction. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It is an arbitrary ranking based on observed effects. A comparison of Richter magnitude to typical Modified Mercalli intensity is presented in Table 3-55, while a description of each intensity level is presented below.

**Table 3-55: Comparison of Earthquake Magnitude and Intensity**

| Richter Magnitude | Typical Maximum Modified Mercalli Intensity |
|-------------------|---------------------------------------------|
| 1.0 to 2.9        | I                                           |
| 3.0 to 3.9        | II to III                                   |
| 4.0 to 4.9        | IV to V                                     |
| 5.0 to 5.9        | VI to VII                                   |
| 6.0 to 6.9        | VII to IX                                   |
| 7.0 and above     | VIII to XII                                 |

Source: USGS

### Previous Occurrences

According to the Northeastern States at Boston College, there have been 150 recorded earthquakes in Connecticut between 1678 and 2014. All recorded quakes had a Richter Scale magnitude of less than 5.0, and the vast majority had a magnitude of less than 3.0. The Northeast States Emergency Consortium reports that only 115 earthquakes were strong enough to be detected by people, and only the 1791 earthquake caused significant damage. Additional instances of seismic activity

occurring in and around the Region are noted below based on information in USGS documents, from the Weston Observatory, the 2023 CT NHMP, other municipal hazard mitigation plans, and newspaper articles.

- A devastating earthquake near Three Rivers, Quebec on February 5, 1663 caused moderate damage in parts of Connecticut.
- Strong earthquakes in Massachusetts in November 1727 and November 1755 were felt strongly in Connecticut.
- May 16, 1791: The strongest earthquake in Connecticut history occurred in East Haddam in 1791 and is recorded with intensity VII. According to USGS, the earthquake, which was felt in Boston and New York City, caused stone walls and chimney tops to fall, and latched doors to open. Weston Observatory estimates that this quake had a 4.4 magnitude.
- October 26, 1845: An Intensity V earthquake occurred in Bridgeport and approximated 3.9 to 4.3 on the Richter scale. This event damaged stone fences in Weston and rang a church bell in Westport.
- July 28, 1875: An early morning tremor caused Intensity V damage throughout Connecticut and Massachusetts.
- October 19, 1985: A small earthquake awakened many in lower Fairfield County. The earthquake measured 4.0 on the Richter Scale, and its epicenter was located in Westchester County. The quake caused only minor damage, such as cracks in windows.
- October 28, 1991: A 3.0-magnitude earthquake was recorded in Greenwich near where the Mianus River meets the Stamford boundary. No damage was reported.
- November 30, 2010: A magnitude 3.9 earthquake occurred 117 miles southeast of Bridgeport, Connecticut. The quake did not cause damage in Connecticut but was felt by residents along Long Island Sound.
- August 21, 2011: A magnitude 5.8 earthquake struck 38 miles from Richmond, Virginia. The quake was felt from Georgia to Maine and reportedly as far west as Chicago. Many residents of Connecticut experienced the swaying and shaking of buildings and furniture during the earthquake. According to Cornell University, the quake was the largest event to occur in the east central United States since instrumental recordings have been available to seismologists.
- September 8, 2012: A magnitude 2.1 quake occurred near Stamford. Dozens of residents reported feeling the ground move. No injuries were reported.
- The 2015 January and February earthquake swarm in the Plainfield, Connecticut area were the most significant geologic events to occur in the state in some time according to the Connecticut State Geologist. The swarm included earthquakes ranging in magnitude from 2.0 to 3.3. No damage was reported in the Region.
- September 9, 2020: According to Patch.com, a magnitude 3.1 quake centered in New Jersey was felt by residents in Danbury and Stamford as recorded by the USGS.

### Probability of Future Events

According to the 2023 CT NHMP, there are areas within the state that have had seismic activity in the past, and the long-term probability does exist of an earthquake with a magnitude greater than 5.0 occurring, although the risk is relatively very low. Based on the historical record, it is likely that one or more earthquakes with a magnitude lower than 3.0 will occur within the next 100 years. The southwest corner of the state has the highest probability of experiencing a magnitude 4.5 or larger earthquake within 250 years.

According to the USGS, Connecticut is in an area of moderate to low risk for earthquakes. The USGS prepared Modified Mercalli Intensity hazard maps for the U.S. in 2018, depicting estimates of certain intensities (and types of damage) being exceeded over the next 50 years. The Region has a 50% chance of experiencing an earthquake with an intensity of III or less in the next 50 years, a 10% chance of experiencing an intensity of IV, and a 2% chance of experiencing an intensity of V.

The 2023 CT NHMP notes that there is limited evidence that climate change has an impact on earthquake activity, though recent research indicates that earthquakes may be sensitive to changes on the Earth's surface, such as shifts in water or atmospheric pressure.

### Impacts to Community Assets

Unlike seismic activity in California, earthquakes in Connecticut are not associated with specific known faults. Instead, earthquakes with epicenters in Connecticut are referred to as intraplate activity. Bedrock in Connecticut and New England in general is highly capable of transmitting seismic energy; thus, the area impacted by an earthquake in Connecticut can be four to 40 times greater than that of California. For example, the relatively strong earthquake that occurred in Virginia in 2011 was felt in Connecticut because the energy was transmitted over a great distance through hard bedrock. In addition, population density is up to 3.5 times higher in Connecticut than in California, potentially putting more people at risk.

Surficial earth materials behave differently in response to seismic activity. Unconsolidated materials such as sand and artificial fill can amplify the shaking associated with an earthquake. In addition, artificial fill material has the potential for liquefaction. When liquefaction occurs, the strength of the soil decreases, and the ability of soil to support building foundations and bridges is reduced. Increased shaking and liquefaction can cause greater damage to buildings and structures and a greater loss of life.

**Liquefaction** is a phenomenon in which the strength and stiffness of a soil are reduced by earthquake shaking or other rapid loading. It occurs in soils at or near saturation and especially in finer textured soils.

Areas of steep slopes can collapse during an earthquake, triggering landslides. Seismic activity can also break utility lines, including water mains, electric and telephone lines, and stormwater management systems. Damage to utility lines can lead to fires, especially in electric and gas mains. Dam failure can also pose a significant threat to developed areas during an earthquake.

The 2023 CT NHMP identifies the area from Greenwich to New Haven as one of the most vulnerable to potential earthquakes. The built environment in Connecticut includes old non-reinforced masonry that is not seismically designed. Those who live or work in non-reinforced masonry buildings, especially those built on filled land or unstable soils, are at the highest risk for injury due to the occurrence of an earthquake.

### Affected Population

Damaging earthquakes tend to be regional events, and the entire region is likely to be affected by such an event. Poorly constructed buildings are most likely to be damaged during such an event, potentially displacing residents and businesses. During more severe events, the entire community will feel indirect impacts due to power outages and roadway damage.

### Loss Estimates

According to the FEMA HAZUS-MH Estimated Annualized Earthquake Losses for the United States (2008) document, FEMA used probabilistic curves developed by the USGS for the National Earthquakes Hazards Reduction Program to calculate Annualized Earthquake Losses for the United States. Based on the results of this study, FEMA calculated the annualized earthquake loss for Connecticut to be \$11,622,000. This figure placed Connecticut 30th out of the 50 states in terms of

annualized earthquake loss. The magnitude of this figure stems from the fact that Connecticut has a large building inventory that would be damaged in a severe earthquake.

The 2019 CT NHMP simulated four "maximum plausible" earthquake scenarios (three historical, one potential) within HAZUS-MH to generate the potential earthquake risk to the state of Connecticut. The data from these scenarios were extracted from the HAZUS-MH output for the 2019 CT NHMP to generate potential damages in the Region from those events, using the default year 2010 building inventories and census data. The four events are as follows:

- Magnitude 5.7, epicenter in Portland, based on historic event
- Magnitude 5.7, epicenter in Haddam, based on historic event
- Magnitude 6.4, epicenter in East Haddam, based on historic event
- Magnitude 5.7, epicenter in Stamford, magnitude based on USGS probability mapping

For this 2026 WestCOG HMP update, HAZUS-MH loss estimates from the 2019 CT NHMP have been increased to account for inflation; no other adjustments have been made.

While a significant earthquake has never been centered in the Region, the modeling suggests that a significant event in or near the region would have a serious impact. These simulations highlight the significance of the location of the epicenter to the damages that could be expected. A moderately strong earthquake centered near a more populated, built-up area would be expected to result in considerably more damage than one located in a more remote area.

While these scenarios are unlikely, each would result in significant damage in the region with the Stamford scenario causing the greatest damage. As Table 3-56 shows, more than 52% of all buildings in the Region would be at least moderately damaged, including over 34,500 completely destroyed.

**Table 3-56: Number of Buildings Damaged in Region by Earthquake Scenario**

| Damage Level                             | East    |         |          |          |
|------------------------------------------|---------|---------|----------|----------|
|                                          | Haddam  | Haddam  | Portland | Stamford |
| <b>None</b>                              | 165,865 | 189,593 | 189,026  | 61,461   |
| <b>Slight</b>                            | 23,555  | 7,293   | 7,726    | 33,815   |
| <b>Moderate</b>                          | 8,383   | 1,727   | 1,847    | 40,755   |
| <b>Extensive</b>                         | 857     | 132     | 142      | 28,196   |
| <b>Complete</b>                          | 93      | 8       | 9        | 34,526   |
| <b>% with Moderate or Greater Damage</b> | 5%      | 1%      | 1%       | 52%      |

Source: HAZUS-MH

Furthermore, many essential facilities would lose functionality during the first day, as shown in Table 3-57. For example, the HAZUS-MH model simulates that only 25% of available hospital beds in the region would be available immediately following the Stamford scenario earthquake, and EOCs in the region would be operating at only 34% functionality on the day following the earthquake. The information suggests that earthquake response would be impacted in the region due to the damage sustained to these facilities.

As expected for an event that causes widespread structure damage, sheltering requirements are also expected to be substantial during the Stamford scenario. Potential shelter requirements are presented in Table 3-58. Significant outside resources would be needed to cope with the aftermath of the Stamford scenario.

**Table 3-57: Average Percent Functionality of Essential Facilities on Day 1 Following Earthquake**

| Facility            | East   |        |          |          |
|---------------------|--------|--------|----------|----------|
|                     | Haddam | Haddam | Portland | Stamford |
| <b>EOC</b>          | 71%    | 86%    | 86%      | 34%      |
| <b>Fire Dept.</b>   | 72%    | 87%    | 86%      | 44%      |
| <b>Hospitals</b>    | 73%    | 87%    | 87%      | 25%      |
| <b>Police Dept.</b> | 72%    | 87%    | 86%      | 41%      |
| <b>Schools</b>      | 72%    | 87%    | 87%      | 28%      |

Source: HAZUS-MH

**Table 3-58: Shelter Requirements by Earthquake Scenario**

| Need                                     | East   |        |          |          |
|------------------------------------------|--------|--------|----------|----------|
|                                          | Haddam | Haddam | Portland | Stamford |
| <b>Displaced Households</b>              | 535    | 121    | 126      | 20,016   |
| <b>People Needing Short-term Shelter</b> | 320    | 72     | 75       | 11,826   |

Source: HAZUS-MH

The economic impact from the Stamford scenario would be devastating, costing the region over \$24 billion in damage from building-related and lifeline-related losses. Table 3-59 summarizes the direct economic losses to homes and businesses in the region (not including potential lifeline-related losses to utilities and transportation systems).

**Table 3-59: Economic Loss in Region by Earthquake Scenario (Millions of 2026 Dollars)**

| Municipality   | East           |              |              |                 |
|----------------|----------------|--------------|--------------|-----------------|
|                | Haddam         | Haddam       | Portland     | Stamford        |
| Bethel         | \$36           | \$8          | \$9          | \$121           |
| Bridgewater    | \$4            | \$1          | \$1          | \$4             |
| Brookfield     | \$38           | \$8          | \$10         | \$63            |
| Danbury        | \$150          | \$31         | \$34         | \$524           |
| Darien         | \$31           | \$6          | \$6          | \$1,131         |
| Greenwich      | \$111          | \$23         | \$23         | \$4,380         |
| New Canaan     | \$34           | \$6          | \$6          | \$1,595         |
| New Fairfield  | \$18           | \$4          | \$4          | \$35            |
| New Milford    | \$51           | \$10         | \$14         | \$38            |
| Newtown        | \$56           | \$14         | \$18         | \$89            |
| Norwalk        | \$156          | \$31         | \$33         | \$3,500         |
| Redding        | \$15           | \$4          | \$4          | \$109           |
| Ridgefield     | \$44           | \$9          | \$9          | \$624           |
| Sherman        | \$5            | \$1          | \$1          | \$6             |
| Stamford       | \$218          | \$44         | \$44         | \$10,335        |
| Weston         | \$18           | \$4          | \$4          | \$158           |
| Westport       | \$69           | \$14         | \$14         | \$715           |
| Wilton         | \$44           | \$9          | \$9          | \$1,021         |
| <b>WestCOG</b> | <b>\$1,096</b> | <b>\$224</b> | <b>\$240</b> | <b>\$24,446</b> |

Source: HAZUS-MH

HAZUS-MH was also used to simulate a probabilistic earthquake scenario, calculating an annualized loss estimate for each municipality. These data were extracted for the WestCOG municipalities. Property losses include building and contents losses, and other losses include inventory, relocation, rental, and wage losses. Results are presented in Table 3-60.

**Table 3-60: Annualized Economic Loss in Region Due to Earthquake (Thousands)**

| Municipality   | Property Loss    | Income Loss    | Other Losses   | Total Annualized Losses |
|----------------|------------------|----------------|----------------|-------------------------|
| Bethel         | \$77.5           | \$3.0          | \$14.8         | \$95.3                  |
| Bridgewater    | \$6.1            | \$0.3          | \$1.0          | \$7.4                   |
| Brookfield     | \$73.8           | \$4.0          | \$15.0         | \$92.8                  |
| Danbury        | \$337.5          | \$17.4         | \$75.5         | \$430.4                 |
| Darien         | \$100.3          | \$4.6          | \$16.8         | \$121.8                 |
| Greenwich      | \$439.3          | \$23.1         | \$83.0         | \$545.5                 |
| New Canaan     | \$102.6          | \$4.9          | \$18.3         | \$125.8                 |
| New Fairfield  | \$41.6           | \$0.9          | \$5.4          | \$48.0                  |
| New Milford    | \$94.0           | \$4.8          | \$19.5         | \$118.3                 |
| Newtown        | \$97.5           | \$4.1          | \$17.1         | \$118.8                 |
| Norwalk        | \$418.8          | \$21.6         | \$86.8         | \$527.1                 |
| Redding        | \$36.0           | \$1.5          | \$5.4          | \$42.9                  |
| Ridgefield     | \$119.9          | \$5.6          | \$20.8         | \$146.3                 |
| Sherman        | \$12.4           | \$0.3          | \$1.5          | \$14.1                  |
| Stamford       | \$739.6          | \$37.1         | \$152.8        | \$929.5                 |
| Weston         | \$40.3           | \$1.9          | \$6.0          | \$48.3                  |
| Westport       | \$157.0          | \$9.8          | \$32.6         | \$199.5                 |
| Wilton         | \$116.5          | \$5.9          | \$21.6         | \$144.0                 |
| <b>WestCOG</b> | <b>\$3,010.5</b> | <b>\$151.0</b> | <b>\$593.8</b> | <b>\$3,755.3</b>        |

Source: HAZUS-MH

### National Risk Index

FEMA's NRI was utilized to obtain information for a risk analysis on earthquakes at the census tract level across WestCOG. Figure 3-27 displays the risk rating by census tract in the WestCOG region for earthquake.

Earthquake risk in the WestCOG region ranges from very low to relatively low. Table 3-61 shows a breakdown of community risk in WestCOG by census tract.

**Table 3-61: Community risk ratings for earthquake, breakdown by census tracts**

| Community     | Total Census Tracts | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk |
|---------------|---------------------|--------------------------------------------|--------------------------------------------------|
| Bethel        | 4                   | 4                                          | -                                                |
| Bridgewater   | 1                   | 1                                          | -                                                |
| Brookfield    | 3                   | 2                                          | 1                                                |
| Danbury       | 20                  | 8                                          | 12                                               |
| Darien        | 5                   | 5                                          | -                                                |
| Greenwich     | 15                  | 10                                         | 5                                                |
| New Canaan    | 5                   | 5                                          | -                                                |
| New Fairfield | 3                   | 3                                          | -                                                |
| New Milford   | 5                   | 5                                          | -                                                |
| Newtown       | 6                   | 6                                          | -                                                |

| Community      | Total Census Tracts | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk |
|----------------|---------------------|--------------------------------------------|--------------------------------------------------|
| Norwalk        | 22                  | 16                                         | 6                                                |
| Redding        | 2                   | 2                                          | -                                                |
| Ridgefield     | 6                   | 5                                          | 1                                                |
| Sherman        | 1                   | 1                                          | -                                                |
| Stamford       | 33                  | 25                                         | 8                                                |
| Weston         | 2                   | 2                                          | -                                                |
| Westport       | 7                   | 7                                          | -                                                |
| Wilton         | 5                   | 5                                          | -                                                |
| <b>WestCOG</b> | <b>145</b>          | <b>112</b>                                 | <b>33</b>                                        |

Figure 3-28 shows the expected annual loss ratings throughout the COG based on the NRI for earthquake.

Table 3-62 describes the projected annualized losses from earthquake by community. The highest expected annual loss due to earthquake is within Stamford, Danbury, Greenwich, and Norwalk, all of which have over \$200,000 in expected annual loss. The WestCOG region has a total expected annual loss of approximately \$1.59 million.

**Table 3-62: Breakdown of NRI expected annual losses from earthquake by community**

| Community      | Expected Annual Loss |
|----------------|----------------------|
| Bethel         | \$28,227             |
| Bridgewater    | \$2,323              |
| Brookfield     | \$54,615             |
| Danbury        | \$279,341            |
| Darien         | \$64,779             |
| Greenwich      | \$241,677            |
| New Canaan     | \$52,643             |
| New Fairfield  | \$12,344             |
| New Milford    | \$37,366             |
| Newtown        | \$45,989             |
| Norwalk        | \$215,633            |
| Redding        | \$26,039             |
| Ridgefield     | \$49,977             |
| Sherman        | \$3,707              |
| Stamford       | \$359,072            |
| Weston         | \$17,281             |
| Westport       | \$65,477             |
| Wilton         | \$37,942             |
| <b>WestCOG</b> | <b>\$1,594,432</b>   |

### Earthquake Risk

- Relatively Low
- Very Low

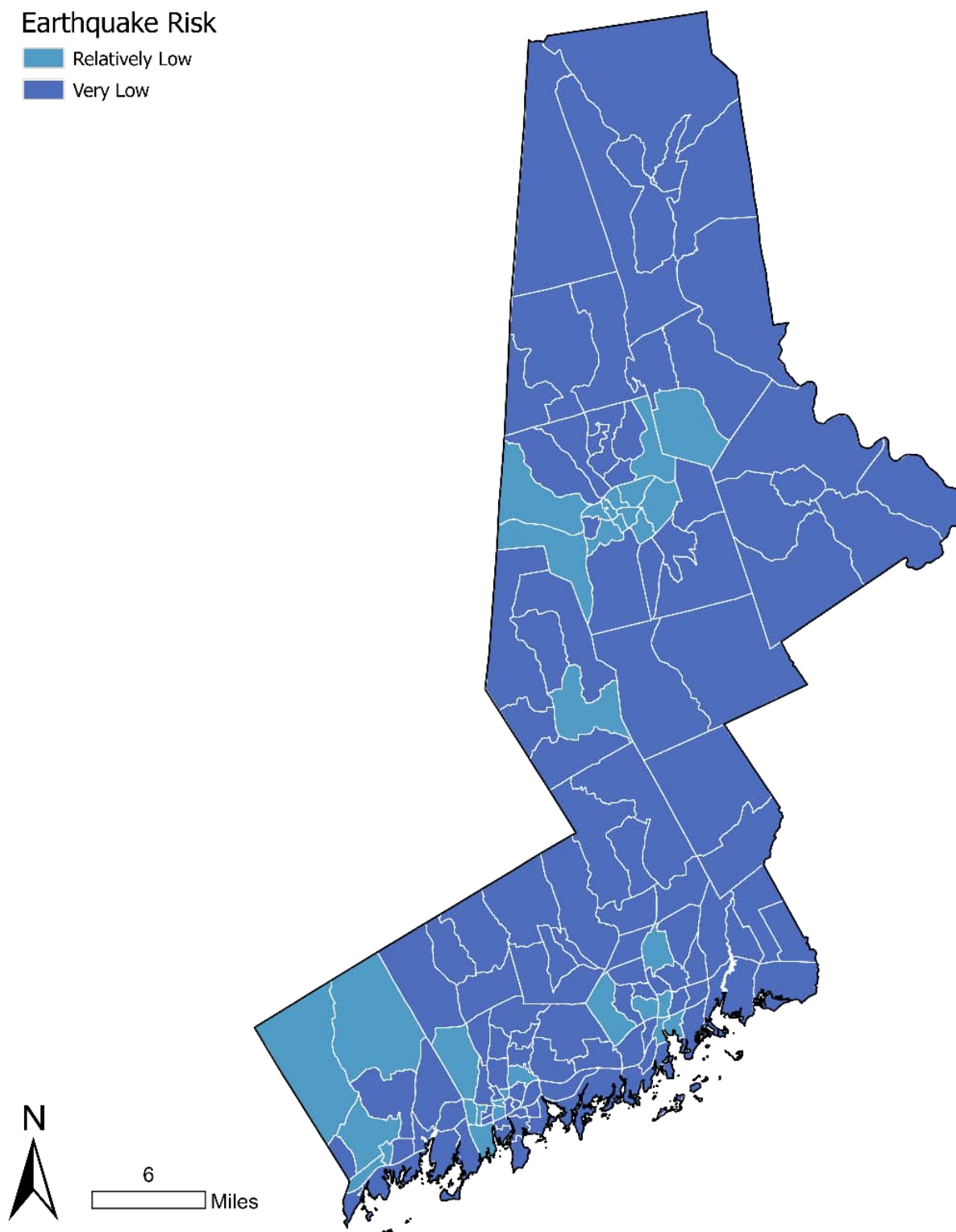


**Figure 3-27: Risk Rating for Earthquake, shown at the census tract level**

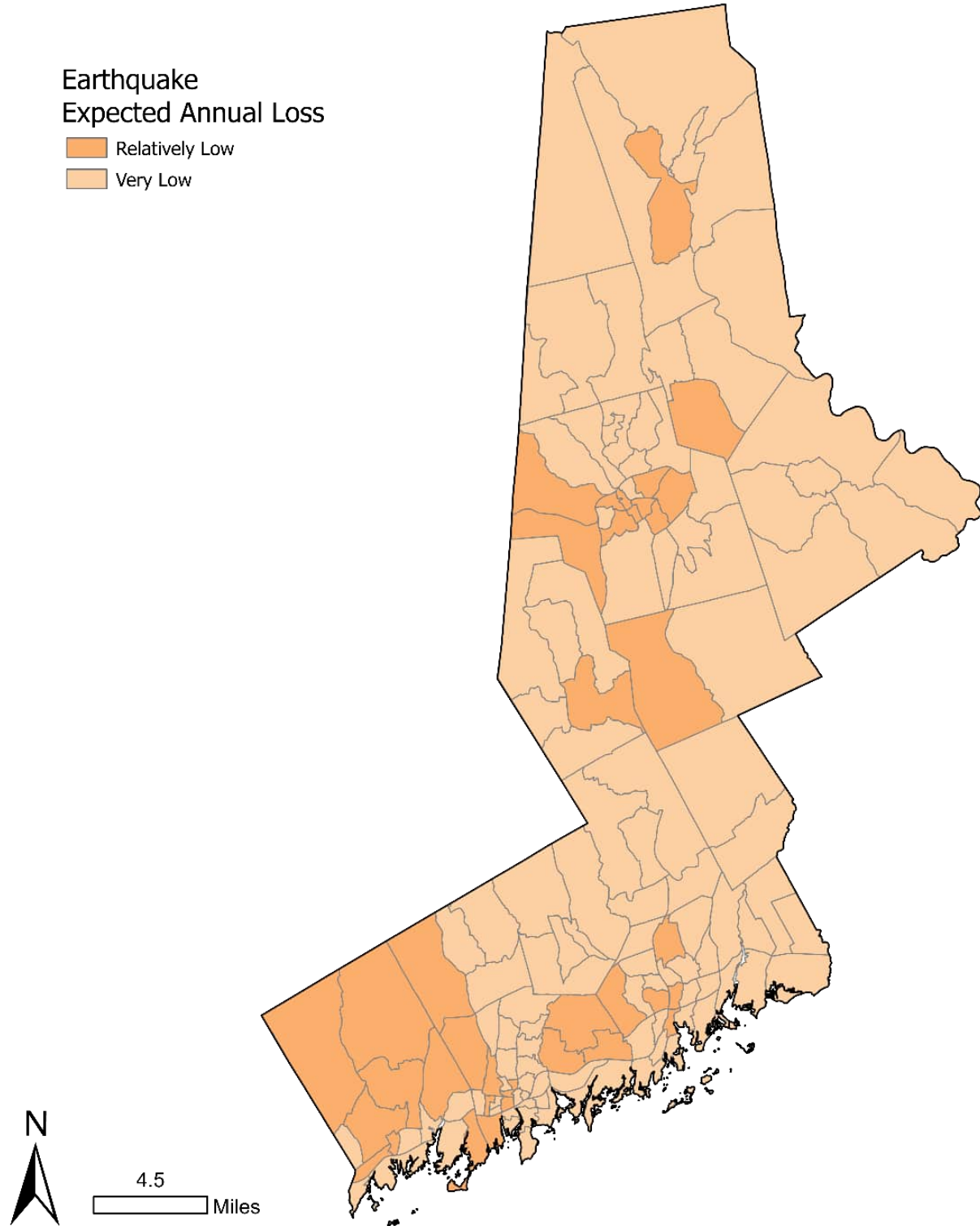


Figure 3-28: NRI Earthquake Expected Annual Loss Rating

### 3.2.10 Dam Overtopping and Failure Events

Dam failure is generally caused by other natural hazards: floods arising from thunderstorms, spring thaw, and hurricanes; wind damage from hurricanes and tornadoes; damage from ice jams, and forces from earthquakes. Failure due to material fatigue is also possible, but regular maintenance and dam inspections can detect leaks and other signs of material fatigue before the problem escalates. A Fact Sheet regarding dam hazards is presented on the next page.

#### Location

Dam failure can only occur at and along the watercourses downstream of dams. Although the effects of dam failure can impact any of the WestCOG municipalities, the actual level of impact can differ based on the number and hazard classification of the dams within and upstream of the community.

In the case of a lower hazard dam, the effect of the failure would likely be constrained within the 1% annual chance floodplain or the 0.2% annual chance floodplain. The failure of a higher hazard dam could produce effects far greater than the 0.2% annual chance flood and could also cause a chain reaction where downstream dams also overtop and fail.

#### Extent

The Connecticut DEEP administers the statewide Dam Safety Program and designates a classification to each state-inventoried dam based on its potential hazard. The hazard classifications are described in Table 3-63.

**Table 3-63: Connecticut DEEP Dam Classifications**

| Hazard Class | Hazard Potential                                                                                                                                                                                                                                                                                                                                |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AA</b>    | <b>Negligible</b> hazard potential dam which, if it were to fail, would result in no measurable damage to roadways, land and structures, and negligible economic loss.                                                                                                                                                                          |
| <b>A</b>     | <b>Low</b> hazard potential dam which, if it were to fail, would result in damage to agricultural land, damage to unimproved roadways, or minimal economic loss.                                                                                                                                                                                |
| <b>BB</b>    | <b>Moderate</b> hazard potential dam which, if it were to fail, would result in damage to normally unoccupied storage structures, damage to low volume roadways, or moderate economic loss.                                                                                                                                                     |
| <b>B</b>     | <b>Significant</b> hazard potential dam which, if it were to fail, would result in possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to or interruption of the use or service of utilities; damage to primary roadways and railroads; or significant economic loss. |
| <b>C</b>     | <b>High</b> hazard potential dam which, if it were to fail, would result in the probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to main highways; or great economic loss.                                                                                         |

Source: Connecticut DEEP

According to the Association of State Dam Safety Officials, dam failures are most likely to occur due to one of five reasons:

- **Overtopping** caused by water spilling over the top of the dam due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest. These account for approximately 34% of all U.S. dam failures.

# REGIONAL CHALLENGES

## DAM HAZARDS



*Shepaug Dam  
Photo Wikipedia*



*Dam removal along the Norwalk River  
Photo The Hour*

### FOR MORE INFORMATION

Dam Safety Regulatory Program  
(860) 424-3706  
[DEEP.DamSafety@ct.gov](mailto:DEEP.DamSafety@ct.gov)

### WHAT IS THE CHALLENGE?

With precipitation patterns changing, and rainstorms becoming more intense due to climate change, dams may become increasingly stressed as water volumes increase during these heavy storms. Dam failure, especially higher hazard dams, can have serious impacts including loss of life, economic loss, and environmental damage.

Unlike other major infrastructure which is owned and regulated by the government, it is estimated that 56% of U.S. dams are privately owned (FEMA). These privately owned dams are often not maintained and are found to be in poor condition. The ownership status of these dams presents challenges when working to address necessary improvements.

The Connecticut Dam Safety Regulatory Program works to ensure that state dams are operated and maintained both safely and effectively. The program also requires owners of Class C (high hazard) and Class B (significant hazard) dams to develop an Emergency Action Plan (EAP) and periodically update the EAP.

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

There are over 800 dams in the region, with 40 of these classified as "High Hazard".

