2025 Hazard Mitigation Plan

Onondaga County, New York

Volume 1: Countywide Planning Elements

TABLE OF CONTENTS

Executive Summary x

Chapter 1. Introduction 1-1

1.1. Hazard Mitigation Program 1-1

1.2. Planning Area 1-2

1.3. Participating Jurisdictions 1-2

1.4. Plan Participation 1-3

1.4.1. Core Planning Team *1-4*

1.4.2. Steering Committee *1-4*

1.4.3. Local Planning Teams *1-5*

1.4.4. Supporting Organizations *1-5*

1.5. Plan Approval and Adoption 1-6

Chapter 2. Planning Process 2-1

2.1. Review of Existing Programs and Plans 2-4

2.2. Plan Organization 2-6

2.3. Equity Consideration for the Underserved Population 2-6

Chapter 3. Community Profile 3-1

3.1. Topography 3-2

3.1.1. Hydrography and Hydrology *3-3*

3.2. Climate 3-7

3.3. Land Use 3-8

3.4. Changes in Development and Development Trends 3-11

3.4.1. Strong Centers *3-12*

3.4.2. Housing and Neighborhoods *3-13*

3.4.3. Community Mobility *3-15*

3.4.4. Greenways and Blueways *3-16*

3.4.5. Agriculture *3-16*

3.4.1. Micron *3-17*

3.5. Demographics 3-17

3.5.1. Population and Population Density *3-17*

3.5.2. Income and Socioeconomic Status *3-21*

3.5.3. Sex and Age Distribution *3-22*

3.5.4. Race and Ethnic Distribution *3-23*

3.5.5. Disabled Population *3-24*

3.5.6. Underserved Population *3-24*

3.6. Economy 3-27
3.7. Critical Facilities 3-29
3.7.1. Essential Facilities 3-31
3.7.2. Transportation Systems 3-34
3.7.3. Lifeline Utility Systems 3-37
3.7.4. High Potential Loss Facilities 3-38
3.8. Capability Assessment 3-40
3.8.1. Planning and Regulatory Capabilities 3-40
3.8.2. Administrative and Technical Capabilities 3-42
3.8.3. Fiscal Capabilities 3-43
3.8.4. Education and Outreach Capabilities 3-46
3.8.5. Community Classifications 3-46
3.8.6. Self-Assessment of Capability 3-47
3.8.7. Needs to Expand/Improve Capabilities 3-47
3.9. National Flood Insurance Program 3-48
3.9.1. Floodplain Administrators 3-49
3.9.2. New York State Floodplain Management 3-51
3.9.3. Participation Activities 3-51
3.10. Hazard Mitigation Plan Integration 3-53
3.10.1. Existing Plan Integration 3-53
3.10.2. Potential Future Integration 3-54
Chapter 4. Hazard Identification and Risk Assessment 4-1
4.1. Identified Hazards 4-1
4.1.1. Climate Change Analysis 4-3
4.2. Presidential Disaster and Emergency Declarations 4-4
4.3. Risk Assessment Methodology 4-5
4.3.1. Probability of Occurrence 4-6
4.3.2. Extent Factors 4-6
4.3.3. Vulnerability Factors 4-7
4.3.4. Impact Factors 4-8
4.4. FEMA National Risk Index Score 4-12
4.4.1. Expected Annual Loss 4-13
4.4.2. Social Vulnerability 4-13
4.4.3. Community Resilience 4-14
4.5. Total Risk Scores 4-14
4.6. Hazard Profiles 4-17

4.6.1. Drought *4-17*
4.6.2. Earthquake *4-31*
4.6.3. Heat Wave/Extreme Heat *4-46*
4.6.4. Flood *4-59*
4.6.5. Geological Hazards *4-95*
4.6.6. Harmful Algal Bloom *4-113*
4.6.7. Invasive Species and Infestation *4-129*
4.6.8. Severe Weather *4-143*
4.6.9. Wildfire *4-165*
4.6.10. Winter Weather *4-175*
Chapter 5. Mitigation Strategy **5-1**
5.1. Mitigation Goals 5-1
5.2. Mitigation Strategies and Actions 5-3
5.2.1. Action Status *5-3*
5.3. Mitigation Action Plan 5-4
5.3.1. Mitigation Action Estimated Timeline *5-4*
5.3.2. Mitigation Action Prioritization *5-4*
5.3.3. Mitigation Action Benefit Cost Review *5-6*
5.4. Changes in Priority 5-7
Chapter 6. Plan Maintenance **6-1**
6.1. Monitoring, Evaluating, and Updating the Plan 6-1
6.1.1. Monitoring *6-1*
6.1.2. Evaluating *6-1*
6.1.3. Plan Update *6-5*
Appendix A. Mitigation Actions **A-1**
Appendix B. Stakeholder Engagement **B-1**
Appendix C. Public Engagement **C-1**
Appendix D. Plan Adoption **D-1**

LIST OF TABLES

Table 1-1. Participating Jurisdictions 1-3
Table 1-2. Core Planning Team Members 1-4
Table 1-3. Hazard Mitigation Steering Committee Members 1-5
Table 3-1. Onondaga County Monthly Climate Summary (1991 – 2020) 3-7
Table 3-2. Land Use Cover for Onondaga County 3-8
Table 3-3. Housing Physical Characteristics 3-10
Table 3-4. Onondaga County Business Patterns (2022) 3-11
Table 3-5. Housing Units Built (2019 – 2023) 3-14
Table 3-6. Physical Housing Characteristics in Onondaga County 3-14

Table 3-7. Characteristics Summary of the Market Types in Onondaga County 3-14
Table 3-8. Mode of Transportation to Work in Onondaga County 3-15
Table 3-9. Population Estimates 3-17
Table 3-10. Percentage of Householders 65 Years Old and Over By Municipality 3-21
Table 3-11. Poverty Thresholds for 2023 by Size of Family 3-22
Table 3-12. Age Distribution (2023) 3-22
Table 3-13. Racial and Ethnic Distribution (2023) 3-23
Table 3-14. Disability Characteristics (2023) 3-24
Table 3-15. Community Resilience Estimates for Equity 3-25
Table 3-16. CDC's Social Vulnerability Index (2022) 3-26
Table 3-17. Neighborhoods At Risk Table 3-27
Table 3-18. Employment by Industry (2023) 3-28
Table 3-19. Employment Status (2023) 3-28
Table 3-20. Occupation (2023) 3-28
Table 3-21. Household Income (2023) 3-29
Table 3-22. Critical Facilities in Onondaga County 3-29
Table 3-23. Bulk Storage Program Registration Requirements 3-39
Table 3-24. Planning and Regulatory Capabilities 3-40
Table 3-25. Administrative and Technical Capabilities 3-42
Table 3-26. Fiscal Capabilities 3-43
Table 3-27. Education and Outreach Resources 3-46
Table 3-28. Community Classifications 3-46
Table 3-29. Self-Assessment Capability 3-47
Table 3-30. NFIP Participation Information 3-48
Table 3-31. Floodplain Administrators 3-49
Table 3-32. Current Plan Integration 3-53
Table 3-33. Potential Future Integration 3-54
Table 4-1. Onondaga County Hazards 4-2
Table 4-2. Disaster Declarations for Onondaga County 4-4
Table 4-3. Probability of Occurrence 4-6
Table 4-4. Extent/Intensity Factor 4-7
Table 4-5. Catastrophic Factor 4-7
Table 4-6. Population Exposure Factor 4-7
Table 4-7. Property Exposure Factor 4-8
Table 4-8. Changes in Development Factor 4-8
Table 4-9. Population and Life Safety Factor 4-9
Table 4-10. Underserved/Equity Factor 4-9
Table 4-11. Property Damage Factor 4-10
Table 4-12. Economic Factor 4-10
Table 4-13. Environmental Factor 4-10
Table 4-14. Essential Operations Factor 4-11
Table 4-15. Future Development Factor 4-11
Table 4-16. Climate Change Factor 4-12
Table 4-17. Risk Index Score for Onondaga County *(FEMA National Risk Index)* 4-13
Table 4-18. Expected Annual Loss for Onondaga County *(FEMA National Risk Index)* 4-13
Table 4-19. Social Vulnerability for Onondaga County *(FEMA National Risk Index)* 4-13
Table 4-20. Community Resilience for Onondaga County *(FEMA National Risk Index)* 4-14
Table 4-21. 2025 Hazard Risk Score for Onondaga County 4-15
Table 4-22. Types of Drought 4-17
Table 4-23. State Drought Index Stages 4-19

Table 4-24. Palmer Drought Severity Index 4-20
Table 4-25. U.S. Drought Monitor Classification 4-21
Table 4-26. Drought Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-22
Table 4-27. Drought Events in Onondaga County (2019 – 2024) 4-22
Table 4-28. Agricultural Land in Onondaga County (2022) 4-26
Table 4-29. 25-Year Climate Projections for Onondaga County 4-29
Table 4-30. Future Climate Indicators for Onondaga County 4-29
Table 4-31. Drought Expected Annual Loss *(FEMA National Risk Index)* 4-30
Table 4-32. Drought Risk Index (FEMA National Risk Index) 4-30
Table 4-33. Drought Total Risk Score 4-30
Table 4-34. Earthquake Hazards 4-31
Table 4-35. Modified Mercalli Intensity Scale vs. Richter Scale 4-33
Table 4-36. Modified Mercalli Intensity and PGA Equivalent 4-34
Table 4-37. Damage Levels Experienced in Earthquakes 4-34
Table 4-38. NEHRP Soil Classification 4-35
Table 4-39. Earthquake Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-37
Table 4-40. Earthquake Events Impacting Onondaga County 4-37
Table 4-41. Onondaga County Population and Building Value Data 4-39
Table 4-42. Expected Building Damage by Occupancy 4-39
Table 4-43. Expected Building Damage by Building Type 4-39
Table 4-44. Expected Damage to Essential Facilities 4-40
Table 4-45. Expected Damage to Utility Systems 4-41
Table 4-46. Expected Damage to the Transportation Systems 4-41
Table 4-47. Building Related Economic Loss Estimates *(Millions of Dollars)* 4-42
Table 4-48. Physical Housing Characteristics in Onondaga County 4-43
Table 4-49. Earthquake Expected Annual Loss *(FEMA National Risk Index)* 4-44
Table 4-50. Earthquake Risk Index (FEMA National Risk Index) 4-44
Table 4-51. Earthquake Total Risk Score 4-45
Table 4-52. National Weather Service Heat Advisories 4-47
Table 4-53. NWS HeatRisk Categories 4-48
Table 4-54. Heat Wave Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-48
Table 4-55. Heat Wave/Extreme Heat Events in Onondaga County (1950 – 2024) 4-49
Table 4-56. Underserved and At-Risk Population 4-50
Table 4-57. Agricultural Land in Onondaga County (2022) 4-53
Table 4-58. Future Climate Indicators for Onondaga County 4-55
Table 4-59. Heat Wave/Extreme Heat Expected Annual Loss *(FEMA National Risk Index)* 4-57
Table 4-60. Heat Wave/Extreme Heat Risk Index *(FEMA National Risk Index)* 4-58
Table 4-61. Heat Wave/Extreme Heat Total Risk Score 4-58
Table 4-62. Types of Ice Jams 4-60
Table 4-63. Total Land Area in the 1% and 0.2% Annual Chance Flood Zone 4-62
Table 4-64. Onondaga County Major Flooding Sources 4-65
Table 4-65. High Hazard Dams in Onondaga County 4-66
Table 4-66. Significant Hazard Dams in Onondaga County 4-66
Table 4-67. New York State Inventory of Dams High Hazard Dams in Onondaga County 4-67
Table 4-68. New York State Inventory of Dams Intermediate Hazard Dams in Onondaga County 4-67
Table 4-69. Levees in Onondaga County 4-70
Table 4-70. National Weather Service Flood Advisories 4-72
Table 4-71. Flash Flood Guidance 4-72
Table 4-72. National Weather Service Flash Flood Impact-Based Warnings 4-73
Table 4-73. National Weather Service River Flood Severity Categories 4-73

Table 4-74. USACE Dam Hazard Categories 4-73
Table 4-75. NYSDEC Dam Hazard Classification 4-74
Table 4-76. USACE Levee Safety Action Classification 4-75
Table 4-77. Riverine Flooding Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-77
Table 4-78. Onondaga County Repetitive Loss and Severe Repetitive Loss Properties 4-78
Table 4-79. Onondaga County NFIP Policies 4-79
Table 4-80. Flood Events in Onondaga County (1950 – 2024) 4-81
Table 4-81. Significant Flood Events in Onondaga County (2019 – 2024) 4-81
Table 4-82. Disaster Declarations for Onondaga County 4-82
Table 4-83. USDA Disaster Designation (2019 – 2024) 4-83
Table 4-84. Underserved and At-Risk Population 4-84
Table 4-85. Building Exposure by Occupancy Type for the County 4-85
Table 4-86. Building Exposure by Occupancy Type for the Scenario 4-85
Table 4-87. Onondaga County Population and Building Value Data 4-86
Table 4-88. Expected Building Damage by Occupancy 4-86
Table 4-89. Expected Building Damage by Building Type 4-86
Table 4-90. Expected Damage to Essential Facilities 4-87
Table 4-91. Building Related Economic Loss Estimates *(Millions of Dollars)* 4-88
Table 4-92. Future Climate Indicators for Onondaga County 4-90
Table 4-93. Riverine Flooding Expected Annual Loss *(FEMA National Risk Index)* 4-93
Table 4-94. Riverine Flooding Risk Index *(FEMA National Risk Index)* 4-93
Table 4-95. Flood Total Risk Score 4-94
Table 4-96. Types of Slope Movement 4-95
Table 4-97. United States Geological Survey Landslide Advisories 4-103
Table 4-98. Landslide Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-104
Table 4-99. Underserved and At-Risk Population 4-107
Table 4-100. Landslide Expected Annual Loss *(FEMA National Risk Index)* 4-111
Table 4-101. Landslide Risk Index (FEMA National Risk Index) 4-111
Table 4-102. Geological Hazards Total Risk Score 4-112
Table 4-103. NYSDEC Lakes Monitoring Program 4-114
Table 4-104. Shoreline of Major Onondaga County Bodies of Water 4-115
Table 4-105. NYHABS Status (Investigating HAB) 4-116
Table 4-106. NYHABS Status (Confirmed HAB) 4-116
Table 4-107. Harmful Algal Bloom in Onondaga County 4-117
Table 4-108. Harmful Algal Bloom Total Risk Score 4-128
Table 4-109. Invasive Species in Onondaga County (1980 – 2024) 4-137
Table 4-110. Disaster Declarations for Onondaga County 4-138
Table 4-111. Invasive Species Total Risk Score 4-142
Table 4-112. Hail Speed Estimates 4-143
Table 4-113. Types of Strong Winds 4-144
Table 4-114. Types of Tornadoes 4-144
Table 4-115. Types of Tropical Cyclones 4-145
Table 4-116. Converting Traditional Hail Size Description 4-151
Table 4-117. Beaufort Wind Scale 4-152
Table 4-118. Enhanced Fujita Scale 4-153
Table 4-119. National Weather Service Severe Weather Advisories 4-153
Table 4-120. Saffir Simpson Hurricane Wind Scale 4-154
Table 4-121. National Hurricane Center Tropical Cyclone Advisories 4-155
Table 4-122. Hail Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-156
Table 4-123. Strong Wind Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-156

Table 4-124. Tornado Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-156
Table 4-125. Tornado Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-156
Table 4-126. Severe Weather Events in Onondaga County (1950 – 2024) 4-156
Table 4-127. Significant Severe Weather Events in Onondaga County 4-157
Table 4-128. Disaster Declarations for Onondaga County 4-158
Table 4-129. Underserved and At-Risk Population 4-159
Table 4-130. Hail Expected Annual Loss *(FEMA National Risk Index)* 4-162
Table 4-131. Strong Wind Expected Annual Loss *(FEMA National Risk Index)* 4-162
Table 4-132. Tornado Expected Annual Loss *(FEMA National Risk Index)* 4-162
Table 4-133. Hurricane Expected Annual Loss *(FEMA National Risk Index)* 4-163
Table 4-134. Hail Risk Index (FEMA National Risk Index) 4-163
Table 4-135. Strong Wind Risk Index (FEMA National Risk Index) 4-163
Table 4-136. Tornado Risk Index (FEMA National Risk Index) 4-163
Table 4-137. Hurricane Risk Index (FEMA National Risk Index) 4-163
Table 4-138. Severe Weather Total Risk Score 4-164
Table 4-139. Types of Wildfires 4-165
Table 4-140. NYSDEC Fire Danger Ratings 4-168
Table 4-141. National Weather Service Fire Advisories 4-168
Table 4-142. Air Quality Index for Ozone and Particle Pollution 4-169
Table 4-143. Wildfire Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-170
Table 4-144. Underserved and At-Risk Population 4-171
Table 4-145. Future Climate Indicators for Onondaga County 4-173
Table 4-146. Wildfire Expected Annual Loss *(FEMA National Risk Index)* 4-174
Table 4-147. Wildfire Risk Index (FEMA National Risk Index) 4-174
Table 4-148. Wildfire Total Risk Score 4-174
Table 4-149. Types of Winter Precipitation 4-175
Table 4-150. Ice-Related Hazards 4-177
Table 4-151. National Weather Service Winter Weather Advisories 4-178
Table 4-152. National Weather Service Winter Storm Severity Index 4-179
Table 4-153. Regional Snowfall Index 4-180
Table 4-154. National Weather Service Cold Weather Advisories 4-180
Table 4-155. Winter Weather Annualized Frequency for Onondaga County *(FEMA National Risk Index)* . 4-180
Table 4-156. Ice Storm Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-181
Table 4-157. Cold Wave Annualized Frequency for Onondaga County *(FEMA National Risk Index)* 4-181
Table 4-158. Winter Weather Events in Onondaga County (1950 – 2024) 4-182
Table 4-159. Disaster Declarations for Onondaga County 4-182
Table 4-160. USDA Disaster Designation (2019 – 2024) 4-182
Table 4-161. Underserved and At-Risk Population 4-184
Table 4-162. Winter Weather Expected Annual Loss *(FEMA National Risk Index)* 4-192
Table 4-163. Ice Storm Expected Annual Loss *(FEMA National Risk Index)* 4-192
Table 4-164. Winter Weather Risk Index *(FEMA National Risk Index)* 4-192
Table 4-165. Ice Storm Risk Index (FEMA National Risk Index) 4-193
Table 4-166. Winter Weather Total Risk Score 4-193
Table 5-1. Onondaga County Mitigation Goals and Objectives 5-1
Table 5-2. Onondaga County Mitigation Action Summary 5-3
Table 5-3. Project Status Parameters 5-4
Table 5-4. Prioritization Score 5-5
Table 5-5. Implementation Priority 5-6
Table 5-6. Estimated Cost (Numerical Estimates) Parameters 5-6
Table 5-7. Estimated Cost (Qualitative) Parameters 5-6

Table 5-8. Benefits Parameters 5-7
Table 6-1. Five-Year Action Plan 6-4

LIST OF FIGURES

Figure 1-1. National Benefit Cost Ratio (BCR) Per Peril 1-2
Figure 3-1. Topographical Map 3-2
Figure 3-2. Onondaga County Watersheds 3-3
Figure 3-3. Oswego River Basin 3-4
Figure 3-4. Susquehanna River Basin 3-6
Figure 3-5. Land Use Cover 3-9
Figure 3-6. County Population (2012 – 2023) 3-19
Figure 3-7. Changes in Population by Census Tract (2015 – 2019) 3-20
Figure 3-8. Critical Facilities in Onondaga County 3-30
Figure 3-9. Hospitals 3-32
Figure 3-10. Schools 3-34
Figure 3-11. Transportation Systems in Onondaga County 3-36
Figure 4-1. New York State Drought Regions 4-19
Figure 4-2. U.S. Drought Monitor for Onondaga County 4-22
Figure 4-3. Water Service Areas and Well Distribution 4-25
Figure 4-4. Fault Systems in Onondaga County 4-32
Figure 4-5. USGS National Seismic Hazard Map 4-36
Figure 4-6. National Weather Service Heat Index Chart 4-46
Figure 4-7. Community Resilience Challenges Index (CRCI) in Onondaga County 4-51
Figure 4-8. Population Below Poverty Level in Onondaga County 4-51
Figure 4-9. Population 65 Years Old and Over in Onondaga County 4-52
Figure 4-10. Heat Index: Summer Average of Daily Highs 4-56
Figure 4-11. Heat Index: Summer Average of Daily Highs at Mid-Century 4-56
Figure 4-12. Heat Index: Days Over 95°F at Mid-Century 4-57
Figure 4-13. Onondaga County Special Flood Hazard Area 4-64
Figure 4-14. High Hazard Dams in Onondaga County *(NID)* 4-68
Figure 4-15. High and Intermediate Hazard Dams in Onondaga County *(New York State Inventory of Dams)*. 4-69
Figure 4-16. Levees in Onondaga County 4-71
Figure 4-17. Building Sites with Flooding *(Historical Model)* 4-92
Figure 4-18. Building Sites with Flooding *(RCP8.5: Mid-Century Model)* 4-92
Figure 4-19. Landslide Susceptibility 4-99
Figure 4-20. Geographic Features in Tully Valley 4-102
Figure 4-21. Past Harmful Algal Bloom Events in Onondaga County 4-120
Figure 4-22. Past Harmful Algal Bloom Advisories in Onondaga County 4-120
Figure 4-23. Average Summer Daily High Temperature Within HUC 10 Watersheds in Onondaga County *(RCP8.5: Mid-Century Model)* 4-122
Figure 4-24. Average Summer Daily High Temperature Within HUC 12 Watersheds in Onondaga County *(RCP8.5: Mid-Century Model)* 4-122
Figure 4-25. Average Spring Daily High Temperature Within HUC 10 Watersheds in Onondaga County *(RCP8.5: Mid-Century Model)* 4-123
Figure 4-26. Average Spring Daily High Temperature Within HUC 12 Watersheds in Onondaga County *(RCP8.5: Mid-Century Model)* 4-123
Figure 4-27. Average Fall Daily High Temperature Within HUC 10 Watersheds in Onondaga County *(RCP8.5: Mid-Century Model)* 4-124

Figure 4-28. Average Fall Daily High Temperature Within HUC 12 Watersheds in Onondaga County *(RCP8.5: Mid-Century Model)* 4-124
Figure 4-29. Average Annual Precipitation Within HUC 10 Watersheds in Onondaga County *(Historical Model vs. RCP4.5 Scenario)* 4-126
Figure 4-30. Average Annual Precipitation Within HUC 12 Watersheds in Onondaga County *(Historical Model vs. RCP4.5 Scenario)* 4-126
Figure 4-31. Average Annual Precipitation Within HUC 10 Watersheds in Onondaga County *(Historical Model vs. RCP8.5 Scenario)* 4-127
Figure 4-32. Average Annual Precipitation Within HUC 12 Watersheds in Onondaga County *(Historical Model vs. RCP8.5 Scenario)* 4-127
Figure 4-33. Ash Tree Distribution in New York 4-134
Figure 4-34. Confirmed Hemlock Adelgid in New York 4-135
Figure 4-35. Onondaga County Hail History (1950 – 2024) 4-147
Figure 4-36. Onondaga County Strong Wind History (1950 – 2024) 4-148
Figure 4-37. Onondaga County Tornado History (1950 – 2024) 4-149
Figure 4-38. Onondaga County Tropical Storm/Hurricane History (1861 – 2024) 4-150
Figure 4-39. SPC Severe Thunderstorm Categories 4-151
Figure 4-40. Onondaga County Wildland Urban Interface 4-167
Figure 4-41. National Weather Service Wind Chill Chart 4-178
Figure 4-42. Winter Average Daily Low Temperature *(Historical Model)* 4-187
Figure 4-43. Winter Average Daily Low Temperature *(RCP8.5: Mid-Century Model)* 4-187
Figure 4-44. Winter Average Daily High Temperature *(Historical Model)* 4-189
Figure 4-45. Winter Average Daily High Temperature *(RCP8.5: Mid-Century Model)* 4-189
Figure 4-46. Percent Change in Average Winter Precipitation *(Historical Model vs. RCP8.5:Mid-Century Model)* 4-190
Figure 4-47. Percent Change in Maximum Single-Day Winter Precipitation *(Historical Model vs. RCP8.5:Mid-Century Model)* 4-191

EXECUTIVE SUMMARY

Hazard mitigation is the implementation of long-term and short-term policies, programs, projects, and other activities to reduce deaths, injuries, and property damage resulting from disasters. Onondaga County and a coalition of 36 jurisdictional plan participants prepared and updated the 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan (the Plan) to identify the risks posed by hazards and find ways to reduce their impact. The Plan identifies potential hazards that could negatively impact County operations and assesses the risk and vulnerability of life safety and County assets for each hazard. Furthermore, this Plan establishes strategies and priorities to mitigate risk from natural hazards, identifies specific mitigation projects for each hazard, guides the County in associated risk management activities, and establishes eligibility for future mitigation program funds. The development of this Plan was a collaborative effort among the Onondaga County Core Planning Team and Steering Committee, with support from Integrated Solutions Consulting (ISC).

Onondaga County is located in central New York State, on the eastern side of the Finger Lakes Region. The County is bordered by Cayuga County to the west, Oswego County to the north, Madison County to the east, and Cortland County to the south. Onondaga County extends approximately 30 miles north and south and 35 miles east and west, with a total area of about 806 square miles (land and water). In 2023, the County had an estimated population of 471,611, making it the eleventh most populous county in New York State and the 27th largest by total area. The County is comprised of 35 municipalities, which include one (1) city, 19 towns, and 15 villages. The Onondaga Nation Territory is also located within the County, near the towns of Onondaga and LaFayette.

The responsibility for hazard mitigation lies with many, including private property owners, businesses and industry, and local, state, and federal governments. Through multi-jurisdictional partnerships, local jurisdictions within an area that has uniform risk exposure can pool resources and eliminate redundant planning activities. Onondaga County extended this planning effort to all municipalities within the County and the Onondaga County Water Authority (OCWA). The list of participating jurisdictions that were part of the entire planning process and are covered under this Plan is below.

Onondaga County, Cities, Towns, Villages		
Onondaga County	Village of Fayetteville	Town of Onondaga
Village of Baldwinsville	Town of Geddes	Town of Otisco
Town of Camillus	Village of Jordan	Town of Pompey
Village of Camillus	Town of LaFayette	Town of Salina
Town of Cicero	Village of Liverpool	Town Skaneateles
Town of Clay	Town of Lysander	Village of Skaneateles
Town of DeWitt	Town of Manlius	Village of Solvay
Village of East Syracuse	Village of Manlius	Town of Spafford
Town of Elbridge	Town of Marcellus	City of Syracuse
Village of Elbridge	Village of Marcellus	Town of Tully
Town of Fabius	Village of Minoa	Village of Tully
Village of Fabius	Village of North Syracuse	Town of Van Buren
Special Districts		
Onondaga County Water Authority		

The six (6) goals for this Plan, as identified by the Onondaga County Steering Committee, are listed below. The goals represent the County's long-term strategic vision for achieving successful mitigation efforts. Additionally, the

Steering Committee identified 29 objectives, which are specific strategies and steps, to assist the communities in attaining the listed goals.

Goals	
1	Protect life, property, and the environment.
2	Increase understanding and awareness of natural hazard risk.
3	Promote resiliency throughout the County.
4	Protect the environment and natural resources.
5	Promote and support partnerships.
6	Enhance disaster preparedness, response, and recovery.

There are a number of hazards that pose a threat to human life, health, and well-being, and this Plan is not meant to compile an exhaustive list. Onondaga County identified 10 natural hazards for this Plan. The hazards that have been identified as significant in Onondaga County and that are to be considered in this Plan are listed below.

Natural Hazards
Drought
Earthquake
Heat Wave/Extreme Heat
Flood *(riverine, flash/urban, ice jam, dam and levee failure)*
Geological Hazards *(landslides, land subsidence, mudboils)*
Harmful Algal Bloom
Invasive Species and Infestation *(Emerald Ash Borer, Hemlock Woolly Adelgid, True Armyworm, Common Reed (Phragmites), Eurasian Watermilfoil, Water Chestnut, Tick-Borne Diseases, Mosquito-Borne Diseases)*
Severe Weather *(severe thunderstorms – hail, strong winds/damaging winds, tornadoes – hurricane/tropical storm)*
Winter Weather *(winter storms – snowstorms, blizzards, lake effect storms, ice storms, nor'easter – cold wave/extreme cold)*
Wildfire *(wildfire smoke)*
Note: *As per the 2019 Onondaga County Hazard Mitigation Plan, the Steering Committee and Planning Partnership maintained the grouping of hazards, based on the similarity of hazard events, their typical concurrence or their impacts, consideration of how hazards have been grouped FEMA guidance documents (e.g., FEMA 386-2, Understanding Your Risks, Identifying Hazards and Estimating Losses, FEMA's Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy, FEMA's Local Mitigation Planning Handbook), and consideration of hazard grouping in the State's Hazard Mitigation Plan.*

Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. It allows emergency management personnel and first responders to establish early response priorities by identifying potential hazards and vulnerable assets. The process focuses on the following elements:

- **Hazard identification:** Use all available information to determine what types of hazards may affect a jurisdiction, how often they can occur, and their potential severity.
- **Vulnerability Identification:** Determine the impact of natural hazard events on the population, environment, economy, properties, and lands of the region. Develop hazard profiles to understand each hazard in terms of:
    - Location (geographic area within the planning area most affected by the hazard)
    - Extent/Intensity (severity of each hazard)
    - Probability and Frequency
    - Past Events

- **Assess Vulnerability and Impacts:**
    - Exposure identification: Estimate the total number of assets in the jurisdiction that are likely to experience a hazard event if it occurs by overlaying hazard maps with the asset inventories.
    - Vulnerability identification and loss estimation: Assess the impact of hazard events on the people, property, economy, and lands of the region, including estimates of the cost of potential damage or costs that can be avoided by mitigation.
    - Future changes that may impact vulnerability: Analyze how demographic changes, projected development, and climate change impacts can alter current exposure and vulnerability.

The risk assessment for this hazard mitigation plan evaluates the risk of natural hazards prevalent in the planning area and meets the requirements of the Federal Disaster Mitigation Act of 2000 (44 CFR, Section 201.6(c)(2)).

Each jurisdiction performed risk rankings to compare the probable impacts of the hazards of concern. For each community, the rankings assessed the probability of each hazard's occurrence and its likely impact on people, property, and the economy. The hazard ranking for each plan participant can be found in their respective annexes. The results of the countywide ranking, which were used to establish mitigation actions and priorities, are summarized below.

Note: *The sub hazards for flood (i.e., urban/flash flood, riverine/creek, ice jam, and dam and levee failure), geological hazards (i.e., landslide, land subsidence, and mudboils), severe weather (i.e., strong winds/damaging winds, severe thunderstorms, tropical storm/hurricane, hail, and tornado) and winter weather (i.e., cold wave/extreme cold) were individually ranked in the hazard risk ranking; however, flood, geological hazards, severe weather, and winter weather are each considered as the main hazard throughout this Plan.*

Hazard Ranking			
High	Urban/Flash Flood *(Flood)*	**Medium**	Tropical Storm/Hurricane *(Severe Weather)*
High	Winter Weather *(Blizzards, Lake Effect Snow, Nor'easter, Ice Storm)*	**Medium**	Dam and Levee Failure *(Flood)*
High	Strong Winds/Damaging Winds *(Severe Weather)*	**Low**	Hail *(Severe Weather)*
High	Harmful Algal Bloom	**Low**	Earthquake
High	Severe Thunderstorm *(Severe Weather)*	**Low**	Tornado *(Severe Weather)*
Medium	Riverine/Creek, Ice Jam *(Flood)*	**Low**	Wildfire *(Wildfire Smoke)*
Medium	Invasive Species and Infestation	**Low**	Landslide *(Geological Hazards)*
Medium	Cold Wave/Extreme Cold *(Winter Weather)*	**Low**	Land Subsidence *(Geological Hazards)*
Medium	Heat Wave/Extreme Heat	**Low**	Mudboils *(Geological Hazards)*
Medium	Drought		

The heart of a hazard mitigation plan is the mitigation strategy, which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how Onondaga County and the participating jurisdictions will achieve the overall purpose or mission of the planning process. As part of the update process, mitigation goals and objectives were reevaluated, and mitigation actions were updated/amended, identified, evaluated, and prioritized. Over 500 mitigation projects were identified and updated by the County and

participating jurisdictions. Mitigation actions and status for each plan participant can be found in their respective annexes.

The 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan was submitted for review and approval to the New York State Division of Homeland Security and Emergency Services (NYS DHSES) and Federal Emergency Management Agency (FEMA) in June 2025. The 2025 update of the Onondaga County Hazard Mitigation Plan was approved by NYS DHSES and FEMA in [enter date – Month ##, 202#], and has been officially adopted by the Onondaga County Legislature in [enter date – Month ##, 202#]. Each participating jurisdiction will formally adopt the Plan by resolution within one (1) year of FEMA's approval date to be formally recognized by FEMA as part of the Onondaga County Hazard Mitigation Plan.

The following key elements are included in the 2025 Onondaga County Hazard Mitigation Plan.

- **Planning Process:** The Core Planning Team, Steering Committee, plan participants, and planning process are described and documented.
- **Community Profile:** Demographics (including underserved population), social, and economic data, as well as land use descriptions, and development changes and trends, are updated to reflect the status of Onondaga County and its jurisdictions.
- **Hazard Risk Assessment:** Outlines the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. In this section, the process focuses on the following elements – hazard description, location, extent/intensity, probability and frequency, historical events, vulnerability, and impacts.
- **Mitigation Strategy:** The mitigation strategy describes how the community will accomplish the overall purpose of the planning process. In this section, mitigation goals and objectives were reevaluated and updated, and mitigation actions were updated, identified, evaluated, and prioritized.
- **Plan Maintenance:** The Hazard Mitigation Plan requires monitoring, evaluation, and updating every five (5) years. This section includes a schedule for annual monitoring and evaluation of the programmatic outcomes established in the Plan, as well as for producing a formal Plan revision every five (5) years.
- **Appendices:** Includes the Onondaga County's mitigation actions, stakeholder and public engagement details, supporting documentation, and the plan adoption.
- **Annexes:** This Plan includes 36 plan participants – 35 municipalities and one (1) special district – and each jurisdiction developed its own annex. All jurisdiction specific information and supporting documentation (e.g., hazard vulnerability and impacts, mitigation actions) can be found in the respective annexes.

CHAPTER 1. INTRODUCTION

In response to the requirements of the Federal Disaster Mitigation Act of 2000, Onondaga County and the jurisdictions within the County have developed this Hazard Mitigation Plan (HMP), which serves as a regulatory update to the 2019 Onondaga County Hazard Mitigation Plan (the Plan). The Federal Disaster Mitigation Act of 2000 requires jurisdictions to develop and maintain a hazard mitigation plan to remain eligible for certain Federal disaster assistance and hazard mitigation funding programs (e.g., Hazard Mitigation Grant Program). Renewal of the Plan every five (5) years is required to encourage continual awareness of mitigation strategies. Additionally, communities that participate in the Federal Emergency Management Agency (FEMA) Community Rating System (CRS), a voluntary program that reduces National Flood Insurance Program (NFIP) premiums, and are designated as a Category C repetitive loss community must prepare a Floodplain Management Plan (FMP) or a Repetitive Loss Area Analysis (RLAA). However, the CRS Program allows multi-hazard and multi-jurisdictional mitigation plans to fulfill this requirement.

FEMA defines a hazard mitigation plan as the documentation of a state or local government's evaluation of natural hazards and the strategies to mitigate these hazards. Furthermore, FEMA issues and updates guidelines for these plans (last updated in 2023). The New York State Division of Homeland Security and Emergency Services (NYS DHSES) also supports plan development for jurisdictions in New York and issued the New York State Hazard Mitigation Planning Standards (last updated in 2022) for hazard mitigation plans developed with funds administered by NYS DHSES.

This Plan fulfills the federal requirements for mitigation funding outlined in 44 Code of Federal Regulations (CFR), Section 201.6 (44 CFR § 201.6) and United States Code (USC) 42, Section 5165 (42 USC § 5165), the CRS Program, and provides the jurisdiction with a blueprint for reducing the impacts of natural, human-caused, and technological hazards.

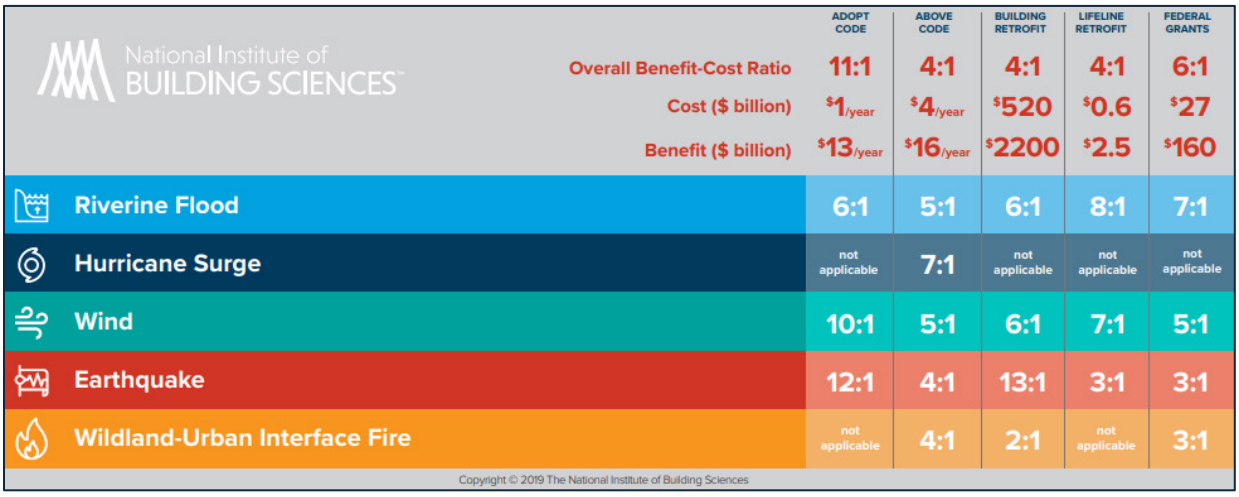
1.1. HAZARD MITIGATION PROGRAM

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risks and effects associated with specific hazards. Mitigation planning forms the foundation for Onondaga County’s long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The long-term benefits of mitigation planning include the following:

- An increased understanding of hazards that impact Onondaga County and its jurisdictions.
- Building more sustainable and disaster-resistant communities.
- Increasing education and awareness of hazards, their threats, and risks.
- Developing feasible and achievable actions for risk reduction in the County and its jurisdictions.
- Building relationships by involving the whole community.
- Identify implementation approaches that focus resources on the most significant risks and vulnerabilities.
- Financial savings through partnerships that support planning and mitigation efforts.
- Focus the use of limited resources on hazards that have the most significant impact on the community.
- Reduce long-term impacts and damages to life safety, public health, and structures.
- Reduce repair costs.

Studies show that hazard mitigation can save up to $6 for every $1 invested. **Figure 1-1** provides the benefit cost ratio for five (5) natural hazards and five (5) sets of mitigation strategies (i.e., adopting model codes, federal mitigation grants, private sector building retrofit, exceeding codes, and mitigating infrastructure).[1]

Figure 1-1. National Benefit Cost Ratio (BCR) Per Peril



1.2. PLANNING AREA

The planning area was defined to consist of the County, all 35 municipal jurisdictions (i.e., cities, towns, and villages) located within Onondaga County, and one (1) special district, the Onondaga County Water Authority. All partners to this Plan have jurisdictional authority within this planning area.

Onondaga County and the participating jurisdictions intend to implement this Plan with full coordination and participation from county and local departments, organizations, and groups, as well as relevant state and federal entities. Coordination helps ensure that stakeholders have established communication channels and relationships necessary to support mitigation planning and the mitigation actions included in **Appendix A** of this Plan and in each annex.

1.3. PARTICIPATING JURISDICTIONS

In May 2024, Onondaga County notified all municipalities within the County of the pending planning process and invited them to formally participate. Jurisdictions were asked to formally inform the County of their intent to participate (via a Letter of Intent) and to identify two (2) planning points of contact to facilitate municipal participation and represent the interests of their respective communities. Completed Letters of Intent to Participate are provided in each jurisdictional annex.

All participating jurisdictions (i.e., cities, towns, villages, and special districts) listed in **Table 1-1** were represented by one (1) or more representatives. Responsibilities for each of the participating jurisdiction's representatives included the following:

- Represent their jurisdiction throughout the entire planning process.

[1] National Institute of Building Sciences. (2019). Natural Hazard Mitigation Saves (2019 Report). Retrieved from https://www.nibs.org/files/pdfs/NIBS_MMC_MitigationSaves_2019.pdf.

- Assure participation of all departments and functions within their jurisdiction that have a role in hazard mitigation (e.g., planning, engineering, code enforcement, police and emergency services, public works).
- Assist in gathering information for inclusion in the Plan update, including the use of previously developed reports and data.
- Support and promote public engagement throughout the planning process.
- Report on progress of mitigation actions identified in prior Hazard Mitigation Plan updates, as applicable.
- Identify, develop, and prioritize appropriate mitigation actions.
- Report on progress of integration of the prior Hazard Mitigation Plan into other planning processes and municipal operations.
- Support and develop or update the jurisdiction's annex.
- Review, amend, and approve all sections of the Plan update.
- Adopt, implement, and maintain the Plan.

Contact information for each representative and documentation of participation in the Plan update are available in **Appendix B**. The County also invited key organizations to assist and review the Plan update process; supporting documentation is also available in **Appendix B**.

Table 1-1. Participating Jurisdictions

Onondaga County, Cities, Towns, Villages		
Onondaga County	Village of Fayetteville	Town of Onondaga
Village of Baldwinsville	Town of Geddes	Town of Otisco
Town of Camillus	Village of Jordan	Town of Pompey
Village of Camillus	Town of LaFayette	Town of Salina
Town of Cicero	Village of Liverpool	Town Skaneateles
Town of Clay	Town of Lysander	Village of Skaneateles
Town of DeWitt	Town of Manlius	Village of Solvay
Village of East Syracuse	Village of Manlius	Town of Spafford
Town of Elbridge	Town of Marcellus	City of Syracuse
Village of Elbridge	Village of Marcellus	Town of Tully
Town of Fabius	Village of Minoa	Village of Tully
Village of Fabius	Village of North Syracuse	Town of Van Buren
Special Districts		
Onondaga County Water Authority		

1.4. PLAN PARTICIPATION

Updating this Plan involved assistance in identifying and evaluating hazards and mitigation actions from five (5) main groups – the Core Planning Team, the Steering Committee, representatives from County jurisdictions, members of the public, and other stakeholders.

1.4.1. Core Planning Team

The Core Planning Team consisted of key members from the Onondaga County Department of Planning and staff from Integrated Solutions Consulting (ISC). The Core Planning Team also served on the Steering Committee and helped guide the planning process. **Table 1-2** lists the Core Planning Team members from the Onondaga County Department of Planning.

Table 1-2. Core Planning Team Members

Name	Title	Jurisdiction/Organization
Megan Costa	Deputy Director	Onondaga County Department of Planning
Jeffery Harrop	Planner II	Onondaga County Department of Planning

1.4.2. Steering Committee

Hazard mitigation planning enhances collaboration and support among diverse parties whose interests can be affected by hazard losses. A Hazard Mitigation Steering Committee (the Steering Committee) was formed to oversee all phases of the planning process.

Throughout this Plan update, the Steering Committee agreed to meet as often as needed through the planning process. The Core Planning Team facilitated each meeting, which addressed objectives set by the established work plan. All members of the Steering Committee were actively involved in attending meetings and were responsible for the following:

- Providing guidance and oversight of the planning process on behalf of the general planning partnership.
- Attending and participating in Steering Committee meetings.
- Assisting with the development and completion of certain planning elements, including:
    - Reviewing, identifying, and prioritizing natural, human-caused, and technological hazards that impact Onondaga County.
    - Coordinating and conducting outreach activities with stakeholders, plan participants, and the public.
    - Assuring the data and information in the Plan update are based on the best available data.
    - Reviewing, updating, and identifying the Plan's goals and objectives.
    - Reviewing, identifying, and prioritizing mitigation actions and projects.
    - Defining and identifying critical facilities.
    - Reviewing and updating the planning area's capability assessment and consideration of mitigation alternatives.
- Reviewing and providing feedback on the draft Plan during the public comment period, before submitting to NYS DHSES and FEMA Region 2.

The Steering Committee members are listed in **Table 1-3,** and the Steering Committee Meetings sign-in sheets are available in **Appendix B**.

Table 1-3. Hazard Mitigation Steering Committee Members

Name	Title	Jurisdiction/Organization
Bob Jacobs	Regional Emergency Response Coordinator	New York State Department of Environmental Conservation (Region 7)
Brian Kelley	Commissioner	Onondaga County Parks
Damian Ulatowski	Supervisor	Town of Clay
Dan Wears	Commissioner of Emergency Management	Onondaga County Department of Emergency Management
Don Jordan	Deputy Planning Director	Onondaga County Department of Planning
Frank Moses	Executive Director	Skaneateles Lake Association
James D'Angostino	Director	Syracuse Metropolitan Transportation Council
Jeffery Harrop	Planner II	Onondaga County Department of Planning
Jeffrey Till	Deputy Director	Onondaga County Health Department (Environmental Health)
JoAnne Spoto Decker	Commissioner	Onondaga County Department of Adult and Long-Term Care Services
Joe Nicoletti	Highway Superintendent	Town of Clay
Mario Colone	Program Manager	Syracuse Metropolitan Transportation Council
Mark Territo	Planning Commissioner	Town of Clay
Marty Voss	Commissioner	Onondaga County Department of Transportation
Matthew Snyder	President	Oneida Lake Association, Inc.
Megan Costa	Deputy Director	Onondaga County Department of Planning
Michael Alexander	Senior Transportation Planner	Syracuse Metropolitan Transportation Council
Richard Waterman	Mayor	Village of Camillus
Shannon Harty	Commissioner	Onondaga County Water Environmental Protection

1.4.3. Local Planning Teams

Each participating jurisdiction identified representatives to serve on its Local Planning Team. The Local Planning Teams were instrumental in identifying community-specific risks and hazards, and in prioritizing mitigation actions that would reduce the costs of disaster response and recovery, protect people and infrastructure, and minimize overall disruption to their respective communities in the event of a disaster. The members of each Local Planning Team are listed under each jurisdictional annex.

1.4.4. Supporting Organizations

Throughout the planning process, key stakeholders, departments, and community organizations, including local community organizations that provide support to underserved communities, were involved in providing key input, data, disseminating information about the Plan, survey, meetings, and reviewing the draft of the Plan (i.e., public comment period). Details on stakeholder engagement throughout the planning process, along with a list of stakeholders, are in **Appendix B**.

1.5. PLAN APPROVAL AND ADOPTION

The Plan presents a comprehensive description of Onondaga County's commitment to significantly reduce or eliminate the potential impacts of disasters through planning and mitigation. Adoption by the local governing body within New York State legitimizes the Plan and authorizes Onondaga County and its jurisdictions to implement mitigation responsibilities and activities.

A hazard mitigation plan must document that it has been formally adopted by the governing bodies of the jurisdictions requesting federal approval of the plan (44 CFR Section 201.6(c)(5)). For multi-jurisdictional plans, such as this, each jurisdiction requesting approval must formally adopt the Plan. This Plan will be submitted for a pre-adoption review to NYS DHSES and FEMA Region 2 before adoption. Once pre-adoption approval (i.e., approvable pending adoption or APA) has been provided, all participating jurisdictions will formally adopt the Plan. Federal Disaster Mitigation Act of 2000 compliance and its benefits cannot be achieved until the Plan is adopted.

Following adoption of the Plan, the jurisdiction must submit a copy of the resolution or other legal document showing formal adoption (acceptance) of the Plan to the Onondaga County Hazard Mitigation Coordinator (i.e., Onondaga County Department of Planning staff). Onondaga County will forward the executed resolutions to NYS DHSES, after which they will be submitted to FEMA for recordkeeping. The jurisdictions understand that FEMA will transmit an acknowledgement of verification of formal plan adoption and the official approval of the Plan to the Onondaga County Hazard Mitigation Coordinator.

Copies of the resolutions adopting **Volume 1 (Countywide Planning Elements)** can be found in **Appendix D,** and resolutions for each plan participant can be found under each jurisdictional annex.

CHAPTER 2. PLANNING PROCESS

The Onondaga County Hazard Mitigation Plan was developed to provide a basis for identifying and managing natural hazards and to meet federal, state, and local requirements for hazard mitigation and FEMA mitigation grant funding.

Updating this Plan began with an initial kick-off meeting with the Onondaga County Department of Planning on October 18, 2023. Following this meeting, a series of Stakeholder and Jurisdiction Introductory Webinars were held on July 8 and 10, 2024. The main purpose of these webinars was to provide information regarding FEMA's Hazard Mitigation Program directive and how participating in this Plan will enable jurisdictions (i.e., cities, towns, villages, and special districts) to become eligible for FEMA hazard mitigation grant programs. Furthermore, the planning process involved the following:

- Review of the existing Plan.
- Updating Onondaga County's hazard history.
- Gathering information on local hazards from individual communities.
- Gathering input on hazard priorities.
- Identifying specific vulnerabilities and desired mitigation strategies.
- Evaluating the previous Plan goals, objectives, and mitigation strategies.
- Determining the status of previous mitigation strategies and action plans.
- Identifying Repetitive Loss and Severe Repetitive Loss properties.
- Facilitating the activities of the Steering Committee.
- Conducting multiple public meetings and outreach activities.

Information regarding Onondaga County's hazards and applicable mitigation strategies was obtained through two (2) Stakeholder Workshops held in the Onondaga County Department of Emergency Management (Training Room) on July 22 and 23, 2024. Additionally, a comprehensive public survey reached 131 residents and yielded 89 completed responses.

The 2024 Onondaga County Hazard Mitigation Questionnaire (i.e., Public Survey) was available beginning in July 2024. As part of this survey, Steering Committee members, community representatives, and members of the public were asked to rate each of the hazards in terms of perceived risk. Furthermore, they were asked to rate the "mitigation importance" of each identified hazard in the Plan. The information gathered from this survey was used to inform the hazard risk prioritization process and to ensure the Plan adequately addressed the public's concerns and priorities. An in person public meeting was held on July 22, 2024. The meeting was advertised to allow residents to provide input on the Plan. Additionally, a draft of the Plan was made available on the Onondaga County Hazard Mitigation website for public review and comment from May 1, 2025, through May 30, 2025.

The purpose of the two (2) Stakeholder Workshops was to ensure local jurisdictions had the opportunity to identify their community's risks and identify/update their mitigation strategies and priorities. These Workshops included local planning team members from each city, town, village, and special district. Participants validated the County's risk assessment findings, described specific hazard risks and concerns for their communities, updated existing mitigation actions/strategies from the 2019 Plan, and worked with their local planning teams to identify new mitigation initiatives. Through a combination of ranking exercises, worksheets, and discussions, workshop

participants evaluated hazard risk results, action plans, and rankings; and selected options for mitigating specific hazards to be included in the 2025 Plan update.

In summary, the planning process consisted of the following key tasks:

Task 1: Organize the Planning Effort
This task was meant to establish the overall foundation of the hazard mitigation planning process. The Onondaga County Department of Planning created a Core Planning Team to attend meetings, gather data and historical information, review drafts, and participate in mitigation brainstorming sessions. Additionally, a Steering Committee was formed to provide overall guidance and direction throughout the mitigation planning process. Participating jurisdictions were invited to form Local Planning Teams to ensure their jurisdiction's mitigation needs and priorities were addressed. *Refer to Section 1.4 of this Plan for a list of Core Planning Team and Steering Committee members, and to each annex for the respective Local Planning Team members.*

A series of stakeholder and jurisdiction introductory webinars was conducted for all potential plan participants and stakeholders to provide information on the FEMA Hazard Mitigation Program directive and demonstrate how participating in the Plan enables each jurisdiction's eligibility for the FEMA Hazard Mitigation Assistance grant programs. To confirm jurisdictional participation, each participating jurisdiction (i.e., plan participant) was required to execute a Letter of Intent. This agreement outlined the roles and responsibilities of each plan participant, and established commitment from and a cooperative working relationship between the plan participant and the County in the development and implementation of the Onondaga County Hazard Mitigation Plan.

An inclusive and engaging outreach strategy to solicit meaningful input from stakeholders and the public throughout the planning process was developed. Outreach methods included, but were not limited to, presentational meetings, interactive interviews for data collection and information sharing, workshops, public surveys, and engagement on social media platforms, county and municipal websites, and via e-mail. Furthermore, the Core Planning Team conducted an initial identification and gathering of the diverse data and resources necessary to complete the subsequent tasks. The data collection effort included a clear timeline outlining when and how data will be requested and submitted from plan participants, stakeholders, and the public.

Task 2: Review and Update Community Profiles and Existing Conditions
To provide better context for the planning area, a review and update of the County's community profile and the existing conditions for each plan participant were completed. The community profile served as the foundation of the hazard risk assessment. Details and analyses of each jurisdiction's demographic characteristics (including underserved populations), the built environment (including land use), critical infrastructure and facilities, the natural environment, and the local economy were presented and evaluated as distinct yet interrelated topics for understanding risk and resilience in each participating jurisdiction.

Task 3: Review and Evaluate Impacts of Hazards of Concern (Hazard Risk Assessment)
The Steering Committee identified the hazards to include in this Plan. Hazard profiles were reviewed and updated to address the location, extent/intensity, probability, frequency, past events, vulnerabilities, and impacts. The hazard profiles included vulnerability and impact analyses of life safety and health, property damage and critical infrastructure, changes in development and their impact on future development, underserved and at-risk populations, and climate change. The Team leveraged the hazard profiles from the previous Plan and the New York State Hazard Mitigation Plan for foundational hazard information, and used local resources to inventory Onondaga County's assets and estimate losses. The Core Planning Team, Steering Committee, and plan participants provided input and subject matter expertise throughout this process. Furthermore, each plan participant assessed and documented the vulnerability and impacts to people, property, the environment, and critical infrastructure for each hazard of concern.

Task 4: Review Capabilities and Integrate Resources
A capability assessment for each community was completed to outline the unique set of capabilities, including planning, regulatory, administrative, technical, fiscal, and education and outreach available to accomplish hazard mitigation and reduce long-term vulnerability. This assessment may result in the identification of specific actions that expand jurisdictional capabilities to achieve the hazard mitigation goals and objectives. Additionally, it provided an opportunity to coordinate the objectives and resources of existing local planning mechanisms that can support the implementation of this Plan. The Plan also documents each participant's ability to expand and improve the identified capabilities. An assessment of each jurisdiction's participation in the National Flood Insurance Program (NFIP) was also included.

Task 5: Review and Update the Mitigation Strategy
The Mitigation Strategy includes a five (5) year blueprint to reduce the risk posed by and the impacts of the hazards outlined in this Plan, along with the mitigation goals, objectives, and actions. Mitigation goals were reviewed and updated as broad statements that serve as general guidelines for what Onondaga County aims to achieve with the Plan. The mitigation objectives were also reviewed and updated to connect goals with implementable mitigation actions. To help achieve the goals outlined in this Plan, existing mitigation actions were updated, and new mitigation actions were identified. Mitigation actions are specific projects, activities, or processes that should be implemented to reduce or eliminate long-term risks to people, property, and the environment posed by hazards and their impacts. Additionally, an implementation action plan was updated and improved to describe how the mitigation actions will be prioritized, implemented, and incorporated into the community's existing planning mechanisms.

The Core Planning Team met with plan participants, via stakeholder workshops and one-on-one meetings, to develop and prioritize mitigation strategies and actions that would reduce the costs of disaster response and recovery, protect people, property, the environment, and infrastructure, and minimize overall disruption to the County and its municipalities in the event of a disaster. *Onondaga County's list of mitigation actions can be found in **Appendix A** of this Plan, and a list of mitigation actions for each plan participant can be found in the respective annexes.*

Task 6: Review and Update the Plan Maintenance Process
The plan maintenance process outlines the monitoring, evaluating, and updating of the Plan in the next five (5) years. The Onondaga County Hazard Mitigation Plan is a living document that guides actions over time and major revisions to the document are not likely to be needed during the five (5) year life of the Plan. However, new risk information may become available, requiring minor changes to the Plan. This includes, but is not limited to, amendments to the risk assessment, reviews of existing mitigation actions, and the implementation of new mitigation actions. Keeping the Plan current will assist with implementation.

Task 7: Draft and Submit Plan
The Core Planning Team compiled all the relevant sections of the Plan to produce a Plan draft for review (i.e., public comment period). During the public comment period, all plan participants, stakeholders, and the public were given the opportunity to review and provide feedback on the entire Plan (Volume 1 and annexes). The feedback was reviewed and, as applicable, incorporated by the Core Planning Team for Volume 1 and by the Local Planning Teams for the annexes. Once the Plan was finalized, it was submitted to the NYS DHSES and FEMA Region 2 for review and approval.

Task 8: Adopt the Plan
Each jurisdiction that is included in this Plan must have its governing body formally adopt the plan within one (1) year of FEMA's designation of APA. Onondaga County Department of Planning coordinated the effort to ensure the APA was formally adopted by each participating jurisdiction (i.e., city, towns, villages, and special districts) and that at least one (1) jurisdiction adopted the Plan within one (1) year of the APA notification from FEMA.

Public Involvement and Participation
Public involvement and participation occurred throughout the entire planning process outlined in this section.

The public was given an opportunity to be involved throughout the planning process via a public survey, in-person public meeting, and public engagement activities to review the Plan draft. The public was invited to attend the public meeting to review the risk assessment results and discuss mitigation strategies. A comprehensive public survey, with 89 completed responses as of December 1, 2024, was also conducted. The survey results were used to inform the hazard risk prioritization process and to ensure the Plan adequately addresses the public's concerns and priorities. *The complete survey and a summary of its findings can be found in **Appendix C**.* Once the draft Plan was completed, the public was given an opportunity to review and provide comments on **Volume 1** and each jurisdiction annex. The public comment period began on May 1, 2025. The Plan was made available on the Onondaga County Hazard Mitigation Plan website, where the public was invited to review and provide feedback. The County announced this opportunity through a press release, social media advertisements (i.e., Facebook, Instagram), the Onondaga County Public Libraries, and the County's Disaster Preparedness Committee. Additional outreach was conducted by the plan participants, who promoted the public review process on their respective social media, websites, newsletters, and bulletin boards. *Further details on public engagement and participation, along with supporting documentation, can be found in **Appendix C**.*

To further facilitate continued public involvement in the planning process, the public will have an opportunity to provide continual feedback and input. As future needs and concerns arise, or if the public would like to provide feedback on the latest version of the Onondaga County Hazard Mitigation Plan, the public is invited to use the form provided on the County's website to submit comments.

2.1. REVIEW OF EXISTING PROGRAMS AND PLANS

The Onondaga County Hazard Mitigation Plan update strives to use the best available technical information, plans, studies, and reports throughout the planning process to support hazard profiling, risk and vulnerability assessment, review and evaluation of mitigation capabilities, and the identification, development, and prioritization of county- and local level mitigation strategies.

Plans, reports, and other technical information were identified and provided directly by the County, participating jurisdictions, and numerous stakeholders involved in the planning process, as well as through independent research by the planning consultant. The County and participating jurisdictions were tasked with updating the inventory of their respective capability assessments and providing relevant planning and regulatory documents, as applicable. Relevant documents, including plans, reports, and ordinances, were reviewed to identify the following:

- Existing municipal capabilities.
- Needs to improve and/or expand capabilities, which may be identified within the County or local mitigation strategies.
- Mitigation goals and objectives are outlined in Chapter 5 of this Plan.
- Updates to the existing mitigation actions (i.e., mitigation actions identified in previous Plan updates) to be incorporated into the updated County and local mitigation strategies.

The following local regulations, codes, ordinances, and plans were reviewed during this process to develop mitigation planning goals, objectives, and strategies that are consistent across local and regional planning and regulatory mechanisms to accomplish complementary and mutually supportive strategies:

- Comprehensive Plans/Master Plans
- Building Codes
- Fire Codes
- Zoning and Subdivision Ordinances
- National Flood Insurance Program/Flood Damage Prevention Ordinances
- Site Plan Requirements
- Local Waterfront Revitalization Plans
- Stormwater Management Plans
- Emergency Management and Response Plans
- Land Use and Open Space Plans
- Capital Improvement Plans
- 2023 New York State Hazard Mitigation Plan

An assessment of each jurisdiction's capabilities that can contribute to the reduction of long-term vulnerabilities to hazards is addressed in their respective annexes. It should be noted that this Plan does not replace any existing plans or programs but is intended to provide a reference on hazard mitigation to be used in planning and program development.

Primary responsibility for the development and implementation of mitigation strategies and policies lies with local governments (i.e., each plan participant). However, various regional, state, and federal partners and resources are available to assist communities in the development and implementation of mitigation strategies. In New York State, NYS DHSES is the lead agency providing hazard mitigation planning assistance to local jurisdictions. NYS DHSES provides guidance to support mitigation planning. In addition, FEMA provides grants, tools, guidance, and training to support mitigation planning.

Additional input and support for this planning effort were obtained from a range of agencies and through public engagement. The Onondaga County Department of Planning and the Steering Committee provided project management and oversight of the planning process. While participating jurisdictions were asked to identify primary and alternate local points of contact, broad participation by jurisdiction representatives was encouraged and supported throughout the planning process. A list of municipal and Steering Committee members is provided in **Table 1-1** (under Section 1.3) and **Table 1-3** (under Section 1.4), respectively.

This Plan was prepared in accordance with the following regulations and guidance:

- FEMA Hazard Local Planning Policy Guide (effective April 2023)
- FEMA Local Mitigation Planning Handbook (May 2023)
- FEMA Integrating Hazard Mitigation into Local Planning (April 2022)

- FEMA Plan Integration: Linking Local Planning Efforts (July 2015)
- Federal Disaster Mitigation Act of 2000 (Public Law 106-390, October 30, 2000)
- 44 Code of Federal Regulations (CFR) Parts 201 and 206 (including: Feb. 26, 2002, Oct. 1, 2002, Oct. 28, 2003, and Sept. 13, 2004 Interim Final Rules).
- FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)
- NYS DHSES Hazard Mitigation Planning Standards (2022)
- New York State Hazard Mitigation Plan (2023)

2.2. PLAN ORGANIZATION

The Onondaga County Hazard Mitigation Plan update is organized in two (2) volumes. **Volume 1** provides information on the overall planning process, hazard profiles, hazard risk assessment, plan maintenance, and Onondaga County's mitigation strategy and actions. As such, **Volume 1** includes all information that applies to the entire planning area (Onondaga County). **Volume 2** provides an annex dedicated to each participating jurisdiction. Each annex outlines the jurisdiction's capability assessment; identifies unique vulnerabilities to the hazards; documents mitigation plan integration with other planning efforts; records the status of existing mitigation actions; and presents an individualized mitigation strategy. The annexes are intended to provide a useful resource for each jurisdiction for implementation of mitigation projects and future grant opportunities, and a place for each jurisdiction to record and maintain their local aspect of the Countywide Plan.