An EAP can provide critical information for WestCOG municipalities when planning for dam failure and mitigation strategies. Helpful information includes:

- Inundation maps identifying potential inundation areas
- Lists of streets, roadways, addresses and highways that are subject to flooding.
- Identification of emergency evacuation routes.
- Identifying dam operation personnel responsible for monitoring and emergency response.

Any municipality within the region with a Class B or C dam (or downstream of one) should ensure that EAPs have been filed with municipal offices so this critical information is readily available for both planning and emergency response purposes.

- **Foundation defects** including settlement and slope instability cause about 30% of all U.S. dam failures.
- **Cracking** caused by movements such as the natural settling of a dam.
- Inadequate maintenance and upkeep.
- **Piping** when seepage through a dam is not properly filtered and soil particles continue to progress and form sinkholes in the dam. This accounts for approximately 20% of all U.S. dam failures. Seepage often occurs around hydraulic structures such as pipes and spillways, through animal burrows, around roots of woody vegetation, and through cracks in dams, dam appurtenances, and dam foundations.

### Previous Occurrences

According to the National Performance of Dams Program (NPDP) at Stamford University, there were three (3) recorded dam failure events in Fairfield County and four (4) in Litchfield County between 1877 and 2023. Three known dam failures in the Region include:

- January 31, 1869: The icy surface of the frozen Kohanza Reservoir in Danbury broke and caused the upper Kohanza dam to burst, which in turn caused a flood surge on the lower dam. The flood waters carried ice floes, rocks, and trees that swept away houses and buildings and destroyed three bridges in a matter of minutes, resulting in 13 deaths and \$100,000 in damages as recorded in the February 3, 1869, edition of the New York Herald. An etching of the disaster is presented as Figure 3-29.



**Figure 3-29: Engraving of the Ruins of the Upper Dam of the Kohanza Reservoir in Danbury**

Source: *Harper's Weekly*, February 1869

- According to the NPDP, the Millard Pond Dam in Norwalk on the Five Mile River failed during the 1955 floods.
- A dam failure occurred in Sherman due to flooding in April of 2007. Floodwaters at Rogers Pond Dam (Class BB) overtopped the spillway, resulting in a complete failure that drained the pond. Part of the earthen embankment failed, and the floodwaters cut a breach 30 feet wide and 15 feet deep (Figure 3-30). Minimal downstream damage and no injuries were reported. The dam was originally constructed in 1945 and was repaired following the breach.

Other major dam failures in Connecticut occurred in 1938 and 1955 due to hurricanes; in 1961 (Crystal Lake Dam in Middletown); in 1963 (Spaulding Pond Dam in Norwich); and on June 5-6, 1982 (Bushy Hill Pond Dam in Deep River). The October 7-15, 2005, heavy rainfall caused 14 complete or partial dam failures across northern Connecticut and damage to

another 30 dams across the state. A partial dam breach on the Yantic River occurred in January 2024 in Bozrah, Connecticut, resulting in evacuations downstream in the Town of Bozrah and the City of Norwich.



**Figure 3-30: Rogers Pond Dam Breach in Sherman**  
Source: Town of Sherman

### Probability of Future Events

Dam failures are most likely triggered by another natural disaster or hazard and are unlikely to occur when regular maintenance and inspections are performed. Therefore, dam failures are less likely to occur than the natural disasters that may trigger them. For example, a 1% annual chance flood will not always cause a dam failure because most spillways are designed to pass a greater discharge (such as some fraction of the probable maximum flood event). However, smaller privately owned dams are typically inspected and maintained less often than those owned by municipalities, utilities, and state governments. Therefore, the probability of a major (Class C or Class B) dam failure in the region is believed to be less than 1% over the next 100 years, while the annual probability of a minor dam failure is estimated at 1%.

According to the 2023 CT NHMP, climate change is likely to have significant effects on the hydrograph used for the design of a dam, resulting in reductions to the designed margins of safety, also known as freeboard, for dams. Loss of the designed margin of safety may cause floodwaters to more readily overtop the dam or create unintended loads. Such situations could lead to a dam failure. Climate change may also lead to higher intensity rainfall events and increase the probability of dam failures in Connecticut.

As a result, the failure probability of low hazard, significant hazard, and under-designed high hazard dams may increase.

### Impacts to Community Assets

Not all dams pose a serious threat; the vast majority of dams in the state impound water bodies that, either because of their size or location, would not cause major destruction in the event of a dam failure. All dams are subject to regular inspections mandated by Connecticut DEEP, based on hazard classification. Class C and B dams are required to have Emergency Action Plans prepared to guide response personnel in case a failure is imminent; these plans identify downstream areas at risk.

Of the 825 registered dams in the Region, 40 are Class C. Another 33 are Class B, 120 are Class BB, and the remaining 632 are dams whose failure would have relatively little potential impact on life or property. The 40 class C dams are distributed throughout the region (Table 3-64).

**Table 3-64: Significant and High Hazard Dams**

| <b>Municipality</b> | <b>Class B</b> | <b>Class C</b> | <b>Total</b> |
|---------------------|----------------|----------------|--------------|
| Bethel              | 0              | 1              | 1            |
| Bridgewater         | 0              | 0              | 0            |
| Brookfield          | 0              | 0              | 0            |
| Danbury             | 3              | 8              | 11           |
| Darien              | 1              | 0              | 1            |
| Greenwich           | 2              | 9              | 11           |
| New Canaan          | 1              | 3              | 4            |
| New Fairfield       | 0              | 1              | 1            |
| New Milford         | 3              | 3              | 6            |
| Newtown             | 2              | 1              | 3            |
| Norwalk             | 5              | 1              | 6            |
| Redding             | 0              | 3              | 3            |
| Ridgefield          | 5              | 1              | 6            |
| Sherman             | 2              | 0              | 2            |
| Stamford            | 4              | 3              | 7            |
| Weston              | 1              | 1              | 2            |
| Westport            | 3              | 1              | 4            |
| Wilton              | 1              | 4              | 5            |
| <b>WestCOG</b>      | <b>33</b>      | <b>40</b>      | <b>73</b>    |

Source: Connecticut DEEP

All but four municipalities in the region have at least one Class C dam. Bridgewater, Brookfield, Darien, and Sherman do not house a Class C dam, but Bridgewater and Brookfield are downstream of Class C dams. Figure 3-11 shows the location and class of each dam in the Region.

Failure of any of the dams or dikes that impound Candlewood Lake could significantly impact areas of Danbury, Bethel, Brookfield, New Milford, and Bridgewater. Candlewood Lake was formed to provide water supply storage for hydroelectric power generation, but it is also a significant recreational resource. The Emergency Action Plan (EAP) for the project includes inundation mapping depicting sunny-day and worst-case scenarios. Loss estimates for failure of the Danbury Dike and New Milford Dam were calculated using HAZUS-MH in the previous single-jurisdiction HMPs.

- Under the worst-case scenario failure of the Danbury Dike, over peak flood heights of over 20 feet could be expected downstream in Danbury, and approximately 100 buildings in Brookfield would be substantially damaged or destroyed, resulting in \$206 million in damage. Additional minor damage would be expected in Bethel along the Sympaug Brook corridor.
- Under the worst-case scenario for the dam in New Milford, approximately 190 buildings in New Milford would be substantially damaged or destroyed, resulting in \$146 million in damage; approximately 70 buildings in Newtown would be substantially damaged or destroyed, resulting in \$28 million in damage; additional minor damage would be expected in Bridgewater, and flooding along the Still River would be expected in Brookfield.

Other dams whose failure could potentially cause significant damage in the region include:

- The Samuel Senior Dam, whose failure would affect downstream areas in Weston and Westport. This dam had substantial repairs performed in 2014 and 2015.

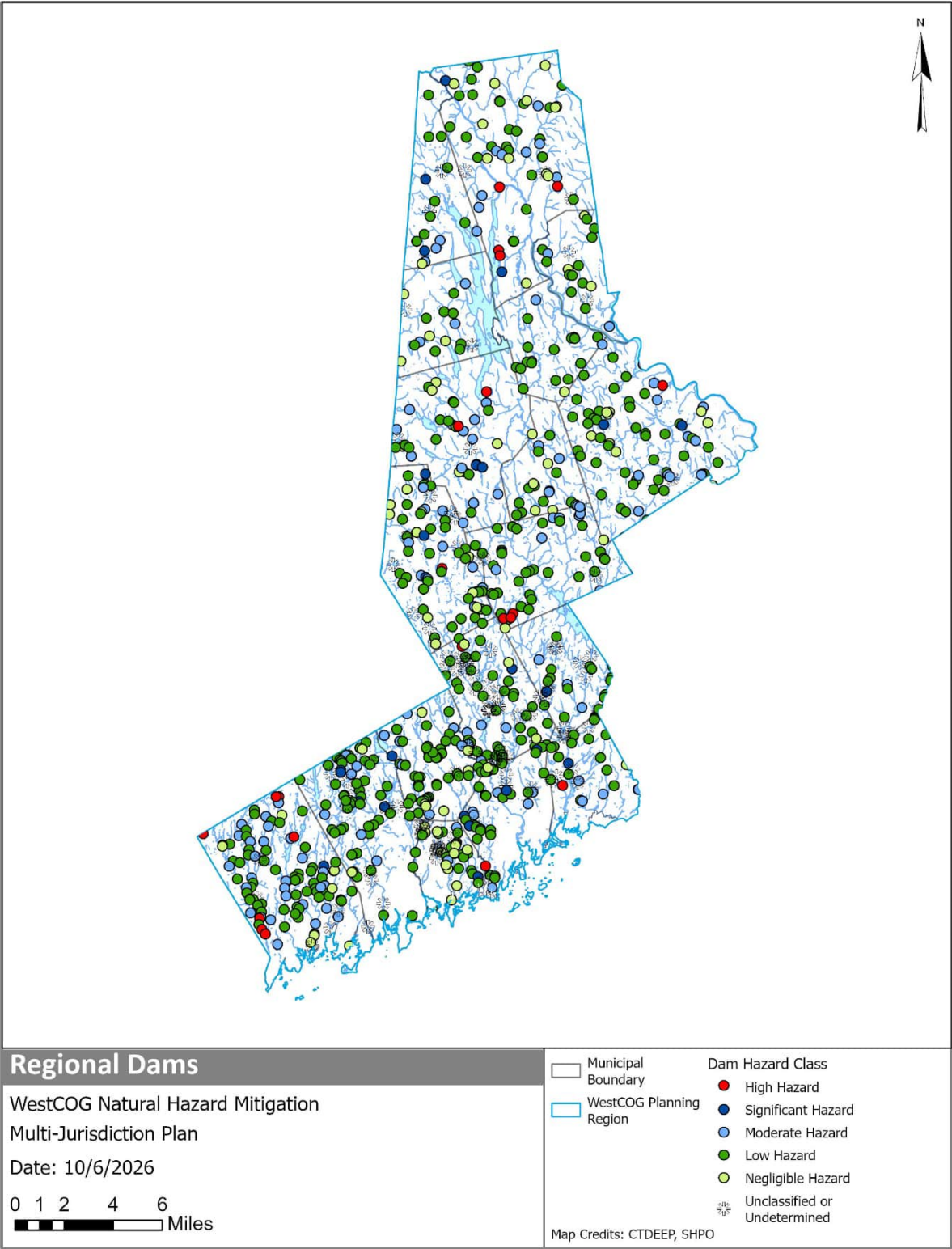


Figure 3-31: Map of Dams in WestCOG

- Areas downstream of the Browns Reservoir Dam (in Lewisboro, NY) and the John D. Milne, and Grupes Reservoir Dams in New Canaan in New Canaan, Wilton, and Norwalk. These reservoir dams are owned by the City of Norwalk First Taxing District.

#### Affected Population

Once a dam collapses, the damage it causes largely depends on the types of land uses downstream. While the Sherman dam primarily damaged undeveloped areas, the Danbury failure was a disaster that greatly affected developed areas of the city. Not only can buildings downstream be inundated by the resulting flooding, but they can also be damaged by the violent torrent of water, which acts like a battering ram. Utility connections can be severed, in turn causing fires and power outages; people can be injured or even killed by rushing waters and the ice or debris carried therein.

Furthermore, failure of a reservoir dam could result in a water supply emergency for the affected utility. Refer to the risk assessment section for flooding (Section 3.3.2) for more information.

#### Loss Estimates

Due to the relatively minimal historic record of dam failure events that estimate or report damages specific to dam failure, it is challenging to reliably quantify annualized loss estimates. According to the NPDP, four dam failures caused approximately \$150,000 in damage in Litchfield County between 1877 and 2023. In Fairfield County, three dam failures are recorded, but no damage figures are reported.

Estimated annualized losses from dam failure were allocated across WestCOG municipalities based on NPDP figures presented in the 2023 State HMP using a three-step process. First, the total statewide dam failure losses reported in the 2023 State HMP (\$4,785,830) were divided by the 146-year period of record, resulting in a statewide annualized loss estimate of \$32,780. That statewide estimate was then prorated to the county level based on the share of residents living within mapped dam failure inundation zones: 170,523 in Fairfield County and 30,952 in Litchfield County, compared with 413,351 statewide. This produced county-level annualized loss estimates of \$13,523 for Fairfield County and \$2,455 for Litchfield County. Finally, each county-level estimate was allocated to individual WestCOG municipalities based on each municipality's share of its county's 2020 Census population.

The annualized loss estimates due to dam failure in each WestCOG municipality based on this method, are presented in Table 3-65.

**Table 3-65: Annualized Dam Failure Loss Estimates**

| Municipality  | Annualized Loss |
|---------------|-----------------|
| Bethel        | \$658           |
| Bridgewater   | \$22            |
| Brookfield    | \$567           |
| Danbury       | \$2,797         |
| Darien        | \$695           |
| Greenwich     | \$2,053         |
| New Canaan    | \$667           |
| New Fairfield | \$439           |
| New Milford   | \$909           |
| Newtown       | \$360           |
| Norwalk       | \$1,209         |
| Redding       | \$116           |
| Ridgefield    | \$332           |

| Municipality   | Annualized Loss |
|----------------|-----------------|
| Sherman        | \$47            |
| Stamford       | \$1,796         |
| Weston         | \$137           |
| Westport       | \$360           |
| Wilton         | \$245           |
| <b>WestCOG</b> | <b>\$13,408</b> |

Source: CT NHMP

### 3.2.11 Extreme Temperatures

#### Extreme Heat

Extreme heat is typically a summer phenomenon that involves substantially hotter temperatures and/or more humid than average weather for a location at that time of year. The NWS can issue heat-related messages to inform citizens of forecasted extreme heat conditions.

These messages are based on projected or observed heat index values and include:

- Excessive Heat Outlook: When there is a potential for an excessive heat event within three to seven days;
- Excessive Heat Watch: When conditions are favorable for an excessive heat event within 12 to 48 hours, but some uncertainty exists regarding occurrence and timing; and
- Excessive Heat Warning / Advisory: When an excessive heat event is expected within 36 hours. These messages are usually issued when confidence is high that the event will occur. A warning implies that conditions could pose a threat to life or property, while an advisory is issued for less serious conditions that may cause discomfort or inconvenience but could still lead to threat to life and property if caution is not taken.

#### Extreme Cold

Extreme cold events occur when temperatures drop well below normal in an area for a period of time. Extremely cold air comes every winter and affects millions of people across the United States. This arctic air, together with brisk winds, can lead to dangerously cold wind chill values. People exposed to extreme cold are susceptible to frostbite in a matter of minutes. Areas of the body most prone to frostbite are uncovered skin and the extremities, such as hands and feet. Hypothermia is another threat during extreme cold. Hypothermia occurs when the body loses heat faster than it can produce.

Cold weather can also affect crops. In late spring or early fall, cold air outbreaks can damage or kill produce for farmers, as well as residential plants and flowers. A freeze occurs when the temperature drops below 32°F. Freezes and their effects are significant during the growing season. Frost develops on clear, calm nights and can occur when the air temperature is in the mid-30s. Each plant species has a different tolerance to cold temperatures (<https://www.weather.gov/safety/cold>).

#### Location

The entire WestCOG region is at risk of extreme temperatures.

The entire WestCOG region is vulnerable to extreme heat, but particularly the urban communities with high levels of impervious surfaces and little vegetation. This combination can produce a “heat island” effect with increased temperatures and few opportunities to seek respite from heat. CIRCA has developed a Climate Change Vulnerability Index that combines built, social, and ecological factors to identify areas that are vulnerable to the extreme heat impacts of climate change. This statewide tool can be used to view vulnerability at a regional scale. More information about the CIRCA Climate Change Vulnerability Index can be found here: <https://resilientconnecticut.uconn.edu/ccvi/>.

According to the 2023 CT NHMP, Litchfield County has the most reported extreme cold and cold events in the state.

### Extent

The “heat index” or “apparent temperature” is often used to measure how hot the air “feels” based on temperature and humidity. The index can be used as an indicator of potential health effects (Figure 3-32).

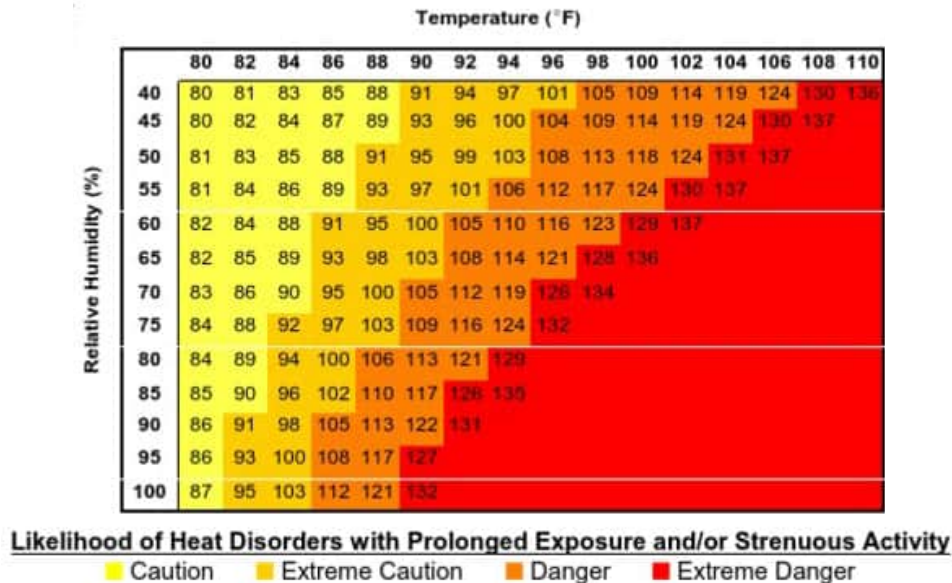


Figure 3-32. NWS Heat Index Chart

The NWS Wind Chill Temperature chart uses advances in science, technology, and computer modeling to provide an accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures. The chart does the following:

- Calculates wind speed at an average height of 5 feet, the typical height of an adult human face, based on readings from the national standard height of 33 feet, the typical height of an anemometer
- Is based on a human face model
- Incorporates heat transfer theory based on heat loss from the body to its surroundings, during cold and breezy/windy days
- Lowers the calm wind threshold to 3 mph
- Uses a consistent standard for skin tissue resistance
- Assumes no impact from the sun, i.e., clear night sky.

The existing systems for classifying and declaring extreme temperature risks are appropriate for the WestCOG region. Extreme temperatures have not been characterized outside of these systems of classification. Furthermore, the communities of the region are using these risk products and warnings to determine when warming and cooling centers should be opened.



## Wind Chill Chart

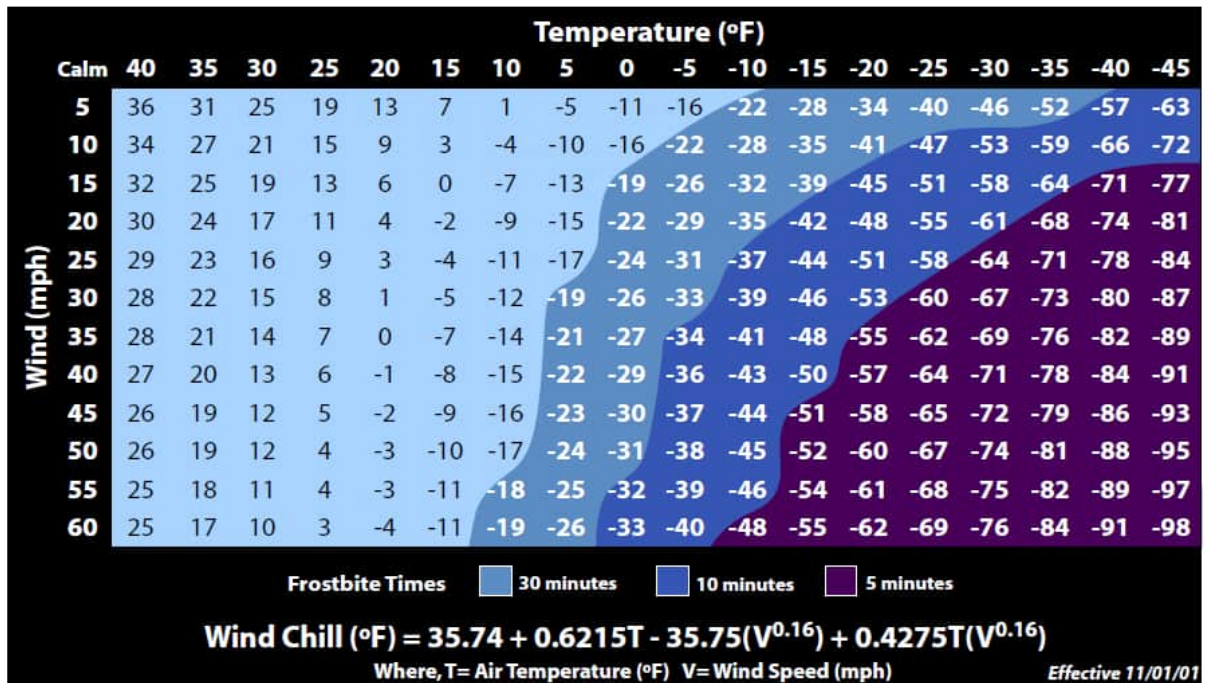


Figure 3-33: NWS Wind Chill Chart

### Previous Occurrences

In Connecticut, extreme heat events typically occur in summer. The impact of these events can affect the local population, tourism industry, and agricultural industry. NOAA indicates that there are between seven and 10 days above 90 degrees in summer in Connecticut. The hottest temperature on record in Connecticut is 106 degrees Fahrenheit, occurring in Danbury, on July 15, 1995. That same record temperature was reached again in August of 1916 in Torrington. The NOAA NCEI Storm Events Database has recorded only four occurrences of high excessive heat in the WestCOG Region since 1998, all of which occurred in July. This list is not intended to be a full account of previous events. Rather provides examples of historic heat events that will very likely repeat in the future.

- July 22, 2011: Excessive heat between 95 and 105 degrees, along with heat indices in excess of 105 degrees occurred. The heat index was as high as 108 degrees at 3 PM at New Haven Airport (KHVN), and 107 degrees at 2 PM at Groton Airport in New London on July 22nd. An oppressive, hot, and humid air mass produced excessive heat, resulting in daytime temperatures of 95 to 105 degrees and nighttime lows in the 70s and 80s.
- July 1, 2018: The Automated Weather Observing System (AWOS) at Chester reported heat indices of 105 to 109 during the afternoon hours. A Bermuda high pumped in heat and high humidity across the area.
- July 20, 2019: The AWOS at Chester reported heat indices of 105 to 109 during the afternoon hours. A Bermuda high pumped in heat and high humidity across the area.
- July 21, 2019: The KSNC AWOS recorded a heat index between 105 and 110 from 1400 and 1900 hours. A Bermuda High pumped in a hot and humid air mass northward into the area.

Even fewer extreme cold temperatures were listed in the NOAA NCEI database, for the same period of record, with only three events listed; two of which were in January of 2000 and one in February of 2023. The coldest recorded days in Connecticut were in 1943 and 1961, with the record setting temperature of negative 32 degrees Fahrenheit. Temperatures with below zero wind chill values were recorded as recently as February 2023.

### Probability of Future Events

Extreme heat and heat waves are *very likely* during the summer months in the communities within the WestCOG region. As global temperatures continue to rise, heat waves are likely to occur more frequently in the future.

Extreme temperatures are often unpredictable and may be localized, making it difficult to assess their probability. Based on historical records, the WestCOG Region is estimated to experience an extreme temperature event once every five years.

Extreme temperature events can occur simultaneously with drought and winter storms, but one can occur without the other. While extreme temperature events can cause death to any person of any age, the elderly, very young, and mobility restricted are considered the most at risk.

According to the CT NHMP, the average annual temperature in Connecticut has increased by 3.5°F since 1900. Historically unprecedented warming is projected to continue through this century. Less warming is expected under a lower emissions future (the coldest end-of-century projections being about 2°F warmer than the historical average) and more warming under a higher emissions future (the hottest end-of-century projections being about 10°F warmer than the hottest year in the historical record). Higher temperatures will cause environmental changes, including:

- Hotter nights, which can be especially dangerous.
- More heat waves
- Bad ground-level ozone (smog) days

According to the WestCOG Climate and Stormwater Hazard Assessment:

- By 2050, in a high CO<sub>2</sub>-emissions scenario (RCP 8.5), average temperatures are expected to rise by approximately 5°F and continue to rise thereafter.
- Heat Wave Days (6 or more consecutive days with daily maximum temperatures above the 90th percentile) are expected to rise from 4 days annually to 48 days annually by 2050.
- Summer Days (the annual number of days when the daily maximum temperature is above 77°F) are projected to rise from 81 days annually to 118 days annually by 2050.
- Tropical Nights (the annual number of days where the daily minimum is below 68°F) are projected to rise from 10 days annually to 40 days annually by 2050.

The 2023 CT NHMP reports that climate change is expected to cause inland and northern areas of the state to experience fewer cold extremes, and those cold extremes will become less intense. Extreme cold waves are expected to decrease in frequency and duration with continued winter warming. These changes will reduce the number of cold-related deaths.

### National Risk Index

The NRI provides relative risk levels for cold waves and heat waves. Results are presented below.

## Cold Wave

FEMA's NRI was utilized to obtain information for a risk analysis on cold wave at the census tract level across WestCOG. Figure 3-34 displays the risk rating by census tract in the WestCOG region for cold wave.

Cold wave risk in the WestCOG region ranges from very low to relatively low. Table 3-66 shows a breakdown of community risk in WestCOG by census tract.

**Table 3-66: Community risk ratings for cold wave, breakdown by census tracts**

| Community      | Total Census Tracts | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk |
|----------------|---------------------|--------------------------------------------|--------------------------------------------------|
| Bethel         | 4                   | -                                          | 4                                                |
| Bridgewater    | 1                   | -                                          | 1                                                |
| Brookfield     | 3                   | -                                          | 3                                                |
| Danbury        | 20                  | 1                                          | 19                                               |
| Darien         | 5                   | 4                                          | 1                                                |
| Greenwich      | 15                  | 6                                          | 9                                                |
| New Canaan     | 5                   | 2                                          | 3                                                |
| New Fairfield  | 3                   | -                                          | 3                                                |
| New Milford    | 5                   | -                                          | 5                                                |
| Newtown        | 6                   | 1                                          | 5                                                |
| Norwalk        | 22                  | 4                                          | 18                                               |
| Redding        | 2                   | -                                          | 2                                                |
| Ridgefield     | 6                   | 2                                          | 4                                                |
| Sherman        | 1                   | -                                          | 1                                                |
| Stamford       | 33                  | 7                                          | 26                                               |
| Weston         | 2                   | -                                          | 2                                                |
| Westport       | 7                   | 5                                          | 2                                                |
| Wilton         | 5                   | 1                                          | 4                                                |
| <b>WestCOG</b> | <b>145</b>          | <b>33</b>                                  | <b>112</b>                                       |

Figure 3-35 shows the expected annual loss ratings throughout the COG based on the NRI for cold wave.

Table 3-67 describes the projected annualized losses from cold wave by community. The highest expected annual losses due to cold wave are within the cities of Stamford and Danbury, each of which have over \$11,000 in expected annual loss. The WestCOG region has a total expected annual loss of approximately \$71,211.

**Table 3-67: Breakdown of NRI expected annual losses from cold wave by community**

| Community     | Expected Annual Loss | Community      | Expected Annual Loss |
|---------------|----------------------|----------------|----------------------|
| Bethel        | \$2,708              | Newtown        | \$3,958              |
| Bridgewater   | \$650                | Norwalk        | \$7,826              |
| Brookfield    | \$2,413              | Redding        | \$1,299              |
| Danbury       | \$11,238             | Ridgefield     | \$3,297              |
| Darien        | \$1,869              | Sherman        | \$581                |
| Greenwich     | \$5,209              | Stamford       | \$11,644             |
| New Canaan    | \$1,825              | Weston         | \$1,366              |
| New Fairfield | \$1,772              | Westport       | \$2,401              |
| New Milford   | \$8,713              | Wilton         | \$2,442              |
| --            | --                   | <b>WestCOG</b> | <b>\$71,211</b>      |

### Cold Wave Risk

- Relatively Low
- Very Low

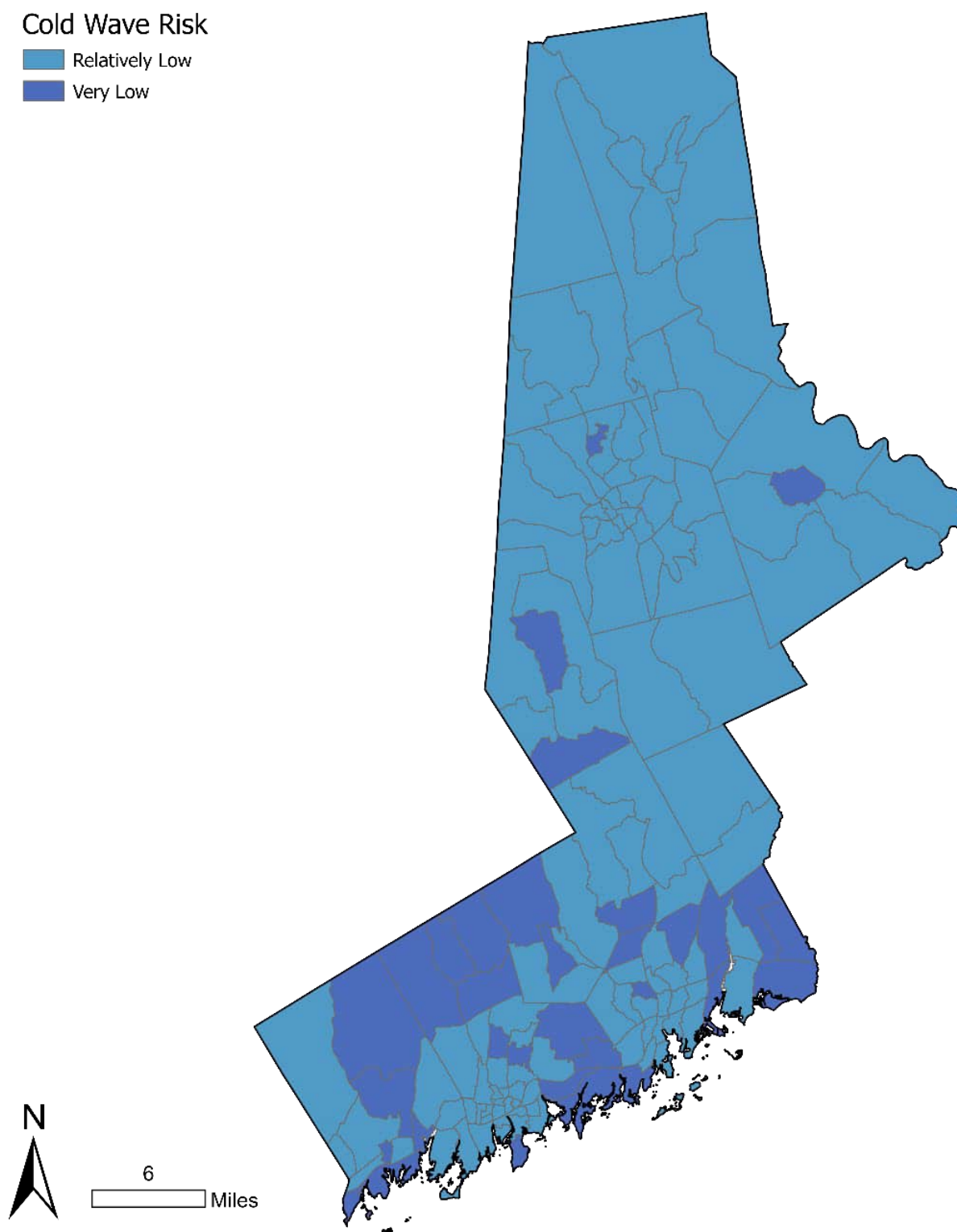


**Figure 3-34: Risk Rating for cold wave shown at the census tract level**

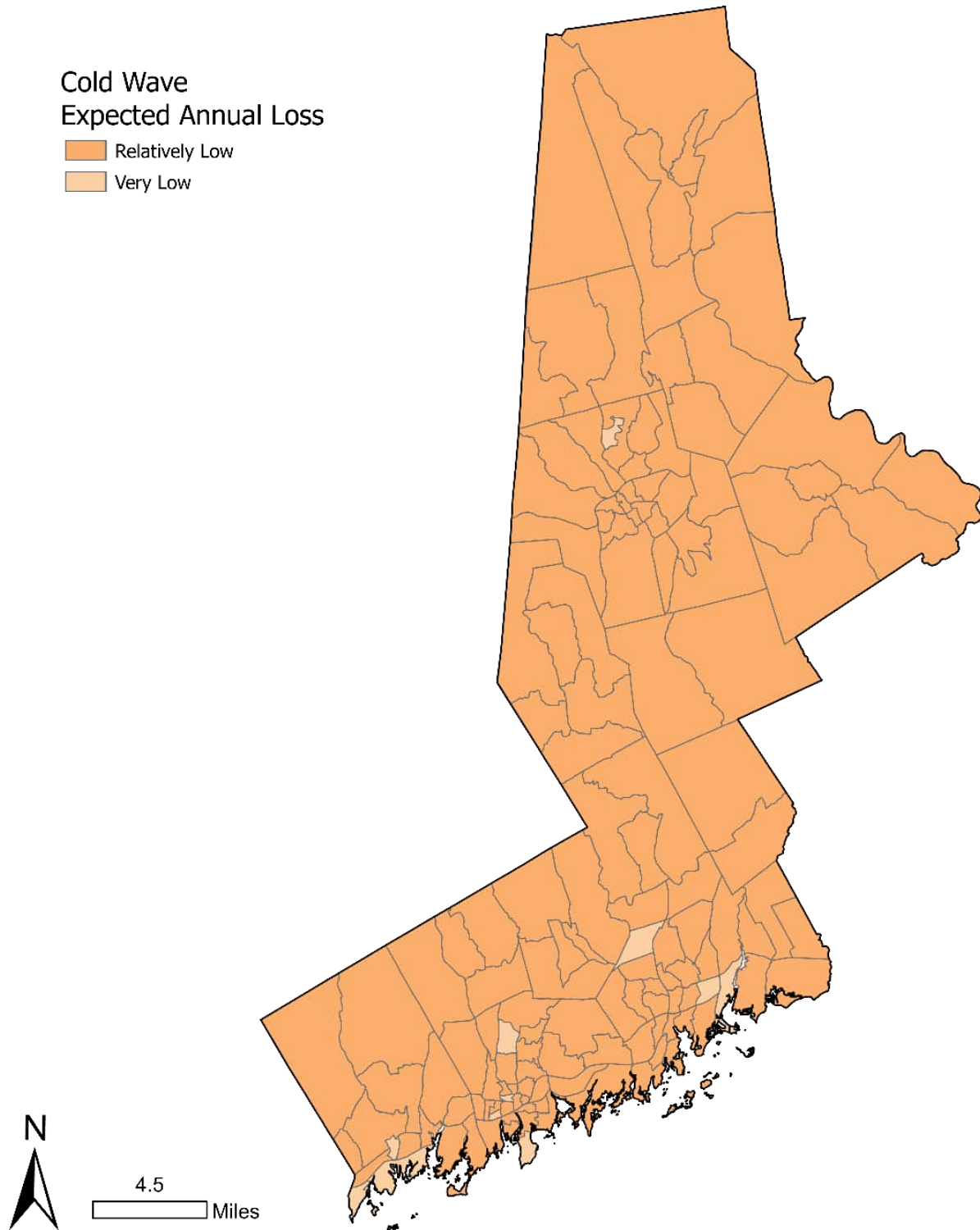


**Figure 3-35: NRI Cold Wave Expected Annual Loss Rating**

## Heat Wave

FEMA's NRI was utilized to obtain information for a risk analysis on heat wave at the census tract level across WestCOG. Figure 3-36 displays the risk rating by census tract in the WestCOG region for heat wave.

Heat wave risk in the WestCOG region ranges from very low to relatively low with the majority of census tracts at a relatively low risk to heat wave. Table 3-68 shows a breakdown of community risk in WestCOG by census tract.

**Table 3-68: Community risk ratings for heat wave, breakdown by census tracts**

| Community      | Total Census Tracts | Number of Census Tracts with Very Low Risk | Number of Census Tracts with Relatively Low Risk |
|----------------|---------------------|--------------------------------------------|--------------------------------------------------|
| Bethel         | 4                   | -                                          | 4                                                |
| Bridgewater    | 1                   | 1                                          | -                                                |
| Brookfield     | 3                   | -                                          | 3                                                |
| Danbury        | 20                  | -                                          | 20                                               |
| Darien         | 5                   | -                                          | 5                                                |
| Greenwich      | 15                  | 1                                          | 14                                               |
| New Canaan     | 5                   | -                                          | 5                                                |
| New Fairfield  | 3                   | -                                          | 3                                                |
| New Milford    | 5                   | 1                                          | 4                                                |
| Newtown        | 6                   | -                                          | 6                                                |
| Norwalk        | 22                  | -                                          | 22                                               |
| Redding        | 2                   | -                                          | 2                                                |
| Ridgefield     | 6                   | -                                          | 6                                                |
| Sherman        | 1                   | -                                          | 1                                                |
| Stamford       | 33                  | -                                          | 33                                               |
| Weston         | 2                   | -                                          | 2                                                |
| Westport       | 7                   | -                                          | 7                                                |
| Wilton         | 5                   | -                                          | 5                                                |
| <b>WestCOG</b> | <b>145</b>          | <b>3</b>                                   | <b>142</b>                                       |

Figure 3-37 shows the expected annual loss ratings throughout the COG based on the NRI for heat wave.

Table 3-69 describes the projected annualized losses from heat wave by community. The highest expected annual loss due to heat wave is within the City of Stamford, with over \$90,000 in expected annual loss. The WestCOG region has a total expected annual loss of approximately \$419,437.

**Table 3-69: Breakdown of NRI expected annual losses from heat wave by community**

| Community     | Expected Annual Loss | Community      | Expected Annual Loss |
|---------------|----------------------|----------------|----------------------|
| Bethel        | \$15,324             | Newtown        | \$20,806             |
| Bridgewater   | \$252                | Norwalk        | \$61,860             |
| Brookfield    | \$13,272             | Redding        | \$6,726              |
| Danbury       | \$64,844             | Ridgefield     | \$18,794             |
| Darien        | \$14,557             | Sherman        | \$2,769              |
| Greenwich     | \$40,383             | Stamford       | \$92,021             |
| New Canaan    | \$14,072             | Weston         | \$7,762              |
| New Fairfield | \$10,190             | Westport       | \$18,490             |
| New Milford   | \$3,437              | Wilton         | \$13,878             |
| --            | --                   | <b>WestCOG</b> | <b>\$419,437</b>     |

### Heat Wave Risk

- Relatively Low
- Very Low

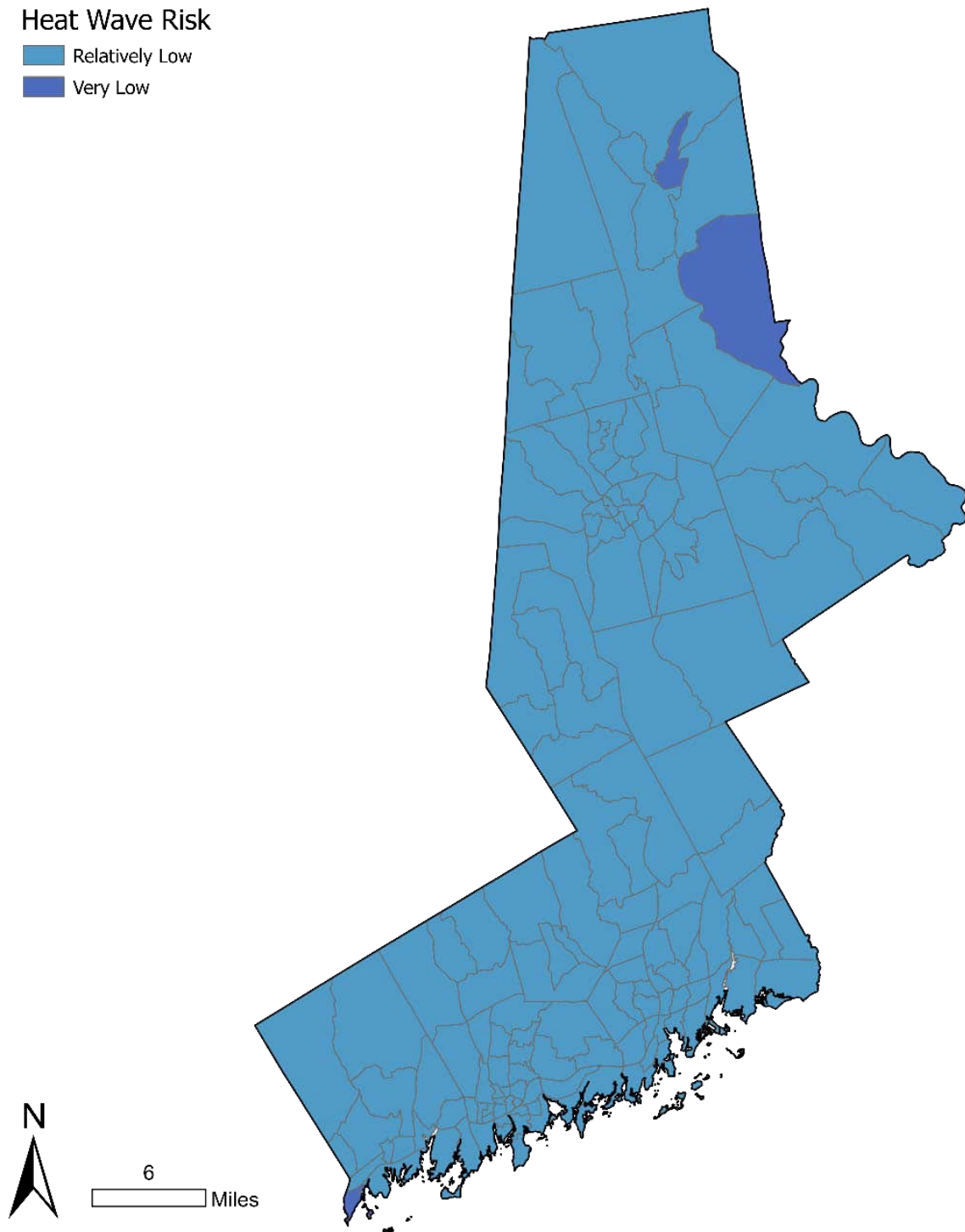


**Figure 3-36: Risk Rating for heat wave shown at the census tract level**

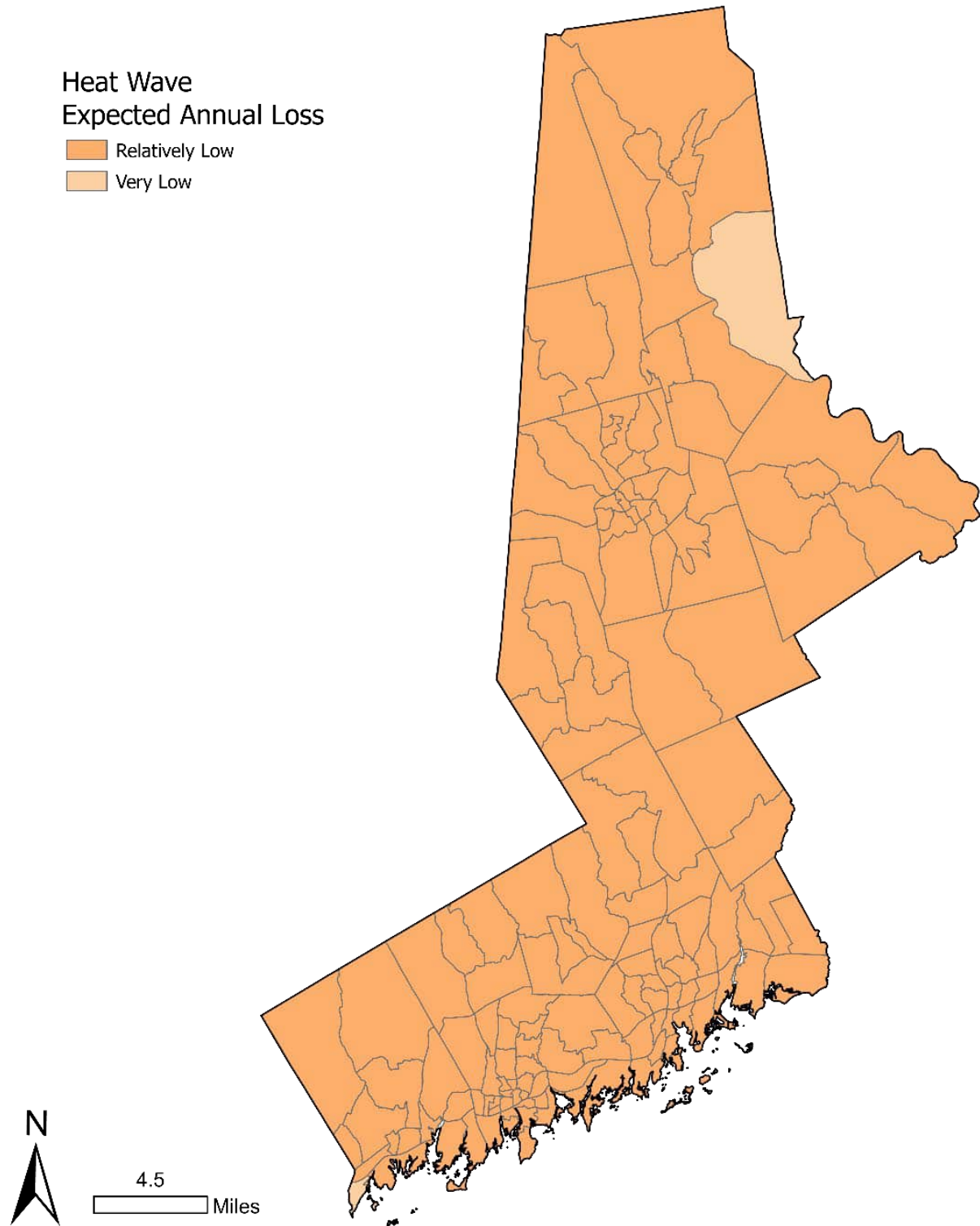


Figure 3-37: NRI Heat Wave Expected Annual Loss Rating

### 3.3 Overall Hazard Risk

This document has been prepared with the understanding that a single hazard effect may be caused by multiple hazard events. For example, flooding may occur as a result of heavy rain, a hurricane, or a winter storm. Thus, Tables 3-70 and 3-71 provide summaries of the hazard events and hazard effects that impact the Region, including criteria for characterizing the locations impacted by the hazards, the frequency of occurrence of the hazards, and the magnitude or severity of the hazards. The information collected and evaluated in Section 3.1, Section 3.2, and in Section 3.3 were used to quantify the summaries.

Furthermore, it is understood that each natural hazard may have multiple effects; for example, a hurricane causes high wind and flooding. Some hazards can also have similar effects; for example, hurricanes and earthquakes both can potentially cause dam failure. Based on the rankings in Table 3-70 and Table 3-71, information regarding structures and populations at risk, hazard information in the historic record, and the available loss estimates, each hazard is provided with an overall qualitative summary rank of risk. This is provided by community in Table 3-72 as some communities may feel lesser effects from certain hazards than others.

**Table 3-70: Hazard Event Ranking**

| Hazard Event                   | Location <sup>1</sup> | Freq. of Occur. <sup>2</sup> | Magnitude or Severity <sup>3</sup> | Rank |
|--------------------------------|-----------------------|------------------------------|------------------------------------|------|
| Winter Storms                  | 3                     | 3                            | 2                                  | 8    |
| Hurricanes/<br>Tropical Storms | 3                     | 2                            | 3                                  | 8    |
| Drought                        | 3                     | 2                            | 1                                  | 6    |
| Earthquakes                    | 3                     | 2                            | 1                                  | 6    |
| Thunderstorms                  | 2                     | 3                            | 1                                  | 6    |
| Tornadoes                      | 1                     | 2                            | 3                                  | 6    |
| Dam Failure                    | 1                     | 0                            | 4                                  | 5    |
| Wildfires                      | 1                     | 1                            | 1                                  | 3    |
| Extreme Temperatures           | 3                     | 2                            | 1                                  | 6    |

<sup>1</sup> Small (1) affects an isolated to specific area during one event. Medium (2) affects a slightly larger area or multiple areas during one event. Large (3) affects most or all of the community during one event.

<sup>2</sup> Unlikely (0) has a less than 1% probability in the next 100 years. Possible (1) has between a 1% and 10% probability, or at least one chance in the next 100 years. Likely (2) has a greater than 10% probability, or at least one chance in the next 10 years. Highly Likely (3) is expected at least once per year.

<sup>3</sup> Limited (1) means injuries and/or illnesses are treatable with first aid; minor quality of life loss; shutdown of critical facilities for 24 hours or less; less than 10% of property severely damaged. Significant (2) means injuries and/or illnesses do not result in permanent disability; shutdown of critical facilities for less than 2 weeks; 10% to 25% of property severely damaged. Critical (3) means injuries and/or illnesses result in permanent disability; critical facilities shut down for more than 2 weeks; 25% to 50% of property severely damaged. Catastrophic (4) means multiple deaths, shutdown of critical facilities for more than 1 month; more than 50% of property severely damaged.

**Table 3-71: Hazard Effect Ranking**

| Hazard Effect                   | Location <sup>1</sup> | Freq. of Occur. <sup>2</sup> | Magnitude or Severity <sup>3</sup> | Rank |
|---------------------------------|-----------------------|------------------------------|------------------------------------|------|
| Severe Winds                    | 3                     | 3                            | 2                                  | 8    |
| Snow                            | 3                     | 3                            | 2                                  | 8    |
| Blizzard                        | 3                     | 2                            | 2                                  | 7    |
| Coastal Flooding                | 2                     | 3                            | 2                                  | 7    |
| Riverine Flooding               | 2                     | 3                            | 2                                  | 7    |
| Falling Trees / Branches        | 2                     | 3                            | 2                                  | 7    |
| Hurricane Wind                  | 3                     | 1                            | 3                                  | 7    |
| Disruption of Normal Activities | 1                     | 3                            | 2                                  | 6    |
| Ice                             | 3                     | 2                            | 1                                  | 6    |
| Major Dam Failure               | 2                     | 0                            | 4                                  | 6    |
| Ground Shaking                  | 3                     | 1                            | 2                                  | 6    |
| Crop Loss                       | 2                     | 2                            | 1                                  | 5    |
| Hail                            | 2                     | 2                            | 1                                  | 5    |
| Lightning                       | 1                     | 3                            | 1                                  | 5    |
| Nuisance Flooding               | 1                     | 3                            | 1                                  | 5    |
| Post-Event Trauma               | 2                     | 1                            | 2                                  | 5    |
| Tornado Wind                    | 1                     | 1                            | 3                                  | 5    |
| Extreme Cold                    | 3                     | 1                            | 1                                  | 4    |
| Extreme Heat                    | 3                     | 1                            | 1                                  | 4    |
| Fire / Heat / Smoke             | 1                     | 2                            | 1                                  | 4    |
| Tsunami                         | 2                     | 1                            | 1                                  | 4    |
| Landslide                       | 1                     | 1                            | 1                                  | 3    |
| Minor Dam Failure               | 1                     | 1                            | 1                                  | 3    |

Note: 1, 2, and 3 are the same as the table above.

**Table 3-72: Qualitative Summary of Hazard Risk**

| Municipality  | Riverine Flooding | Coastal Flooding | Winter Storms | Tropical Cyclones & Hurricanes | Tornadoes | Thunderstorms | Wildfires | Drought | Earthquakes | Dam Failure | Extreme Temperatures |
|---------------|-------------------|------------------|---------------|--------------------------------|-----------|---------------|-----------|---------|-------------|-------------|----------------------|
| Bethel        | M                 | -                | M             | H                              | L         | M             | L         | L       | M           | L           | L                    |
| Bridgewater   | L                 | -                | L             | M                              | M         | L             | M         | L       | L           | L           | L                    |
| Brookfield    | L                 | -                | M             | H                              | L         | M             | M         | L       | M           | L           | M                    |
| Danbury       | H                 | -                | H             | H                              | M         | M             | L         | L       | H           | L           | H                    |
| Darien        | M                 | H                | M             | H                              | L         | M             | L         | L       | M           | L           | M                    |
| Greenwich     | M                 | H                | M             | H                              | L         | M             | L         | L       | H           | L           | H                    |
| New Canaan    | M                 | -                | M             | H                              | L         | M             | L         | L       | H           | L           | M                    |
| New Fairfield | M                 | -                | M             | H                              | L         | M             | M         | L       | M           | L           | L                    |
| New Milford   | M                 | -                | M             | H                              | H         | M             | M         | M       | M           | L           | L                    |

| Municipality   | Riverine Flooding | Coastal Flooding | Winter Storms | Tropical Cyclones & Hurricanes | Tornadoes | Thunderstorms | Wildfires | Drought  | Earthquakes | Dam Failure | Extreme Temperatures |
|----------------|-------------------|------------------|---------------|--------------------------------|-----------|---------------|-----------|----------|-------------|-------------|----------------------|
| Newtown        | M                 | -                | H             | H                              | L         | M             | M         | L        | M           | L           | M                    |
| Norwalk        | M                 | H                | M             | H                              | M         | M             | L         | L        | H           | L           | H                    |
| Redding        | M                 | -                | M             | H                              | L         | L             | M         | L        | M           | L           | L                    |
| Ridgefield     | M                 | -                | M             | H                              | L         | M             | M         | L        | H           | L           | M                    |
| Sherman        | M                 | -                | L             | M                              | L         | L             | M         | L        | M           | L           | L                    |
| Stamford       | M                 | H                | H             | H                              | M         | M             | L         | L        | H           | L           | H                    |
| Weston         | M                 | -                | M             | H                              | L         | L             | M         | L        | M           | L           | L                    |
| Westport       | M                 | H                | M             | H                              | L         | M             | L         | L        | H           | L           | M                    |
| Wilton         | M                 | -                | M             | H                              | L         | M             | M         | L        | H           | L           | M                    |
| <b>WestCOG</b> | <b>M</b>          | <b>H</b>         | <b>M</b>      | <b>H</b>                       | <b>M</b>  | <b>M</b>      | <b>M</b>  | <b>L</b> | <b>H</b>    | <b>L</b>    | <b>M</b>             |

Note: L = Low, M = Moderate, H = High

Risk is a product of frequency and vulnerability, and sometimes the equation includes consequences. The breakdown of the summary rankings is as follows:

- **High** risk hazards typically affect the entire community and/or have repeated impacts year to year or are less frequent but highly damaging events.
- **Moderate** risk hazards typically affect all or portions of the community and have repeated impacts from year to year that are not particularly damaging.
- **Low** risk hazards typically affect only a limited area of a community or are generally infrequent.

The WestCOG municipalities believe that coastal flooding, riverine flooding, winter storms, and tropical cyclones and hurricanes present the highest risk to Region. Thunderstorms, tornadoes, earthquakes, wildfires, and extreme temperatures present an overall moderate risk. The remaining hazards and effects evaluated in this Plan present a relatively low risk to the region. The number of strategies and actions identified by each community in the annexes tends to be greater for the higher risk hazards than for the lower risk hazards, as expected from the level of risk.

## 4.0 Existing Capabilities

Hazard mitigation is accomplished at the federal, state, regional, and local levels. While most activities to mitigate hazard risk take place at the local level, other entities also have an important role to play in reducing vulnerability to natural hazards, as well as floodplain management. For example, projects listed in this Plan update may be eligible for certain federal grant programs. The following sections highlight existing capabilities that promote hazard mitigation in the Region.

### Capabilities

According to FEMA, each community has a unique set of capabilities, including authorities, policies, programs, staff, funding, and other resources available to accomplish mitigation and reduce long-term vulnerability. These can include both local capabilities as well as planning and regulatory authorities at the regional, state, and federal levels.

### 4.1 Federal

There are numerous federal strategies in place to mitigate the effects of natural hazards. In addition to the HMA grant programs identified in Section 7.1, grant funding and technical resources are available through the U.S. Fire Administration, the U.S. Fish and Wildlife Service, USACE, and other federal agencies as discussed in Section 7.2 and Section 7.3. Specific federal programs that contribute to mitigation on a daily basis are discussed below.

Of note, FEMA has prepared the document *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*. This document is available for download from FEMA<sup>1</sup> and provides a resource that communities can use to identify and evaluate a range of potential mitigation actions to reduce risk from natural hazards and disasters. In addition, FEMA<sup>2</sup> has prepared a Risk Management Series brochure that outlines various publications on natural disasters.

#### 4.1.1 Flood Mitigation

Mitigation for flooding is provided by programs through FEMA and its NFIP, the NWS, the USACE, and the NRCS.

#### National Flood Insurance Program

One of the most effective methods of property protection for existing homes is for the homeowner to purchase flood insurance through the NFIP. While insurance does not prevent flooding, insurance payouts assist homeowners in restoring their properties more quickly than could be performed with savings alone. The NFIP was created by the U.S. Congress in 1968 to help provide a means for property owners to financially protect themselves from the impacts of flooding.

For more information about the NFIP, visit <https://www.floodsmart.gov/>

The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP. Participating communities agree to adopt and enforce ordinances that meet or exceed the minimum federal requirements to reduce the risk of flooding. Each of the WestCOG municipalities has continually participated in the NFIP since the dates the initial Flood Hazard Boundary Maps were developed for their communities, as detailed in Table 4-1, and each municipality plans to continue its participation in the NFIP for the foreseeable future using the FIRMs developed by FEMA. Preliminary FIS and FIRM products have been issued for the 16 municipalities in Fairfield County, but they have not been approved (by FEMA) for adoption and are not yet effective.