2.3. EQUITY CONSIDERATION FOR THE UNDERSERVED POPULATION

Some disasters occur on larger scales, are more influenced by built environments, and are most likely to continue impacting those most at risk because of existing health conditions, limited resources, past underrepresentation in mitigation planning, historical disinvestment in their communities, or other factors. In this case, people in widely different locations can be the most harmed by recurring disaster cycles, so mitigation strategies should also aim to break cycles of loss driven by social and economic disparities. Hazard mitigation strategies can reduce existing risk, for example, by relocating a building out of a frequently flooded area. In each case, an attempt has been made to reduce the harm from a future flood before it occurs. Strategies may also seek to make future development less vulnerable to hazards when it is built. Examples include requiring new structures to be elevated above predicted flood levels or building structures to better withstand future hazards. Hazard mitigation plans are designed to involve stakeholders from different perspectives to ensure plans use the best available data, align with the needs of the entire community, and align with other plans, such as general plans, capital improvement plans, and climate action plans.

The Onondaga County Hazard Mitigation Plan recognizes that not all members of the community are impacted in the same way by natural, human-caused, and technological disasters. Some community members are at more risk for a number of possible reasons. A mitigation strategy that uses a 'one size fits all' approach and fails to recognize different levels of risk will not adequately or efficiently support historically underserved populations and may even worsen inequalities after a disaster.

This Plan highlights equity as a key component of the Plan's overall vision and seeks to continue developing a shared understanding among participants of how hazard mitigation can be made more inclusive and to proactively create strategies that reduce existing disparities in risk and hazard recovery. Addressing the whole community requires recognizing that while a single solution for all seems fair, it does not address historical inequalities or current differences in age, financial resources, housing stability, neighborhood investment, health or ability, and access to government services. In mitigation planning, this means that successfully reducing risk in the most meaningful and efficient way requires understanding how the distribution of resources will actually reduce risk and for whom.

Equitable mitigation success should be measured by assessing who was most impacted in loss of life or financial harm by past and future disasters, quantifiable reductions of vulnerability to those most at risk, and increasing engagement with historically underserved populations and community organizations to better understand how plans and processes and natural hazard events are affecting different communities. The following highlights how this Plan addresses this priority.

Chapter 3 (Community Profile): This chapter describes different demographic and economic factors in Onondaga County. Additionally, data from the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) and Community Resilience Estimates (CRE) for equity, developed by the United States Census Bureau, were included. Additionally, data on at-risk populations in Onondaga County and their vulnerability to climate change impacts are provided.

Chapter 4 (Hazard Identification and Risk Assessment): This chapter includes FEMA's National Risk Index scores for the County for social vulnerability and community resilience. *Social vulnerability* is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.[2] *Community resilience* is defined as the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions.[3] Additionally, it includes a hazard ranking methodology that specifically assessed the impact of the hazard on underserved populations. Furthermore, each hazard profile includes a narrative of the vulnerability and impacts for the underserved and at-risk population, FEMA's Expected Annual Loss analysis, and the County's National Risk Index score. The Risk Index score is based on the following components: Social Vulnerability, Community Resilience, and Expected Annual Loss (based on Exposure, Annualized Frequency, and Historic Loss Ratio (HLR) factors, for a total of five (5) risk factors).[4]

Mitigation goals were updated to encourage greater participation and engagement from underserved populations and groups, and align with the Onondaga County Comprehensive Plan, which prioritizes diversity, inclusion, and equity. During Stakeholder Workshops, where new and ongoing mitigation strategies were discussed, jurisdictional representatives were encouraged to consider how the mitigation actions directly and/or indirectly led to equitable outcomes.

During this Plan update process, a comprehensive community preparedness questionnaire was developed and disseminated. The questionnaire was designed with a specific focus to better understand the challenges and concerns related to access and functional needs, access to information, ability to recover, and services needed, especially for those who may be underserved or lack access to key resources.

The County and participating jurisdictions have a responsibility to ensure equitable outcomes in the implementation of this Plan and to take action to reduce vulnerabilities to disasters experienced disproportionately by marginalized populations.

When conducting community engagement related to the implementation or update of this Plan, Onondaga County will ensure that the entire community has an opportunity to participate in the process and discussion. FEMA defines

[2] Federal Emergency Management Agency. (2023). Social Vulnerability. Retrieved from https://hazards.fema.gov/nri/social-vulnerability.
[3] Federal Emergency Management Agency. (2023). Community Resilience. Retrieved from https://hazards.fema.gov/nri/community-resilience.
[4] Federal Emergency Management Agency. (2023). Determining Risk. Retrieved from https://hazards.fema.gov/nri/determining-risk.

the *whole community* as the groups and organizations that should share the responsibility for emergency preparedness and mitigation, including:[5]

- Individuals
- Families
- Businesses
- Faith-based and community organizations
- Non-profit groups
- Schools and academia
- Media
- Local and state government
- Artists and arts organizations
- Tribal government and associations
- Territories
- Other federal agencies

[5] Federal Emergency Management Agency. (n.d.). Guide to Expanding Mitigation. Retrieved from https://www.fema.gov/sites/default/files/documents/fema_mitigation-guide_whole-community.pdf.

CHAPTER 3. COMMUNITY PROFILE

Onondaga County was established in 1794 and comprises 35 separate municipalities, which include one (1) city, 19 towns, and 15 villages. The Onondaga Nation Territory is also located in the County, between the towns of Onondaga and LaFayette. The County is located within 350 miles of all major cities in the northeast United States. The population was 467,873 in July 2023, a 1.8% decrease from 476,523 in 2020.[6] According to the United States Census Bureau, Onondaga County is the eleventh most populous county in New York State.[7]

Onondaga County is located in central New York State, on the eastern side of the Finger Lakes Region. The County is bordered by Cayuga County to the west, Oswego County to the north, Madison County to the east, and Cortland County to the south. The County extends approximately 30 miles north and south and 35 miles east and west, with a total area of about 806 square miles (land and water). The only city, Syracuse, is located in the center of the County with one (1) of the five (5) lakes, Onondaga Lake, in its northwestern corner. Several major highways run through Onondaga County, including Interstates 81, 90, 481, and 690, and United States Routes 11 and 20.

Development in Onondaga County has continued in the City of Syracuse's suburban area, causing a shift in population from the City to surrounding communities over the past several decades. This population shift is supported by increased water and sewer infrastructure, which has enabled previously undeveloped areas to be developed.

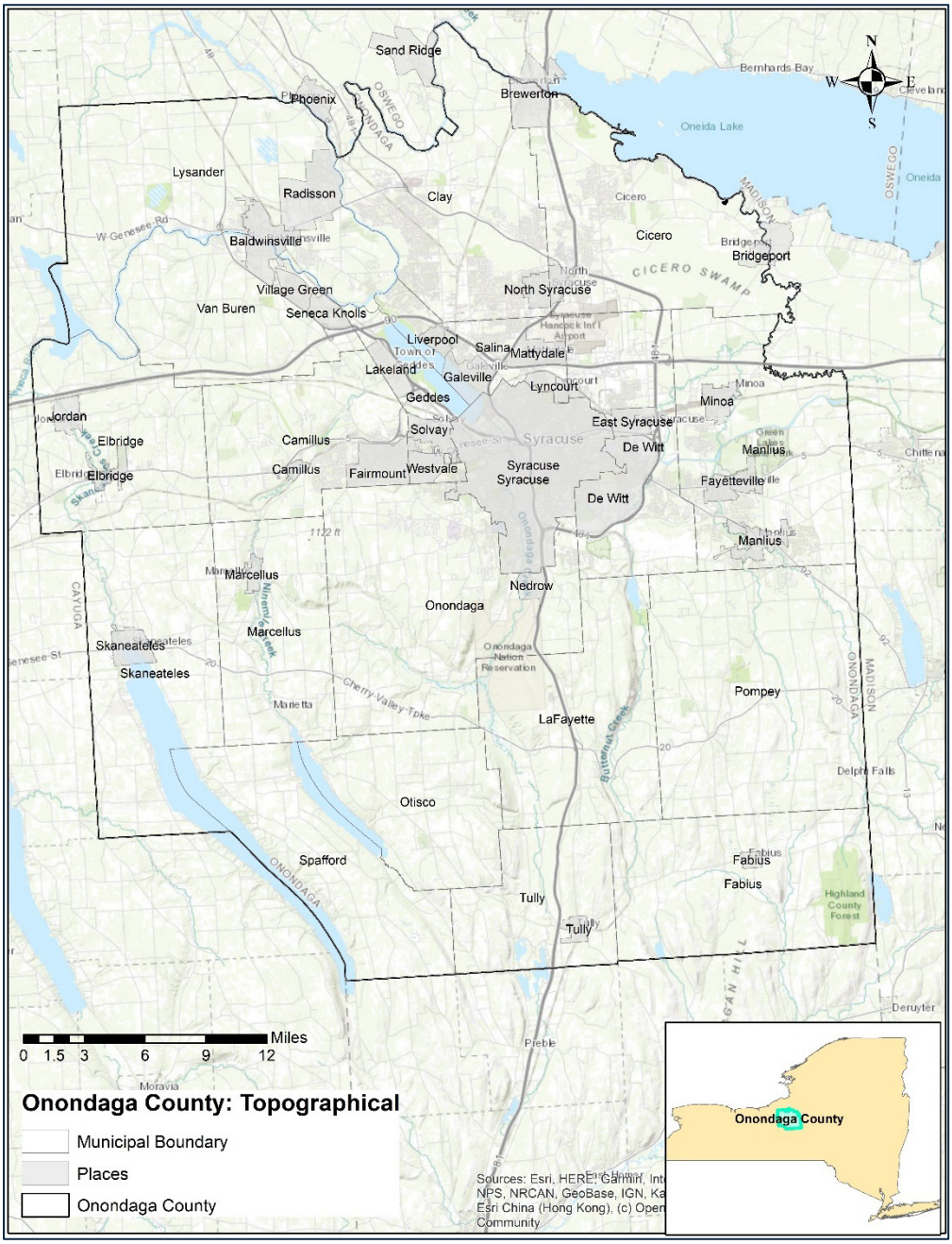
Like most locations in the United States, Onondaga County is vulnerable to a series of natural hazards that threaten life safety, public health, businesses, the economy, and critical infrastructure.

[6] United States Census Bureau. (2023). QuickFacts: Onondaga County, New York. Retrieved from https://www.census.gov/quickfacts/fact/table/onondagacountynewyork/.
[7] United States Census Bureau. (2023). DP05: ACS Demographics and Housing Estimates (ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP05?q=New+York+Counties.

3.1. TOPOGRAPHY

Onondaga County is located in the eastern section of the Finger Lakes Region of New York State. The northern part of the County is a relatively level lake plain. The lake plain region includes Oneida Lake, the Three Rivers (i.e., Oneida River, Seneca River, and Oswego River), and the Erie Canal, which is part of the New York State Canal System. The southern part of the County lies on the Appalachian Plateau, with high hills and locally famous drumlins rising at the southern edge of the City of Syracuse. Skaneateles Lake, Onondaga Lake, and Otisco Lake are within the County, while Cross Lake is partially in Onondaga County, and the Oneida Lake shoreline forms the northern border of Onondaga County. **Figure 3-1** illustrates the topographical map for Onondaga County.

Figure 3-1. Topographical Map



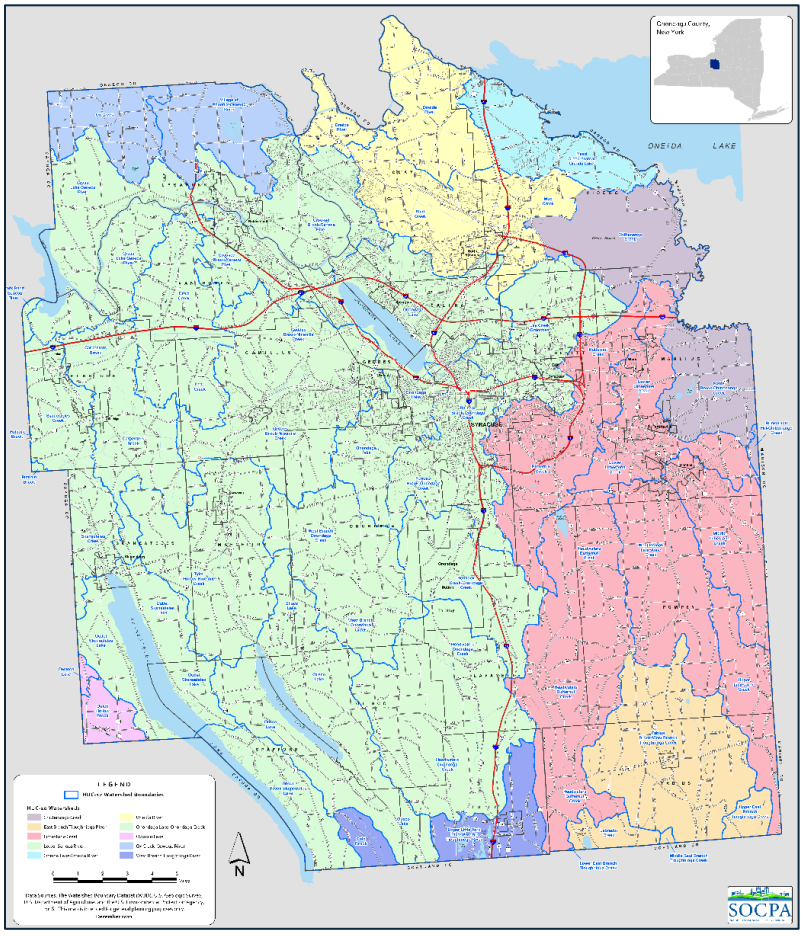
3.1.1. Hydrography and Hydrology

The major rivers of Onondaga County include the Seneca, Oneida, and Oswego rivers, collectively known as the Three Rivers. The Seneca River begins at the outflow of Seneca Lake and flows eastward for approximately 61 miles to the Three Rivers, in Onondaga County, where it combines with the Oneida River and becomes the Owego River, which empties into Lake Ontario. Several portions of the New York State Canal System include the Seneca River.[8] Nine Mile, Onondaga, Butternut, and Chittenango creeks are also important waterways within the County.

3.1.1.1. Drainage Basins and Watersheds

There are eight (8) watersheds located within Onondaga County, as illustrated in **Figure 3-2**.[9] A watershed is the area of land that drains into a body of water, such as a river, lake, stream, or bay. It is separated from other systems by high points in the area, such as hills or slopes. It includes not only the waterway itself but also the entire land area that drains to it. For example, the watershed of a lake would consist not only of the streams entering the lake but also the land area that drains into those streams and eventually the lake. Drainage basins generally refer to large watersheds that encompass the watersheds of many smaller rivers and streams.

Figure 3-2. Onondaga County Watersheds



[8] New York State Department of Environmental Conservation. (n.d.). Seneca River. Retrieved from https://dec.ny.gov/places/seneca-river.

[9] Syracuse-Onondaga County Planning Agency. The watershed boundaries are based on hydrologic unit code (HUC) levels 10 and 12 from the Watershed Boundary Dataset produced by the USGS, USDA, and US EPA.

Oswego River Basin

Most of Onondaga County falls within the Oswego River Basin shown in **Figure 3-3**.[10] The Oswego River Basin is located in central New York State and contains a diverse system of rivers, streams, and lakes. It has an area of approximately 5,100 square miles and encompasses three (3) physiographic provinces – the Appalachian Plateau, the Tug Hill Plateau, and the Lake Ontario Plain.[11] This Basin is one of the largest in the State and includes most of the New York Finger Lakes, which cover 6% of the watershed's total surface area. The drainage area of the Oswego River Basin consists of all of Seneca County; most of Onondaga, Cayuga, Tompkins, Schuyler, Yates, and Ontario counties; large portions of Oswego, Oneida, Madison, and Wayne counties; and smaller parts of Lewis, Cortland, Chemung, Steuben, and Livingston counties. Many bodies of water and tributaries fall within the Oswego River Basin including, but not limited to, Oneida (2,330 miles) and Clyde (1,630 miles) rivers; Oneida (51,091 acres), Cayuga (42,812 acres), Seneca (42,646 acres), Keuka (11,712 acres), and Canandaigua (10,605 acres) lakes; and Cayuga (1,500 miles) and Seneca (1,240 miles) lake tributaries.[12]

Figure 3-3. Oswego River Basin



Within the Oswego River Basin, there are three (3) watersheds within Onondaga County – the Seneca River, the Oneida River, and the Oswego River.

[10] Musser, K. (2012). OswegoRiverMap.png. Retrieved from https://upload.wikimedia.org/wikipedia/commons/4/41/Oswegorivermap.png.
[11] United States Geological Survey. (2000). Managing the Water Resources of the Oswego River Basin in Central New York. Retrieved from https://pubs.usgs.gov/fs/1999/0180/report.pdf.
[12] New York Department of Environmental Conservation. (n.d.). Oswego River/Finger Lakes Watershed. Retrieved from https://dec.ny.gov/nature/waterbodies/watersheds/oswego-river-finger-lakes.

Seneca River Watershed

The Seneca River watershed has approximately 4,370 miles of streams and a drainage area of 3,468 square miles. This watershed spans 14 New York counties – Cayuga, Chemung, Cortland, Livingston, Monroe, Onondaga, Ontario, Schuyler, Seneca, Steuben, Tioga, Tompkins, Wayne, and Yates. The Seneca River is located in central New York State and flows west to east from Seneca Lake, and it is part of the New York State Canal System. The River stretches from Geneva in Ontario County to Phoenix, where its waters combine with those of the Oneida and Oswego Rivers, which flow into Lake Ontario. This River traverses from west to east within the northern portion of Onondaga County.

The Onondaga Lake watershed of the Seneca River watershed covers 285 square miles, located almost entirely within Onondaga County, and encompasses the major urban area of the City of Syracuse. The primary natural tributaries to the lake are Onondaga Creek and Nine Mile Creek, which together account for approximately 70% of the water that flows into Onondaga Lake each year. Other natural tributaries include Ley Creek, Harbor Brook, Saw Mill Creek, and Bloody Brook.[13]

Oneida River Watershed

The Oneida River watershed includes 69 municipalities (13 in Onondaga County) and a drainage area of 872,722 acres (1,363 square miles). This watershed spans six (6) New York counties – Cortland, Lewis, Madison, Oneida, Onondaga, and Oswego.[14] The Oneida River is a large river that forms part of the boundary between Oswego and Onondaga counties. Flowing roughly westward is the outlet of Oneida Lake and part of the New York State Barge Canal. The Oneida River stretches approximately 18 miles from Oneida Lake to Three Rivers, where it joins with the Seneca River to form the Oswego River. The Oswego River eventually empties into Lake Ontario and traverses the northeastern section of Onondaga County.[15]

Skaneateles Lake Watershed

Skaneateles Lake is the fourth largest lake in the Finger Lakes of New York State, and it is the only unfiltered natural lake in the State. It is a long, narrow lake that is 16 miles long, has a maximum depth of 300 feet, and contains a total of 413 billion gallons of water.[16] That watershed is approximately 59 square miles, and the lake has a surface area of 13.6 square miles. Skaneateles Lake is governed by three (3) counties and seven (7) municipalities – the counties of Onondaga, Cayuga, and Cortland, the towns of Skaneateles, Niles, Scott, Spafford, and Sempronius, the Village of Skaneateles, and the City of Syracuse. The Watershed is home to approximately 2,600 residences, of which 1,000 are along the shoreline, and over 60 farms with over 2,000 livestock. The Lake's high water quality is used for drinking water for the City of Syracuse, towns of Camillus, DeWitt, Geddes, and Onondaga, and the Village of Skaneateles.[17]

Otisco Lake Watershed

Otisco Lake is the most easterly of the Finger Lakes and the eighth largest. It is approximately 5.4 miles long, 0.75 miles wide, and covers 3.5 square miles. The watershed area covers nearly 24,777 acres and is found in six (6) towns between two (2) counties – Cortland and Onondaga. Onondaga County Water Authority (OCWA) customers receive a portion of their drinking water from Otisco Lake. OCWA treats and delivers water from the Lake to the

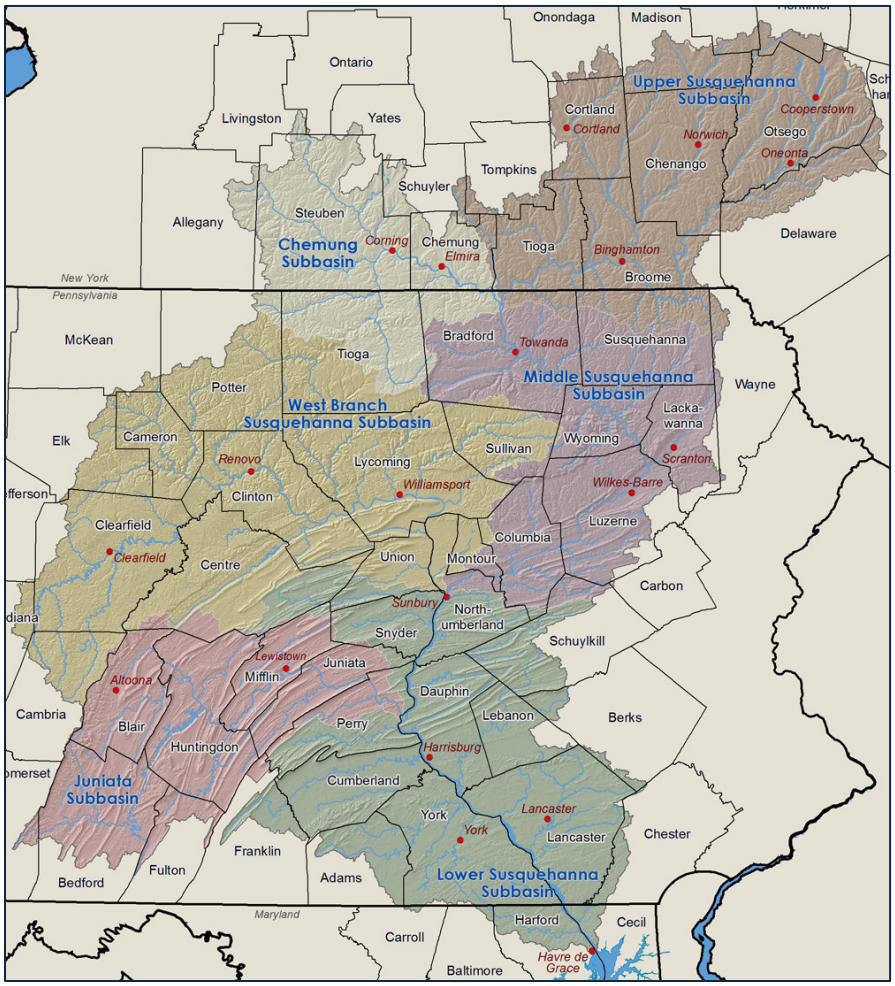
[13] New York State Department of Environmental Conservation. (n.d.). Onondaga Lake: Onondaga Lake and Watershed. Retrieved from https://dec.ny.gov/nature/waterbodies/watersheds/management/great-lakes/onondaga-lake.
[14] Central New York Regional Planning & Development Board. (n.d.). Watershed Facts – Oneida Lake Watershed 9 Element Plan. Retrieved from https://www.cnyrpdb.org/oneida9e/watershed-facts/.
[15] New York State Department of Environmental Conservation. (n.d.). Oneida River. Retrieved from https://dec.ny.gov/places/oneida-river.
[16] New York State Department of Environmental Conservation. (n.d.). Skaneateles Lake. Retrieved from https://dec.ny.gov/places/skaneateles-lake.
[17] Skaneateles Lake Association. (n.d.). Lane & Watershed Facts. Retrieved from https://skaneateleslake.org/watershed/.

southern and western half of Onondaga County.[18] This includes the towns of Camillus, Cicero, Clay, DeWitt, Elbridge, Geddes, Lysander, Marcellus, Onondaga, Otisco, Salina, Skaneateles, Spafford, and VanBuren, the City of Syracuse, and the villages of Camillus, East Syracuse, Liverpool, Marcellus, Minoa, North Syracuse, and Solvay.[19]

Susquehanna River Basin

The Susquehanna River basin, illustrated in **Figure 3-4**, drains a total of 27,510 square miles. It covers half of Pennsylvania, and portions of New York and Maryland. In total, it includes all portions of 66 counties within these three (3) states. There are six (6) major subbasins within the Susquehanna River Basin. The Basin has more than 49,000 miles of waterway.[20]

Figure 3-4. Susquehanna River Basin



[18] Otisco Lake Watershed Advisory Committee. (2014). Otisco Lake Watershed Management Plan. Retrieved from http://www.ongov.net/health/env/documents/OTISCO-MANAGEMENT-PLAN2013MAY20.pdf.
[19] Onondaga County Water Authority. (n.d.). Sources of Water. Retrieved from https://www.ocwa.org/about/sources-of-water/.
[20] Susquehanna River Basin Commission. (2016). Susquehanna River Basin Facts. Retrieved from https://www.srbc.gov/our-work/fact-sheets/docs/river-basin-facts.pdf.

Upper Susquehanna Subbasin

The source of the Susquehanna River is Otsego Lake in Cooperstown, New York. From Cooperstown, the river flows southward through New York and into Pennsylvania just south of Windsor, New York. Downstream of Great Bend, it flows back into New York and continues westward before joining the Chemung River at Sayre, Pennsylvania. It has a total drainage area of 4,944 square miles (4,520 in New York State and 424 in Pennsylvania). The major tributaries of this subbasin are the Chenango River, Tioughnioga River, and Unadilla River. It is the only subbasin in Onondaga County within the Susquehanna River Basin.[21]

3.2. CLIMATE

The climate of Onondaga County is very similar to that of most of the Northeast United States and is classified as Humid Continental under the Modified Köppen Climate Classification System. Differences in latitude, topography, and proximity to large bodies of water all affect the climate across New York State. Precipitation during the warm, growing season (April through September) is characterized by convective storms that generally form in advance of an eastward moving cold front or during periods of local atmospheric instability. Occasionally, tropical cyclones move up from southern coastal areas and produce heavy rainfall. Both types of storms are typically characterized by relatively short periods of intense precipitation that produce large amounts of surface runoff and little recharge.

The cool season (October through March) is characterized by large, low pressure systems that move northeastward along the Atlantic coast or the western side of the Appalachian Mountains. Storms that form within these systems are characterized by long periods of steady precipitation in the form of rain, snow, or ice, and tend to produce less surface runoff and more recharge than the summer storms because they have a longer duration and occasionally result in snowmelt.

The region's climate is characterized by mild summers; the average July temperature is 71.8°F, and the summer (June, July, and August) average maximum temperature is 79.8°F. On average, the maximum temperatures are at or above 90°F for approximately 10 days each year, but rarely exceed 100°F. Winter temperatures are often severe; the average January temperature is 24.1°F, and the winter (December, January, and February) average minimum temperature is 19.3°F. On average, the minimum temperatures are below 0°F for approximately eight (8) days of the year and at or below 32°F for 132 days in the year. Overall, the County averages 39.9 inches of rainfall and 127.8 inches of snowfall annually. The monthly climate summary for the Syracuse Hancock International Airport weather station is listed in **Table 3-1**.[22]

Table 3-1. Onondaga County Monthly Climate Summary (1991 – 2020)

Average Temperature *(°F)*												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Mean**
24.1	25.5	33.8	46.3	58.2	67.0	71.8	70.4	62.9	51.3	40.5	30.4	48.5
Average Maximum Temperature *(°F)*												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Mean**
31.7	33.6	42.4	56.4	69.2	77.3	81.7	80.3	73.1	60.1	48.3	37.1	57.6
Average Minimum Temperature *(°F)*												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Mean**
16.5	17.5	25.2	36.2	47.3	56.7	62.0	60.4	52.7	42.4	32.7	23.7	39.4

[21] Susquehanna River Basin Commission. (n.d.). Subbasins: Upper Susquehanna River. Retrieved from https://www.srbc.gov/portals/susquehanna-atlas/data-and-maps/subbasins/.
[22] National Centers for Environmental Information. (2021). U.S. Climate Normals Quick Access (Syracuse Hancock Intl Ap, NY). Retrieved from https://www.ncei.noaa.gov/access/us-climate-normals/.

Total Average Precipitation *(inches)*												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
2.6	2.5	3.0	3.5	3.4	3.6	3.9	3.7	3.4	3.9	3.2	3.3	39.9
Total Average Snowfall *(inches)*												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
34.0	30.3	19.8	3.0	0.1	0.0	0.0	0.0	0.0	0.2	9.8	30.6	127.8

3.3. LAND USE

Natural resources, topographic constraints, water lines, sewers, and roads influence land use in Onondaga County. The County has a relatively compact development pattern, comprising rural, suburban, and urban areas. Land development has followed a pattern of decentralization over the past several decades, leading to suburban expansion and mixed patterns of stability, decline, and redevelopment in the City of Syracuse.

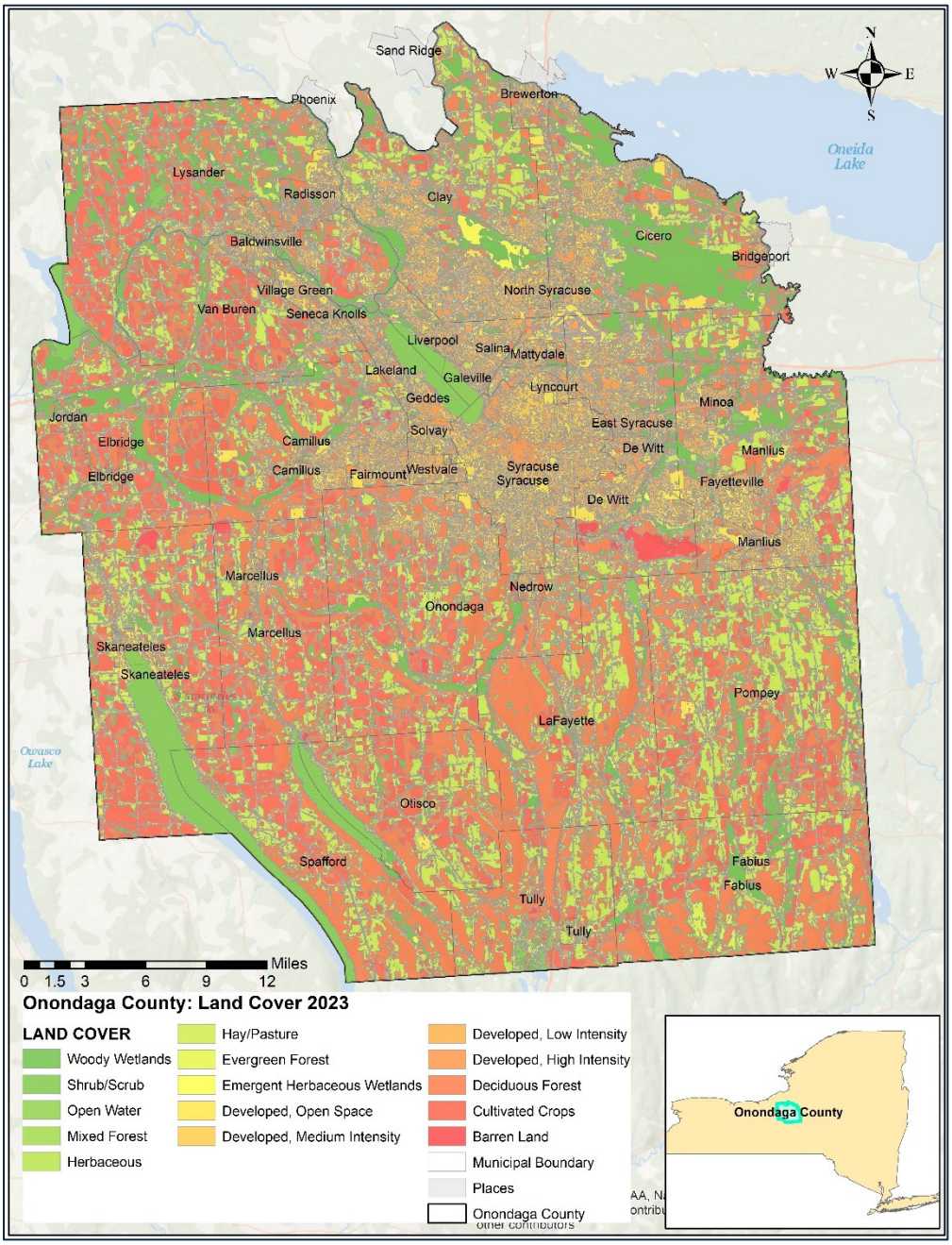
The urbanized area in the County is mainly found in Syracuse and extends outward along former "farm to market" roads. Suburban areas are found around villages, wetlands, and floodplains, avoiding glacial uplands and steep valleys in the southern towns. These suburban areas are surrounded by farmland, wooded areas, parks, and protected open space. Retail and commercial uses are concentrated in downtown areas, in shopping malls and office parks, and along primary roadways. Industrial areas are typically located near rail lines.

Land use has changed over the years in Onondaga County. Manufacturing has declined while institutional and government uses have increased. Retail uses have seen many changes in the relative strength of various malls and commercial areas. Office use, along with other service activities, has increased, primarily in suburban locations. Agriculture remains an extensive land use; however, the number of farms and the number of employees is decreasing slightly. **Table 3-2** lists the land use by acreage, square mileage, and percentage for each land use designation in Onondaga County. **Figure 3-5** illustrates the County's land use cover.

Table 3-2. Land Use Cover for Onondaga County

Category	Acres	Square Miles	Percent
Deciduous Forest	136,948	214.0	26.6%
Hay/Pasture	84,969	132.8	16.5%
Cultivated Crops	72,475	113.2	14.1%
Developed, Open Space	51,705	80.8	10.0%
Developed, Low Intensity	50,054	78.2	9.7%
Woody Wetlands	46,256	72.3	9.0%
Developed, Medium Intensity	23,778	37.2	4.6%
Open Water	17,107	26.7	3.3%
Mixed Forest	11,942	18.7	2.3%
Developed, High Intensity	8,756	13.7	1.7%
Evergreen Forest	4,358	6.8	0.8%
Emergent Herbaceous Wetlands	3,112	4.9	0.6%
Barren Land	2,755	4.3	0.5%
Herbaceous	761	1.2	0.1%
Shrub/Scrub	390	0.6	0.1%
Total	**515,365**	**805**	**100%**

Figure 3-5. Land Use Cover



A housing unit is defined as a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. A household is defined as all the individuals who occupy a housing unit. Therefore, there may be more than one (1) household per housing unit. In 2018, the United States Census Bureau reported 207,567 housing units in Onondaga County, increasing to 211,683

housing units in 2023, a 2.0% increase.[23, 24] Additionally, approximately 63.3% of the County's housing units are single-family detached. In 2022, the median value of an owner-occupied housing unit in Onondaga County was estimated at $185,300. **Table 3-3** outlines further details on Onondaga County's housing characteristics.[25]

Table 3-3. Housing Physical Characteristics

Units in Structure	Estimate	Percent
1-Unit, Detached	133,988	63.3%
1-Unit, Attached	8,190	3.9%
2 Units	16,733	7.9%
3 or 4 Units	11,207	5.3%
5 to 9 Units	10,632	5.0%
10 to 19 Units	9,203	4.3%
20 or More Units	19,022	9.0%
Mobile Home	2,702	1.3%
Boat, RV, Van, etc.	6	0.0%
Bedrooms in Household	**Estimate**	**Percent**
No Bedroom	5,032	2.4%
1 Bedroom	24,864	11.7%
2 Bedrooms	48,609	23.0%
3 Bedrooms	82,022	38.7%
4 Bedrooms	42,362	20.0%
5 or More Bedrooms	8,794	4.2%
Total Housing Units	**211,683**	

The 2022 County business patterns data identified 11,263 business establishments that employ 216,712 people in Onondaga County. The retail trade industry has the highest number of establishments in the County, with 1,553 establishments. This is followed by the other services (except public administration) sector, with 1,224 establishments, and the health care and social assistance industry, with 1,214 establishments. However, the health care and social assistance industry employs the highest number, with 42,265 employees, followed by the retail trade industry with 27,345 employees. **Table 3-4** outlines further details on Onondaga County's business patterns in 2022.[26]

[23] United States Census Bureau. (2018). DP04: Selected Housing Characteristics (2018: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2018.DP04?g=050XX00US36067.
[24] United States Census Bureau. (2023). QuickFacts: Onondaga County, New York. Retrieved from https://www.census.gov/quickfacts/fact/table/onondagacountynewyork/.
[25] United States Census Bureau. (2023). DP04: Selected Housing Characteristics (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP04?g=050XX00US36067.
[26] United States Census Bureau. (2022). CB2200CBP: All Sectors: County Business Patterns, including ZIP Code Business Patterns, by Legal Form of Organization and Employment Size Class for the U.S., States, and Selected Geographies (2022: ECNSVY Business Patters County Business Patterns). Retrieved from https://data.census.gov/table/CBP2022.CB2200CBP?q=CB2200CBP&g=050XX00US36067.

Table 3-4. Onondaga County Business Patterns (2022)

Industry	Number of Establishments	Number of Employees
Retail Trade	1,553	27,345
Other Services (except public administration)	1,224	8,540
Health care and social assistance	1,214	42,265
Accommodation and food services	1,173	18,638
Professional, scientific, and technical services	1,120	14,670
Construction	1,081	9,974
Finance and Insurance	660	10,229
Wholesale Trade	636	12,339
Administrative, support, and waste management and remediation services	630	13,095
Real estate, rental, and leasing	511	3,489
Manufacturing	391	18,518
Transportation and Warehousing	339	10,651
Information	229	3,760
Arts, entertainment, and recreation	227	3,416
Educational services	146	12,721
Management of companies and enterprises	81	5,388
Utilities	27	1,570
Agriculture, forestry, fishing, and hunting	9	16
Industries not classified	7	1
Mining, quarrying, and oil and gas extraction	5	87
Total	**11,263**	**216,712**

3.4. CHANGES IN DEVELOPMENT AND DEVELOPMENT TRENDS

In New York State, land use regulatory authority is vested in towns, villages, and cities. However, many development and preservation issues transcend local municipal boundaries. In Onondaga County, each municipality (i.e., town, village, and city) is empowered by the Municipal Home Rule Law to plan and zone within its boundaries. FEMA requires that communities consider land use trends, which can impact the need for and the priority of mitigation options over time. Land use trends can also significantly impact exposure and vulnerability to various hazards. For example, significant development in a hazard area increases the building stock and population exposed to that hazard.

An understanding of these development trends can help plan for future development and ensure appropriate mitigation, planning, and preparedness measures are in place to protect people, property, the environment, and infrastructure.

The County's housing market in the early 21st Century is characterized by low values relative to the State and nation, sprawling suburban single-family home development in the absence of population growth, and long-term distressed conditions in the urban core of Syracuse. This remains fundamentally true in the early and mid-2020s, despite market tightness and rising home sale prices in the post-2020 period. But new housing demand attributable to the

Micron development, estimated by czb at 20,000 to 25,000 households, has the potential to positively impact chronic housing market challenges.[27]

Between the early 1970s and early 2020s, the County experienced economic change, population stagnation, suburbanization, and sprawl, all of which contributed to housing and development challenges.

- Economic change impacted markets traditionally reliant on manufacturing employment. Onondaga County, like many urban regions in the northeast, was at one point heavily dependent on manufacturing employment but transitioned over time to service employment (i.e., healthcare and education industry), leading up to the mid-2020s.
- The population failed to grow partially because more people left the County than moved into the County.
- Since 1970, physical development has been the result of suburbanization, not population growth. Many areas within the County have been urbanized over the decades, converting woods and farms into housing tracts and shopping plazas. This development activity simply facilitated the redistribution of population within the County, as the City of Syracuse lost population and towns and villages gained.
- Urban sprawl without growth consumed land and led to the decline of the region's core. The redistribution of population from Syracuse to the suburbs expanded suburban housing unit development, as Syracuse lost population and households.[28]

In July 2023, Onondaga County adopted Plan Onondaga, the County's Comprehensive Plan. Plan Onondaga was developed using five (5) separate analytical lenses, or themes, which represent the planning areas of greatest importance to the County and its municipal partners. The five (5) themes are Strong Centers, Housing and Neighborhoods, Community Mobility, Greenways and Blueways, and Agriculture. Furthermore, a Housing Needs Assessment, a component of the Comprehensive Plan, explores the County's housing market and its challenges in greater depth and argues that one of the County's greatest housing needs is an improved approach to land use planning.

3.4.1. Strong Centers

Strong centers are walkable, people-oriented places that mix jobs, housing, shopping, dining, culture, public spaces, entertainment, transportation, and services. Typically, strong centers include mixed-use developments in which residential, commercial, retail, and/or office spaces are integrated into a single building. Onondaga's vision is to strengthen the quality of life and economic stability of local communities by developing amenity-rich, vibrant, and walkable centers.

Having strong centers is critical for the County's economic competitiveness because companies looking to open new offices or branches normally choose locations based on quality of life. Therefore, Onondaga County is focused on development across the County through five (5) types of centers.

- **Traditional Center:** Includes villages and hamlets that already exist in Onondaga County.
- **Emerging Center:** Includes targeted intersections and the areas surrounding them that have been identified for mixed-use investments, mobility hubs, and transit stops.

[27] Onondaga County. (2024). Onondaga County Housing Needs Assessment. Retrieved from https://plan.ongov.net/wp-content/uploads/2024/06/OnondagaHousing_JUNE2024_FINAL.pdf.
[28] Ibid.

- **Town Growth Center:** Are strategic investment areas targeted for large-scale mixed-use growth. These incorporate transit-oriented development, multiple community intersections, and integrated greenways, and are intended to serve surrounding neighborhoods.
- **Employment Center:** Includes dense commercial centers with concentrated commercial or industrial activities and large numbers of jobs. These can be office or industrial parks, or corporate campuses with integrated retail, trails, and amenities.
- **City Center:** Includes the City of Syracuse, which is the largest and most central urban area in the region.

Downtown Syracuse and the surrounding neighborhoods are the cultural center of Onondaga County. Between 2010 and 2023, more than $1 Billion in capital improvements have been completed in Downtown Syracuse, including residential and commercial projects, infrastructure, and cultural amenities. The growth that the City Center has experienced mirrors demographic and development trends throughout the United States. The investments have coincided with population growth in the City Center. A significant portion of the growth is attributable to the addition of housing units in Downtown and its surrounding neighborhoods (e.g., Franklin Square, University Hill). Many of the multi-family projects are mixed-use, which incorporate housing, commercial, retail, and community-based uses. Mixed-use development is expected to contribute to the population growth, liveliness, and economic strength of the City Center. However, growth in multi-family and mixed-use projects has occurred throughout the entire County.

Onondaga County intends to foster investment in existing and new multi-modal centers throughout the County. Existing and emerging centers have been identified based on their ability to support additional growth, access to water and/or sewer infrastructure, and potential to be located adjacent to transportation infrastructure (e.g., enhanced bus service, bicycle lanes, and pedestrian sidewalk and trail networks).

3.4.2. Housing and Neighborhoods

Housing and neighborhoods, as planning themes, address the needs and desires people have for the structures and places where they live. Onondaga's vision is to support affordable, attractive, diverse, and efficient housing and neighborhoods to retain and attract future residents.

Onondaga County experiences housing and demographic trends similar to those seen throughout the United States. Currently, the County's housing market is characterized as soft (similar to many areas across Upstate New York), with lower housing demand and stagnant property values limiting growth. Furthermore, the County has experienced slow to stable population growth, an aging housing stock, and an aging population. A variety of neighborhoods varying in condition, housing types, the built environment, and demographic composition can be found throughout the County.

The housing market in Onondaga County has historically been considered affordable, but between 2016 and 2020, single-family home sale prices increased 16% (21% in the City of Syracuse). Although the sale prices have increased, there is a lack of available inventory, which increases the sale prices. There has been an increase in demand for apartment units over detached owner-occupied homes. The average rental prices have increased since 2017, and the rental vacancy rates decreased between 2019 and 2021. Furthermore, the rental prices in the City of Syracuse have significantly outpaced national averages.

These changes in housing preferences and needs within the County suggest a need for the development of more alternatives to single-family housing, including multi-family options. The number of permits for single-family

homes has declined, from a surge in the early 2000s, while permits for multi-family units have increased throughout the County. **Table 3-5** summarizes the total housing units built in Onondaga County between 2019 and 2023.[29]

Table 3-5. Housing Units Built (2019 – 2023)

Type	2019	2020	2021	2022	2023
Single-Family Units	317	280	281	236	253
Multi-Family Units	652	593	250	609	866
Total Units	**969**	**873**	**531**	**845**	**1,086**

3.4.2.1. Aging Housing Stock

Onondaga County's housing stock is older. Approximately 71.2% of the housing units were built before 1980, before hazardous components (e.g., lead, asbestos) were banned in building materials. Meanwhile, only 11.1% of the housing stock was built after 2000. Older housing stock requires ongoing maintenance, investment, and upgrades (e.g., heating and cooling systems) to improve energy efficiency and reduce operational costs. **Table 3-6** outlines information on the age of housing units, categorized by the construction period.[30, 31]

Table 3-6. Physical Housing Characteristics in Onondaga County

Structure Built *(Year)*	Estimate	Percent *(of occupied housing)*
2020 or Later	739	0.3%
2010 to 2019	9,528	4.5%
2000 to 2009	13,196	6.2%
1990 to 1999	14,900	7.0%
1980 to 1989	22,658	10.7%
1970 to 1979	26,527	12.5%
1960 to 1969	26,830	12.7%
1950 to 1959	35,334	16.7%
1940 to 1949	13,663	6.5%
1939 or Earlier	48,308	22.8%
Total Housing Units	**211,683**	

Analyzing market-related data is one approach to understanding housing trends within Onondaga County. It can help policymakers and local officials consider specific strategies, policies, and/or programs that enhance or stabilize neighborhoods and increase the marketability and value of older neighborhoods. Housing and income data were sorted and broken into four (4) market types – strong, stable, middle, and soft – as outlined in **Table 3-7**.

Table 3-7. Characteristics Summary of the Market Types in Onondaga County

Market Type	Strong	Stable	Middle	Soft
Population Change	+4.9%	+1.4%	-0.8%	+16.0%
Household Change	+10.2%	+1.8%	-0.4%	-3.9%

[29] Data provided by the Onondaga County Department of Planning based on Real Property Data (2024).
[30] Onondaga County. (2023). Plan Onondaga: A Comprehensive Plan for Onondaga County. Retrieved from https://plan.ongov.net/the-plan/.
[31] United States Census Bureaus. (2023). DP04: Selected Housing Characteristics (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP04?g=050XX00US36067.

Market Type	Strong	Stable	Middle	Soft
Median Home Sale Price	$248,000	$185,500	$135,000	$80,500
Percent Change in Home Sale Price (2016 – 2020)	+16.0%	+17.0%	+23.0%	+10.0%
Median Gross Rent	$1,377	$966	$861	$786
Median Household Income	$100,000	$78,000	$58,500	$29,500
Percent of Renters that are Housing Cost Burdened	45.0%	40.0%	38.0%	52.0%
Poverty Rate	4.0%	7.0%	12.0%	39%
Percent Neighborhood Market Type with Onondaga County	28.0%	45.0%	25.0%	2.0%

Strong Market: *Areas with significant population growth, the highest median home values, higher incomes, and considerable confidence in the market, but may lack affordable housing.*
Stable Market: *Areas with positive population growth, higher median home values, and moderate to high incomes with market confidence that encourage investment in properties.*
Middle Market: *Areas with declining populations, lower median home values, lower household incomes, but the strongest in overall affordability of the housing stock. As a result, these neighborhoods have experienced the highest percentage increase in home sale prices.*
Soft Market: *Areas where there has been a significant decline in population, the most moderate increase in home values, the lowest median household income, and significant poverty. These neighborhoods have the least market confidence and require outside influence to encourage reinvestment in properties.*

Onondaga County intends to foster investment in existing and new housing and neighborhoods. Greater housing diversity near identified centers and other commercial areas will help deliver transportation and other services and support strategic infrastructure investment. Furthermore, in order to provide equitable access to healthy natural environments nearby and recreation opportunities, planning will include extending mobility and greenway features into or near neighborhoods.

3.4.3. Community Mobility

Community mobility is the ability of people to travel from place to place within the County. Strategies for community mobility aim to expand transportation choices and improve safety for all users. Onondaga's vision is to enhance mobility by improving safety, accessibility, and diversity of options for moving people within and between communities. Most of the County's population uses private vehicles to travel to and from work, and the highest use of public transportation is in the City of Syracuse and the Town of Geddes. In communities where transit services are convenient, ridership is higher, and in communities with a robust pedestrian and bicycle infrastructure, alternate trips are more frequent.[32] **Table 3-8** outlines the details on the mode of transportation to work in Onondaga County.[33]

Table 3-8. Mode of Transportation to Work in Onondaga County

Means of Transportation	Estimate	Percent
Drove Alone	163,873	72.9%
Carpooled	17,983	8.0%
Public Transportation	4,721	2.1%
Walked	8,317	3.7%
Bicycle	674	0.3%

[32] Onondaga County. (2023). Plan Onondaga: A Comprehensive Plan for Onondaga County. Retrieved from https://plan.ongov.net/the-plan/.
[33] United States Census Bureau. (2023). S0801: Commuting Characteristics by Sex (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S0801?g=050XX00US36067.

Means of Transportation	Estimate	Percent
Taxicab, Motorcycle, or Other Means	3,597	1.6%
Worked from Home	25,626	11.4%

There are multiple initiatives in Onondaga County focused on modernizing mobility infrastructure. Consistent focus and collaboration among the County, municipalities, the State of New York, and federal agencies will be required for the success of modernizing mobility infrastructure. Onondaga County intends to foster the long-term development of transit and cycling corridors, as well as improved pedestrian infrastructure linking residential areas with commercial areas, employment opportunities, and open space systems. Transit corridors include improvements to transit services (e.g., dedicated busways, station stops, and bus-priority lanes) to increase ridership. Cycle corridors contain dedicated bicycle infrastructure (e.g., bike lanes, bicycle parking) and provide recreational and alternative mobility options connecting residential areas and neighborhoods to employment and entertainment centers. Pedestrian priority zones (e.g., sidewalks, crosswalks, traffic calming, other pedestrian-oriented infrastructure) are concentrated within designated centers.

3.4.4. Greenways and Blueways

Greenways and blueways are corridors of open space or waterways that incorporate diverse natural, cultural, and scenic features. Onondaga County's vision is to protect and expand greenways and blueways to provide unique recreation and ecological health opportunities. Greenways and blueways offer a variety of benefits for the region and local communities by enhancing the community's ecology, strengthening the economy, addressing equity, contributing to placemaking, and increasing connectivity.

The proposed Onondaga County greenway system includes two (2) types of greenways – those intended for conservation of natural areas and those intended for recreation. The main function of a conservation greenway is to protect natural ecosystems and requires little maintenance other than assuring protection. Conversely, recreation greenways, which include mobility corridors, provide space for outdoor recreation and require maintenance to keep trails and equipment in proper condition. A blueway is a navigable water body that creates the opportunity for recreational water routes and provides ecological protection for aquatic and shoreline habitats through conservation and maintenance activities. Maintenance of blueways includes protecting watersheds to maintain water quality, managing invasive species that can impact waterways, and creating public facilities to provide access to the waterways.

Historically, development in Onondaga County has not prioritized preserving open space resources for recreation or habitat protection, and natural landscapes have been altered by the design of single-family neighborhoods outside of and separate from traditional centers. However, over the past few decades, there has been a focus on preserving open space, creating green space retroactively, and restoring ecosystems. For example, restoring industrial areas along the Onondaga Lake shoreline.

3.4.5. Agriculture

Agriculture is the science, art, and business of cultivating soil, producing crops, and raising livestock. Innovative agricultural and farming practices are needed to promote economic development while also protecting the community's environment. Onondaga County's vision is to ensure that agriculture remains a viable and integral part of the County's economy and a defining characteristic of the landscape.

Farming is a key economic sector for Onondaga County, where a variety of agricultural land uses occur in nearly all the towns and villages surrounding the City of Syracuse, and farmland is primarily concentrated in the western and southern portions of the County. Farms in Onondaga County are among the most productive in the State, well connected to local and regional consumers, and add approximately $178 Million to the local economy.

3.4.1. Micron

In October 2022, Micron Technology Inc. announced that it would locate its largest semiconductor manufacturing facility in the Town of Clay, in the northern portion of the County. This facility will be the largest economic development project to date in the United States, creating 9,000 jobs at the facility and an estimated 50,000 new permanent jobs in the region, especially in Onondaga County. The plant will be located in the White Pine Commerce Park in the Town of Clay and will create a dramatic shift in employment centers.[34] Additionally, the project will introduce jobs and an industry that will support the County's existing and planned mixed-use centers.

3.5. DEMOGRAPHICS

3.5.1. Population and Population Density

Onondaga County has a population of 471,611 as of July 2023. Between 2010 and 2020, the population decreased by approximately 0.5%; however, it increased by 2.2% between 2020 and 2023. According to the United States Census Bureau, the population counts for the villages are generally included in the town's population totals. Therefore, the population for a town includes the population of the village(s) within the town's boundaries. **Table 3-9** shows Onondaga County's population distribution by jurisdiction between 2010 and 2023.[35]

Table 3-9. Population Estimates

Jurisdiction	2010	2020	2023	Population Change *(2010 – 2023)*
City of Syracuse	144,734	142,553	146,211	1.0%
Town of Camillus	23,910	24,268	25,260	5.6%
Town of Cicero	30,868	30,793	31,218	1.1%
Town of Clay	58,094	59,401	60,083	3.4%
Town of De Witt	25,549	25,072	25,773	0.9%
Town of Elbridge	5,927	5,733	5,443	-8.2%
Town of Fabius	2,277	2,205	2,097	-7.9%
Town of Geddes	17,166	16,415	16,884	-1.6%
Town of LaFayette	4,921	4,823	4,877	-0.9%
Town of Lysander	21,250	22,854	23,035	8.4%
Town of Manlius	32,171	31,787	33,402	3.8%
Town of Marcellus	6,203	6,062	6,021	-2.9%
Town of Onondaga	22,658	22,271	22,635	-0.1%
Town of Otisco	2,532	2,533	2,494	-1.5%
Town of Pompey	6,895	7,286	7,060	-0.9%
Town of Salina	33,574	32,453	32,945	-1.9%
Town of Skaneateles	7,219	7,191	7,095	-1.7%
Town of Spafford	1,979	1,835	1,754	-11.4%
Town of Tully	2,719	2,679	2,648	-2.6%
Town of Van Buren	13,043	13,337	14,246	9.2%

[34] New York State Empire State Development. (n.d.). Micron Will Invest $100 Billion to Establish Leading-Edge Memory Fab in Central NY. Retrieved from https://esd.ny.gov/micron.
[35] United States Census Bureau. (2023). DP05: ACS Demographics and Housing Estimates (ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2022.DP05.

Jurisdiction	2010	2020	2023	Population Change *(2010 – 2023)*
Village of Baldwinsville	7,307	7,732	7,732	5.8%
Village of Camillus	1,208	1,015	1,333	10.3%
Village of East Syracuse	3,092	2,938	3,039	-1.7%
Village of Elbridge	995	1,203	1,308	31.5%
Village of Fabius	475	383	368	-22.5%
Village of Fayetteville	4,349	4,067	4,220	-3.0%
Village of Jordan	1,267	1,447	1,374	8.4%
Village of Liverpool	2,347	2,182	2,604	11.0%
Village of Manlius	4,717	4,456	4,657	-1.3%
Village of Marcellus	1,544	2,190	1,957	26.7%
Village of Minoa	3,416	3,447	3,657	7.1%
Village of North Syracuse	6,619	6,737	6,727	1.6%
Village of Skaneateles	2,351	2,396	2,533	7.7%
Village of Solvay	6,603	6,299	6,590	-0.2%
Village of Tully	856	926	990	15.7%
Onondaga Nation Reservation	15	40	430	-
Onondaga County	**463,704**	**461,591**	**471,611**	**1.7%**

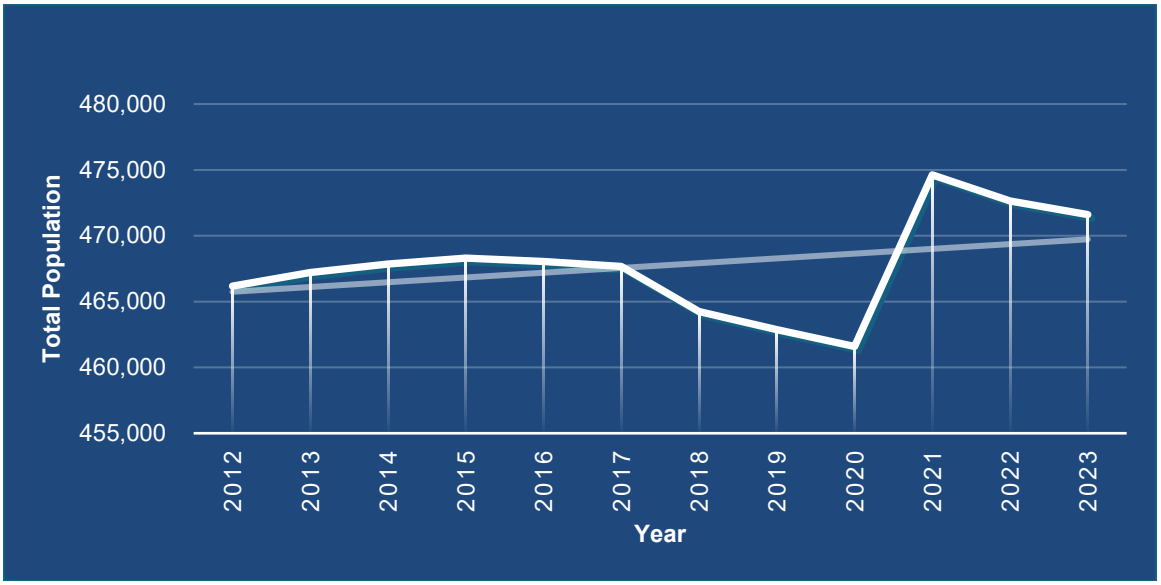
3.5.1.1. Population Trends

Population trends are used as a basis for estimating future changes that could result from the seasonal character of the population and significantly alter the area's character. Population trends can provide a basis for deciding which mitigation approaches to consider and where to apply them. This information can also support planning decisions for future development in vulnerable areas.

On average, Onondaga County's population slightly increased over the last decade, and in 2020, more people resided in the County than in any decade since 1970.[36] Although Onondaga County's population did not undergo notable changes between 2012 and 2017, there was an average 0.3% annual decrease between 2018 and 2020. In 2020, there was a 2.8% population increase, and in 2023, a 0.2% population decrease, as illustrated in **Figure 3-6**, which shows the annual population estimates between 2012 and 2023.[37] On the other hand, after experiencing large population declines between 1970 and 2000, the City of Syracuse population has stabilized in the past 20 years. Between 2010 and 2020, the population in the City of Syracuse had a 2.4% increase for the first time in decades.[38]

[36] Onondaga County. (2023). Plan Onondaga: A Comprehensive Plan for Onondaga County. Retrieved from https://plan.ongov.net/the-plan/.
[37] United States Census Bureau. (2012 – 2022). DP05: ACS Demographic and Housing Estimates (ACS 5-Year. Retrieved from https://data.census.gov/table/ACSDP5Y2022.DP05?g=050XX00US36067.
[38] Onondaga County. (2023). Plan Onondaga: A Comprehensive Plan for Onondaga County. Retrieved from https://plan.ongov.net/the-plan/.

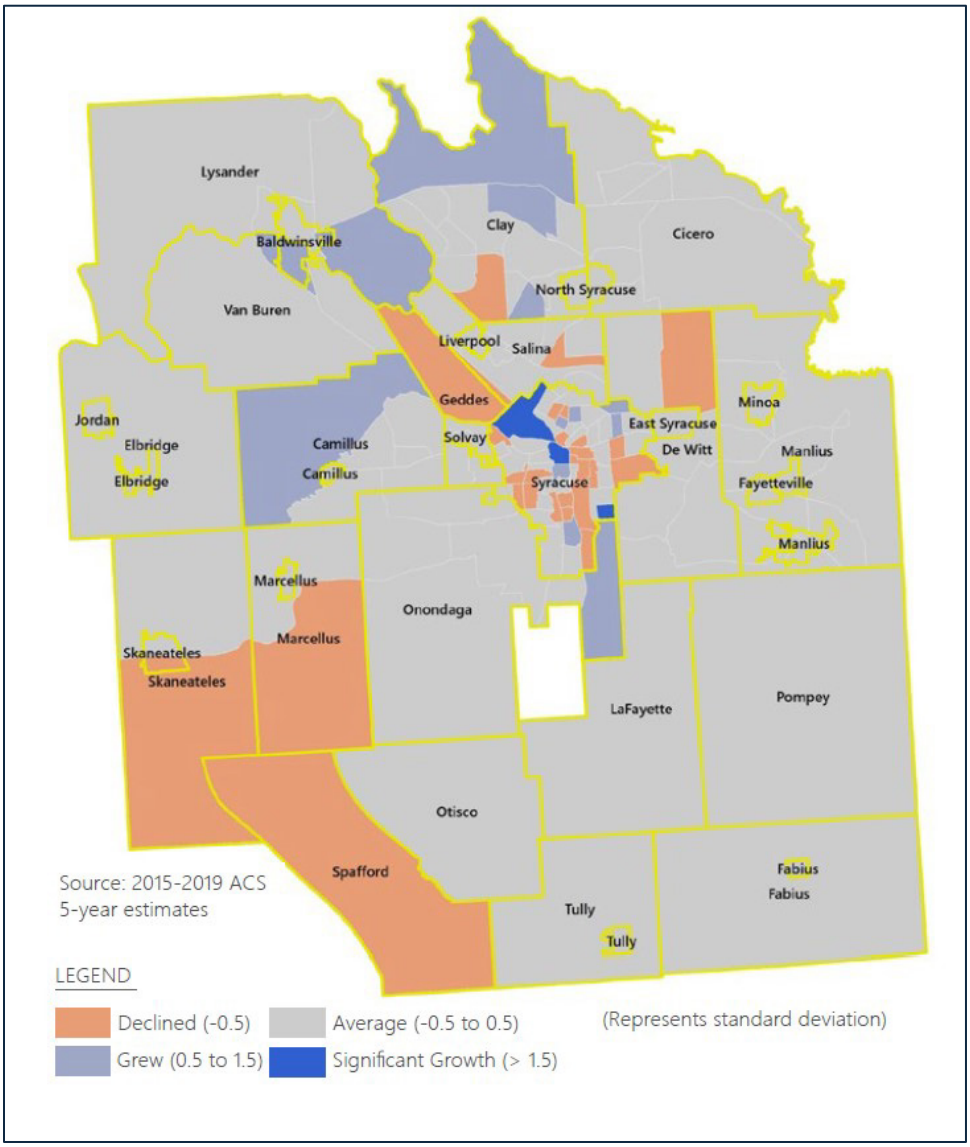
Figure 3-6. County Population (2012 – 2023)



Between 2010 and 2019, population changes did not occur evenly across the County; some areas experienced population declines, while others experienced population increases. **Figure 3-7** illustrates the changes in population by Census Tract in the County between 2015 and 2019. Portions of Clay, Lysander, Baldwinsville, Camillus, and the Town of Onondaga experienced a population increase due to new single-family homes and multi-family unit construction. However, the most significant population growth was recorded in Downtown Syracuse, the Lakefront, and Syracuse University's South Campus, primarily driven by the development of new apartments and mixed-use projects. The population in the southwestern portion of the County is likely associated with the higher housing costs, making the area less affordable.[39]

[39] Ibid.

Figure 3-7. Changes in Population by Census Tract (2015 – 2019)



Projections completed for New York State's economic development agency by the consulting firm Regional Economic Models, Inc. (REMI) further indicate that the five (5) county Central New York region (Cayuga, Cortland, Madison, Onondaga, and Oswego) could have 60,000 additional residents in 2040, above and beyond whatever the population would otherwise be had Micron not arrived. It is fair to assume that Onondaga County, home to about 60% of the population of the five (5) county area in 2020, would become home to the same proportion of new residents as well, putting the County in a position to add about 36,000 new residents by 2040. Such population growth would represent an increase of around 3% in each of the following two (2) decades (i.e., the 2020s and 2030s). For comparison, the County's population grew by about 2% per decade during the 2000s and 2010s.