<sup>1</sup> [https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas\\_02-13-2013.pdf](https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas_02-13-2013.pdf)

<sup>2</sup> [https://www.fema.gov/sites/default/files/2020-07/rms\\_pubs\\_brochure\\_3\\_07\\_0.pdf](https://www.fema.gov/sites/default/files/2020-07/rms_pubs_brochure_3_07_0.pdf)

**Table 4-1: NFIP Status**

| Municipality  | Initial FHB<br>Identified | Initial FIRM<br>Identified | Current<br>Effective<br>Map Date | Pending Study and Map<br>Dates |
|---------------|---------------------------|----------------------------|----------------------------------|--------------------------------|
| Bethel        | 4/5/1974                  | 2/15/1984                  | 6/18/2010                        | Preliminary FIS 7/26/23        |
| Bridgewater   | 12/6/1974                 | 11/1/1979                  | 11/1/1979                        | ---                            |
| Brookfield    | 7/26/1974                 | 6/15/1979                  | 6/18/2010                        | Preliminary FIS 7/26/23        |
| Danbury       | 8/2/1974                  | 5/2/1977                   | 6/18/2010                        | Preliminary FIS 7/26/23        |
| Darien        | 7/26/1974                 | 1/2/1981                   | 7/8/2013                         | Preliminary FIS 7/26/23        |
| Greenwich     | 10/18/1974                | 9/30/1977                  | 7/8/2013                         | Preliminary FIS 7/26/23        |
| New Canaan    | 7/19/1974                 | 5/16/1977                  | 6/18/2010                        | Preliminary FIS 7/26/23        |
| New Fairfield | 1/31/1974                 | 2/15/1974                  | 6/18/2010                        | Preliminary FIS 7/26/23        |
| New Milford   | 11/29/1974                | 4/15/1980                  | 6/4/1987                         | ---                            |
| Newtown       | 10/18/1974                | 6/15/1979                  | 6/18/2010                        | Preliminary FIS 7/26/23        |
| Norwalk       | 10/25/1974                | 4/3/1978                   | 10/16/2013                       | Preliminary FIS 7/26/23        |
| Redding       | 8/23/1974                 | 6/15/1982                  | 6/18/2010                        | Preliminary FIS 7/26/23        |
| Ridgefield    | 9/13/1974                 | 9/30/1982                  | 6/18/2010                        | Preliminary FIS 7/26/23        |
| Sherman       | 2/21/1975                 | 6/18/1987                  | 6/18/2010                        | Preliminary FIS 7/26/23        |
| Stamford      | 8/2/1974                  | 1/16/1981                  | 7/8/2013                         | Preliminary FIS 7/26/23        |
| Weston        | 3/8/1974                  | 10/17/1978                 | 6/18/2010                        | Preliminary FIS 7/26/23        |
| Westport      | 7/19/1974                 | 7/2/1980                   | 7/8/2013                         | Preliminary FIS 7/26/23        |
| Wilton        | 3/15/1974                 | 11/17/1982                 | 10/16/2013                       | Preliminary FIS 7/26/23        |

Source: FEMA Community Status Book

Homes and buildings in high-risk flood areas, defined by FEMA as areas with a 1% annual chance of flooding and known as SFHAs, are required to have flood insurance if the building is financed with a mortgage from federally regulated or insured lender. Homes and businesses in moderate (0.2% annual chance of flooding) to low-risk areas that have such mortgages are typically not required to have flood insurance, although it may be required at the discretion of the lender. Property owners and renters in these areas may always voluntarily choose to purchase flood insurance. According to the NFIP, over 20% of all NFIP insurance claims and one-third of all federal disaster assistance payouts for flooding come from properties outside of SFHAs.

Adoption of a different floodplain map is allowed under NFIP regulations as long as the new map covers a larger floodplain than the FIRM. It should be noted that the community's map will not affect the current FIRM or alter the SFHA used for setting insurance rates or making map determinations; it can only be used by the community to regulate floodplain areas. The FEMA Region I office has more information on this topic. Contact information can be found in Section 7.2.

The NFIP works closely with more than 80 private insurance companies to offer flood insurance because flooding is not covered under standard homeowner's insurance policies. Rates are set nationally and do not differ from company to company or agent to agent, and unlike many types of insurance rates, do not increase when claims are made. Property owners should be encouraged to submit claims under the NFIP whenever flooding damage occurs in order to increase the eligibility of the property for projects under the various mitigation grant programs.

A variety of structural-related mitigation strategies, including the use of freeboard, can be applied to new development and substantial redevelopment, although these are beyond the minimum requirements of the NFIP. The first-floor elevation is one of the primary components to determining the flood risk of a structure within a SFHA. The minimum national standard

under the NFIP for the elevation of the first floor of new and substantially improved structures is to place the floor at or above the base flood elevation. Freeboard requirements (such as those mandated by the State of Connecticut Building Code) provide an additional level of protection to areas at risk of flooding by requiring new development or substantial improvement to be elevated to the base flood elevation plus an additional amount.

The hydrology and hydraulics used to define SFHAs is detailed in a FIS which must be concurrently reviewed to properly interpret FIRMs. FEMA encourages local communities to use more accurate topographic maps to expand upon the FIRMs published by FEMA. This is because many FIRMs were originally created using quadrangle maps prepared by the United States Geological Survey with 10-foot contour intervals, but many municipalities today have contour maps of one- or two-foot intervals that show more recently constructed roads, bridges, and other anthropologic features. An alternate approach is to record high water marks and establish those areas inundated by a recent severe flood to be the new regulatory floodplain. While these maps cannot replace the FIRM for insurance purposes, they may be used to regulate development provided that the mapped area is the same size or larger than that mapped on the FIRM.

Reductions in floodplain area or revisions of a mapped floodplain can only be accomplished through revised FEMA-sponsored engineering studies or Letters of Map Change. To date, several Letters of Map Amendment and Letters of Map Revision have been submitted for the WestCOG municipalities, which is expected, given the relatively developed nature of the local floodplains.

In order to encourage more flood resilient development and assist local communities in implementing the NFIP regulations, FEMA has developed a variety of training modules and publications, as presented below:

- A compilation of flood resistant provisions in the 2018 International Building Code<sup>3</sup>
- A publication to protect building utility systems from flood damage<sup>4</sup>
- A publication to floodproof non-residential buildings<sup>5</sup>
- A publication and flyer<sup>6</sup> for protecting manufactured homes from floods and other hazards
- A Home Builder's Guide to Coastal Construction covering coastal flooding<sup>7</sup>

FEMA defines RLPs as any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling ten-year period, since 1978. RLPs in the region are discussed in section 3.3.2 of this HMP.

Efforts to reduce flood losses in the region must include RLP losses, which strain the NFIP. For a risk evaluation to be effective, the list of RLPs in the community must be accurate; however, inaccuracies in FEMA RLP lists are prolific nationwide. As a regional example, consider that two of the RLPs located in Norwalk are listed by FEMA as being in other WestCOG communities, and one RLP property located in Stratford (outside the region) is listed by FEMA as being in Bethel. Communities must therefore carefully review and correct their local RLP lists. Misplaced properties must be formally transferred to the correct municipality, duplicates must be cleared, and mitigation status should be updated to ensure that resources are directed to the properties with most risk and highest flood losses.

The following action is therefore recommended for each municipality, as appropriate:

- After WestCOG obtains the list of RLPs from the State NFIP Coordinator each year, work with CT DEEP to validate and/or correct the RL list and update the mitigation status of each listed property.

<sup>3</sup> [https://www.fema.gov/sites/default/files/2020-08/fema\\_2018-i-codes-flood-provisions.pdf](https://www.fema.gov/sites/default/files/2020-08/fema_2018-i-codes-flood-provisions.pdf)

<sup>4</sup> [https://www.fema.gov/sites/default/files/2020-07/fema\\_p-348\\_protecting\\_building\\_utility\\_systems\\_from\\_flood\\_damage\\_2017.pdf](https://www.fema.gov/sites/default/files/2020-07/fema_p-348_protecting_building_utility_systems_from_flood_damage_2017.pdf)

<sup>5</sup> [https://www.fema.gov/sites/default/files/2020-07/fema\\_p-936\\_floodproofing\\_non-residential\\_buildings\\_110618pdf.pdf](https://www.fema.gov/sites/default/files/2020-07/fema_p-936_floodproofing_non-residential_buildings_110618pdf.pdf)

<sup>6</sup> [https://www.fema.gov/sites/default/files/2020-07/fema85\\_flyer\\_052219.pdf](https://www.fema.gov/sites/default/files/2020-07/fema85_flyer_052219.pdf)

<sup>7</sup> [https://www.fema.gov/sites/default/files/2020-08/fema499\\_2010\\_edition.pdf](https://www.fema.gov/sites/default/files/2020-08/fema499_2010_edition.pdf)

The following action is presently undertaken by WestCOG, and will continue over the lifespan of this plan:

- Contact the owners of Repetitive Loss Properties and nearby properties at risk to inquire about mitigation undertaken and suggest options for mitigating flooding in those areas. This should be accomplished with a letter directly mailed to each property owner.

### **Substantial Damage/Substantial Improvement**

All new construction and substantial improvements located within the 100-year floodplain must conform to minimum elevation requirements and construction standards so as to minimize flood damage. Substantial improvements are defined as any combination of improvements, the cost of which equals or exceeds 50% of the market value before improvement started. The floodplain manager or building official is responsible for administering the substantial improvement and substantial damage provisions codified in the floodplain management regulations. This is typically done in close coordination with the land use office. In the event of a major disaster, resulting in a number of substantially damaged buildings that would overwhelm town staff, the town would reach out to the state NFIP coordinator's office for assistance in training additional staff.

### **Community Rating System**

FEMA's Community Rating System (CRS) is a voluntary program that offers discounts of flood insurance premiums to communities that undertake activities beyond minimum flood insurance standards. Activities include public outreach and information regarding flood protection, open space protection, stormwater management, and floodplain mitigation. Newtown (Class 9, 5% discount), Stamford (Class 7, 15% discount), and Westport (Class 8, 10% discount) presently participate in the CRS program. Due to the rigorous requirements of the CRS program, this HMP will be monitored, evaluated, and updated under CRS activity 510.

The CRS program requires that communities with 10 or more RLPs (Category C communities) prepare a floodplain management plan that covers the RLP areas. Category C communities in the Region include Danbury, Darien, Greenwich, New Milford, Norwalk, Stamford, Weston, Westport, and Wilton.

Multi-jurisdictional HMPs that are prepared in accordance with the CRS Floodplain Management Planning process qualify for floodplain management planning credit in the CRS Program under CRS activity 510. Each CRS community is awarded approximately 200 points for adopting this HMP. CRS Program requirements for this HMP post-adoption include:

- An annual evaluation report on progress towards Plan implementation must be prepared and submitted with the community's annual CRS recertification. This report must be submitted to the governing body, released to the media, and made available to the public.
- If a community is receiving credit as a result of participation in a multi-jurisdictional HMP, the annual evaluation report must discuss the individual strategies and actions for that community. This can be performed by participating in a multi-jurisdictional annual plan review committee or through separate submittals by each community. A community will not receive credit if it was not present at the regional meeting. Therefore, the submittal needs to record attendance and show who participated in the preparation of the report.
- The community must update the HMP every five years.

As public information activities are an important and required component of the CRS, the public participation requirements and recommendations of this HMP regarding public education and awareness can be implemented through the CRS program.

### National Weather Service

The NWS issues a Flood Advisory, Flood Watch, Flood Warning, or Flash Flood Warning to advise citizens when hazardous flooding conditions may occur. State and local governments typically rely on NWS forecasts to prepare for and respond to flooding events.

- A **Flood Advisory** is issued when a specific weather event that is forecasted to occur may become a nuisance, but when flooding is not expected to be bad enough to issue a warning.
- A **flood watch** or a **flash flood watch** is issued for an area when conditions in or near the area are favorable for a flood or flash flood, respectively. A flash flood watch or flood watch does not necessarily mean that flooding will occur, but that people should be prepared for a warning to be issued.
- A **flood warning** or a **flash flood warning** is issued for an area when parts of the area are either currently flooding, highly likely to flood, or when flooding is imminent. People in areas at risk of flooding should move immediately to high ground.

### United States Army Corps of Engineers

USACE has designed, constructed, and operated flood protection projects in a variety of communities across Connecticut. According to the FIS for Fairfield County, within the Region, the USACE:

- Constructed a local protection project in Danbury consisting of approximately 3,625 feet of concrete conduit and 2,695 feet of enlarged and realigned riprapped trapezoidal channel on the Still River downstream from Triangle Street to upstream of the railroad yards. The project required rebuilding four railroad bridges, constructing two highway bridges, and removing a privately owned bridge. The project protects a major industrial area in Danbury.
- Constructed a hurricane barrier (functionally, a levee) that protects low-lying development on 640 acres in the south end of Stamford from flooding caused by hurricanes or severe coastal storms of the 0.2% annual chance recurrence interval. This area is generally located between the Rippowam River and Cummings Park.

The USACE also oversees levee certification for all levees in the region. Other leveed areas include:

- The southeastern junction of Route 7 and the Merritt Parkway in Norwalk, just north of the confluence of the Norwalk and Silvermine Rivers. This levee protects approximately 26 acres and extends 0.45 miles along the bank of the Norwalk River.
- Two levees are located in Greenwich on the Byram River in the vicinity of Pemberwick Park. The two levees protect an area of approximately 14.3 acres total.

The USACE has performed many studies of potential flood protection projects in the region, such as at Lovers Leap Gorge New Milford, that ultimately were not constructed as they did not appear to be cost-effective. The USACE has also provided dam evaluation services, with a significant number of Phase I and Phase II dam assessments completed in the late 1970s throughout Connecticut. Furthermore, the USACE reviews and accredits levee systems such as those in Norwalk along the Norwalk River and in Stamford, as described above.

### **Natural Resource Conservation Service**

The NRCS also designs and funds flood mitigation projects through its Emergency Watershed Protection (EWP) program. According to the FIS for Fairfield County, following the 1955 floods, the NRCS designed an entire system of flood control structures for the Norwalk River watershed, including five floodwater retarding structures and three lengths of channel modifications. Only two of the related dams were constructed – one on Ridgefield Brook in Ridgefield and the other on Spectacle Brook, a tributary to Comstock Brook, in Wilton. The sections of channel modification have not been completed, as the remaining three dams were never constructed.

More recently, the NRCS EWP program focuses on funding projects to address debris-clogged stream channels, undermined and unstable streambanks, jeopardized water control structures and public infrastructure, wind-borne debris removal, and damaged upland sites stripped of protective vegetation by fire or drought. Landowners must have a project sponsor (typically a local government) to support any EWP grant application.

#### **4.1.2 Winter Storms**

FEMA's Building Sciences division regularly prepares guidance materials for construction in areas impacted by winter storms. For example, FEMA<sup>8</sup> has produced a Snow Load Safety Guidance Document.

#### **4.1.3 Tropical Cyclones and Hurricanes**

NOAA issues an annual hurricane outlook to provide a general guide to each upcoming hurricane season based on various climatic factors. However, it is impossible to predict exactly when and where a hurricane will occur. NOAA believes that "hurricane landfalls are largely determined by the weather patterns in places the hurricane approaches, which are only predictable within several days of the storm making landfall." Tracking of hurricanes has advanced to the point where areas often have one week of warning time or more prior to a hurricane strike.

Connecticut is located in FEMA Zone II regarding maximum expected wind speed. The maximum expected wind speed for a three-second gust is 160 mph. This wind speed could occur as a result of either a hurricane or a tornado. The American Society of Civil Engineers recommends that new buildings be designed to withstand this peak three-second gust.

FEMA has also prepared multiple publications regarding mitigating potential wind damage, including the following presented below:

- A wind retrofit guide and flyer<sup>9</sup> for residential buildings
- Detailed guidelines for conducting wind vulnerability assessments of existing critical facilities<sup>10</sup>
- A compilation of the wind resistant provisions of the 2018 International Building Code<sup>11</sup>

#### **4.1.4 Tornadoes and Thunderstorms**

Provision of effective warnings is the primary method of existing mitigation for tornadoes and thunderstorm-related hazards. The NOAA NWS issues watches and warnings when severe weather is likely to develop or has developed, respectively. Table 4-2 lists the NOAA Watches and Warnings, respectively, as pertaining to actions to be taken by emergency management personnel in connection with thunderstorms and tornadoes.

<sup>8</sup> [https://www.fema.gov/sites/default/files/2020-07/fema\\_snow\\_load\\_2014.pdf](https://www.fema.gov/sites/default/files/2020-07/fema_snow_load_2014.pdf)

<sup>9</sup> [https://www.fema.gov/sites/default/files/2020-07/p-804\\_wind-retrofit-guide-residential.pdf](https://www.fema.gov/sites/default/files/2020-07/p-804_wind-retrofit-guide-residential.pdf)

<sup>10</sup> <https://www.fema.gov/sites/default/files/2020-07/guidelines-wind-vulnerability.pdf>

<sup>11</sup> <https://www.fema.gov/sites/default/files/2020-07/2018-ibc-compilation-wind-resistant-provisions.pdf>

Both the FEMA and the NOAA websites contain valuable information regarding preparing for and protecting oneself during a tornado as well as information on a number of other natural hazards. Available information from FEMA includes:

- Design and construction guidance for creating and identifying community shelters
- Recommendations to better protect a business, community, and home from tornado damage, including construction and design guidelines for structures
- Ways to better protect property from wind damage
- Ways to protect property from flooding damage
- Construction of safe rooms within homes

**More information is available from:**

FEMA: <http://www.fema.gov/library/>

NOAA:  
<https://www.nssl.noaa.gov/education/svrwx101/>

**Table 4-2: NOAA Watches and Warnings**

| Weather Condition                  | Meaning                                                                                                                                         | Action                                                                                                                                                         |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Flash Flood Watch</b>           | It is possible that rain will cause flash flooding in your area.                                                                                | Notify personnel to watch for street or river flooding.                                                                                                        |
| <b>Flash Flood Warning</b>         | Flash flooding is occurring or imminent in your area.                                                                                           | Watch local rivers and streams. Be prepared to evacuate low-lying areas. Take appropriate actions listed in emergency plans.                                   |
| <b>Severe Thunderstorm Watch</b>   | Severe thunderstorms are possible in your area, with winds greater than 58 mph, or hail 0.75-inches in diameter, or a tornado likely to develop | Notify personnel and watch for severe weather.                                                                                                                 |
| <b>Severe Thunderstorm Warning</b> | Severe thunderstorms are occurring or are imminent in your area based on spotters or as indicated by weather radar.                             | Notify personnel and watch for severe conditions or damage (i.e., downed power lines and trees). Take appropriate actions listed in municipal emergency plans. |
| <b>Tornado Watch</b>               | Tornadoes are possible in your area.                                                                                                            | Notify personnel and be prepared to move quickly if a warning is issued.                                                                                       |
| <b>Tornado Warning</b>             | Tornadoes are occurring or are imminent in your area.                                                                                           | Notify personnel, watch for severe weather, and ensure personnel are protected. Take appropriate actions listed in emergency plans.                            |

Source: NOAA

NOAA information includes a discussion of family preparedness procedures and the best physical locations during a storm event. NOAA encourages all residents to purchase a NOAA weather radio containing an alarm feature.

#### 4.1.5 Wildfires

The NWS issues a Red Flag warning when winds will be sustained or there will be frequent gusts above a certain threshold (usually 25 mph), the relative humidity is below 30%, and precipitation for the previous five days has been less than one-

quarter inch. Such conditions can cause wildfires to quickly spread from their source area. FEMA has produced a “Defensible Space” Technical Fact Sheet for Construction in Wildfire Zones<sup>12</sup>.

#### 4.1.6 **Drought**

The National Integrated Drought Information System available at <https://www.drought.gov/drought/> is a multi-federal agency effort that tracks drought conditions throughout the United States. A variety of resources are available related to planning and preparedness, education, and recovery from droughts. This site incorporates current data developed by the United States Drought Monitor that can be accessed at <https://droughtmonitor.unl.edu/>.

#### 4.1.7 **Earthquakes**

FEMA has produced several resources that addresses seismic building code provisions and retrofits for improving earthquake resilience in new and buildings, which can be downloaded at: <https://www.fema.gov/emergency-managers/risk-management/earthquake/seismic-building-codes>

#### 4.1.8 **Dam Failure**

FEMA has prepared a fact sheet<sup>13</sup> to increase awareness of potential dam risk. The Association of State Dam Safety Officials provides a variety of resources related to dam management, primarily aimed at state dam safety officials but also useful for dam owners, stakeholders, and the public. This information can be accessed from <https://www.damsafety.org/>.

#### 4.1.9 **Extreme Temperatures**

The NOAA National Integrated Heat Health Information System (NIHHIS) hosts [www.heat.gov](http://www.heat.gov), a platform which hosts data and tools related to extreme heat, has information on risk reduction, and provides details on extreme heat warnings. The EPA has information on adapting to extreme heat to help improve community resilience to heat events. This information can be found at: [Adapting to Heat | US EPA](#). The EPA has also created an Incident Action Checklist which can be utilized to prepare for extreme cold and winter storm events. The checklist can be found here: [Incident Action Checklist-ExtremeCold](#)

## 4.2 **State**

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Numerous State of Connecticut capabilities are in place to mitigate the effects of natural hazards in Connecticut. The Connecticut Department of Emergency Services and Public Protection (DESPP), Connecticut DEMHS, the Connecticut DEEP, the CTDOT, and other agencies provide funding and technical assistance related to mitigation, as discussed in Section 7.3. Specific state programs that contribute to mitigation on a daily basis are discussed below.

#### 4.2.1 **Multiple Hazards**

##### **Hazard Mitigation Planning**

The 2023 Connecticut Natural Hazards Mitigation Plan provides guidance for hazard mitigation activities within the State and has undergone a full revision using the best available data and subject-matter experts for the required update. This plan fulfills the standard state mitigation planning requirements (44 CFR § 201.4). The state is committed to a long-term strategy for reducing risks to natural hazards, as shown in the mitigation strategy set forth in this plan. Mitigation actions will reduce risk from natural hazards to citizens, state facilities, and critical facilities. Connecticut is committed to the implementation of

<sup>12</sup> <https://www.ready.gov/sites/default/files/2020-03/home-builder-guide-construction-defensible-space.pdf>

<sup>13</sup> [https://www.fema.gov/sites/default/files/2020-08/damsafety\\_awareness\\_factsheet4.pdf](https://www.fema.gov/sites/default/files/2020-08/damsafety_awareness_factsheet4.pdf)

the plan through continued involvement of the steering committee. The complete mitigation strategy includes specific strategies for each goal as well as prioritized implementable actions.

- **Goal 1** – Protect safety, public infrastructure, private property, and the environment by implementing physical hazard mitigation and climate adaptation projects that effectively and equitably reduce risk.
- **Goal 2** – High Hazard Dams: Reduce vulnerabilities to and from high hazard potential dams.
- **Goal 3** – Forward-Looking Policy and Planning: Adapt to climate change and natural hazards through forward-looking policies, plans, regulations, and programs that reduce risk and support long-term resilience.
- **Goal 4** – Awareness and Education: Increase general awareness of Connecticut’s natural and climate-related hazards and promote measures available to reduce risks through educational outreach.
- **Goal 5** – Capability- and Capacity-Building: Enhance the capability and capacity of State agencies, regional entities, and local governments to identify vulnerabilities and risks, integrate risk reduction strategies, and implement resilience projects.

The plan provides hazard ranking, vulnerability analysis, and loss estimation that supports the development of regional mitigation plans. Each state plan update “rolls up” local and regional plan data. State and local plans are intended to complement one another and to provide for a two-way exchange of information.

### Codes and Design Standards

Connecticut municipalities currently use the 2026 Connecticut State Building Code. This statewide code is based on the 2021 International Code Council (ICC) codes, with specific state amendments. The Code incorporates the standards in high-wind design and seismic activity appropriate for the state. The code is significant relative to flood mitigation. It requires 1 foot of freeboard in all A, AE, and VE zones (VE zones have a risk of significant wave action and tend to be found along coastlines; coastal A zones (A or AE zones occurring in coastal areas are regulated like VE zones in certain cases; flood openings are required in breakaway walls; and essential facilities must be elevated 2 feet above the BFE or to the 0.2% annual chance flood elevation. Local building officials are bound by the state code.

Through local implementation of the State Building Code, WestCOG municipalities help reduce the risks associated with natural hazards in new developments. According to the Connecticut Department of Administrative Services, the 2026 State Building Code includes the 2021 International Building Code. Pursuant to sections 29-252a and 29-253 of the Connecticut General Statutes, respectively, this code shall be the building code for all towns, cities, and boroughs and all state agencies. The provisions of this code apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures.

### Connecticut Institute for Resilience and Climate Adaptation (CIRCA)

CIRCA is a multidisciplinary center of excellence that brings together experts in the natural sciences, engineering, economics, political science, finance, and law to provide practical solutions to problems arising as a result of a changing climate. The institute helps coastal and inland floodplain communities in Connecticut and throughout the Northeast better adapt to changes in climate, as well as make their human-built infrastructure more resilient while protecting valuable ecosystems and the services they offer to human society. Initiatives focus on living shorelines, critical infrastructure, inland flooding, coastal flooding, sea level rise, and policy and planning.

CIRCA runs a research program as well as an external grants program for Connecticut municipalities and partners in resilience. To date, CIRCA has awarded 23 projects through its Municipal Resilience Grants Program to 19 municipalities and the state's regional planning organizations (councils of governments). The CIRCA research program has received funding from CT DEEP, CT DOT, the Connecticut Department of Housing, and NOAA. Research projects cover sea level rise and storm flooding statistics, green infrastructure and living shorelines evaluation, economic modeling, and policy analysis and planning.

Through its initial years as an institute, CIRCA projects and products provided significant support to municipalities and the state for resilience planning. In October 2017, CIRCA released localized sea level rise planning scenarios for the state and recommended that Connecticut plan for the upper end of the likely range of 20 inches/50 centimeters of sea level rise by 2050. This "planning threshold" is periodically reviewed by CIRCA and was last updated in 2025.

The Resilient Connecticut program was originally deployed by the CIRCA in 2020, with the WestCOG region included in the pilot program area. Funded by a Housing and Urban Development National Disaster Resilience Competition, it focuses on regional resilience and adaptation planning through engagement and risk assessments that provide information for municipal to regional scale initiatives and pilot projects. As part of this effort, a Climate Change Vulnerability Index (CCVI) was developed statewide. Under "Phase III", studies and concept designs were developed and executed in several areas. The final reports for these Phase III studies are available at the Resilient Connecticut Website at: <https://resilientconnecticut.uconn.edu/>. Thus, CIRCA's Resilient Connecticut program is listed as a potential funding source for potential actions.

#### **Farmland Preservation - Public Act 490**

Public Act 490 (Connecticut General Statutes Sections 12-107a through 107-f) allows farm, forest, or open space land to be assessed at its use value rather than its fair market or highest and best use value (as determined by the property's most recent "fair market value" revaluation) for purposes of local property taxation. Without the lower use value assessment, most landowners would have to sell the land because they would not be able to afford the property taxes on farm, forest, or open space land." (<https://portal.ct.gov/DOAG/Commissioner/Commissioner/Public-Act-490---The-Basics>)

PA 490 enables landowners to pay tax on PA 490 land at its current value rather than its highest value (i.e., as farmland rather than as potential housing development). This helps reduce the municipal property tax burden on farms and helps to prevent the forced conversion of farm, forest, and open space lands to more lucrative uses. Unlike many tax statutes, PA 490 includes a Declaration of Policy, which is public policy making it within the public interest to encourage the preservation of these lands to maintain a readily available source of food and farm products in the state.

#### **Emergency Alerting and Notification Systems**

All the WestCOG communities currently have a reverse notification system. This may be part of or an addition to the CT Alert Emergency Alerting and Notification System, powered by Everbridge, offered by the State of Connecticut. This emergency notification system, which relies on GIS technologies, allows communities in the Region to alert residents to impending natural hazards, thereby reducing risks to life and property. According to the CTAlert.gov website, all WestCOG municipalities currently subscribe to the CTAlert system. All citizens in Connecticut, however, can register with CTAlert to receive emergency notifications that are sent statewide.

Many communities rely upon alerts from the State of Connecticut to open heating and cooling centers within their communities. The identification and discussion of heating and cooling centers is a major change from previous editions of this NHMP, with new actions considered regarding the placement of such centers as well as their accessibility connection to nearby transit options that will allow people to reach the centers.

### Power Outages

The following program is available for municipalities to apply for funding for the creation of micro-grids.

- State of Connecticut, Microgrid Program – An initial award of \$18 million was announced in 2013 for nine microgrid projects in Connecticut. An additional \$15 million in funding to continue microgrid work was authorized as part of the State's FY14-FY15 Biennial Budget. While the program is currently not available, it is still valid and may be funded in the future. More information can be found at: <https://portal.ct.gov/deep/energy/microgrid-grant-and-loan/microgrid-grant-and-loan-program>.

Solar and battery storage (e.g., Tesla Powerwall) technologies are available to provide backup to residential and certain commercial buildings, increasing resilience.

FEMA's HMGP program will occasionally fund backup power generators for municipal critical facilities.

### Historic Resources

Recognizing that historic and cultural resources are increasingly at risk to natural hazards and climate change, SHPO embarked on a resiliency planning study for historic and cultural resources beginning in 2016. Working with the state's Councils of Government and municipalities throughout the planning process, numerous examples were identified where historic and cultural resources were specifically at risk now, could be at risk in the future, and could help generate consensus for resiliency actions. Historic resources are difficult to floodproof, elevate, or relocate without potential loss of their historicity. Therefore, a thorough understanding of the site-specific options for each set of historic resources is necessary prior to disasters that could damage these resources in order to avoid damage during recovery.