As discussed in Section 3.4.1 of this Plan, Micron is going to construct the largest economic development project in the nation's history in Onondaga County, which is anticipated to provide 9,000 jobs at the facility and an estimated 50,000 new permanent jobs in the region by 2055. As a result, the County estimates to add over 24,000 new residents

by 2040.[40] Micron's impact on population and development is thoroughly discussed in the County's Comprehensive Plan and the Housing Needs Assessment.

Aging Population

Similar to other counties across Upstate New York, Onondaga County's population is older and aging. The average age is 39.8 years old, and approximately 30% of households have someone who is 65 years old or older. Approximately 31% of households in the County are owned by individuals 65 years old and over; however, the percentage in some municipalities listed in **Table 3-10** is higher.

Table 3-10. Percentage of Householders 65 Years Old and Over By Municipality

Municipality	Percent
Village of Minoa	41.0%
Village of Skaneateles	40.0%
Town of Skaneateles	39.0%
Town of LaFayette	38.0%
Town of Geddes	38.0%
Village of Liverpool	37.0%
Town of Spafford	37.0%
Village of Elbridge	36.0%
Village of Marcellus	36.0%
Village of LaFayette	35.0%
Village of Tully	35.0%
Town of DeWitt	35.0%
Town of Salina	35.0%
Village of Solvay	34.0%
Town of Otisco	34.0%
Town of Tully	34.0%
City of Syracuse	33.0%
Town of Elbridge	33.0%
Town of Manlius	33.0%
Town of Marcellus	33.0%
Village of Fabius	32.0%
Town of Camillus	32.0%
Town of Pompey	31.0%
This table lists only the municipalities with a percentage higher than the County's.	

3.5.2. Income and Socioeconomic Status

In 2022, the median household income in Onondaga County was $71,479. About 13.6% of the households in Onondaga County are below the poverty level.[41] The United States Census Bureau identifies households with two

[40] Onondaga County. (2024). Onondaga County Housing Needs Assessment. Retrieved from https://plan.ongov.net/wp-content/uploads/2024/06/OnondagaHousing_JUNE2024_FINAL.pdf.
[41] United States Census Bureau. (2023). QuickFacts: Onondaga County, New York. Retrieved from https://www.census.gov/quickfacts/fact/table/onondagacountynewyork/.

(2) adults and two (2) children with an annual household income below $30,900 per year as "low-income". **Table 3-11** outlines the 2022 poverty thresholds by the size of family unit.[42]

Table 3-11. Poverty Thresholds for 2023 by Size of Family

Size of Family Unit	Weighted Average Threshold
One (1) Person	$15,480
Two (2) People	$19,680
Three (3) People	$24,230
Four (4) People	$31,200
Five (5) People	$36,990
The source of the weighted average thresholds is the 2024 Current Population Survey Annual Social and Economic Supplement (CPS ASEC).	

Cost-burdened households remain significant throughout the County, despite increasing household incomes. In Onondaga County, almost 50% of renter households are cost-burdened, and approximately 25% are severely cost-burdened. Furthermore, nearly 20% of owner-occupied households are housing cost burdened. The majority of these households are located within the City of Syracuse. The majority of cost-burdened households are found within neighborhoods where households are more likely to be renters.[43]

3.5.3. Sex and Age Distribution

Approximately 18.2% of the population in Onondaga County is 65 years old and over, compared to the State average of 18.6%. It is also estimated that 21.1% of the County's population is 18 years old or younger, compared to the State average of 20.2%. Females make up 51.5% of the Onondaga County population, and the average median age is 39.5 years old. The age group with the highest percentage is 60 to 64 years old, while the 15 to 19 years old age group is the second highest. The overall age distribution for Onondaga County is outlined in **Table 3-12**.[44]

Children are considered vulnerable to hazard events because they depend on others to safely access resources during emergencies and may experience increased health risks from exposure to hazards. The elderly are more apt to lack the physical and economic resources necessary to respond to hazard events and are more likely to suffer health-related consequences. Additionally, the elderly are more likely to live in senior care and living facilities, where emergency preparedness is at the discretion of facility operators. However, those living on their own may have more difficulty evacuating without additional assistance.

Table 3-12. Age Distribution (2023)

Age Group	Estimate	Percent
Under 5 Years	25,989	5.5%
5 to 9 Years	26,912	5.7%
10 to 14 Years	29,193	6.2%
15 to 19 Years	33,804	7.2%
20 to 24 Years	30,957	6.6%
25 to 29 Years	30,281	6.4%

[42] United States Census Bureau. (2023). Poverty Thresholds. Retrieved from https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html.
[43] Onondaga County. (2023). Plan Onondaga: A Comprehensive Plan for Onondaga County. Retrieved from https://plan.ongov.net/the-plan/.
[44] United States Census Bureau. (2023). S0101: Age and Sex (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S0101?g=050XX00US36067.

Age Group	Estimate	Percent
30 to 34 Years	31,249	6.6%
35 to 39 Years	30,705	6.5%
40 to 44 Years	26,220	5.6%
45 to 49 Years	25,461	5.4%
50 to 54 Years	29,440	6.2%
55 to 59 Years	30,730	6.5%
60 to 64 Years	34,889	7.4%
65 to 69 Years	27,983	5.9%
70 to 74 Years	22,297	4.7%
75 to 79 Years	14,933	3.2%
80 to 84 Years	9,306	2.0%
85 Years and Over	11,262	2.4%

3.5.4. Race and Ethnic Distribution

The majority of the population in Onondaga County is White (75.9%), with the next highest percent being Black or African American (10.8%). **Table 3-13** outlines the racial and ethnic distribution in Onondaga County.[45]

Table 3-13. Racial and Ethnic Distribution (2023)

Race and Ethnicity	Estimate	Percent
White (not Hispanic or Latino)	358,131	75.9%
Black or African American	50,946	10.8%
American Indian and Alaska Native	2,530	0.5%
Asian	18,728	4.0%
Native Hawaiian and Other Pacific Islander	261	0.1%
Two (2) or More Races	32,714	6.9%
Some Other Race Alone	8,301	1.8%
Hispanic or Latino	27,105	5.7%

Individuals with limited English proficiency are vulnerable because they may lack access to accurate, timely information due to language barriers. Cultural differences can also complicate how information is conveyed to the population with limited English proficiency and to racial and ethnic minorities. Approximately 7.6% of the County's population is foreign-born.[46] 89.0% of the population in Onondaga County only speaks English. Other than English, the most commonly spoken languages in Onondaga County are other Indo-European languages (3.4%) and Spanish (3.2%).[47]

[45] United States Census Bureau. (2023). DP05: ACS Demographic and Housing Estimates (2023:ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP05?g=050XX00US36067.
[46] United States Census Bureau. (2023). QuickFacts: Onondaga County, New York. Retrieved from https://www.census.gov/quickfacts/fact/table/onondagacountynewyork/.
[47] United States Census Bureau. (2023). S1601: Language Spoken at Home (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S1601?g=050XX00US36067.

3.5.5. Disabled Population

The Americans with Disabilities Act (ADA) defines individuals with a disability to include those who have physical, sensory, or cognitive impairment that might limit a major life activity.[48] In Onondaga County, 13.8% of the population has a disability (i.e., hearing, vision, cognitive, ambulatory, self-care, or independent living difficulty). People with disabilities are more likely to require assistance when responding to a hazard event and during the 72 hours after a hazard event, which is the period generally reserved for self-help. Furthermore, individuals with disabilities are likely to be compounded with other vulnerabilities (e.g., age, economic disadvantage, race, and ethnicity). **Table 3-14** summarizes estimates of the disabled population by disability type, age, race, and ethnicity in Onondaga County.[49]

Table 3-14. Disability Characteristics (2023)

Disability Type	Estimate	Percent
Hearing Difficulty	15,009	3.2%
Vision Difficulty	10,443	2.2%
Cognitive Difficulty	27,266	6.2%
Ambulatory Difficulty	30,100	6.8%
Self-Care Difficulty	12,037	2.7%
Independent Living Difficulty	24,464	6.7%
Age	**Estimate**	**Percent**
Under 5 years	314	1.2%
5 to 17 years	5,027	6.8%
18 to 34 years	9,362	8.7%
35 to 64 years	24,934	14.1%
65 to 74 years	10,087	20.3%
75 years and over	14,650	43.9%
Race and Ethnicity	**Estimate**	**Percent**
White (not Hispanic or Latino)	48,279	13.9%
Black or African American	8,229	16.4%
American Indian and Alaska Native	425	16.9%
Asian	1,460	7.8%
Native Hawaiian and Other Pacific Islander	14	6.7%
Two (2) or More Races	4,290	13.2%
Some Other Race Alone	1,085	13.2%
Hispanic or Latino	3,212	12.0%

3.5.6. Underserved Population

FEMA defines underserved populations as groups that have limited or no access to resources or that are otherwise disenfranchised. These groups may include, but are not limited to, socioeconomically disadvantaged people, people with limited English proficiency, geographically isolated or educationally disenfranchised people, people of color,

[48] National Network, Information, Guidance, and Training on the Americans with Disabilities Act. (2024). What is the definition of disability under the ADA? Retrieved from https://adata.org/faq/what-definition-disability-under-ada.
[49] United States Census Bureau. (2023). S1810: Disability Characteristics (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S1810?g=050XX00US36067.

as well as those of ethnic and national origin minorities, women and children, individuals with disabilities and others with access and functional needs, and seniors.[50]

Identifying the underserved population within the community can help Onondaga County target preparedness, response, and mitigation actions. Populations with a higher level of vulnerability may be more severely affected during an emergency or disaster. Underserved populations have unique needs that public officials must consider to help ensure the safety of communities with higher levels of risk.

The Community Resilience Estimates (CRE) for equity, developed by the United States Census Bureau, is a metric that identifies vulnerable communities based on factors such as socioeconomic conditions, health disparities, and access to resources. According to the CRE, 20.7% of Onondaga County's population is "socially vulnerable". **Table 3-15** outlines the CRE for equity for each social vulnerability component in Onondaga County. The CRE categorizes residents as being highly socially vulnerable if an individual has three (3) or more components of social vulnerability. Residents with one (1) or two (2) components have moderate social vulnerability, and residents with zero (0) components have low social vulnerability. In Onondaga County, 38.9% have low social vulnerability, 37.8% moderate, and 20.0% high.[51]

Table 3-15. Community Resilience Estimates for Equity

Social Vulnerability Components		Percent	
Social	High school graduate or higher	91.4%	***Higher*** *than national estimate.*
	With a disability	13.9%	***Higher*** *than national estimate.*
	Civilian veterans	6.2%	***Lower*** *than national estimate.*
	Female Householder, no spouse/partner present with own children under 18 years old	5.2	***Higher*** *than national estimate.*
	Male Householder, no spouse/partner present with own children under 18 years old	1.2%	***Equal*** *the national estimate.*
Economic	Below poverty	13.9%	***Higher*** *than national estimate.*
	No health insurance coverage	3.5%	***Lower*** *than national estimate.*
	Employed full-time, year-round	49.3%	***Lower*** *than national estimate.*
	Gini Index of income inequality*	0.4622	***Lower*** *than national estimate.*
Housing / Household	With broadband internet subscription	87.1%	***Lower*** *than national estimate.*
	1.51 or more occupants per room	0.4%	***Lower*** *than national estimate.*
	No vehicles available	12.2%	***Higher*** *than national estimate.*
	Speaks English less than "very well"	4.3%	***Lower*** *than national estimate.*

** The Gini coefficient ranges from zero (0), indicating perfect equality (where everyone receives an equal share), to one(1), perfect inequality (where only one recipient or group of recipients receives all the income).*

CDC's SVI is considered an appropriate and authoritative dataset to identify areas where efforts can be prioritized to ensure equitable outcomes from mitigation planning and actions. Social vulnerability refers to a community's capacity to prepare for and respond to the stress of natural, human-caused, and technological disasters. CDC's SVI combines 16 census-derived social factors, within four (4) themes (i.e., socioeconomic status, household characteristics, racial and ethnic minority status, and housing type and transportation) that summarize the extent to

[50] Federal Emergency Management Agency. (n.d.). Glossary: Underserved Population/Communities. Retrieved from https://www.fema.gov/about/glossary.
[51] United States Census Bureau. (2022). Community Resilience Estimates for Equity Profiles. Retrieved from https://www.census.gov/library/visualizations/interactive/community-resilience-estimates-for-equity.html.

which an area is socially vulnerable to disasters. The overall SVI combines all variables to provide a comprehensive assessment, and the possible scores range from zero (0) (lowest vulnerability) to one (1) (highest vulnerability).[52]

The overall SVI score for Onondaga County is 0.588, which indicates a medium to high level of vulnerability. **Table 3-16** outlines the SVI information for each social factor for Onondaga County.[53]

Table 3-16. CDC's Social Vulnerability Index (2022)

Theme	Social Factors	Population	Percent
Socioeconomic Status	People below 150% poverty estimate	98,031	20.7%
	Unemployed *(Civilian 16 years old and older)*	13,526	2.9%
	Housing Cost Burden	48,845	10.3%
	No High School Diploma	28,017	5.9%
	No Health Insurance	16,201	3.4%
Household Characteristics	65 years old and older	84,343	17.8%
	17 years and younger	99,353	21.0%
	Civilian with a Disability	65,297	13.8%
	Single-Parent Household	12,463	2.6%
	English Language Proficiency	7,643	1.6%
Racial and Ethnic Minority Status	• Hispanic or Latino (of any race) • Black or African American • Asian • American Indian or Alaska Native • Native Hawaiian or Pacific Islander • Two or More Races • Other Races	117,443	24.8%
Housing Type and Transportation	Multi-Unit Structures	28,588	6.0%
	Mobile Homes	2,525	0.5%
	Crowding	3,057	0.6%
	No Vehicle	23,594	5.0%
	Group Quarters	20,234	4.3%

Onondaga County intersects 18 Census Tracts where vulnerability to climate change exceeds the United States average. **Table 3-17** outlines indicators of a population more likely to experience adverse outcomes from disruptions due to extreme weather events, climate change, pollution, or limited health care access. High percentages for any of these indicators may indicate populations at higher risk and in need of outreach from disaster planning, public health, or social service organizations.[54]

[52] Centers for Disease Control and Prevention. (2024). CDC/ATSDR SVI 2022 Documentation. Retrieved from https://www.atsdr.cdc.gov/placeandhealth/svi/documentation/pdf/SVI-2022-Documentation-H.pdf.
[53] Centers for Disease Control and Prevention. (2022). CDC/ATSDR Social Vulnerability Index (SVI). Retrieved from https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.
[54] Northeast Regional Climate Center. (n.d.). Find At-Risk Neighborhoods. Retrieved from https://nar.headwaterseconomics.org/.

Table 3-17. Neighborhoods At Risk Table

Indicators (2022)*	Population *(within at-risk Census Tracts)*	Percentage	United States Percentage	Percent Difference *(County vs. United States)*
People under 5 years old	3,916	8.8%	5.7%	43%
People over 65 years old	5,439	12.3%	16.5%	-29%
People of color *(including Hispanic)*	26,299	59.4%	41.1%	36%
People who do not speak English well	3,459	8.6%	4.1%	71%
People without a high school degree	6,391	23.2%	10.9%	72%
Families in poverty	2,458	26.2%	8.8%	99%
Housing units that are rentals	11,563	65.9%	35.2%	61%
Households with no car	5,713	32.5%	8.3%	119%
People with disabilities	7,907	17.9%	12.9%	32%
People without health insurance	2,246	5.1%	8.7%	-52%
** ACS 5-year estimates: 2022 represents average characteristics from 2018 – 2022.*				

3.6. ECONOMY

In 2023, 63.0% of the 16 and over population was in the labor force. Of the 228,336 civilian-employed population, 76.8% were employed in the private sector. Onondaga County is currently experiencing an average unemployment rate of 3.2%. Educational services, health care, and social assistance represent the largest sector, employing over 32.5% of the workforce.[55] The largest employers include Syracuse University, State University of New York (SUNY) Upstate Medical University, the Syracuse City School District, National Grid, the United States Army, Lockheed Martin, and Crouse Hospital. Additionally, Onondaga County is home to many small businesses, with over 80% of the County's 46,992 employers having fewer than 20 workers.[56]

The arrival of Micron in Onondaga County is projected to bring significant economic benefits to the County and the State. Micron plans to invest up to $100 Billion to build the United States' largest semiconductor fabrication facility in the Town of Clay. An economic impact study projects that Micron will generate significant economic growth for the State, including Onondaga County:[57]

- Over 50,000 new permanent jobs in New York State by 2055, 70% in Central New York.
- Approximately 12,000 annual temporary jobs from capital expenditures from 2025 to 2044.
- $9.6 Billion annually in real GDP impact from 2025 to 2055.

[55] United States Census Bureau. (2023). DP03: Selected Economic Characteristics (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP03?q=DP03&g=050XX00US36067.
[56] Onondaga County. (2023). Plan Onondaga: A Comprehensive Plan for Onondaga County. Retrieved from https://plan.ongov.net/the-plan/.
[57] New York State Empire State Development. (n.d.). Micron Will Invest $100 Billion to Establish Leading-Edge Memory Fab in Central NY. Retrieved from https://esd.ny.gov/micron.

- $16.7 Billion annually in real output impact from 2025 to 2055.
- $17.2 Billion in total New York State government revenue (spanning 2025 to 2055)
- $31 Billion in Micron construction spending, with 5,600 related jobs on average at federal prevailing wage for the first 20 years (2025 to 2044).

Table 3-18 through **Table 3-20** provides a breakdown of the economic characteristics of Onondaga County.[58]

Table 3-18. Employment by Industry (2023)

Industry Sector	Estimate	Percent
Agriculture, forestry, fishing, hunting, and mining	1,181	0.5%
Construction	12,159	5.3%
Manufacturing	18,490	8.1%
Wholesale Funds	5,155	2.3%
Retail Trade	24,314	10.6%
Transportation, warehousing, and utilities	13,225	5.8%
Information	4,454	2.0%
Finance and insurance, real estate, and leasing	14,266	6.2%
Professional, scientific, management, and administrative	24,921	10.9%
Educational services, health care, and social assistance	74,276	32.5%
Arts, entertainment, recreation, accommodation, and food	17,154	7.5%
Other services (except public administration)	10,033	4.4%
Public administration	8,708	3.8%
Civilian Employed Population 16 Years and Over	**228,336**	

Table 3-19. Employment Status (2023)

Employment Status	Estimate	Percent
Civilian Labor Force	240,601	62.8%
Employed	228,336	59.6%
Unemployed	12,265	3.2%
Armed Forces	637	0.2%
Not in Labor Force	141,854	37.0%

Table 3-20. Occupation (2023)

Occupation Type	Estimate	Percent
Management, business, science, and arts	104,977	46.0%
Service occupations	37,335	16.4%
Sales and office occupations	47,440	20.8%
Natural resources, construction, and maintenance	13,715	6.0%
Production, transportation, and material moving	24,869	10.9%
Civilian Employed Population 16 Years and Over	**228,336**	

[58] United States Census Bureau. (2023). DP03: Selected Economic Characteristics (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP03?q=DP03&g=050XX00US36067.

The median household income in Onondaga County, estimated in 2023, was $74,740, while 9.4% of households in the County have an annual income of less than $15,000 and are therefore below the poverty level. **Table 3-21** outlines the breakdown of household income in Onondaga County..[59]

Table 3-21. Household Income (2023)

Income	Number of Households *(Estimate)*	Percent
Less than $10,000	11,824	6.1%
$10,000 to $14,999	6,579	3.4%
$15,000 to $24,999	14,595	7.5%
$25,000 to $34,999	13,456	6.9%
$35,000 to $49,999	20,316	10.4%
$50,000 to $74,999	31,079	15.9%
$75,000 to $99,999	25,060	12.9%
$100,000 to $149,999	34,384	17.6%
$150,000 to $199,999	18,395	9.4%
$200,000 or more	19,275	9.9%
Median Household Income	**$74,740**	
Total Households	**194,963**	

3.7. CRITICAL FACILITIES

Critical facilities are those that are critical to the health and welfare of the population and are especially important following an incident or disaster. As defined for this Plan, critical facilities include airports, correctional facilities, dams, emergency operations centers, fire stations, hospitals, municipal halls, police stations, and schools. Critical infrastructure can include the roads and bridges that provide ingress and egress and allow emergency vehicles access to those in need, as well as the utilities that provide water, electricity, and communication services to the community.

Essential facilities are a subset of critical facilities that are important for ensuring a full recovery following a hazard event. For the hazard risk assessment, this category was defined to include police, fire, emergency medical services (EMS), schools/colleges, shelters, senior facilities, and medical facilities.

A comprehensive inventory of critical facilities in Onondaga County was developed from various County and State GIS data, County departments, and input from the Steering Committee. The inventory of critical facilities presented in this Plan reflects the current state of this effort at the time of publication. **Table 3-22** summarizes the number of critical facilities within each category. **Figure 3-8** illustrates the locations of the critical facilities within Onondaga County.

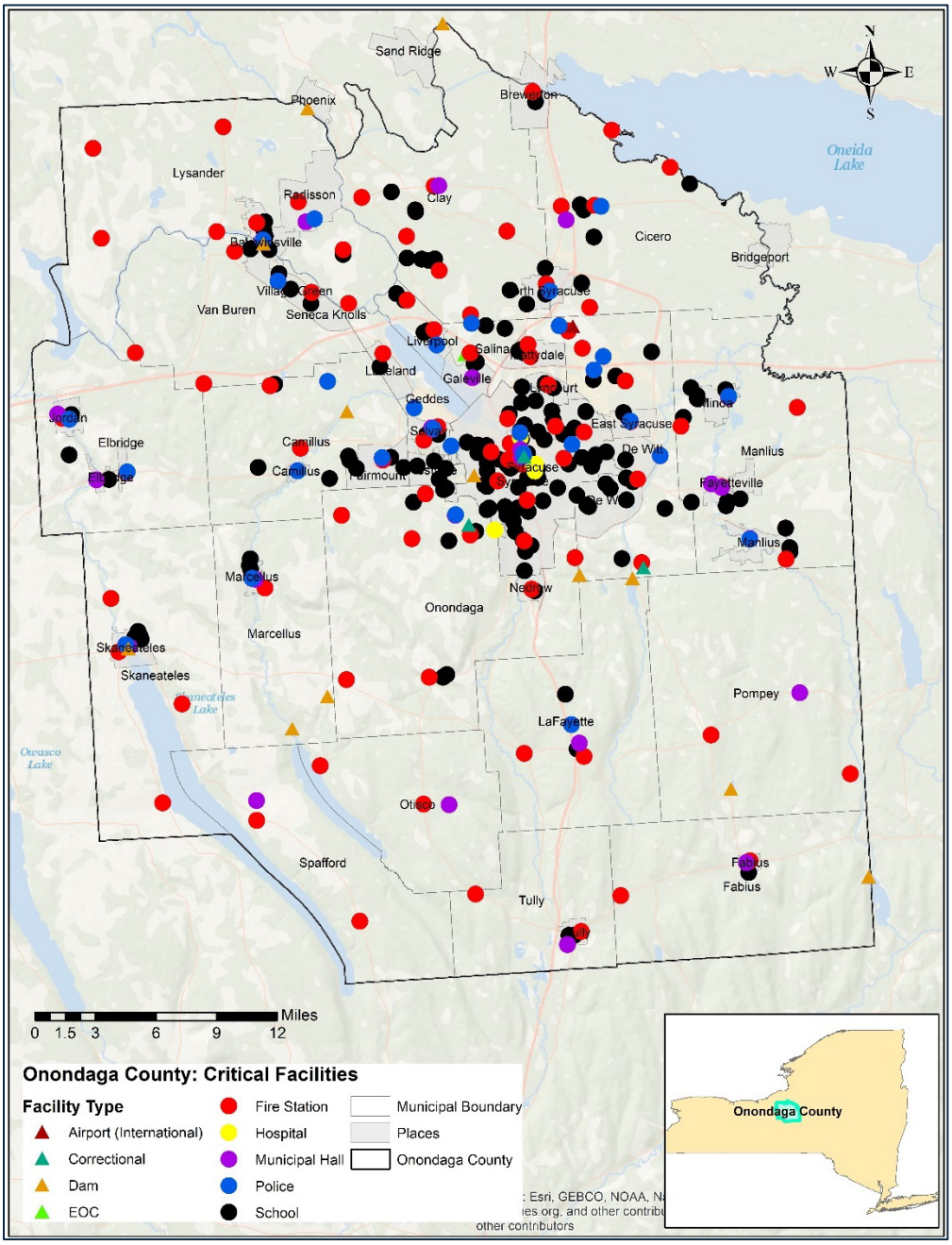
Table 3-22. Critical Facilities in Onondaga County

Critical Facility Type	Number of Facilities
Airport	1
Correctional Facilities	3
Dam	12
Emergency Operations Center	1

[59] Ibid.

Critical Facility Type	Number of Facilities
Fire Station	87
Hospital	6
Municipal Hall	35
Police Station	30
Schools	163

Figure 3-8. Critical Facilities in Onondaga County



3.7.1. Essential Facilities

For the purposes of this Plan, essential facilities include emergency facilities, hospitals, and schools.

3.7.1.1. Emergency Facilities

Emergency facilities include emergency management, communications, police, and fire. Onondaga County identified 87 fire stations and 30 police stations in the County. Emergency Communications within Onondaga County are coordinated by the Department of Emergency Communications/911 Center. The mission of the Onondaga County Department of Emergency Communications is to serve as the critical and vital link between Onondaga County citizens and the public safety agencies serving the County.

Additional Emergency Facilities

The New York State Department of Transportation (NYSDOT) has two (2) facilities that are considered essential facilities:

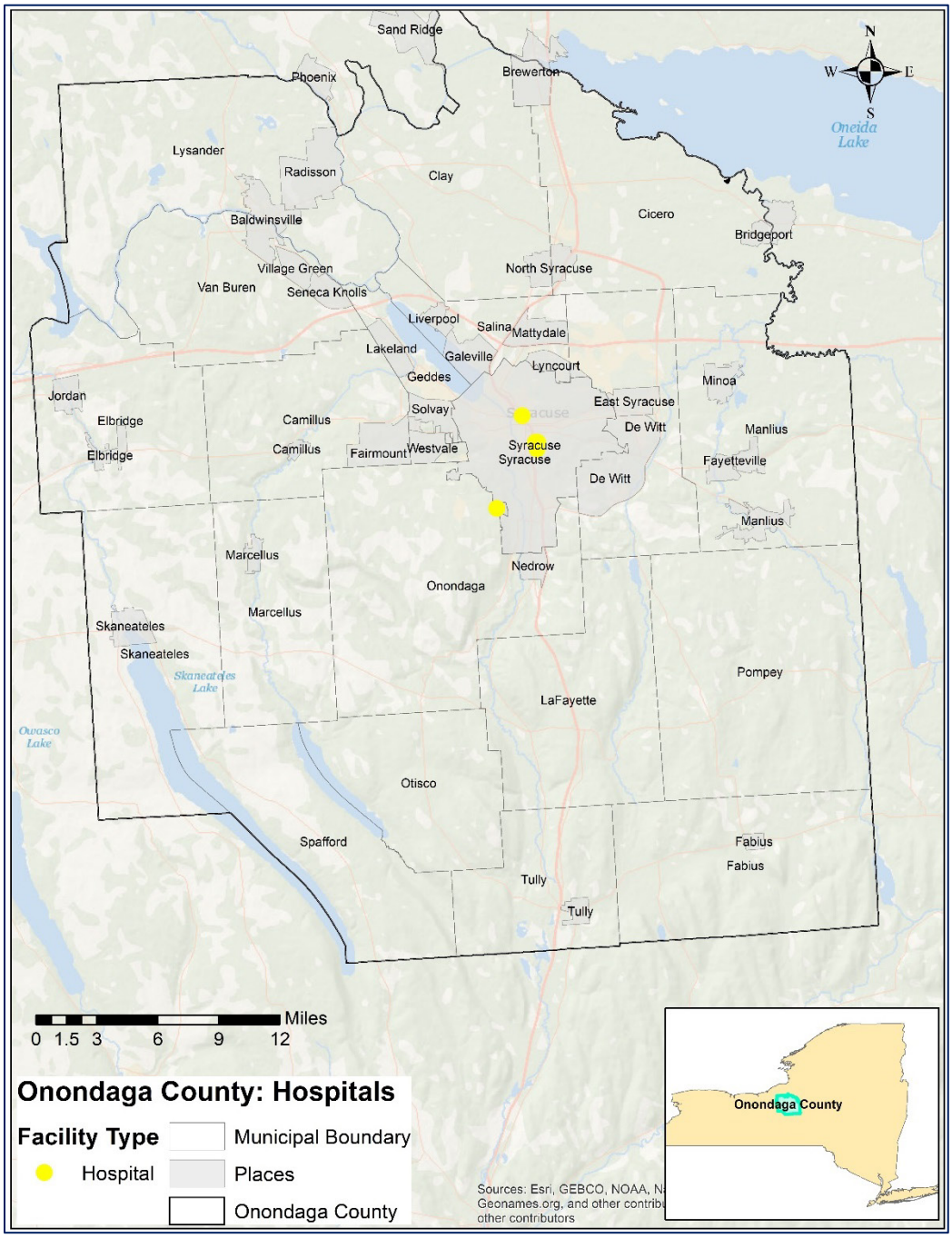
- Transportation Management Center housed at the Region 3 Office in the City of Syracuse.
- Regional Operations Center located at the NYSDOT building on South Bay Road.

3.7.1.2. Hospitals

There are six (6) major hospitals located within Onondaga County. **Figure 3-9** shows the location of hospitals within the County.

- Crouse Hospital
- St. Joseph's Hospital
- Upstate Golisano Children's Hospital
- Upstate Medical University (University Hill/Downtown)
- Upstate University Hospital at Community Campus
- Veterans Hospital

Figure 3-9. Hospitals



3.7.1.3. Schools

Onondaga County is home to 18 school districts and four (4) charter schools. Additionally, Onondaga County is a center of higher learning, with 11 higher education institutions, making it the third largest concentration of colleges and universities in the United States.[60]

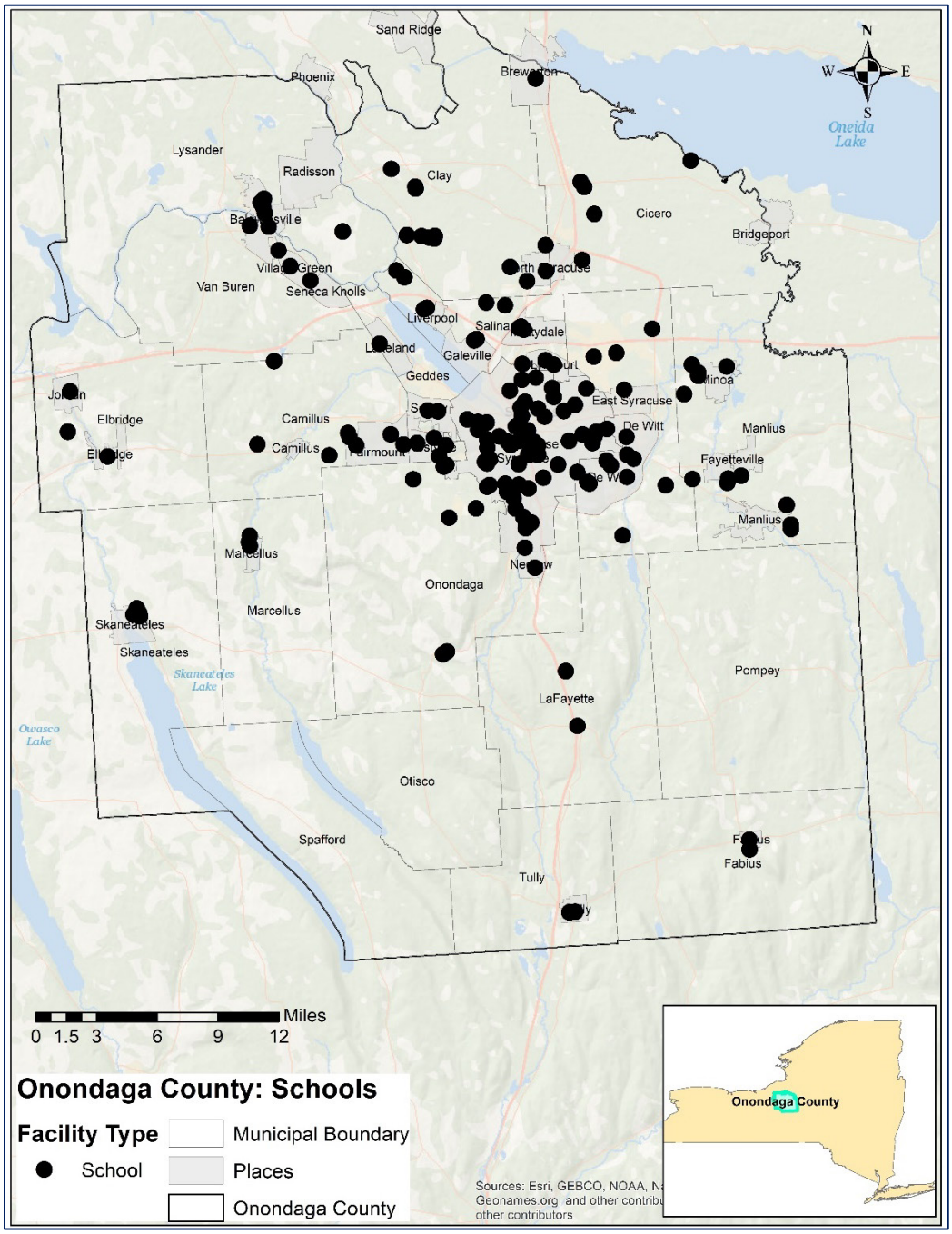
[60] New York State Education Department. (2024). Onondaga County Data. Retrieved from https://data.nysed.gov/profile.php?county=42.

- Syracuse University is one of the nation's most highly regarded private colleges, offering a diverse portfolio of undergraduate and graduate degrees to its 29,139 students (based on 2023-2024 enrollment data).[61] Syracuse University's Maxwell School of Citizenship and Public Affairs and Newhouse School of Communications are consistently ranked as the Country's best schools of public administration and journalism, respectively.
- LeMoyne College is a Jesuit-run liberal arts college.
- State University of New York's Upstate Medical University is the largest medical school in upstate New York.
- SUNY College of Environmental Science and Forestry is the premier college in the nation focused on science, design, engineering, and management of natural resources and the environment.
- Onondaga Community College is a two (2) year college that is part of the SUNY system.

During an emergency, schools are an important resource to the community because they can serve as shelters. **Figure 3-10** shows the location of schools within the County.

[61] New York State Education Department. (2024). Syracuse University Enrollment (2023-2024). Retrieved from https://data.nysed.gov/highered-enrollment.php?year=2024&instid=800000040733.

Figure 3-10. Schools



3.7.2. Transportation Systems

Onondaga County's transportation network offers residents and employees various options for transportation throughout the County and the region. Transportation throughout the County runs along Interstates 81, 90, 481, and 690, as well as United States Routes 11 and 20. There are over 300 routes, including 30 state routes, throughout the County. Nearly 2,000 miles of roadways in Onondaga County are owned by individual municipalities, with most identified as local roadways. The County owns approximately 800 miles of roads. **Figure 3-11** shows the location of transportation facilities within Onondaga County.

3.7.2.1. Highway, Roadways, and Associated Systems

Onondaga County has been appropriately named the "Crossroads of New York State" due to the State's two (2) major interstate routes – the east-west New York State Thruway (I-90) and the north-south Interstate 81, which intersect just north of the City of Syracuse. The New York State Thruway is accessed by six (6) interchanges within the County. Interstate 690 forms an east-west axis through the County, and Interstate 481 provides interstate access to and from suburban towns north and east of the City of Syracuse. Onondaga County is serviced by approximately 3,400 miles of highways, bridges, roads, and streets, as well as the New York State Canal System.

3.7.2.2. Airports

Air passenger service is provided by nine (9) major airlines at the Syracuse Hancock International Airport. In 2024, the airport recorded 71,594 takeoffs and landings and 3,004,937 passengers.[62] The County is also served by six (6) major air cargo carriers. Hancock International Airport is located within a 15 minute drive of downtown Syracuse and within two (2) miles of the crossroads of the region's major east-west interstate highway (Interstate 90/New York State Thruway) and north-south interstate highway (Interstate 81).[63] The County also identified a number of small private airstrips, including Camillus Airport, Marcellus Airport, Skaneateles Aerodrome Airport, and Woodford Airfield Airport.

3.7.2.3. Bus and Other Transit Facilities

Bus service in Onondaga County is provided by three (3) independent carriers and by CENTRO, which is operated by the Central New York Regional Transportation Authority. CENTRO provides a high level of public transportation service to the County. A centralized transit hub, primarily serving bus users, is located in Downtown Syracuse.[64]

CENTRO also operates an intermodal transportation center, the William F. Walsh Regional Transportation Center (RTC), adjacent to the Regional Market, Alliance Bank Stadium, and in proximity to Destiny USA shopping mall. RTC is considered a one-stop transportation center for intercity and local travel, offering service from CENTRO, Adirondack Trailways, Greyhound, FlixBus, and Amtrak. The RTC serves approximately 153,000 people within the City of Syracuse and its neighboring communities. Destinations outside of the County include Rochester, Niagara Falls, Boston, New York City, Washington D.C., and Philadelphia.[65]

Additionally, rideshare services (e.g., Uber and Lyft) are available throughout the County, though service availability depends on driver location and availability.

3.7.2.4. Railroad Facilities

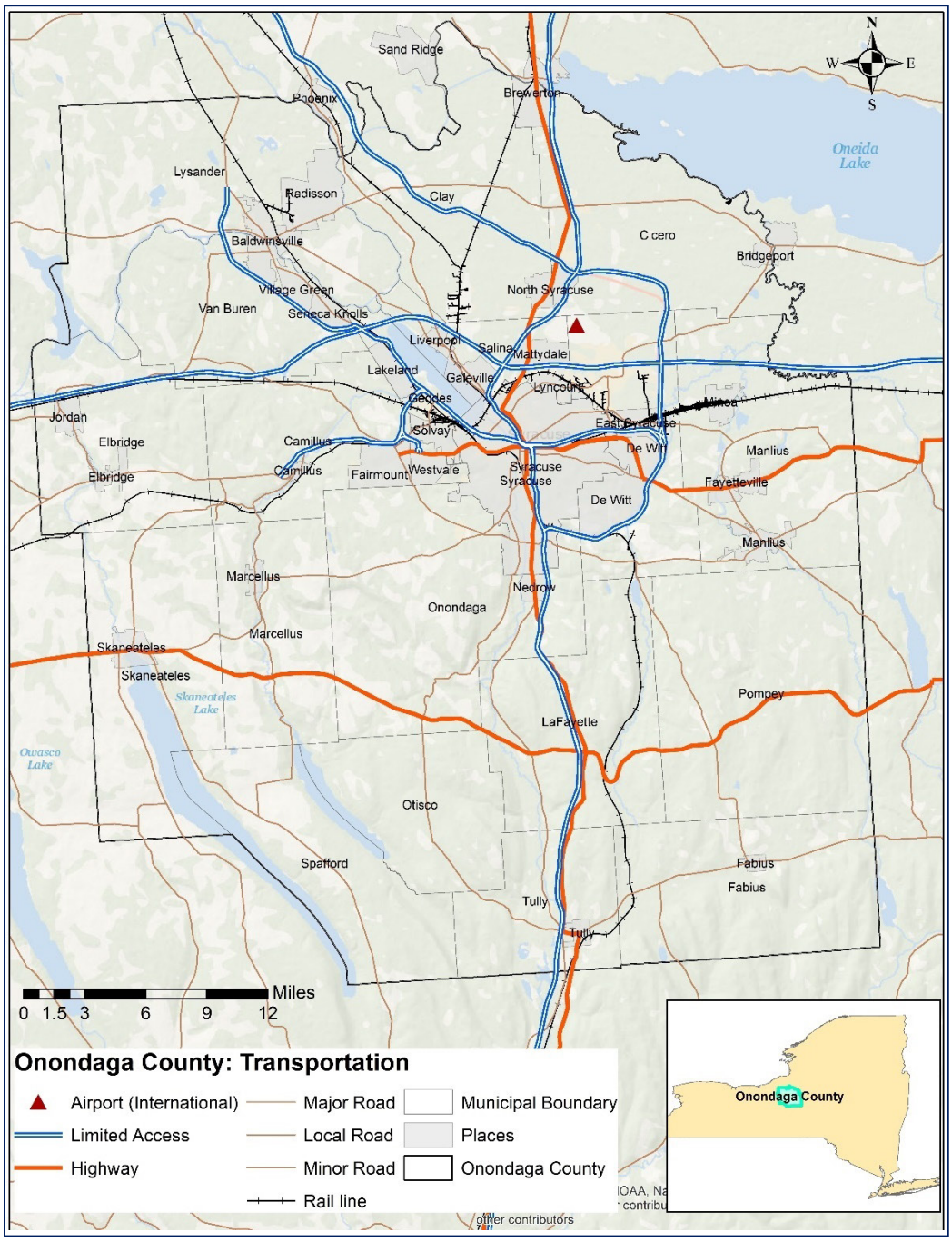
Onondaga County is served by the railroad facilities of CSX (formerly Conrail) and Amtrak, which maintain terminals within the County. Amtrak provides passenger rail service, with stopovers at the RTC, and serves Central New York travelers with eight (8) daily departures from the RTC.

For freight, CSX Transportation operates over 80% of the active rail lines within the County, with its major intermodal facility located at the DeWitt Rail Yard. CSX's computerized rail yard has the capacity to manage 2,200

[62] Syracuse Regional Airport Authority. (2024). Syracuse Hancock International Airport 2024 Annual Report. Retrieved from https://syrairport.org/wp-content/uploads/2025/01/SRAA-2024-Annual-Report-for-Website-1-28-2025.pdf.
[63] Onondaga County. (n.d.). Transportation. Retrieved from http://ongov.net/about/transportation.html.
[64] Ibid.
[65] CENTRO. (n.d.). William F. Walsh Regional Transportation Center. Retrieved from https://www.centro.org/service_schedules/william-f-walsh-regional-transportation-center.

cars per day. CSX is the only Class I freight carrier active in the County. New York, Susquehanna, & Western Railway (Class II) and Finger Lakes Railway (Class III) also serve the County.[66]

Figure 3-11. Transportation Systems in Onondaga County



[66] New York State Department of Transportation. (2024). Map of New York State Railroads. Retrieved from https://www.dot.ny.gov/divisions/operating/opdm/passenger-rail/railroadsmap.

3.7.3. Lifeline Utility Systems

For the purposes of this Plan, lifeline utility systems include potable water, wastewater, energy resources, and communication utility systems.

3.7.3.1. Potable Water

OCWA is responsible for distributing potable water to the majority of County residents. Customers of OCWA receive water that primarily originates from Otisco Lake and Lake Ontario, and, depending on location, some areas receive a mixture of these waters, or their source may vary with seasonal demand. In 2023, OCWA supplied approximately 36.3 million gallons per day to its 500,000 residential and commercial customers located in the five (5) county service territory – Onondaga, Oswego, Madison, Oneida, and Cayuga counties.[67] OCWA also supplies water daily to 48 industrial customers and four (4) municipal wholesale water customers. The Water Authority can also supply water on an intermittent or emergency basis to seven (7) additional municipal water systems.[68]

The OCWA distribution system comprises 48 pumping stations, 63 storage tanks that distribute water via 2,215 miles of water main to roughly 106,000 meter accounts and 14,150 hydrants. The Water Authority operates a 20 million gallons per day (MGD) treatment plant in Marcellus, which filters and chlorinates an average of 18 MGD of water from Otisco Lake. OCWA also operates the Lake Ontario water treatment plant in the Town of Oswego, which is capable of delivering 50 MGD to Onondaga County and currently averages 20 MGD of potable filtered water. OCWA can also purchase up to three (3) MGD from the Syracuse Water Department, with current daily purchases averaging 1.2 MGD.[69]

The Syracuse Water Department supplies water service to the entire City of Syracuse and to portions of the towns of De Witt, Onondaga, Geddes, Camillus, and Salina, and the villages of Skaneateles, Jordan, and Elbridge. The Water Department draws water from Skaneateles Lake for its supply. It can do so without a filtration system because the Lake's water quality is exceptionally high. However, recent harmful algal blooms (HAB) in the County may warrant changes to the intake system. The Syracuse Water Department also draws a small portion of its water from Lake Ontario (through OCWA transmission facilities). In 2023, the Water Department reported 37.7 MGD of water use. The water system comprises over 500 miles of pipelines that deliver water from Skaneateles Lake to the City and distribute it throughout the service area. The water supply system consists of water storage in the Woodland and Westcott Reservoirs. Additionally, water is stored in two (2) standpipes and in the three (3) tanks that make up the Morningside Reservoir.[70]

In addition to the OCWA and Syracuse Water Department, the New York State Department of Environmental Conservation (NYSDEC) maintains a potable water well database and currently reports 294 within the County.[71]

[67] Onondaga County Water Authority. (2023). OCWA 2023 Consumer Confidence Report. Retrieved from https://www.ocwa.org/wp-content/uploads/2024/04/1-OCWA-Statistics.pdf.
[68] Onondaga County Water Authority. (n.d.). Sources of Water. Retrieved from https://www.ocwa.org/about/sources-of-water/.
[69] Information provided by Onondaga County Water Authority. (2024).
[70] City of Syracuse Department of Water. (2023). Annual Drinking Water Quality Report for 2023. Retrieved from https://www.syr.gov/files/sharedassets/public/v/1/2-departments/water/documents/reports/drinking-water-reports/newsletter-2023.pdf.
[71] New York State Department of Environmental Conservation. (2023). Downloadable Well Data. Retrieved from https://dec.ny.gov/environmental-protection/oil-gas/wells-data-geographical-information/downloadable-data.

3.7.3.2. Wastewater Facilities

Wastewater treatment for most municipalities is provided by the Onondaga County Department of Water Environment Protection (WEP), which processes over 33 billion gallons of wastewater each year.[72] To accomplish this, Onondaga County WEP operates six (6) wastewater treatment plants, two (2) regional treatment facilities, two (2) storage facilities, 175 county and municipally owned pump stations, and eight (8) wet weather facilities throughout the Consolidated Sanitary District. The six (6) wastewater treatment plants operated by WEP are Metropolitan Syracuse (Metro), Oak Orchard, Baldwinsville-Seneca Knolls, Meadowbrook-Limestone, Wetzel Road, and Brewerton.[73] As of 2023, WEP calculates approximately 1,700 miles of gravity and force main sewers owned by the county and municipalities that feed into the county treatment system.

Onondaga County WEP is the County's public sewer utility for residents, businesses, and industries within the Consolidated Sanitary District, which includes 18 municipalities.[74] Outside the Sanitary District boundary, several villages also own and maintain their own sewage treatment plants, including Jordan, Marcellus, Minoa, Skaneateles, and Tully.

Where municipal sewage treatment is not available, onsite septic systems are used. Soil quality in the County is variable, leaving many parts of the planning area unsuitable for onsite wastewater treatment. Undersized or unmaintained onsite septic systems can be a problem, particularly in drinking watersheds, where exposure and runoff can affect water quality.

3.7.3.3. Energy Resources

Gas and electric power in Onondaga County are transmitted and distributed primarily by National Grid, with New York State Electric & Gas serving the western areas of the County.

3.7.3.4. Communications

Onondaga County is served by a variety of communications systems, including traditional landlines, fiber-optic, and cellular service provided by multiple companies (e.g., Verizon, Spectrum, and Frontier). Additionally, Onondaga County has an extensive radio communications network used by emergency services agencies, hospitals, law enforcement, public works, transportation, and other supporting organizations.

3.7.4. High Potential Loss Facilities

High potential loss facilities include dams, levees, hazardous materials (HazMat) facilities, nuclear power plants, and military installations.

3.7.4.1. HazMat Facilities

A Superfund site is land contaminated by hazardous waste and identified by the United States Environmental Protection Agency (EPA) as a candidate for cleanup because it poses a risk to human health and/or the environment. These sites are placed on the National Priorities List (NPL). The NPL is a list of national priorities for known or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its

[72] Onondaga County Department of Water Environment Protection. (n.d.). What We Do. Retrieved from http://www.ongov.net/wep/what-we-do.html.
[73] Onondaga County Department of Water Environment Protection. (n.d.). Our Facilities. Retrieved from http://www.ongov.net/wep/facilities.html.
[74] Onondaga County Department of Water Environment Protection. (n.d.). Service Area. Retrieve from http://www.ongov.net/wep/service-area.html.

territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation.[75]

Abandoned hazardous waste sites placed on the federal NPL include those that the EPA has determined present "a significant risk to human health or the environment," with the sites being eligible for remediation under the Superfund Trust Fund Program. As of 2023, Onondaga County has one (1) hazardous site in the federal Superfund Program that is listed in the NPL.[76]

The EPA Superfund Program reports that there are currently 71 archived Superfund sites located within Onondaga County.[77] An archived Superfund site is one that, based on available information, has no further interest under the Federal Superfund Program and is no longer part of the NPL.

In addition to the hazardous waste sites, there are numerous hazardous facilities in Onondaga County cataloged by the NYSDEC's Bulk Storage Program Database. The Bulk Storage Program includes three (3) types of facilities – Petroleum Bulk Storage (PBS), Major Oil Storage Facilities (MOSF), and Chemical Bulk Storage (CBS). **Table 3-23** outlines the NYSDEC's Bulk Storage Program registration requirements for each facility type. As of August 2024, 1,848 sites within Onondaga County are listed in NYSDEC's Bulk Storage Program Database.[78]

Table 3-23. Bulk Storage Program Registration Requirements

Facility Type	Registration Requirements
Petroleum Bulk Storage (PBS)	• One (1) or more tank systems that are designed to store a combined capacity of more than 1,100 gallons or more of petroleum in aboveground and/or underground storage tanks. **OR** • One (1) or more underground tank systems that are designed to store 110 or more gallons of petroleum.
Major Oil Storage Facilities (MOSF)	• Facilities that store a total of 400,000 gallons or more of petroleum in aboveground and underground storage tanks.
Chemical Bulk Storage (CBS)	• An aboveground storage tank larger than 185 gallons. **OR** • Any size underground storage tank. **OR** • In a container that can store 1,000 kg or more for a period of 90 consecutive days or more.

3.7.4.2. Dam and Levees

Refer to the dam and levee sections under the Flood profile in Section 4.6.4 of this Plan for details on the dams and levees located within Onondaga County.

[75] United States Environmental Protection Agency. (2023). Superfund: National Priorities List (NPL). Retrieved from https://www.epa.gov/superfund/superfund-national-priorities-list-npl.
[76] United States Environmental Protection Agency. (2023). Superfund Sites Search. Retrieved from https://cumulis.epa.gov/supercpad/cursites/srchrslt.cfm?start=1.
[77] Ibid.
[78] New York State Department of Environmental Conservation. (2024). Bulk Storage Database. Retrieved from https://extapps.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=4.

3.8. CAPABILITY ASSESSMENT

Federal regulations require hazard mitigation plans to identify goals for reducing long-term vulnerabilities to the identified hazards in the planning area (Section 201.6(c)(3)(i)). A critical step in developing specific hazard mitigation actions and projects is assessing existing authorities, policies, programs, resources, and capabilities to use or modify local tools to reduce losses and vulnerability from profiled hazards.

A capability assessment was conducted for Onondaga County and participating jurisdictions' authorities, policies, programs, and resources. Goals and mitigation actions were developed using input from this assessment. Information regarding the County's implementation of and continued participation in the National Flood Insurance Program (NFIP) can be found in Section 3.9. *Capability assessments for each participating jurisdiction can be found in their respective annexes.*

The Core Planning Team assessed Onondaga County's capabilities that can contribute to the reduction of long-term vulnerabilities to hazards. The capabilities include the following categories.

- Planning and Regulatory Capabilities
- Administrative and Technical Capabilities
- Financial Capabilities
- Education and Outreach Capabilities

Additionally, ways to expand and improve these existing policies and programs to integrate hazard mitigation into the County's day-to-day activities were considered.

3.8.1. Planning and Regulatory Capabilities

Table 3-24 includes local ordinances, policies, and laws to manage growth and development (e.g., land use plans, capital improvement plans, transportation plans, emergency preparedness and response plans, building codes, and zoning ordinances).

Table 3-24. Planning and Regulatory Capabilities

Capability Category	Yes/No	Authority *(local, county, state, federal)*	Responsible Department/ Agency	Code Citation and Comments *(e.g., Code Chapter, name of plan, explanation of authority, etc.)*
Planning Capability				
Comprehensive Plan	Yes	County	Onondaga County Department of Planning	Last updated in 2023
Capital Improvements Plan	Yes	County	Onondaga County Legislature, Office of the County Executive	2024-2029 Capital Improvement Plan

Capability Category	Yes/No	Authority *(local, county, state, federal)*	Responsible Department/ Agency	Code Citation and Comments *(e.g., Code Chapter, name of plan, explanation of authority, etc.)*
Floodplain Management / Basin Plan	Yes	County	Onondaga County Soil & Water Conservation District	Stream Stabilization Plans
Stormwater Management Plan	Yes	State, Local	Onondaga County Office of the Environment	Member of the Central New York (CNY) Stormwater Coalition
Open Space Plan	No	N/A	N/A	N/A
Stream Corridor Management Plan	No	N/A	N/A	N/A
Watershed Management or Protection Plan	Yes	Local	Municipalities	Onondaga, Otisco, Oneida, and Skaneateles lakes have watershed management plans
Economic Development Plan	Yes	State, County	Central New York Regional Economic Development Council	The CNY Ascent: Reaching New Heights 2023 Strategic Plan
Comprehensive Emergency Management Plan	Yes	County	Onondaga County Department of Emergency Management	Last updated in 2016
Emergency Operation Plan	Yes	County	Onondaga County Department of Emergency Management	Refer to the Comprehensive Emergency Management Plan for a list of Emergency Operations Plans
Post-Disaster Recovery Plan	Yes	County	Onondaga County Department of Emergency Management	Last updated in 2019
Transportation Plan	Yes	State	Syracuse Metro Transportation Council	2050 Long Range Transportation Plan – Moving Towards a Greater Syracuse
Strategic Recovery Planning Report	No	N/A	N/A	N/A
Climate Action Plan	Yes	Local	Onondaga County Office of the Environment	Last updated in 2017. The Plan is undergoing an update to be completed in Spring 2025
Resilience Plan	No	N/A	N/A	N/A
Regulatory Capability				
Building Code	No	State, Local	N/A	Building Code of New York State Regulated by each municipality
Zoning Ordinance	No	Local	N/A	Regulated by each municipality
Subdivision Ordinance	No	Local	N/A	Regulated by each municipality
NFIP Flood Damage Prevention Ordinance	No	Local	N/A	Regulated by each municipality

Capability Category	Yes/No	Authority *(local, county, state, federal)*	Responsible Department/ Agency	Code Citation and Comments *(e.g., Code Chapter, name of plan, explanation of authority, etc.)*
NFIP: Cumulative Substantial Damages	No	Local	N/A	Regulated by each municipality
NFIP: Freeboard	No	Local	N/A	Regulated by each municipality
Growth Management Ordinances	No	Local	N/A	Regulated by each municipality
Site Plan Review Requirements	No	Local	N/A	Regulated by each municipality
Stormwater Management Ordinance	No	Local	N/A	Regulated by each municipality
Municipal Separate Storm Sewer System (MS4)	Yes	State, Local	Onondaga County Office of the Environment	Stormwater Management Program Plan
Natural Hazard Ordinance	No	Local	N/A	Regulated by each municipality
Post-Disaster Recovery Ordinance	No	Local	N/A	Regulated by each municipality
Real Estate Disclosure Requirement	Yes	State	New York State Department of State, Real Estate Agent	New York Code – Article 14 §460-467 (Property Condition Disclosure Act)
Other (Special Purpose Ordinances [i.e., sensitive areas, steep slope])	No	N/A	N/A	N/A

3.8.2. Administrative and Technical Capabilities

The administrative and technical capabilities listed in **Table 3-25** include County (i.e., public and private) staff, their skills, and tools that can be used for mitigation planning and implementation. This capability includes engineers, planners, emergency managers, Geographic Information System (GIS) analysts, building inspectors, grant writers, and floodplain managers. Small communities may rely on other government entities, such as counties or special districts, for resources.

Table 3-25. Administrative and Technical Capabilities

Capability	Yes/No	Position/Department/Agency
Administrative Capability		
Planning Board	Yes	Onondaga County Planning Board
Mitigation Planning Committee	Yes	Onondaga County Department of Planning, Onondaga County Department of Emergency Management
Environmental Board/Commission	Yes	Onondaga County Council on Environmental Health
Open Space Board/Committee	No	N/A
Economic Development Commission/Committee	Yes	Onondaga County Industrial Development Agency Regional Economic Development Councils
Maintenance programs to reduce risk	Yes	Operating departments that are involved in infrastructure and facilities

Capability	Yes/No	Position/Department/Agency
Mutual aid agreements	Yes	Fire/EMS Departments, Onondaga County Department of Water Environment Protection, Onondaga County Department of Transportation
Technical/Staffing Capability		
Planner(s) or engineer(s) with knowledge of land development and land management practices	Yes	Onondaga County Department of Planning, Onondaga County Department of Water Environment Protection, Onondaga County Department of Transportation, Onondaga County Health Department, Onondaga County Soil & Water Conservation District
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Yes	Onondaga County Department of Water Environment Protection, Onondaga County Department of Transportation, Onondaga County Health Department
Planners or engineers with an understanding of natural hazards	Yes	Onondaga County Department of Water Environment Protection, Onondaga County Department of Transportation
NFIP Floodplain Administrator	No	*Municipal responsibility*
Surveyor(s)	Yes	Onondaga County Department of Transportation, Onondaga County Soil & Water Conservation District
Personnel skilled or trained in GIS applications	Yes	Onondaga County Department of Planning
Scientist familiar with natural hazards	Yes	Onondaga County Health Department
Warning systems/services	Yes	Reverse 911, Emergency Notification System (NY Alert), Emergency Alert System, 211
Emergency Manager	Yes	Onondaga County Department of Emergency Management
Grant writer(s)	Yes	Various county departments, Onondaga County Soil & Water Conservation District (for some agricultural-environmental projects)
Staff with expertise or training in benefit/cost analysis	Yes	Various county departments
Professionals trained in conducting damage assessments	Yes	Onondaga County Department of Emergency Management, Onondaga County Department of Water Environment Protection, Onondaga County Department of Transportation

3.8.3. Fiscal Capabilities

Table 3-26 lists fiscal capabilities available to the County that may be used to implement mitigation activities to reduce risk and enhance resiliency. This capability includes available funding sources from local budgets, state and federal grants, potential cost-sharing arrangements with private entities, existing insurance policies, and the ability to generate additional revenue through fees and bonds related to mitigation.

Table 3-26. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use
Community Development Block Grants (CDBG, CDBG-DR)	Yes *(for use in income-eligible Census Block groups)*
Federal Hazard Mitigation Assistance Program *(i.e., Hazard Mitigation Grant Program (HMGP), HMGP Post Fire, Flood Mitigation Assistance (FMA) Program)*	Yes

Financial Resources	Accessible or Eligible to Use
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes
User fees for water, sewer, gas, or electric service	Yes
Impact fees for homebuyers or developers of new development/homes	No
Stormwater Utility Fee	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	Yes
Other federal or state funding programs	Yes
Open Space Acquisition funding programs	Yes

Municipal Fiscal Capabilities: Onondaga County and individual municipalities are (legally, not necessarily practically) able to fund mitigation projects through existing local budgets, local appropriations (e.g., referendums and bonding), and through a variety of federal and state loan and grant programs. Many municipalities noted throughout the planning process that they face increasing fiscal constraints, including declining revenues, budget constraints, and tax caps. In an effort to overcome these fiscal challenges, municipalities have continued to leverage resource sharing and combine available funding with grants and other sources, and note that plans and inter-municipal cooperation are beneficial for obtaining grants.

Federal Hazard Mitigation Assistance Program: The Hazard Mitigation Assistance Program provides grant funding to communities looking to protect against disaster losses and to prepare in advance of disasters. The Program's vision is to be a driver for resilience through partnerships and mitigation investments with states, tribes, territories, and local governments. The Program's mission is to design, build, and nurture high-performing teams that promote and deliver risk reduction programs. Further information and guidance on this Program can be found in the Hazard Mitigation Assistance Program and Police Guide (effective July 30, 2024).

- **Hazard Mitigation Grant Program (HMGP):** HMGP ensures that state, local, tribal, and territorial governments have the financial opportunity to plan for and implement hazard mitigation measures that reduce the risk of loss of life and property from future natural disasters during the reconstruction process following a disaster. HMGP is authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act and implemented in regulations at 44 Code of Federal Regulations (CFR) §§ 206.430-440. HMGP funding is available when authorized through a major disaster declaration. The amount of HMGP funding available to the applicant is based on the estimated total federal assistance, subject to the sliding-scale formula FEMA provides for disaster recovery for each disaster declaration. Furthermore, all applicants and sub applicants must have a FEMA-approved hazard mitigation plan adopted by the jurisdiction in accordance with 44 CFR Part 201 and applicable mitigation planning policies to receive HMGP funding.
- **Hazard Mitigation Grant Program Post Fire (HMGP Post Fire):** HMGP Post Fire assistance is available to help communities implement hazard mitigation measures after wildfire disasters in any area affected by a fire for which assistance is provided under a Fire Management Assistance Grant (FMAG) declaration. Section 1204 of the Disaster Recovery Reform Act of 20189 amended Section 404 of the Stafford Act to allow FEMA to provide HMGP Post Fire assistance for hazard mitigation measures that substantially reduce the risk of future damage, hardship, loss, or suffering in any area affected by a fire for which assistance was provided under Section 420 of the Stafford Act. States and territories that have received an FMAG declaration and certain federally recognized tribes are eligible to apply for assistance under HMGP Post

Fire. Furthermore, all applicants and sub applicants must have a FEMA-approved hazard mitigation plan adopted by the jurisdiction in accordance with 44 CFR Part 201 and applicable mitigation planning policies to receive HMGP Post Fire funding.

- **Flood Mitigation Assistance Program (FMA):** The FMA is a competitive program that provides funding to states, local communities, federally recognized tribes, and territories for projects that reduce or eliminate the risk of flood damage to structures insured by the National Flood Insurance Program (NFIP). FMA funding is available through the National Flood Insurance Fund for flood hazard mitigation activities and plan development, and is appropriated by Congress each year. NFIP participation is required to be eligible for funding; sub applicants must also be in "good standing" with the NFIP. Furthermore, all applicants and sub applicants must have a FEMA-approved hazard mitigation plan that has been adopted by the jurisdiction in accordance with 44 CFR Part 201 and applicable mitigation planning policies by the application deadline and at the time FEMA obligates funding for mitigation activities.

Federal and State Disaster and Recovery Assistance Program: After a major disaster, various types of assistance may be made available by local, state, and federal governments. The types and levels of disaster assistance depend on the severity of the damage and the declarations issued in response to the disaster. Among the general types of assistance that may be provided should the President of the United States declare the event a major disaster are, but is not limited to, the following:

- Individual Assistance (IA)
- Public Assistance (PA)
- Small Business Administration (SBA) Loans
- Social Services Block Grant Program (SSBG)
- Homeland Security Grant Program (HSGP)
    - State Homeland Security Program (SHSP)
    - Urban Areas Security Initiative (UASI)
    - Operation Stonegarden (OPSG) Program
- Community Development Block Grants (CDBG)
- Revolving Loan Fund (RLF) Program
- Federal Transit Authority (FTA) Emergency Relief Program
- BRIDGE NY
- Emergency Watershed Protection Program
- NYSDEC Climate Smart Communities (CSC) Grant Program
- Water Quality Improvement Project (WQIP) Program
- New York State Environmental Facilities Corporation (EFC) Wastewater Infrastructure Engineering Planning Grant (EPG)
- Community Risk and Resilience Act (CRRA)

3.8.4. Education and Outreach Capabilities

Table 3-27 lists the County's education and public outreach capabilities that can be used to inform residents about potential hazards, educate on mitigation strategies, and encourage proactive actions to reduce the community's impacts to disasters. These capabilities include fire safety programs, hazard awareness campaigns, public information, and communications offices.

Table 3-27. Education and Outreach Resources

Resource	Yes/No	Position/Department/Agency
Public Information Officer	Yes	Onondaga County Sheriff's Office Onondaga County Communications
Personnel skilled or trained in website development	Yes	Onondaga County Department of Information Technology
Hazard mitigation information available on the jurisdiction's website	Yes	Onondaga County Department of Planning ***Website:*** *ongov.net/planning/haz.html*
Utilize social media for hazard mitigation education	Yes	Onondaga County Communications Onondaga County Department of Emergency Management Onondaga County Department of Planning
Citizen boards or commissions that address issues related to hazard mitigation	Yes	Onondaga County Council on Environmental Health
Other programs already in place that could be used to communicate hazard-related information	Yes	Onondaga County Soil & Water Conservation District, Office of Emergency Management
An established warning system for hazard events	Yes	Onondaga County Communications, NY Alert Emergency Notification System

3.8.5. Community Classifications

The community classification relates to the community's ability to provide effective services to reduce its vulnerability to the identified hazards. These classifications can be viewed as a gauge of the community's capabilities across all phases of emergency management (i.e., preparedness, response, recovery, and mitigation) and are used as underwriting parameters to determine the costs of various insurance forms. **Table 3-28** summarizes classifications for community programs available to Onondaga County.

Table 3-28. Community Classifications

Program	Yes/No	Classification *(if applicable)*	Date Classified *(if applicable)*
Community Rating System (CRS)	No	N/A	N/A
Building Code Effectiveness Grading Schedule (BCEGS)	No	N/A	N/A
Public Protection (ISO Fire Protection Classes 1 to 10)	No	N/A	N/A
New York State Department of Environmental Conservation Climate Smart Community	No	N/A	N/A
Storm Ready Certification	Yes	N/A	N/A
Firewise Communities classification	No	N/A	N/A
Natural disaster/safety programs in/for schools	No	N/A	N/A
Organizations with mitigation focus (advocacy group, non-government)	No	N/A	N/A
Public-private partnership initiatives addressing disaster-related issues	No	N/A	N/A

3.8.6. Self-Assessment of Capability

Table 3-29 provides an approximate measure of Onondaga County's capability to work in a hazard mitigation capacity and/or effectively implement hazard mitigation strategies to reduce hazard vulnerabilities.

Table 3-29. Self-Assessment Capability

Capability Area	Degree of Hazard Mitigation Capability		
	Limited *(If limited, what are your obstacles?)*	***Moderate***	***High***
Planning and Regulatory		**X**	
Administrative and Technical			**X**
Fiscal		**X**	
Education and Outreach		**X**	
Community Political		**X**	
Community Resiliency		**X**	
Capability to integrate mitigation into municipal processes and activities		**X**	

3.8.7. Needs to Expand/Improve Capabilities

Onondaga County identified existing authorities, policies, programs, funding, and/or resources that need to be expanded and/or improved in order to support the implementation of the hazard mitigation initiatives identified in this Plan (e.g., mitigation actions).

Onondaga County's significant countywide planning capabilities, primarily executed through the Department of Planning and the Office of the Environment, are documented by the list of existing plans in **Table 3-24**. The County is currently also advancing work toward a new Greenways + Blueways Planning Program, which relates to several hazard mitigation goals and objectives outlined in this Hazard Mitigation Plan. When considering the need to expand the library of completed hazard mitigation-related plans (e.g., Open Space, Stream Corridor Management, Strategic Recovery, and Resilience plans), the County must first assess the need for such additional planning, evaluate capability and jurisdiction in doing so, and then take the appropriate actions to develop and adopt such plans.

Onondaga County's regulatory capability, as it relates to planning, zoning, and land use regulation, and other related activities, is limited by New York State's Municipal Home Rule Law, which grants local municipalities the authority to adopt and amend local laws regarding their property, affairs, and government.

Onondaga County's administrative and technical capabilities are also strong, but could be improved with the addition of key personnel and resources throughout the County's physical services departments, with strengths in hazard mitigation, environmental management, and civil engineering. Further improvements to the County's administrative capabilities may be possible through increased engagement of existing or new boards or committee structures to facilitate inter-agency and inter-community coordination on hazard-related matters.

At the County government level, fiscal capabilities are available through various means, as shown in **Table 3-26**. However, while the mechanisms may be present, significant fiscal constraints faced by governments at both the County and, even more so, the municipal or special district level are always a challenge. Grant funding is limited, difficult to apply for, and often challenging to procure for hazard mitigation related activities in Upstate New York. The burdens of immediate and ongoing infrastructure maintenance often outweigh the desire for necessary upgrades

and modernization, despite the benefits. Local community political capability, while typically strong in support of hazard mitigation, is in constant flux and influenced by national and statewide political forces.

Onondaga County continues to seek opportunities to expand and improve its education and outreach capabilities. Such opportunities include reviewing methods and programs for addressing and communicating hazard-related issues and information, using traditional and social media to reach a broader audience, and soliciting and informing the public about their needs and concerns related to hazard mitigation.

3.9. NATIONAL FLOOD INSURANCE PROGRAM

As of December 2024, 34 out of the 35 jurisdictions within the County are members of the National Flood Insurance Program (NFIP). **Table 3-30** identifies each community and the date each participant joined the NFIP.[79]

One (1) of the NFIP communities also participates in the Community Rating System (CRS), which is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions, meeting the three (3) goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance ratings.
- Promote flood insurance awareness.

Table 3-30. NFIP Participation Information

Jurisdiction	Community ID	NFIP Participation Date	Current Effective FIRM Date	CRS Entry Date	CRS Current Effective Date	CRS Class
City of Syracuse	360595	4/12/1974	11/4/2016	10/1/1993	10/1/2016	7
Town of Camillus	360570	9/6/1974	11/4/2016	N/A	N/A	N/A
Town of Cicero	360572	11/1/1974	11/4/2016	N/A	N/A	N/A
Town of Clay	360573	7/1/1977	11/4/2016	N/A	N/A	N/A
Town of DeWitt	360973	3/22/1974	11/4/2016	N/A	N/A	N/A
Town of Elbridge	360575	5/31/1974	11/4/2016	N/A	N/A	N/A
Town of Fabius	360577	8/16/1974	11/4/2016	N/A	N/A	N/A
Town of Geddes	360579	5/17/1974	11/4/2016	N/A	N/A	N/A
Town of LaFayette	360581	8/2/1974	11/4/2016	N/A	N/A	N/A
Town of Lysander	360583	12/13/1974	11/4/2016	N/A	N/A	N/A
Town of Manlius	360584	2/22/1974	11/4/2016	N/A	N/A	N/A
Town of Marcellus	360585	5/3/1974	11/4/2016	N/A	N/A	N/A
Town of Onondaga	360588	8/30/1974	11/4/2016	N/A	N/A	N/A
Town of Otisco	360589	5/31/1974	11/4/2016	N/A	N/A	N/A
Town of Pompey	360590	5/31/1974	11/4/2016	N/A	N/A	N/A
Town of Salina	360591	4/11/1975	11/4/2016	N/A	N/A	N/A

[79] Federal Emergency Management Agency, National Flood Insurance Program. (2024). Community Status Book Report. Retrieved from https://www.fema.gov/cis/NY.pdf.

Jurisdiction	Community ID	NFIP Participation Date	Current Effective FIRM Date	CRS Entry Date	CRS Current Effective Date	CRS Class
Town of Skaneateles	360592	11/8/1974	11/4/2016	N/A	N/A	N/A
Town of Spafford	360594	12/13/1974	11/4/2016	N/A	N/A	N/A
Town of Tully	361296	10/18/1974	11/4/2016	N/A	N/A	N/A
Town of Van Buren	360596	5/3/1974	11/4/2016	N/A	N/A	N/A
Village of Baldwinsville	360569	3/15/1974	11/4/2016	N/A	N/A	N/A
Village of Camillus	360571	7/30/1976	11/4/2016	N/A	N/A	N/A
Village of East Syracuse	360574	4/12/1974	11/4/2016	N/A	N/A	N/A
Village of Elbridge	360576	5/31/1974	11/4/2016	N/A	N/A	N/A
Village of Fabius	360689	--	11/4/2016	N/A	N/A	N/A
Village of Fayetteville	360578	7/26/1974	11/4/2016	N/A	N/A	N/A
Village of Jordan	360580	4/12/1974	11/4/2016	N/A	N/A	N/A
Village of Liverpool	360582	7/26/1974	11/4/2016	N/A	N/A	N/A
Village of Manlius	360977	8/2/1974	11/4/2016	N/A	N/A	N/A
Village of Marcellus	360586	4/12/1974	11/4/2016	N/A	N/A	N/A
Village of Minoa	361017	6/28/1974	11/4/2016	N/A	N/A	N/A
Village of North Syracuse	360587	6/7/1974	11/4/2016	N/A	N/A	N/A
Village of Skaneateles	360593	5/31/1974	11/4/2016	N/A	N/A	N/A
Village of Solvay	361564	--	11/4/2016	N/A	N/A	N/A
Village of Tully	361552	10/18/1974	11/4/2016	N/A	N/A	N/A

3.9.1. Floodplain Administrators

All NFIP participating jurisdictions have a designated Floodplain Administrator who is charged with enforcing floodplain regulations, routinely monitoring the floodplains, and providing community assistance, such as encouraging owners to maintain flood insurance. A list of Onondaga County Floodplain Administrators (County and cities) can be found in **Table 3-31**. Floodplain management in Onondaga County is managed at the municipal level, so the County does not have a designated Floodplain Administrator.

Table 3-31. Floodplain Administrators

Jurisdiction	Name	Title	Department	Phone Number
Onondaga County	N/A	N/A	N/A	N/A
City of Syracuse	Jake Dishaw	Deputy Commissioner of Code Enforcement	Code Enforcement	(315) 448-4706
Town of Camillus	Greg Humphrey	Code Enforcement Officer	Office of Code Enforcement / Building Inspection	(315) 488-1335
Town of Cicero	Steven Procopio	Director of Code Enforcement	Zoning & Planning Department	(315) 699-2201
Town of Clay	Mark Territo	Planning Commissioner	Department of Planning and Development	(315) 652-3800 Ext. 124
Town of DeWitt	Doug Miller	Town Engineer	Miller Engineers	(315) 558-8417

Jurisdiction	Name	Title	Department	Phone Number
Town of Elbridge	James White	Highway Superintendent	Highway Department	(315) 689-9031
Town of Fabius	Mike Decker	Code Enforcement Officer	Code Enforcement and Zoning	(315) 378-2722
Town of Geddes	Greg Sgromo	Town Engineer	Code Enforcement Department	(315) 449-4940
Town of LaFayette	Robert Lamson	Code Enforcement Officer	Planning & Zoning	(315) 677-5371
Town of Lysander	Timothy Wolsey	Code Enforcement Officer	Codes, Planning, Zoning	(315) 638-1210
Town of Manlius	Thomas Poitras	Code Enforcement Officer	Planning & Development	(315) 637-8619
Town of Marcellus	John Houser	Code Enforcement Officer	Code Enforcement Office	(315) 673-3269 Ext. 4
Town of Onondaga	Christopher Perdue	Code Enforcement Officer	Code Enforcement Department	(315) 469-3144
Town of Otisco	Robert Hayes	Code Enforcement Officer	Code Enforcement	(315) 378-6737
Town of Pompey	Tim Bearup	Codes Officer	Building/Zoning Department	(315) 682-9877
Town of Salina	Mark Lafaver	Director	Department of Planning and Development	(315) 451-0492
Town of Skaneateles	Robert Herrmann Jr.	Code Enforcement Officer	Building & Codes Department	(315) 685-0833
Town of Spafford	Howard Tanner	Code Enforcement Officer	Building/Codes Department	(315) 730-7439
Town of Tully	Benjamin Vincent	Code Enforcement Officer	Zoning & Building Department	(315) 696-4693 Ext. 19
Town of Van Buren	Tim Gainey	Code Enforcement Officer	Code Enforcement Office	(315) 635-3604
Village of Baldwinsville	Gregory Sgromo	Village Engineer	Code Enforcement	(315) 449-4940
Village of Camillus	Bill Reagan	Code Enforcement Officer	Code Enforcement Office	(315) 430-7927
Village of East Syracuse	Chris Shields	Director of Code Enforcement	Building and Code Enforcement Department	(315) 437-3541 Ext. 3206
Village of Elbridge	Howard Tanner	Code Enforcement Officer	Codes Office	(315) 689-3404
Village of Fabius	N/A	N/A	N/A	N/A
Village of Fayetteville	Michael E. Jones	Code Enforcement Officer	Building and Codes Department	(315) 637-9864
Village of Jordan	Harold Gilfus	Code Enforcement Officer	Codes Office	(315) 374-3631
Village of Liverpool	Bill Reagan	Code Official	Building Safety & Code Enforcement Department	(315) 430-7927
Village of Manlius	Michael Decker	Code Enforcement Officer	Code Enforcement, Building and Zoning Department	(315) 720-8544
Village of Marcellus	Paul Stacey	Code Enforcement Officer	Codes Enforcement Office	(315) 673-3112

Jurisdiction	Name	Title	Department	Phone Number
Village of Minoa	Michael Jones	Code Enforcement Officer	Office of Code Enforcement	(315) 656-3100
Village of North Syracuse	Nick Rohm	Code Enforcement Officer	Code Enforcement Department	(315) 458-4763
Village of Skaneateles	Cosimo Pagano	Director of Municipal Operations	Department of Public Works	(315) 552-4053
Village of Solvay	John Camp	Code Enforcement Officer	Code Enforcement Office	(315) 455-2000
Village of Tully	Benjamin Vincent	Code Enforcement Officer	Zoning & Planning Department	(315) 696-4693 Ext. 19

3.9.2. New York State Floodplain Management

Two (2) departments have statutory authorities and programs that affect floodplain management at the local jurisdiction level in New York State – the New York State Department of Environmental Conservation (NYSDEC) and the Department of State's Division of Code Enforcement and Administration (DCEA).

NYSDEC is charged with conserving, improving, and protecting the State's natural resources and environment, and preventing, abating, and controlling water, land, and air pollution. Programs that have bearing on floodplain management are managed by the Bureau of Flood Protection and Dam Safety, which cooperates with federal, state, regional, and local partners to protect lives and property from floods, coastal erosion, and dam failures. These objectives are accomplished through floodplain management and both structural and nonstructural means. Three (3) sections under the Bureau support the aforementioned objectives.

- The **Dam Safety Section** is responsible for reviewing repairs and modifications to dams and assuring that dam owners operate and maintain dams in a safe condition through inspections, technical reviews, enforcement, and emergency planning.
- The **Flood Control Projects Section** is responsible for reducing flood risk to life and property through the construction, operation, and maintenance of flood control facilities.
- The **Coastal Erosion and Floodplain Management Section** has two (2) branches:
    - The ***Coastal Erosion Branch*** works to reduce coastal erosion and storm damage to protect lives, natural resources, and properties through structural and non-structural means.
    - The ***Floodplain Management Branch*** is responsible for reducing flood risk to life and property through management of activities, including development in flood hazard areas, and for reviewing and developing revised flood maps. The Branch serves as the NFIP State Coordinating Agency and, in this capacity, is the liaison between FEMA and New York communities that elect to participate in the NFIP. The Section provides a wide range of technical assistance.

3.9.3. Participation Activities

Floodplain management in Onondaga County is managed at the municipal level; however, the County continues to support municipalities in the following NFIP activities:

- Provides the following services – permit review, GIS, inspections, and engineering capability.
- Educates private owners and other stakeholders about the importance of flood insurance through public outreach events, workshops, and/or seminars.

- Enforces local floodplain regulations and monitors compliance
- Ensures floodplain management regulations meet or exceed FEMA or State minimum requirements.

NFIP participation for each plan participant can be found in their respective annex.

3.9.3.1. Freeboard

New York State Building Code (2020): *Chapter 16 (Structural Design), Section 1612 (Flood Loads), 1612.3.1 (Design Flood Elevations), 1612.3.1.1 (Freeboard)*

[NY] 1612.3.1 Design Flood Elevations: Where design flood elevations are not included in the flood hazard areas established in Section 1612.3 (Establishment of Flood Hazard Areas), or where floodways are not designated, the building official is authorized to require the applicant to do one (1) of the following:

- Obtain and reasonably utilize any design flood elevation (DFE) and floodway data available from a federal, state, or other source.
- Determine the design flood elevation or floodway in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a registered design professional who shall document that the technical methods used reflect currently accepted engineering practice.

[NY] 1612.3.1.1 Freeboard: The design flood elevation for the design and construction of buildings and structures shall be determined in accordance with Sections 1612.3 (Establishment of Flood Hazard Areas) through 1612.3.1 (Design Flood Elevations), as applicable, plus a freeboard of two (2) feet.

When there is a base flood elevation (BFE) available, the lowest floor, including any basement, must be at or above the BFE plus two (2) feet. Elevation may be by means of properly compacted fill, a solid slab foundation, or a "crawl space" foundation, which contains permanent openings to let flood waters in and out. Non-residential structures may be flood-proofed in lieu of elevation. Where a local floodplain administrator has information to estimate a BFE (e.g., historic flood records or a hydraulic study), that elevation must be utilized. If the development consists of more than five (5) acres or more than 50 lots, the permit applicant must develop a BFE and build accordingly. Communities may exceed this requirement by providing additional freeboard. In most New York communities, new structures must have the lowest floor at three (3) feet or more above the highest adjacent grade.

3.9.3.2. Substantial Damage

New York State Building Code (2020): *Chapter 16 (Structural Design), Section 1612.1*

Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50% of the market value of the structure before the damage occurred.

3.9.3.3. Substantial Improvement

New York State Building Code (2020): *Chapter 16 (Structural Design), Section 1612.1*

Any repair, reconstruction, rehabilitation, alteration, addition, or other improvement of a building or structure, the cost of which equals or exceeds 50% of the market value of the structure before the improvement or repair is started. If the structure has sustained *substantial damage*, any repairs are considered substantial improvement regardless of the actual repair work performed. The term does not, however, include either:

- Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the building official and that are the minimum necessary to assure safe living conditions.
- Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure.

3.9.3.4. Substantial Damage/Substantial Improvement Determination Process

Substantial Damage/Substantial Improvement determinations are managed at the municipal level by local officials responsible for enforcing floodplain management ordinances. *Refer to each jurisdictional annex for further information on the Substantial Damage/Substantial Improvement determination process within their jurisdiction.*

3.10. HAZARD MITIGATION PLAN INTEGRATION

For a community to successfully reduce long-term risk, hazard mitigation must be integrated into day-to-day planning processes and initiatives. Plan integration is the process by which communities critically assess the existing planning framework and align efforts with the goal of reducing long-term risk and building a more resilient community. It involves a two (2) way exchange of information and incorporation of ideas and concepts between hazard mitigation plans and other community plans. In particular, plan integration involves incorporating hazard mitigation principles and actions into other plans and integrating planning mechanisms into hazard mitigation plans. Plan integration involves community plans, policies, codes, and programs that guide development, roles, and responsibilities in implementing these capabilities. Additionally, plan integration is achieved through the involvement of key staff and community officials in collaborative hazard mitigation planning.

3.10.1. Existing Plan Integration

A hazard mitigation plan must explain how the jurisdiction incorporated the previous Plan update over the last five (5) years to demonstrate progress in local mitigation efforts. During the performance period since the adoption of the previous Hazard Mitigation Plan, Onondaga County has made progress in integrating components of the hazard mitigation strategy (e.g., goals, objectives, and actions) into the planning initiatives and mechanisms. **Table 3-32** highlights the planning mechanisms/initiatives in which the previous Plan was integrated and the information integrated.

Table 3-32. Current Plan Integration

Planning Initiative	Integration Description
Comprehensive Plan	The County's Comprehensive Plan, updated in 2023, considers hazard-prone areas at a countywide scale and aims to foster environmental protection, sensible development and land use practices, and natural hazard risk management.
Capital Improvement Plan	The Plan includes projects that can help mitigate potential hazards. The County will strive to ensure consistency between the Hazard Mitigation Plan and the current and future Capital Improvement Plan. The Hazard Mitigation Plan may identify new possible funding sources for capital improvement projects and may result in modifications to proposed projects based on the results of the hazard risk assessment.
Stormwater Management Program	Onondaga County is a covered Municipal Separate Storm Sewer System (MS4) entity with a formal Stormwater Management Program. The Stormwater Management Program is designed to reduce the discharge of pollutants to the maximum extent practicable (MEP) in order to protect water quality, satisfy the appropriate water quality requirements, and mitigate stormwater flooding.

Planning Initiative	Integration Description
Comprehensive Emergency Management Plan	The County's Comprehensive Emergency Management Plan (CEMP) is an all-hazards plan that outlines how the County will efficiently and effectively manage emergency and disaster situations. Furthermore, it includes a Continuity of Operations Plan (COOP). The CEMP references the process, organizational procedures, and coordination to identify mitigation opportunities during response.

3.10.2. Potential Future Integration

A hazard mitigation plan must explain how the jurisdiction intends to incorporate this Plan update into planning mechanisms over the next five (5) years. The capability assessment presented in Section 4 of this Annex identifies codes, plans, and programs that provide opportunities for integration. **Table 3-33** outlines planning mechanisms/initiatives that do not currently integrate the goals and recommendations of this Plan but provide opportunities to do so in the future.

Table 3-33. Potential Future Integration

Planning Initiative	Integration Description
Comprehensive Plan	The County's Comprehensive Plan should consider incorporating the mitigation goals and objectives from this Hazard Mitigation Plan update. Furthermore, it could leverage the hazard risk assessment (2025 update) to enhance land use, open space, and housing policies in hazard-prone areas, better supporting the Comprehensive Plan's overall vision and goals while also reducing hazard risk.
Climate Action Plan	The Climate Action Plan includes a baseline inventory of the County's carbon emissions, a breakdown of those emissions by source, and recommendations to improve the County's greenhouse gas inventory. The County could leverage the Climate Action Plan to identify mitigation actions and initiatives for inclusion in this Hazard Mitigation Plan. This would not only enhance the greenhouse gas inventory but also help reduce the severity of climate change impacts on the hazards identified in the Hazard Mitigation Plan.
Stormwater Management Program	The County will integrate updated standards and guidelines from this Hazard Mitigation Plan (2025 update) into the MS4 process and Stormwater Management Program. Mitigation actions to reduce the risk of stormwater flooding could be identified and incorporated into the Hazard Mitigation Plan to explore potential funding opportunities.
Open Space Strategies and Conservation Standards	The County's Department of Planning and other agencies work with existing agencies and organizations to develop open space strategies and conservation standards that new developments must meet. The updated Hazard Mitigation Plan could be leveraged when updating these strategies and standards for new developments.
County Budget	The County could include a line item for mitigation projects/activities in the capital improvements budget and/or county budget.

The County's Local Planning Team will identify all relevant planning initiatives scheduled for update in the next year and during the annual update process of the Hazard Mitigation Plan. Additionally, the Local Planning Team will identify opportunities to integrate key elements of the Hazard Mitigation Plan, specifically relevant strategies, into the planning initiatives. Mitigation actions were identified to promote plan integration in future revisions of this Plan.

CHAPTER 4. HAZARD IDENTIFICATION AND RISK ASSESSMENT

A risk assessment is the process of measuring the potential loss of life, personal injury, economic losses, and property damage resulting from identified hazards. It allows planning personnel to address and reduce hazard impacts and emergency management personnel to establish early response priorities by identifying potential hazards and vulnerable assets. Results of the risk assessment are used in subsequent mitigation planning processes, including the determination and prioritization of mitigation actions that reduce each jurisdiction's risk from a specified hazard. Past, present, and future conditions must be evaluated to most accurately assess risk for the County and each jurisdiction. The process focuses on the following elements:

- **Hazard identification:** Use all available information to determine what types of hazards may affect a jurisdiction, how often they can occur, and their potential severity.
- **Vulnerability Identification:** Determine the impact of natural hazard events on the population, environment, economy, and lands of the region. Develop hazard profiles to understand each hazard in terms of:
    - Location (geographic area within the planning area most affected by the hazard)
    - Extent/Intensity (severity of each hazard)
    - Probability and Frequency
    - Past events
- **Assess Vulnerability and Impacts:**
    - Exposure identification: Estimate the total number of assets in the jurisdiction that are likely to experience a hazard event if it occurs by overlaying hazard maps with the asset inventories.
    - Vulnerability identification and loss estimation: Assess the impact of hazard events on the people, property, economy, and lands of the region, including estimates of the cost of potential damage or costs that can be avoided by mitigation.
    - Future changes that may impact vulnerability: Analyze how demographic changes, projected development, and climate change impacts can alter current exposure and vulnerability.

This Plan is designated to comply with requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities and 44 CFR Part 201 (44 CFR § 201.6), which states that local governments must have an approved Hazard Mitigation Plan in place for eligibility of pre-disaster and/or post-disaster mitigation grant funds. This Plan is also designed to comply with FEMA and NYS DHSES guidance documents (particularly the Local Mitigation Planning Policy Guide, effective April 19, 2023), as well as other applicable federal, state, and local regulations. This was accomplished by evaluating the impacts of known natural hazards, prioritizing mitigation alternatives, and coordinating hazard mitigation with other Onondaga County programs and policies.

4.1. IDENTIFIED HAZARDS

To provide a strong foundation for mitigation actions in this Plan, Onondaga County focused on a full range of hazards that could impact the planning area, then identified and ranked those that posed the greatest concern. The hazard of concern identification process incorporated input from:

- County departments
- Participating jurisdictions
- 2023 New York State Hazard Mitigation Plan
- 2019 Onondaga County Hazard Mitigation Plan
- Hazard planning documents developed by state, federal, and private agencies on the frequency, magnitude, and costs associated with the various hazards that have previously, or could feasibly, impact the region
- National Centers for Environmental Information data from 2019 through 2024
- National Oceanic and Atmospheric Administration
- National Weather Service
- United States Geological Survey
- FEMA National Risk Index
- Qualitative or anecdotal information regarding natural hazards and the perceived vulnerability of the planning area assets

There are a number of hazards that pose a threat to human life, health, and well-being, and this Plan is not meant to compile an exhaustive list. Those addressed in disaster planning are generally categorized as natural, human-caused, or technological. This Plan focuses solely on natural hazards relevant to Onondaga County. While some hazards can affect the entire County, others (e.g., flooding) are more localized in their geographic extent.

Hazards that have been ranked as significant in Onondaga County will be considered in this Plan, as listed in **Table 4-1**.

Table 4-1. Onondaga County Hazards

Natural Hazards
Drought
Earthquake
Heat Wave/Extreme Heat
Flood *(riverine, flash/urban, ice jam, dam and levee failure)*
Geological Hazards *(landslides, land subsidence, mudboils)*
Harmful Algal Bloom
Invasive Species and Infestation *(Emerald Ash Borer, Hemlock Woolly Adelgid, True Armyworm, Common Reed (Phragmites), Eurasian Watermilfoil, Water Chestnut, Tick-Borne Diseases, Mosquito-Borne Diseases)*
Severe Weather *(severe thunderstorms – hail, strong winds/damaging winds, tornadoes – hurricane/tropical storm)*
Winter Weather *(winter storms – snowstorms, blizzards, lake effect storms, ice storms, nor'easter – cold wave/extreme cold)*
Wildfire *(wildfire smoke)*
Note: *As per the 2019 Onondaga County Hazard Mitigation Plan, the Steering Committee and Planning Partnership maintained the grouping of hazards, based on the similarity of hazard events, their typical concurrence or their impacts, consideration of how hazards have been grouped FEMA guidance documents (e.g., FEMA 386-2, Understanding Your Risks, Identifying Hazards and Estimating Losses, FEMA's Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy, FEMA's Local Mitigation Planning Handbook), and consideration of hazard grouping in the State's Hazard Mitigation Plan.*

Per FEMA's requirement to consider all natural hazards, the following natural hazards were not included because they are not considered significant for the Onondaga County planning area, given its geographic location and lack of significant historical occurrences.

- Avalanche
- Coastal Flooding
- Lightning
- Tsunami
- Volcanic Activity

The 2025 Onondaga County Hazard Mitigation Plan update incorporates the best available data throughout the Plan to provide an updated understanding of the risks Onondaga County faces.

4.1.1. Climate Change Analysis

Onondaga County Department of Planning partnered with the Center of Excellence for Risk-Based Community Resilience Planning at Colorado State University and AT&T to conduct a climate analysis for four (4) of the hazards identified for this Plan – heat wave/extreme heat, flooding (i.e., pluvial flooding), harmful algal blooms, including changes in stormwater runoff, and winter weather. The Climate Risk and Resilience Portal (ClimRR) data was combined with other publicly available datasets to provide region-specific climate insights. ClimRR provides peer-reviewed climate datasets in a nontechnical format and puts high-resolution, forward-looking climate data into the hands of communities that need them most. Through this tool, community leaders and public safety officials can understand how changing climate risks will affect the populations within their communities. Furthermore, access to this information will assist leaders in strategically investing in infrastructure and response capabilities to protect communities for future generations. Currently, ClimRR has climate projection maps available for temperature, heat index, precipitation, wind, and fire weather.

The maps included in this analysis highlight climate projections for Onondaga County and show only a subset of the available maps in ClimRR. All the data presented has been modeled by dynamically downscaling an ensemble of three (3) separate global climate models using the Weather Research and Forecasting model (WRF), which is the regional climate model of North America. The following definitions and clarifications will help better understand the maps presented in this Plan.

- **RCP4.5** represents a scenario in which human greenhouse gas (GHG) emissions peak around 2040, then decline.
- **RCP8.5** represents the worst-case scenario in which human GHG emissions continue to rise throughout the 21st century.
- **Historical** maps are also the result of climate modeling. These do not reflect actual recorded values from the past, but rather the model outputs when historic GHG emission values are used as inputs.
- Timeframes:
    - **Historical/Baseline:** 1995 – 2004
    - **Mid-Century:** 2045 – 2054

ClimRR is designed to be interactive with FEMA's Resilience Analysis and Planning Tool (RAPT) to provide local data on social vulnerability and community characteristics. RAPT includes GIS data layers of community characteristics that represent potential challenges to disaster resilience, important data layers for equity considerations, and community infrastructure locations and characteristics. For example, analysts were able to focus planning efforts on communities most vulnerable to the impacts of heat waves/extreme heat events by viewing

projections of high temperatures in the future alongside community data on populations with disabilities or those who are electrically dependent.

The complete analysis has been summarized in an ArcGIS StoryMap that can be accessed via the following link: ongov.net/planning/haz.html. The information for the hazards analyzed in this report can be found under the vulnerability and impacts section of each hazard profile (i.e., heat wave/extreme heat, flood, harmful algal bloom, and winter weather).

4.2. PRESIDENTIAL DISASTER AND EMERGENCY DECLARATIONS

Presidential disaster declarations are typically issued for hazard events that cause more damage than state and local governments can manage without assistance from the Federal government. However, no specific dollar loss threshold has been established for these declarations. A presidential disaster declaration activates federal recovery programs to help disaster victims, businesses, and public entities. Some of the programs are matched by state programs. Review of presidential disaster declarations helps establish the probability of recurrence for each hazard and identify targets for risk reduction. **Table 4-2** lists all federal disaster and emergency declarations that included Onondaga County between May 1954 and December 2024, according to FEMA.

Table 4-2. Disaster Declarations for Onondaga County

Disaster Number	Incident Period	Declaration Date	Incident Category	Title
DR-4625	August 18 – 19, 2021	October 8, 2021	Hurricane	Remnants of Tropical Storm Fred
DR-4480	January 20, 2020 – May 11, 2023	March 20, 2020	Biological	COVID-19 Pandemic
EM-3434	January 20, 2020 – May 11, 2023	March 13, 2020	Biological	COVID-19
EM-3351	October 27 – November 8, 2012	October 28, 2012	Hurricane	Hurricane Sandy
DR-1993	April 26 – May 8, 2011	June 10, 2011	Flood	Severe Storms, Flooding, Tornadoes, and Straight-line Winds
EM-3262	August 29 – October 1, 2005	September 30, 2005	Hurricane	Hurricane Katrina Evacuation
DR-1564	August 13 – September 16, 2004	October 1, 2004	Severe Storm	Severe Storms and Flooding
DR-1534	May 13 – June 17, 2004	August 3, 2004	Severe Storm	Severe Storms and Flooding
EM-3186	August 14 – 16, 2003	August 23, 2003	Infrastructure	Power Outage
DR-1467	April 3 – 5, 2003	May 12, 2003	Severe Ice Storm	Ice Storm
DR-1391	September 11, 2001	September 11, 2001	Fire	Terrorist Attack
EM-3155	May 22 – November 1, 2000	October 11, 2000	Other	Virus Threat (West Nile Virus)
DR-1335	May 3 – August 13, 2000	July 21, 2000	Severe Storm	Severe Storms
DR-1244	September 7, 1998	September 11, 1998	Severe Storm	Severe Weather
DR-1095	January 19 – 30, 1996	January 24, 1996	Flood	Severe Storms/Flooding
EM-3107	March 13 – 17, 1993	March 17, 1993	Snowstorm	Severe Blizzard
DR-487	October 2, 1975	October 2, 1975	Flood	Severe Storms, Heavy Rain, Landslides, Flooding

Disaster Number	Incident Period	Declaration Date	Incident Category	Title
DR-447	July 23, 1974	July 23, 1974	Flood	Severe Storms, Flooding
DR-338	June 23, 1972	June 23, 1972	Flood	Tropical Storm Agnes

4.3. RISK ASSESSMENT METHODOLOGY

As part of the Onondaga County Department of Planning's hazard mitigation planning process, the risk assessment evaluates natural hazards that may impact all or portions of the County. Hazard identification, historical occurrences, and risk modeling (where applicable and available for specific hazards) information was collected from multiple sources, including, but not limited to:

- Environmental Systems Research Institute (Esri)
- Federal Emergency Management Agency
- National Centers for Environmental Information
- National Weather Services
- United States Geological Survey
- United States Drought Monitor
- Hazus (for Earthquake and Flood)
- Local repositories

This information was analyzed to assess the risks and vulnerabilities of people, property, the environment, and the jurisdiction's essential operations posed by these hazards. Furthermore, a risk ranking was performed for the hazards of concern described in this Plan. The risk ranking is an important step in developing an action plan, as it allows jurisdictions to compare risk factors across hazards. That comparison provides critical information for selecting hazard mitigation actions and their priorities. This process is not only intended to help focus actions on the hazards with the highest ranking, but also to ensure that jurisdictions are aware of the hazards that ranked low yet still pose significant risk.

In order to provide an informed and comprehensive ranking of the hazards addressed in this Plan, a number of factors were considered – probability, extent, vulnerability, and impact. The sum of all the weighted factors for the extent, vulnerability, and impact categories was combined into a final consequence score. Probability multiplied by the consequence yielded a total risk score for each hazard.

Extent + Vulnerability + Impact = Consequence

Consequence x Probability = Total Risk Score

These results were determined by conducting a data-driven quantitative assessment, reviewing and ranking local knowledge from local subject matter experts, and developing other risk elements by the Core Planning Team based on the collected data. These elements were then aggregated to inform the analysis.

At the fundamental level, consequence is an assessment of the potential impact(s) if the hazard incident actually occurs. In this assessment, the consequence of an event (or the impact) will be interdependent on the following factors:

- Vulnerabilities (i.e., social, physical, and community conditions)
- Capabilities and capacities
- Mitigation
- Characteristics of the hazard event (i.e., magnitude, scale)

The frequency/probability of the hazard is not included in assessing the consequence because, without the event, there is no consequence or impact.

4.3.1. Probability of Occurrence

The probability of occurrence of a hazard is indicated by a probability factor based on the likelihood of annual occurrence. Numerical probability factors were assigned as follows.

Table 4-3 outlines the probability of occurrence factors used in the risk assessment calculations for this Plan. A significant hazard event is defined as any hazard occurrence that directly or indirectly damages structures or infrastructure, impedes normal business operations, and/or is likely to cause serious or fatal injuries.

Table 4-3. Probability of Occurrence

Probability	Description	Probability Factor
High	Significant hazard event is likely to occur annually.	3
Medium	Significant hazard event is likely to occur within 25 years.	2
Low	Significant hazard event is likely to occur within 100 years.	1
Unlikely	There is little to no probability of significant occurrence, or the recurrence interval is greater than every 100 years.	0

The assessment of hazard frequency is generally based on past hazard events in the area and the professional judgment of local subject matter experts.

4.3.2. Extent Factors

Extent was assessed in two (2) categories – extent/intensity potential and the catastrophic probability of the hazard. Numerical extent factors were assigned as follows.

4.3.2.1. Extent/Intensity Factor

Extent is defined as the range of anticipated intensities of the identified hazards. This category is most commonly expressed using various scientific scales (e.g., Saffir-Simpson, Enhanced Fujita, Modified Mercalli). Extent/Intensity Factors are hazard-specific and are detailed in each hazard profile. **Table 4-4** outlines the extent/intensity factors used in the risk assessment calculations for this Plan.

Table 4-4. Extent/Intensity Factor

Probability	Description	Probability Factor
High	Historical and/or probabilistic models/studies for this hazard indicate the possibility of a high-intensity incident.	3
Medium	Historical and/or probabilistic models/studies for this hazard indicate the possibility of a medium-intensity incident.	2
Low	Historical and/or probabilistic models/studies for this hazard indicate the possibility of a low-intensity incident.	1
Unlikely	Historical and/or probabilistic models/studies for this hazard indicate the possibility of little to no intensity.	0

4.3.2.2. Catastrophic Factor

The probability that a hazard could be catastrophic. Catastrophes are defined as significant incidents that cause sudden and great harm or destruction. **Table 4-5** outlines the catastrophic factors used in the risk assessment calculations for this Plan.

Table 4-5. Catastrophic Factor

Probability	Description	Probability Factor
High	High potential that this hazard could be catastrophic.	3
Medium	Medium potential that this hazard could be catastrophic.	2
Low	Low potential that this hazard could be catastrophic.	1
Unlikely	Virtually no probability that this hazard could be catastrophic.	0

Each category was assigned a weighting factor to reflect its significance, consistent with what is typically used for measuring the benefits of hazard mitigation actions – a weighting factor of three (3) was assigned for *Extent/Intensity* and its potential for *Catastrophe*.

4.3.3. Vulnerability Factors

Vulnerabilities were assessed in three (3) categories – population exposure, property exposure, and exposure based on changes in development. Numerical vulnerability factors were assigned as follows.

4.3.3.1. Population Exposure Factor

Population exposure values were assigned based on the percentage of the total population exposed to the hazard event. **Table 4-6** outlines the population exposure factors used in the risk assessment calculations for this Plan.

Table 4-6. Population Exposure Factor

Probability	Description	Probability Factor
High	30% or more of the population is exposed to the hazard.	3
Medium	15% to 29% of the population is exposed to the hazard.	2
Low	14% or less of the population is exposed to the hazard.	1
No Vulnerability	None of the population is exposed to the hazard.	0

4.3.3.2. Property Exposure Factor

Property exposure values were assigned based on the percentage of the total property value exposed to the hazard event. **Table 4-7** outlines the property exposure factors used in the risk assessment calculations for this Plan.

Table 4-7. Property Exposure Factor

Probability	Description	Probability Factor
High	25% or more of the total assessed property value is exposed to the hazard.	3
Medium	10% to 24% of the total assessed property value is exposed to a hazard.	2
Low	9% or less of the total assessed property value is exposed to a hazard.	1
No Vulnerability	None of the total assessed property value is exposed to a hazard.	0

4.3.3.3. Changes in Development

Changes in development in the past five (5) years have increased or decreased the community's vulnerability/exposure to the hazard. **Table 4-8** outlines the changes in development factors used in the risk assessment calculations for this Plan.

Table 4-8. Changes in Development Factor

Probability	Description	Probability Factor
High	Changes in development have increased the vulnerability/exposure of the community to the hazard by 10% or more.	3
Medium	Changes in development have increased the vulnerability/exposure of the community to the hazard between 5% and 9%.	2
Low	Changes in development have increased the vulnerability/exposure of the community to the hazard by 4% or less.	1
No Vulnerability	Changes in development had no effect and/or have decreased the vulnerability/exposure of the community to the hazard.	0

Each category was assigned a weighting factor to reflect the significance, consistent with those typically used for measuring the benefits of hazard mitigation actions – a weighting factor of three (3) was assigned for *Population Exposure*, and a weighting factor of one (1) was assigned for *Property Exposed* and *Changes in Development*.

4.3.4. Impact Factors

Hazard impacts were assessed in eight (8) categories – population and life/safety, underserved/equity, property damage, economic, environmental, essential operations, future development, and climate change. Numerical impact factors were assigned as follows.

4.3.4.1. Population and Life Safety Factor

Population and life safety values were assigned based on the best available data (historical and probabilistic) for people vulnerable to the hazard event and whether the affected population is likely to experience adverse impacts from the hazard incident. **Table 4-9** outlines the population and life safety factors used in the risk assessment calculations for this Plan.

Table 4-9. Population and Life Safety Factor

Probability	Description	Probability Factor
High	Populations exposed to this hazard are likely to experience significant adverse impacts, such as fatalities and severe injuries.	3
Medium	Populations exposed to this hazard are likely to experience some adverse impacts, such as injuries requiring acute medical care.	2
Low	Populations exposed to this hazard are likely to experience minimal adverse impacts, such as ambulatory injuries.	1
No Impact	Populations exposed to this hazard are not likely to experience significant adverse impacts.	0

4.3.4.2. Underserved/Equity Factor

Underserved/equity values were assigned based on the best available data for underserved populations vulnerable to the hazard event and on whether the affected population is likely to experience adverse/disproportionate impacts from the hazard incident, resulting in greater equity disparities. **Table 4-10** outlines the underserved/equity factors used in the risk assessment calculations for this Plan.

Table 4-10. Underserved/Equity Factor

Probability	Description	Probability Factor
High	Underserved populations exposed to the hazard are likely to experience significant adverse/disproportionate impacts, such as fatalities and severe injuries.	3
Medium	Underserved populations exposed to the hazard are likely to experience some adverse/disproportionate impacts, such as injuries requiring acute medical care.	2
Low	Underserved populations exposed to the hazard are likely to experience minimal adverse/disproportionate impacts, such as ambulatory injuries.	1
No Impact	Underserved populations exposed to the hazard are not likely to experience significant adverse/disproportionate impacts.	0

4.3.4.3. Property Damage Factor

Property damage values were assigned based on the expected total property damage incurred from a hazard incident. It is important to note that values represent estimates of the loss from a major incident based on historical data or probabilistic models/studies. **Table 4-11** outlines the property damage factors used in the risk assessment calculations for this Plan.

Table 4-11. Property Damage Factor

Probability	Description	Probability Factor
High	More than $5 Million in property damages is expected from a single major hazard event, or damages are expected to occur to 15% or more of the property value within the jurisdiction.	3
Medium	More than $500,000 but less than $5 Million in property damages is expected from a single major hazard event, or damages are expected to occur to more than 5% but less than 15% of the property value within the jurisdiction.	2
Low	Less than $500,000 in property damages is expected from a single major hazard event, or less than 5% of the property value within the jurisdiction	1
No Impact	Little to no property damage is expected from a single major hazard event.	0

4.3.4.4. Economic Factor

An estimate of the impact, expressed in dollars, on the local economy is based on a loss of business revenue, crop losses, worker wages, and local tax revenues, or on the impact on the local gross domestic product (GDP). **Table 4-12** outlines the economic factors used in the risk assessment calculations for this Plan.

Table 4-12. Economic Factor

Probability	Description	Probability Factor
High	Where the total economic impact is likely to be greater than $10 Million.	3
Medium	Total economic impact is likely to be greater than $100,000, but less than or equal to $10 Million.	2
Low	Total economic impact is not likely to be greater than $100,000.	1
No Impact	Virtually no significant economic impact.	0

4.3.4.5. Environmental Factor

An estimate of the environmental impact from a major hazard event requiring outside resources and support, and/or repair, clean-up, restoration, and/or preservation work. **Table 4-13** outlines the environmental factors used in the risk assessment calculations for this Plan.

Table 4-13. Environmental Factor

Probability	Description	Probability Factor
High	Environmental impact from a single major hazard event is likely to be significant, requiring extensive outside resources and support; and/or repair, clean-up, restoration, and/or preservation work.	3
Medium	Environmental impact from a single major hazard event is likely to be localized, requiring some outside resources and support; and/or repair, clean-up, restoration, or preservation work.	2
Low	Environmental impact from a single major hazard event is likely to be minimal, requiring little to no outside resources and support, and/or minimal repair, clean-up, restoration, or preservation work.	1
No Impact	No environmental impacts from a single major hazard event are likely.	0

4.3.4.6. Essential Operations Factors

The essential operations factor is the impact on the jurisdiction's ability to meet the community's essential day-to-day operational demands and needs after a single major hazard event. **Table 4-14** outlines the essential operations factors used in the risk assessment calculations for this Plan.

Table 4-14. Essential Operations Factor

Probability	Description	Probability Factor
High	Impact greater than 72 hours on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event.	3
Medium	Impact between 24 and 72 hours on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event.	2
Low	Impact less than 24 hours on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event.	1
No Impact	No impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event.	0

4.3.4.7. Future Development Factor

The future development factor is the potential for future development to increase or decrease the impact/consequence of the hazard. **Table 4-15** outlines the future development factors used in the risk assessment calculations for this Plan.

Table 4-15. Future Development Factor

Probability	Description	Probability Factor
High	Future development trends will significantly increase the impact/consequence of this hazard.	3
Medium	Future development trends will increase the impact/consequence of this hazard, but not significantly.	2
Low	Future development trends will minimally increase the impact/consequence of this hazard.	1
No Impact	Future development trends will not increase the impact/consequence of the hazard, and/or may even decrease the impact/consequence of this hazard.	0

4.3.4.8. Climate Change Factor

The potential for climate change to increase the risk of the hazard (i.e., type, location, and range of anticipated intensities of the hazard and its impacts). **Table 4-16** outlines the climate change factors used in the risk assessment calculations for this Plan.

Table 4-16. Climate Change Factor

Probability	Description	Probability Factor
High	Climate Change trends will significantly increase the risk of this hazard and its impacts.	3
Medium	Climate Change trends will increase the risk of this hazard and its impacts, but not significantly.	2
Low	Climate Change trends will minimally increase the risk of this hazard and its impacts.	1
No Impact	Climate change trends will not increase the risk of the hazard and its impacts.	0

Each category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions – a weighting factor of three (3) was assigned for *Population and Life Safety*, and *Underserved/Equity*, and a weighting factor of two (2) was assigned for *Property Damage*. A weighting factor of one (1) was assigned for *Economic*, *Environmental*, *Essential Operations, Future Development*, and *Climate Change*.

4.4. FEMA NATIONAL RISK INDEX SCORE

The National Risk Index (NRI) is a dataset and online tool that illustrates the United States' communities most at risk for 18 natural hazards. These include:

- Avalanche
- Coastal Flooding
- Cold Wave
- Drought
- Earthquake
- Hail
- Heat Wave
- Hurricane
- Ice Storm
- Landslide
- Lightning
- Riverine Flooding
- Strong Wind
- Tornado
- Tsunami
- Volcanic Activity
- Wildfire
- Winter Weather

Not all the hazards on this list apply to Onondaga County; therefore, only those hazards with a defined risk to the County will be included in this Plan, as listed in **Table 4-1**. The NRI's goal is to fill gaps in available data and analyses to better inform federal, state, local, tribal, and territorial decision makers as they develop risk reduction strategies.

In the NRI, risk is defined as the potential for negative impacts from a natural hazard. The Risk Index is based on three (3) components – a natural hazards component (Expected Annual Loss), a consequence enhancing component (Social Vulnerability), and a consequence reduction component (Community Resilience). Using these components, the composite and hazard type Risk Index values are calculated for each community (county and Census Tract). Risk Index values form an absolute basis for measuring Risk within the NRI and are used to generate Risk Index percentiles and ratings across communities..[80] **Table 4-17** illustrates the Risk Index rating and score for Onondaga County.

[80] Federal Emergency Management Agency. (2023). Determining Risk. Retrieved from https://hazards.fema.gov/nri/determining-risk.

Table 4-17. Risk Index Score for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Rating	Score
Onondaga County	Relatively High	76.6
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

4.4.1. Expected Annual Loss

The Expected Annual Loss (EAL), the natural hazards component of the NRI, represents the average economic loss, in dollars, from natural hazards each year. It is calculated for each hazard type and quantifies loss for relevant consequence types – buildings, people, and agriculture. The EAL score and rating represent a community's relative level of expected losses each year when compared to other communities at the same level. Since the EAL score is positively associated with a community's risk, the higher EAL score results in a higher Risk Index score.[81] **Table 4-18** illustrates the EAL rating and score for Onondaga County.

Table 4-18. Expected Annual Loss for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Rating	Score
Onondaga County	Relatively High	77.8
Expected Annual Loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).		

An EAL score and rating are calculated independently for each consequence type (i.e., buildings, population, and agriculture) for each county and Census Tract. The population EAL is measured in fatalities and injuries, while the building and agriculture values are measured in dollars. However, for consistency in the unit of measurement, the population EAL was monetized into population equivalence using a value of statistical life (VSL) approach, where each fatality or 10 injuries is treated as $11.6 Million of economic loss.

4.4.2. Social Vulnerability

Social vulnerability, the consequence enhancing risk component of the NRI, measures the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate deaths, injuries, losses, or disruptions to livelihoods. The Social Vulnerability score and rating represent the relative level of a community's social vulnerability compared to all other communities at the same level. A higher Social Vulnerability score results in a higher Risk Index score.[82] **Table 4-19** illustrates the Social Vulnerability rating and score for Onondaga County.

Table 4-19. Social Vulnerability for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Rating	Score
Onondaga County	Relatively Moderate	55.7
Social Vulnerability is measured using the Social Vulnerability Index (SoVI) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).		

[81] Federal Emergency Management Agency. (2023). Expected Annual Loss. Retrieved from https://hazards.fema.gov/nri/expected-annual-loss.
[82] Federal Emergency Management Agency. (2023). Social Vulnerability. Retrieved from https://hazards.fema.gov/nri/social-vulnerability.

4.4.3. Community Resilience

Community resilience, the consequence reduction risk component, measures the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. The Community Resilience score and rating represent the relative level of a community's resilience compared to all other communities at the same level. Since the score is inversely proportional to a community's risk, the higher Community Resilience score results in a lower Risk Index score.[83] **Table 4-20** illustrates the Community Resilience rating and score for Onondaga County.

Table 4-20. Community Resilience for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Rating	Score
Onondaga County	Very High	90.3
Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).		

4.5. TOTAL RISK SCORES

Table 4-21 represents the overall risk scores for Onondaga County, based on the Risk Assessment Methodology defined at the beginning of this section. Following a data-driven quantitative assessment, reviewing and ranking local knowledge from local subject matter experts, and developing other risk elements by the Core Planning Team based on data collected. These elements were aggregated to inform the analysis. The hazards are ranked from highest to lowest based on the Total Risk Score. However, if the Risk Score is the same, then it is ranked by the Probability Factor. If the Probability Factor is the same, then it is ranked by the sum of the Impact Factor. If the Impact Factor is the same, then it is ranked by the sum of the Vulnerability Factor.

[83] Federal Emergency Management Agency. (2023). Community Resilience. Retrieved from https://hazards.fema.gov/nri/community-resilience.

Table 4-21. 2025 Hazard Risk Score for Onondaga County

Hazard Event	Probability	Consequence (Sum of weighted factors)				Total Risk
	Probability Factor	Extent (sum of the weighted Extent factors)	Vulnerability (sum of the weighted Vulnerability factors)	Impact (sum of the weighted Impact factors)	Consequence Score	Total Risk Score (Probability x Consequence)
Flood (Urban/Flash Flood)	3	12	11	29	52	73
Winter Weather (Blizzards, Lake Effect Snow, Nor'easter, Ice Storm)	3	12	14	21	47	67
Strong Winds/Damaging Winds *(Severe Weather)*	3	12	16	16	44	63
Harmful Algal Bloom	3	9	10	22	41	60
Severe Thunderstorm *(Severe Weather)*	3	9	16	14	39	57
Flood (Riverine/Creek, Ice Jam)	2	15	11	29	55	54
Invasive Species and Infestation	3	9	7	18	34	51
Cold Wave/Extreme Cold *(Winter Weather)*	2	12	14	21	47	48
Heat Wave/Extreme Heat	2	9	11	19	39	41
Drought	2	12	12	13	37	39
Tropical Storm/Hurricane *(Severe Weather)*	1	9	16	24	49	27
Dam and Levee Failure *(Flood)*	1	12	6	27	45	25
Hail *(Severe Weather)*	1	6	16	14	36	21
Earthquake	1	6	16	12	34	20
Tornado *(Severe Weather)*	1	6	6	22	34	20

Hazard Event	Probability	Consequence (Sum of weighted factors)				Total Risk
	Probability Factor	Extent (sum of the weighted Extent factors)	Vulnerability (sum of the weighted Vulnerability factors)	Impact (sum of the weighted Impact factors)	Consequence Score	Total Risk Score (Probability x Consequence)
Wildfire *(Wildfire Smoke)*	1	3	6	14	23	14
Landslide *(Geological Hazards)*	1	3	6	12	21	13
Land Subsidence *(Geological Hazards)*	1	3	6	12	21	13
Mudboils *(Geological Hazards)*	1	3	6	12	21	13

Total Risk Score Legend

Classification	Probability Factor	Extent (sum if the weighted Extent factors)	Vulnerability (sum if the weighted Vulnerability factors)	Impact (sum if the weighted Impact factors)	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

4.6. HAZARD PROFILES

4.6.1. Drought

4.6.1.1. Description

Drought is a period characterized by prolonged periods of below normal precipitation. It is a temporary irregularity that differs from aridity, a permanent feature of the climate found in regions with typically low rainfall. Drought conditions occur in virtually all climatic zones; however, the characteristics vary significantly from one region to another and are relative to the region's normal precipitation.

Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life. Additionally, drought can lead to water pollution due to the lack of rainfall needed to dilute chemicals in water sources. Contaminated water supplies can harm plants and animals. If water is not getting into the soil, the ground will dry up and become unstable, which increases the risk of erosion and loss of topsoil.

Drought is part of the climate cycle and an underestimated, slow-moving hazard that can cause as much damage as other, faster-moving hazards (e.g., hurricanes, flooding). To assist with drought classification and monitoring, scientists have defined five (5) types of drought, listed in **Table 4-22**.[84]

Table 4-22. Types of Drought

Type	Description
Meteorological	Occurs when dry weather patterns dominate the area.
Hydrological	Occurs when low water supply becomes evident in the water system
Agricultural	Occurs when crops become affected by drought.
Socioeconomic	Occurs when the supply and demand of various commodities are affected by drought.
Ecological	Occurs when natural ecosystems are affected by drought.

4.6.1.2. Location

Droughts can occur anywhere in the Onondaga County region and affect the entire planning area. Variations in normal precipitation levels can lead to periods of dry weather and drought. Onondaga County is located between the Great Lakes and the Atlantic Ocean. These bodies of water provide significant moisture, generating precipitation throughout the region. In addition, Onondaga County has numerous lakes, including two (2) of the New York Finger Lakes – Otisco Lake and Skaneateles Lake. Numerous streams in Onondaga County flow north to join the Seneca River or Oneida River watersheds.

Major streams include Chittenango Creek, Limestone Creek, Butternut Creek, Onondaga Creek, Nine Mile Creek, and Skaneateles Creek. Based on available historical records, the communities in the planning area are equally susceptible to drought events.

4.6.1.3. Extent/Intensity

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. Droughts develop gradually over long periods, which can make it complicated to forecast when one will occur. The longer the drought and the larger the affected area, the more severe the potential impacts. New

[84] National Integrated Drought Information System. (2023). What is a Drought? Drought Basics. Retrieved from https://www.drought.gov/what-is-drought/drought-basics.

York State applies two (2) methodologies to identify the different drought stages – the State Drought Index (SDI) and the Palmer Drought Severity Index (PDSI).

SDI compares four (4) parameters to historic or "normal" values to evaluate drought conditions – stream flows, precipitation, lake and reservoir storage levels, and groundwater levels. New York's Drought Management Task Force uses those factors, along with water use, the duration of the dry period, and season, to assess drought across different parts of the State. The Index helps assess the impact on water supply, the regional economy, and the environment.[85]

The New York State Department of Environmental Conservation (NYSDEC) has divided New York State into eight (8) drought management regions, as illustrated in **Figure 4-1**, based on climatological, physiographic, and other factors. Onondaga County (circled in red) is located within the Finger Lakes Region (Region VII).[86]

NYSDEC monitors precipitation, lake and reservoir levels, stream flow, and groundwater levels at least monthly in each region and more frequently during drought. Subsequently, this data is used to assess the condition of each region, which can range from "normal" to "drought disaster", as described in **Table 4-23**.[87] NYSDEC Current Drought Conditions can be accessed via the following link: https://dec.ny.gov/environmental-protection/water/water-quantity/current-drought-conditions.

[85] New York State Department of Environmental Conservation. (n.d.). Drought. Retrieved from https://dec.ny.gov/environmental-protection/water/water-quantity/drought.
[86] New York State Disaster Preparedness Commission. (2024). New York State Comprehensive Emergency Management Plan: Drought Management Coordination Annex. Retrieved from https://www.dhses.ny.gov/system/files/documents/2024/03/final-nys-drought-management-coordination-annex-wv-march-2024.pdf.
[87] Ibid.

Figure 4-1. New York State Drought Regions

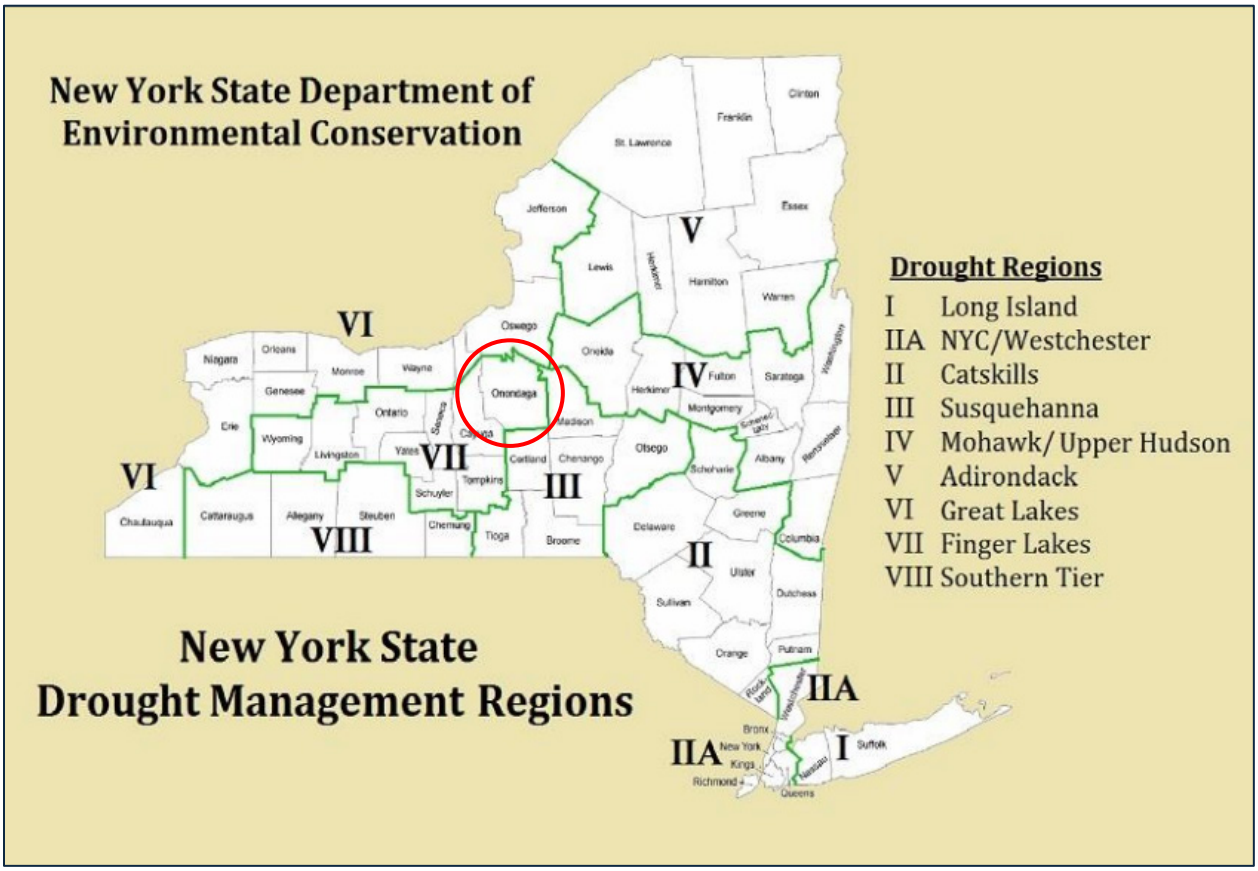


Table 4-23. State Drought Index Stages

Drought Stage	Drought Index Range	Description
Watch	100 – 150	This stage is declared by the NYSDEC. It is intended to give advanced notice of a developing drought. At this stage, the general public is urged to conserve water. Public water purveyors and industries are urged to update and begin to implement individual drought contingency plans.
Warning	75 – 100	This stage is declared by NYSDEC. It is a notice of impending and imminent severe drought conditions. A warning declaration includes stepping up public awareness and increasing voluntary conservation. Public water supply purveyors and industries are urged to continue to implement local drought contingency plans. Federal, State, and local water resources agencies are notified to prepare for emergency response measures.
Emergency	50 – 75	This stage is declared by the New York State Disaster Preparedness Commission (DPC) and, upon recommendation of the Drought Management Task Force. It is a notice of existing severe and persistent drought conditions. An emergency declaration is a notice for local water resources agencies to mandate conservation and implement other emergency response measures. A continuing and worsening drought emergency may result in the Governor declaring a drought disaster. It is a notice of the most severe and persistent drought conditions. At this stage, a significant proportion of communities in the impacted area are likely unable to respond adequately.

Drought Stage	Drought Index Range	Description
Disaster	0 – 50	This is the most severe stage of persistent drought conditions, and it is declared by the Governor when a significant proportion of communities in the impacted area are unable to address local needs adequately. In response, an Executive Declaration and Order by the Governor may be necessary to marshal State personnel and resources.

PDSI is the most prominent index of meteorological drought used in the United States for drought monitoring. The PDSI uses readily available temperature and precipitation data to estimate relative dryness, indicating prolonged and abnormal moisture deficiency or excess. As an important climatological tool, the PDSI helps evaluate the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. Furthermore, it can be utilized to identify disaster areas and indicate the availability of irrigation water, reservoir levels, range conditions, the amount of stock water, and the potential intensity of wildfires.[88, 89]

The PDSI is a standardized measure that compares moisture deficiency and excess on a numerical scale that usually ranges from positive five (5) to a negative five (5). Positive values indicate an excess of moisture supply, and negative values indicate moisture demand exceeding supply. **Table 4-24** displays the PDSI categories.