The five coastal COGs in Connecticut hosted historic resources resiliency planning meetings in June 2016. During winter 2016-2017, individual meetings were held with the shoreline communities. Reports were issued to these communities in late 2017 based on the COG meetings and the local meetings. These reports outline eight strategies that can be employed to make historic and cultural resources more resilient. They are:

- Identify Historic Resources
- Revisit Historic District Zoning Regulations
- Strengthen Recovery Planning
- Incorporate Historic Preservation into Planning Documents
- Revisit Floodplain Regulations and Ordinances
- Coordinate Regionally and with the State
- Structural Adaptation Measures
- Educate

A best practice guide for planning techniques to make historic resources more resilient was distributed in 2018. This guide can be used by all jurisdictions in Connecticut when undertaking the development of hazard mitigation plans. Resiliency concepts were added to the update of the State Historic Preservation Plan in 2017-2018, with the goal of helping all of the state's communities make historic resources more resilient.

### Sustainable CT

Sustainable CT is a voluntary certification program created by the Connecticut Conference of Municipalities (CCM) to recognize thriving and resilient Connecticut communities. Sustainable CT is an independently funded, grassroots, municipal effort designed to support all Connecticut municipalities, regardless of size, geography, or resources. Sustainable CT empowers municipalities to create high collective impact for current and future residents.

Sustainable CT provides a wide-ranging menu of best practices for building sustainable municipalities. Municipalities choose Sustainable CT actions from this “Master Action List,” implement them, and earn points toward certification. Many actions are consistent with the goals of hazard mitigation and, if accomplished, may demonstrate progress with hazard mitigation. One such action is to conduct a Climate Vulnerability Assessment to identify how climate change will impact the community. Each municipality in the region has incorporated projected climate change impacts within its respective annex of the Hazard Mitigation Plan.

Sustainable CT also provides opportunities for grant funding to help communities promote economic well-being and enhance equity, all while respecting the finite capacity of the natural environment. The initiative specifically encourages consideration of low-income residents and their vulnerability to extreme weather events.

### **Additional State Resources**

Additional information on state resources and funding sources include:

- Connecticut Department of Energy and Environmental Protection (DEEP) Climate Resilience Fund – This state- and federally-funded program began accepting applications in 2022 in order to fund innovative resilience plans and projects to help municipalities and other entities develop project pipelines to protect their communities from extreme weather. Projects are supported at the planning, advancement, and deployment stages. In 2025, DEEP announced that the 2025 priorities for awards through this fund include projects that use innovative approaches to increase community resilience by addressing multiple natural hazards, support reliable energy and reduce electrical outages, as well as promote nature-based solutions and community engagement. More information can be found on the program website at <https://portal.ct.gov/connecticutclimateaction/executive-order/deep-climate-resilience-fund>.
- Connecticut Department of Housing CDBG Small Cities Program- This federally funded program provides funding to municipalities with populations of less than 50,000 for a variety of activities, including acquisition of property, relocation, public facilities and improvements, code enforcement, planning, and capacity building, among other uses. More information can be found at: <https://portal.ct.gov/doh/doh/programs/small-cities-program>.
- Connecticut Department of Energy and Environmental Protection (DEEP) Open Space and Watershed Land Acquisition Grant Program – provides financial assistance to municipalities and nonprofit land conservation organizations to acquire open space. More information can be found at: <https://portal.ct.gov/deep/open-space/open-space-and-watershed-land-acquisition-grant-program>.
- Connecticut Department of Energy and Environmental Protection (DEEP) Nonpoint Source Management Grant Program – provides grants for the prevention, control, and/or abatement of nonpoint source pollution. Funded under Section 319(h) of the Federal Clean Water Act. More information can be found at: <https://portal.ct.gov/deep/water/nps/request-for-proposals-for-nonpoint-source-management-grant-program>.
- Connecticut Department of Emergency Services and Public Protection, Division of Emergency Management and Homeland Security – provides strategic planning and grant assistance. More information can be found at: [https://portal.ct.gov/demhs/emergency-management/resources-for-officials/community-preparedness-and-grants?language=en\\_US](https://portal.ct.gov/demhs/emergency-management/resources-for-officials/community-preparedness-and-grants?language=en_US).
- Connecticut Sea Grant and New York Sea Grant Sustainable and Resilient Communities (SRC) Program – The SRC Program was deployed in response to a needs assessment for communities in the Long Island Sound watershed in Connecticut and New York. The program administers grant writing assistance (applicants can use Sea Grant funds to develop applications for various resilience-related grants) and planning support. Funds are not provided to a

municipality; instead, the Sea Grant program retains a consultant to assist the awarded municipality. Round 1 projects were completed in 2025-2026, whereas Round 2 projects began in summer and fall of 2025 and will extend into 2026-2027. Round 3 projects were announced in November 2026, for execution in 2027-2028. More information can be found online at: <https://seagrant.uconn.edu/focus-areas/resilient-communities/programs/>.

#### 4.2.2 **Flooding**

##### **Stormwater and Erosion Control**

By statute (Section 22a-325 – 22a-329 of the CGS), all municipalities in Connecticut are required to adopt regulations pertaining to soil erosion and sediment control and all applications for proposed development which will disturb more than a half-acre must include a soil erosion and sediment control plan. The DEEP has guidelines which serve as the technical standard for compliance with the statute. The Connecticut Stormwater Quality Manual provides guidance on site planning, source control, and stormwater practices, including the design, construction, and maintenance of stormwater systems, to protect the quality of Connecticut waters. The practices detailed in the Manual aim to reduce the volume of urban runoff and pollutant discharges, recharge groundwater, and control peak flows. These types of stormwater best practices not only protect water quality but also minimize flooding risks.

The Connecticut Guidelines for Erosion and Sedimentation Control also detail specific measures that can reduce the damages and pollution associated with erosion and sedimentation, while simultaneously reducing flooding risks. In 2012, CT DEEP updated the Manual and Guidelines to incorporate appendices on Low Impact Development (LID). Low Impact Development manages stormwater by designing with nature in mind. LID techniques seek to retain stormwater close to where it falls, thus keeping runoff out of pipes that drain to waterways. The most recent update occurred in 2024.

WestCOG encourages its member municipalities to adopt and enforce regulations that require new development to implement these best practices as far as possible.

The State of Connecticut passed legislation in 2021 that makes it easier for municipalities to form stormwater authorities and implement stormwater utilities. Specifically, the Connecticut legislature passed Substitute House Bill 6441, authorizing the creation of municipal stormwater authorities pursuant to Section 22a-498 of the Connecticut General Statutes. This bill allows any Connecticut municipality to establish a stormwater authority that assesses and collects scaled user fees from property owners for the purpose of maintaining. To date, no WestCOG communities have developed stormwater authorities.

##### **Regulation of Wetlands and Watercourses**

Activities in wetland areas and watercourses are regulated under Chapter 440 (Sec. 22a-28 – Sec. 22a-45d) of the Connecticut General Statutes. Under this statute, each municipality is required to establish an inland wetlands agency, identify boundaries of inland wetlands and watercourse areas, promulgate regulations to protect the inland wetlands and watercourses within their boundaries, and require that no regulated activities shall be conducted without a permit. All municipalities in the region have established inland wetlands agencies and have enacted inland wetlands and watercourses regulations.

According to the Connecticut Council on Environmental Quality (CEQ), between 60 and 90 acres of inland wetlands were altered statewide by development from 2004 until 2011, when the rate spiked to more than 200 acres. (Detailed data are not available to the public or CEQ.) Also, according to CEQ, municipal agencies, which issue 95 percent of all inland wetland permits, have become more conserving of wetlands in recent years. CEQ attributes this increased protectiveness to the completion of wetlands training programs by municipal agency members and staff.

### **Ice Jam Monitoring**

The Connecticut DEEP monitors the occurrence of ice jams throughout the state. Ice jam flooding last occurred in Connecticut in 2018, with ice jams historically occurring in the region along the Housatonic River and West Aspetuck River in New Milford and the Saugatuck River in Westport.

### **Codes and Design Standards**

The CTDOT has standards for the design of culverts and bridges on State roads, and these standards are often used by local communities. CTDOT uses the NOAA-published Volume 10, Version 3.0 of the “NOAA Atlas 14, Precipitation-Frequency Atlas of the United States” for the northeastern states for its runoff calculations.

Connecticut Public Act 18-182 updated the flood design standards for state-funded critical facilities. This Public Act requires the use of the most updated sea level rise scenarios (such as those developed by CIRCA or others) to be considered under local and regional planning in the state. Example facilities covered by the act include schools, elderly housing facilities, residences, and hazardous waste facilities. The base flood elevation for such facilities is the 0.2% annual chance flood elevation. Furthermore, for critical facilities within the coastal boundary, any floodproofing must exceed the base flood elevation by two feet plus any increase necessary to account for the most recent sea level rise scenario.

### **Helping Small Businesses Mitigate Impacts**

According to FEMA, 40% of businesses affected by disaster never reopen, and 25% that do reopen fail; other studies show that 90% of businesses fail within two years of being struck by a disaster. Natural disasters can result in property damage, loss of inventory, and business interruption; another important risk that many small businesses face is that of environmental contamination and legal liabilities resulting from toxic chemical releases into the environment during or following a disaster.

In an effort to assist small businesses with natural hazard mitigation, Connecticut DEEP has proposed strategies for towns to implement education and awareness programs with recommendations for best management practices (BMPs) to help business owners and municipalities prevent commercial pollutants from entering the environment. Such education and awareness programs may help small businesses and the municipalities in which they are located avoid expensive cleanups, reduce legal liability challenges, mitigate potential risks to public health, and accelerate business recovery and reopening – reducing negative impacts to the municipality’s economic base.

The municipalities of the region can benefit from mitigation actions related to mitigating flood impacts to small businesses that use toxic chemicals. A selection from the following actions was included in each of the municipal annexes in 2021, depending on the needs of each community at the time:

- Provide information on the municipal website about CT DEEP training and information around small business chemical management for hazard resilience.
- Use the CT Toxics Users and Climate Resilience Map to identify toxic users located in hazard zones within your community. Contact those users to inform them about the CT DEEP small business chemical management initiative.
- Host a CT DEEP presentation for municipal staff and local businesses about business chemical management for hazard resilience.

These actions have been retired, as the WestCOG municipalities understand the resources are available as needed.

#### **4.2.3 Winter Storms**

The CTDOT is responsible for maintenance and plowing along state roadways, and local communities coordinate with the CTDOT when problems need to be addressed.

The amended Connecticut Building Code specifies that a pressure of 30 to 40 psf be used as the base “ground snow load” for computing snow loading for different types of roofs. The psf is set by the municipality, with shoreline municipalities in the Region being assigned 30 psf and inland municipalities assigned 35 psf. The International Building Code specifies the same pressure for habitable attics and sleeping areas and specifies a minimum pressure of 35 psf for all other areas.

#### **4.2.4 Tropical Cyclones and Hurricanes**

Wind loading requirements are addressed through the state building code. The 2018 Connecticut State Building Code specifies the design wind speed for construction in all Connecticut municipalities, with the addition of split zones for some towns. The ultimate design wind speed is assigned by the municipality, and within the Region varies from 110 mph to 130 mph depending on the risk category of the structure.

The Connecticut Public Utility Regulatory Authority (PURA) piloted a “micro-grid” program following storms Irene, Alfred, and Sandy, designed to provide backup power supplies to small areas critical to public supply distribution, such as supermarkets, gas stations, and pharmacies. These infrastructure improvements will allow for small areas of the power grid to be isolated and operated independently through emergency generators. Presently underway at PURA in 2020 is consideration of three policy tracks considering reliability and system resilience metrics and targets, non-wire alternatives, and the state’s clean and renewable energy program as part of its review of grid modernization efforts.

#### **4.2.5 Tornadoes and Thunderstorms**

According to the 2023 CT NHMP, the occurrence of tornadoes in Connecticut is not considered frequent enough to justify the construction of tornado shelters at this time. Instead, the state has provided NOAA weather radios to all public schools as well as many municipalities for use in local government buildings. These radios provide immediate notification of a weather watch or warning such that the community can advise students or residents to take appropriate precautions. In addition, the Connecticut State Building Code includes guidelines for the proper grounding of buildings and electrical boxes.

#### **4.2.6 Wildfires**

Connecticut enacted its first statewide forest fire control system in 1905, when the state was largely rural with very little secondary growth forest. By 1927, the state had most of the statutory foundations for today’s forest fire control programs and policies in place, such as the State Forest Fire Warden system, a network of fire lookout towers and patrols, and regulations regarding open burning. The severe fire weather in the 1940s prompted the state legislature to join the Northeastern Interstate Forest Fire Protection Compact with its neighbors in 1949.

There are procedures in place for requesting assistance or other resources to aid in responding to all hazards, including forest and wildland fires. The first responding authority would be the local jurisdiction. If there is a need for additional aid or resources beyond the local capabilities, the Intrastate Mutual Aid Compact (Connecticut General Statute Sec. 28-22a) outlines the process for requesting assistance. If regional resources are depleted, Connecticut DEEP’s Division of Forestry may be requested to assist local fire departments in suppressing wildland fires.

The Forestry Division maintains an active forest fire prevention program and a specially trained force of firefighting personnel to combat fires that ravage an average of 1,300 acres of forestland per year. During the spring fire season and at other times of high or above fire danger, the division broadcasts daily predictions of fire danger and issues advisories to state park staff, municipalities, fire departments, and the media. The division also has crews ready to assist the U.S. Forest Service in controlling large fires across the nation.

The Forestry Division at the Connecticut DEEP keeps close watch over areas with below normal precipitation and utilizes precipitation and soil moisture data to compile and broadcast daily forest fire probability forecasts. Forest fire danger levels are classified as low, moderate, high, very high, or extreme.

The Connecticut DEEP has an Open Burning Program for municipalities. The program requires individuals to be nominated by the Chief Executive Officer in each municipality that allows open burning. Nominees must take an online training course and exam to become certified by the Connecticut DEEP as a local "Open Burning Official." Permit template forms were also revised to provide permit requirements so that the applicant/permittee is made aware of the requirements prior to, during, and after the burning activity. The regulated activity is then overseen by the certified local official.

#### 4.2.7 **Drought**

The State of Connecticut maintains a website at <https://portal.ct.gov/Water/Drought/Drought-Home> that is the drought information center maintained by the Interagency Drought Work Group. Links are provided to various information sources such as the U.S. Drought Monitor; groundwater, streamflow, and reservoir levels; and the Palmer Drought Severity Index. As such, State officials are well-positioned to track the occurrence of droughts in Connecticut and assist local communities.

As a planning mitigation effort developed after the 2002 drought that affected the state, the National Drought Mitigation Center through the Interagency Drought Work Group prepared a "Connecticut Drought Preparedness and Response Plan". The purpose of this plan is to help assess and reduce the impact a drought has over an area by conserving essential water use during water shortages. These two mitigation practices may make the difference in the severity of a period of drought across the region. The Connecticut Drought Preparedness and Response Plan was last updated in 2022.

The Connecticut Department of Public Health completed the Water Utility Coordinating Committee process in 2018 and prepared a Statewide Coordinated Water System Plan. This process identified future public water supply needs in Connecticut and the utilities best suited to meet those needs. The impacts of drought on the availability of water supply (and to a lesser extent, control of wildfires through evaluation of fire protection) is listed as one of the top ten considerations for the State's public water suppliers.

The Forestry Division at the Connecticut DEEP keeps watch over areas exhibiting below normal precipitation, because of the increased risk of fires in times of drought. The Connecticut Farm Services Agency manages the Livestock Forage Disaster Program or "LFP" which provides compensation to eligible livestock producers that have suffered grazing losses for covered livestock on land that is native or improved pastureland with permanent vegetative cover or is planted specifically for grazing. The grazing losses must be due to a qualifying drought condition as measured by the U.S. Drought Monitor during the normal grazing period for the county.

The Connecticut Farm Services Agency manages the Livestock Forage Disaster Program "LFP", which provides compensation to eligible livestock producers that have suffered grazing losses for covered livestock on land that is native or improved pastureland with permanent vegetative cover or is planted specifically for grazing. The grazing losses must be due to a qualifying drought condition as measured by the U.S. Drought Monitor during the normal grazing period for the county.

#### 4.2.8 **Earthquakes**

CTDOT has indicated that one of its long-term goals is to design and retrofit earthquake resistant roads and bridges. In addition, the 2018 Connecticut State Building Code includes seismic design criteria for buildings. New construction in each of the WestCOG municipalities is required to meet the requirements of Seismic Design Category B or C depending on site soil class.

#### 4.2.9 Dam Failure

The Dam Safety Section of the Connecticut Department of Energy and Environmental Protection's (DEEP) Inland Water Resources Division enforces the state's dam safety laws. The Dam Safety Office administers the inspection of existing dams, dikes or similar structures, and the permitting process for the construction, repair, or alteration of dams. The Office inspects hundreds of dams annually based on their classification and potential risk to life and property and then targets a limited number of lower hazard dams for inspection on a rolling basis. Any dams deemed unsafe upon inspection must be repaired by the owner.

The Office of Dam Safety works to minimize the potential damage of dam breaches. Dams which receive Dam Construction permits for repair and/or reconstruction are designed to pass at least the 100-year rainfall event with one foot of freeboard (a factor of safety against overtopping). The most critical and hazardous dams are required to meet a spillway design standard much higher than passing the runoff from a 100-year rainfall event. Although not all the dams under DEEP jurisdiction have been shown to be able to withstand the 100-year rainfall event, most of the dams meet this standard due to original design requirements or recent spillway upgrades.

For the most part if smaller rainfall events, i.e., the 10-year and 25-year events occur more frequently there will be little impact on the ability of Connecticut dams to operate safely. The Dam Safety Program's ultimate responsibility is to ensure all jurisdictional dams in the state are being operated and maintained in a safe condition. The owners of high and significant hazard dams are required by statute to regularly inspect, maintain, and repair their dams and have current Emergency Action Plans (EAPs) ready for implementation should hazardous conditions arise. The program's major responsibilities include:

- Inspections. The responsibility to undertake regulatory inspections was transferred from the state DEEP to dam owners through legislation in 2013. Program staff still perform inspections of all types, but all regulatory inspections are required to be performed by engineers hired by the dam owner. In rare cases, DEEP has the authority to perform these inspections and charge the property owner. Regulatory Inspections must meet the requirements of Section 22a-409 of the regulation.
- Emergency Action Plans (EAP) for B and C dams. Program staff review all EAPs for conformance with Section 22a-411a of the regulation. Staff attend EAP tabletops and drills. The owners of the larger flood control levees in the state, which are DEEP jurisdictional and have more recently been accredited by FEMA and certified by the USACE, are not presently required to submit an EAP pursuant to 22a-411a of the regulations as an appropriate guideline for writing an EAP for these levee structures does not exist at this time. The need to have updated EAPs for this small subset of dams was put on hold until guidelines could be written and because the existing levee operations plans written by the USACE are the presiding documents for these structures.

As more and more state- and privately-owned dams get repaired, the number of dams that will not meet the state minimum requirements for spillway design diminishes. However, the average age of all dams in Connecticut increases and we should remain vigilant.

Additional dam safety resources can be found here:

- Association of State Dam Safety Officials- Website with advice and information on dam safety. More information can be found at: <http://www.damsafety.org/>
- Connecticut Department of Energy and Environmental Protection (DEEP) Dam Safety Program - More information can be found at: <https://portal.ct.gov/deep/water/dams/dams-safety>.

- U.S. Army Corps of Engineers Levee Program – Information on levee safety, risk assessment, and risk reduction. More information can be found on the Army Corps website at: <https://www.usace.army.mil/Missions/Civil-Works/Levee-Safety-Program/>.

### 4.3 Regional

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While hazard mitigation activities take place at the local level, WestCOG and other regional entities also play an important role in reducing vulnerability to natural hazards and in floodplain management. Descriptions of regional projects and plans are presented below.

#### 4.3.1 Regional Hazard Mitigation Planning

WestCOG and its precursor agencies have long promoted hazard mitigation planning in the region. It is generally expected that WestCOG will facilitate HMP maintenance and coordinate the next regional HMP update prior to the expiration of this Plan.

#### 4.3.2 Regional Emergency Planning Team and Emergency Support Functions

WestCOG communities are part of Connecticut DEMHS Region 1 and Region 5, which include Regional Emergency Planning Teams that facilitate emergency management and hazard mitigation efforts in those areas. The DEMHS regions utilize area representatives with a diverse variety of experience to comprise Emergency Support Functions that support overall DEMHS goals while providing in-depth insight and guidance for certain emergency areas. For example, ESF-6 deals with all emergency operations as it relates to regional mass care. The chairs of ESF-6 are responsible for providing and ensuring adequate amounts of regional assets are available in the event of an emergency, for providing annual training and exercises for volunteer staff and municipalities, and for ensuring emergency preparedness at the regional level.

WestCOG also serves on ESF-1, which deals with transportation matters with regard to emergency management planning. WestCOG has assisted in the review of diversion route maps and developing an inventory of transit resources for emergency and evacuation planning. ESF-1 meets for both DEMHS regions 1 and 5 and includes WestCOG, NVCOG, NHCOG, and MetroCOG.

#### 4.3.3 Unified Planning Work Program

This program includes several studies related to hazard mitigation, particularly resilience efforts to analyze, assess, and improve the transportation system's vulnerability to natural hazards such as flooding and storm surge. The most recent documents for the Region were released on May 16, 2019.

#### 4.3.4 Regional Viewer

WestCOG maintains a Regional Viewer consisting of property data and aerial imagery. Future improvements will be aimed at including regional zoning layers, FEMA flood zones, wetland data, and stormwater features. All of this information is useful in evaluating the potential effects of hazards.

#### 4.3.5 Regional Stormwater Management Planning

One requirement for municipalities under the MS4 program is to map all stormwater infrastructure, which is a challenge for many WestCOG communities due to the age of the infrastructure, lost records, submerged infrastructure, and limited staff

and funding availability. WestCOG has assisted its municipalities by prioritizing watersheds for mapping, as noted on the Fact Sheet following this page.

#### 4.3.6 Regional Plan of Conservation and Development

The Regional POCD 2020-2030 encourages infrastructure and climate resiliency as well as development patterns that avoid exacerbating runoff and flooding. The document includes a discussion on climate change (including sea level rise and the potential effects on stormwater management, surface water quality, erosion and sedimentation, and other issues. The POCD notes that many FIRMs are already obsolete because of changing rainfall patterns.

The Regional POCD notes that common priorities exist in the region's previous hazard mitigation plans that must be built upon to ensure a consistent regional approach to hazard mitigation. Numerous goals and policies in the Regional POCD are related to hazard mitigation, although some policies are more practical and/or achievable in the 5-year timeframe of this HMP than others. Potential projects that should be pursued by WestCOG in the next five years as noted in the Regional POCD include:

- Develop sample zoning language for adoption by WestCOG municipalities to address impervious surfaces, building coverage, model stream belts, tower siting, and Green Area cover standards.
- Request that FEMA update FIRMs in the region with updated hydrological data. Note that this may be occurring as part of the updated FEMA studies underway.

#### 4.3.7 Regional CRS Support

The NFIP CRS recognizes and rewards community floodplain management activities exceeding the minimum NFIP standards (see Section 4.1.1). By implementing local mitigation, floodplain management, and outreach activities that exceed the minimum NFIP requirements, communities can improve their CRS "class" and receive a discount on flood insurance premium rates within the community.

The Regional CRS Program supports member communities in their efforts to join the CRS, and to improve their CRS class rating once they have joined. Support available to communities through WestCOG include:

- Securing FEMA and CRS informational pamphlets for public locations, such as municipal offices or public libraries
- Development of a regional and community-based website
- Regional flood information GIS databases
- A flood information web map hosted by WestCOG
- Analysis of regional open space parcels within flood zones
- Regional CRS coordination, file sharing, and tracking

For example, WestCOG secured funding from CIRCA to assist Greenwich, Darien, Norwalk, and Danbury with applying to FEMA's CRS program. These communities have the four largest paid flood insurance premium totals in the region that are not in the CRS program. Entrance of these communities into the CRS program is anticipated to save, on average, \$75 to \$150 for each policy owner annually.

For this HMP, certain communities have a CRS-related action included in their municipal annexes. Communities that are already members of the CRS program have, in many cases, actions that explicitly or implicitly will help maintain or improve their CRS scores if implemented. Three communities have an action to pursue enrollment in the CRS program.

# MITIGATION SUCCESS STORY

## FLOOD STUDIES IN DARIEN

### EXECUTIVE SUMMARY WATERSHED EVALUATION OF STONY BROOK



May 29, 2009  
MMI #1581-04-1  
  
*Prepared for:*  
Town of Darien  
2 Renshaw Road  
Darien, Connecticut 06820  
  
*Prepared by:*  
MILONE & MACBROOM, INC.  
99 Realty Drive  
Cheshire, Connecticut 06410

*Cover Page for the Stony Brook Study*

## WHAT IS IT?

The Town of Darien hired a consultant to evaluate flooding conditions along several watercourses within the community, including the Stony Brook, Goodwives River, and Noroton River watersheds. Residents have experienced significant flooding within these watersheds. The flood studies performed present evaluations of hydraulic conditions and recommendations for mitigation where possible.

The flood studies consisted of:

- Hydrologic evaluations of the watersheds
- Hydraulic analysis of river channels
- Evaluation of mitigation measures
- Development of a master plan for long-term improvements

The final reports included summaries of flooding concerns and locations, detailed flood maps and hydraulic information, and site-specific flood mitigation recommendations.

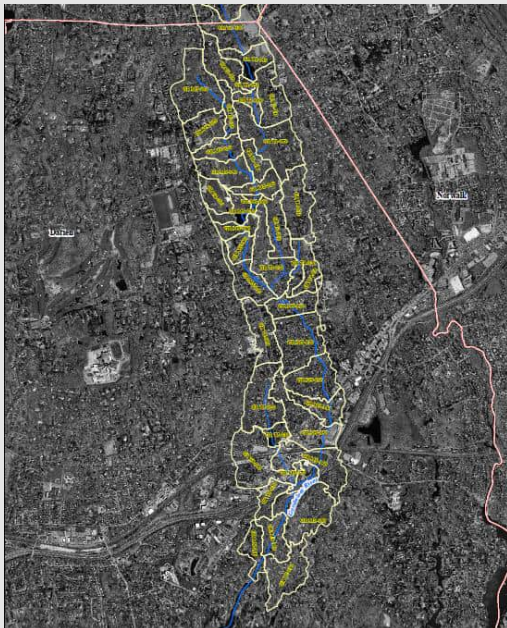
Since completion of the studies, Darien has been able to implement mitigation activities recommended in the reports.

## REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

WestCOG municipalities can perform detailed flood studies that cover the entire communities, or that focus on specific watersheds that have known flood challenges.

Performing studies that evaluate flooding on the watershed scale allows for a more comprehensive understanding of that area's hydrology and hydraulic setting, which will enable implementation of more successful and sustainable solutions.

As climate change alters precipitation patterns and accelerates sea level rise, these kinds of flood studies may become even more important.



*Goodwives River Watershed Map*

## FOR MORE INFORMATION

Jeremy Ginsberg  
Planning & Zoning Director  
Town of Darien  
2 Renshaw Road  
Darien, CT 06820

#### **4.3.8 Road-Stream Crossing Survey Program**

The Housatonic Valley Association (HVA) has been surveying and monitoring culverts throughout the Housatonic Valley in order to identify perched, undersized, and shallow culverts which both impede fish passage and are issues for flood conveyance. Work is ongoing, but thus far 15% of the surveyed culverts are expected to overtop during a 25-year flood event. HVA's program prioritizes the crossings at most risk and helps municipalities to find funding to upgrade such crossings. HVA is also creating Road-Stream Crossing Management Plans specific to municipalities to assist communities with identifying replacements, and also, in coordination with its project partners such as Trout Unlimited, can provide design assistance to reduce project costs.

#### **4.3.9 WestCOG Economic Development Strategy**

The Western Connecticut Economic Development District is a federally recognized economic development district within the Region. WestCOG produced, maintains, and implements an economic development strategy (known as the CEDS) which considers resilience and mitigation efforts in its goals, strategies, and projects. Goal 5 within the CEDS, "A More Sustainable and Resilient Region", is dedicated to promoting responsible strategies that contribute to both environmental sustainability and economic development.

Strategies in the CEDS include:

- Providing businesses resources for disaster recovery, educating businesses about disaster preparation and recovery
- Working with municipalities to make recovery frameworks for businesses
- Planning for the impacts of sea level rise, and coastal and riverine flooding
- Studying the impacts of sea level rise, and coastal and riverine flooding
- Prioritizing projects which mitigate the impacts of flooding

#### **4.3.10 WestCOG HMA Grant Assistance Program**

Recognizing the importance of not only informing its municipalities of grant opportunities but also advancing projects to the funding phase, WestCOG commenced the flood grant assistance program in 2022. The program has included the following elements:

- Annual letters to owners of RL properties to advise them of HMA funding opportunities.
- Public information meetings in Westport and Stamford to directly engage with property owners about acquisitions and elevations.
- Screening of more than 30 potential residential elevation projects.
- Development of at least 15 residential elevation projects under FMA, FMA Swift Current, and HMGP that were submitted in 2023, 2024, and 2025 for properties in Greenwich, Stamford, and Westport.
- Development of a BRIC application for a flood warning system in Danbury.
- Development of a scoping grant application for a study in Westport.
- Development of a nonresidential flood mitigation project for a commercial condominium building in Stamford.
- Response to RFIs and coordination regarding potential awards.