Table 4-24. Palmer Drought Severity Index

Palmer Drought Severity Index	Category
-4.00 and below	Extreme Drought
-3.00 to -3.99	Severe Drought
-2.00 to -2.99	Moderate Drought
-1.99 to +1.99	Mid-Range
+2.00 to +2.99	Moderately Moist
+3.00 to +3.99	Very Moist
+4.00 and above	Extremely Moist

The U.S. Drought Monitor (USDM) is a collaboration between the National Drought Mitigation Center (NDMC), USDA, and NOAA. They also rate drought nationwide by intensity utilizing a D0 (Abnormally Dry) to D4 (Exceptional Drought) scale, shown in **Table 4-25**.[90] The map updates weekly to show the location and intensity of drought across the country.[91]

[88] National Weather Service, Climate Prediction Center. (2005). Drought Indices: Explanation. Retrieved from https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/palmer_drought/wpdanote.shtml.
[89] National Center for Atmospheric Research. (n.d.). Climate Data Guide: Palmer Drought Severity Index (PDSI). Retrieved from https://climatedataguide.ucar.edu/climate-data/palmer-drought-severity-index-pdsi.
[90] National Drought Mitigation Center. (n.d.). What is USDM. Retrieved from https://droughtmonitor.unl.edu/About/WhatistheUSDM.aspx.
[91] National Integrated Drought Information System. (2023). U.S. Drought Monitor (USDM). Retrieved from https://www.drought.gov/data-maps-tools/us-drought-monitor.

Table 4-25. U.S. Drought Monitor Classification

Category	Description	Possible Impacts	PDSI Range
D0	Abnormally Dry	Used for areas showing dryness, but not yet in drought, or for areas recovering from drought. ***Going into drought:*** • Short-term dryness is slowing planting, growth of crops, or pastures. ***Coming out of drought:*** • Some lingering water deficits. • Pastures or crops not fully recovered.	-1.0 to -1.9
D1	Moderate Drought	• Some damage to crops and pastures. • Streams, reservoirs, or wells are low, and some water shortages are developing or imminent. • Voluntary water use restrictions requested.	-2.0 to -2.9
D2	Severe Drought	• Crop or pasture losses are likely. • Water shortages are common. • Water restrictions imposed.	-3.0 to -3.9
D3	Extreme Drought	• Major crop/pasture losses. • Widespread water shortages or restrictions.	-4.0 to -4.9
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses. • Shortages of water in reservoirs, streams, and wells are creating water emergencies.	-5.0 or less

4.6.1.4. Probability and Frequency

In the past, Onondaga County has experienced a range of drought conditions, from abnormally dry (D0) to severe (D2), according to PDSI and USDM. Based on the historical occurrences and climate projections for the region, it is anticipated that Onondaga County will continue to experience drought events in the future. The County's communities are equally susceptible to drought events and should consider mitigation actions to reduce the impacts of moderate drought. The probability of occurrence for drought in Onondaga County is medium because significant occurrences of this hazard are likely to occur within 25 years.

Meteorological drought can begin and end rapidly, while hydrological drought develops much more slowly and takes a lot longer to recover. Due to the significant differences in drought types, various indices have been developed to measure and monitor drought across sectors. The USDM depicts drought integrated across all time scales and differentiates between agricultural and hydrological impacts.[92] Meanwhile, NOAA utilizes the PDSI to measure drought conditions. It is estimated that Onondaga County will continue to experience direct and indirect impacts of drought on occasion, with secondary effects potentially disrupting or damaging agricultural activities and creating water supply shortages within communities.

The drought annualized frequency value represents the average number of recorded drought hazard occurrences, in event days, per year over the period of record (22 years). **Table 4-26** outlines the annualized frequency of drought in Onondaga County, based on FEMA NRI data.

[92] National Oceanic and Atmospheric Administration. (n.d.). Did You Know? Index (Definition of Drought). Retrieved from https://www.ncei.noaa.gov/access/monitoring/dyk/drought-definition.

Table 4-26. Drought Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(2000 – 2021)*	Annualized Frequency
Onondaga County	0	0 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

4.6.1.5. Past Events

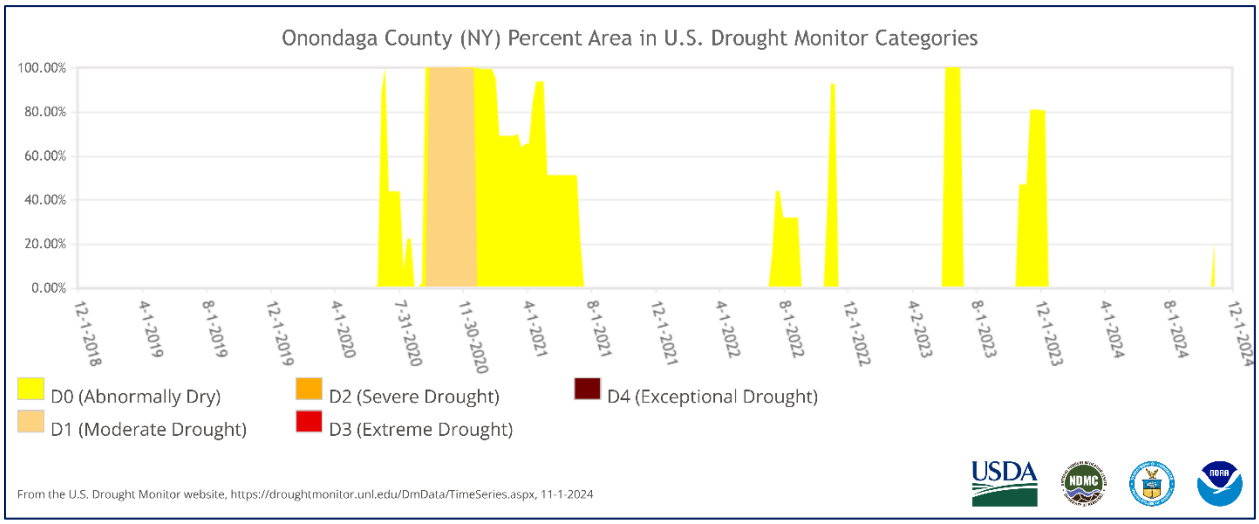
Droughts recur every few years. Unlike other hazards (e.g., floods and blizzards), droughts are not easily defined as "events". Onondaga County typically does not experience severe or extreme drought due to its proximity to the Great Lakes and the Atlantic Ocean. In the last five (5) years (2019 – 2024), other than a moderate drought (D1) in 2020, Onondaga County has not experienced significant drought events, as illustrated in **Figure 4-2**. Furthermore, NYSDEC has not declared drought disasters for Onondaga County.

Table 4-27 identifies known drought events between 2019 and 2024 that have affected Onondaga County.

Table 4-27. Drought Events in Onondaga County (2019 – 2024)

Event Dates	Event Details
November 14 – December 12, 2023	According to the USDM, conditions held at a D0 (Abnormally Dry) in Onondaga County.
June 6 – July 4, 2023	According to the USDM, conditions held at a D0 (Abnormally Dry) in Onondaga County.
November 1 – 8, 2022	According to the USDM, conditions held at a D0 (Abnormally Dry) in Onondaga County.
September 22, 2020 – July 6, 2021	According to the USDM, conditions held between D0 (Abnormally Dry) and D1 (Moderate Drought) in Onondaga County

Figure 4-2. U.S. Drought Monitor for Onondaga County



Between 1954 and 2024, New York State underwent one (1) drought-related disaster (DR), which was classified as a water shortage by FEMA (DR-204) in August 1965. Generally, drought-related disasters affect a wide region of

the State and thus may have impacted many counties. However, Onondaga County was not included in the disaster declaration.[93]

The United States Department of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans available to producers suffering losses in those counties and in contiguous counties. In the last five (5) years (2019 – 2024), Onondaga County has not been included in any USDA disaster declarations in relation to drought.

4.6.1.6. Vulnerability and Impacts

Life Safety and Public Health: The entire population of Onondaga County is vulnerable to drought events, but it is likely to experience minimal impacts to droughts. During droughts, air quality can decrease due to wildfires and dust, which produce air particulates that irritate the lungs and bronchial passages, exacerbating chronic respiratory conditions. Additionally, drought conditions can also increase the incidence of illness and disease (e.g., mosquito-borne diseases, anxiety, depression, and other adverse mental health outcomes).[94] Furthermore, local firefighting can be impacted due to water availability, and health problems related to low water flows and poor water quality can increase. If droughts are severe enough, these health problems can lead to loss of human life.

Increased temperatures expected under drought conditions pose a threat to public health and the life safety of the population. Heat stress, a recurrent health problem for vulnerable residents, has been the leading weather-related cause of death in the United States since 1986. Furthermore, disruptions to electricity and water supplies will exacerbate these health problems. Residential and commercial heating, ventilation, and air conditioning (HVAC) systems can malfunction due to water shortages caused by drought, exposing vulnerable populations to extreme heat.[95] Other possible impacts include recreational risks; effects on air quality; diminished living conditions related to energy, air quality, and sanitation and hygiene; compromised food and nutrition; and increased incidence of illness and disease.[96]

Soil water can be depleted quickly during periods. When precipitation deficiencies persist for an extended period, people who depend on other water sources will begin to feel the impact of the shortage. Those who rely on surface water (i.e., lakes) and subsurface water (i.e., groundwater) are usually the last to be affected. A short-term drought that persists for three (3) to six (6) months may have little impact on people who are reliant on surface and subsurface water, depending on the characteristics of the hydrologic system and the intensity of water use.[97]

Groundwater levels depend on recharge from precipitation infiltration, so when a drought affects the land surface, it can impact groundwater levels below ground. When rainfall is below normal for an extended period (i.e., several weeks, months, or years), the flow of streams and rivers declines, water levels in lakes and reservoirs fall, and the depth of water in wells increases.

The water level in the aquifer that supplies a well does not always remain constant. Droughts, seasonal rainfall variations, and pumping affect groundwater levels. If a well is pumped faster than the aquifer feeding it, it can be

[93] Federal Emergency Management Agency. (n.d.). New York Water Shortage (DR-204). Retrieved from https://www.fema.gov/disaster/204.
[94] National Integrated Drought Information System. (n.d.). Drought.gov, By Sector: Public Health. Retrieved from https://www.drought.gov/sectors/public-health.
[95] Cybersecurity and Infrastructure Security Agency. (2021). Drought and Infrastructure: A Planning Guide. Retrieved from https://www.cisa.gov/sites/default/files/publications/Drought_and_Infrastructure_A_Planning_Guide_508c.pdf.
[96] National Integrated Drought Information System. (n.d.). Drought.gov, By Sector: Public Health. Retrieved from https://www.drought.gov/sectors/public-health.
[97] New York State Energy Research and Development Authority. (2014). Responding to Climate Change in New York State. Retrieved from https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/ClimAID/2014-ClimAid-Report.pdf.

recharged by precipitation or other underground flow, lowering water levels in the well. This can happen during drought due to extreme rainfall deficits. The water level in a well can also be reduced if nearby wells are withdrawing water.[98]

As previously stated, drought can cause water shortages for human consumption. The drought hazard is a concern for Onondaga County because rural populations within the County rely upon private water supply from local groundwater resources. **Figure 4-3** displays the water service areas and distribution of wells throughout the County. Public water service areas are primarily located in the City of Syracuse and the surrounding municipalities, as well as in the villages around the County. The distribution of wells outside these water service areas is apparent and shows the rural populations and the Village of Baldwinsville's reliance on these wells for water supply.

Underserved and At-Risk Population: The underserved and at-risk population exposed to drought conditions in Onondaga County is likely to experience minimal adverse/disproportionate impacts. This population is particularly susceptible to drought and extreme temperatures, which are associated with drought conditions, due to their age, health conditions, and limited ability to mobilize to reach shelters, cooling, and medical resources. Some drought-related health effects are short-term, while others can be long-term.[99] Droughts have a profound impact on underserved and at-risk populations, exacerbating existing vulnerabilities and creating new challenges. Individuals most vulnerable to the health impacts of droughts are those with chronic medical conditions (e.g., cardiovascular disease, respiratory conditions, mental illness), lower-income, infants and children, and the elderly.[100]

Social impacts primarily involve public safety, health, conflicts among water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many economic and environmental effects of drought conditions also induce social impacts.[101]

Property Damage and Critical Infrastructure: Less than 9% or less of the total assessed property, infrastructure, and resources value is vulnerable (i.e., exposed) to droughts and little to no property damage is expected from a single major drought event. Although no structures will be directly affected by drought conditions, landscapes may be significantly impacted, imposing a financial burden on property owners. However, these impacts are not considered critical in planning for drought hazards. Additionally, buildings and infrastructure do not need to be physically damaged to trigger a service interruption. For example, extreme heat, which accompanies drought, makes the power grid's machinery run less efficiently and simultaneously increases demand to meet greater cooling needs. This combination raises the risk of grid overloading and causing brownouts or blackouts. Similarly, drought conditions harm water delivery services but do not cause physical damage to pipes or water treatment plants.

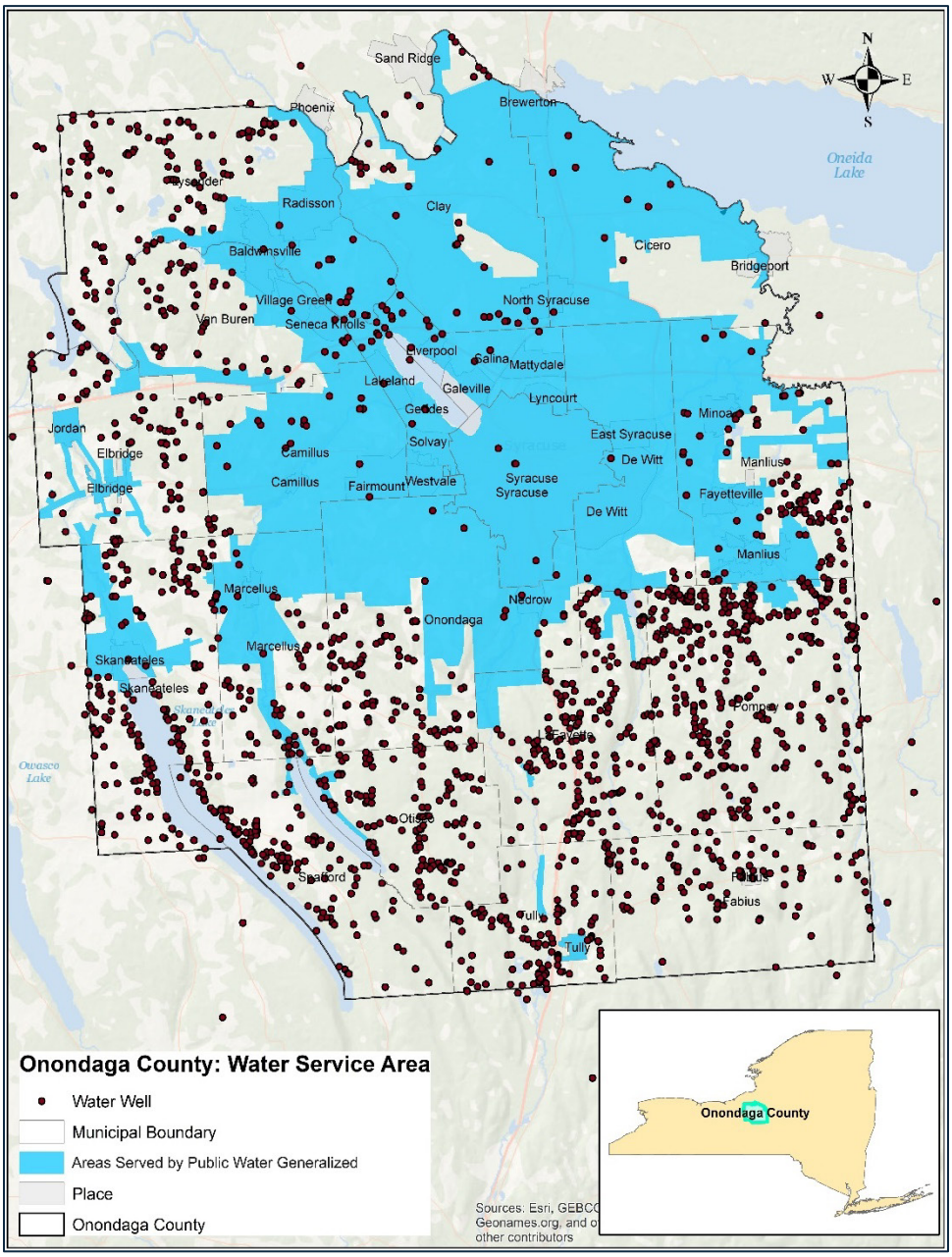
Water supply facilities may be affected by drought events. The County's water supply system is a mix of public and privately owned systems, but much of the rural population is served by private wells, and can be significantly affected by periods of diminished groundwater resources. A short-term drought that persists for three (3) to six (6)

[98] Unites Staes Geological Survey. (2016). Groundwater Wells. Retrieved from https://www.usgs.gov/special-topics/water-science-school/science/groundwater-wells.
[99] Centers for Disease Control and Prevention. (n.d.). Health Implications of Drought. Retrieved from https://www.cdc.gov/nceh/drought/implications.htm.
[100] Centers for Disease Control and Prevention. (n.d.). Populations Impacted by Drought. Retrieved from https://www.cdc.gov/drought-health/toolkit/vulnerable-populations.html.
[101] New York State Energy Research and Development Authority. (2014). Responding to Climate Change in New York State. Retrieved from https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/ClimAID/2014-ClimAid-Report.pdf.

months may have little impact on surface and subsurface water, depending on the characteristics of the hydrologic system and the intensity of water use.[102]

As mentioned, drought events generally do not impact buildings; however, they can impact agriculture-related facilities and critical facilities associated with potable water supplies. Also, critical facilities within and adjacent to the WUI are considered vulnerable to wildfire.

Figure 4-3. Water Service Areas and Well Distribution



[102] New York State Energy Research and Development Authority. (2014). Responding to Climate Change in New York State. Retrieved from https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/ClimAID/2014-ClimAid-Report.pdf.

Economy: If a significant drought occurs in the County, the total economic impact (based on loss of business revenue, crops, worker wages, and local tax revenue, or on the impact on the local GDP) is likely to be greater than $100,000, but less than or equal to $10 Million. Industries that rely on water for their operations may be impacted the most (e.g., agriculture, forestry, fisheries, and waterborne activities). In addition to losses in crop yields and livestock production, drought is associated with increased insect infestations, plant diseases, and wind erosion. Drought may lead to reduced income for farmers and reduced business for retailers and others who provide goods and services to farmers. Subsequently, this leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue. Prices for food, energy, and other products may also increase as supplies decrease.[103]

Direct and indirect losses to agricultural producers, livestock producers, timber producers, fishery producers, and tourism may include:

- Damage to crop quality and crop losses.
- Insect infestation leading to crops and tree losses.
- Plant diseases leading to loss of crops and trees.
- Reduced productivity of livestock due to unavailability of food and mortality rates (e.g., milk production, meat).
- Reduction in tourism and outdoor activities (e.g., hunting, fishing, and boating).
- Increased risk of brush fires and wildfires due to dried crops, grasses, and dying trees.

During a drought, the agricultural industry is most at risk of economic impacts and damage. Crops do not mature during droughts, resulting in lower yields, undernourishment of wildlife and livestock, decreased land values, and ultimately financial losses to the farmer.[104] A large majority of the state's agriculture is fed by rainfall without irrigation; however, summer precipitation is currently insufficient to fully meet crop water needs in most years.[105] In 2022, there were 572 farms within Onondaga County, encompassing 164,239 acres of total farmland. The average farm size was 287 acres. Onondaga County farms had a total market value of agricultural products sold of $271.5 Million ($68.8 Million in crop sales and $121.3 Million in livestock, poultry, and related products), averaging $474,629 per farm. **Table 4-28** lists the acreage of agricultural land exposed to the drought hazard.[106]

Table 4-28. Agricultural Land in Onondaga County (2022)

Number of Farms	Land in Farms *(acres)*	Total Cropland *(acres)*	Harvested Cropland *(acres)*	Total Cropland Used Only for Pastureland *(acres)*
572	164,239	117,495	104,084	9,475

[103] Ibid.
[104] University of Nebraska-Lincoln. (2000). Chapter 18 Drought: Pervasive Impacts of a Creeping Phenomenon. Retrieved from https://digitalcommons.unl.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1070&context=droughtfacpub.
[105] New York State Energy Research and Development Authority. (2014). Responding to Climate Change in New York State (ClimAID). Retrieved from https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/EMEP/climaid/ClimAID-Report.pdf.
[106] United States Department of Agriculture. (2022). Census of Agriculture: County Profile (Onondaga County, New York). Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/New_York/cp36067.pdf.

In 2022, the top three (3) agricultural products sold in Onondaga County were milk from cows at $153.3 Million; grains, oilseeds, dry beans, and dry peas at $33.4 Million; and poultry and eggs at $30.1 Million.[107]

If the average production (dollar value) per crop type could be identified on a per acre basis, loss estimates could be developed based on an assumed percentage of damage that could result from a drought. If a drought impacted 40% of the agricultural products sold from Onondaga County farms, based on 2022 market values, this would be a loss of $108.6 Million.

A prolonged drought can have a profound economic impact on a community. Increased demand for water and electricity may result in shortages and higher costs for these resources. Industries that rely on water for business may be impacted the most (e.g., landscaping businesses). Although most businesses will still be operational, they may be impacted aesthetically. These aesthetic impacts are most significant within the recreation and tourism industry. Moreover, droughts in other areas could impact the food supply and prices for residents within the County.

Changes in Development and Impact of Future Development: Changes in development have minimally increased the vulnerability of Onondaga County to drought. Future development trends will minimally increase the impact of drought within Onondaga County. The drought hazard could impact any areas of growth, as the entire planning area is exposed and vulnerable to droughts. Future growth could reduce the amount of potable water available due to increased demand on water resources.

Projections provided by New York State's economic development agency indicate that the five (5) counties within the Central New York region could have 60,000 additional residents in 2040, which is above and beyond what the population would be at that time. Onondaga County, home to half of the population in the five (5) county area, is in a position to add approximately 30,000 new residents by 2040. An increase in population will require more housing. This is in part due to the arrival of the proposed Micron semiconductor fabrication plant in the Town of Clay, as well as a significant supply chain industry related to the semiconductor industry in the County.[108]

The City of Syracuse remains the County's economic core, accounting for approximately 37% of the region's total employment. Primary employers in the City include higher education, medical fields, professional offices, and tourism/hospitality, which are expected to remain strong employers in the future. Manufacturing and retail have largely migrated to suburban areas in recent decades.

As has occurred across the country after 1950, suburbanization has led to substantial growth in the Towns surrounding the City of Syracuse, at the expense of the City's population. While population is expected to continue to increase in the most suburbanized Towns and Villages, particularly with Micron's entry into the northern suburbs, the City of Syracuse has seen a resurgence of new housing and economic investment over the past two (2) decades. Over 60% of new housing units since 2000 have been constructed in the City, primarily as multi-family development.[109] This trend is also expected to continue as significant new investments are being made to facilitate new economic activity in urban areas. As outlined in the County's Comprehensive Plan, Plan Onondaga, the County continues to encourage development in areas already served by water and sewer infrastructure (e.g., Onondaga County Consolidated Sanitary District), and revitalization and reinvestment in existing built communities, rather than further expansion into rural and agricultural lands.

[107] Ibid.
[108] Onondaga County. (2024). Onondaga County Housing Needs Assessment. Retrieved from https://plan.ongov.net/wp-content/uploads/2024/06/OnondagaHousing_JUNE2024_FINAL.pdf.
[109] Onondaga County Real Property Services Database.

Effects of Climate Change in Severity of Impacts: Summer droughts are projected to increase, affecting water supply, agriculture, ecosystems, and energy production.[110] An increased incidence of drought may reduce water availability, primarily placing additional stress on the population. It is unlikely that exposure to and vulnerability to structures would increase directly as a result of drought, although secondary impacts (e.g., wildfire) may increase and threaten structures. While water is typically plentiful in Onondaga County, if a wildfire were to occur during a drought, emergency services may face complications due to water shortages, depending on their water source. Critical water-related service sectors may need to adjust management practices and actively manage resources. Increased drought incidence may also increase the potential for local economic impacts, including on agricultural production.

Snowfall rates in Onondaga County may increase as the Great Lakes freeze less due to warming temperatures. However, as global average temperatures continue to rise, winter precipitation may fall as rain instead of snow. These fluctuations in snowfall could result in an increase or decrease in the County's winter snowpack. Reduced snowpack would increase the likelihood of drought.

Extreme heat events are likely to increase across New York State, and short-duration warm season droughts will become more common. With the increase in temperatures, heat waves (three (3) or more consecutive days with maximum temperatures at or above 90°F) will become more frequent and intense. Summer droughts are projected to increase under these conditions, affecting water supply, agriculture, ecosystems, and energy projects.[111]

By the end of the 21st century, the number of droughts is likely to increase, as the effect of higher temperatures on evaporation is likely to outweigh the increase in precipitation. Droughts in the northeast United States have been associated with local and remote modes of multi-year ocean-atmosphere variability (e.g., sea surface temperature anomalies in the North Atlantic) that are unpredictable and may change with climate change. Changes in the distribution of precipitation throughout the year and in the timing of snowmelt could increase the frequency of droughts.[112]

Table 4-29 indicates the 25-year climate projections in Onondaga County.[113] **Table 4-30** outlines the drought associated climate indicators for Onondaga County projected through the end of the century.[114]

[110] New York State Energy Research and Development Authority. (2014). Responding to Climate Change in New York State (ClimAID). Retrieved from https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/EMEP/climaid/ClimAID-Report.pdf.
[111] Ibid.
[112] Ibid.
[113] Northeast Regional Climate Center. (n.d.). Neighborhoods at Risk: Climate Projections. Retrieved from https://nar.headwaterseconomics.org/.
[114] Climate Mapping for Resilience and Adaptation. (n.d.). Climate Mapping for Resilience and Adaptation Assessment Tool. Retrieved from https://livingatlas.arcgis.com/assessment-tool/explore/details.

Table 4-29. 25-Year Climate Projections for Onondaga County

Higher Emissions (RCP8.5)
Onondaga County is expected to experience a 237% increase in extremely hot days and a 16% increase in days with heavy precipitation within 25 years.
By 2049, Onondaga County is expected to experience four (4) more days that reach above 95°F (from two (2) days to six (6) days per year).
Lower Emissions (RCP4.5)
Onondaga County is expected to experience a 179% increase in extremely hot days and an 8% increase in days with heavy precipitation within 25 years.
By 2049, Onondaga County is expected to experience three (3) more days that reach above 95°F (from one (1) day to four (4) days per year).
The Representative Concentration Pathways (RCPs), adopted by the Intergovernmental Panel on Climate Change (IPCC), are scenarios developed to project different greenhouse gas concentration trajectories and their potential impacts on global climate by the year 2100. There are two (2) commonly referenced RCPs – RCP4.5 (Intermediate Emissions Scenario) and RCP8.5 (High Emissions Scenario). ***RCP4.5:*** *This pathway reflects a scenario where global emissions peak around 2040 and then decline, leading to a moderate level of climate change. RCP4.5 is often used in climate modeling to assess future climate impacts and to guide policy decisions on mitigation strategies.* ***RCP8.5:*** *This pathway reflects a scenario where global emissions continue to rise through 2100 (i.e., business as usual scenario).*

Table 4-30. Future Climate Indicators for Onondaga County

Indicators	Modeled History (1976 – 2005)	Early Century (2015 – 2044)		Mid Century (2035 – 2064)		Late Century (2070 – 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min – Max	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*
Precipitation							
Average annual total precipitation	**40 inches**	**42 inches**	**42 inches**	**42 inches**	**43 inches**	**43 inches**	**44 inches**
	39 – 41	40 – 44	39 – 44	39 – 46	39 – 45	40 – 46	41 – 47
Days per year with precipitation *(Wet Days)*	**238 days**	**234 days**	**234 days**	**233 days**	**231 days**	**232 days**	**228 days**
	234 – 241	222 – 244	218 – 241	224 – 244	218 – 243	216 – 243	206 – 249
Days per year with no precipitation *(Dry Days)*	**128 days**	**131 days**	**131 days**	**132 days**	**134 days**	**133 days**	**137 days**
	124 – 131	121 – 143	124 – 147	121 – 141	122 – 147	122 – 149	116 – 159
Maximum number of consecutive dry days	**8 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**10 days**
	7 – 9	7 – 10	8 – 11	8 – 10	7 – 12	8 – 11	7 – 12
Temperature Thresholds							
Annual days with maximum temperature greater than 90°F	**3 days**	**12 days**	**13 days**	**18 days**	**24 days**	**25 days**	**52 days**
	3 – 6	4 – 23	5 – 21	6 – 35	9 – 43	8 – 51	16 – 91
Annual days with maximum temperature greater than 100°F	**0 days**	**0 days**	**0 days**	**1 days**	**2 days**	**2 days**	**9 days**
	0 – 0	0 – 2	0 – 2	0 – 6	0 – 8	0 – 6	0 – 36

4.6.1.7. FEMA NRI Expected Annual Loss Estimates

A drought NRI EAL score and rating represent a community's relative level of expected agriculture loss each year due to droughts when compared to the rest of the United States. The EAL score is positively associated with a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-31** outlines the drought EAL for Onondaga County.

Table 4-31. Drought Expected Annual Loss *(FEMA National Risk Index)*

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	n/a	n/a	$0	$0	No Expected Annual Losses	0.0
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

4.6.1.8. FEMA Drought Risk Index Score

The drought Risk Index score and rating represent a community's relative risk for droughts when compared to the rest of the United States. **Table 4-32** illustrates the drought Risk Index rating and score for Onondaga County.

Table 4-32. Drought Risk Index (FEMA National Risk Index)

Jurisdiction	Rating	Score
Onondaga County	No Rating	0.0
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability, and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

Table 4-33 outlines the Drought Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

Table 4-33. Drought Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Drought	2	12	12	13	37	39

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

4.6.2. Earthquake

4.6.2.1. Description

Earthquakes are rapid shaking of the earth caused by the release of energy stored in rocks. The United States Geological Survey (USGS) defines an earthquake as the sudden slip on a fault, the resulting ground shaking, and the radiated seismic energy caused by the slip, volcanic or magmatic activity, or other sudden stress changes in the Earth (e.g., a human-made explosion). Ground shaking is a term used to describe the vibration of the ground during an earthquake. In addition to the initial ground shaking, other earthquake hazards include building collapses, surface displacement or cracking, landslides, liquefaction, tsunamis, seiches, flooding resulting from dam or levee damage, fires from ruptured gas lines, downed power lines, and other sources. **Table 4-34** defines several earthquake hazards.[115] *Landslides and flooding will be addressed separately in this Plan.* Earthquakes cause both vertical and horizontal ground shaking, which varies both in amplitude (the amount of displacement of the seismic waves) and frequency (the number of seismic waves per unit time), usually lasting less than 30 seconds.[116]

Most earthquakes occur at the boundaries where the Earth's tectonic plates meet (faults); less than 10% of earthquakes occur within plate interiors. As plates continue to move and plate boundaries change geologically over time, weakened boundary regions become part of the interiors of the plates. These zones of weakness within continents can cause earthquakes in response to stresses that originate at plate edges or in the deeper crust.[117]

The location of an earthquake is commonly described by its focal depth and the geographic position of its epicenter. Focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus or hypocenter). The epicenter of an earthquake is the point on the Earth's surface directly above the hypocenter.[118] Earthquakes usually occur without warning, and their effects can affect areas far from the epicenter.[119]

Table 4-34. Earthquake Hazards

Hazard	Description
Surface Faulting	Displacement that reaches the earth's surface during a slip along a fault. Commonly occurs with shallow earthquakes with an epicenter less than 20 kilometers (12.4 miles).
Ground Shaking	The movement of the Earth's surface caused by earthquakes. Ground shaking is produced by waves generated by a sudden slip on a fault, which travel through the Earth and along its surface.
Landslide	A movement of surface material down a slope.
Liquefaction	A process by which water-saturated sediment temporarily loses strength and acts as a fluid, like the wet sand near the water at the beach. Ground shaking from an earthquake can cause this effect. Liquefaction susceptibility is determined by geological history, depositional setting, and soil topographic position. Effects may occur along the shorelines of the ocean, rivers, and lakes, and they can also happen in low-lying areas away from water bodies in locations where the groundwater is near the earth's surface.
Tectonic Deformation	A change in the original shape of a material caused by stress and strain.
Tsunami	A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or exploding volcanic islands.

[115] U.S Geological Survey. (n.d.). Earthquake Hazards Program Glossary. Retrieved from https://www.usgs.gov/glossary/earthquake-hazards-program.
[116] U.S Geological Survey. (n.d.). What are the Effects of Earthquakes. Retrieved from https://www.usgs.gov/programs/earthquake-hazards/what-are-effects-earthquakes.
[117] Ibid.
[118] Ibid.
[119] Federal Emergency Management Agency. (n.d.). Earthquake. Retrieved from https://community.fema.gov/ProtectiveActions/s/article/Earthquake.

Hazard	Description
Seiche	The sloshing of a closed body of water (e.g., a lake or bay) from earthquake shaking

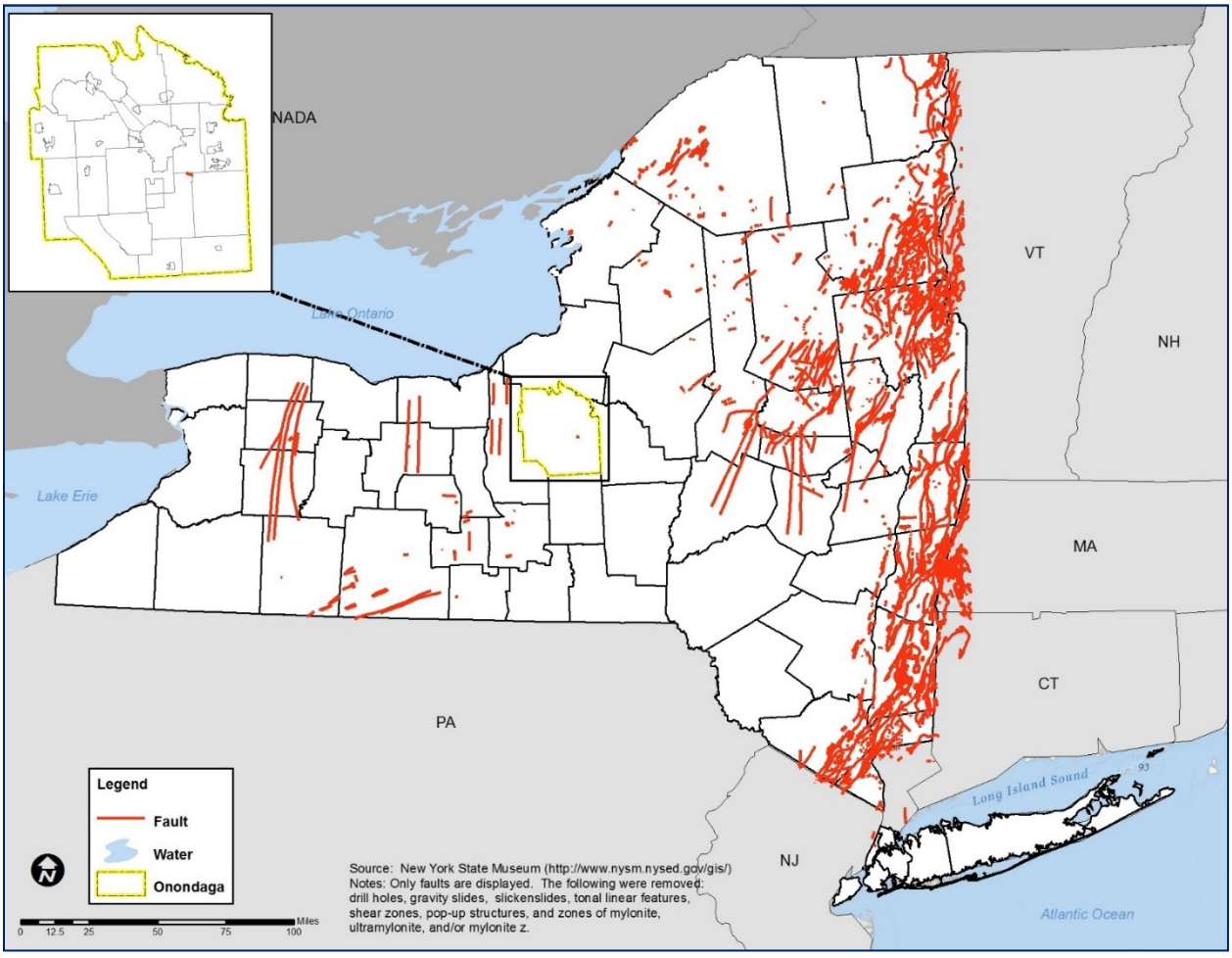
4.6.2.2. Location

There are three (3) general regions in New York State with higher seismic risk than other parts of the State.

- The north and northeast third of the State, which includes the Adirondack Mountains region and a portion of the greater Albany-Saratoga region.
- The southeast corner, which includes the greater New York City area and western Long Island.
- The northwest corner, which includes Buffalo and its surrounding area.

Onondaga County is not located in a region with high seismic risk.[120] **Figure 4-4** illustrates the fault systems located within and around Onondaga County. According to **Figure 4-4**, there is one (1) small fault line within the County.

Figure 4-4. Fault Systems in Onondaga County



[120] Cornell University. (n.d.). Earthquakes in New York State. Retrieved from https://deepgeothermalheat.engineering.cornell.edu/cubo-science-intro/earthquakes-in-new-york-state/.

4.6.2.3. Extent/Intensity

Earthquakes are measured both in terms of their inherent magnitude and in terms of their local intensity. There are several standard measures of earthquakes, including the Richter Scale and the Modified Mercalli Intensity (MMI) scale. The Richter Scale measures the magnitude of an earthquake's energy release. Magnitude is measured by seismographs. The MMI scale, the most commonly used intensity scale, is an observed measure of the earthquake's intensity felt at the earth's surface and varies depending on the observer's location relative to the earthquake's epicenter. The MMI Scale comprises 12 increasing levels, designated by Roman numerals, ranging from imperceptible shaking to catastrophic destruction.

Table 4-35 correlates the MMI Scale with the Richter Scale and the effects of ground shaking. The lower numbers on the intensity scale focus on how people felt the earthquake, while the higher numbers focus on observed structural damage. For intensity VIII or above, structural engineers usually contribute information for assigning intensity values.[121]

Table 4-35. Modified Mercalli Intensity Scale vs. Richter Scale

Intensity	Description/Damage	Richter Scale *(approximate)*
I. Instrumental	Not felt.	1 – 2
II. Just Perceptible	Felt by only a few people, especially on upper floors of tall buildings.	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings.	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle.	4
V. Rather Strong	Generally felt by everyone; sleeping people may be awakened.	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling object.	5
VII. Very Strong	General alarm; walls and plaster crack.	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged.	6
IX. Ruinous	Some houses collapse; pipes break.	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides.	7
XI. Very Disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad; severe landslides).	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered.	8

The MMI scale is generally represented visually using shake maps, which show the expected ground shaking at any given location produced by an earthquake with a specified magnitude and epicenter. An earthquake only has one (1) magnitude and one (1) epicenter, but it produces a range of ground shaking at sites throughout the region. This shaking depends on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the Earth's crust. A USGS shake map shows variations in ground shaking in a region immediately after significant earthquakes.

The ground experiences acceleration as it shakes during an earthquake. The peak ground acceleration (PGA) is a measure of how hard the earth shakes in a given geographic area. It is expressed as a percentage of the acceleration due to gravity (% g). Horizontal and vertical PGA vary with soil or rock type. An earthquake hazard assessment

[121] United States Geological Survey. (n.d.) The Modified Mercalli Intensity Scale. Retrieved from https://www.usgs.gov/programs/earthquake-hazards/modified-mercalli-intensity-scale.

involves estimating the annual probability that ground accelerations will exceed certain levels and then summing these probabilities over a period of interest. **Table 4-36** displays the MMI scale and its relationship to the PGA of the area.[122]

Table 4-36. Modified Mercalli Intensity and PGA Equivalent

Modified Mercalli Intensity	Perceived Shaking	Peak Ground Acceleration (PGA) *(%g)*	Potential Damage
I	Not Felt	< 0.17	None
II	Weak	0.17 – 1.4	None
III	Weak	0.17 – 1.4	None
IV	Light	1.4 – 3.9	None
V	Moderate	3.9 – 9.2	Very Light
VI	Strong	9.2 – 18	Light
VII	Very Strong	18 – 34	Moderate
VIII	Severe	34 – 65	Moderate to Heavy
IX	Violent	65 – 124	Heavy
X +	Extreme	> 124	Very Heavy

Damage levels experienced in an earthquake vary with the intensity of ground shaking and with the seismic capacity of structures, as illustrated in **Table 4-37**.

Table 4-37. Damage Levels Experienced in Earthquakes

Ground Motion Percentage *(%g)*	Explanation of Damages
1 – 2	Motions are widely felt by people; hanging plants and lamps swing strongly, but damage levels, if any, are usually very low.
< 10	Usually, it causes only slight damage, except in unusually vulnerable facilities.
10 – 20	May cause minor-to-moderate damage in well-designed buildings, with higher levels of damage in poorly designed buildings. At this level of ground shaking, only unusually poor buildings would be subject to potential collapse.
20 – 50	May cause significant damage in some modern buildings and very high levels of damage (including collapse) in poorly designed buildings.
> 50	May cause higher levels of damage in many buildings, even those designed to resist seismic forces.

The New York State Geological Survey conducted seismic shear-wave tests of the State's surficial geology (glacial deposits). Based on these test results, the surficial geologic materials of New York State were categorized according to the National Earthquake Hazard Reduction Program's (NEHRP) Soil Site Classifications (**Table 4-38**). The NEHRP developed five (5) soil classifications, defined by shear-wave velocity, that impact the severity of an earthquake. The soil classification system ranges from Class A to Class E, where Class A represents hard rock that reduces ground motion from earthquakes, and Class E represents soft soils that amplify and magnify ground shaking, increasing building damage and losses. Class E soil includes water-saturated mud and artificial fill. The strongest amplification of shaking is expected for this soil type. Seismic waves travel faster through hard rock than through softer rock and sediments. As waves pass from harder to softer rocks, they slow down and their amplitude

[122] Freeman, A. S. (2004). Earthquake Engineering Intensity Scale: A Template with Many Uses. Retrieved from https://engineering.purdue.edu/~ayhan/Publications/13wcee_EEIS%20by%20SAFAITFP.pdf.

increases. Shaking tends to be stronger at locations with softer surface layers where seismic waves move more slowly. Ground motion above an unconsolidated landfill or soft soils can be more than 10 times stronger than at neighboring locations on rock for small ground motions.[123]

Onondaga County is predominantly underlain by NEHRP Soil Class B, with Class C soils interspersed throughout the County. A large concentration of Class D and E soil is located in the County's northern regions.

Table 4-38. NEHRP Soil Classification

Soil Classification	Description
A	Hard rock
B	Rock
C	Very dense soil and soft rock
D	Stiff soils
E	Soft soils

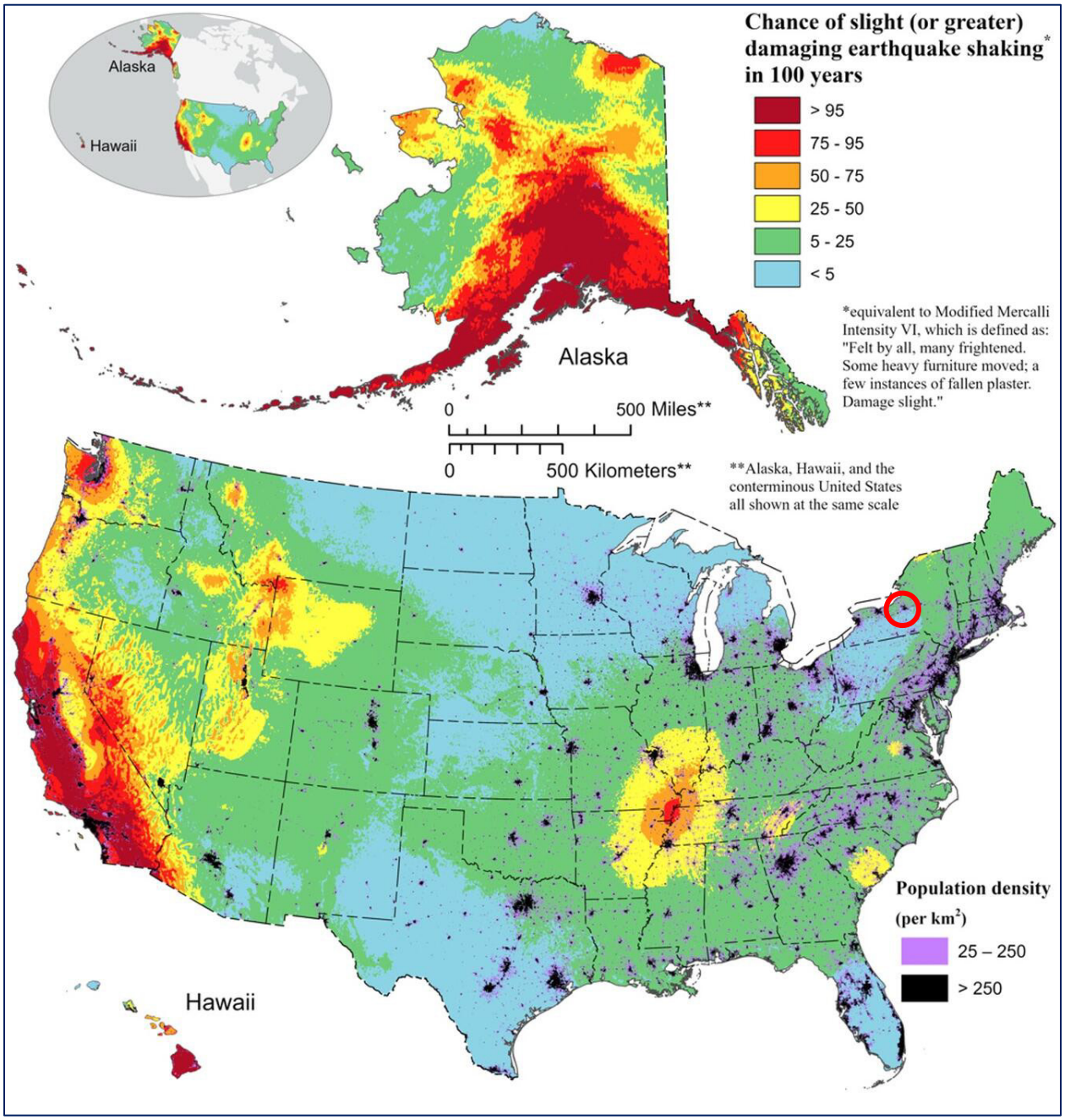
4.6.2.4. Probability and Frequency

Onondaga County is not located on a boundary of a tectonic plate, where 90% of the world's earthquakes occur. However, there are a number of fault systems within New York State and the United States/Canada border with a history of small to moderate earthquakes. Therefore, the probability of occurrence for earthquakes in Onondaga County is low because a significant hazard event is likely to occur within 100 years.

National maps of earthquake shaking hazards provide essential information for creating and updating seismic design requirements for building codes, insurance rates, earthquake loss studies, retrofit priorities, and land use planning. After a thorough review of the studies, professional engineering organizations update the seismic-risk maps and seismic design requirements in building codes.[124] The USGS National Seismic Hazard Maps reflect the best and most current understanding of earthquake hazard in an area, the distribution of damaging earthquake shaking across the United States, and compare earthquake shaking hazard areas with other areas across the United States.[125] **Figure 4-5** illustrates the most recent USGS National Seismic Hazard Map, last updated in 2023, which represents the likelihood of damaging earthquake shaking in the United States over the next 100 years. The map shows that there is less than 5% chance of a damaging earthquake occurring in Onondaga County (red circle). A "damaging earthquake shaking" in this map is the equivalent of MMI VI or higher.[126]

[123] Federal Emergency Management Agency. (n.d.). Earthquake coordinators Web Site. Ground Softness. Retrieved from https://training.fema.gov/emiweb/earthquake/neh0102330.htm.
[124] United States Geological Survey, Earthquake Hazards Program. (n.d.). Hazards. Retrieved from https://www.usgs.gov/programs/earthquake-hazards/hazards.
[125] United States Geological Survey, Earthquake Hazards Program. (2022). Introduction to the National Seismic Hazard Maps. Retrieved from https://www.usgs.gov/programs/earthquake-hazards/science/introduction-national-seismic-hazard-maps.
[126] United States Geological Survey. (2024). National Seismic Hazard Model (2023) - Chance of Damaging Earthquake Shaking. Retrieved from https://www.usgs.gov/media/images/national-seismic-hazard-model-2023-chance-damaging-earthquake-shaking.

Figure 4-5. USGS National Seismic Hazard Map



The earthquake annualized frequency value represents the modeled frequency of an earthquake hazard occurrence per year. A higher annualized frequency value results in higher EAL and Risk Index scores. **Table 4-39** outlines the annualized earthquake frequency for Onondaga County, based on FEMA NRI data.

Table 4-39. Earthquake Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(2021 dataset)*	Annualized Frequency
Onondaga County	n/a	0.024% chance per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

4.6.2.5. Past Events

New York State has a history of earthquake occurrences. According to the USGS earthquake catalog search, between 1950 and December 2024, the State experienced over 494 earthquakes. Of those events, no earthquake epicenters were recorded in Onondaga County.[127] According to the New York State Hazard Mitigation Plan, the State has also experienced strong ground shaking from earthquakes centered within the United States and Canadian provinces. These events are considered significant because earthquakes like these could cause damage within the State under certain circumstances. Most of the earthquakes in New York have occurred in the greater New York City area, the Adirondack Mountains region, and the western part of the State.[128]

Between 1954 and 2024, New York State underwent one (1) earthquake-related disaster declaration (DR) by FEMA (DR-1415) in May 2002. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. However, Onondaga County was not included in the disaster declaration.[129]

Known earthquake events (magnitude 5.0 or greater) that have impacted New York State and Onondaga County are identified in **Table 4-40**.[130] In the last five (5) years (2019 – 2024), no earthquakes have been reported in Onondaga County.

Table 4-40. Earthquake Events Impacting Onondaga County

Date	Location	FEMA Declaration Number	County Designated	Description
May 17, 2013	Shawville, Canada	N/A	N/A	A magnitude 5.1 earthquake in Shawville, Canada, was felt in portions of New York, including Onondaga County. Shaking was felt throughout the County with some reports of items falling off shelves.
August 23, 2011	Richmond, Virginia	N/A	N/A	A magnitude 5.8 earthquake centered northwest of Richmond, Virginia, was felt throughout the East Coast. Shaking was felt throughout the County.
June 23, 2010	Ontario/Quebec border, Canada	N/A	N/A	A magnitude 5.4 earthquake at the Ontario/Quebec border region in Canada was felt throughout the northeast, including Onondaga County.

[127] United States Geological Survey. (2024). Search Earthquake Catalog (Included Magnitude 0.5 and above). Retrieved from https://earthquake.usgs.gov/earthquakes/search/.
[128] New York State Division of Homeland Security and Emergency Services. (2023). New York State Hazard Mitigation Plan. Retrieved from https://mitigateny.org/.
[129] Federal Emergency Management Agency. (n.d.). New York Earthquake (DR-1415). Retrieved from https://www.fema.gov/disaster/1415.
[130] United States Geological Survey. (2024). Search Earthquake Catalog. Retrieved from https://earthquake.usgs.gov/earthquakes/search/.

4.6.2.6. Vulnerability and Impacts

A probabilistic assessment was conducted for a 1,000-year probabilistic earthquake scenario in Hazus to analyze the earthquake hazard and provide a range of loss estimates.

Life Safety and Public Health: The entire population of Onondaga County is vulnerable (i.e., exposed) to the direct and indirect impacts from earthquakes. However, the population and life safety (i.e., casualties and facilities) are likely to experience minimal adverse impacts in the event of an earthquake in Onondaga County.

Although the overall risk to public safety and loss of life from an earthquake in the County is minimal, there is a higher risk to public safety for those inside buildings due to structural damage or for people walking beneath building ornamentations and chimneys, which may be shaken loose and fall during an earthquake. Additionally, there is a strong correlation between structural damage and the number of injuries and casualties from an earthquake. Further, the time of day also exposes different sectors of the community to the hazard. The degree of exposure is dependent on many factors, including the age and type of construction of a structure, the soil type(s) a structure is located on, and the intensity of the earthquake. Whether directly or indirectly impacted, residents could face business closures, road closures that could isolate populations, and the loss of function of critical facilities and infrastructure.

Hazus estimated the number of households expected to be displaced by the earthquake and the number of displaced people who will require accommodation in temporary public shelters. The model estimates three (3) households to be displaced due to the earthquake. Of these, two (2) people (out of a total population of 476,516) will seek temporary shelter in public shelters.

Underserved and At-Risk Population: The underserved and at-risk population exposed to an earthquake event in Onondaga County is likely to experience minimal adverse/disproportionate impacts. The most vulnerable populations are those in the built environment, particularly those near unreinforced masonry structures. Of these most vulnerable populations, socially vulnerable populations, including the elderly (65 years old and over) and individuals living below the census poverty threshold, are most susceptible. Factors leading to this higher susceptibility include decreased mobility and the financial ability to respond during a hazard, as well as the location and construction quality of their housing. There are approximately 84,343 residents (17.8%) who are 65 years old and over within the County, and 13.6% of the households in Onondaga County are below the poverty level.[131, 132]

Property Damage and Critical Infrastructure: The entire total assessed property, infrastructure, and resources value in Onondaga County is vulnerable (i.e., exposed) to earthquakes and less than $500,000 in property damage is expected from a single earthquake event, or less than 5% or the property value within the County. Additionally, structures located over soft soils (i.e., NEHRP Soil Classes D and E) are more susceptible to earthquakes because these types of soils amplify ground shaking to damaging levels even during moderate earthquakes.

There is a strong correlation between PGA and the damage a building might undergo, and a building's construction determines how well it can withstand the force of an earthquake. Unreinforced masonry buildings are most at risk during an earthquake because the walls are prone to collapse outward, whereas steel and wood buildings absorb more of the earthquake's energy. Additional attributes that affect a building's capability to withstand an earthquake's force include its age, number of stories, and quality of construction.

[131] United States Census Bureau. (2022). S0101: Age and Sex (2022: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2022.S0101?g=050XX00US36067.
[132] United States Census Bureau. (2023). QuickFacts: Onondaga County, New York. Retrieved from https://www.census.gov/quickfacts/fact/table/onondagacountynewyork/.

Building damage resulting from the 1,000-year probabilistic earthquake analysis was estimated using Hazus. In addition, annualized losses were calculated. Hazus estimates that there are 166,000 buildings in the region, which have an aggregated total replacement cost of $90.743 Million. **Table 4-41** provides a general distribution of the building value within Onondaga County. In terms of building construction types found in the County, wood frame construction makes up 90% of the building inventory, and the remaining 10% is distributed between the other general building types (i.e., steel, concrete, precast, reinforced masonry, unreinforced masonry, manufactured housing).

Table 4-41. Onondaga County Population and Building Value Data

Population	Residential Building Value	Non-Residential Building Value	Total
476,516	$58.063 Million	$32.680 Million	$90.743 Million

Hazus estimates that about 488 buildings will be at least moderately damaged, which is less than 1% of the buildings in Onondaga County. An estimated two (2) buildings are estimated to be damaged beyond repair. **Table 4-42** summarizes the estimated numbers of buildings damaged by general occupancy in the County.

Table 4-42. Expected Building Damage by Occupancy

Building Occupancy	None		Slight		Moderate		Extensive		Complete	
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*
Agriculture	1,015	0.6	18	0.7	3	0.7	0.4	1.0	0	0.8
Commercial	7,720	4.7	291	10.8	99	21.9	13	37.0	0.8	34.9
Education	186	0.1	7	0.3	2	0.5	0.3	0.7	0	0.7
Government	366	02	15	0.6	5	1.2	0.6	1.7	0	1.7
Industrial	2,688	1.6	111	4.2	42	9.3	6	15.6	0	12.0
Other Residential	22,751	13.9	391	14.6	63	14.0	2	4.5	0	2.2
Religion	586	0.4	24	0.9	8	1.7	1	2.9	0	3.4
Single Family	128,385	78.4	1,828	68.1	228	50.7	13	36.5	1	44.3
Total	**163,695**	-	**2,684**	-	**451**	-	**36**	-	**2**	-

Table 4-43 summarizes the expected damage by general building type.

Table 4-43. Expected Building Damage by Building Type

Building Occupancy	None		Slight		Moderate		Extensive		Complete	
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*
Wood	148,806	90.9	1,973	73.5	176	39.1	0.5	1.3	0	0
Steel	5,982	3.7	178	6.6	59	13.1	5	14.4	0	0.6
Concrete	1,263	0.8	39	1.4	11	2.4	0.5	1.4	0	0.0
Precast	414	0.3	17	0.6	10	2.3	2	5.0	0	0.1
Reinforced Masonry	48	0.0	1	0.1	0.3	0.1	0	0.1	0	0
Unreinforced Masonry	6,133	3.8	421	15.7	174	38.7	27	76.7	2	99.4
Manufactured Housing	1,049	0.6	56	2.1	20	4.4	0.4	1.2	0	0
Total	**163,695**	-	**2,684**	-	**451**	-	**36**	-	**2**	-

Historically, Building Officials Code Administration (BOCA) regulations in the northeast United States were developed to address local concerns, including heavy snow loads and wind. Seismic requirements for design criteria are not as stringent as those on the West Coast, which rely on the more seismically focused Uniform Building Code. As a result, a smaller earthquake in the northeast can cause more structural damage than if it occurred on the West Coast.

All critical facilities in Onondaga County are considered exposed and vulnerable to earthquakes. *Refer to Section 3.7 of this Plan for a complete inventory of critical facilities in Onondaga County.*

Hazus breaks critical facilities into two (2) groups – essential facilities (i.e., hospitals, medical clinics, schools, fire stations, police stations, and emergency operations centers) and high potential loss facilities (i.e., dams, levees, military installations, nuclear power plants, and hazardous material sites). For essential facilities, there are nine (9) hospitals in the County with a total bed capacity of 1,932 beds. There are 160 schools, 73 fire stations, 31 police stations, and one (1) emergency operation center. With respect to high potential loss facilities, there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations, and no nuclear power plants.

The Hazus model estimates the time to restore critical facilities to fully functional use. Before the earthquake, Onondaga County had 1,932 hospital beds available for use. On the day of the earthquake, Hazus estimates that 1,683 hospital beds (87%) are available for use by patients already in the hospital and those injured by the earthquake. After one (1) week, 95% of the beds will be back in service, and 99% will be operational after 30 days. **Table 4-44** summarizes the expected damage to essential facilities in Onondaga County. All essential facilities are expected to have functionality greater than 50% on day one (1) after the earthquake event.

Table 4-44. Expected Damage to Essential Facilities

Classification	Total	Number of Facilities		
		At Least Moderate Damage *(greater than 50% damage)*	***Complete Damage*** *(greater than 50%)*	***With Functionality*** *(greater than 50% on day 1)*
Hospitals	9	0	0	9
Schools	160	0	0	160
Emergency Operations Center	1	0	0	1
Police Stations	31	0	0	31
Fire Stations	73	0	0	73

Hazus divides the lifeline inventory between transportation and utility lifeline systems. There are seven (7) transportation systems (i.e., highways, railways, light rail, bus, ports, ferry, and airports) and six (6) utility systems (i.e., potable water, wastewater, natural gas, crude and refined oil, electric power, and communications). Hazus estimates that the total value of the lifeline inventory (transportation and utilities) is over $17.733 Million, which includes 559.2 miles of highways, 469 bridges, and 5,852 miles of pipeline (i.e., potable water, wastewater, natural gas, and oil). **Table 4-45** summarizes the expected damage to utility systems in Onondaga County. All utility systems are expected to have functionality greater than 50% on day one (1) after the earthquake event.

Table 4-45. Expected Damage to Utility Systems

System	Total	Number of Locations			
		With at Least Moderate Damage	With Complete Damage	With Functionality Greater than 50%	
				After Day 1	*After Day 7*
Potable Water	0	0	0	0	0
Wastewater	13	0	0	13	13
Natural Gas	1	0	0	1	1
Oil Systems	2	0	0	2	2
Electrical Power	4	0	0	4	4
Communication	33	0	0	33	33

Earthquake events can significantly affect roads and bridges, many of which provide the only access to certain neighborhoods. Because softer soil generally follows floodplain boundaries, bridges that cross watercourses should be considered vulnerable. Another key factor in the degree of vulnerability is the age of facilities and infrastructure, which correlates with standards in place at the time of construction. Damage to transportation systems (e.g., roadway segments, railroad tracks), assuming these features would undergo damage due to ground failure, can result in interruptions of regional transportation and distribution of materials. Losses to the community that would result from damage to lifelines could exceed the costs of repair. **Table 4-46** summarizes damage estimates to the transportation system.

Table 4-46. Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Moderate Damage	With Complete Damage	With Functionality Greater than 50%	
					After Day 1	*After Day 7*
Highway	Segments	488	0	0	488	488
	Bridges	469	0	0	469	469
	Tunnels	0	0	0	0	0
Railways	Segments	106	0	0	106	106
	Bridges	93	0	0	93	93
	Tunnels	0	0	0	0	0
	Facilities	2	0	0	2	2
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	4	0	0	4	4
Ferry	Facilities	0	0	0	0	0
Port	Facilities	12	0	0	12	12
Airport	Facilities	2	0	0	2	2
	Runways	5	0	0	5	5

Economy: Earthquakes also impact the economy, including loss of business function, damage to inventory (i.e., buildings, transportation, and utility systems), relocation costs, wage loss, and rental loss due to repair and

replacement of buildings. Hazus estimates building-related economic losses, including income losses (i.e., wage, capital-related, rental, and relocation losses) and capital stock losses (i.e., structural, non-structural, content, and inventory losses).

Hazus estimates total building related losses were $153.9 Million where 26.0% of the losses were related to business interruption in Onondaga County. The analysis concluded that the largest loss was sustained by the residential occupancies, which comprised 35% of the total loss. **Table 4-47** summarizes the building related economic loss estimates.

Table 4-47. Building Related Economic Loss Estimates *(Millions of Dollars)*

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses	Wage	0.0	0.8	8.4	0.4	1.5	11.1
	Capital-Related	0.0	0.3	6.7	0.2	0.3	7.5
	Rental	0.5	1.8	4.5	0.4	0.4	7.6
	Relocation	1.7	0.8	6.1	2.2	3.1	13.8
	Subtotal	**2.2**	**3.7**	**25.7**	**3.2**	**5.2**	**40.1**
Capital Stock Losses	Structural	5.0	4.4	8.7	4.8	3.5	26.3
	Non Structural	20.2	11.5	16.4	8.2	7.0	63.3
	Content	4.9	2.3	6.9	5.1	3.1	22.2
	Inventory	0.0	0.0	1.1	0.7	0.2	2.0
	Subtotal	**30.0**	**18.2**	**33.1**	**18.8**	**13.7**	**113.8**
Total		**32.3**	**21.9**	**58.75**	**22.0**	**19.0**	**153.9**

Hazus estimates the amount of debris that will be generated by the earthquake event. Debris estimates were divided into two (2) categories – brick/wood and reinforced concrete/steel. The distinction is made because of the different types of materials handling equipment required to manage debris.

The analysis estimated that a total of 44,000 tons of debris will be generated. Of the total amount, 72% is comprised of brick/wood, and the remainder will be reinforced concrete/steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 1,760 truckloads (25 tons/truck) to remove the debris.

Changes in Development and Impact of Future Development: Changes in development have minimally increased the vulnerability of Onondaga County to earthquakes. Future development trends will minimally increase the impact of earthquakes within Onondaga County. Generally, new developments are more resistant to earthquake damage than older construction, as building code seismic design standards have improved over time, and modern codes, such as the International Building Code, include provisions for classifying soils.

The housing stock in Onondaga County is older. Of the 211,683 occupied housing units in Onondaga County, approximately 58.6% of the housing structures were built before the 1970s, prior to the implementation of substantial improvements to building codes and construction practices. Understanding the distribution of housing structures by age helps identify older and potentially more vulnerable buildings. **Table 4-48** outlines information on the age of the housing units, categorized by period when they were built.[133]

[133] United States Census Bureaus. (2023). DP04: Selected Housing Characteristics (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP04?g=050XX00US36067.

Table 4-48. Physical Housing Characteristics in Onondaga County

Structure Built *(Year)*	Estimate	Percent *(of occupied housing)*
2020 or Later	739	0.3%
2010 to 2019	9,528	4.5%
2000 to 2009	13,196	6.2%
1990 to 1999	14,900	7.0%
1980 to 1989	22,658	10.7%
1970 to 1979	26,527	12.5%
1960 to 1969	26,830	12.7%
1950 to 1959	35,334	16.7%
1940 to 1949	13,663	6.5%
1939 or Earlier	48,308	22.8%
Total Housing Units	**211,683**	

Projections provided by New York State's economic development agency indicate that the five (5) counties within the Central New York region could have 60,000 additional residents in 2040, which is above and beyond what the population would be at that time. Onondaga County, home to half of the population in the five (5) county area, is in a position to add approximately 30,000 new residents by 2040. An increase in population will require more housing. This is in part due to Micron's arrival in the County.[134] The City of Syracuse remains the County's economic core with approximately 37% of the region's total employment located in the City. However, the population in suburban areas has increased over the last decade and is expected to continue to grow. This population decentralization (population expanded away from the economic core) results in longer commutes, more vehicle miles traveled, and the need to expand transportation infrastructure.[135] This trend shows populations moving into the more rural areas of the County, which may cause delays after an earthquake event if transportation infrastructure is compromised.

As has occurred across the country after 1950, suburbanization has led to substantial growth in the Towns surrounding the City of Syracuse, at the expense of the City's population. While population is expected to continue to increase in the most suburbanized Towns and Villages, particularly with Micron's entry into the northern suburbs, the City of Syracuse has seen a resurgence of new housing and economic investment over the past two (2) decades. Over 60% of new housing units since 2000 have been constructed in the City, primarily as multi-family development.[136] This trend is also expected to continue as significant new investments are being made to facilitate new economic activity in urban areas. As outlined in the County's Comprehensive Plan, Plan Onondaga, the County continues to encourage development in areas already served by water and sewer infrastructure (e.g., Onondaga County Consolidated Sanitary District), and revitalization and reinvestment in existing built communities, rather than further expansion into rural and agricultural lands.

Effects of Climate Change in Severity of Impacts: The exact nature and extent of this impact still need to be studied and fully understood as it pertains to climate change. Some research shows a correlation between melting glaciers and tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the Earth's crust. As newly freed crust returns to its original, pre-glacial shape, it could cause seismic plates to slip and

[134] Onondaga County. (2024). Onondaga County Housing Needs Assessment. Retrieved from https://plan.ongov.net/wp-content/uploads/2024/06/OnondagaHousing_JUNE2024_FINAL.pdf.
[135] Syracuse Metropolitan Transportation Council. (2015). 2050 Long Range Transportation Plan. Retrieved from https://smtcmpo.org/wp-content/uploads/2019/05/2015-LRTP-2050-Report.pdf.
[136] Onondaga County Real Property Services Database.

stimulate volcanic activity, according to research on prehistoric earthquakes and volcanoes. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes.[137]

Because the impacts of climate change on earthquakes are not well understood, it is difficult to determine whether the County's vulnerability will increase or decrease. However, climate change may amplify the secondary impacts of earthquakes. As a result of the climate change projections discussed above, the County's assets located in areas of saturated soil and at the base of steep slopes are at a higher risk of landslides and mudslides due to seismic activity. *Refer to the Geological Hazards profile in this Plan for further details on landslides and mudslides*. Failure of a dam storing an increased volume of water would result in flooding of the County's assets located in the inundation area.

4.6.2.7. FEMA NRI Expected Annual Loss Estimates

An earthquake NRI EAL score and rating represent a community's relative level of expected building and population loss each year due to earthquakes when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-49** outlines the earthquake EAL for Onondaga County.

Table 4-49. Earthquake Expected Annual Loss *(FEMA National Risk Index)*

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$151,562	$751,435	n/a	$902,997	77.9	Relatively High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

4.6.2.8. FEMA Earthquake Risk Index Score

The earthquake Risk Index score and rating represent a community's relative risk for earthquakes when compared to the rest of the United States. **Table 4-50** illustrates the earthquake Risk Index rating and score for Onondaga County.

Table 4-50. Earthquake Risk Index (FEMA National Risk Index)

Jurisdiction	Rating	Score
Onondaga County	79.2	Relatively High
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

[137] National Aeronautics and Space Administration. (2023). Glaciers Spur Alaskan Earthquakes. Retrieved from https://svs.gsfc.nasa.gov/2969/.

Table 4-51 outlines the Earthquake Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

Table 4-51. Earthquake Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Earthquake	1	6	16	12	34	20

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

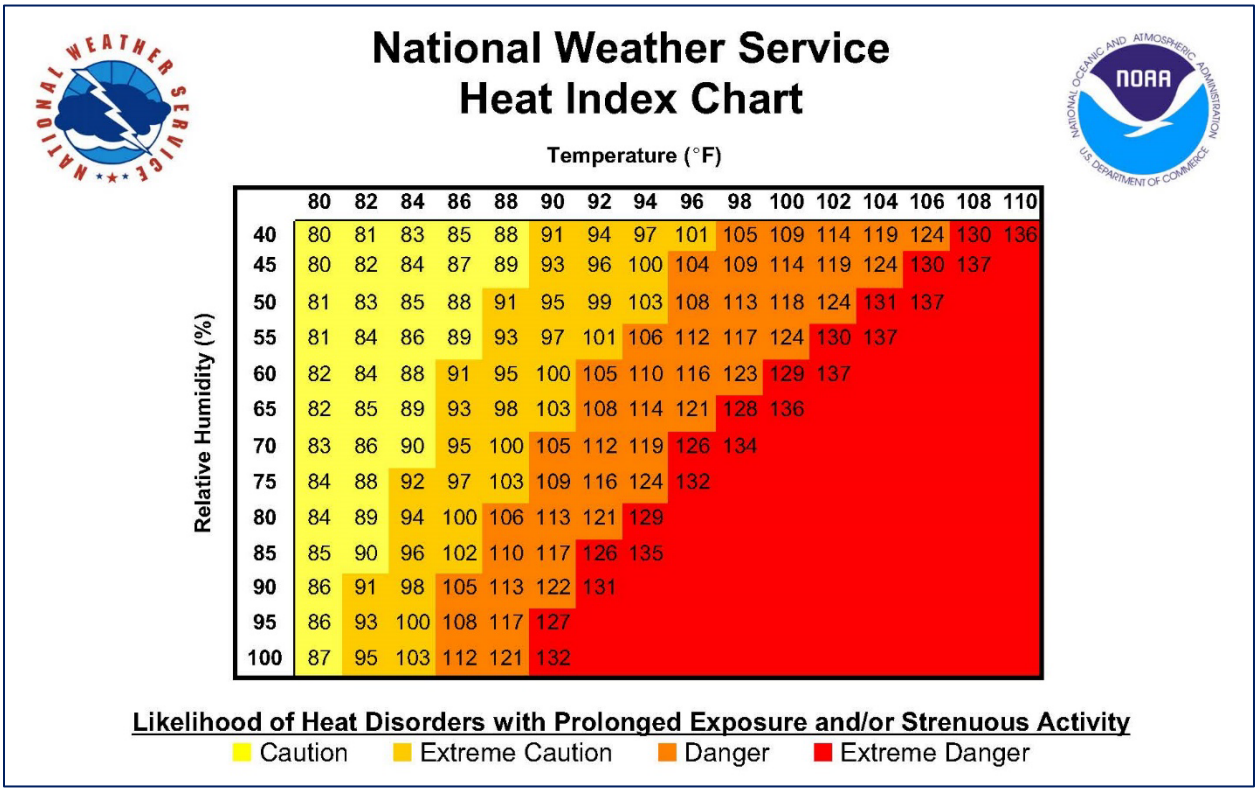
4.6.3. Heat Wave/Extreme Heat

4.6.3.1. Description

The definition of a heat wave varies depending on factors such as location, weather conditions (e.g., temperature, humidity, cloud cover), and the time of year.[138] However, excessive/extreme heat is defined as a prolonged period of extremely hot weather, with temperatures above the average high.[139] Heat alone does not make high temperatures dangerous; it is the combination of humidity and heat that makes them dangerous.[140] The Heat Index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature (i.e., ambient temperature).

Figure 4-6 illustrates the National Weather Service's (NWS) Heat Index Chart. The NWS primarily uses Heat Index values to determine excessive heat events and issue the appropriate advisories.[141]

Figure 4-6. National Weather Service Heat Index Chart



[138] U.S. Environmental Protection Agency and the Centers for Disease Control and Prevention. (2016). Climate Change and Extreme Heat: What You Can Do to Prepared. Retrieved from https://www.epa.gov/sites/default/files/2016-10/documents/extreme-heat-guidebook.pdf.
[139] Federal Emergency Management Agency. (n.d.). Extreme Heat | What. Retrieved from https://community.fema.gov/ProtectiveActions/s/article/Extreme-Heat-What.
[140] National Oceanic and Atmospheric Administration. (2022). Heat Index. Retrieve from https://www.noaa.gov/jetstream/global/heat-index#.
[141] National Weather Service. (n.d.). Heat Forecast Tools. Retrieved from https://www.weather.gov/safety/heat-index.

4.6.3.2. Location

Heat waves/extreme heat events can occur anywhere in the Onondaga County region and affect the entire planning area.

4.6.3.3. Extent/Intensity

During an excessive heat event, each NWS Forecast Office issues excessive heat advisories, watches, and warnings. **Table 4-52** outlines the heat-related products issued by the NWS Binghamton, New York Weather Forecast Office. NWS' local offices collaborate with local agencies (e.g., emergency managers, public health professionals) to determine when an advisory should be issued for the local area by establishing heat index thresholds for each advisory.

Table 4-52. National Weather Service Heat Advisories

Type	Description
Excessive Heat Outlook	Issued when the potential exists for an excessive heat event in the next three (3) to seven (7) days. An Outlook provides information to those who need considerable lead time to prepare for the event.
Heat Advisory	Issued within 12 hours of the onset of extremely dangerous heat conditions. The criteria for a Heat Advisory in Onondaga County is a heat index between 95°F and 104°F for a minimum of two (2) hours. Heat advisories are issued for the county when any location within that county is expected to reach the criteria. *A heat advisory means that people can be affected by heat if precautions are not taken. The issuance of a heat advisory is important to raise public awareness that these precautions need to be taken. Heat advisories are also used to trigger other actions and regulations, such as no evictions, no turning off of power, changing outdoor work requirements, etc.*
Excessive Heat Watch	Issued when Heat Warning criteria is possible (between 50% and 79%) one (1) to two (2) days in advance.
Excessive Heat Warning	Issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. The criteria for an Excessive Heat Warning in Onondaga County is a heat index of 105°F or greater lasting for two (2) hours or more. Excessive Heat Warnings are issued for the county when any location within that county is expected to reach the criteria. *An excessive heat warning means that some people can be seriously affected by heat if precautions are not taken. In addition to raising public awareness, issuing a heat warning will alert hospitals and officials to take certain actions to prepare for and respond to an increase in emergency calls, and to activate programs to check on seniors and the homebound. In some cases, cooling centers can be open or designated, and donation programs are activated for fans and air conditioners. As in the case of an advisory, certain regulations may change, such as turning off people's electricity, evictions, and outside work requirements.*

The NWS HeatRisk Tool is a color numeric-based index that provides a forecast of the potential level of risk for heat-related impacts over a 24-hour period. This serves as a supplementary tool for official NWS heat products and is intended to provide risk guidance for decision-makers and heat-vulnerable populations who require specific actions at levels below the NWS heat product thresholds.

This Tool takes into consideration the following – how unusual the heat is for the time of the year, the duration of the heat (daytime and nighttime temperatures), and if those temperatures pose an elevated risk of heat-related impacts based on data from the United States Centers for Disease Control and Prevention (CDC). **Table 4-53** outlines the NWS HeatRisk categories and risk of heat-related impacts.[142]

[142] National Weather Service. (2024). NWS HeatRisk. Retrieved from https://www.wpc.ncep.noaa.gov/heatrisk/.

Table 4-53. NWS HeatRisk Categories

Category		Risk of Heat-Related Impacts
0	Green	Little to no risk from expected heat.
1	Yellow	**Minor:** This level of heat affects primarily those individuals extremely sensitive to heat, especially when outdoors without effective cooling and/or adequate hydration.
2	Orange	**Moderate:** This level of heat affects most individuals sensitive to heat, especially those without effective cooling and/or adequate hydration. Impacts possible on some health systems and on heat-sensitive industries.
3	Red	**Major:** This level of heat affects anyone without effective cooling and/or adequate hydration. Impacts likely in some health systems, heat-sensitive industries and infrastructure.
4	Magenta	**Extreme:** This level of rare and/or long-duration extreme heat with little to no overnight relief affects anyone without effective cooling and/or adequate hydration. Impacts likely in most health systems, heat-sensitive industries and infrastructure.

4.6.3.4. Probability and Frequency

The probability of occurrence for a heat wave/extreme heat event in Onondaga County is medium because a significant hazard event is likely to occur every 25 years.

The heat wave annualized frequency value represents the average number of recorded heat wave hazard occurrences in event days per year over the period of record (16 years). **Table 4-54** outlines the annualized frequency of heat waves in Onondaga County, based on FEMA NRI data.

Table 4-54. Heat Wave Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(2005 – 2021)*	Annualized Frequency
Onondaga County	7	0.4 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

4.6.3.5. Past Events

Table 4-55 documents past heat wave/extreme heat events from 1950 through 2024 in Onondaga County based on data collected from the National Centers for Environmental Information (NCEI) database. Although there have not been significant heat wave/excessive heat events in Onondaga County, a period of record warm temperatures was experienced across central New York between March 17, 2012, and March 23, 2012, as the jet stream was pushed farther north than is typical for the time of year and a persistent southerly flow developed over an unusually large area of the United States. The Binghamton weather station saw seven (7) days in a row of record high temperatures, the second longest string on record. Temperatures across central New York reached well into the 70s, with typically warmer valley locations near or just above 80°F. The Binghamton and Hancock Airport in Syracuse weather stations recorded over 12°F above normal for the month, breaking records for the month of March.[143]

[143] NOAA, National Centers for Environmental Information. (2012). Storm Events Database (Event #373324). Retrieved from https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=373324.

Table 4-55. Heat Wave/Extreme Heat Events in Onondaga County (1950 – 2024)

Type	Total Occurrences *(1950 – 2024)*	Fatalities	Injuries	Property Damage	Crop Damage
Excessive Heat	2	0	0	$0	$0
Heat	3	0	0	$0	$0
Total	**5**	**0**	**0**	**$0**	**$0**

Between 1953 and 2024, there have been no major disaster (DR), or emergency (EM) declarations in New York State related to extreme heat. However, the State has experienced heat waves/extreme heat events that did not result in a presidential declaration or cause documented damage reimbursed through FEMA's disaster recovery programs.[144]

4.6.3.6. Vulnerability and Impacts

Life Safety and Public Health: The entire population of Onondaga County is vulnerable to heat waves/extreme heat events, and it is likely to experience some adverse impacts to heat waves/extreme heat. Individuals exposed to extreme heat can suffer from heat-related illnesses (i.e., heat stroke, heat exhaustion, heat cramps), and if left untreated, can result in death. Additionally, extreme heat can exacerbate pre-existing health issues such as cardiovascular and respiratory diseases (e.g., asthma, chronic obstructive pulmonary disease (COPD)). Over 700 people die from extreme heat every year in the United States.[145] Extended periods of extreme heat (i.e., heat waves) can burden health and emergency services, strain critical infrastructure (i.e., water, energy, and transportation), and impact food and livelihoods if people lose crops or livestock.[146] During heat waves, the energy infrastructure can be strained by increased electricity demand as people use air conditioning to stay cool. This can result in brownouts or blackouts, disrupting critical services and people's ability to cool down, increasing the likelihood of heat-related illnesses, and straining health and emergency services.

Underserved and At-Risk Population: The underserved and at-risk population exposed to a heat wave/extreme heat event in Onondaga County is likely to experience some adverse/disproportionate impacts. This population faces unique vulnerabilities and impacts from heat waves/extreme heat events, including but not limited to individuals with chronic medical conditions, children, the elderly, low-income families, and outdoor workers. Extreme heat can exacerbate chronic medical conditions (e.g., cardiovascular disease, respiratory conditions, diabetes, cerebrovascular diseases) because these individuals may be less likely to sense or respond to changes in temperature and may be taking medications that can worsen the effects of heat.[147] Children are more vulnerable to heat waves/extreme heat events because they have a smaller body mass to surface area ratio than adults, and are more likely to become dehydrated because they lose more fluid at a faster rate and are less likely to rehydrate themselves after long periods of time. Furthermore, children are more likely to play outside and may lack the judgment to limit exertion during extreme heat.[148] The elderly are vulnerable due to their body's decreased ability to regulate temperature, and are more likely to have chronic medical conditions and to take prescription medication that affects the body's ability to control temperature and sweat. Low-income families may not have the financial

[144] New York State Division of Homeland Security and Emergency Services. (2023). New York State Hazard Mitigation Plan. Retrieved from https://mitigateny.org/.
[145] U.S. Centers for Disease Control and Prevention. (2024). Protect Yourself from the Dangers of Extreme Heat. Retrieved from https://www.cdc.gov/climate-health/php/resources/protect-yourself-from-the-dangers-of-extreme-heat.html.
[146] World Health Organization. (n.d.). Heatwaves. Retrieved from https://www.who.int/health-topics/heatwaves.
[147] U.S. Centers for Disease Control and Prevention. (2024). Heat and Chronic Conditions. Retrieved from https://www.cdc.gov/heat-health/risk-factors/heat-and-chronic-conditions.html.
[148] U.S. Centers for Disease Control and Prevention. (2024). Protecting Children's Health During and After Natural Disasters: Extreme Heat. Retrieved from https://www.epa.gov/children/protecting-childrens-health-during-and-after-natural-disasters-extreme-heat.

means for air conditioning, making it harder to stay cool, comfortable, and healthy during periods of extreme heat. Additionally, there is a correlation between low-income and poor health outcomes and preexisting health conditions among the low-income population. Low-income individuals may be uninsured and are less likely to seek medical attention if they become ill. Outdoor workers include, but are not limited to, agriculture, construction, building maintenance, and landscaping. This population is significantly vulnerable to heat waves/extreme heat events because these jobs, often physically intense, require them to be outside and expose them to the risk of heat-related illnesses (e.g., heat cramps, heat exhaustion, heat stroke). Furthermore, outdoor work may also be halted during high temperatures, which can cause significant economic hardships. **Table 4-56** summarizes the vulnerable and at-risk population for heat waves/extreme heat in Onondaga County.

Table 4-56. Underserved and At-Risk Population

Category	Estimate	Percent
Population in Poverty (i.e., low-income population)[149]	62,884	13.9%
Uninsured Population[150]	15,532	3.3%
Senior (65 years old and over)[151]	85,781	18.2%
Children (5 years old and under)[155]	25,989	5.5%

FEMA's Community Resilience Challenges Index (CRCI) is a composite of 22 community resilience indicators, commonly used across 14 peer-reviewed community resilience methodologies, which include data points on population and household characteristics, housing, healthcare, economic factors, and connection to community.[152] Analyzing this data can help identify areas with a higher number of people who are more vulnerable to extreme heat, within locations projected to see the most heat waves/extreme heat events. **Figure 4-7** illustrates the CRCI score in Onondaga County. According to the map, the area immediately surrounding the City of Syracuse has a high CRCI score, which is a logical area to focus mitigation strategies for heat waves/extreme heat events.

Figure 4-8 illustrates the percentage of the population below the poverty level in Onondaga County. According to the map, the areas with the highest percentage of population below the poverty level are within and immediately surrounding the City of Syracuse. This helps highlight the areas that are more likely to benefit from programs that help low-income households access reliable, climate-controlled spaces (e.g., energy bill rebates, providing window air conditioners, opening and/or extending the hours of cooling centers accessible from public transit routes).

Figure 4-9 illustrates the percentage of residents aged 65 years old and over in Onondaga County. This map highlights areas with underserved and at-risk populations that were not identified in the previous maps (**Figures 4-7** and **4-8**). While the CRCI score and the percentage of the population below the poverty level are higher within the City of Syracuse area, another segment of the underserved and at-risk population, the elderly, is more widely distributed across the County. Understanding where these vulnerable populations are concentrated helps develop a more targeted outreach and mitigation strategies for heat waves/extreme heat events.

[149] United States Census Bureau. (2023). S1701: Poverty in the Past 12 Months (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S1701?g=050XX00US36067.
[150] United States Census Bureau. (2023). S2701: Selected Characteristics of Health Insurance Coverage in the United States (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S2701?g=050XX00US36067.
[151] United States Census Bureau. (2023). DP05: ACS Demographic and Housing Estimates (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP05?g=050XX00US36067.
[152] Federal Emergency Management Agency. (2024). FEMA Community Resilience Challenges Index (FEMA CRCI). Retrieved from https://experience.arcgis.com/experience/376770c1113943b6b5f6b58ff1c2fb5c/page/FEMA-CRCI/.

Figure 4-7. Community Resilience Challenges Index (CRCI) in Onondaga County

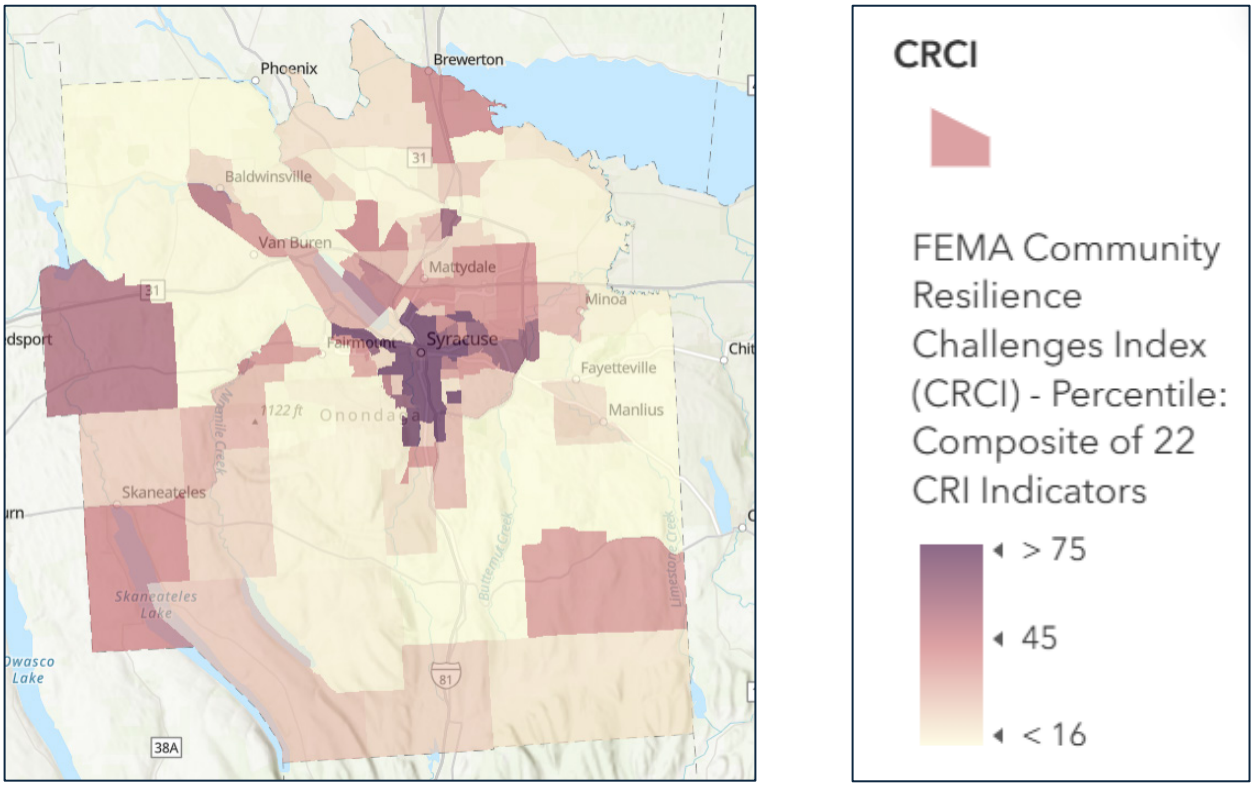


Figure 4-8. Population Below Poverty Level in Onondaga County

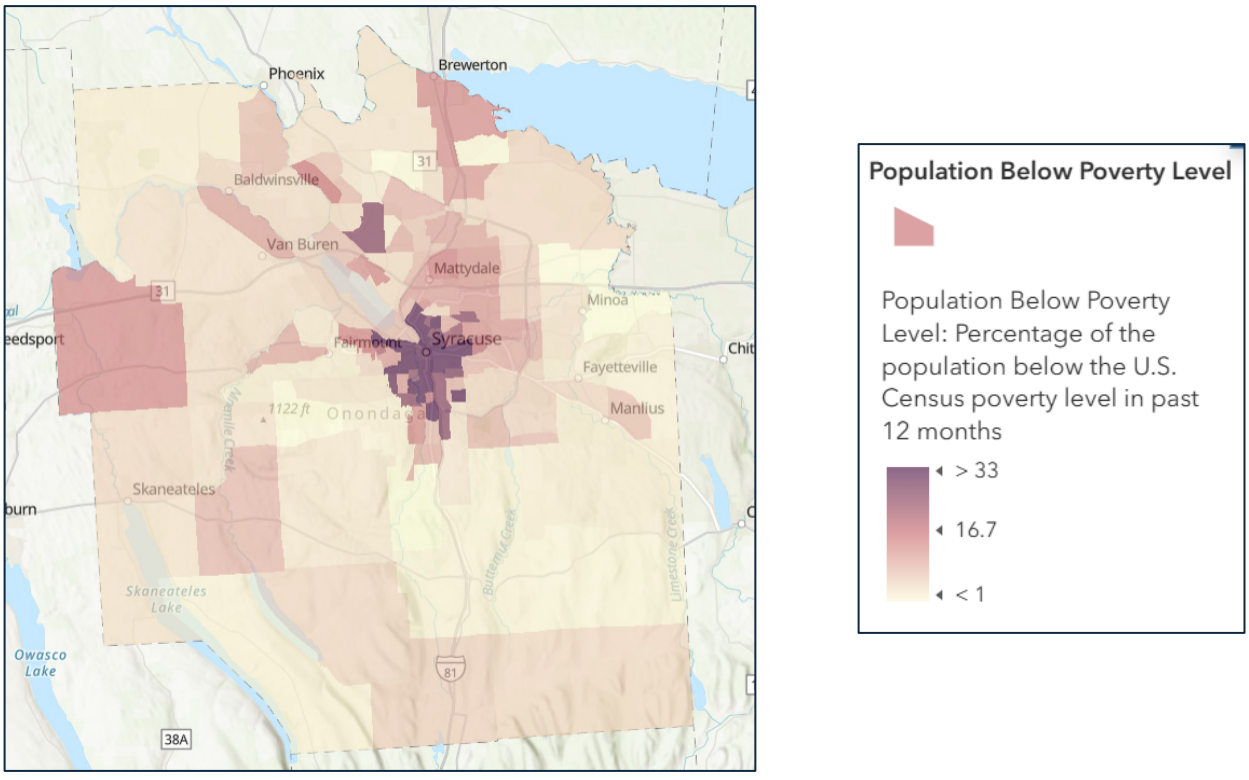
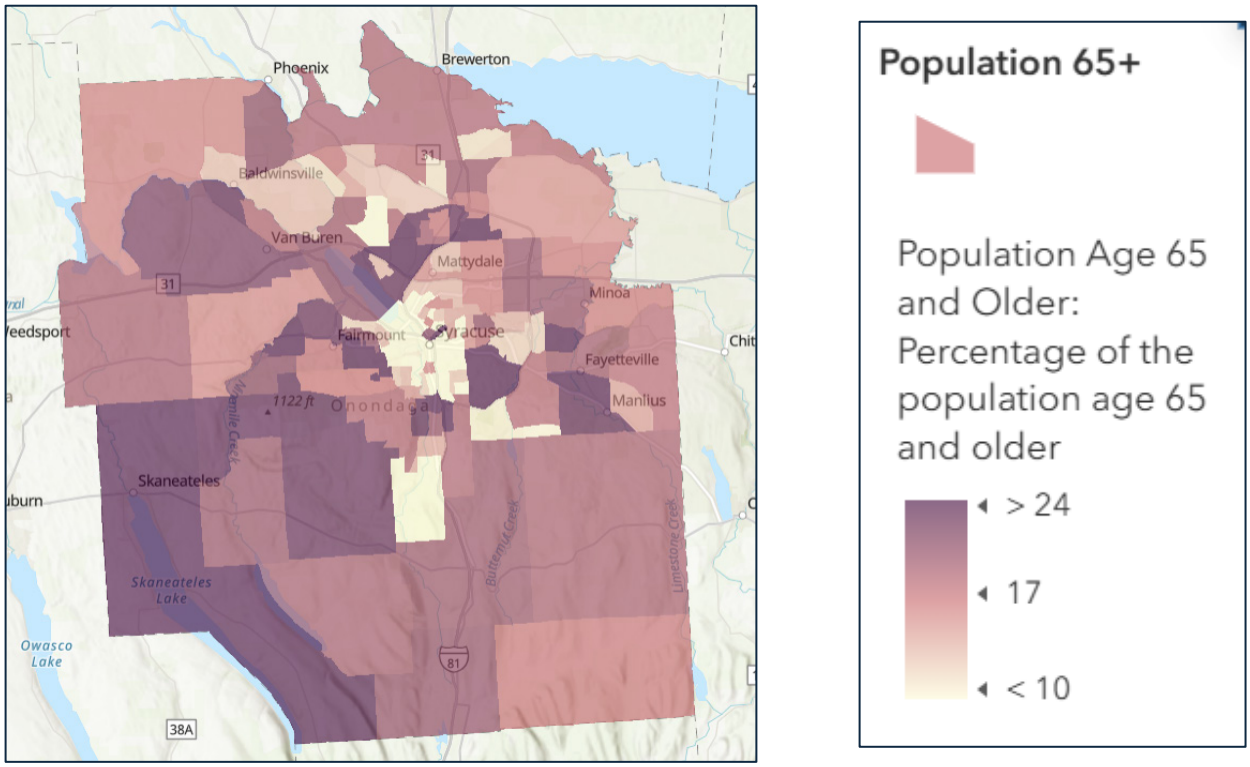


Figure 4-9. Population 65 Years Old and Over in Onondaga County



Property Damage and Critical Infrastructure: Little to no property damage is expected from a single major heat wave/extreme heat event because this hazard is not known for causing direct damage to property. However, heat waves/extreme heat events can stress critical infrastructure, resulting in secondary impacts. For example, increased electrical loads can lead to an unstable grid and power loss (i.e., brownouts, blackouts) during extreme heat waves, which impacts access to cooling systems. Power lines can become less efficient due to overheating, leading to drooping, and load-shedding capacity can be overwhelmed as transformers degrade or become damaged. Direct sunlight and heat can result in concrete degradation (e.g., cracks, material dimpling, and structural expansion that allows moisture to infiltrate and compromise the structure's stability). Overheated materials can permeate buildings and increase cooling needs. Extreme heat can cause dams and levees to lose efficiency due to cracks, breaks, and elevation shifts from subsidence due to heat and overpulling.[153]

Economy: Agriculture would be most impacted by heat waves/extreme heat events. Extreme heat can reduce crop yields and livestock production, increase insect infestations and plant diseases, and increase wind erosion. Like drought, heat waves/extreme heat may lead to reduced income for farmers and reduced business for retailers and others who provide goods and services to farmers. Subsequently, this leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue. Prices for food, energy, and other products may also increase as supplies decrease.[154]

Direct and indirect losses to agricultural producers, livestock producers, timber producers, fishery producers, and tourism may include:

[153] Cybersecurity & Infrastructure Security Agency. (n.d.). Retrieved from https://www.cisa.gov/topics/critical-infrastructure-security-and-resilience/extreme-weather-and-climate-change/extreme-heat.
[154] Ibid.

- Damage to crop quality and crop losses.
- Insect infestation leading to crops and tree losses.
- Plant diseases leading to loss of crops and trees.
- Reduced productivity of livestock due to unavailability of food and mortality rates (e.g., milk production, meat).
- Reduction in tourism and outdoor activities (e.g., hunting, fishing, and boating).
- Increased risk of brush fires and wildfires due to dried crops, grasses, and dying trees.

When a heat wave/extreme heat event occurs, the agricultural industry is most at risk for economic impact and damage. Crops do not mature during extreme temperatures, resulting in lower yields, undernourishment of wildlife and livestock, decreased land values, and ultimately financial losses to the farmer.[155] A large majority of the State's agriculture is fed by rainfall without irrigation; however, summer precipitation is currently not sufficient to fully meet crop water needs during most years.[156] In 2022, there were 572 farms within Onondaga County, encompassing 164,239 acres of total farmland. The average farm size was 287 acres. Onondaga County farms had a total market value of agricultural products sold of $271.5 Million ($68.8 Million in crop sales and $121.3 Million in livestock, poultry, and related products), averaging $474,629 per farm. **Table 4-57** lists the acreage of agricultural land exposed to the heat wave/extreme heat hazard.[157]

Table 4-57. Agricultural Land in Onondaga County (2022)

Number of Farms	Land in Farms *(acres)*	Total Cropland *(acres)*	Harvested Cropland *(acres)*	Total Cropland Used Only for Pastureland *(acres)*
572	164,239	117,495	104,084	9,475

In 2022, the top three (3) agricultural products sold in Onondaga County were milk from cows at $153.3 Million; grains, oilseeds, dry beans, and dry peas at $33.4 Million; and poultry and eggs at $30.1 Million.[158]

If the average production (dollar value) per crop type could be identified on a per acre basis, loss estimates could be developed based on an assumed percent damage that could result from a heat wave/extreme heat. If a heat wave event impacted 40% of the agricultural products sold from Onondaga County farms, based on 2022 market values, this would be a loss of $108.6 Million.

A prolonged heat wave/extreme heat event can lead to drought conditions, which can have a profound economic impact on a community. Increased demand for water and electricity may result in shortages and higher costs for these resources. Although most businesses will still be operational, they may be impacted aesthetically. These

[155] University of Nebraska-Lincoln. (2000). Chapter 18 Drought: Pervasive Impacts of a Creeping Phenomenon. Retrieved from https://digitalcommons.unl.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1070&context=droughtfacpub.
[156] New York State Energy Research and Development Authority. (2014). Responding to Climate Change in New York State (ClimAID). Retrieved from https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/EMEP/climaid/ClimAID-Report.pdf.
[157] United States Department of Agriculture. (2022). Census of Agriculture: County Profile (Onondaga County, New York). Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/New_York/cp36067.pdf.
[158] New York State Energy Research and Development Authority. (2014). Responding to Climate Change in New York State. Retrieved from https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/ClimAID/2014-ClimAid-Report.pdf.

aesthetic impacts are most significant within the recreation and tourism industry. Moreover, heat waves/extreme heat events in other areas could impact the food supply and food prices for residents in the County.

Changes in Development and Impact of Future Development: Changes in development have increased the vulnerability of Onondaga County to heat wave/extreme heat, but not significantly. Future development trends will minimally increase the impact of heat wave/extreme heat within Onondaga County. This hazard could impact any areas of growth, as the entire planning area is exposed and vulnerable to heat waves/extreme heat.

Similar to other counties across Upstate New York, Onondaga County's population is older and aging. The average median age is 39.8 years old, and approximately 30% of households have someone who is 65 years old or older. Approximately 31% of households in the County are owned by individuals 65 years of age or older.[159] An aging population within the County results in more individuals (i.e., the elderly) who are uniquely vulnerable to heat waves/extreme heat. Furthermore, approximately 71.2% of the housing units were built before 1980, and only 11.1% of the housing stock was built after 2000. Older housing stock requires ongoing maintenance, investment, and upgrades (e.g., cooling systems) to improve energy efficiency and reduce operational costs. A lack of cooling systems (i.e., air conditioning) in older housing units within the County could expose residents of these structures and increase their risk of heat-related illnesses.[160]

Effects of Climate Change in Severity of Impacts: Average temperatures have increased by almost 2.6°F in the State of New York since 1901. Since 2000, temperatures have been higher than in any period on record, and the State has warmed more rapidly than the national average. Temperatures are projected to increase in all regions of the State. The number of days with temperatures above 90°F in Syracuse is expected to increase to 37 days per year in the 2050s and 57 days per year in the 2080s (the average was 10 days per year between 1981 and 2010). Subsequently, the number of days below 32°F is expected to decrease. Changes in temperature outside affect the amount of energy residents use to heat (i.e., heating degree days) and cool (i.e., cooling degree days) their residences and other buildings. The annual average temperatures throughout the State are well below 65°F; however, heating degree days have decreased by about eight (8) days per year, and cooling degree days have increased by two (2) days per year between 1895 and 2022. Much of the change has occurred in the last two (2) decades. This trend in cooling and heating degree days is expected to continue. Changes in heating and cooling degree days could mean that residents use less energy for heating and more for cooling (i.e., air conditioning); however, many New Yorkers lack access to air conditioners, increasing their vulnerability to extreme heat.[161]

Table 4-58 outlines the drought associated climate indicators for Onondaga County projected through the end of the century.[162]

[159] Onondaga County. (2023). Plan Onondaga: A Comprehensive Plan for Onondaga County. Retrieved from https://plan.ongov.net/the-plan/.
[160] United States Census Bureaus. (2023). DP04: Selected Housing Characteristics (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP04?g=050XX00US36067.
[161] New York State Energy Research and Development Authority. (2024). New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate (Temperature Section). Retrieved from https://nysclimateimpacts.org/explore-the-assessment/new-york-states-changing-climate/nysc-temperature/.
[162] Climate Mapping for Resilience and Adaptation. (n.d.). Climate Mapping for Resilience and Adaptation Assessment Tool. Retrieved from https://livingatlas.arcgis.com/assessment-tool/explore/details.

Table 4-58. Future Climate Indicators for Onondaga County

Indicators	Modeled History (1976 – 2005)	Early Century (2015 – 2044)		Mid Century (2035 – 2064)		Late Century (2070 – 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min – Max	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*
Precipitation							
Average annual total precipitation	**40 inches**	**42 inches**	**42 inches**	**42 inches**	**43 inches**	**43 inches**	**44 inches**
	39 – 41	40 – 44	39 – 44	39 – 46	39 – 45	40 – 46	41 – 47
Days per year with precipitation *(Wet Days)*	**238 days**	**234 days**	**234 days**	**233 days**	**231 days**	**232 days**	**228 days**
	234 – 241	222 – 244	218 – 241	224 – 244	218 – 243	216 – 243	206 – 249
Days per year with no precipitation *(Dry Days)*	**128 days**	**131 days**	**131 days**	**132 days**	**134 days**	**133 days**	**137 days**
	124 – 131	121 – 143	124 – 147	121 – 141	122 – 147	122 – 149	116 – 159
Maximum number of consecutive dry days	**8 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**10 days**
	7 – 9	7 – 10	8 – 11	8 – 10	7 – 12	8 – 11	7 – 12
Temperature Thresholds							
Annual days with maximum temperature greater than 90°F	**3 days**	**12 days**	**13 days**	**18 days**	**24 days**	**25 days**	**52 days**
	3 – 6	4 – 23	5 – 21	6 – 35	9 – 43	8 – 51	16 – 91
Annual days with maximum temperature greater than 100°F	**0 days**	**0 days**	**0 days**	**1 days**	**2 days**	**2 days**	**9 days**
	0 – 0	0 – 2	0 – 2	0 – 6	0 – 8	0 – 6	0 – 36

Figure 4-10 illustrates the modeled historical summer heat index, and **Figure 4-11** illustrates the modeled mid-century projections of summer heat index. These values are averages of daily heat index highs, also known as the "feels like" temperatures by NWS, across the entire summer season (June, July, and August). The maps show the summer heat index rising by over 4°F, with a considerable portion of the County surpassing the 80°F threshold. This threshold is outlined by the Occupational Safety and Health Administration (OSHA) as being a temperature of greater concern. When the heat index is at or above 80°F, there is an increase in serious occupational heat-related illnesses and injuries become more frequent, especially in workplaces where unacclimated workers perform strenuous work (e.g., construction workers, farmers).[163]

Figure 4-12 illustrates the number of days by mid-century that the heat index will exceed 95°F. In the historical model, Onondaga County showed less than one (1) day a summer on average with a heat index over 95°F. This suggests that heat will become an increasingly important public health concern within the County throughout the next century.

[163] Occupational Safety and Health Administration. (2022). Temporary Worker Initiative: Expose to Outdoor and Indoor Heat-Related Hazards. Retrieved from https://www.osha.gov/sites/default/files/publications/OSHA4185.pdf.

Figure 4-10. Heat Index: Summer Average of Daily Highs

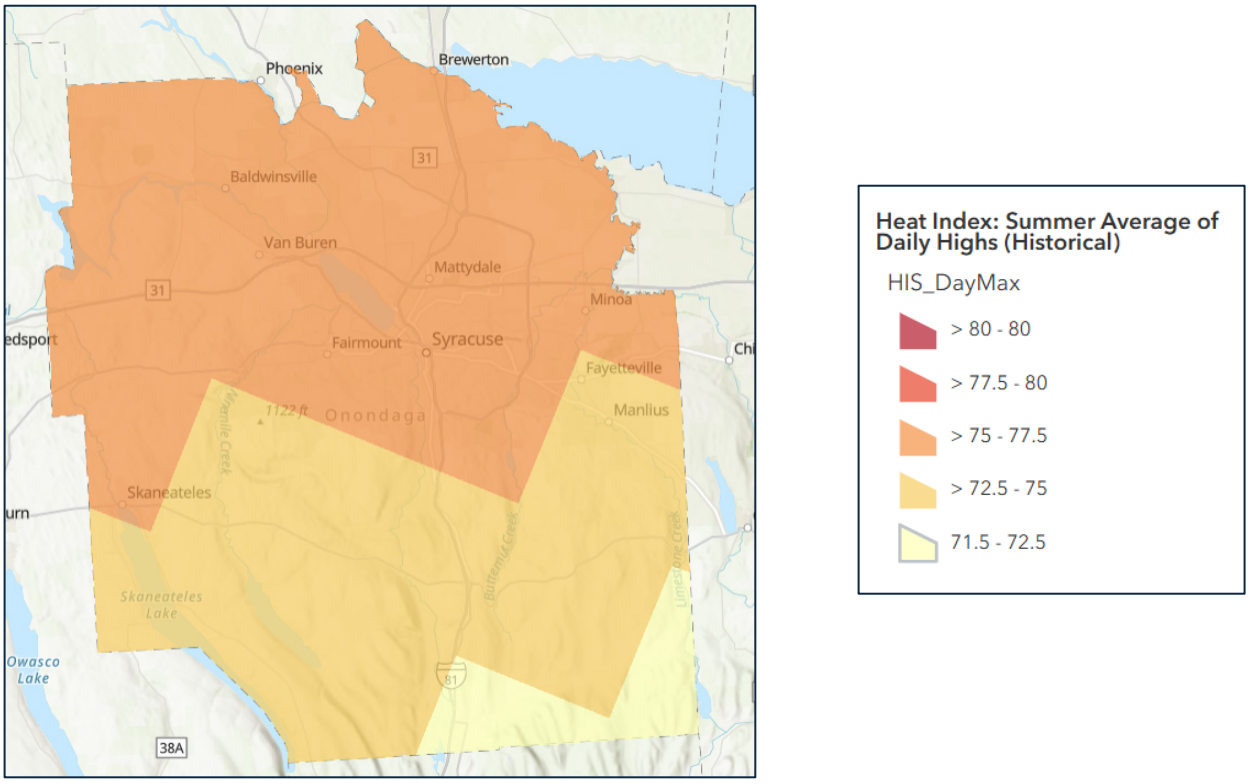


Figure 4-11. Heat Index: Summer Average of Daily Highs at Mid-Century

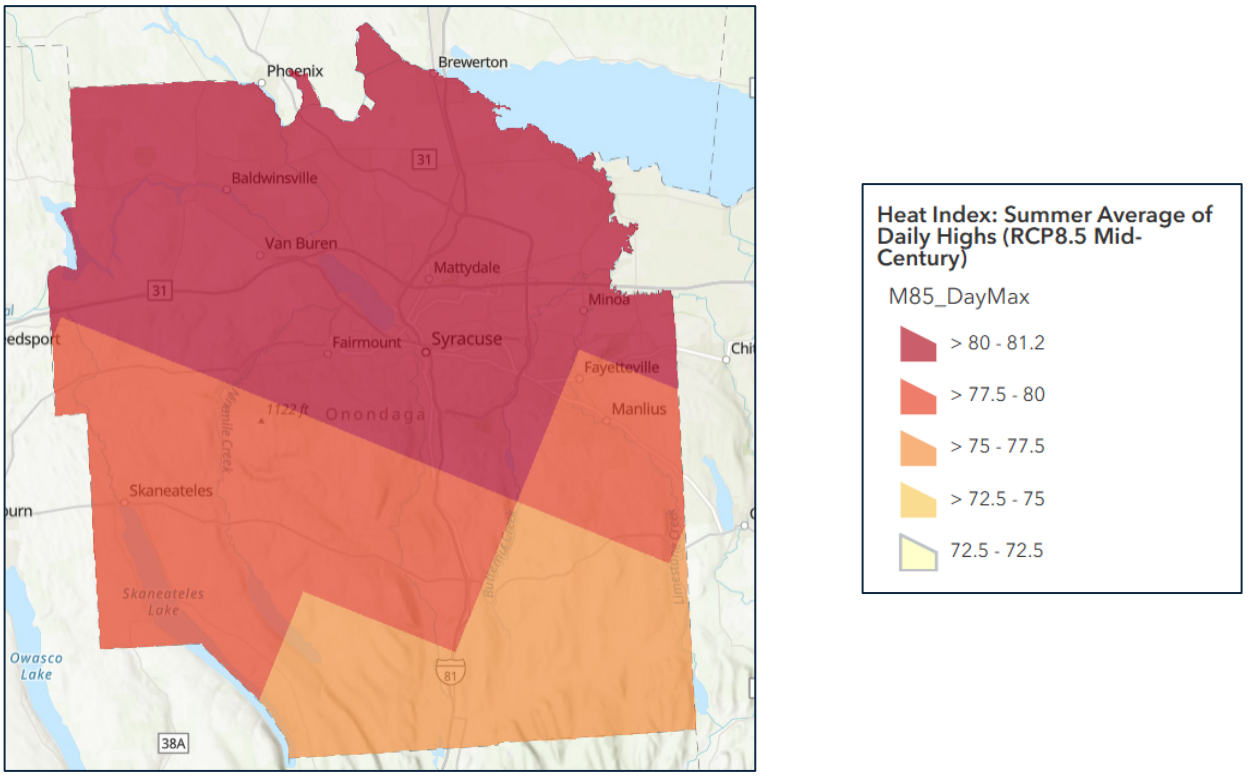
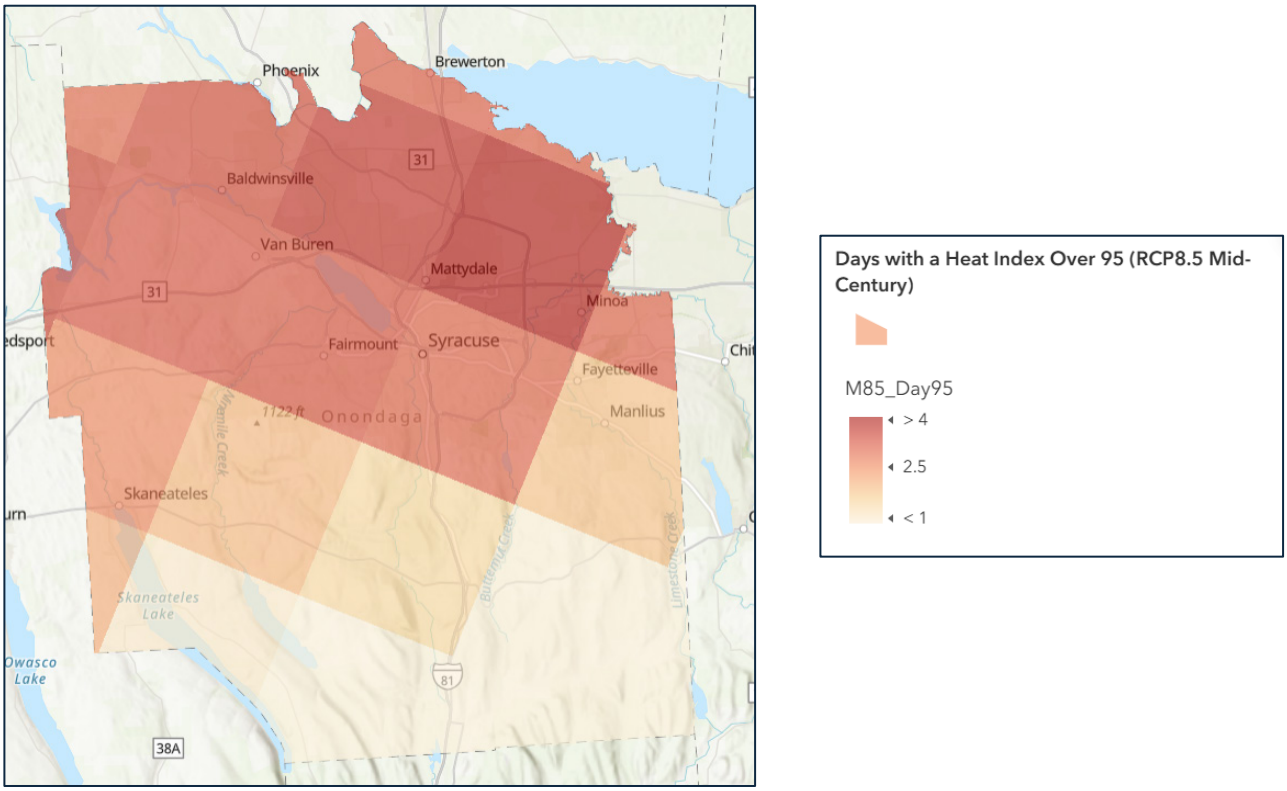


Figure 4-12. Heat Index: Days Over 95°F at Mid-Century



4.6.3.7. FEMA NRI Expected Annual Loss Estimates

A heat wave NRI EAL score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to heat waves when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-59** outlines the heat wave EAL for Onondaga County.

Table 4-59. Heat Wave/Extreme Heat Expected Annual Loss *(FEMA National Risk Index)*

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$684,268	$1	$4,447	$688,716	86.7	Very High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

4.6.3.8. FEMA Heat Wave/Extreme Heat Risk Index Score

The heat wave Risk Index score and rating represent a community's relative risk for heat waves when compared to the rest of the United States. **Table 4-60** illustrates the heat wave Risk Index rating and score for Onondaga County.

Table 4-60. Heat Wave/Extreme Heat Risk Index *(FEMA National Risk Index)*

Jurisdiction	Rating	Score
Onondaga County	Very High	84.6
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

Table 4-61 outlines the Heat Wave/Extreme Heat Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

Table 4-61. Heat Wave/Extreme Heat Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Heat Wave/Extreme Heat	2	9	11	19	39	41

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

4.6.4. Flood

4.6.4.1. Description

Floods are among the most common and widespread of all weather-related natural disasters and cause more deaths each year than tornadoes, hurricanes, and lightning. A flood is defined as an overflowing of water onto dry land, which occurs when the existing channel of a stream, river, canyon, or other watercourses cannot contain excess runoff from rainfall or snowmelt.[164] Floods can develop slowly over a period of days or develop quickly, with catastrophic effects that can be local (i.e., impacting a neighborhood or community) or regional (i.e., affecting entire river basins, coastlines, and multiple counties or states).

Riverine Flooding

Occurs when water levels rise over the top of riverbanks due to excessive rain from tropical systems making landfall, persistent thunderstorms over the same area for extended periods, combined rainfall and snowmelt, or an ice jam.[165]

Flash Flood

Occurs during heavy or excessive rainfall over a short period, generally less than six (6) hours. Flash floods are usually characterized by raging torrents that form after heavy rains and rip through riverbeds, urban streets, or mountain canyons. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance, after a levee or dam has failed, or after a sudden release of water by a debris or ice jam.[166]

Shallow Flooding

Shallow flooding is defined as flooding with an average depth of three (3) feet or less, where no defined channels exist. There are different types of shallow flooding, and the types of flows that result in shallow flooding include:[167]

- Unconfined flows over broad, relatively low relief areas (e.g., alluvial plains).
- Intermittent flows in arid regions that have not developed a system of well-defined channels.
- Overbank flows, which are independent of the main channel.
- Overbank flows in urban areas.
- Flows collect in depressions to form ponding areas.

If local conditions cannot accommodate intense precipitation through infiltration and surface runoff, water may accumulate, causing flooding. During winter and spring, frozen ground and snow accumulations may contribute to inadequate drainage and localized ponding. Flooding issues of this nature generally occur in areas with flat gradients and tend to increase with urbanization, which speeds the accumulation of floodwaters due to impervious surfaces. Shallow street flooding can occur unless channels are improved to accommodate increased flows.

[164] National Oceanic and Atmospheric Administration, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Flood Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/floods/.
[165] National Oceanic and Atmospheric Administration, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Flood Types. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/floods/types/.
[166] Ibid.
[167] Federal Emergency Management Agency. (2020). Guidance for Flood Risk Analysis and Mapping: Shallow Flooding Analysis and Mapping. Retrieved from https://www.fema.gov/sites/default/files/documents/fema_shallow-flooding-guidance.pdf.

High groundwater levels can be a concern and cause problems even in areas without surface flooding. Basements are susceptible to high groundwater levels. Seasonally high groundwater is common in many areas of Onondaga County, while elsewhere it occurs only after long periods of above average precipitation.

Urban drainage flooding is caused by increased water runoff from urban development and inadequate drainage systems. Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent localized flooding on streets and other urban areas. They make use of a closed conveyance system that channels water away from an urban area to surrounding streams. This bypasses the natural processes of water filtration through the ground, containment, and evaporation of excess water. Since drainage systems reduce the time it takes surface water to reach surrounding streams, flooding in those streams can occur more quickly and reach greater depths than before development in that area.

Ice Jam

An ice jam occurs when pieces of floating ice are carried with a stream's current and accumulate behind any obstruction to the stream flow. Obstructions may include river bends, the mouths of tributaries, points where the river slope decreases, and dams and bridges. The water held back by this obstruction can cause flooding upstream, and if the obstruction suddenly breaks, flash flooding can occur downstream.[168] The formation of ice jams depends on the weather and physical condition of the river and stream channels. They are most likely to occur where the channel slope naturally decreases, in culverts, and along shallows where channels may freeze solid. Ice jams and resulting floods can occur at different times of the year: fall freeze-up from the formation of frazil ice; mid-winter periods when stream channels freeze solid, forming anchor ice; and spring breakup when rising water levels from snowmelt or rainfall break existing ice cover into pieces that accumulate at bridges or other types of obstructions. **Table 4-62** lists the four (4) types of ice jams.[169]

Table 4-62. Types of Ice Jams

Type	Description
Freezeup	Freezeup-type jams are associated with the formation and accumulation of frazil ice, which eventually forms a continuous ice cover, and typically occur during early winter to midwinter. These types of ice jams are usually not associated with large discharge events.
Breakup	Breakup-type jams are frequently associated with rapid increases in runoff and rises in river stage resulting from rainfall and/or snowmelt. These types of ice jams usually occur during the late winter or early spring. Due to the large volumes of ice involved and the greater discharges associated with them, breakup-type jams are predominant in ice jam flooding.
Floating	Floating-type jams are considered to be those where the ice is not grounded to the channel's bottom, and significant flow takes place beneath the ice cover. Floating-type jams are typical of deeper rivers and can cause significant backwater effects.
Ground	Grounded-type jams are characterized by an ice cover partially grounded to the channel bed, with most of the flow diverted into overbank and floodplain areas. This type of ice jam is typical of shallow, confined stream sections and can cause significant backwater effects.

Dam and Levee Failure

A dam is an artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material, for the purpose of storage or control of water. Dams are human-built multipurpose structures built primarily for floodwater control, water supply, power production, agriculture, and recreation. Dam failure is any malfunction or abnormality outside of the design that adversely affects a dam's primary function of impounding water.

Most dam failures fall into one (1) or more of three (3) categories – structural, mechanical, and hydraulic.

[168] National Weather Service. (n.d.). Flood Related Hazards. Retrieved from https://www.weather.gov/safety/flood-hazards.
[169] Federal Emergency Management Agency. (2018). Guidance for Flood Risk Analysis and Mapping: Ice Jam Analyses and Mapping. Retrieved from https://www.fema.gov/sites/default/files/2020-02/Ice_Jam_Guidance_Feb_2018.pdf.

- **Structural Failure:** Includes foundation defects (e.g., settlement and slope instability) or damage caused by earthquakes.
- **Mechanical Failure:** Includes malfunctioning gates, conduits, or valves.
- **Hydraulic Failure:** Overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest.

Planned releases through spillways, whether intended or in response to emergency situations, can cause flooding and public safety hazards, even in the absence of a dam failure. During periods of extreme flow, dams may fill to capacity, necessitating emergency releases that can flood downstream areas.[170]

A levee is a human-built structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to reduce flood hazards posed by temporary flooding.[171] A levee failure can occur when flood waters exceed the height of a levee and flow over its crown (i.e., overtopping) or when breaching occurs. A levee breach can occur gradually or suddenly when part of the levee gives way, resulting in an opening through which floodwater may pass. The most dangerous breaches happen quickly during periods of high water. The resulting stream of water can quickly flood a large area behind the failed levee with little to no warning.[172]

4.6.4.2. Location

Flooding potential is influenced by climatology, meteorology, and topography (i.e., elevations, latitude, bodies of water, and waterways).

Floodplains

A floodplain is defined as the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or body of water that becomes inundated during a flood. In Onondaga County, floodplains line the rivers and streams within the County. Changes in land use alter the boundaries of floodplains, the amount of impervious surface, the placement of obstructing structures in floodways, changes in precipitation and runoff patterns, improvements in technology for measuring topographic features, and the use of different hydrologic modeling techniques.

Floodplain is synonymous with the 100-year floodplain. A 100-year floodplain does not mean that a flood will occur once every 100 years; it is defined as an area with 1% chance of flooding in any given year. Therefore, the 100-year flood could occur more than once in a relatively short period. Additionally, areas within the 100-year floodplain can flood in smaller storms. These areas are identified on the Flood Insurance Rate Map (FIRM) as a Special Flood Hazard Area (SFHA), the standard term used by most federal and state agencies and the National Flood Insurance Program (NFIP).[173] The 1% annual chance floodplain establishes the area subject to flood insurance and floodplain management requirements and is also referred to as the regulatory floodplain. Similarly, the 500-year floodplain will not occur every 500 years, but it is an event with a 0.2% chance of being equaled or exceeded each year.

The SFHA, each Flood Zone, and the 500-year floodplain are illustrated in **Figure 4-13**. As depicted in **Figure 4-13**, flood hazard zones occur throughout the County at locations along the Seneca River, at the confluence of the

[170] Federal Emergency Management Agency. (2018). Guidance for Flood Risk Analysis and Mapping: Dams/Reservoir and Non-Dam Features. Retrieved from https://www.fema.gov/sites/default/files/2020-02/Dams_Reservoirs_and_Non_Dam_Features_Guidance_Nov_2019.pdf.
[171] Ibid.
[172] American Society of Civil Engineers. (2010). So, You Live Behind a Levee! Retrieved from https://www.spl.usace.army.mil/Portals/17/SoYouLiveBehindLevee.pdf.
[173] Federal Emergency Management Agency. (2020). Flood Zones. Retrieved from https://www.fema.gov/glossary/flood-zones.

Seneca and Oneida Rivers, and are associated with numerous creeks throughout the County, but are more prevalent in the northern part of the County.

The FIRM data provided by FEMA to Onondaga County shows the following flood hazard areas:

- **1% Annual Chance Flood Hazard:** Area with 1% chance of flooding in any given year (i.e., 100-year floodplain). This includes Zone A, Zone AE, and Zone A. Mandatory flood insurance requirements and floodplain management standards apply. Base flood elevations are provided in Zone AE. Zone AO has associated flood depths derived from detailed hydraulic analyses. Zone A has no determined flood depths.
- **0.2% Annual Chance Flood Hazard:** Area of minimal flood hazard, usually depicted on FIRMs as the 500-year floodplain or Shaded X Zone.