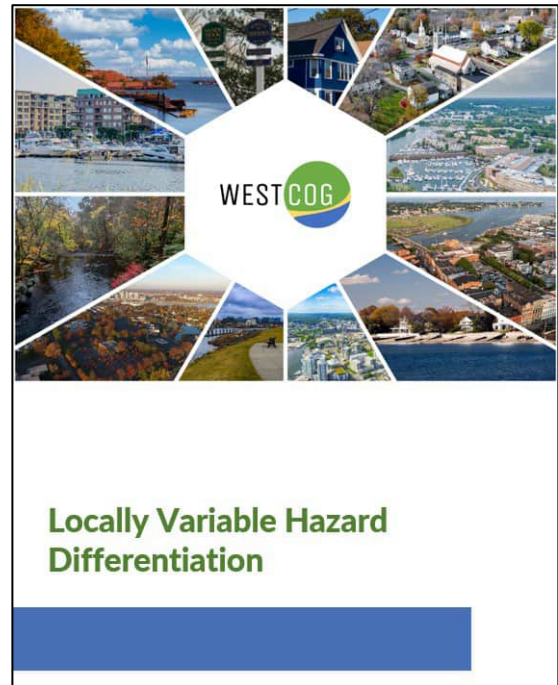
The grant assistance program is continuing into 2027, and WestCOG plans to fund it in future fiscal years. This effort is captured in a new regional mitigation action described in Section 5.4.

#### 4.3.11 WestCOG Climate and Stormwater Assessment

The regional climate and stormwater assessment was referenced several times in preceding sections. This assessment was conducted in the first six months of 2026 to provide the 18 member municipalities with resources to comply with elements of Public Act 25-33 (the "climate bill"). The deliverables of this program included:

- Regional Climate Assessment
- Locally Variable Hazard Assessment
- Technical Data Interpretation Memo
- Model Plan of Conservation and Development (POCD) Chapter
- Implementation Guidance

WestCOG has pre-programmed a calendar function to ensure that member municipalities are reminded of the presence of the resources before they undertake POCD updates. This effort is captured in a new regional mitigation action described in Section 5.4.



## 4.4 Municipal

Local mitigation capabilities generally fall within the six categories of Prevention, Property Protection, Emergency Services, Public Education and Awareness, Natural Resource Protection, and Structural Projects. An individual action could fall within one or more of these categories. Typical general local mitigation capabilities are discussed below.

### 4.4.1 Prevention

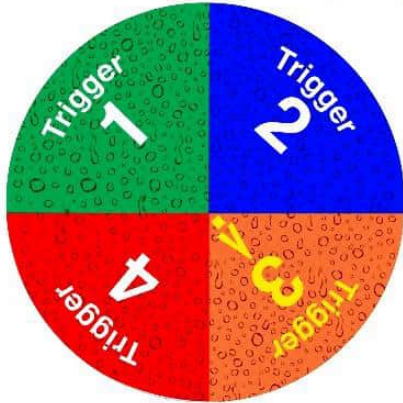
In general, preventative strategies are those that will keep a problem from getting worse. These often include the adoption of regulations or conducting planning studies to better understand a vulnerability and potential solutions. The Fact Sheets on the following pages describe examples of flood and drought plans and studies that serve as hazard prevention strategies.

Prevention capabilities in the region include zoning regulations and subdivision regulations that restrict development in areas at risk of flooding or other unsafe areas, provide design criteria for development in certain zones, and require open space to be set aside. In Connecticut, the local ordinance designed to meet the minimum standards of the NFIP is often contained directly within the zoning regulations. However, recall from Section 4.2.1 that the State Building Code is more restrictive than the minimum NFIP standard. Local enforcement of the State Building Code is also a preventative measure overseen by the local Building Official. The Connecticut State Building Code is enforced statewide.

However, simply implementing the State Building Code locally without updating the flood damage prevention regulations may be insufficient, as the permitting and building approvals are not always parallel. Updating local regulations to incorporate State Building Code requirements will avoid confusion, aid enforcement, and make inspections more effective. Furthermore, updating local zoning regulations can support municipal efforts to bring the local building-stock up to code.

# MITIGATION SUCCESS STORY

## AQUARION DROUGHT PLANNING AND ALERTS



Aquarion Drought Trigger Framework  
Image: Aquarion Water Company



Sign announces water ban  
Photo: CT Post

### WHAT IS IT?

Aquarion Water Company publishes weekly water supply updates for the water systems in the WestCOG region. The weekly status reports summarize water demand, reservoir status, and rainfall trends, thereby providing key data to municipalities to help inform decision-making about activities such as water restrictions.

To simplify the information, Aquarion assigns current conditions as one of four “Drought Triggers.” Each trigger level calls for successively more significant water conservation measures, such as voluntary or mandatory irrigation restrictions. Water conservation measures recommended by Aquarion include:

- Cut your grass taller: taller grass shades roots and retains soil moisture
- Water less: grass roots will respond by growing deeper
- Adjust your sprinklers so that they’re not watering the street or sidewalk
- Use hand watering or drip irrigation for shrubs and flowers
- Inspect your irrigation system for leaks, breaks, or blockages
- Turn off the water while soaping, shaving, or brushing and minimize baths and the amount of water you use for each; trim a minute off your showers
- Wash only full loads in your dishwasher and washing machine
- Reuse dehumidifier, shower, or other water to water plants

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Aquarion and its member communities sustained severe losses in the drought of 2015-2017. Reactionary water use bans and restrictions imposed on new developments caused economic disruptions, and emergency measures such as the temporary pipeline along the Merritt Parkway cost Aquarion millions of dollars in unplanned expenditures.

Lessons learned during the drought have contributed to permanent changes such as alternate-day lawn watering restrictions in southwest Fairfield County. These changes, in turn, have fostered judicious water use that allow economic activity and avoid emergency water supply expenditures. These avoided losses are aligned with the goals of hazard mitigation and reduce costs going forward, allowing the communities and Aquarion to sustain subsequent flashy droughts like the one experienced in 2020.

### FOR MORE INFORMATION

Aquarion Water Company  
200 Monroe Turnpike  
Monroe, CT 06468  
1-800-732-9678  
[www.aquarionwater.com/conservation](http://www.aquarionwater.com/conservation)

Connecticut DEEP has designed a model ordinance that incorporates the higher regulatory standards required by the State Building Code. The model ordinance includes provisions for both inland and coastal communities as discussed in Section 4.2.1. These model regulations outline the changes municipalities need to make to incorporate the current State Building Code language.

Local inland wetlands and watercourses regulations provide an additional layer of local oversight over activities that may encroach upon wetlands and watercourses. Local regulations are typically enforced by a Zoning Enforcement Officer or a Land Use Inspector, municipal employees who serve as liaisons to the applicable commissions. Prevention capabilities also include regular inspections of dams by the property owner.

Each WestCOG municipality has a local POCD. Several goals of these plans are pertinent to hazard mitigation, including conservation goals such as protecting natural resources, addressing drainage problems, preserving open space and greenways, and infrastructure goals such as addressing community facility and utility needs. POCDs typically identify watercourses, steep slopes greater than 25%, wetlands, and the SFHA as resources to preserve and avoid to the extent possible. A typical goal identified in local POCDs is to encourage future development away from sensitive natural resources and to minimize potential impacts. A variety of goals and objectives related to hazard mitigation have been identified in the local POCDs which are discussed in the annexes for each community. *As municipalities incorporate the requirements of Public Act 25-33, POCDs will tend to include more information about natural hazards and climate-driven challenges; and more strategies and actions that reduce risks.*

### 4.4.2 Property Protection

Property protection strategies typically address the vulnerability of individual buildings. This can include methods to make one building or a series of nearby buildings more resilient.

Many property protection measures, such as elevation to reduce the impact of flooding, are costly and may require the acquisition of grant funding to be successfully completed. Details of a successful home elevation in Greenwich are presented on the following Fact Sheet. WestCOG municipalities have experience in preparing grant applications, such that this effort can be performed when applicable. Other resources are available to assist with grant applications, including WestCOG staff and private consultants.

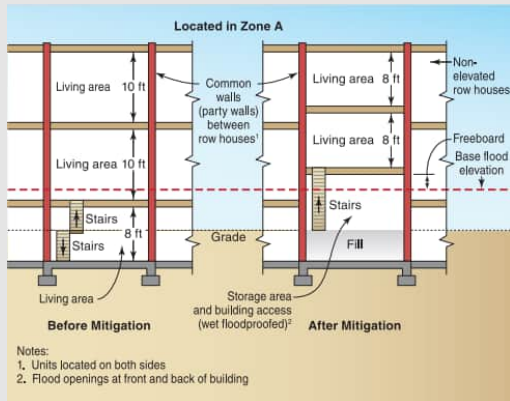
Each WestCOG municipality has a tree warden who encourages residents to cut down trees that may be dangerous to power lines, and who identifies trees on municipal property and along rights-of-way that require trimming. While local public works staff can perform ground-level trimming, most elevated trimming is contracted out in the region.

The SHPO historic resource resiliency planning initiative is described in more detail in Section 4.2.1. Most municipal annexes in this HMP include at least one action related to this initiative.

Because community planners often do not know which resources may be historic or cultural, or which are most likely to be considered historic in the next decade as structures built in the 1950s and 1960s become eligible, it can be difficult to evaluate risks to flooding and other hazards. Municipalities should inform owners of historic property regarding retrofitting methods that are hazard resilient but do not conflict with historic preservation goals.

# MITIGATION SUCCESS STORY

## HOME ELEVATIONS: GREENWICH



*Home elevation example, FEMA*



*Greenwich home elevation  
Photo Helen Neafsey / CT Post*

### WHAT IS IT?

Home elevation generally refers to the retrofit of a residential property so that all livable spaces are raised above flood levels. This is completed by converting the lower levels of a structure into an enclosure that is flood resistant or completely floodable, in compliance with FEMA guidelines. While there are several techniques for home elevation, typically an existing structure is lifted off of its existing foundation and placed onto a new, higher foundation. New construction built above flood elevations is also referred to as being elevated.

Home elevation projects must adhere to local zoning regulations and ordinances. These include requirements to be elevated above the local Base Flood Elevation (BFE) and freeboard (additional elevation requirements above the BFE, typically instituted as a safety precaution), and compliance with local height restrictions (some communities offer flexible height restrictions in the case of home elevations performed to meet floodplain zoning regulations).

Home elevation is the only flood mitigation activity permissible by FEMA for private properties in flood zones.

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Flood damages and repairs can be extremely costly depending on the event and severity of impairment. Therefore, homeowners are urged to seek mitigation strategies to help ease the financial burden of flood recovery.

Property owners throughout the region with homes vulnerable to flooding, in either coastal or riverine flood zones, can consider elevation as a mitigation strategy. While it can be costly, grant funds can be utilized for elevation projects.

The town of Greenwich was able to obtain FEMA funding to partially fund elevations along the shoreline. Damages from Superstorm Sandy in conjunction with a change to municipal codes encouraged residents to elevate.

Other WestCOG municipalities have successfully elevated homes over the past few decades including Westport and Newtown.

### FOR MORE INFORMATION

Dan Warhoza  
Emergency Management Operations  
Coordinator  
Town of Greenwich  
[Daniel.Warhoza@greenwichct.org](mailto:Daniel.Warhoza@greenwichct.org)

#### 4.4.3 Emergency Services

Emergency services strategies typically aim to strengthen or protect emergency services before, during, or immediately after an incident. Mitigation measures related to emergency services typically involve increasing lead times prior to the occurrence of an event and ensuring that adequate facilities and supplies are available to properly respond to an event including backup supplies such as generators. An example of how New Canaan improved its emergency power capabilities is presented in the Fact Sheet following this section.

Local emergency management directors are typically responsible for monitoring local weather warnings and advising local personnel, and work with the owners of large dams to ensure there is lead time to enact the EAP if a failure is imminent. Mitigation strategies that protect reservoirs and wellfields used to provide fire protection water also fall under emergency services.

Each WestCOG municipality maintains a community-wide Emergency Operations Plan (EOP) that is currently updated annually. Under Public Act 15-20, beginning on January 1, 2017, local EOPs must be updated and filed with DEMHS every other year. This plan may include evacuation procedures for certain parts of a community, such as mobile parks, campgrounds, or areas subject to flooding. It may also identify areas that may be difficult to access with emergency vehicles, such as narrow roads or steep roads that may be difficult to pass during winter storms. In addition, each community is party to other emergency planning documents, such as EAPs for significant and high hazard dams. These EOPs and EAPs provide a framework for responding to emergencies. Note that local emergency management directors are also typically responsible for maintaining mutual aid agreements with surrounding communities.

All municipalities currently utilize the state supported WebEOC, an interactive web application, for their incident management functions. The software enables the state, regions, and their municipalities to track and monitor data and resources. WebEOC capabilities include event reporting, data repositories, and situational awareness. The latter creates the ability to communicate resource requests to mobile or field devices, so long as an internet connection is provided. The software requires diligence from the user end, with a need for continuous updates and the sending of information.

One measure taken each winter is plowing. Local public works departments typically perform local plowing with assistance from local park departments and outside contractors. Pre-storm treatment is applied in most communities to mitigate the impacts to driving, and parking bans can be declared in each WestCOG municipality to ensure that access can be maintained for plows. Most communities have standardized plowing routes that prioritize access to critical facilities.

The WestCOG municipalities rely primarily on radio, television, area newspapers, the internet, local emergency notification systems such as CodeRED, and the state CT Alert emergency notification system to notify residents of oncoming storm danger and to announce the availability of shelters. Some communities are small enough that the creation of informational displays in local municipal buildings and high traffic businesses (such as supermarkets) can be performed. Other local capabilities are described in each annex. Prior to severe storm events, WestCOG municipalities ensure that warning and notification systems and communication equipment are functioning properly and prepare for possible evacuations in impacted areas.

Several WestCOG communities have Local Emergency Planning Committees that focus on preparedness. Committee roles may include identification and cataloging of potential hazards, identifying available resources, mitigating hazards when feasible, and preparing emergency plans. These committees are structured to anticipate and plan the initial emergency response for foreseeable disasters, but not to participate in the response.

# MITIGATION SUCCESS STORY

## RESILIENT LOCAL POWER SYSTEMS IN NEW CANAAN



*Turning on the Town Hall Solar Array  
Photo: Grace Duffield*



*New Canaan WWTF*

### WHAT IS IT?

The Town of New Canaan has been working to mitigate the impacts of large-scale power outages on its local operations. Their efforts have consisted of expansion of emergency power systems, construction of small-scale combined heat and power (CHP; also called cogeneration) plants, and installation of solar panels.

New Canaan has acquired a trailer to transport a portable generator to provide backup power to shelters, and is currently looking into acquiring a second, larger trailer. The Town is actively pursuing installation of a CHP at the Wastewater Treatment Facility (WWTF), the Middle School, the High School, the YMCA (a shelter), and the Highway Garage.

The Town has installed solar panels at four municipal buildings and the South School, and is currently solarizing East School. The Town also has plans to solarize parts of the Middle School, High School, and WWTF, as well as the YMCA and Waveny Care Network. Solar power is already located at the Town Pool and Nature Center.

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Power-outages caused by the effects of winter storms, hurricanes, lightning, and other natural hazards is one of the most cited impacts of natural disasters in the region. Such outages can have direct impacts on health, safety, and the economy, as well as indirect impacts on hazard response and recovery efforts.

New Canaan's multifaceted approach to increasing local power generation (by acquiring generators, constructing more significant CHP plants, and installing solar power) enhances local power resiliency.

Communities can also consider developing microgrids that encompass critical facilities. A microgrid is a localized electric system that includes both electricity sources (such as power plants, generators, fuel cells, or solar panels) and electricity users. Under normal conditions, a microgrid is connected to regional electric grids, but during regional power outages a microgrid is able to act in "island mode," maintaining power to connected users.

### FOR MORE INFORMATION

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In addition, some communities have Community Emergency Response Teams composed of local citizens trained to assist emergency responders. Local emergency staff typically review new development projects for emergency response access concerns and encourage the creation of through streets to ensure multiple modes of egress and encourage private property owners to widen access for emergency equipment. Finally, the purchase of any new emergency response equipment (such as all-terrain vehicles to access remote wildfires) would fall under this category.

The 18 WestCOG communities have made many improvements to mitigate the ever-present threat of violence through regular training and the purchase of appropriate protective equipment. Only with continued vigilance can the region continue to strengthen its preparations and ensure the well-being of its communities.

#### **4.4.4 Public Education and Awareness**

Public education strategies seek to inform State officials, local officials, or the general public about ways to protect oneself from the effects of natural hazards, ways to increase resiliency to natural hazards, or to increase coordination between groups to achieve a common goal. For example, the WestCOG municipalities each make available a variety of pamphlets related to hazard mitigation and/or have website sections dedicated to discussing emergency preparedness. A Fact Sheet included on the following page describes an example of an informational brochure developed by the City of Stamford and sent to property owners in flood zones. Local building departments also have information available regarding design standards.

A variety of federal agencies (FEMA, NOAA, etc.) have information available on family preparedness procedures and the best physical locations to be during each type of storm event. This information is made available by each WestCOG municipality when pamphlets are available.

#### **4.4.5 Natural Resource Protection**

Natural resource protection strategies focus on the protection of natural resources, often through the acquisition of open space to prevent future development. Preservation or enhancement of open space could, for example, allow floodplain functions to be able to be performed unimpeded by development. A common natural resource protection strategy is the acquisition of property at risk of flooding and converting that property to open space, but undeveloped land could also be purchased and so assigned. Subdivision regulations typically require open space set-asides to provide a measure of natural resource protection, and local POCDs typically either have or reference an Open Space Plan that prioritizes future open space acquisition, development of trails and greenways, and funding sources for open space. Of particular interest to many communities is that recreational uses on open space are encouraged within SFHAs. Communities often work directly with local land trusts to accomplish common conservation and floodplain management goals related to land acquisition. An example of a property acquisition mitigation success story in Stamford is described on the following Fact Sheet.

Communities that control large areas of forests and brushland occasionally conduct controlled burns to minimize the amount of low-lying combustible materials that could lead to dangerous wildfires during dry conditions. Such burns are often conducted under the guidance of the Connecticut DEEP.

The availability of the *Low Impact Sustainable Development Design Manual* presents an opportunity to guide local flood hazard mitigation actions. Strategies such as reducing impervious surfaces, installing infiltration systems, and zone-specific standards can address environmental impacts that come from typical development approaches such as extensive parking areas, box-building construction, and rapid stormwater removal from a site.

# MITIGATION SUCCESS STORY

## STAMFORD FLOOD PROTECTION INFORMATION BROCHURE

### Be Prepared for Flooding

**Flood Protection Information  
Stamford, Connecticut**



*Stamford Flood Brochure Cover*

### WHAT IS IT?

The City of Stamford produces an annual brochure full of useful information for residents and property owners related to flood hazards and mitigation. The brochure covers identification of flood zones, natural and beneficial functions of the floodplain, flood warning systems, the National Flood Insurance Program, property protection, relevant laws, and ways to get assistance.

The annual brochure is distributed to properties within mapped flood zones, and is available at municipal buildings and through the city's website.

Production and distribution of the brochure helps meet FEMA Community Rating System (CRS) requirements. Through the CRS, communities can earn points for actions that go above and beyond minimum FEMA mitigation requirements, and reduce federal flood insurance premiums for local property owners.

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Public communication, education, and outreach about flood and other natural hazard risks is an important part of a comprehensive hazard mitigation strategy.

These efforts must be performed on a regular basis, and should target a wide audience.

Public engagement programs can include:

- Brochures mailed to residents
- Informational websites
- Social media campaigns
- Workshops, seminars, or webinars
- Educational materials at municipal buildings

### FOR MORE INFORMATION

City of Stamford  
Environmental Protection Board  
888 Washington Boulevard  
Stamford, CT 06901  
203-977-4028  
[www.bepreparedstamford.org](http://www.bepreparedstamford.org)

# MITIGATION SUCCESS STORY

## MILL RIVER PARK PROPERTY ACQUISITIONS IN STAMFORD



*High flows in Mill River Park  
Photo: The Olin Studio*



*Aerial design drawing of the park  
Image: The Olin Studio*

### WHAT IS IT?

The Mill River Corridor Project is an ambitious effort that has added some 19 acres of parkland along both sides of the Rippowam (Mill) River and upgraded seven acres of parkland.

Creation of the park included dam removal, dredging, planting and landscape design, and acquisition of properties and easements to preserve open space. Property acquisitions included the purchase and removal of existing structures, as well as acquisition of open space in order to prevent development on those lots.

Overall, the project has cost over \$20 million, over half of which has come from federal funding. The Mill River Corridor Project has mitigated dam failure hazard through dam removal, and mitigated flood hazards by creating floodplain storage and preventing development within an area of flood risk. It has also created social and ecological benefits.

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Property owners that experience flooding regularly may be interested in relocating or may struggle to sell their property as values drop. Municipalities may want to avoid the costs of ongoing maintenance, mitigation, and emergency response activities.

In such situations, municipalities can support owners by acquiring their at-risk properties and enabling them to relocate. Flooding can be further mitigated by removing structures on such properties and preserving them as open space.

State and federal grants are often available for property acquisition and open space creation, bringing money into the community and supporting the local economy.

### FOR MORE INFORMATION

Stamford Planning & Zoning  
888 Washington Boulevard  
7th Floor  
Stamford, CT 06901  
(203) 977-4711

LID can increase the resilience of communities to the impacts of climate change on the natural, built, and human environments. Installation of LID infrastructure increases small and rural community resiliency in many ways, including:

- Protecting drinking water supplies, streams, rivers, and other water resources throughout the watershed
- Protecting natural vegetation, hydrology, and other resources on development sites
- Reducing damage to local roads, bridges, the built environment, as well as to agricultural resources and human environments.

Mitigation actions that promote the use of LID techniques were incorporated into many of the municipal annexes of this HMP. Primarily, this was done through the action related to Sustainable CT, which includes a sub-action to “Revise regulations to promote LID”.

#### **4.4.6 Structural Projects**

Structural project strategies typically include the construction of a capital improvement that reduces vulnerability to natural hazard damage, such as dams, floodwalls, or access roads into outlying areas. Drainage systems and public water systems are the most typical structural projects in place in most WestCOG communities.

Structural projects related to flood mitigation are aimed at drainage system installation and maintenance and increasing conveyance at culverts and bridges. Local public works departments are typically responsible for maintenance of municipal drainage systems, while the CTDOT maintains those for state roads. This maintenance includes programs to clean out blockages caused by growth and debris. An example of a recent drainage project funded in Brookfield and road drainage improvements in New Milford are presented on the following Fact Sheets.

Other structural project strategies can include the installation of new water mains to provide fire protection to outlying areas or the installation of dry hydrants for the same purpose. Storage tanks can also be installed in new developments in outlying areas to provide a source of firefighting water. Such structural projects are also typically emergency services projects.

# MITIGATION SUCCESS STORY

## BROOKFIELD DRAINAGE PROJECT



*Flooding in the Meadowbrook  
Manor neighborhood  
Photo Newstimes (Hearst  
Connecticut Media)*



*Construction on Meadowbrook Road  
Photo Carol Kaliff / Newstimes  
(Hearst Connecticut Media)*

### FOR MORE INFORMATION

Ralph Tedesco, P.E.  
Director of Public Works  
Town of Brookfield  
(203) 775-7300  
[www.brookfieldct.gov/public-works](http://www.brookfieldct.gov/public-works)

### WHAT IS IT?

Meadowbrook Manor in Brookfield has been plagued by flooding for more than five decades. In addition to direct damage to property and the blocking of roads, severe flooding events in Meadowbrook Manor resulted in contaminated septic water flowing into homes.

Through an evaluation of flooding within the Still River Corridor, the Town identified a cause of the flooding to be the insufficient drainage infrastructure in the neighborhood.

In 2016, the town successfully implemented a conveyance and drainage improvement project at Meadowbrook Manor.

The project used \$1.3 million in FEMA funding, as well as a local match, to install a new stormwater drainage system with increased capacity to reduce flooding from Lime Kiln Brook.

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Municipalities across the region struggle with flooding attributed to inadequate drainage and undersized culverts and bridges.

Drainage systems may not be sufficient for current flow conditions because of a combination of expanding impervious surfaces over time (which leads to increase peak flow volumes), rising precipitation magnitudes related to climate change, degradation and lack of maintenance, or inadequate initial design standards.

In order to address this challenge, communities can upgrade or construct new drainage and sewer systems are appropriately sized to pass high flow events under current conditions. Sizing culverts and bridges so that debris can pass unimpeded can have additional benefits in terms of performance, longevity, and local ecosystems.

# MITIGATION SUCCESS STORY

## ROAD DRAINAGE IMPROVEMENTS IN NEW MILFORD



*Photos of the roads before repair  
Photo: New Milford*

### WHAT IS IT?

The Town of New Milford performed a road repaving and repair project on Squire Hill Road and Long Mountain Road.

The project included drainage upgrades, erosion damage repairs and mitigation, and improvements to the road surface.

While not explicitly pursued as a hazard mitigation action, the project mitigated flood and erosion concerns and improved emergency services capabilities by reducing the risk of these roads becoming impassible.

### REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Communities are always pursuing capital improvement projects and may not realize that many of those projects also have hazard mitigation benefits. Drainage improvements on roadways can mitigate flood damages to the roadway and downstream, reduce pollution to downstream waterbodies, and maintain important transportation connectors to allow emergency access and egress.

Municipalities should review their capital improvement plans to identify projects that achieve, or can be revised to achieve, hazard mitigation goals. Those projects can then be included in the hazard mitigation plan and may be eligible for FEMA funding.

### FOR MORE INFORMATION

New Milford Highway Department  
6 Young's Field Rd  
New Milford, CT 06776  
[public\\_works@newmilford.org](mailto:public_works@newmilford.org)  
(860) 355-6045

## 5.0 Mitigation Strategies

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### 5.1 Types of Mitigation Strategies

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Potential mitigation strategies are numerous and varied. Not all mitigation strategies are appropriate for every community, and some communities have greater capacity to institute mitigation strategies than others. The general mitigation strategies below should be considered by each WestCOG municipality whenever conditions are appropriate. These are in addition to the specific strategies and actions outlined in each municipal annex.

#### 5.1.1 Prevention

Example preventative mitigation strategies for natural hazards can include:

- Strengthening flood mitigation provisions in local land use regulations to be, at a minimum, consistent with those in the State Building Code.
  - Structures in all inland SFHAs (including A zones) must have the lowest floor elevated to the BFE plus 1 foot
  - Structures in coastal SFHAs must have the bottom of the lowest horizontal structural member elevated to the BFE plus 1 foot
  - Critical facilities must meet the above requirements to the BFE plus 2 feet
- Strengthen flood mitigation provisions in local land use regulations by adopting “No Adverse Impact” policies, and/or lengthening the timeframe utilized for substantial improvement calculations to two or more years
- Develop and/or strengthen stormwater management regulations and programs, such as by reducing stormwater runoff from new development sites and the adoption of impervious surface limitations
- Prepare watershed management plans
- Join FEMA’s CRS program
- More effectively use FEMA Elevation Certificates to ensure compliance with flood regulations (as required for the CRS program)
- Conduct hydrologic and hydraulic studies to evaluate risks and potential flood mitigation strategies.
- Develop stream buffer ordinances
- Assess the vulnerability of structures and infrastructure in shoreline areas to the sea level rise scenarios prepared by CIRCA
- Prohibit reconstruction and redevelopment in areas susceptible to chronic flooding
- Utilize a tracking program to track natural events and responses in order to help prioritize potential future projects.

#### 5.1.2 Property Protection

A variety of property protection strategies can be implemented at the local level to prevent damage to individual properties. These can include:

- Elevating and floodproofing for homes and businesses, particularly RLPs
- Creation of flood walls to protect one or more buildings
- Inspection of trees and tree-trimming along power lines (by Eversource) and near vulnerable structures
- Locating utilities underground
- Insulating pipes to protect against freezing and bursting
- Removing snow from flat roofs or using heating coils to melt snow

- Temporarily hardening homes and businesses in advance of heavy wind events (boarding windows, closing shutters, moving small items inside)
- Performing wind damage retrofit projects (installing shutters, wind-resistant windows, code plus projects (those that exceed the local building code), roof projects, and load path projects)
- Strengthening and retrofitting non-reinforced masonry buildings and non-ductile concrete facilities that are particularly vulnerable to ground shaking
- Encouraging property owners to remove deadfall in wooded areas of their properties, and to trim back overgrowth encroaching on structures
- Hardening of critical facilities and infrastructure
- Installing surge protection on critical electronics

### 5.1.3 Emergency Services

Example mitigation actions related to emergency services may include:

- Floodproofing critical facilities, such as wastewater treatment plants, police and fire stations, EOCs, and emergency shelters
- Relocating critical facilities to locations outside of flood prone areas
- Requiring new municipal critical facilities to comply with the State of Connecticut design standards for critical facilities regardless of funding source
- Upgrade or install generators to ensure adequate backup power is available to critical facilities
- Improve coordination with local utilities, particularly "Make Safe" crews for clearing of tree debris near powerlines
- Improve emergency access to critical facilities
- Encourage or perform public water supply infrastructure upgrades for areas with substandard fire protection, and extensions into areas without adequate fire protection
- Install dry hydrants or cisterns in areas where public water supply is not available
- Purchase equipment to fight forest fires in remote areas

### 5.1.4 Public Education and Awareness

Example mitigation actions related to public education and awareness may include:

- Perform outreach regarding flood risk, sea level rise, and safety, particularly to flood prone neighborhoods and owners of RLPs.
- Encourage property owners and renters in flood prone areas to purchase flood insurance
- Hold workshops to facilitate dissemination of information on technical assistance programs
- Add pages to municipal websites dedicated to natural hazard event preparation and safety during power outages
- Add seasonal pages to municipal websites to address preparation for typical natural hazard events such as winter storms, hurricanes, and thunderstorms
- Disseminate informational pamphlets and brochures to public locations such as municipal buildings and libraries
- Distribute wildfire risk information to properties along the wildland-urban interface.

### 5.1.5 Natural Resource Protection

Example projects may include:

- Acquisition of property at risk of flooding (particularly RLPs) and conservation to permanent open space
- Protection and restoration of natural flood mitigation features such as wetlands, riverbanks, and dunes

- Establish riparian or vegetative buffers to prevent erosion, slow drainage, and improve water quality
- Establish a green infrastructure program
- Implement beach nourishment programs
- Acquiring land in potential salt marsh advancement areas

#### 5.1.6 **Structural Projects**

Structural projects may include bracing and hardening for critical equipment, such as generators, or retrofitting a dam to pass a larger flood event without causing damage to the dam. Other example projects may include:

- Increasing capacity of stormwater drainage systems
- Separating combined storm sewer and sanitary sewer systems
- Increasing capacity of detention and retention ponds and basins
- Elevating roads, bridges, and other infrastructure above the base flood elevation and/or potential sea levels
- Constructing berms and dikes of erosion-resistant material to protect vulnerable buildings and areas
- Installing bioengineered bank stabilization techniques
- Establishing debris management and clearing capabilities

Power outages caused by the effects of winter storms, hurricanes, lightning, and other natural hazards are one of the most cited impacts of natural disasters in the region. Such outages can have direct impacts on health, safety, and the economy, as well as indirect impacts on hazard response and recovery efforts.

Municipalities can mitigate damages and disruption caused by outages by working to increase the resiliency of the power grid, improving outage response, installing emergency generators in critical facilities, developing local power generation and microgrids, and helping residents and businesses prepare for outages.

A microgrid is a localized electric system that includes both electricity sources (such as power plants, generators, fuel cells, or solar panels) and electricity users. Under normal conditions, a microgrid is connected to regional electric grids, but during regional power outages a microgrid is able to act in “island mode,” maintaining power to connected users – typically critical facilities and nearby commercial nodes such as gas stations, pharmacies, and grocery stores.

Every municipal annex in this HMP includes some mitigation actions related to increasing the resiliency of the electric grid. Some mitigation actions include the following:

- Coordinate with the local energy utility on efforts to improve grid resiliency and outage response.
- Perform public outreach and education about power outage safety and mitigation.
- Maintain public “comfort stations” for residents without power to keep warm or cool, and recharge electronic devices.
- Create a communications plan that considers power loss, and the possible loss of internet and phone capabilities that may result.
- Maintain a list of residents who rely on powered medical devices to facilitate check-ins and response during power outages.
- Install backup power at critical facilities
- Explore development of local power generation (such as solar panels) and microgrids

## 5.2 Mitigation Challenges

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The following challenges faced by local communities in implementing hazard mitigation measures are common to most municipalities in the region. In the discussion of mitigation strategies that follows, some additional challenges unique to certain communities may be included; however, the following challenges apply to most WestCOG municipalities. These challenges can affect the effectiveness of existing authorities, policies, programs, and resources; however, local governments have a range of procedures and tools that allow them to adjust their programs, procedures, and resources over time to mitigate natural hazards more effectively.

### 5.2.1 Limited Resources

Local communities, as well as state and federal governments, private enterprises, nonprofit organizations, and households all face financial limitations which can restrict their ability to fully implement measures and activities that are in their best interest. At the local level, most financial resources are provided through property tax revenue, with additional support from state and federal governments through various programs and grants. The lingering effects of the Great Recession have severely tightened most local budgets. State budget limitations also affect local resources.

Through the local political and planning processes and budget deliberations, municipalities routinely reevaluate local programs and policies and adjust spending priorities. Expenditures on programs that support natural hazard mitigation may not always be considered by a community and its citizens as high a priority as expenditures related to schools or other local initiatives as well as those related to mandated programs and expenditures. The lack of, or limits on, funding can lead to reduced effectiveness in a municipality's capability to accomplish hazard mitigation.

At the regional level, WestCOG's ability to implement mitigation activities is also tied to financial limitations. Funding is derived primarily from state and federal grants and programs, and municipal dues. As these various levels of government face financial cutbacks and changes in spending priorities, financial support to WestCOG can be impacted.

Finally, as discussed throughout Sections 4.1, 4.2, and 4.3, there are numerous ongoing federal, state, and regional programs ongoing that compete for the attention of local staff, boards, and commissions. As noted in those sections (and also in Section 5.1), there are numerous potential actions for WestCOG municipalities derived from these initiatives that are relevant to the goals of this HMP. Specific actions related to these programs have been incorporated, as noted above, into each municipal annex.

### 5.2.2 Multiple Jurisdictions

Hazard mitigation requires coordination among the multiple federal, state, and local agencies that influence development, maintenance, and emergency response activities. At the local level, some municipalities have difficulty getting their inland wetlands commissions and public works staff to agree on the appropriateness of drainage maintenance activities to reduce the risk of flooding. In addition, some communities face flooding risks from natural and/or man-made influences located in other communities, requiring interlocal coordination and communication. Finally, it can be difficult for a community to take full advantage of available federal and state resources for mitigation activities because programs are spread among different departments and agencies, such as FEMA, the U.S. Department of Agriculture, Connecticut DEEP, and DEMHS.

Most WestCOG municipalities are active in regional organizations such as WestCOG, the Connecticut Conference of Municipalities, and the Connecticut Council of Small Towns, which provide a variety of services such as management and technical assistance, training, and coordination among various agencies; lobbying for changes in state legislation; use of

shared resources; and negotiating for competitive contracts for a variety of goods and services. These organizations can help improve the effectiveness of many local efforts, including hazard mitigation.

### 5.2.3 State Infrastructure

Many WestCOG municipalities have previously identified stormwater management as a high-priority natural hazard mitigation concern. This concern continues. Many communities have specific locations subject to periodic flooding that result from state road drainage systems. Resolving minor flooding problems on state roads is difficult for municipalities because they have no purview over improvements on state infrastructure. Some such flooding areas pose emergency access risks while others present minor property damage concerns. Several towns also identified difficulties with the state's response to storm, snow, and accident cleanup on state roads.

In the aftermath of the two storms of 2011, Irene and Alfred, the Governor appointed a Two Storm Panel to review how the storms were handled and to make recommendations for future disaster preparedness and response. Among the panel's recommendations were a number calling for improvements in state infrastructure and disaster preparedness, including developing "new engineering standards that will better protect the built environment from the effects of extreme weather," improved GIS mapping and analysis, and planning for the issues rising sea levels will have on combined sewer overflows and dam safety.

### 5.2.4 Vulnerability to Power Outages

The widespread and lengthy power outages resulting from downed wires and damages to transmission lines due to Irene and the October snowstorm in 2011 brought attention to the need for tree maintenance in utility rights-of-way and along roadways and the need for better coordination and communication between Eversource and municipal officials. Among the Two Storm Panel's recommendations were calls for improved coordination among electric and telecommunications utilities, municipalities, and state agencies in dealing with tree maintenance; a comprehensive study of the feasibility, cost, and reliability of undergrounding utilities; and the establishment of a state working group to improve municipal and utility collaborations. Coordination issues occurred in many communities during Tropical Storm Isaias in August 2020, suggesting that coordination improvements have yet to be fully established.

## 5.3 Ranking of Mitigation Strategies

To prioritize recommended mitigation actions, it is necessary to determine how effective each measure will be in reducing or preventing damage. A set of criteria commonly used by public administration officials and planners was applied to each proposed strategy. The method, called STAPLEE, is outlined in FEMA planning documents such as Developing the Mitigation Plan (FEMA 386-3) and Using Benefit-Cost Review in Mitigation Planning (FEMA 386-5). STAPLEE stands for the "Social, Technical, Administrative, Political, Legal, Economic, and Environmental" criteria for making planning decisions.

Criteria were divided into potential benefits (pros) and potential costs (cons) for each mitigation strategy. The questions in Table 5-1 were asked about the proposed mitigation strategies:

Benefit-cost review was emphasized in the prioritization process by double ranking technical feasibility and economic considerations. Another consideration is the potential social costs of a project. FEMA encourages communities to consider issues of environmental justice when considering mitigation projects. This is because certain types of mitigation projects may disproportionately affect lower income areas or higher income areas as opposed to helping all members of a community.

**Table 5-1: STAPLEE Benefit-Cost Overview**

| Benefit (Pro)                                                                                                                                                                                                                                                                                                 | Cost (Con)                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Social</b>                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                         |
| Is the proposed strategy socially acceptable to the community?                                                                                                                                                                                                                                                | <p>Are there any equity issues involved that would mean that one segment of the community could be treated unfairly?</p> <p>Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower-income people?</p> <p>Is the action compatible with present and future community values?</p> |
| <b>Technical</b>                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                         |
| <p>Will the proposed strategy work?</p> <p>Will it reduce losses in the long term with minimal secondary impacts?</p>                                                                                                                                                                                         | <p>Is the action technically feasible?</p> <p>Will it create more problems than it will solve?</p> <p>Does it solve the problem or only a symptom?</p>                                                                                                                                                                                  |
| <b>Administrative</b>                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                         |
| Does the project make it easier for the community to administrate future mitigation or emergency response actions?                                                                                                                                                                                            | <p>Does the community have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained?</p> <p>Can the community perform the necessary maintenance?</p> <p>Can the project be accomplished in a timely manner?</p>                                                                 |
| <b>Political</b>                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                         |
| <p>Is the strategy politically beneficial?</p> <p>Is there public support both to implement and maintain the project?</p> <p>Is there a local champion willing to see the project to completion?</p> <p>Can the mitigation objectives be accomplished at the lowest cost to the community (grants, etc.)?</p> | <p>Have political leaders participated in the planning process?</p> <p>Do project stakeholders support the project enough to ensure success?</p> <p>Have the stakeholders been offered the opportunity to participate in the planning process?</p>                                                                                      |
| <b>Legal</b>                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                         |
| <p>Is there a technical, scientific, or legal basis for the mitigation action?</p> <p>Are the proper laws, ordinances, and resolutions in place to implement the action?</p>                                                                                                                                  | <p>Does the community have the authority to implement the proposed action?</p> <p>Are there any potential legal consequences?</p> <p>Will the community be liable for the actions or support of actions, or for lack of action?</p> <p>Is the action likely to be challenged by stakeholders who may be negatively affected?</p>        |
| <b>Economic</b>                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                         |
| Are there currently sources of funds that can be used to implement the action? What benefits will the action provide? Does the action contribute to community goals, such as capital improvements or economic development?                                                                                    | <p>Does the cost seem reasonable for the size of the problem and the likely benefits?</p> <p>What burden will be placed on the tax base or local economy to implement this action? What proposed actions should be considered but be tabled for implementation until outside sources of funding are available?</p>                      |

| Benefit (Pro)                                                                           | Cost (Con)                                                                                                                                              |
|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental                                                                           |                                                                                                                                                         |
| Will this action beneficially affect the environment (land, water, endangered species)? | Will this action comply with local, state, and federal environmental laws and regulations? Is the action consistent with community environmental goals? |

Each proposed mitigation strategy presented in this plan was evaluated and quantitatively assigned a "benefit" score and a "cost" score for each of the seven STAPLEE criteria, as outlined below:

- For potential benefits, a score of "1" was assigned if the project will have a beneficial effect for that particular criterion; or a "0" if the project would have a negligible effect or if the questions were not applicable to the strategy.
- For potential costs, a score of "-1" was assigned if the project would have an unfavorable impact for that particular criterion; or a "0" if the project would have a negligible impact or if the questions were not applicable to the strategy.
- Technical and Economic criteria were double weighted (multiplied by two) in the final sum of scores as noted above.
- The total benefit score and cost score for each mitigation strategy was summed to determine each strategy's final STAPLEE score.

An evaluation matrix with the total scores from each strategy can be found appended to each municipal annex. A copy of the complete STAPLEE score matrix for all actions is in Appendix D. In general, the highest scoring was determined to be of more importance economically, socially, environmentally, and politically and, hence, is prioritized over those with lower scoring. Scoring is translated into rankings of "High", "Medium", or "Low" relative to range of scores for that community. The mitigation strategy is divided into objectives and tasks at the end of each community section with the priority of each task clearly identified.

An implementation strategy and schedule are included for each strategy and action, detailing the responsible department and anticipated time frame for the specific recommendations listed throughout each annex. The cost of each strategy and action has been estimated into ranges. Exact cost estimates were not developed for this planning document. Funding sources for proposed strategies and actions are also listed. More information about potential funding sources is provided in Section 7.0.

## 5.4 Regional Mitigation Strategies

As presented in Section 1.2, **WestCOG's goal for this HMP** is to reduce loss of life, damage to property and infrastructure, costs to residents and businesses, and municipal service costs due to the effects of natural hazards and disasters. Education of residents and policymakers and the connection of hazard mitigation planning to other community planning efforts are key to achieving this goal, as is the enhancement and preservation of natural resource systems in each member community.

In order to achieve this goal, WestCOG has developed the following objectives and strategies that it will attempt to implement over the next five years. These objectives are primarily aimed at implementation of state planning goals and assistance to WestCOG municipalities related to implementation of their strategies and actions.

The statuses of regional, shared actions from 2021 are provided below. Some actions have been continued with modifications.

**Table 5-2: Status of WestCOG Mitigation Strategies from 2021 Update****Objective 1: Assist with HMP implementation and maintenance.****Strategies and Actions:**

1.1 Notify municipalities of the availability of funding sources and provide guidance for grant applications.

**Action Description:** Notify member communities of the annual opportunity to apply for HMA grant funding and the opportunity to apply for HMGP funding whenever applicable. Provide letters of support when appropriate. Provide a seminar (with assistance from DEMHS) or other guidance to assist with preparation of grant applications.

**Lead:** WestCOG

**Priority:** Moderate

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** Annually or more frequently as grant opportunities are available

**Status:** Complete – will be carried forward as HMA Assistance Program.

1.2 Host an annual meeting to encourage HMP maintenance.

**Action Description:** WestCOG will host an annual meeting of local coordinators to discuss the status of regional initiatives, collect feedback on implementation of local strategies and actions, provide a forum to discuss implementation challenges, and to share ideas. WestCOG will request that local coordinators hold an internal meeting to track progress on local mitigation actions, and add new actions if appropriate, prior to attending the regional meeting.

**Lead:** WestCOG

**Priority:** Moderate

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** Annually

**Status:** Complete – held an annual meeting in 2023, 2024, and 2025 in accordance with the HMA Assistance Program, and will be carried forward as a part of the Program.

1.3 Secure funding for regional projects

**Action Description:** WestCOG will help secure funding for regional projects that may benefit more than one community. Example projects included in the Regional POCD include encouraging FEMA to update the hydrology used to generate FIRMs for riverine flooding in the region, advocating for adoption of stream belt regulations, and working with communities to reduce the impact of impervious surfaces.

**Lead:** WestCOG

**Priority:** Low

**Estimated Cost:** Varies

**Potential Funding Source(s):** WestCOG operating budget, grants

**Timeframe:** As needed

**Status:** Partially complete – Effort is ongoing and the COG has executed some projects. This will be carried forward to continue progress.

1.4 Encourage local communities to participate in the CRS program by hosting an informational workshop.

**Action Description:** WestCOG can organize an informational workshop to present the CRS program to its member municipalities. Speakers from FEMA and ISO will be requested to present, and existing CRS communities will be asked to provide lessons learned.

**Lead:** WestCOG

**Priority:** Low

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** 2022

**Status:** No progress = this has been on hold as the COG has been focusing on the HMA Assistance Program.

1.5 Secure funding for HMP update

**Action Description:** WestCOG will secure funding in a timely manner in order to ensure that the next HMP update is completed and adopted before expiration of this HMP.

**Lead:** WestCOG

**Priority:** High

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** 2024-2025

**Status:** Completed – utilized in 2026.

## **Objective 2: Assist WestCOG municipalities in implementing State of Connecticut planning goals.**

### **Strategies and Actions:**

2.1 Assist local communities regarding identification of historic and cultural resources and potential mitigation actions.

**Action Description:** WestCOG will assist with identification of historic resources, review of floodplain and historic preservation regulations and ordinances, regional and state coordination, incorporation of historic preservation into planning documents, recovery planning, adaptation measures, and education. This will particularly be important for the two Litchfield County communities where SHPO has not performed a detailed study.

**Lead:** WestCOG

**Priority:** Low

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** As requested

**Status:** Not completed – will be carried forward

2.2 Encourage participation in the Sustainable CT program.

**Action Description:** The Sustainable CT program is a potential way for WestCOG communities to help track sustainability goals and actions and there are many parallels for hazard mitigation. WestCOG will encourage enrollment in the program and provide technical assistance and guidance to assist communities with enrollment.

**Lead:** WestCOG

**Priority:** Low

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** As requested

**Status:** Completed – all communities who can participate are doing so.

2.3 Assist small businesses in the region to better prepare for natural hazards.

**Action Description:** WestCOG will coordinate with its members and local chambers of commerce to prepare a presentation aimed at assisting small businesses in the region to prepare for and mitigate the impact of natural hazards. This includes recommendations for improved chemical safety practices to protect the environment and public health following natural hazard events. A seminar will be provided with requested speakers from DEEP and other agencies focused on business needs.

**Lead:** WestCOG

**Priority:** Low

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** 2023

**Status:** Completed as needed - remove

2.4 Work with municipalities to create recovery frameworks for businesses.

**Action Description:** When a disaster strikes, municipalities often provide recovery centers for citizens. A similar type of service or facility could also be dedicated to meeting business needs. In an emergency, space could be allocated that provides electricity and an internet connection so that some businesses can still maintain operations even at a diminished capacity. The Western Connecticut Economic Development District will work with municipalities to designate these recovery services and/or facilities. This strategy is included in the WestCOG CEDS.

**Lead:** WestCOG

**Priority:** Low

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget, U.S. Economic Development Administration Grants

**Timeframe:** 2023

**Status:** Capability – the COG has staff which monitors for these opportunities. Remove for next update.

2.5 Provide technical assistance regarding the MS4 program.

**Action Description:** Municipal separate storm sewer permit registrations and compliance remains an important consideration for many WestCOG municipalities. As compliance may achieve parallel hazard mitigation actions, WestCOG will provide technical assistance to its communities related to compliance as requested.

**Lead:** WestCOG

**Priority:** Low

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** As requested

**Status:** Capability – COG provides assistance as needed. Remove for next update.

New actions are listed below.

Table 5-3 WestCOG Mitigation Strategies for 2026 – 2031

**Objective 1: Assist with HMP implementation and maintenance.****Strategies and Actions:****1.1 Notify municipalities of the availability of funding sources and provide guidance for grant applications.**

**Action Description:** Notify member communities of the annual opportunity to apply for HMA grant funding and the opportunity to apply for HMGP funding whenever applicable. Provide letters of support when appropriate. See also action #1.4 below.

**Lead:** WestCOG

**Priority:** Moderate

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** Annually or more frequently as grant opportunities are available

**Status:** Carried Forward

**1.2 Host an annual meeting to facilitate HMP maintenance.**

**Action Description:** WestCOG will host an annual meeting of local coordinators to discuss the status of regional initiatives, collect feedback on implementation of local strategies and actions, provide a forum to discuss implementation challenges, and to share ideas. WestCOG will request that local coordinators hold an internal meeting to track progress on local mitigation actions, and add new actions if appropriate, prior to attending the regional meeting.

**Lead:** WestCOG

**Priority:** Moderate

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** Annually, mid-year

**Status:** Carried forward

**1.3 Secure funding for regional projects.**

**Action Description:** WestCOG will help secure funding for regional projects that may benefit more than one community. Past example projects included advocating for adoption of stream belt regulations and working with communities to reduce the impact of impervious surfaces.

**Lead:** WestCOG

**Priority:** Low

**Estimated Cost:** Varies

**Potential Funding Source(s):** WestCOG operating budget, grants

**Timeframe:** As needed

**Status:** Carried forward

#### 1.4 Continue the HMA Grant Assistance Program.

**Action Description:** WestCOG will continue to provide assistance to member communities on the development of HMA Grant applications.

**Lead:** WestCOG

**Priority:** High

**Estimated Cost:** Varies

**Potential Funding Source(s):** WestCOG operating budget, grants

**Timeframe:** As needed when HMA grant opportunities are open

**Status:** Carried forward

#### 1.5 Continue outreach to Repetitive Loss Property owners.

**Action Description:** WestCOG will continue to provide assistance to member communities on distributing mailers to RL property owners throughout the region. This outreach will include information on flood risks as well as mitigation options and funding opportunities.

**Lead:** WestCOG

**Priority:** Moderate

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget, grants

**Timeframe:** Annually in late summer

**Status:** New

### **Objective 2: Assist WestCOG municipalities in implementing State of Connecticut planning goals.**

#### **Strategies and Actions:**

#### 2.1 Assist local communities regarding identification of historic and cultural resources at risk.

**Action Description:** As WestCOG communities move to implement the SHPO recommendations related to historic and cultural resources, WestCOG will assist with identification of historic resources, review of floodplain and historic preservation regulations and ordinances, regional and state coordination, incorporation of historic preservation into planning documents, recovery planning, adaptation measures, and education.

**Lead:** WestCOG

**Priority:** Low

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** As requested

**Status:** Carried forward

#### 2.2 Deploy Climate and Stormwater Assessment resources to municipalities for POCD updates.

**Action Description:** As WestCOG communities pursue POCD updates, the COG should ensure all resources from the Assessment are made available. WestCOG can work with each municipality to understand how the Assessment applies to their community and they best way for the POCD to consider and integrate the information.

**Lead:** WestCOG

**Priority:** High (the provisions of this action are required by Public Act 25-33)

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** WestCOG has already pre-populated messages and information into a calendar that corresponds to the likely POCD planning processes for each of the 18 municipalities that will undertake a POCD update from 2026-2031.

**Status:** New

**2.3 While developing the Housing Growth Plan, incorporate hazard risk reduction where appropriate.**

**Action Description:** As WestCOG pursues the development of a regional Housing Growth Plan, regional and local risks and risk reduction needs should be considered and acknowledged as part of the Plan.

**Lead:** WestCOG

**Priority:** High

**Estimated Cost:** Low

**Potential Funding Source(s):** WestCOG operating budget

**Timeframe:** The Housing Growth Plan is due in 2029. WestCOG will spend most of 2027-2028 developing the plan.

**Status:** New

## 6.0 Plan Implementation

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### 6.1 Plan Adoption

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Upon receipt of FEMA's conditional approval on [REDACTED], each municipality's governing body as well as WestCOG's council formally adopted the Plan Update (with an initial adoption date of [REDACTED]). Copies of each municipal adoption resolution are included in Appendix E.

### 6.2 Plan Implementation

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Implementation of the strategies contained within this plan will depend largely on the availability of resources. Each municipality and WestCOG will have to consider the costs, availability of funding, and economic and other impacts of each mitigation action individually. In general, preference should be given to accomplishing tasks that have positive benefit-cost ratios, and those that are ranked high priority. The groundwork has been set for initiating the proposed mitigation activities: responsible agencies, implementation time frames, and potential funding sources have been identified for each proposed action.

Following adoption, copies of this Plan update will be made available to all community departments by the chief elected official and the local coordinator of each municipality as a planning tool to be used in conjunction with existing plans, regulations, budgets, capital improvement programs, day-to-day operations, and other processes and projects. It is expected that revisions to other community plans and regulations will reference this Plan update and its updates. Specific community plans that could be updated to include references to this Plan update are discussed within each community annex, but could include the following existing programs and activities:

- FEMA CRS– Many mitigation strategies can contribute positively toward a community's score in this program, which can lower flood insurance rates for properties in the community.
- Regional POCD – Each municipality is included in the development and update of a regional plan which is intended to guide future development throughout each community in the planning region. Municipalities should take steps to ensure consistency between the regional POCD and this Plan update.
- Local EOPs – EOPs are part of an overall emergency management program and provide specific details on how a community will respond to emergencies. These plans are updated annually. Information contained within this Plan update will help to inform specific strategies and actions within local Emergency Operations Plans.
- Long-Range Transportation Plan – Each municipality is included in the development and update of the transportation plan, which is intended to help meet the needs of the region's residents for safety, mobility, and a healthy economy effectively and efficiently, while preserving the region's quality of life and its historical, man-made, and natural/environmental resources. Municipalities should take steps to ensure consistency between roads and bridges in need of repair in the regional transportation plan and this Plan.
- Local Bridge Program – This program provides for financial assistance from the state to municipalities for the removal, replacement, reconstruction, or rehabilitation of local bridges. Municipalities should take steps to ensure consistency between bridges in need of repair listed in the local bridge program and in this Plan.

- Capital Improvement Program – Each municipality should consider including projects identified in this HMP in its municipal CIP.
- Local POCDs – Each municipality has a POCD that guides development in the community. Information contained within this Plan should be utilized to encourage growth and development in areas that are less susceptible to natural hazards and to encourage safe development practices. Information in this Plan update will be incorporated or referenced in the next POCD update in each community as well as other planning documents.
- Water Conservation Plans and Emergency Contingency Plans – Water systems that serve more than 1,000 people are required by State law to develop these plans. They provide current information regarding long-term supply and demand management as well as short-term emergency planning for the utility, including instructions on how to proceed when water supplies are curtailed by drought. The information in this Plan update may help inform these plans by identifying vulnerable areas.
- Water System Risk and Resilience Assessments (RRAs) – Water systems that serve more than 3,300 people are required by Federal law to develop these plans. They are used by water systems to plan, prepare, and respond to damage from natural hazards, accidents, and terrorist attacks. The information in this Plan update may help inform such plans by identifying vulnerable areas and linkages between local and utility response planning.

WestCOG will be responsible for encouraging that local plan updates incorporate pertinent information from this HMP. In some cases, the specific incorporation of the information in previous HMPs to other community plans has occurred as listed in each municipal annex. In all cases, the most recent HMP was utilized as an additional reference to provide guidance to community staff.

## 6.3 Plan Monitoring

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The plan maintenance process includes monitoring, evaluating, and updating the Plan update. This process is detailed below.

### 6.3.1 Plan Maintenance Oversight

Future monitoring, evaluating, and updating of the overall Plan update will be coordinated by WestCOG. Each community has assigned a Local Coordinator who will be responsible for monitoring the successful implementation of this Plan update at the local level. As individual strategies and actions of this Plan update are implemented, they must be implemented by the municipal departments that oversee these activities. The Local Coordinator and/or designee will provide the linkage between the multiple municipal departments involved in hazard mitigation at the local level. As this Plan update will be adopted by the local government, coordination is expected to occur without significant barriers. The Local Coordinator for each community in this Plan update is identified as the Municipal Contact at the bottom of page ii and is responsible for Plan maintenance as discussed in the remainder of Section 6.3.

### 6.3.2 Site Reconnaissance for Specific Suggested Actions

The Local Coordinator and/or designee, with the assistance of appropriate department personnel, will perform regular reconnaissance-level inspections of sites that are associated with specific actions (such as culvert and bridge replacements, home elevations, vegetation clearing areas, etc.). This will ensure that the suggested actions remain viable and appropriate. The worksheet in Appendix F will be filled out for specific project-related actions as appropriate. This worksheet is taken from the *Local Mitigation Planning Handbook*.

The Local Coordinator and/or designee will be responsible for obtaining a current list of RLPs in the community each year. This list is available from the State NFIP Coordinator with Connecticut DEEP. The RLPs shall be subject to a windshield survey at least once every two years to ensure that the list is reasonably accurate relative to addresses and other basic information. Some of the reconnaissance-level inspections could occur incidentally during events such as flooding when the response is underway.

### **6.3.3 Annual Reporting and Meeting**

The Local Coordinator and/or designee is responsible for holding an annual local meeting to review the Plan update. Matters to be reviewed on an annual basis include the goals and objectives of the Plan update, hazards or disasters that occurred during the preceding year, mitigation activities that have been accomplished to date, a discussion of reasons that implementation may be behind schedule, and suggested actions for new projects and revised activities. Results of site reconnaissance efforts will be reviewed. A meeting should be conducted at least two months before the annual application cycle for grants under the HMA program. This will enable a list of possible projects to be circulated to applicable local departments to review and provide sufficient time to develop a grant application. The Local Coordinator and/or designee shall prepare and maintain documentation and minutes of each review meeting. This meeting will also prepare Local Coordinators for the regional meeting of Local Coordinators to be held by WestCOG as noted in Section 5.4.

### **6.3.4 Post-Disaster Reporting and Meeting**

Subsequent to federally-declared disasters in Connecticut that include the county of the participating community (Fairfield County for all communities except Bridgewater and New Milford, which are in Litchfield County), a meeting shall be conducted by the Local Coordinator with representatives of appropriate departments to develop a list of possible projects for developing an HMGP application. The Local Coordinator shall prepare a report of the recent events and ongoing or recent mitigation activities for discussion and review at the pre-HMGP application meeting. This report may be consistent with any post-event reports required by FEMA. Public outreach may be solicited for HMGP applications at a *separate* public meeting that could be combined with a community meeting to discuss the Plan update.

### **6.3.5 Continued Public Involvement**

Continued public involvement will be sought regarding the monitoring, evaluating, and updating of this Plan.

- The public is invited to send written comments about the Plan for consideration for future Plan updates. Written comments should be addressed to the Local Coordinator in each community.
- Each community will seek public involvement regarding Plan maintenance through a combination of community meetings, presentations on local cable access channels, and/or input to web-based information gathering tools. Each Local Coordinator will be responsible for publicizing the request for public comment, including notifications posted on the municipal website.
- Each community will be responsible for making public comments available for consideration during the Plan review process.

## 6.4 Plan Amendments

Plan amendments are allowed by the resolutions signed by each municipality. A simple amendment can be prepared using the worksheet in Appendix F. The amendment worksheet is straightforward, providing the following reasons for the amendment. They can be checked off by the local coordinator.

- A shelter or cooling center has been changed
- A critical facility has changed
- A new hazard risk has become apparent
- An action has been completed
- An action needs to be modified
- A new action is needed
- Other: \_\_\_\_\_

Amendments will be filed with the local coordinator and WestCOG.