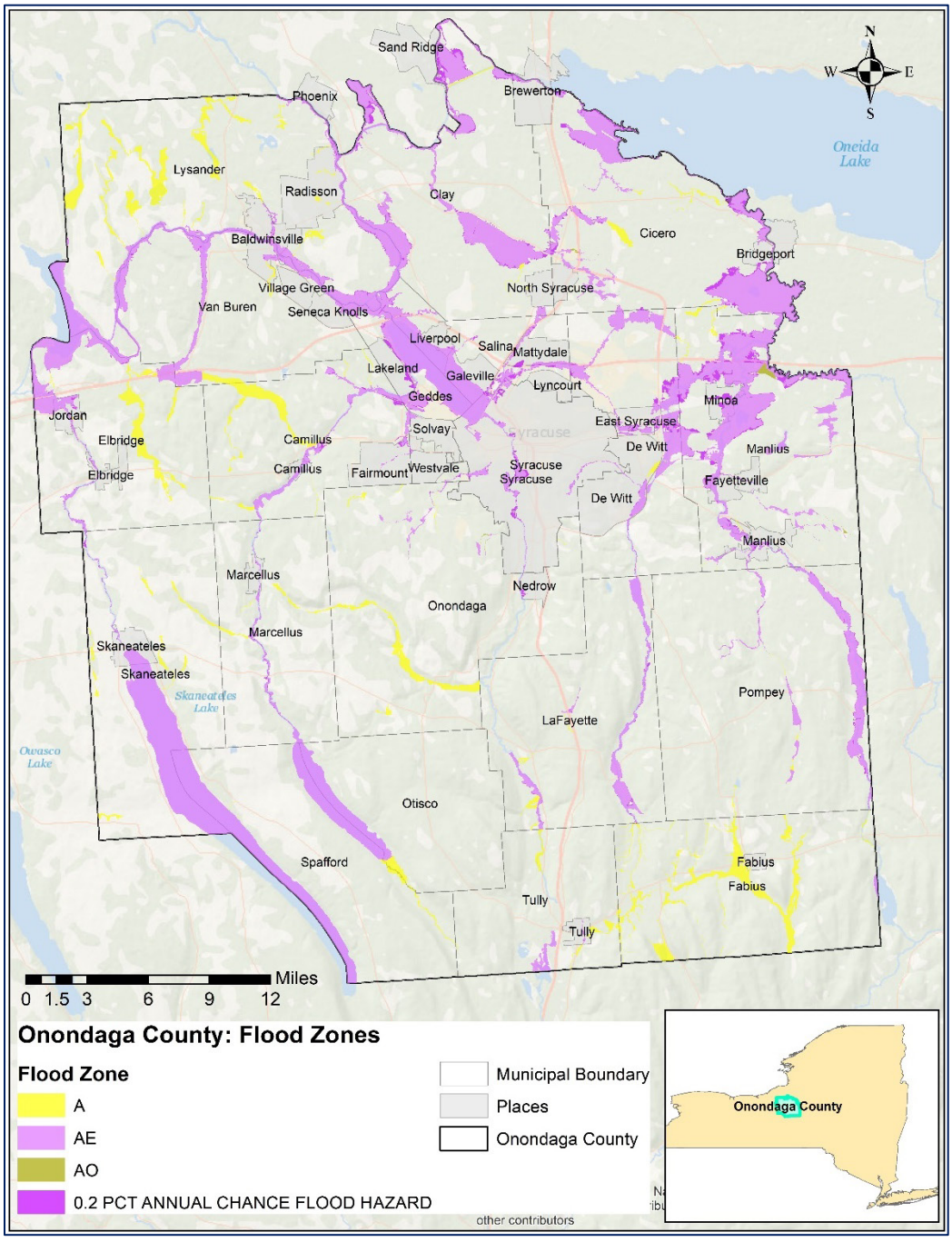
The total land area in the floodplain, including the bodies of water, is summarized in **Table 4-63**. The total land area located in the 1% and 0.2% annual chance flood zones was calculated using the regulatory FIRM for each jurisdiction. Each jurisdictional annex includes information regarding specific areas of flooding for each participating jurisdiction.

Table 4-63. Total Land Area in the 1% and 0.2% Annual Chance Flood Zone

Jurisdiction	Total Area *(acres)*	1% Annual Chance Flood Zone		0.2% Annual Chance Flood Zone	
		Area (acres)	*Percent of Total*	*Area (acres)*	*Percent of Total*
City of Syracuse	16,406.3	945.8	5.8%	1,153.9	7.0%
Town of Camillus	21,764.9	1,653.3	7.6%	1,798.6	8.3%
Town of Cicero	30,487.6	5,282.6	17.3%	5,744.9	18.8%
Town of Clay	30,673.3	4,542.4	14.8%	5,089.8	16.6%
Town of DeWitt	20,593.2	2,100.3	10.2%	2,348.0	11.4%
Town of Elbridge	23,120.2	2,903.4	12.6%	2,959.5	12.8%
Town of Fabius	29,669.3	2,358.3	7.9%	2,358.4	7.9%
Town of Geddes	6,444.9	2,346.8	36.4%	2,539.7	39.4%
Town of LaFayette	28,391.3	1,416.2	5.0%	1,490.9	5.3%
Town of Lysander	40,174.3	5,268.0	13.1%	5,403.2	13.4%
Town of Manlius	28,920.5	5,621.6	19.4%	6,294.5	21.8%
Town of Marcellus	20,443.2	461.1	2.3%	504.1	2.5%
Town of Onondaga	39,806.6	1,000.7	2.5%	1,025.2	2.6%
Town of Otisco	19,915.3	1,252.8	6.3%	1,252.8	6.3%
Town of Pompey	42,564.1	2,021.0	4.7%	2,154.4	5.1%
Town of Salina	9,410.7	2,095.9	22.3%	2,300.3	24.4%
Town of Skaneateles	30,126.1	4,240.1	14.1%	4,261.9	14.1%
Town of Spafford	25,030.8	4,349.5	17.4%	4,349.5	17.4%
Town of Tully	16,404.1	497.8	3.0%	497.8	3.0%
Town of Van Buren	22,258.1	1,827.8	8.2%	1,904.8	8.6%
Village of Baldwinsville	2,071.5	299.7	14.5%	336.5	16.2%
Village of Camillus	224.2	53.3	23.8%	57.9	25.8%
Village of East Syracuse	1,007.8	221.1	21.9%	280.3	27.8%

Jurisdiction	Total Area *(acres)*	1% Annual Chance Flood Zone		0.2% Annual Chance Flood Zone	
		***Area** (acres)*	***Percent of Total***	***Area** (acres)*	***Percent of Total***
Village of Elbridge	683.7	17.5	2.6%	19.7	2.9%
Village of Fabius	255.8	12.1	4.7%	12.1	4.7%
Village of Fayetteville	1,105.0	123.0	11.1%	127.8	11.6%
Village of Jordan	736.2	201.3	27.3%	224.2	30.5%
Village of Liverpool	487.1	61.8	12.7%	72.1	14.8%
Village of Manlius	1,146.8	135.8	11.8%	169.7	14.8%
Village of Marcellus	394.9	29.4	7.4%	33.1	8.4%
Village of Minoa	762.5	176.0	23.1%	274.2	36.0%
Village of North Syracuse	1,266.6	11.3	0.9%	11.3	0.9%
Village of Skaneateles	1,089.1	220.0	20.2%	222.6	20.4%
Village of Solvay	1,027.4	26.8	2.6%	27.2	2.6%
Village of Tully	393.5	33.5	8.5%	37.6	9.6%
Onondaga County	**515,257.1**	**53,808.0**	**10.4%**	**57,338.7**	**11.1%**

Figure 4-13. Onondaga County Special Flood Hazard Area



Riverine, Flash, and Shallow Flooding

The land area within Onondaga County drains into two (2) major river drainage basins – the Seneca-Oneida-Oswego River Basin (part of the Lake Ontario watershed) and the Susquehanna River Basin. *Refer to Section 3.1 of this Plan for a map of the major drainage basins.* However, most of Onondaga County falls within the Oswego River

Basin. The major bodies of water and tributaries within the Oswego River basin in Onondaga County that experience frequent flooding are listed in **Table 4-64**..[174]

Table 4-64. Onondaga County Major Flooding Sources

Oswego River (of the Oswego River sub-Watershed)	Onondaga Lake	Bloody Brook
Oneida Lake	Otisco Lake	Harbor Brook (in the Onondaga Lake sub-watershed)
Oneida River	Onondaga Creek	Skaneateles Lake
Butternut Creek	Nine Mile Creek	Skaneateles Creek
Limestone Creek (of the Oneida River sub-Watershed)	Ley Creek	Seneca River (of the Lower Seneca River Watershed)

The most documented location of historical flooding lies within the Onondaga Lake sub-watershed, particularly along Onondaga Creek. The current creek channel conditions and the large flood control structure (dam) located just below the junction of Onondaga Creek and its West Branch (in the Onondaga Nation Territory) have reduced flooding within the City of Syracuse. However, because of the historical straightening of the Creek, flood waters have been known to move through the City rapidly and can become dangerous during high-water events. Portions of the creek and its banks are fenced off to prevent injury and death during these flood periods.

Ice Jam

Ice jams can occur along any of Onondaga County's rivers and streams.

Dam and Levee Failure

The National Inventory of Dams (NID) consists of dams meeting at least one (1) of the following criteria:

- High hazard potential classification – loss of human life is likely if the dam fails.
- Significant hazard potential classification – no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.
- Equal or exceed 25 feet in height and exceed 15 acre-feet in storage.
- Equal or exceed 50 acre-feet storage and exceed six (6) feet in height.

Although the goal of the NID is to include all dams in the United States that meet these criteria, in reality, this inventory is limited to information that can be gathered and properly interpreted. In most cases, dams that meet the NID criteria are regulated (e.g., construction permits, inspections, and/or enforcement) by federal or state agencies, which have basic information on the dams within their jurisdictions. All high hazard dams have Emergency Action Plans (EAP) in place; however, due to data privacy and protected information, this information is not included in this Plan. Existing EAPs include inundation data for all listed high hazard dams. According to the NID, most high hazard dams do not include a USACE risk assessment as outlined in the NID tool's risk tab.

According to the NID, there are a total of 22 dams within Onondaga County, of which nine (9) are classified as high hazard dams and seven (7) as significant hazard dams. The NID high hazard and significant hazard dams in

[174] New York State Department of Environmental Conservation. (n.d.). Oswego River/Finger Lakes Watershed. Retrieved from https://dec.ny.gov/nature/waterbodies/watersheds/oswego-river-finger-lakes.

Onondaga County are listed in **Table 4-65** and **Table 4-66**, respectively.[175] **Figure 4-14** displays the high hazard dams in Onondaga County. The NID numbers differ from the New York State Inventory of Dams, which identifies 82 dams in Onondaga County – nine (9) are high hazard, seven (7) are intermediate hazard, 65 are low hazard, and one (1) does not have a hazard classification.[176] The high hazard and intermediate hazard dams in Onondaga County, per the New York State Inventory of Dams, are listed in **Table 4-67** and **Table 4-68**, respectively. **Figure 4-15** displays the high and intermediate hazard dams in Onondaga County.

Table 4-65. High Hazard Dams in Onondaga County

Name	National ID	Location	Owner	Type	Condition Assessment	Condition Assessment Date	Height *(feet)*	Normal Storage *(acre-feet)*	Max Discharge *(cubic feet / second)*	EAP
Deruyter Dam	NY00774	Onondaga County	New York State Canal Corporation	Earth	Poor	9/12/2018	68	11,890	769	Yes
Onondaga Dam	NY00794	Onondaga County	NYSDEC – Division of Water	Earth	Satisfactory	7/31/2017	67	No Data	82,350	Yes
Jamesville Reservoir Dam	NY00418	Onondaga County	New York State Canal Corporation	Masonry, Concrete	Poor	9/12/2018	53	3,900	8,070	Yes
Woodland Reservoir Dam	NY00412	Onondaga County	City of Syracuse	Earth	Satisfactory	9/12/2018	36	370	No Data	Yes
East Syracuse Reservoir Dam	NY00417	Onondaga County	Jefrey Booher	Earth, Concrete	Poor	5/8/2017	33	280	1,300	Yes
Skaneateles Lake Dam	NY00414	Onondaga County	City of Syracuse	Masonry	Satisfactory	8/8/2019	22	141,000	860	Yes
Lock 24 Dam Erie Canal	NY00792	Onondaga County	New York State Canal Corporation	Masonry	Poor	6/12/2019	21	34,100	23,271	Yes
Otisco Lake Dam	NY00753	Onondaga County	Onondaga County Water Authority	Concrete, Stone	Satisfactory	7/31/2017	18	26,067	31,345	Yes
Velasko Road Detention Basin Dam	NY00688	Onondaga County	Onondaga County Department of Water Environment Conservation Protection	Earth	Satisfactory	9/23/2019	13	No Data	1,850	Yes

Table 4-66. Significant Hazard Dams in Onondaga County

Name	National ID	Location	Owner	Type	Condition Assessment	Condition Assessment Date	Height *(feet)*	Normal Storage *(acre-feet)*	Max Discharge *(cubic feet / second)*	EAP
Doubletree Subdivision Dam	NY14148	Onondaga County	Town of DeWitt	Earth	Poor	9/20/2019	28	No Data	215	Yes
Edwards Falls Dam	NY01419	Onondaga County	Central New York Land Trust, David C. Muraco	Masonry, Earth	Poor	3/17/2015	24	20	3,500	Yes
Willetts Pond Dam	NY14765	Onondaga County	Radisson Community Association Inc., Town of Lysander	Earth	Poor	6/12/2019	24	9	500	No

[175] United States Army Corps of Engineers. (n.d.). National Inventory Dams. Retrieved from https://nid.sec.usace.army.mil/#/.
[176] New York State Department of Environmental Conservation, Division of Water. (2023). Dams/NYS DEC Dams. Retrieved from https://www.arcgis.com/home/item.html?id=5a7d83359cc842e08711215408f5b55c&sublayer=29.

Name	National ID	Location	Owner	Type	Condition Assessment	Condition Assessment Date	Height *(feet)*	Normal Storage *(acre-feet)*	Max Discharge *(cubic feet / second)*	EAP
Glencliff Road Detention Basin Dam	NY11752	Onondaga County	Village of Manlius	Earth, Concrete	Satisfactory	9/20/2019	13	No Data	907	Yes
Pompey Center Pond Dam	NY01634	Onondaga County	Michael Seemann	Earth	Satisfactory	9/12/2018	13	40	218	Yes
Lake Oberon Dam	NY11542	Onondaga County	Radisson Community Association Inc.	Earth	Satisfactory	6/12/2019	12	5	No Data	Yes
Willow Stream Dam	NY14920	Onondaga County	Town of Clay	Earth	Poor	7/1/2019	10	55	529	No

Table 4-67. New York State Inventory of Dams High Hazard Dams in Onondaga County

Name	State ID	Federal ID	Location	River or Stream	Type	Last Condition Rating	Recent Inspection Date	Height *(feet)*	Normal Storage *(acre-feet)*	Max Discharge *(cubic feet / second)*
Lock 24 Dam Erie Canal	072-0230	NY00792	Village of Baldwinsville	Seneca River	Masonry	Unsound *(More analysis needed)*	12/14/2021	21	34,100	23,274
Velasko Road Detention Basin Dam	082-4339	NY00688	City of Syracuse	Harbor Brook	Earth	Deficiently Maintained	10/23/2023	13	0	1,850
Woodland Reservoir Dam	082-0342	NY00412	Town of Geddes	None	Earth	No Deficiencies Noted	6/3/2024	36	370	n/a
Skaneateles Lake Dam	073-0355	NY00414	Village of Skaneateles	Skaneateles Creek	Masonry	No Deficiencies Noted	10/23/2023	22	141,000	860
Otisco Lake Dam	073-2751	NY00753	Town of Marcellus	Nine Mile Creek	Concrete Gravity, Laid Up Stone	Deficiently Maintained	10/23/2023	18	26,067	31,345
Onondaga Dam	083-4366	NY00794	Town of LaFayette	Onondaga Creek	Earth	Deficiently Maintained	10/23/2023	67	0	82,350
East Syracuse Reservoir Dam	083-0387	NY00417	Town of DeWitt	Hollow Creek	Earth, Concrete Gravity	Unsound – Deficiency Recognized	6/3/2024	33	280	1,300
Jamesville Reservoir Dam	083-0396	NY00418	Town of LaFayette	Butternut Creek	Masonry, Concrete Gravity	Unsound – Deficiency Recognized	6/3/2024	53	3,900	8,070
Deruyter Dam	093-0537	NY00774	Town of Fabius, Town of Cazenovia (Madison County)	Limestone Creek	Earth	Unsound – Deficiency Recognized	6/3/2024	68	11,890	769

Table 4-68. New York State Inventory of Dams Intermediate Hazard Dams in Onondaga County

Name	State ID	Federal ID	Location	River or Stream	Type	Last Condition Rating	Recent Inspection Date	Height *(feet)*	Normal Storage *(acre-feet)*	Max Discharge *(cubic feet / second)*
Lake Oberon Dam	072-4102	NY11542	Town of Lysander	TR – Seneca River	Earth	No Deficiencies Noted	10/24/2023	12	5	n/a
Willetts Pond Dam	072-5121	NY14765	Town of Lysander	TR – Seneca River	Earth	Unsound – Deficiency Recognized	10/24/2023	24	9	500
Willow Stream Dam	082-5262	NY14920	Town of Clay	TR – Seneca River	Earth	Deficiently Maintained	10/24/2023	10	55	529
Doubletree Subdivision Dam	083-4998	NY14148	Town of DeWitt	None	Earth	Unsound *(More analysis needed)*	11/22/2023	28	0	215

Name	State ID	Federal ID	Location	River or Stream	Type	Last Condition Rating	Recent Inspection Date	Height *(feet)*	Normal Storage *(acre-feet)*	Max Discharge *(cubic feet / second)*
Glencliff Road Detention Basin Dam	083-4315	NY11752	Town of Manlius	TR – Sweet Road	Earth, Concrete Gravity	Deficiently Maintained	10/23/2023	13	0	907
Edwards Falls Dam	093-0424	NY01419	Town of Manlius	Limestone Creek	Masonry, Earth	Unsound *(More analysis needed)*	4/18/2024	24	20	3,500
Pompey Center Pond Dam	093-5124	NY01634	Town of Pompey	None	Earth	Deficiently Maintained	6/27/2022	13	40	218

Figure 4-14. High Hazard Dams in Onondaga County *(NID)*

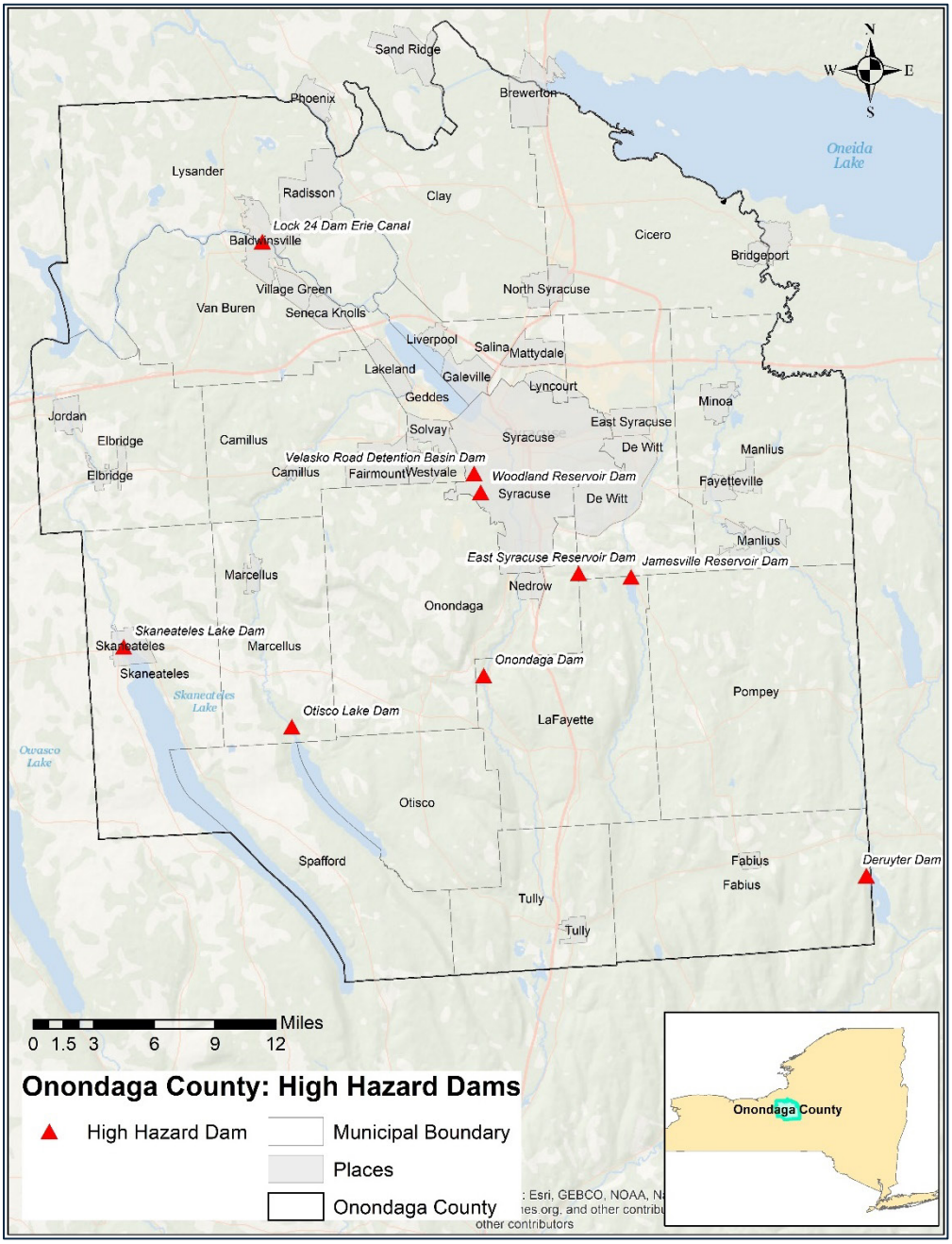
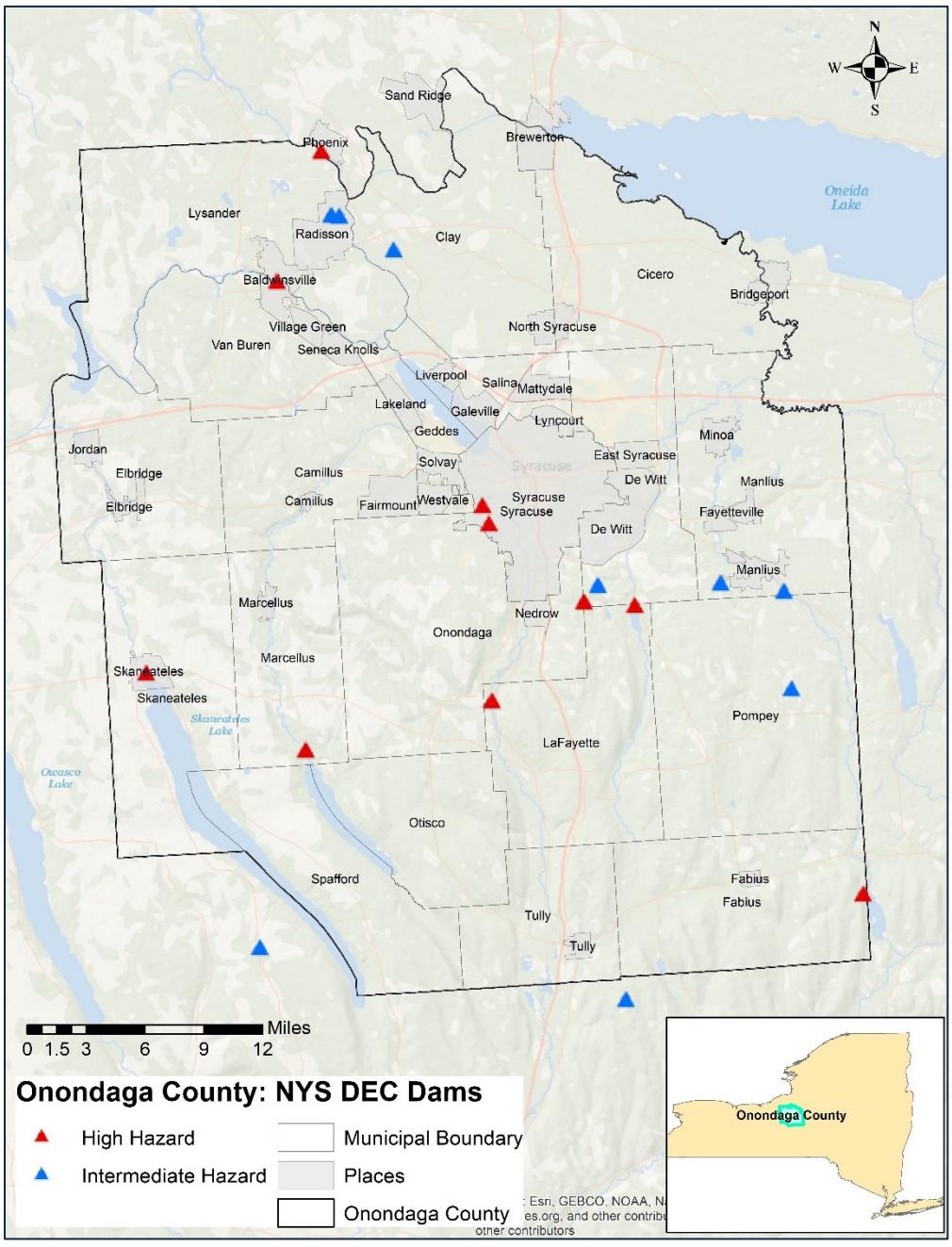


Figure 4-15. High and Intermediate Hazard Dams in Onondaga County
(New York State Inventory of Dams)



According to the National Levee Database, there are four (4) levees in the County which are included in the USACE Levee Program, listed in **Table 4-69**. **Figure 4-16** displays the levee systems within Onondaga County.[177]

[177] United States Army Corps of Engineers. (n.d.). National Levee Database. Retrieved from https://levees.sec.usace.army.mil/.

Table 4-69. Levees in Onondaga County

Levee Name	System ID	Operation / Maintenance Organization	Location	Flooding Source	Behind Levee
Limestone Creek	1205000056	FEMA Region 2	Fayetteville, New York	Limestone Creek	**39** Buildings **153** People **$40 M** Property Value **0** Critical Structures
Marcellus Tyler Hollow	1205000003	Village of Marcellus	Marcellus, New York	No Data	**0** Buildings **0** People **$0** Property Value **0** Critical Structures
Onondaga Creek/Syracuse (Left Bank and Channel)	2405000018	New York State Department of Environmental Conservation	Syracuse, New York	Onondaga Creek	**21** Buildings **102** People **$10 M** Property Value **1** Critical Structures
Onondaga Creek/Syracuse (Right Bank)	2405000019	New York State Department of Environmental Conservation	Syracuse, New York	Onondaga Creek	**72** Buildings **494** People **$20 M** Property Value **0** Critical Structures

Figure 4-16. Levees in Onondaga County



4.6.4.3. Extent/Intensity

The extent/intensity of a flood depends not only on the amount of water that accumulates in a period of time, but also on the land's ability to manage water. The size of rivers and streams in an area and infiltration rates are

significant factors. When it rains, the soil acts like a sponge. When the land is saturated or frozen, infiltration rates decrease, and any more water that accumulates must flow as runoff.[178]

Flooding can be unexpected and leave a short window for evacuation, if required. The NWS Binghamton, New York Weather Forecast Office is responsible for issuing flood advisories in Onondaga County. **Table 4-70** outlines the flood advisories issued by the NWS as conditions warrant.

Table 4-70. National Weather Service Flood Advisories

Type	Description
Flood Advisory	Issued when a flood event warrants notification but is less urgent than a warning. Advisories are issued for conditions that could cause a significant inconvenience, and if caution is not exercised, could lead to situations that may threaten life and/or property.
Flood Watch	Issued to indicate current or developing conditions that are favorable for flooding. The occurrence is neither certain nor imminent. A watch is typically issued within several hours to days ahead of the onset of possible flooding. In situations where a river or stream is expected to be the main source of the flooding, forecast confidence may allow for a Flood Watch to be issued several days in advance.
Flood Warning	Issued to inform the public of flooding that poses a serious threat to life and/or property. A Flood Warning may be issued hours to days in advance of the onset of flooding based on forecast conditions. Floods occurring along a river usually contain river stage (level) forecasts.
Flash Flood Watch	Issued to indicate current or developing conditions that are favorable for flash flooding. The occurrence is neither certain nor imminent. A watch is typically issued within several hours to days ahead of the onset of possible flash flooding.
Flash Flood Warning	Issued to inform the public, emergency management, and other cooperating agencies that flash flooding is in progress, imminent, or highly likely. Flash Flood Warnings are urgent messages as dangerous flooding can develop very rapidly, with a serious threat to life and/or property. Flash Flood Warnings are usually issued minutes to hours in advance of the onset of flooding.

Flash Flood Guidance (FFG) provides a general indication of the amount of rainfall evenly distributed over various durations (in hours), necessary to cause small streams to overflow their natural banks. **Table 4-71** outlines the FFG for Onondaga County.[179] During heavy rainfall, accurate interpretation of the guidance involves combining rainfall that has already occurred with any additional rainfall confidently expected to fall at the same location in the immediate future. Furthermore, FFG values represent estimates of average soil moisture and stream flow conditions. Flooding may occur with less rainfall than indicated in areas of high rainfall intensities, impervious surfaces, or steep slopes.[180]

Table 4-71. Flash Flood Guidance

Hour	Rainfall *(inches)*
1	1.8
3	2.2
6	2.7

[178] Harris, T. (2023). What Is a Flood and Why Is the Surge of Water So Dangerous? Retrieved from https://science.howstuffworks.com/nature/natural-disasters/flood.htm.
[179] National Weather Service. (n.d.). Flash Flood Guidance by County. Retrieved from https://www.weather.gov/bgm/productCountyFFG.
[180] National Weather Service. (n.d.). Flash Flood and Headwater Guidance. Retrieved from https://www.weather.gov/marfc/Flash_Flood_Headwater_Guidance.

NWS issues Flash Flood Warnings Impact-Based Warnings for events that occur within approximately six (6) hours of heavy rainfall. The flash flood impact-based warnings fall into the three (3) categories listed in **Table 4-72**.[181]

Table 4-72. National Weather Service Flash Flood Impact-Based Warnings

Type	Description
Base	Used most of the time when flash flood impact is possible.
Considerable	Used rarely, when there are indications flash flooding capable of unusual severity or impact is imminent or ongoing and urgent action is needed to protect lives and property. Will trigger the Wireless Emergency Alert system.
Catastrophic	Used exceedingly rarely, when a flash flood threat to life and catastrophic damage is occurring or is imminent, and floodwaters have risen or will rise to levels rarely, if ever, seen. Will trigger the Wireless Emergency Alert system.

When a river reaches flood stage, NWS River Forecast Centers convey the magnitude of observed forecast flooding using flood severity categories based on property damage and public threat. The three (3) flood severity categories are listed in **Table 4-73**.[182]

Table 4-73. National Weather Service River Flood Severity Categories

Type	Definition
Minor Flooding	Minimal or no property damage, but possibly some public threat or inconvenience.
Moderate Flooding	Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
Major Flooding	Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

Federal guidelines provide for a three (3) level classification system that defines low, significant, and high-hazard potential classifications depending on the potential for loss of life, economic loss, and environmental damage resulting from a hypothetical dam failure. The USACE dam hazard categories are listed in **Table 4-74**.

Table 4-74. USACE Dam Hazard Categories

Hazard Category	Direct Loss of Life	Lifeline Losses	Property Losses	Environmental Losses
Low	None *(rural location, no permanent structures for human habitation).*	No disruption of services *(cosmetic or rapidly repairable damage).*	Private agricultural lands, equipment, and isolated buildings.	Minimal incremental damage.
Significant	Rural location, only transient or day-use facilities.	Disruption of essential facilities and access.	Major public and private facilities.	Major mitigation required.
High	Certain (one or more) extensive residential, commercial, or industrial development.	Disruption of essential facilities and access.	Extensive public and private facilities.	Extensive mitigation costs or impossible to mitigate.

[181] National Weather Service. (2019). Impact-Based Flash Flood Warning. Retrieved from https://www.weather.gov/media/wrn/FFW-IBW-factsheet.pdf.
[182] National Oceanic and Atmospheric Administration, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Frequently Asked Questions About Floods. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/floods/faq/.

The hazard categories are assigned to overall projects, not individual structures within a project. The four (4) general categories are described below.

- **Direct Loss of Life:** The loss of life potential based on inundation mapping of the area downstream of the project. Analyses of loss of life potential should consider the population at risk, the time of travel of the flood wave, and the warning time.
- **Lifeline Losses:** Indirect threats to life caused by the interruption of lifeline services due to project failure or operational disruption; for example, loss of critical medical facilities or access to them.
- **Property Losses:** Damage to project facilities and downstream property and indirect impact due to loss of project services, such as impact due to loss of a dam and navigation pool, or impact due to loss of water or power supply.
- **Environmental Losses:** Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally occur for the magnitude flood event under which the failure occurs.

The NYSDEC Division of Water, Bureau of Flood Protection and Dam Safety, uses a dam downstream hazard classification system similar to those of many states and federal agencies. **Table 4-75** outlines the four (4) dam classifications, listed in order of increasingly adverse consequences from a dam failure and building on each other, with the higher levels adding to the consequences of the lower levels.[183]

Table 4-75. NYSDEC Dam Hazard Classification

Class	Classification	Definition
A	Low Hazard	A dam failure is unlikely to result in damage to anything more than isolated or unoccupied buildings, undeveloped lands, minor roads such as town or county roads; is unlikely to result in the interruption of important utilities, including water supply, sewage treatment, fuel, power, cable or telephone infrastructure; and/or is otherwise unlikely to pose the threat of personal injury, substantial economic loss or substantial environmental damage.
B	Intermediate Hazard	A dam failure may result in damage to isolated homes, main highways, and minor railroads; may result in the interruption of important utilities, including water supply, sewage treatment, fuel, power, cable, or telephone infrastructure; and/or is otherwise likely to pose the threat of personal injury and/or substantial economic loss or substantial environmental damage. Loss of human life is not expected.
C	High Hazard	A dam failure may result in widespread or serious damage to home(s); damage to main highways, industrial or commercial buildings, railroads, and/or important utilities, including water supply, sewage treatment, fuel, power, cable or telephone infrastructure; or substantial environmental damage; such that the loss of human life or widespread substantial economic loss is likely.
D	Negligible or No Hazard	A dam that has been breached or removed, or has failed or otherwise no longer materially impounds waters, or a dam that was planned but never constructed. Class "D" dams are considered to be defunct dams posing negligible or no hazard. The department may retain pertinent records regarding such dams.

The USACE Levee Safety Program's key activities include levee inspections, risk assessments, and the sharing of levee information.[184] To better inform stakeholders and residents about the residual risk in their communities,

[183] New York State Department of Environmental Conservation, Division of Water Program Policy. (n.d.). DOW TOGS 3.1.5 – Guidance for Dam Hazard Classification (Draft). Retrieved from https://extapps.dec.ny.gov/docs/water_pdf/togs315.pdf.
[184] United States Army Corps of Engineers. (n.d.). Levee Safety Program. Retrieved from https://www.usace.army.mil/Missions/Civil-Works/Levee-Safety-Program/.

USACE uses the Levee Safety Action Classification (LSAC) tool.[185] **Table 4-76** outlines the LSAC risk levels, actions, and risk characteristics for each level.[186] The LSAC is not a levee rating or grade, but a classification system designed to consider the following:

- Probability of the levee being loaded (hazard).
- Existing condition of the levee.
- The current and future maintenance of the levee (performance).
- The consequences if the levee were to fail or be overwhelmed.

For example, a levee that reduces risk for a dense population will have a different classification than an equally constructed levee serving a smaller population, because the consequences of failure are greater.[187]

Table 4-76. USACE Levee Safety Action Classification

Risk	Actions for Levee Systems and Leveed Areas in this Class *(Adapt actions to specific levee system conditions)*	Risk Characteristics of this Class
Very High (1)	Based on risk drivers, take immediate action to implement interim risk reduction measures. Increase frequency of levee monitoring, communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning systems and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions as very high priority.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences result in very high risk.
High (2)	Based on risk drivers, implement interim risk reduction measures. Increase frequency of levee monitoring; communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions as high priority.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in high risk.
Moderate (3)	Based on risk drivers, implement interim risk reduction measures as appropriate. Verify risk information is current and implement routine monitoring program; assure O&M is up to date; communicate risk characteristics to the community in a timely manner; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions as a priority.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in moderate risk.

[185] United States Army Corps of Engineers. (n.d.). Levee Safety Action Classification (LSAC). Retrieved from https://www.mvn.usace.army.mil/LSAC/.
[186] United States Army Corps of Engineers. (n.d.). Levee Safety Action Classification (LSAC). Retrieved from https://www.mvn.usace.army.mil/Portals/56/docs/PAO/LSACs/LSAC%20Table.pdf.
[187] United States Army Corps of Engineers. (n.d.). Levee Safety Action Classification (LSAC). Retrieved from https://www.mvn.usace.army.mil/LSAC/.

Risk	Actions for Levee Systems and Leveed Areas in this Class *(Adapt actions to specific levee system conditions)*	Risk Characteristics of this Class
Low (4)	Verify risk information is current and implement routine monitoring program and interim risk reduction measures if appropriate; assure O&M is up to date; communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions to further reduce risk to as low as practicable.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in low risk.
Very Low (5)	Continue to implement routine levee monitoring program, including operation and maintenance, inspections, and monitoring of risk. Communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance.	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very low risk.
No Verdict	Not enough information is available to assign an LSAC.	

**Levee risk is the risk that exists due to the presence of the levee system, and this is the risk used to inform the decision on the LSAC assignment.*

The information presented in this table does not reflect the overtopping without breach risk associated with the presence or operation of the levee system.

4.6.4.4. Probability and Frequency

The probability of occurrence for flash floods, riverine/creek floods (including ice jams), and dam and levee failures was analyzed separately.

- The probability of occurrence for flash flooding in Onondaga County is high because a significant hazard event is likely to occur annually.
- The probability of occurrence for riverine/creek flooding and ice jam is medium because a significant hazard event is likely to occur every 25 years
- The probability of occurrence for dam and levee failure is low because a significant hazard event is likely to occur within 100 years.

The presence of elements that cause flooding and past major flooding throughout the County suggests that many people and properties are at risk from the flood hazard in the future. It is estimated that Onondaga County will continue to experience direct and indirect impacts of flooding events each year, which may induce secondary hazards such as infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, transportation delays, accidents, and inconveniences. Additionally, isolated, lower-impact events occur with regularity. The number of years between floods of any given severity significantly varies due to a naturally changing climate. Climate change is expected to increase the severity and frequency of heavy rainfall in Onondaga County, likely leading to more flooding and dam and levee failures.

The FEMA NRI analyses flooding data as riverine flooding – when streams and rivers exceed the capacity of their natural or constructed channels to accommodate water flow, and water overflows the banks, spilling out into adjacent low-lying, dry land.[188] The riverine flooding annualized frequency value represents the average number of recorded riverine flooding hazard occurrences, in event days, per year over the period of record (24 years). **Table 4-77** outlines the annualized frequency of riverine flooding in Onondaga County, based on FEMA NRI data.

[188] Federal Emergency Management Agency. (n.d.). FEMA National Risk Index: Riverine Flooding. Retrieved from https://hazards.fema.gov/nri/riverine-flooding.

Table 4-77. Riverine Flooding Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(1996 – 2019)*	Annualized Frequency
Onondaga County	24	1.0 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

Repetitive Loss and Severe Repetitive Loss Properties

FEMA defines a Repetitive Loss property as an NFIP-insured property meeting at least one (1) of the following paid loss criteria since 1978, regardless of any changes in ownership:

- Four (4) or more separate claims payments greater than $5,000 each (including building and contents payment).
- Two (2) or more separate flood insurance claims payments (building payments only), where the total of the payments is greater than the property's current value.

Additionally, to receive a designation, at least two (2) of the claim payments must occur within 10 years of one another.[189]

A Severe Repetitive Loss property is defined by FEMA as any NFIP-insured single-family or multi-family residential building meeting at least one (1) of the following paid loss criteria since 1978 or from a building constructed after 1978, regardless of any changes in ownership:

- That has incurred flood-related damage for which four (4) or more separate claims payments have been made, with the amount of each claim (including building and contents payments) exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000.
- For which at least two (2) separate claims payments (building payments only) have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the building.[190]

Table 4-78 summarizes FEMA Repetitive Loss and Severe Repetitive Loss properties within Onondaga County.

[189] Federal Emergency Management Agency, National Flood Insurance Program. (2023). A Policyholder's Guide to Severe Repetitive Loss. Retrieved from https://agents.floodsmart.gov/sites/default/files/fema_nfip-policyholders-guide-severe-repetitive-loss_brochure_07-2023.pdf.

[190] Federal Emergency Management Agency, National Flood Insurance Program. (2021). National Flood Insurance Program: Flood Insurance Manual. Retrieved from https://www.fema.gov/sites/default/files/documents/fema_nfip-all-flood-insurance-manual-apr-2021.pdf.

Table 4-78. Onondaga County Repetitive Loss and Severe Repetitive Loss Properties

Jurisdiction	Repetitive Loss Properties		Severe Repetitive Loss Properties	
	Total	*Occupancy*	*Total*	*Occupancy*
City of Syracuse	8	**3** Single Family **1** Two (2)-Four (4) Unit Residential Building **1** More than Four (4) Units Residential Building **1** Non-Residential Building **2** Single-Family Residential Building	1	**1** Non-Residential Building
Town of Camillus	0	--	0	--
Town of Cicero	23	**19** Single Family **1** Two (2)-Four (4) Unit Residential Building **2** Single-Family Residential Building **1** Residential Non-Condo Building	0	--
Town of Clay	0	--	0	--
Town of DeWitt	6	**5** Non-Residential Building **1** Non-Residential Business	3	**3** Non-Residential Building
Town of Elbridge	1	**1** Single Family	0	--
Town of Fabius	0	--	0	--
Town of Geddes	0	--	0	--
Town of LaFayette	3	**1** Single Family **2** Single-Family Residential Building	0	--
Town of Lysander	4	**3** Single Family **1** Single-Family Residential Building	0	--
Town of Manlius	3	**2** Single Family **1** Two (2)-Four (4) Unit Residential Building	0	--
Town of Marcellus	0	--	0	--
Town of Onondaga	2	**2** Single Family	0	--
Town of Otisco	0	--	0	--
Town of Pompey	0	--	0	--
Town of Salina	1	**1** Single Family	0	--
Town of Skaneateles	0	--	0	--
Town of Spafford	0	--	0	--
Town of Tully	0	--	0	--
Town of Van Buren	0	--	0	--
Village of Baldwinsville	0	--	0	--
Village of Camillus	1	**1** Residential Non-Condo Building	0	--
Village of East Syracuse	0	--	0	--

Jurisdiction	Repetitive Loss Properties		Severe Repetitive Loss Properties	
	Total	*Occupancy*	*Total*	*Occupancy*
Village of Elbridge	1	**1** Single Family	0	--
Village of Fabius	--	--	--	--
Village of Fayetteville	0	--	0	--
Village of Jordan	0	--	0	--
Village of Liverpool	1	**1** More Than Four (4) Units Residential Building	0	--
Village of Manlius	0	--	0	--
Village of Marcellus	0	--	0	--
Village of Minoa	0	--	0	--
Village of North Syracuse	0	--	0	--
Village of Skaneateles	1	**1** Single Family	0	--
Village of Solvay	0	--	0	--
Village of Tully	0	--	0	--

Occupancy Type: *Single Family = Single family residence • Two (2)-Four (4) Unit Residential Building = Two (2)-four (4) unit residential building • More Than Four (4) Units Residential Building = Residential building with more than four (4) units • Non-Residential Building = Non-residential building • Non-Residential Business = Non-residential business • Single Family Residential Building = Single-family residential building with the exception of a mobile home or a single residential unit within a multi-unit building • Residential (2, 3, or 4 units) Non-Condo Building = Residential non-condo building with two (2), three (3), or four (4) units seeking insurance on all units • Residential (5 or more units) Non-Condo Building = Residential non-condo building with 5 or more units seeking insurance on all units • Residential Mobile/Manufactured Home = Residential mobile/manufactured home • Residential Condo Association = Residential condo association seeking coverage on a building with one (1) or more units • Single Residential Unit = Single residential unit within a multi-unit building • Non-Residential Mobile/manufactured Home = Non-residential mobile/manufactured home • Non-Residential Building = Non-residential building • Non-Residential Unit = Non-residential unit within a multi-unit building*

Table 4-79 summarizes the NFIP active policies and coverage in force data for Onondaga County and its municipalities.

Table 4-79. Onondaga County NFIP Policies

Jurisdiction	Community ID	NFIP Policies	Insurance in Force	Total Claims Paid	Sum of Claims Paid
City of Syracuse	360595	161	$99,647	115	$408,395
Town of Camillus	360570	11	$13,842	3	$16,513
Town of Cicero	360572	180	$156,602	153	$1.440 Million
Town of Clay	360573	93	$100,647	49	$455,606
Town of DeWitt	360973	82	$489,512	46	$4.466 Million
Town of Elbridge	360575	13	$12,460	13	$188,179
Town of Fabius	360577	4	$2,483	1	$1,037
Town of Geddes	360579	3	$2,088	3	$46,925
Town of LaFayette	360581	6	$3,511	11	$120,372
Town of Lysander	360583	56	$59,633	44	$819,916
Town of Manlius	360584	110	$111,089	41	$285,597
Town of Marcellus	360585	5	$4,350	4	$8,225
Town of Onondaga	360588	21	$12,684	31	$247,317

Jurisdiction	Community ID	NFIP Policies	Insurance in Force	Total Claims Paid	Sum of Claims Paid
Town of Otisco	360589	1	$332	3	$7,042
Town of Pompey	360590	12	$11,201	7	$91,279
Town of Salina	360591	32	$36,911	12	$47,012
Town of Skaneateles	360592	13	$8,543	7	$109,334
Town of Spafford	360594	5	$2,939	0	$0
Town of Tully	361296	0	$0	0	$0
Town of Van Buren	360596	65	$77,115	28	$675,940
Village of Baldwinsville	360569	10	$8,419	26	$233,943
Village of Camillus	360571	8	$11,891	12	$217,157
Village of East Syracuse	360574	9	$8,073	12	$223,722
Village of Elbridge	360576	1	$3,613	6	$21,974
Village of Fabius	360689	--	--	--	--
Village of Fayetteville	360578	31	$42,065	40	$192,224
Village of Jordan	360580	14	$9,194	3	$7,912
Village of Liverpool	360582	5	$8,459	7	$10,668
Village of Manlius	360977	23	$31,502	10	$38,833
Village of Marcellus	360586	1	$353	7	$12,430
Village of Minoa	361017	31	$29,225	8	$16,061
Village of North Syracuse	360587	4	$3,352	0	$0
Village of Skaneateles	360593	6	$9,543	4	$23,566
Village of Solvay	361564	3	$1,100	6	$10,957
Village of Tully	361552	1	$1,069	0	$0

4.6.4.5. Past Events

Table 4-80 documents past flood events from 1950 through 2024 in Onondaga County based on data collected from NCEI, National Performance of Dams Program (NPDP), and the Cold Regions Research and Engineering Laboratory (CRREL) databases. Notably, in the late afternoon of April 25, 2011, a slow moving warm front moved northward across central New York, bringing a warm, relatively moist air mass to the region. This resulted in warmer temperatures, thunderstorms, and heavy rainfall, leading to significant flash flooding. Severe weather developed with reports of strong winds/damaging winds and hail, and plenty of wind shear in the vicinity of the warm front allowed for several supercell thunderstorms and tornadoes to develop. Onondaga County reported permanent damage to over 250 roads, with most of the damage centered on the Syracuse area, where several roads were totally washed out. The City of Syracuse described the flash flooding as major. Most roads in the County experienced flooding, from ponding to major flooding, and roadway breakdown. After several days, standing water persisted, and several road intersections remained closed. Approximately $9 Million in damage was reported in the County.[191] **Table 4-81** highlights three (3) significant flooding events in Onondaga County within the past five (5) years.

[191] NOAA, National Centers for Environmental Information. (2011). Storm Events Database (Event # 303330). Retrieved from https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=303330.

Table 4-80. Flood Events in Onondaga County (1950 – 2024)

Type	Total Occurrences *(1950 – 2024)*	Fatalities	Injuries	Property Damage	Crop Damage
Flash Flood	24	2	0	$36.3 Million	$0
Flood	7	0	0	$74,000	$0
Dam Failure	0	0	0	$0	$0
Levee Failure	0	0	0	$0	$0
Ice Jam	1	-	-	-	-
Total	**32**	**2**	**0**	**$36.4 Million**	**$0**

Ice jam data from the Cold Regions Research and Engineering Laboratory (CRREL) database does not have fatalities, injuries, property damage or crop damage data available.

Table 4-81. Significant Flood Events in Onondaga County (2019 – 2024)

Date	Type	Description
August 7, 2024	Flash Flood	Thunderstorms developed ahead of a slow moving cold front tracking through western and central New York during the afternoon and evening. Numerous thunderstorm complexes moved over the same locations in Onondaga County, producing up to six (6) inches of rainfall in a short amount of time. Much of the area affected was predominantly urbanized land cover, and flooding of streets and drainage systems persisted for several hours. • A portion of Interstate 690 was closed due to flooding, and some roads were washed out and impassable. • Ponding on area roads was reported, and drivers were rescued after getting stranded in vehicles. • A sewer pump station was damaged due to the flooding, and it was determined to be inoperable in Jacks Reef.
October 26, 2021	Flash Flood	Deep moisture from the Atlantic Ocean was fed into a warm frontal zone located over Central New York by a low pressure near New York City. This led to areas of moderate to heavy rainfall totaling between three (3) and five (5) inches of rain with locally higher amounts. This led to widespread flash flooding across the Southern Tier and Finger Lakes region. • Flash flooding was reported on US Route 20 between Tully Farms Road and Case Hill Road (all lanes were closed); on State Route 290 between North Manlius Street and Clemons Road; and on Bull Street in Cicero. • Up to eight (8) inches of water was recorded across Gully Road. Flooding was also reported on Interstate 81, State Route 11, and US Route 20 (near Exit 15 in LaFayette), which resulted in all lanes being closed. Widespread road flooding was reported in the vicinity of Kirk Park. • Creek in Marcellus Park was overflowing. • Flash flooding damaged numerous roadways and homes in Camillus, which resulted in a voluntary evacuation of 14 homes.

Date	Type	Description
August 17 – 20, 2021	Flood	Moisture and remnants of Tropical Storm Fred moved across parts of the mid-Atlantic and northeast United States between August 17th and 20th. As the system moved over the central parts of New York, including Onondaga County, it produced rainfall amounts between three (3) and seven (7) inches.[192] Severe urban flooding was reported from the Village of East Syracuse across the southern sections of the City of Syracuse and other portions of Onondaga County. Additionally, water rushing over multiple roadways was reported in the Skaneateles area and along US Route 20 to the east. A Major Disaster Declaration (DR-4625) was issued on October 8th as a result of damage caused by the system.
All data was obtained from the NCEI Storm Events Database: https://www.ncdc.noaa.gov/stormevents/.		

Between 1953 and 2024, New York State has been included in 77 flood-related major disasters (DR) or emergency (EM declarations classified as one or a combination of the following disaster types – severe storm, flood, hurricane, and tropical storm. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Onondaga County was included in 11 of these flood-related declarations, listed in **Table 4-82**.[193]

Table 4-82. Disaster Declarations for Onondaga County

Disaster Number	Incident Period	Declaration Date	Incident Category	Title
DR-4625	August 18 – 19, 2021	October 8, 2021	Hurricane	Remnants of Tropical Storm Fred
EM-3351	October 27 – November 8, 2012	October 28, 2012	Hurricane	Hurricane Sandy
DR-1993	April 26 – May 8, 2011	June 10, 2011	Flood	Severe Storms, Flooding, Tornadoes, and Straight-line Winds
DR-1564	August 13 – September 16, 2004	October 1, 2004	Severe Storm	Severe Storms and Flooding
DR-1534	May 13 – June 17, 2004	August 3, 2004	Severe Storm	Severe Storms and Flooding
DR-1335	May 3 – August 13, 2000	July 21, 2000	Severe Storm	Severe Storms
DR-1244	September 7, 1998	September 11, 1998	Severe Storm	Severe Weather
DR-1095	January 19 – 30, 1996	January 24, 1996	Flood	Severe Storms/Flooding
DR-487	October 2, 1975	October 2, 1975	Flood	Severe Storms, Heavy Rain, Landslides, Flooding
DR-447	July 23, 1974	July 23, 1974	Flood	Severe Storms, Flooding
DR-338	June 23, 1972	June 23, 1972	Flood	Tropical Storm Agnes

The United States Department of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans available to producers suffering losses in those counties and in contiguous counties. Between 2019

[192] National Weather Service, Binghamton, NY Weather Forecast Office. (2021). Heavy Rainfall August 17 to 20, 2021 Fred. Retrieved from https://www.weather.gov/bgm/pastFloodAugust202021.
[193] Federal Emergency Management Agency. (2024). Disaster Declarations for States and Counties. Retrieved from https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties.

and 2024, Onondaga County was included in the following four (4) USDA disaster declarations related to flooding, as listed in **Table 4-83**.[194]

Table 4-83. USDA Disaster Designation (2019 – 2024)

Designation Number	Date	Description
S5739	July 10 – July 16, 2024	Combined effects of tornado, hurricane, high wind, flash flooding, excessive rainfall, and hail.
S5640	August 8, 2023 – Ongoing	Combined effects of excessive rainfall and tornado.
S4623	April 15, 2019 – Ongoing	Combined effects of excessive rainfall and flooding, including flash flooding.
S4622	April 1, 2019 – Ongoing	Excessive rainfall.

4.6.4.6. Vulnerability and Impacts

A 100-year flood scenario was conducted in Hazus to analyze the flooding hazard and provide a range of loss estimates.

Life Safety and Public Health: There is 15% to 29% of the population that is exposed to riverine flooding (i.e., ice jam) and flash flooding, and it is likely to experience some adverse impacts to this hazard. Less than 14% of the population is exposed to dam and levee failure, and it is likely to experience significant adverse impacts to this hazard. The population adversely affected by a dam failure event can also include those beyond the disaster area that rely on the dam for providing potable water.

The impacts of flooding on life safety and public health depend on several factors, including the severity of the event and the availability of adequate warning time to residents. The most vulnerable population (i.e., exposed) to the impacts of flooding is within the SFHA (i.e., 100-year floodplain) and within the dam and levee inundation areas. However, flash floods can be localized events that affect areas outside of the floodplain due to localized drainage issues and can directly impact populations and compromise access to emergency services. Most deaths during a flood occur when vehicles are driven into hazardous floodwater. Vehicles trying to drive through flooded areas or standing water can be swept away and potentially drown. Additionally, a number of hazards can be hidden below the flooded areas, which is why it is imperative to avoid floodwater.[195] Cascading impacts may also include exposure to pathogens such as mold. After flooding events, excess moisture and standing water can contribute to mold growth in buildings. Mold may present a health risk to building occupants, especially those with already compromised immune systems (e.g., infants, children, the elderly, and pregnant women). Floodwater can be contaminated by pollutants such as sewage, human and animal feces, pesticides, fertilizers, oil, asbestos, and rusting building materials. Common public health risks associated with flood events also include:

- Unsafe food.
- Contaminated drinking and washing water, and poor sanitation.
- Mosquitoes and animals.
- Carbon monoxide poisoning.

[194] United States Department of Agriculture. (2024). Disaster Designation Information. Retrieved from https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index.
[195] Centers for Disease Control and Prevention. (2022). Flood Waters or Standing Waters. Retrieved from https://www.cdc.gov/healthywater/emergency/extreme-weather/floods-standingwater.html.

- Secondary hazards are associated with re-entering/cleaning flooded structures.
- Mental stress and fatigue.

Advanced weather forecasting, blockades, and warnings generally limit the total number of injuries and casualties resulting from typical riverine flooding. Injuries and deaths are typically avoidable when proper warnings and precautions are taken. In contrast, warning time for dam failure events or flash flooding is limited. These events are frequently associated with other natural hazard events (e.g., earthquakes, landslides, severe weather), which limit their predictability and compound the hazard.

Hazus estimated the number of households that are expected to be displaced due to the flood scenario and the number of displaced people that will require accommodation in temporary public shelters. The model estimates 4,526 households (or 13,577 people) will be displaced due to the flood scenario. Of these, 2,919 people (out of a total population of 476,419) will seek temporary shelter in public shelters.

Underserved and At-Risk Population: The underserved and at-risk population exposed to riverine flooding (i.e., ice jams) and flash flooding in Onondaga County is likely to experience some adverse/disproportionate impacts, and minimal adverse/disproportionate impacts to dam and levee failure. The underserved and at-risk population faces unique vulnerabilities and impacts as a result of flooding. These groups include, but are not limited to, race and ethnic minorities, low-income population, the elderly population, and those with access and functional needs. The low-income population and minorities are more likely to reside in high flood-prone areas and less likely to have flood insurance. Additionally, low-income populations are less likely to evacuate in response to warning systems and more likely to evaluate their risk and decide to evacuate based on the net economic impacts on their families. Race and ethnic minorities may have limited access to information and resources designed to prevent or mitigate flooding risk due to language or cultural differences. The elderly and individuals with access and functional needs are more likely to seek or need medical attention that may not be available due to isolation during a flood event, and they may have more difficulty evacuating.[196] Additionally, individuals without adequate warning of the event (i.e., limited access to modern communications) are also uniquely vulnerable to this hazard.
Table 4-84 summarizes the vulnerable and at-risk population for flooding in Onondaga County.

Table 4-84. Underserved and At-Risk Population

Category	Estimate	Percent
Population in Poverty (i.e., low-income population)[197]	62,884	13.9%
Uninsured Population[198]	15,532	3.3%
Senior (65 years old and over)[199]	85,781	18.2%
Children (5 years old and under)[203]	25,989	5.5%
Race and Ethnic Minorities[200]		
Black or African American	50,946	10.8%

[196] United States Environmental Protection Agency. (2021). Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. Retrieved from https://www.epa.gov/cira/social-vulnerability-report.
[197] United States Census Bureau. (2023). S1701: Poverty in the Past 12 Months (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S1701?g=050XX00US36067.
[198] United States Census Bureau. (2023). S2701: Selected Characteristics of Health Insurance Coverage in the United States (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S2701?g=050XX00US36067.
[199] United States Census Bureau. (2023). DP05: ACS Demographic and Housing Estimates (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP05?g=050XX00US36067.
[200] Ibid.

Category	Estimate	Percent
American Indian and Alaska Native	2,530	0.5%
Asian	18,728	4.0%
Native Hawaiian and Other Pacific Islander	261	0.1%
Two (2) or More Races	32,714	6.9%
Some Other Race Alone	8,301	1.8%
Hispanic or Latino	27,105	5.7%

Property Damage and Critical Infrastructure: 10% to 24% of the total assessed property, infrastructure, and resources value is vulnerable (i.e., exposed) to riverine flooding (ice jam) and more than $5 Million in property damage is expected from a single major flooding event, or damages are expected to occur to 15% or more of the property value within the County. Less than 9% of the total assessed property, infrastructure, and resources value is vulnerable (i.e., exposed) to dam and levee failure, and more than $5 Million in property damage is expected from a single major dam and levee failure event, or damages are expected to occur to 15% or more of the property value within the County.

All buildings and critical infrastructure located within the dam and levee failure inundation areas are considered exposed and potentially vulnerable. The primary impact on buildings would result from the velocity of the water flowing from the dam. Properties located closest to the inundation zone have the greatest potential to experience the largest, most destructive surge of water.

Building damage resulting from a 100-year flood scenario was estimated using Hazus. In addition, annualized losses were calculated. Hazus estimates that there are 166,868 buildings in the region, which have an aggregated total replacement value of $90,736 Million. **Table 4-85** and **Table 4-86** summarize the relative distribution of the value with respect to the general occupancies by the County (i.e., study region) and scenario, respectively.

Table 4-85. Building Exposure by Occupancy Type for the County

Occupancy	Exposure *($1,000)*	Percent of Total
Residential	$58,057,813	64.0%
Commercial	$16,672,394	17.2%
Industrial	$7,647,474	8.4%
Agricultural	$980,024	1.1%
Religion	$994,325	1.1%
Government	$1,287,249	1.4%
Education	$6,096,222	6.7%
Total	**$90,735,501**	**100.0%**

Table 4-86. Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure *($1,000)*	Percent of Total
Residential	$6,583,917	58.7%
Commercial	$2,190,394	19.5%
Industrial	$1,494,265	13.3%
Agricultural	$134,386	1.2%

Occupancy	Exposure ($1,000)	Percent of Total
Religion	$145,394	1.3%
Government	$188,880	1.7%
Education	$479,241	4.3%
Total	**$11,216,477**	**100.0%**

Table 4-87 provides a general distribution of the building value within Onondaga County.

Table 4-87. Onondaga County Population and Building Value Data

Population	Residential Building Value	Non-Residential Building Value	Total
476,419	$58.058 Million	$32.678 Million	$90.736 Million

Hazus estimates that about 1,645 buildings will be at least moderately damaged, which is over 84% of the total number of buildings in the scenario. An estimated 41 buildings will be completely destroyed. **Table 4-88** summarizes the expected damage by general occupancy for the buildings in the County.

Table 4-88. Expected Building Damage by Occupancy

Building Occupancy	1 – 10		11 – 20		21 – 30		31 – 40		41 – 50		> 50	
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*
Agriculture	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Commercial	26	33.0	39	49.0	5	6.0	9	11.0	0	0.0	0	0.0
Education	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Government	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0
Industrial	13	33.0	13	33.0	13	33.0	1	3.0	0	0.0	0	0.0
Religion	1	25.0	3	75.0	0	0.0	0	0.0	0	0.0	0	0.0
Residential	623	29.0	882	40.0	449	21.0	139	6.0	50	2.0	41	2.0
Total	**664**	**-**	**938**	**-**	**467**	**-**	**149**	**-**	**50**	**-**	**41**	**-**

Table 4-89 summarizes the expected damage by general building type.

Table 4-89. Expected Building Damage by Building Type

Building Occupancy	1 – 10		11 – 20		21 – 30		31 – 40		41 – 50		> 50	
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*
Concrete	0	0.0	3	100.0	0	0.0	0	0.0	0	0.0	0	0.0
Manufactured Housing	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	8	100.0
Masonry	14	39.0	14	39.0	8	22.0	0	0.0	0	0.0	0	0.0
Steel	22	39.0	24	42.0	10	18.0	1	2.0	0	0.0	0	0.0
Wood	620	29.0	879	41.0	444	21.0	138	6.0	50	2.0	33	2.0

For essential facilities, there are nine (9) hospitals in the County with a total bed capacity of 1,932 beds. There are 160 schools, 73 fire stations, 31 police stations, and one (1) emergency operation center. The Hazus model estimates the time to restore critical facilities to fully functional use. Before the flood was analyzed in this scenario, Onondaga County had 1,932 hospital beds available for use. On the day of the flood scenario, Hazus estimates that 1,932

hospital beds (100%) are available in the County. **Table 4-90** summarizes the expected damage to essential facilities in Onondaga County.

Table 4-90. Expected Damage to Essential Facilities

Classification	Total	Number of Facilities		
		At Least Moderate	*At Least Substantial*	*Loss of Use*
Emergency Operations Center	1	0	0	0
Fire Stations	73	1	0	0
Hospitals	9	0	0	0
Police Stations	31	0	0	0
Schools	160	6	0	0

Economy: Floods can have a significant impact on the County's economy, including loss of business function, damage to inventory (i.e., buildings, transportation, and utility systems), relocation costs, wage losses, and rental losses due to repair and replacement of buildings. Businesses could be flooded and unable to reopen until necessary repairs are completed. Studies show that 40% of businesses do not reopen after a disaster, another 25% will close one (1) year after the hazard event, and 90% of companies fail within two (2) years of being impacted by a disaster.[201]

Locations that are directly flooded experience the greatest economic impact. In the impacted areas, renovations of commercial buildings may be necessary, disrupting associated services. Significant damage may occur in agricultural areas, with the destruction of crops and other agricultural products. Finally, flooding can cause extensive damage to public utilities and disrupt the delivery of services. Loss of power and communications may occur, and drinking water and wastewater treatment facilities may be temporarily out of operation.

Hazus breaks down building losses into two (2) categories – direct building losses and business interruption losses. Direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. Business interruption losses are the losses associated with the inability to operate a business because of the damage sustained during the flood. Also, business interruption losses include the temporary living expenses for those people displaced from their homes because of the flood.

The total building related losses estimated by Hazus were $1,015 Million where 49.0% of the estimated losses were related to business interruption in Onondaga County. Residential occupancies accounted for 21.9% of the total loss. **Table 4-91** summarizes the losses associated with the building damage.