## 6.5 Five-Year Plan Updates

As noted in Section 5.4, WestCOG intends to secure the funding required to update the multi-jurisdictional HMP in a timely manner, ensuring that the current Plan does not expire while the update is in development.

To update the Plan, the Local Coordinator will coordinate the appropriate group of local officials, consisting of representatives of many of the same departments solicited for input to this plan update. In addition, local business leaders, community and neighborhood group leaders, relevant private and non-profit interest groups, and the neighboring municipalities will be solicited for representation.

The project action worksheets prepared by the local coordinator and the reports described above will be reviewed. In addition, the following questions will be asked:

- Do the mitigation goals and objectives still reflect the concerns of local residents, business owners, and officials?
- Have local conditions changed so that findings of the risk and vulnerability assessments should be updated?
- Are new sources of information available that will improve the risk assessment?
- If risks and vulnerabilities have changed, do the mitigation goals and objectives still reflect the risk assessment?
- What hazards have caused damage locally since the last edition of the HMP was developed? Were these anticipated and evaluated in the HMP or should these hazards be added to the plan?
- Are current personnel and financial resources at the local level sufficient for implementing mitigation actions?
- For each mitigation action that has not been completed, what are the obstacles to implementation? What are potential solutions for overcoming these obstacles?
- For each mitigation action that has been completed, was the action effective in reducing risk?
- What mitigation actions should be added to the plan and proposed for implementation?
- If any proposed mitigation actions should be deleted from the plan, what is the rationale?

Future HMP updates may include deleting suggested actions as projects are completed, adding suggested actions as new hazard effects arise, or modifying hazard vulnerabilities as land use changes. For instance, several prior actions were removed while preparing this Plan update because (1) they had become institutionalized capabilities, (2) they were successfully completed, (3) they were no longer necessary, or (4) they were subsumed by more specific local or State actions.

## 6.6 Summary of Local Coordinator Responsibilities

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The above Local Coordinator responsibilities are summarized below:

- Facilitate local adoption of HMP.
- Provide guidance to municipal departments regarding incorporating data from the HMP into other municipal planning documents.
- Obtain the list of RLPs from the State NFIP Coordinator every two years and conduct a windshield survey to ensure that the provided list is reasonably accurate. Provide corrections to the State NFIP Coordinator if necessary.
- Perform regular reconnaissance level reviews of potential project areas identified in the municipality's strategies and actions to ensure that the proposed actions continue to be applicable.
- Hold an annual meeting, typically in the summer of each year, to review the HMP and strategies with affected municipal departments. Provide necessary information for the municipal grant writer to apply for HMA and other grants.
- Participate in the annual WestCOG workshop for Local Coordinators to discuss the HMP and progress to date on mitigation actions.
- Following a disaster, make a list of possible projects for potential implementation using HMGP grants. Solicit public comment on the list through the use of a public meeting or other methods.
- Secure continued public involvement in the planning process by requesting comment on the HMP as well as in advance of the next HMP update.
- Coordinate with WestCOG and other municipal departments regarding the 5-year HMP update.

## 7.0 Resources and References

Technical and financial resources to assist with implementation of this plan can be found herein. In particular, local adoption of this Plan enables each participating community to access the HMA grant programs described in Section 7.1.

### 7.1 HMA Grant Programs

#### 7.1.1 Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. A key purpose of the HMGP is to ensure that any opportunities to take critical mitigation measures to protect life and property from future disasters are not "lost" during the recovery and reconstruction process after a disaster. The "5% Initiative" is a subprogram that provides the opportunity to fund mitigation actions that are consistent with the goals and objectives of the state and local mitigation plans and meet all HMGP requirements, but for which it may be difficult to conduct a standard benefit-cost analysis (BCA) to prove cost effectiveness.



#### 7.1.2 Flood Mitigation Assistance (FMA) Program

The FMA program was created as part of the National Flood Insurance Reform Act, or "NFIRA," of 1994 (42 U.S.C. § 4101), with the goal of reducing or eliminating claims under the NFIP. The NFIP provides the funding for the FMA program. FEMA provides FMA funds to assist states and communities with implementing measures that reduce or eliminate the long-term risk of flood damage to buildings, homes, and other structures insurable under the NFIP. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities. The FMA program is subject to the availability of appropriation funding, as well as any program-specific directive or restriction made with respect to such funds.



#### 7.1.3 Building Resilient Infrastructure and Communities

The Building Resilient Infrastructure and Communities (BRIC) program aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience. The BRIC program replaced the previous Pre-Disaster Mitigation funding program in 2020. FEMA anticipates BRIC funding projects that demonstrate innovative approaches to partnerships, such as shared funding mechanisms, and/or project design. For example, an innovative project may bring multiple funding sources or in-kind resources from a range of private and public sector stakeholders or offer multiple benefits to a community in addition to the benefit of risk reduction.

#### 7.1.4 Eligible Activities

The HMA grant programs may provide between 75% to 100% funding for eligible projects, depending on the project type. Note that 100% funding is only typically available for severe repetitive loss properties, and most grants receive a 75% federal

share. HMGP and FMA grants have traditionally had a maximum federal share of \$3 million, while the BRIC grants may have a maximum federal share of \$50 million in 2020.

Table 7-1 presents potential mitigation project and planning activities allowed under each HMA grant program described above as outlined in the most recent HMA Unified Guidance document. Many of the strategies and actions developed in this plan fall within this list of eligible activities.

**Table 7-1: HMA Eligible Activities**

| Eligible Activities                                              | HMGP | FMA | BRIC |
|------------------------------------------------------------------|------|-----|------|
| Property Acquisition and Structure Demolition or Relocation      | X    | X   | X    |
| Structure Elevation                                              | X    | X   | X    |
| Mitigation Reconstruction                                        | X    | X   | X    |
| Dry Floodproofing of Historic Residential Structures             | X    | X   | X    |
| Dry Floodproofing of Non-residential Structures                  | X    | X   | X    |
| Generators                                                       | X    | X   |      |
| Localized Flood Reduction Projects                               | X    | X   | X    |
| Non-Localized Flood Reduction Projects                           | X    | X   |      |
| Structural Retrofitting of Existing Buildings                    | X    | X   | X    |
| Non-structural Retrofitting of Existing Buildings and Facilities | X    | X   | X    |
| Safe Room Construction                                           | X    | X   |      |
| Wind Retrofit for One- and Two-Family Residences                 | X    | X   |      |
| Infrastructure Retrofit                                          | X    | X   | X    |
| Soil Stabilization                                               | X    | X   | X    |
| Wildfire Mitigation                                              | X    | X   |      |
| Post-Disaster Code Enforcement                                   | X    |     |      |
| Advance Assistance                                               | X    |     |      |
| 5% Initiative Projects                                           | X    |     |      |
| Miscellaneous / Other                                            | X    | X   | X    |
| Hazard Mitigation Planning                                       | X    | X   | X    |
| Planning Related Activities                                      | X    |     |      |
| Technical Assistance                                             |      |     | X    |
| Management Cost                                                  | X    | X   | X    |

Source: 2015 HMA Guidance, BRIC Website

### 7.1.5 **Benefit-Cost Analysis**

According to FEMA, BCA is a method that determines the future risk reduction benefits of a hazard mitigation project and compares those benefits to its cost. The result is a benefit-cost ratio (BCR). A project is considered cost-effective when the BCR is 1.0 or greater. HMA grant applicants (states) and sub-applicants (municipalities) must use FEMA-approved methodologies and tools – such as the BCA Toolkit - to demonstrate the cost-effectiveness of their projects.

The current BCA Toolkit<sup>14</sup> is an Add-On for Microsoft Excel. FEMA provides both online study courses and classroom courses to train users on the BCA Toolkit and encourages local officials to contact the State Hazard Mitigation Officer for assistance reviewing and performing a BCA. Consultants are also available to assist communities in the preparation of BCAs. For

<sup>14</sup> <https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis>

example, Level 2 HAZUS-MH Analysis can be used to generate project benefits for more complicated projects with effects spanning entire neighborhoods or larger areas.

In addition, effective August 15, 2013, acquisition and elevation projects are automatically considered cost-effective if the project costs are less than \$276,000 and \$175,000, respectively. Structures must be located in the SFHA (the 1% annual chance floodplain) to qualify. For these structures, the BCA will not be required.

One potentially important recent change to the HMA grant programs is that “green open space and riparian area benefits can now be included in the project BCR once the project BCR reaches 0.75 or greater.” The inclusion of environmental benefits in the project BCR is limited to acquisition-related activities. These additional benefits can often raise a BCR above 1.0 for eligibility purposes.

## 7.2 Technical and Financial Resources

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This section is comprised of a list of resources that may potentially provide technical and financial assistance for completion of the actions as described in this HMP. This list is not inclusive of all resources and should be updated periodically. In most cases, any grant funding provided by these agencies will have cost-sharing requirements requiring funding through local capital improvement or operating budgets.

### 7.2.1 Federal Resources

#### **Environmental Protection Agency – Region I**

1 Congress Street, Suite 100  
Boston, MA 02114-2023  
(888) 372-7341

EPA offers grants for restoration and repair and for educational activities, including:

- **Capitalization Grants for State Revolving Funds** that can be used for low interest loans to governments to repair, replace, or relocate wastewater treatment plants damaged in floods. The grants do not apply to drinking water or other utilities.
- **Clean Water Act Section 213 Grants** to state agencies that can be used for funding watershed resource restoration activities including wetlands and other aquatic habitats (riparian zones). Only activities that control non-point source pollution are eligible. The cost-share grants are administered through Connecticut DEEP.

#### **Federal Emergency Management Agency (Region I)**

99 High Street, 6<sup>th</sup> Floor, Boston, MA 02110  
(617) 956-7506 <http://www.fema.gov>

FEMA provides funding for mitigation activities through several programs, including the HMA programs described above. Each WestCOG municipality is eligible to apply for funding through the State of Connecticut as a subgrantee. The State of Connecticut (as well as online resources) can provide application development and project eligibility assistance.

#### **Federal Insurance and Mitigation Administration**

The Federal Insurance and Mitigation Administration is comprised of three divisions that administer FEMA’s hazard mitigation programs.

- The **Risk Analysis Division** applies engineering and planning practices in conjunction with advanced technology tools to identify hazards, assess vulnerabilities, and develop strategies to manage the risks associated with natural hazards. FEMA programs administered by the Risk Analysis Division include:
  - Flood Map Modernization Program: Maintains and updates NFIP mapping.
  - National Dam Safety Program: Provides state assistance funds, research, and training in dam safety procedures.
  - National Hurricane Program: Conducts and supports projects and activities that help protect communities from hurricane hazards.
  - Multi-Hazard Mitigation Planning Program: A process for states and communities to identify policies, activities, and tools that can reduce or eliminate long-term risk to life and property from a hazard event.
- The **Risk Reduction Division** works to reduce risk to life and property through the use of land use controls, building practices, and other tools. These activities address risk in both the existing built environment and in future development, and they occur in both pre- and post-disaster environments. FEMA programs administered by the Risk Reduction Division include:
  - HMA Grant Programs: Provides grants to states and local governments to implement long-term hazard mitigation measures as described in Section 7.1.
  - CRS Program: A voluntary incentive program under the NFIP that recognizes and encourages community floodplain management activities.
  - National Earthquake Hazards Reduction Program: Works in conjunction with state and regional organizations to support state and local programs designed to protect citizens from earthquake hazards.
  - Rehabilitation of High Hazard Potential Dam Grant Program: Provides technical, planning, design, and construction assistance in the form of grants for rehabilitation of eligible high hazard potential (Class C) dams. Each eligible state may submit one grant application per year. To be eligible, the dam must have an approved EAP and fail to meet the minimum state dam safety standards and therefore pose an unacceptable risk to the public as determined by the State Dam Safety Program.
- The **Risk Insurance Division** helps reduce flood losses by providing affordable flood insurance for property owners and by encouraging communities to adopt and enforce floodplain management regulations that mitigate the effects of flooding on new and improved structures. FEMA programs administered by the Risk Analysis Division include:
  - NFIP: Enables property owners in participating communities to purchase flood insurance, assists communities in complying with the requirements of the program, and publishes FIRMs and FISs to determine areas of risk.
  - Office of Response & Recovery: As part of the National Disaster Recovery Framework, the Office of Response & Recovery provides information on dollar amounts of past disaster assistance, including Public Assistance, Individual Assistance, and Temporary Housing. Information on retrofitting and acquisition/relocation initiatives is maintained by the division. The Office also provides mobile emergency response support to disaster areas, supports the National Disaster Medical System, and provides urban search and rescue teams for disaster victims in confined spaces. Federal disaster assistance programs are coordinated by this Office, including:
    - *Public Assistance Grant Program*: Provides 75% grants for mitigation projects to protect eligible damaged public and private nonprofit facilities from future damage.
    - *Individuals and Family Grant Program*: Provides "minimization" grants at 100% costs.

- The *HMGP* and *Fire Management Assistance Grant Program*. The Assistance to Firefighters Grant helps local fire departments non-affiliated emergency medical service organizations meet emergency response needs.
- Emergency Management Performance Grants Program: Provides resources to assist state, local, tribal, and territorial governments in preparing for all hazards. Allowable costs support efforts to build and sustain core capabilities across the prevention, protection, mitigation, response, and recovery mission areas.

### **Small Business Administration (Region I)**

10 Causeway Street, Suite 812

Boston, MA 02222-1093

(617) 565-8416 <http://www.sba.gov>

The Small Business Administration has the authority to “declare” disaster areas following disasters that affect a significant number of homes and businesses but that would not need additional assistance through FEMA (Administration assistance is triggered by a FEMA declaration, however). The Administration can provide additional low-interest funds (up to 20% above what an eligible applicant would “normally” qualify for) to install mitigation measures. They can also loan the cost of bringing a damaged property up to state or local code requirements. These loans can be used in combination with the new “mitigation insurance” under the NFIP or in lieu of that coverage.

### **U.S. Army Corps of Engineers**

New England District

696 Virginia Road

Concord, MA 01742-2751

(978) 318-8520

USACE provides 100% funding to states and local governments for floodplain management planning and technical assistance under several flood control acts and the Floodplain Management Services Program. The Flood Risk Management Program provides 50% funding for eligible floodproofing and flood preparedness projects. The Levee Program provides information on levee safety, risk assessment, and risk reduction.

### **U.S. Department of Agriculture**

Natural Resources Conservation Service

Connecticut State Office

344 Merrow Road, Suite A

Tolland, CT 06084-3917

(860) 871-4011

The NRCS works cooperatively with landowners, conservation districts, federal, state, and local governments, and citizens from urban and rural communities to restore and enhance the landscape. NRCS soil conservationists, soil scientists, agronomists, ecologists, engineers, planners, and other specialists promote land stewardship by providing technical assistance through teams to address surface and groundwater quality; wetlands, riparian areas, and biodiversity; aquatic and terrestrial habitat; and impacts of land use changes. The Emergency Watershed Protection and Watershed and Flood Prevention Operations Programs provide technical and financial assistance to reduce or prevent flood damage, reduce soil erosion, and improve water quality.

**U.S. Department of Commerce**

National Weather Service  
Northeast River Forecast Center  
445 Myles Standish Boulevard  
Taunton, MA 02780  
(508) 824-5116 <http://www.nws.noaa.gov>

The NWS provides weather, water, and climate data, forecasts, and warnings for the protection of life and property and the enhancement of the national economy.

U.S. Economic Development Administration  
Philadelphia Regional Office  
900 Market Street, Room 602  
Philadelphia, PA 19107  
(215) 597-8723 <https://www.eda.gov/>

The Administration assists local governments affected by disasters by providing technical assistance and grant funding.

**U.S. Department of Housing and Urban Development**

20 Church Street, 19<sup>th</sup> Floor  
Hartford, CT 06103-3220  
(860) 240-4800 <http://www.hud.gov>

The U.S. Department of Housing and Urban Development offers Community Development Block Grants to communities with populations greater than 50,000, who may contact the agency directly regarding such grants. One program objective is to improve housing conditions for low- and moderate-income families. Projects can include acquiring flood prone homes or protecting them from flood damage. Funding is a 100% grant and can be used as a source of local matching funds for other funding programs such as FEMA's HMA Grants. Funds can also be applied toward "blighted" conditions, which is often the post-flood condition. A separate set of funds exists for conditions that create an "imminent threat." The funds have been used in the past to replace (and redesign) bridges where flood damage eliminates police and fire access to the other side of the waterway. Funds are also available for smaller municipalities through the state administered block grant program participated in by the State of Connecticut.

**U.S. Department of the Interior**

National Park Service  
Rivers, Trails, & Conservation Assistance  
15 State Street  
Boston, MA 02109  
(617) 223-5123 <http://www.nps.gov/rtca>

The National Park Service provides communities with technical assistance to conserve rivers, preserve open space, and develop trails and greenways and assists with the identification of nonstructural options for floodplain development.

### **U.S. Fish & Wildlife Service**

New England Field Office  
70 Commercial Street, Suite 300  
Concord, NH 03301-5087  
(603) 223-2541 <http://www.fws.gov>

The U.S. Fish and Wildlife Service provides technical and financial assistance to restore wetlands and riparian habitats through the North American Wetland Conservation and Partners for Fish and Wildlife programs.

#### **7.2.2 State Resources**

### **Connecticut Department of Administrative Services**

Division of Construction Services  
Office of the State Building Inspector  
450 Columbus Boulevard, Suite 1303  
Hartford, CT 06103  
(860) 713-5900  
<https://portal.ct.gov/DAS/Office-of-State-Building-Inspector/Office-of-State-Building-Inspector>

The Office of the State Building Inspector is housed under the Division of Construction Services. The Office is responsible for administering and enforcing the Connecticut State Building Code and is also responsible for the municipal Building Inspector Training Program.

### **Connecticut Department of Economic and Community Development**

505 Hudson Street  
Hartford, CT 06106-7106  
(860) 270-8000 <https://portal.ct.gov/DECD>

The Connecticut Department of Economic and Community Development administers HUD's State CDBG Program, awards smaller communities and rural areas grants for use in revitalizing neighborhoods, expands affordable housing and economic opportunities, and improves community facilities and services.

### **Connecticut Department of Emergency Services & Public Protection**

25 Sigourney Street, 6<sup>th</sup> Floor  
Hartford, CT 06106-5042  
(860) 256-0800 <https://portal.ct.gov/DEMHS>

DESPP houses DEMHS, which oversees statewide emergency preparedness, response, and recovery, mitigation, and an extensive related training program. The State Hazard Mitigation Officer is responsible for hazard mitigation planning and policy, and oversight and administration of the HMA Grant programs, also has the responsibility for ensuring the CT NHMP is updated every five years.

### **Connecticut Department of Energy & Environmental Protection**

79 Elm Street  
Hartford, CT 06106-5127  
(860) 424-3000 <https://portal.ct.gov/DEEP>

The Connecticut DEEP provides technical assistance to sub-applicants for planning efforts and hazard mitigation assistance projects. The department includes several divisions with various functions related to hazard mitigation:

- The **Bureau of Water Protection and Land Reuse, Inland Water Resources Division** is generally responsible for flood hazard mitigation in Connecticut, including administration of the NFIP.
- The **State NFIP Coordinator** provides floodplain management and flood insurance technical assistance, floodplain management ordinance review, substantial damage/improvement requirements, community assistance visits, and other general flood hazard mitigation planning, including the delineation of floodways.
- The **Flood & Erosion Control Board Program** aids municipalities with active Flood and Erosion Control Boards to solve flooding, beach erosion, and dam repair problems. The program empowers local municipalities to construct and repair flood and erosion management systems. Certain nonstructural measures that mitigate flood damages are also eligible. Funding is provided to communities that apply for assistance through a Flood & Erosion Control Board, with allocations determined by priority when funds are available.
- The **Inland Wetlands and Watercourses Management Program** provides training, technical, and planning assistance to local Inland Wetlands Commissions and reviews and approves municipal regulations for localities.
- The **Dam Safety Program** is charged with the responsibility for the administration and enforcement of Connecticut's dam safety laws. The program regulates the operation and maintenance of dams in the state. Permits the construction, repair, or alteration of dams, dikes, or similar structures and maintains a registration database of all known dams statewide. This program also operates a statewide inspection program.
- The **Clean Water Fund** provides funding and grants under the Clean Water Act involving sewage treatment plant construction and upgrades, combined sewer overflow remediation, nutrient removal and non-point source pollution control projects that protect Long Island Sound, collection system improvements, water pollution control, and river restoration.
- The **Bureau of Water Management Planning and Standards Division** administers the Section 319 nonpoint source pollution reduction grants and municipal facilities program, which deals with mitigating pollution from wastewater treatment plants.
- The **Office of Long Island Sound Programs** administers the Coastal Area Management Act program and Long Island Sound License Plate Program.

### Connecticut Department of Transportation

2800 Berlin Turnpike  
 Newington, CT 06131-7546  
 (860) 594-2000 <https://portal.ct.gov/DOT>

CTDOT administers the federal surface transportation bill, Fixing America's Surface Transportation Act, or "FAST Act," which includes grants for projects that promote alternative or improved methods of transportation. Funding through grants can often be used for projects with mitigation benefits, such as preservation of open space in the form of bicycling and walking trails. CTDOT is also involved in traffic improvements and bridge repairs that could be mitigation related. The Local Bridge Program provides 50% funding for bridges that are structurally deficient or have other issues eligible for funding under the program.

**Connecticut Institute for Resilience & Climate Adaptation**

UConn Avery Point Campus

1080 Shennecosett Road

Groton, CT 06340

(860) 405-9171 <https://circa.uconn.edu/>

CIRCA is a multidisciplinary center of excellence that brings together experts in the natural sciences, engineering, economics, political science, finance, and law to provide practical solutions to problems arising as a result of a changing climate. The institute helps coastal and inland floodplain communities in Connecticut and throughout the Northeast better adapt to changes in climate and also make their human-built infrastructure more resilient while protecting valuable ecosystems and the services they offer to human society. Initiatives focus on living shorelines, critical infrastructure, inland flooding, coastal flooding, sea level rise, and policy and planning.

CIRCA runs a research program as well as an external grants program for Connecticut municipalities and partners in resilience. CIRCA has awarded grants for projects through its Municipal Resilience Grants Program to municipalities and regional councils of governments. Additional grants were awarded to municipalities, nonprofits, academic researchers, a land trust, and a conservation district to assist them with meeting the match requirement for federal or foundation grant programs. The CIRCA research program has received funding from Connecticut DEEP, CTDOT, the Connecticut Department of Housing, and NOAA. Research projects cover sea level rise and storm flooding statistics, green infrastructure and living shorelines evaluation, economic modeling, and policy analysis and planning.

**Connecticut Office of Policy & Management**

450 Capitol Avenue

Hartford, CT 06106

(860) 418-6355

[https://portal.ct.gov/OPM/Bud-Other-Projects/STEAP/STEAP\\_Home](https://portal.ct.gov/OPM/Bud-Other-Projects/STEAP/STEAP_Home)

This agency manages STEAP grants to small towns for economic development, community conservation, and quality-of-life capital projects for localities. Grants are administered by various state agencies depending upon the project type.

**Connecticut State Historic Preservation Office**

Certified Local Government &amp; Grants Coordinator

(860) 500-2356

<https://portal.ct.gov/DECD/Services/Historic-Preservation>

SHPO provides technical assistance related to projects that may affect historic resources, and provides grants to support the identification, preservation, protection, and restoration of historic buildings and sites.

**7.2.3 Private and Other Resources****AmeriCorps**

1-800-942-2677

<https://www.nationalservice.gov/programs/ Americorps>

AmeriCorps provides grants to national and local nonprofits, government agencies, faith-based and other community organizations, and other groups committed to strengthening their communities through volunteering. Service project teams

may be available to assist with projects such as surveying, tree planting, restoration, construction, and environmental education.

**Association of State Dam Safety Officials**

450 Old Vine Street

Lexington, KY 40507

(859) 257-5140 <http://www.damsafety.org>

This is a nonprofit organization of state and federal dam safety regulators, dam owners and operators, dam designers, manufacturers and suppliers, academia, contractors, and others interested in dam safety. Their mission is to advance and improve the safety of dams by supporting the dam safety community and state dam safety programs, raising awareness, facilitating cooperation, providing a forum for the exchange of information, representing dam safety interests before governments, providing outreach programs, and creating a unified community of dam safety advocates.

**Association of State Floodplain Managers**

8301 Excelsior Drive

Madison, WI 53717

(608) 828-3000 <http://www.floods.org>

This is a professional association with a membership of over 7,000 that provides education to assist state and local governments with the NFIP, CRS, and flood mitigation. The Association has developed a series of technical and topical research papers and a series of proceedings from their annual conferences. Many “mitigation success stories” have been documented through these resources and provide a good starting point for planning.

**Connecticut Association of Flood Managers**

P.O. Box 270213

West Harford, CT 06127

ContactCAFM@gmail.com <http://www.ctfloods.org>

The Connecticut Association of Flood Managers is a professional association of local and state floodplain managers, consultants, academics, and experts in related fields that provides training and outreach regarding flood management and mitigation techniques. An educational annual conference is held in Connecticut each year. It is the local state chapter of the Association of State Floodplain Managers.

**Connecticut Land Conservation Council**

27 Washington Street

Middletown, CT 06457

(860) 852-5512 <http://www.ctconservation.org/>

The Council serves Connecticut’s land trusts by representing their interests to state government, connecting them to training and guidance resources on both statewide and local levels, and providing direct assistance to aid in achieving conservation goals. Land trusts may be interested in providing funding to preserve land as open space. Land Trusts operating in the Region include:

- Aspetuck Land Trust, Inc.
- Audubon Connecticut
- Bethel Land Trust, Inc.

- Bridgewater Land Trust, Inc.
- Brookfield Open Space Legacy, Inc.
- Candlewood Valley Regional Land Trust
- Connecticut Audubon Society
- Connecticut Forest & Park Association
- Darien Land Trust
- Dogwood Park Association, Inc.
- Eversource Land Trust
- Greenwich Land Trust, Inc.
- Highstead Foundation
- Housatonic Valley Association
- Land Conservancy of Ridgefield, Inc.
- New Canaan Land Trust
- Newtown Forest Association, Inc.
- Northwest Connecticut Land Conservancy, Inc.
- Norwalk Land Trust
- Redding Land Trust, Inc.
- Roxbury Land Trust, Inc.
- Stamford Land Conservation Trust, Inc.
- Steep Rock Association, Inc.
- The Nature Conservancy – CT Chapter
- The Trust for Public Land
- Wildlife in Crisis Land Trust
- Wilton Land Conservation Trust

#### **Eversource Energy Center**

University of Connecticut

Storrs, CT 06269-3037

860-486-6806 <https://www.eversource.uconn.edu/>

The Center researches and develops new technologies and science-based solutions for increasing the reliability of the electric grid from impacts of storms and climate change. Predictive models include outage predictions, vegetation mapping and mapping of tree risk, electric grid reinforcement modeling, and renewable energy research.

#### **Insurance Institute for Business and Home Safety**

4775 East Fowler Avenue

Tampa, FL 33617

(813) 286-3400 <http://www.ibis.org>

The institute conducts objective scientific research to identify and promote effective actions that strengthen homes, businesses, and communities against natural disasters and other causes of loss. The institute advocates the development and implementation of building codes and standards nationwide and may be a good source of model code language.

**Multidisciplinary Center for Earthquake Engineering and Research**

University at Buffalo  
State University of New York  
Red Jacket Quadrangle  
Buffalo, NY 14261  
(716) 645-3391 <http://mceer.buffalo.edu>

Originally a source for earthquake statistics, research, engineering and planning advice, the Center's mission has expanded from earthquake engineering to the technical and socioeconomic impacts of a variety of hazards, both natural and man-made, on critical infrastructure, facilities, and society.

**National Association of Flood & Stormwater Management Agencies**

1301 K Street, Suite 800 East  
Washington, DC 20005  
(202) 218-4122 <http://www.nafsma.org>

The Association is an organization of public agencies whose function is the protection of lives, property, and economic activity from the adverse impacts of storm and flood waters. The Association advocates public policy, encourages technologies, and conducts education programs which facilitate and enhance the achievement of the public service function of its members.

**National Emergency Management Association**

P.O. Box 11910  
Lexington, KY 40578  
(859) 244-8000 <http://nemaweb.org>

The National Emergency Management Association provides national leadership and expertise in comprehensive emergency management, serves as a vital emergency management information and assistance resource, and advances continuous improvement in emergency management through strategic partnerships, innovative programs, and collaborative policy positions.

**Natural Hazards Center**

University of Colorado at Boulder, 482 UCB  
Boulder, CO 80309-0482  
(303) 492-6818 <http://www.colorado.edu/hazards>

The Natural Hazards Center advances and communicates knowledge regarding hazard mitigation and disaster preparedness, response, and recovery. Using an all-hazards and interdisciplinary framework, the Center fosters information sharing and integration of activities among researchers, practitioners, and policy makers from around the world, supports and conducts research, and provides educational opportunities for the next generation of hazards scholars and professionals. The Floodplain Management Resource Center is a free library and referral service of the Association of State Floodplain Managers for floodplain management publications.

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## Appendix A

### Municipal Planning Process

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## Appendix B

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### Regional Meetings and Workshops:

WestCOG Chief Elected Officials (open to the public) – April 16, 2026  
Municipal Technical Advisory Group (open to the public) – June 9, 2026  
Municipal Planners Quarterly Meeting (open to the public) – July 21, 2026



## Appendix C

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Public and Stakeholder Outreach

*Note that Survey Results are Described in the Document*



# Appendix D

## STAPLEE Matrix

## Appendix E

### Adoption Resolutions

## Appendix F

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Mitigation Action Monitoring Form  
and  
Worksheet to Document Plan Updates and Amendments