[201] Access. (2020). Study: 40% of Businesses Fail to Reopen After a Disaster. Retrieved from https://www.accesscorp.com/press-coverage/study-40-percent-businesses-fail-reopen-disaster/.

Table 4-91. Building Related Economic Loss Estimates *(Millions of Dollars)*

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss	Building	203.3	91.0	55.1	16.5	365.9
	Content	124.7	215.0	156.3	98.5	594.4
	Inventory	0.0	29.9	22.5	2.2	54.4
	Subtotal	**328.0**	**335.9**	**233.9**	**117.1**	**1,014.7**
Business Interruption	Income	2.6	209.5	5.5	37.4	254.9
	Relocation	60.7	55.5	6.6	22.5	145.3
	Rental Income	37.1	42.1	2.4	2.5	84.0
	Wage	6.1	160.7	9.1	312.5	488.4
	Subtotal	**106.4**	**467.8**	**23.6**	**374.9**	**972.6**
Total		**434.3**	**803.6**	**257.4**	**492.0**	**1,987.3**

Hazus estimates the amount of debris that will be generated by the flood scenario. Debris estimates were divided into three (3) general categories – finishes (e.g., drywall, insulation), structural (e.g., wood, brick), and foundations (e.g., concrete slab, concrete block, rebar). The distinction is made because of the different types of materials handling equipment required to manage debris.

The analysis estimated that a total of 25,880 tons of debris will be generated. Of the total amount, 72% is comprised of finishes, 17% is structural, and 12% is foundations. If the debris tonnage is converted to an estimated number of truckloads, it will require 1,036 truckloads (25 tons/truck) to remove the debris.

Changes in Development and Impact of Future Development: Changes in development have minimally increased the vulnerability of Onondaga County to flooding (i.e., riverine flooding, ice jam, flash flooding) and dam and levee failure. Future development trends will increase the impact of riverine flooding (ice jam) and flash flooding, but will minimally increase the impact of dam and levee failure within Onondaga County.

Projections provided by New York State's economic development agency indicate that the five (5) counties within the Central New York region could have 60,000 additional residents in 2040, which is above and beyond what the population would be at that time. Onondaga County, home to half of the population in the five (5) county area, is in a position to add approximately 30,000 new residents by 2040. An increase in population will require more housing. This is in part due to Micron's arrival in the County.[202] Any new development within the SHFA, and dam and levee inundation areas will expose more of the population to floods. However, any new assets (e.g., new construction in hazard-prone areas) will be built to comply with the latest building codes and standards, and will include mitigation measures to protect them from flooding.

As has occurred across the country after 1950, suburbanization has led to substantial growth in the Towns surrounding the City of Syracuse, at the expense of the City's population. While population is expected to continue to increase in the most suburbanized Towns and Villages, particularly with Micron's entry into the northern suburbs, the City of Syracuse has seen a resurgence of new housing and economic investment over the past two (2) decades. Over 60% of new housing units since 2000 have been constructed in the City, primarily as multi-family development.[203] This trend is also expected to continue as significant new investments are being made to facilitate new economic activity in urban areas. As outlined in the County's Comprehensive Plan, Plan Onondaga, the County continues to encourage development in areas already served by water and sewer infrastructure (e.g., Onondaga

[202] Onondaga County. (2024). Onondaga County Housing Needs Assessment. Retrieved from https://plan.ongov.net/wp-content/uploads/2024/06/OnondagaHousing_JUNE2024_FINAL.pdf.
[203] Onondaga County Real Property Services Database.

County Consolidated Sanitary District), and revitalization and reinvestment in existing built communities, rather than further expansion into rural and agricultural lands.

Effects of Climate Change in Severity of Impacts: As global average temperatures increase, evaporation increases, adding moisture to the atmosphere, which results in more precipitation.[204] Globally, heavy precipitation events are expected to increase as much as three (3) times the historical average by the end of the century. Although heavy precipitation does not necessarily result in flooding, the potential for flooding increases, and in some locations, moderate precipitation can cause serious damage.[205]

Although precipitation varied from year to year, the total annual precipitation in New York State increased 10% to 20% between 1901 and 2022. The annual precipitation across the State is expected to continue to increase by about 6% to 17% by the end of the century. New York State is projected to remain a "water rich" state; however, increased precipitation can affect water quality (e.g., increased runoff can contaminate water sources with pollutants, pathogens, and sediments). Additionally, other than flooding, heavy precipitation events can threaten agriculture (e.g., damaged crops, reduced crop yields), infrastructure, ecosystems, and communities. The frequency of heavy precipitation events has increased across the State since the 1950s, and 100-year flood events have occurred nearly twice as often as expected in recent years. Furthermore, the increased frequency of heavy precipitation events in the State is expected to continue.[206] Onondaga County is within the Central Lakes region of the New York State Climate Impacts Assessment, and annual precipitation in this region is projected to increase by 3% to 10% by the 2050s and 5% to 17% by the end of the century.[207]

Table 4-92 outlines the flood associated climate indicators for Onondaga County projected through the end of the century.[208]

[204] Environmental Protection Agency. (n.d.). Climate Change Indicators: U.S. and Global Precipitation. Retrieved from https://www.epa.gov/climate-indicators/climate-change-indicators-us-and-global-precipitation.
[205] Denchak, M. (2019). Flooding and Climate Change: Everything You Need to Know. Retrieved from https://www.nrdc.org/stories/flooding-and-climate-change-everything-you-need-know.
[206] New York State Energy Research and Development Authority. (2024). New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate (Precipitation Section). Retrieved from https://nysclimateimpacts.org/explore-the-assessment/new-york-states-changing-climate/nysc-precipitation/.
[207] New York State Energy Research and Development Authority. (2023). New York State Climate Impacts Assessment: Projections Methodology Report (Appendix: Climate Change Projections Tables, Average Temperature and Precipitation – Central Lakes). Retrieved from https://nysclimateimpacts.org/wp-content/uploads/2024/01/Appendix-Projections_Tables-1.pdf.
[208] Climate Mapping for Resilience and Adaptation. (n.d.). Climate Mapping for Resilience and Adaptation Assessment Tool. Retrieved from https://livingatlas.arcgis.com/assessment-tool/explore/details.

Table 4-92. Future Climate Indicators for Onondaga County

Indicators	Modeled History (1976 – 2005)	Early Century (2015 – 2044)		Mid Century (2035 – 2064)		Late Century (2070 – 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min – Max	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*
Precipitation							
Average annual total precipitation	**40 inches**	**42 inches**	**42 inches**	**42 inches**	**43 inches**	**43 inches**	**44 inches**
	39 – 41	40 – 44	39 – 44	39 – 46	39 – 45	40 – 46	41 – 47
Days per year with precipitation *(Wet Days)*	**238 days**	**234 days**	**234 days**	**233 days**	**231 days**	**232 days**	**228 days**
	234 – 241	222 – 244	218 – 241	224 – 244	218 – 243	216 – 243	206 – 249
Maximum number of consecutive wet days	**17 days**	**17 days**	**17 days**	**17 days**	**17 days**	**17 days**	**17 days**
	15 – 19	14 – 19	15 – 21	14 – 19	15 – 20	15 – 20	15 – 23
Annual Days With:							
Annual days with total precipitation greater than 1 inch	**2 days**	**3 days**	**3 days**	**3 days**	**3 days**	**3 days**	**4 days**
	2 – 3	2 – 4	2 – 4	3 – 4	3 – 4	2 – 4	3 – 5
Annual days with total precipitation greater than 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0 – 0	0 – 0	0 – 0	0 – 0	0 – 0	0 – 0	0 – 1
Annual days with total precipitation greater than 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0 – 0	0 – 0	0 – 0	0 – 0	0 – 0	0 – 0	0 – 0
Annual days that exceed 99th percentile precipitation	**4 days**	**5 days**	**5 days**	**6 days**	**6 days**	**6 days**	**7 days**
	4 – 6	5 – 7	5 – 7	5 – 8	5 – 8	5 – 8	7 – 9
Days with maximum temperature below 32°F	**51 days**	**38 days**	**37 days**	**33 days**	**29 days**	**28 days**	**15 days**
	47 – 54	20 – 48	27 – 48	14 – 44	16 – 38	9 – 40	5 – 28

Figure 4-17 and **Figure 4-18** illustrate ClimRR data from the historical and mid-century models, respectively, for flooding by simulating rainfall and allowing it to flow across the landscape. The analysis is based on a 50-year event (i.e., an event that has a 2% chance of occurring in any given year), and it captures more frequent, lower-impact events rather than less frequent, higher-impact events. The result is 200-meter resolution data on the projected location and extent of flooding. The relative depth of flooding in the historical model shows that 13,201 buildings have some degree of inundation. The majority of these buildings were modeled to experience less than 2.3 inches of flooding, with an average flood depth of 2.7 inches. The same subsection of buildings is projected to experience an average flood depth of 3.4 inches by mid-century. Furthermore, the extent of flooding is projected to expand by mid-century to encompass 25,331 buildings. The majority of these buildings will experience flooding of less than 2.3 inches and an average flood depth of 2.8 inches. The comparison of the historical and mid-century flooding

maps (**Figure 4-17** and **Figure 4-18**) shows that flooding is projected to increase in range and impact across this region from the historical time period to mid-century.

Figure 4-17. Building Sites with Flooding *(Historical Model)*

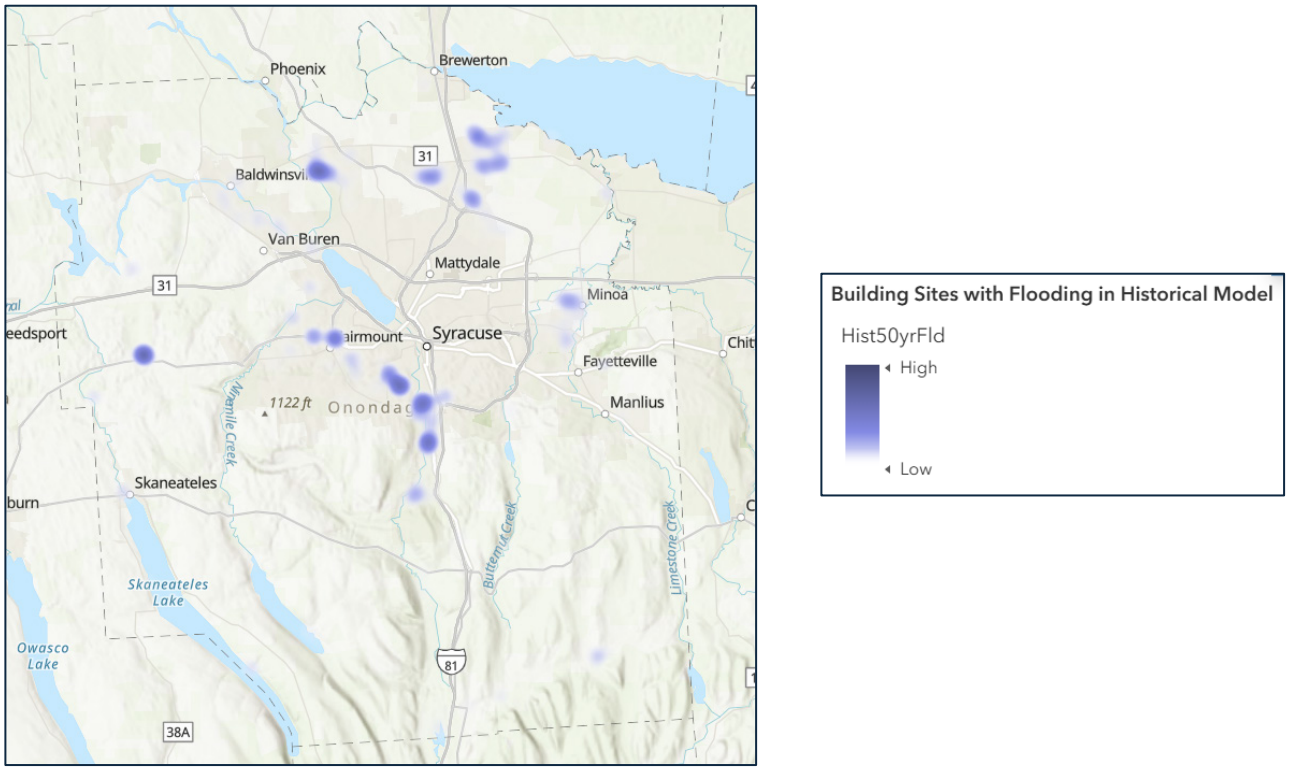
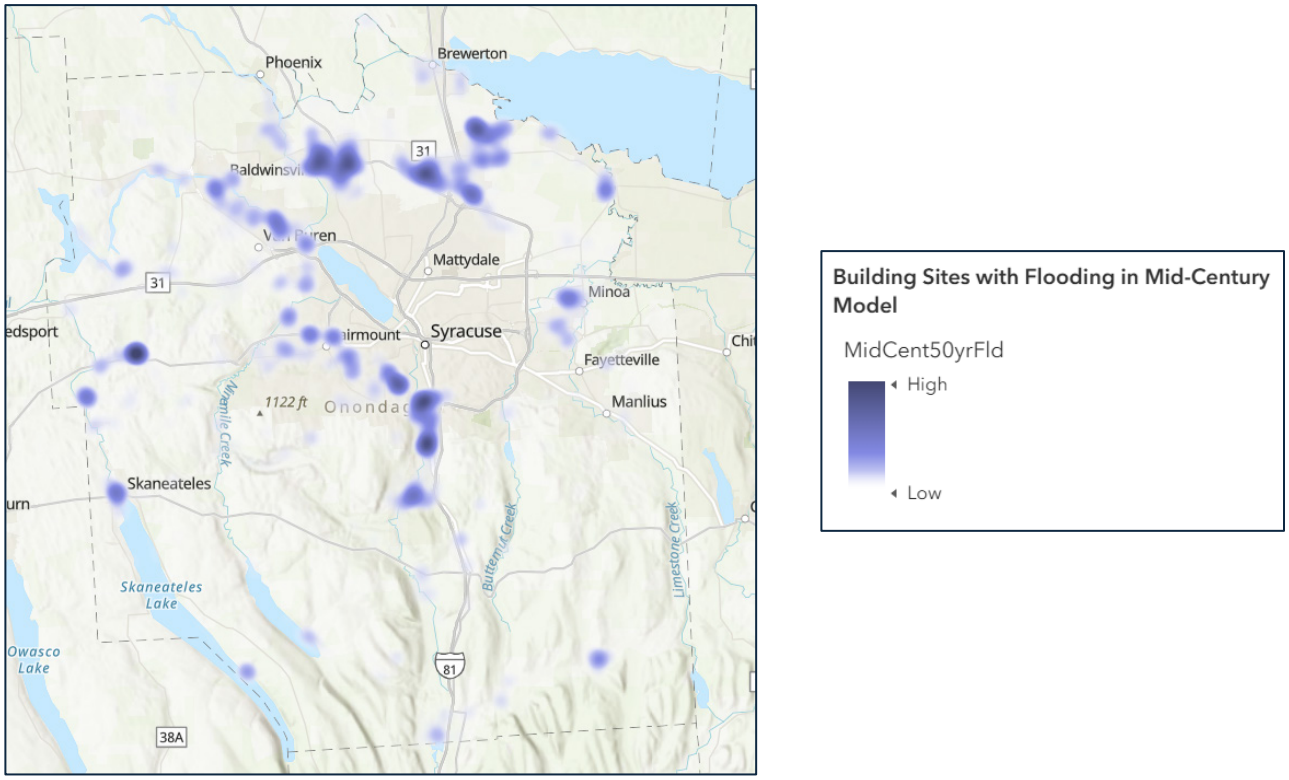


Figure 4-18. Building Sites with Flooding *(RCP8.5: Mid-Century Model)*



4.6.4.7. FEMA NRI Expected Annual Loss Estimates

A riverine flooding NRI EAL score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to riverine flooding when compared to the rest of the United States. The EAL score is positively associated with a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-93** outlines the riverine flooding EAL for Onondaga County.

Table 4-93. Riverine Flooding Expected Annual Loss ***(FEMA National Risk Index)***

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$480,213	$1.5 Million	$24,938	$2.0 Million	83.8	Very High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

4.6.4.8. FEMA Flood Risk Index Score

The riverine flooding Risk Index score and rating represent a community's relative risk for riverine flooding when compared to the rest of the United States. **Table 4-94** illustrates the riverine flooding Risk Index rating and score for Onondaga County.

Table 4-94. Riverine Flooding Risk Index ***(FEMA National Risk Index)***

Jurisdiction	Rating	Score
Onondaga County	Very High	82.2
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

Table 4-95 outlines the Flood Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

Table 4-95. Flood Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Flood *(Flash/Urban Flooding)*	3	12	11	29	52	73
Flood *(Riverine/Creek and Ice Jam)*	2	15	11	29	55	54
Dam and Levee Failure	1	12	6	27	45	25

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

4.6.5. Geological Hazards

4.6.5.1. Description

Geological hazards are natural phenomena that originate from the Earth's geological processes. These can include earthquakes, volcanic eruptions, landslides, and land subsidence.[209] For the purposes of this Plan, this section will include landslides, land subsidence, and mudboils. Earthquakes are addressed individually in Section 4.6.2. These hazards can lead to significant harm to human life, infrastructure, and the environment.

Landslide

A landslide is the downslope movement of a mass of rock, debris, or earth at rates that range from inches per year to tens of miles per hour. Landslides are a type of "mass wasting," which denotes any downslope movement of soil and rock under the direct influence of gravity. The landslide term comprises five (5) types of slope movement – falls, topples, slides, spreads, and flows – which are further subdivided by the type of geologic material (i.e., bedrock, debris, or earth).[210] A significant difference between the types of landslides is their depth and the amount of water they contain. Slope movement occurs when forces acting downslope exceed the strength of the earth's material that composes the slope. The modes of slope movement are listed in **Table 4-96**.[211]

Landslides are an important natural process because they shape the Earth's landscape and contribute to a region's overall environmental quality. However, when landslides impact people, property, or infrastructure, it is considered a natural hazard.

Table 4-96. Types of Slope Movement

Type	Description
Falls	Falls are abrupt, downward movements of rock or earth, or both, that detach from steep slopes or cliffs. The falling material usually strikes the lower slope at angles less than the angle of fall, causing bouncing. The falling mass may break on impact, may begin rolling on steeper slopes, and may continue until the terrain flattens.
Topples	A topple is recognized as the forward rotation out of a slope of a mass of soil or rock around a point or axis below the center of gravity of the displaced mass. Toppling is sometimes driven by the gravity exerted by the weight of material upslope from the displaced mass. Sometimes toppling is due to water or ice in cracks in the mass. Topples can consist of rock, debris (coarse material), or earth materials (fine-grained material). Topples can be complex and composite.
Slides	A slide is a downslope movement of a soil or rock mass occurring on surfaces of rupture or on relatively thin zones of intense shear strain. Movement does not initially occur simultaneously over the entire area that eventually becomes the surface of rupture; the volume of displacing material grows from an area of local failure.
Spreads	An extension of a cohesive soil or rock mass combined with the general subsidence of the fractured mass of cohesive material into softer underlying material. Spreads may result from liquefaction or flow (and extrusion) of the softer underlying material. Types of spreads include block spreads, liquefaction spreads, and lateral spreads.
Flows	A flow is a spatially continuous movement in which the surfaces of shear are short-lived, closely spaced, and usually not preserved. The component velocities in the displacing mass of a flow resemble those in a viscous liquid. Often, there is a gradation from slides to flows, depending on water content, mobility, and the evolution of the movement.

[209] United Nations Office for Disaster Risk Reduction. (n.d.). Hazard. Retrieved from https://www.undrr.org/terminology/hazard.
[210] United States Geological Survey. (n.d.). What is a Landslide and What Causes One? Retrieved from https://www.usgs.gov/faqs/what-landslide-and-what-causes-one.
[211] Highland, L. M. and Bobrowsky, P. (n.d.). The Landslide Handbook – A Guide to Understanding Landslides. Retrieved from https://pubs.usgs.gov/circ/1325/pdf/Sections/Section1.pdf.

Although gravity acting on a steep slope is the primary cause of a landslide, other factors also contribute.[212]

- Erosion by rivers, glaciers, or ocean waves creates oversteepened slopes.
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains.
- Earthquakes generate stresses that can cause weak slopes to fail.
- Earthquakes of magnitude 4.0 and greater have been known to trigger landslides.
- Volcanic eruptions produce loose ash deposits, heavy rain, and debris flows.
- Excess weight from accumulation of rain or snow or stockpiling of rock or ore, from waste piles or human-made structures may stress weak slopes to failure.

Both natural and human-caused environmental changes, including heavy rain, rapid snowmelt, steepening of slopes from construction or erosion, earthquakes, and changes in groundwater levels, may trigger landslides. Areas generally prone to landslide hazards include previous landslide areas, bases of steep slopes, bases of drainage channels, developed hillsides, and areas recently burned by forest and brush fires.[213] Human activities that contribute to slope failure include altering the natural slope gradient, increasing soil water content, and removing vegetation cover. Environmental signs for landslide activity include:[214]

- Springs, seeps, or saturated ground in areas that have not typically been wet before.
- New cracks or unusual bulges in the ground, street pavement, or sidewalks.
- Soil moving away from foundations.
- Ancillary structures (e.g., decks and patios) tilting and moving relative to the main house.
- Tilting or cracking of concrete floors and foundations.
- Broken water lines and other underground utilities.
- Leaning telephone poles, trees, retaining walls, or fences.
- Offset fence lines.
- Sunken or down-dropped road beds.
- Rapid increase in creek water levels, possibly accompanied by increased turbidity (i.e., soil content).
- Sudden decrease in creek water levels while rainfall is ongoing or has just recently ended.
- Sticking doors and windows, and visible open spaces indicating jambs and frames out of plumb.
- A faint rumbling sound that increases in volume as the landslide nears.
- Unusual sounds (e.g., trees cracking or boulders knocking together).

[212] Pacific Northwest Seismic Network. (n.d.). Landslides. Retrieved from https://pnsn.org/outreach/earthquakehazards/landslides.
[213] Federal Emergency Management Agency. (n.d.) Landslide: Where. Retrieved from https://community.fema.gov/ProtectiveActions/s/article/Landslide-Where.
[214] Federal Emergency Management Agency. (n.d.). Landslides: Signs and Clues. Retrieved from https://community.fema.gov/ProtectiveActions/s/article/Landslide-Signs-and-Clues.

Land Subsidence

Land subsidence is the gradual settling or sudden sinking of the Earth's surface as a result of underground material movement. The removal of water, oil, natural gas, or mineral resources from the ground by pumping, fracking, or mining activities is the most common cause of subsidence. Land subsidence can also be caused by natural events (e.g., earthquakes, soil compaction, erosion, sinkhole formation), and it can occur over large areas (e.g., states, provinces) or small areas (e.g., a backyard).[215] Additionally, structures with low strain tolerance (e.g., dams, factories, utility lines) can be severely damaged by land subsidence.

A sinkhole is a depression in the ground that lacks natural surface drainage. When it rains, all of the water stays inside the sinkhole and usually drains into the subsurface. Sinkholes are most common in areas underlain by karst terrain (e.g., limestone, carbonate rock, salt beds, and gypsum) and can occur without warning. These areas are where rock types below the land surface can naturally dissolve in groundwater. When rainfall moves down through the soil, these types of rock begin to dissolve, creating underground spaces and caverns that can lead to sinkholes.[216]

Land subsidence is one of the most varied forms of ground failure affecting the United States, ranging from broad regional land surface lowering to local collapses. Regional lowering may aggravate the flood potential or permanently inundate an area, particularly in coastal or riverine settings. Local collapse may damage or destroy buildings, roads, and utilities.[217] Other impacts of subsidence include, but are not limited to, changes in elevation and slope of streams, canals, and drains; damage to bridges, roads, railroads, storm drains, sanitary sewers, canals, and levees; damage to private and public buildings; and failure of well casings from forces generated by compaction of fine-grained materials in aquifer systems. In some coastal areas, subsidence has caused tides to reach low-lying areas that were once above high tide levels.

Typically, land subsidence poses a greater risk to property than to human life. The average annual damage from all types of subsidence across the United States is estimated at approximately $125 Million.[218] Damage consists primarily of direct structural damage, property loss, and depreciation of land values. It also includes business and personal losses that accumulate during periods of repair.

Mudboils

Mudboils are "muddy springs" composed of water, liquefied sediments, and dissolved mineral salts, which are discharged through surface vents via subsidence fractures caused by persistent artesian groundwater pressure. This persistent natural phenomenon appears to have been exacerbated by solution-mining activities south of the mudboil area. Brackish water and suspended fine sediment will continue to reach Onondaga Creek, even with careful and continuous management.[219]

4.6.5.2. Location

Geological hazards originate from dynamic processes on Earth's surface and occur across a wide range of locations, depending on the local geological conditions.

[215] National Ocean Service. (2024). What is subsidence? Retrieved from https://oceanservice.noaa.gov/facts/subsidence.html
[216] United States Geological Survey. (n.d.). What is the Difference Between a Sinkhole and Land Subsidence? Retrieved from https://www.usgs.gov/faqs/what-difference-between-a-sinkhole-and-land-subsidence.
[217] UNESCO Land Subsidence International Initiative. (n.d.). General Concept. Retrieved from https://www.landsubsidence-unesco.org/general-concepts/.
[218] Weary, D. J. (n.d.). The Cost of Karst Subsidence and Sinkhole Collapse in the United States Compared with Other Natural Hazards. Retrieved from https://core.ac.uk/download/pdf/154473292.pdf.
[219] Onondaga Environmental Institute. (2008). Tully Valley Mudboils: Onondaga Creek Fact Sheet. Retrieved from https://oei2.org/wp-content/uploads/2020/05/Mudboils-revised-FS.pdf.

Landslide

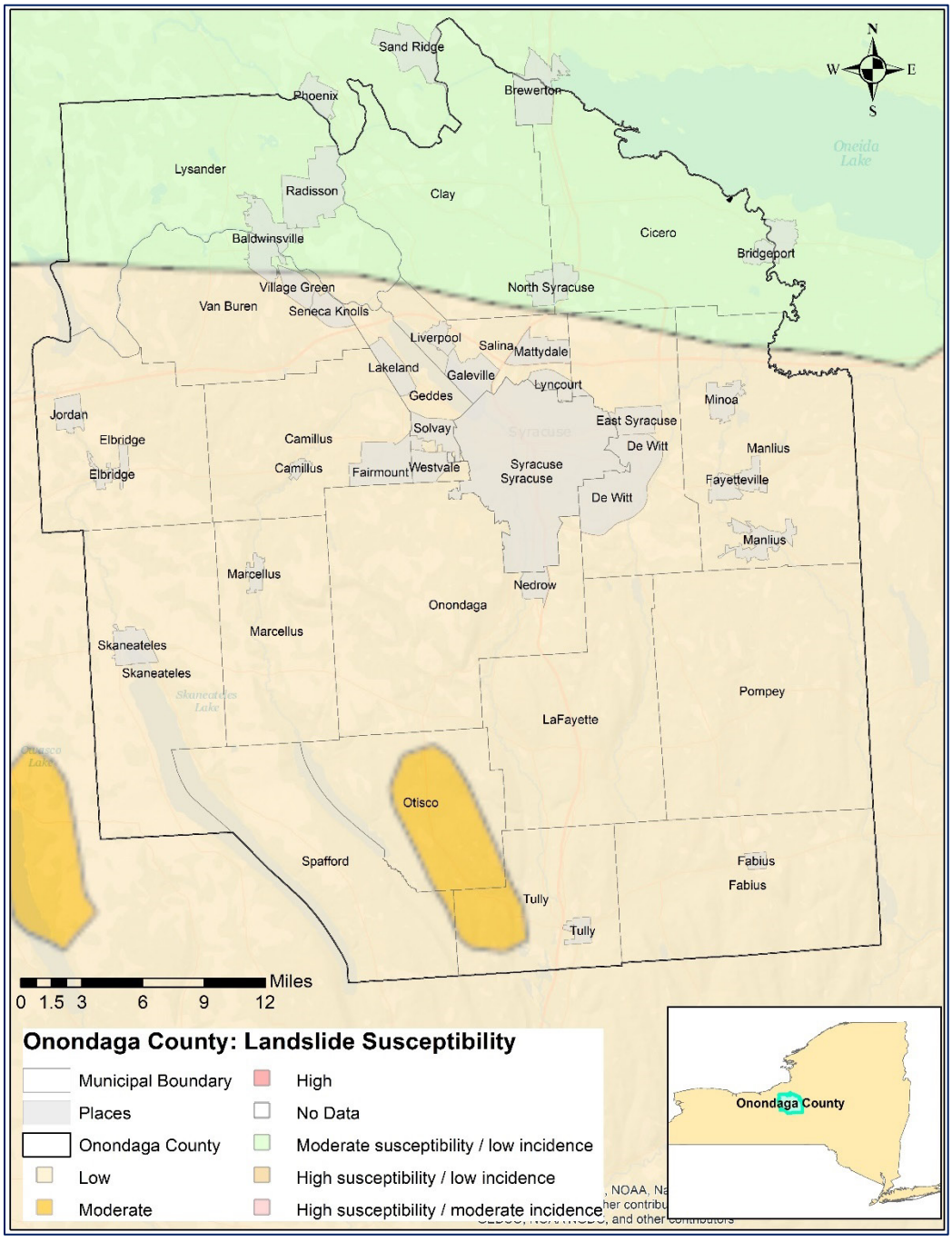
Landslide susceptibility maps describe the relative likelihood of future landsliding based solely on the intrinsic properties of a location or site. There are three (3) site factors that most determine susceptibility – prior failure, rock or soil strength, and slope steepness.[220]

The potential for landslides exists across New York State; however, 80% of the State has a low landslide susceptibility. **Figure 4-19** indicates Onondaga County's landslide susceptibility. The northern portion of the County is shown as having moderate susceptibility to landsliding and a low incidence of occurrence. A small area in the center of the southern portion of the County has a moderate incidence.

Areas with steep slopes are typically at greatest risk of landslides. Steeper slopes increase the likelihood of landslides, especially during periods of heavy rainfall or human activity. However, the primary cause of landslides is the influence of gravity acting on weakened materials that make up a sloping area. In Onondaga County, many steep slopes are located around the lakes in southwestern Onondaga County and in the Tully Valley.

[220] United States Geological Survey. (n.d.). What is a Landslide Hazard Map? Retrieved from https://www.usgs.gov/faqs/what-a-landslide-hazard-map.

Figure 4-19. Landslide Susceptibility



Tully Valley

Tully Valley is located in the Finger Lakes region of New York State in Onondaga County. Tully Valley is a glacially carved valley where lake sediments were deposited. It is approximately six (6) miles long and, on average, about one (1) mile wide along the valley floor. Onondaga Creek flows north through the valley and drains into Lake Ontario. The Valley walls are forested, steep, and generally consist of colluvium (i.e., weathered bedrock) and glacial till (i.e., dense soils) over bedrock. The Valley floor consists of more than 400 feet of glacial lake deposits (i.e., gravel and sand grading upward to silt and clay at the land surface) and its terrain slopes gently (generally less than 10°) from the valley walls toward the center of the Valley. At the land surface, the Valley floor is mantled by a 60 foot thick silt and clay unit; some of the clay within this unit is saturated and extremely soft. These materials were deposited during and after the last period of glaciation, which ended approximately 14,000 years ago. The upstream (south) end of the Valley is covered by coarser sediments that form the head of the Tully (Valley Heads) Moraine. Alluvial fans emanate from the tributary valleys of Rainbow Creek and Rattlesnake Gulf, halfway up the valley and just north of Otisco Road.[221] Land use in Tully Valley is mostly agricultural and low density residential. Brine mining (i.e., solution mining of salt) took place from 1889 to 1986 at the southern end of the Valley, and as a result, the Valley walls and bedrock beneath them contain fractures. Also, north of the Tully Moraine, a section of the Valley floor has sunk due to salt removal beneath it.[222]

Tully Valley has a landslide history dating back to 9,870 14C yr B.P. (before present). The Department of Geography at the University of Heidelberg and the USGS developed a landslide inventory covering the period from 14,000 years ago to the present day, based on the interpretation of aerial photographs of the Tully Valley area. This inventory indicated that 73 total landslides have occurred, of which 22% (16) were classified as active/recently active (present to 200 years), 52% (38) fall in the category old (200 to 10,000 years), and 26% (19) are termed ancient (10,000 to 40,000 years).[223]

The most recent and most documented landslide in Onondaga County and the Tully Valley area occurred on April 27, 1993, along the west wall of the Valley at the base of Bare Mountain. The debris from the landslide covered 1,500 feet of Tully Farms Road with more than 15 feet of mud. Three (3) homes were destroyed due to this event. Most residents were away from their homes at the time, and no fatalities or serious injuries were reported.[224] According to the New York State Geological Association (NYSGA), this landslide was the largest to have occurred in the State in more than 75 years.[225] The location of this landslide, as well as other recent landslide events, is depicted in **Figure 4-20**.

The 1993 Tully Valley landslide and more minor, recently active landslides in the area, particularly along the base of Bare Mountain, have resulted in property damage, suggesting that landslides are an important hazard and potential risk in this area of Onondaga County.[226] In the aftermath of the 1993 Tully Valley landslide, residents and public officials became concerned about the potential landslide hazards in settings similar to the Tully Valley within the County. Federal and State environmental agencies, along with several universities, conducted numerous studies and investigations in the Tully Valley area to identify the causes of landslides and assess the potential for future

[221] Kappel, W. M., Sherwood, D. A., and Johnston, W. H. (1996). Hydrogeology of the Tully Valley and Characterization of Mudboil Activity, Onondaga County, New York. Retrieved from https://pubs.usgs.gov/wri/1996/4043/report.pdf.
[222] Wieczorek, G. F., Negussey, D., and Kappel, W. M. (1998). Landslide Hazards in Glacial Lake Clays - Tully Valley, New York. Retrieved from https://pubs.usgs.gov/fs/fs13-98/.
[223] Jäger, S. and Wieczorek, G. F. (2016). Landslide Susceptibility in the Tully Valley Area, Finger Lakes Region, New York. Retrieved from https://pubs.usgs.gov/of/1994/ofr-94-0615/tvstudy.htm.
[224] United States Geological Survey. (2000). History of Landslides at the Base of Bare Mountain, Tully Valley, Onondaga County, New York. Retrieved from https://ny.water.usgs.gov/pubs/fs/fs19099/FS190-99.pdf.
[225] Negussey, D. et. al. (1997). Investigation of the 1993 Tully Valley Landslide. Retrieved from https://www.nysga-online.org/wp-content/uploads/2019/06/NYSGA-1997-Investigation-of-the-1993-Tully-Valley-Landslide.pdf.
[226] Jäger, S. and Wieczorek, G. F. (2016). Landslide Susceptibility in the Tully Valley Area, Finger Lakes Region, New York. Retrieved from https://pubs.usgs.gov/of/1994/ofr-94-0615/tvstudy.htm.

landslides.[227] Also, the USGS and the NYSGA prepared a map of 160 square miles in southern Onondaga County showing landslide susceptibility categorized as low, moderate, or high. Landslide susceptibility maps, such as **Figure 4-19**, have been used by the towns of Tully and LaFayette and by Onondaga County agencies. Results of landslide potential investigations, followed by mitigation efforts before land use development, help prevent or reduce most adverse economic consequences of landslides.

The Bluffs (along Bluffview) in the Town of Manlius, overlooking Limestone Creek, have experienced geological hazard events in the past. According to an Engineering Feasibility Study conducted in 2005, four (4) attached condominiums along Bluffview were constructed (before 1994) close to the edge of an approximately 80 foot high bluff overlooking Limestone Creek. In May 2002, an approximately 40 foot wide area of the bluff slid into Limestone Creek, carrying the ground surrounding the south side of condominium unit 8181. The earth slope failed after a heavy rainfall event. According to the Study, a glacial till layer (i.e., fine-grained silt, sand, gravel, cobbles, and boulders) supports the floors and footings of the condominiums and is susceptible to erosion by precipitation and roof runoff. The bedrock beneath the soil is thinly bedded, fractured limestone that is susceptible to surface unraveling due to weathering. The Study also states that more profound large-scale instability in the rock cannot be ruled out, and without repair, the building's structure will eventually suffer.[228]

Land Subsidence

Areas underlain by carbonate bedrock are the most susceptible to land subsidence and sinkhole incidents. Areas of limestone, carbonate rock, salt beds, or rocks that can naturally be dissolved by groundwater are more prone to sinkholes. As the rock dissolves, underground spaces and caverns form, leading to sinkholes.[229] In Onondaga County, there are bands of dolomite in the northern and central portions, bands of limestone in the central portion, and small bands of limestone in the southern portion. These areas of the County may experience more sinkholes than other parts due to the underlying rock.

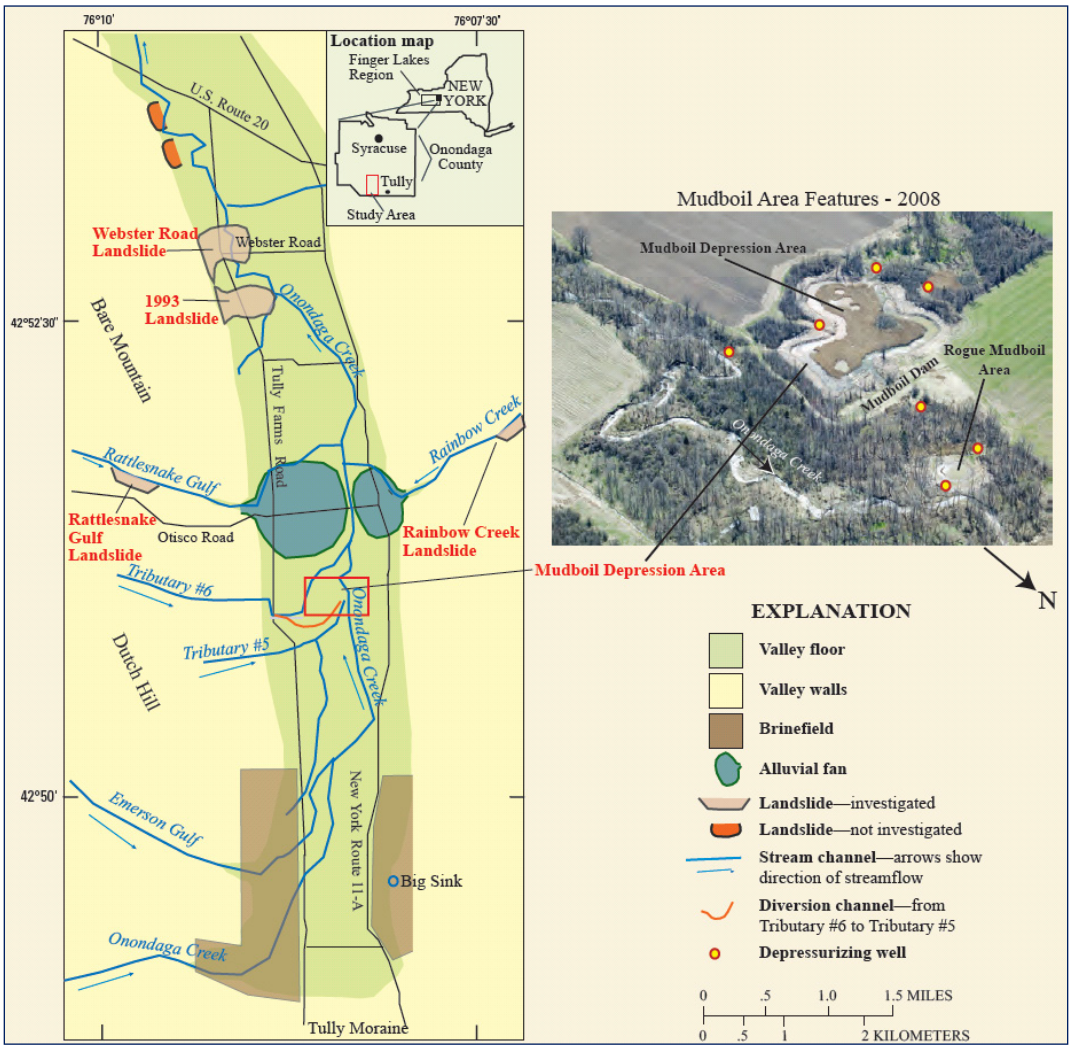
Mudboils

Mudboils have been documented in the Tully Valley since the late 1890s and have continuously discharged sediment-laden (turbid) water into nearby Onondaga Creek since the 1950s. This discharge causes turbidity in the Creek, a tributary of Onondaga Lake. Mudboil activity has led to gradual land surface subsidence, rerouting a major petroleum pipeline and a buried telephone cable, and causing two (2) road bridges to collapse.[230]

The Tully Valley mudboils are volcano-like cones of fine sand and silt that range from several inches to several feet high and from several inches to more than 30 feet in diameter. Active mudboils are dynamic ebb-and-flow features that can form a large cone over several days, then cease flowing, or discharge continuously for several years. **Figure 4-20** illustrates the approximate location of where mudboil activity continues to occur in southern Onondaga County.[231]

[227] United States Geological Survey. (2000). History of Landslides at the Base of Bare Mountain, Tully Valley, Onondaga County, New York. Retrieved from https://ny.water.usgs.gov/pubs/fs/fs19099/FS190-99.pdf.
[228] John P. Stopen Engineering Partnership. (2005). Engineering Feasibility Study for the Bluffview Condominium.
[229] United State Geological Survey. (2018). Water Science School: What is Groundwater? Retrieved from https://www.usgs.gov/special-topics/water-science-school/science/groundwater-what-groundwater.
[230] United States Geological Survey. (2009). Remediation of Mudboil Discharges in Tully Valley of Central New York. Retrieved from https://pubs.usgs.gov/of/2009/1173/pdf/OFR2009_1173.pdf.
[231] Ibid.

Figure 4-20. Geographic Features in Tully Valley



Mudboil discharge within the County is driven by artesian pressure in unconsolidated sediments that are confined by a 60-foot layer of silt and red clay. This process, once begun, has been self-propagating. Artesian pressures are about 20 feet above land surface over most of the Tully Valley floor, but exceed 30 feet above land surface along Onondaga Creek, where Rattlesnake Gulf and Rainbow Creek enter the Tully Valley. The source of artesian pressure is recharge from the Tully Moraine at the south end of the valley, and the alluvial fans of Rattlesnake Gulf and Rainbow Creek.

Most of the mudboils are in two (2) areas of the Tully Valley – the Onondaga Creek mudboil "corridor," which is 1,500 feet long and 300 feet wide along Onondaga Creek, south of Otisco Road, and the five (5) acre area of subsidence, locally known as the mudboil/depression area (MDA), just west of the southern (upstream) end of the mudboil corridor.

Mudboils have been observed in the Tully Valley for nearly 125 years. The earliest known mudboil in Tully Valley, reported in the Syracuse Post-Standard on October 19, 1899, was localized and short-lived. From 1899 to the 1970s, the mudboils within the Onondaga Creek mudboil corridor appeared and dissipated over several weeks to a few months, but had no long-term effect on the water quality of Onondaga Creek and Onondaga Lake, which is 20 miles downstream. Active mudboils became increasingly persistent during the mid-1970s, causing turbid discharges that

degraded the quality of Onondaga Creek. Before the mid-1980s, relatively fresh groundwater was discharged from the MDA. Since then, however, the discharge has been more brackish, and land subsidence (as much as 15 feet locally) has expanded outward. In June 1991, a new mudboil appeared on Onondaga Creek just upstream of the Otisco Road Bridge, and within two (2) months, the bridge collapsed. Subsidence around a 150-foot radius of this collapse area ranges from several inches at the perimeter to more than five (5) feet at the bridge.[232] Currently, the MDA contains most of the active mudboils and accounts for most of the sediment discharged to Onondaga Creek from this part of the Valley; it also has the greatest amount of mudboil-induced land subsidence in the Valley.

4.6.5.3. Extent/Intensity

Geological hazards encompass a variety of natural events stemming from Earth's geological processes, ranging from localized to widespread disasters in extent and intensity. Their extent and intensity can vary based on different factors (e.g., geological conditions).

Landslide

In the United States, landslides cause billions of dollars in damage and kill between 25 and 50 people annually. Casualties are primarily caused by rockfalls, rockslides, and debris flows. Worldwide, landslides cause thousands of casualties and billions of dollars in damage.[233]

Landslides can occur suddenly or slowly. The velocity of mass movement depends on the slope angle, the material, and the water content. Some methods used to monitor mass movements can provide an idea of the type of movement and the amount of time prior to failure. It is also possible to determine what areas are at risk during general time periods. Assessing the geology, vegetation, and predicted precipitation for an area can help inform these predictions. However, there is no practical warning system for individual landslides.

USGS provides a system for notifying potential landslide areas, listed in **Table 4-97**. Watches and warnings may be issued for specific areas and include advice on contacting the local emergency management agency. Additionally, rainfall-induced debris flow watches and warnings are weather-dependent and will closely track NWS flash flood advisories.[234]

Table 4-97. United States Geological Survey Landslide Advisories

Type	Description
Landslide Advisory	A general statement about the potential of landslide activity in a given region relative to developing rainfall predictions. An advisory may include general statements about rainfall conditions that can lead to debris flow, and it may list precautions to be taken in the event of heavy rainfall.
Landslide Watch	It means that landslide activity will be possible, but it is not imminent. People in or planning to travel through a watch area should know landslide preparedness and stay informed about developing weather patterns.
Landslide Warning	Indicate that landslide activity is presently occurring, and extreme caution should be taken.

Land Subsidence

To determine the extent of the subsidence hazard, the affected areas need to be identified, and the probability of the subsidence occurring within some time period needs to be assessed. Natural variables that contribute to the overall

[232] Ibid.
[233] United States Geological Survey. (2004). Landslide Types and Processes. Retrieved from https://pubs.usgs.gov/fs/2004/3072/pdf/fs2004-3072.pdf.
[234] United States Geological Survey. (n.d.). What is the Difference Between a Landslide Advisory, a Landslide Watch, and a Landslide Warning? Retrieved from https://www.usgs.gov/faqs/what-difference-between-landslide-advisory-landslide-watch-and-landslide-warning.

extent of potential subsidence activity in any particular area include soil properties and underlying geologic features. Predicting subsidence is difficult, even under ideal conditions. As a result, the subsidence hazard is often represented by the presence of evaporite or carbonate rock.

No two (2) subsidence areas are exactly alike. Variations in size and shape, the time period under which they occur (i.e., gradually or abruptly), and their proximity to development ultimately determine the magnitude of damage incurred. Based on the geologic formations underlying parts of Onondaga County, subsidence and sinkhole events may occur gradually or abruptly. Events could result in minor elevation changes or deep, gaping holes in the ground surface. Land subsidence events can cause severe damage in urban environments, although gradual events can be addressed before significant damage occurs. Primarily, problems related to subsidence include disruptions to utility services and damage to private and public property (e.g., buildings, roads, underground infrastructure). If long-term subsidence formation is not recognized and mitigation measures are not implemented, fractures or complete collapse of building foundations and roadways may occur.

The worst-case scenario for subsidence in Onondaga County would be a sinkhole forming in an urban area. A sinkhole in a city, either in a highly pedestrian area or under one of the many high traffic roadways or bridges, could potentially cause significant property damage and/or loss of life.

Mudboils

Despite what is understood about mudboils, projections regarding the extent/intensity and duration of future mudboil activity are difficult and involve a high level of uncertainty. However, mudboils have environmental and hydrological implications in the County. The mudboils are a persistent problem in the Tully Valley, and they cover relatively concentrated areas but may have a widespread impact on the local ecosystems and water quality of Onondaga Creek.

4.6.5.4. Probability and Frequency

The probability of occurrence for landslides, land subsidence, and mudboils was analyzed separately.

Landslide

The probability of occurrence for a landslide in Onondaga County is low because a significant hazard event is likely to occur within 100 years. Landslides are often triggered by other natural hazards such as earthquakes, heavy rainfall, floods, or wildfires; as a result, landslide frequency is often related to the frequency of these other hazards. However, a sufficient understanding of landslide processes within the County exists through various studies and mapping sources, enabling an estimation of landslide hazard potential. The potential increase in the risk posed by the landslide hazard can be mitigated through continued understanding and mapping of the hazard and improved capabilities to mitigate and respond to it.

The landslide annualized frequency value represents the average number of recorded landslide hazard occurrences in event days per year over the period of record (11.8 years). **Table 4-98** outlines the annualized landslide frequency for Onondaga County, based on FEMA NRI data.

Table 4-98. Landslide Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(2010 – 2021)*	Annualized Frequency
Onondaga County	5	0.0 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

Land Subsidence

The probability of occurrence for land subsidence is low because a significant hazard event is likely to occur within 100 years. As moderate to low land subsidence susceptibility does exist in Onondaga County and land subsidence has occurred in the State in the past, although very infrequently, land subsidence is likely to occur at some point.

Mudboils

The probability of occurrence for mudboils is low because a significant hazard event is likely to occur within 100 years. Despite what is understood about mudboils, predictions regarding the location within Tully Valley, intensity, and duration of future mudboil activity are difficult and involve a high level of uncertainty. However, it is surmised that mudboils will not go away in the near future.[235]

For years, the Onondaga Lake Management Conference has been conducting remediation efforts to decrease mudboil discharge in Tully Valley. Remediation projects have been designed to reduce artesian pressure that drives mudboil activity and to decrease sediment discharge, but do not stop mudboil activity. Remedial efforts near the Tully Valley mudboils include:

- Diverting flow from the tributary that feeds the MDA to an adjacent tributary. The diversion of water reduced total annual surface water inflow to the MDA by about two-thirds, which in turn reduced sediment loading to Onondaga Creek.
- Installing depressurizing wells at several locations around the MDA and along Onondaga Creek to decrease the artesian pressure. Depressurizing wells installed near the collapsed Otisco Road bridge appear to have reduced sediment discharge and may have stabilized the area around the bridge; alternatively, mudboil activity may have migrated away from the Tully Valley.
- Constructing a dam and sediment-settling impoundment to detain mudboil sediment that would normally discharge to Onondaga Creek.
- Modifying several geologic features that allow surface water to recharge the groundwater system in southern Tully Valley (alluvial fans, losing stream reaches, and sinkholes).

Turbidity in Onondaga Creek will decline, as will the rate of land subsidence in the Tully Valley. Although these remedial activities may have reduced mudboil activity and land subsidence, mudboils will persist in the Tully Valley as long as the two (2) confined aquifers maintain artesian pressure that pushes water above the land surface. Further work is needed at the MDA and along Onondaga Creek to lower artesian heads and reduce the discharge of fine-grained sediments. Left unmitigated, mudboil activity will persist along the Creek, but most of the mudboil activity and land subsidence will be in the MDA as subsidence moves toward the Rattlesnake alluvial fan—one of the sources of artesian pressure in this area. Mudboil activity is greatest during the spring and late fall, when artesian pressures increase rapidly from seasonal recharge to the confined freshwater and brackish-water aquifers. The gradual increase in brackish-water discharge at the MDA may continue as the hydraulic connection between the lower and upper aquifers develops over time.[236]

[235] Mudboil Alternatives Analysis Design Team. (2021). Tully Valley Mudboil Mitigation Alternatives Analysis. Retrieved from https://www.oei2.org/wp-content/uploads/2021/09/01-Mudboil-Alternatives-Analysis-Final-Report.pdf.
[236] United States Geological Survey. (2009). Remediation of Mudboil Discharges in Tully Valley of Central New York. Retrieved from https://pubs.usgs.gov/of/2009/1173/pdf/OFR2009_1173.pdf.

4.6.5.5. Past Events

Numerous sources were researched during this Plan update; however, information regarding occurrences and losses associated with geological hazard events in Onondaga County was limited.

Landslide

In the last five (5) years, Onondaga County has not experienced any recent landslide events. The most recent and most documented landslide in Onondaga County occurred on April 27, 1993, along the west wall of Tully Valley at the base of Bare Mountain. The debris from the landslide covered 1,500 feet of Tully Farms Road with more than 15 feet of mud. Three (3) homes were destroyed due to this event. Most residents were away from their homes at the time, and no fatalities or serious injuries were reported.[237] According to the NYSGA, this landslide was the largest to have occurred in the State in more than 75 years.[238]

Land Subsidence

In the last five (5) years, Onondaga County has not experienced significant land subsidence.

Mudboils

Mudboils in Onondaga County are ongoing events and have been continuously active since the 1950s.

Between 1953 and 2024, there have been no major disaster (DR) or emergency (EM) declarations in New York State related to landslides, land subsidence, or mudboils. However, the State has experienced at least six (6) landslide events that did not result in a presidential declaration or cause damage documented and reimbursed through FEMA's disaster recovery programs.[239]

4.6.5.6. Vulnerability and Impacts

Life Safety and Public Health: Less than 14% of the population is exposed to landslides, land subsidence, and mudboils, and it is likely to experience minimal adverse impacts to these geological hazards. Overall, geologic hazard events would be isolated incidents and impact the population in the immediate area. Specifically, the population located downslope of the landslide hazard areas is particularly vulnerable to this hazard. In addition to causing damage to residential buildings and displacing residents, landslides and land subsidence can block or damage major roadways, hindering travel for emergency responders and individuals trying to evacuate the area. Furthermore, landslides and land subsidence damage the water supply system, which can result in contamination with debris, sewage, and chemicals, and increase the risk of waterborne diseases.

In the United States, landslides result in 25 to 50 deaths each year. Landslides can cause injuries and fatalities to anyone who gets trapped in a vehicle or structure during a landslide, either in transit or if they happen to be standing in the area when the landslide occurs. Buildings, roads, and other structures built on landslide-prone slopes can collapse, trapping people and causing injury or death during a landslide. Additionally, landslides can block roads and pathways, limiting access to emergency services and potentially hindering evacuation and search and rescue efforts.[240] In general, the entire population living in areas with a higher risk of landslides is considered vulnerable. As the population increases and many homes are built on property above or below bluffs and on steep slopes subject to mass movement, the number of lives endangered by this hazard increases.

[237] United States Geological Survey. (2000). History of Landslides at the Base of Bare Mountain, Tully Valley, Onondaga County, New York. Retrieved from https://ny.water.usgs.gov/pubs/fs/fs19099/FS190-99.pdf.
[238] Negussey, D. et. al. (1997). Investigation of the 1993 Tully Valley Landslide. Retrieved from https://www.nysga-online.org/wp-content/uploads/2019/06/NYSGA-1997-Investigation-of-the-1993-Tully-Valley-Landslide.pdf.
[239] New York State Division of Homeland Security and Emergency Services. (2023). New York State Hazard Mitigation Plan. Retrieved from https://mitigateny.org/.
[240] Centers for Disease Control and Prevention. (2024). Landslides and Mudslides and Your Safety. Retrieved from https://www.cdc.gov/landslides-and-mudslides/about/index.html.

Mudboils may not have a direct impact on life safety and public health, but they have indirect impacts. For example, mudboils in Onondaga Creek and its tributaries increase waterway turbidity and can impact the use of these waterways by communities downstream, within and outside Tully Valley, that use them for recreation.[241] Clay and fine silt from mudboils can remain suspended in Onondaga Creek, affecting water quality. Furthermore, mudboils can cause gradual or sudden ground collapses, resulting in structural instability of homes, businesses, and transportation infrastructure (e.g., bridges).

Underserved and At-Risk Population: The underserved and at-risk population exposed to landslides, land subsidence, and mudboils in Onondaga County is likely to experience minimal adverse/disproportionate impacts. The underserved and at-risk population faces unique vulnerabilities and impacts from landslides and other geological hazards. These groups include, but are not limited to, low-income families, the elderly, individuals with access and functional needs, and those living in isolated areas with limited access. Low-income populations are less likely to evacuate in response to warning systems and more likely to evaluate their risk and decide to evacuate based on the net economic impacts on their families. The elderly and individuals with access and functional needs are more likely to seek or need medical attention that may not be available due to isolation during a landslide event, and they may have more difficulty evacuating. Additionally, individuals living in isolated areas with limited access (e.g., one (1) road in and one (1) road out) are vulnerable to being cut off from community lifelines if a landslide were to block access for an extended period.[242] Furthermore, portions of this population may not have access to accurate and timely information due to limited internet access, living in isolated areas, and/or inadequate warning of the event (i.e., limited access to modern communications). Therefore, critical landslide warnings may not reach these individuals in a timely manner, which results in higher injury and mortality rates within these communities. **Table 4-99** summarizes the vulnerable and at-risk population for geological hazards in Onondaga County.

Table 4-99. Underserved and At-Risk Population

Category	Estimate	Percent
Population in Poverty (i.e., low-income population)[243]	62,884	13.9%
Individuals with a Disability[244]	64,374	13.8%
Senior (65 years old and over)[245]	85,781	18.2%

Property Damage and Critical Infrastructure: Less than 9% of the total assessed property, infrastructure, and resources value is vulnerable (i.e., exposed) to landslides, land subsidence, and mudboils; and less than $500,000 in property damage is expected from a single major geological hazard event, or less than 5% of the property value within the County.

Landslides and land subsidence can destabilize the foundations of structures, resulting in financial losses for businesses and residents. As seen along Limestone Creek and the Bluffs in the Town of Manlius, geological hazards can expose the underlying bedrock adjacent to structures, which can erode and threaten the structural integrity and

[241] Onondaga Environmental Institute. (2008). Tully Valley Mudboils: Onondaga Creek Fact Sheet. Retrieved from https://oei2.org/wp-content/uploads/2020/05/Mudboils-revised-FS.pdf.
[242] United States Environmental Protection Agency. (2021). Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. Retrieved from https://www.epa.gov/cira/social-vulnerability-report.
[243] United States Census Bureau. (2023). S1701: Poverty in the Past 12 Months (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S1701?g=050XX00US36067.
[244] United States Census Bureau. (2023). S1810: Disability Characteristics (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S1810?g=050XX00US36067.
[245] United States Census Bureau. (2023). DP05: ACS Demographic and Housing Estimates (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP05?g=050XX00US36067.

safety of the structures above. All critical facilities within the landslide susceptibility areas, steep slope areas, and the Tully Valley in Onondaga County are considered exposed and vulnerable to the geological hazards outlined in this Plan.

In addition to critical facilities, a significant amount of infrastructure can be exposed to geological hazards:

- **Roads:** Access to major roads is crucial to life safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems, and delays for public and private transportation. This can result in economic losses for businesses.
- **Bridges:** Landslides can significantly impact road bridges. Mass movements can knock out bridge abutments or substantially weaken the soil supporting them, making them hazardous to use.
- **Power Lines:** Power lines are generally elevated above steep slopes, but the towers supporting them can be subject to landslides. A landslide could trigger the failure of the soil underneath a tower, causing it to collapse and bring down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.
- **Rail Lines:** Similar to roads, rail lines are important for response and recovery operations after a disaster. Landslides can block travel along rail lines, which would become especially troublesome because detouring a rail line is not as easy as detouring a local road or highway. Many residents rely on public transport to get to work around the County and into Philadelphia and New York City, and a landslide event could prevent travel to and from work.

Several other types of infrastructure may also be exposed to geologic hazards, including water and sewer infrastructure. At this time, all critical facilities, infrastructure, and transportation corridors located within the hazard areas are considered vulnerable until more information becomes available.

The following major transportation routes intersect areas of steep slopes around the County:

- Interstate 81
- Interstate 481
- Interstate 690
- New York State Route 5
- New York State Route 41
- New York State Route 80
- New York State Route 91
- New York State Route 92
- New York State Route 173
- New York State Route 174
- New York State Route 175
- New York State Route 257
- New York State Route 290
- New York State Route 370
- New York State Route 635
- New York State Route 695
- New York State Route 11A
- New York State Route 931F
- U.S. Route 11
- U.S. Route 20

The following major transportation routes traverse areas underlain by carbonate bedrock around the County:

- Interstate 81
- Interstate 481
- Interstate 690
- New York State Route 5
- New York State Route 31
- New York State Route 173
- New York State Route 174
- New York State Route 175
- New York State Route 257
- New York State Route 290
- New York State Route 370
- New York State Route 481
- New York State Route 598
- New York State Route 635
- New York State Route 695

- New York State Route 41
- New York State Route 48
- New York State Route 80
- New York State Route 91
- New York State Route 92
- New York State Route 297
- New York State Route 298
- New York State Route 317
- New York State Route 321
- New York State Route 370
- New York State Route 11A
- New York State Route 930P
- New York State Route 931F
- U.S. Route 11

New York State Route 11A traverses Tully Valley from north to south along the eastern border, running along the east brinefield in southern Tully Valley; and U.S. Route 20 traverses Tully Valley from east to west through the northern region of the Valley.

Economy: The impact of geological hazards on the economy and estimated dollar losses is difficult to measure. As previously stated, landslides and other geological hazards can impose direct and indirect impacts on the community. Direct costs include the actual damage sustained by buildings, property, and infrastructure. Dollar value losses to the County's total building inventory replacement value would impact Onondaga County's tax base and the local economy. Meanwhile, indirect costs (e.g., clean-up operations, business interruption, loss of tax revenues, reduced property values, loss of productivity) are challenging to measure. Additionally, geological hazards threaten transportation corridors, fuel and energy conduits, and communication lines.[246] Rivers and streams can also be impacted by geological hazards, potentially harming water quality, fisheries, and spawning habitat. This can affect the recreational and agricultural economies.

Landslides and other geologic hazards can cause several types of secondary effects, such as blocking access to roads, isolating residents and businesses, and delaying commercial, public, and private transportation. Businesses that heavily rely on transportation infrastructure (e.g., the movement of inventory) can be disrupted if a landslide impacts or damages transportation lifelines.

Changes in Development and Impact of Future Development: Changes in development have minimally increased the vulnerability of Onondaga County to landslides, land subsidence, and mudboils. Future development trends will minimally increase the impact of these geological hazards (i.e., landslides, land subsidence, and mudboils).

Projections provided by New York State's economic development agency indicate that the five (5) counties within the Central New York region could have 60,000 additional residents in 2040, which is above and beyond what the population would be at that time. Onondaga County, home to half of the population in the five (5) county area, is in a position to add approximately 30,000 new residents by 2040. An increase in population will require more housing. This is in part due to Micron's arrival in the County.[247] However, a number of communities in Onondaga County have ordinances and land use laws protecting against development on steep slopes, so future growth and development will not have a direct impact on the County's vulnerability to landslides. Furthermore, any current developments at or near the base of steep slopes may be at risk of losses from a landslide. Although areas with steep slopes are most at risk of landslides, landslides are still possible on lower slopes, and future developments are not entirely free of risk.

As has occurred across the country after 1950, suburbanization has led to substantial growth in the Towns surrounding the City of Syracuse, at the expense of the City's population. While population is expected to continue

[246] Spiker, E. C. and Gori, P. L. (2003). National Landslide Hazards Mitigation Strategy – A Framework of Loss Reduction. Retrieved from https://pubs.usgs.gov/circ/c1244/c1244.pdf.
[247] Onondaga County. (2024). Onondaga County Housing Needs Assessment. Retrieved from https://plan.ongov.net/wp-content/uploads/2024/06/OnondagaHousing_JUNE2024_FINAL.pdf.

to increase in the most suburbanized Towns and Villages, particularly with Micron's entry into the northern suburbs, the City of Syracuse has seen a resurgence of new housing and economic investment over the past two (2) decades. Over 60% of new housing units since 2000 have been constructed in the City, primarily as multi-family development.[248] This trend is also expected to continue as significant new investments are being made to facilitate new economic activity in urban areas. As outlined in the County's Comprehensive Plan, Plan Onondaga, the County continues to encourage development in areas already served by water and sewer infrastructure (e.g., Onondaga County Consolidated Sanitary District), and revitalization and reinvestment in existing built communities, rather than further expansion into rural and agricultural lands.

As the population increases outside the City of Syracuse (i.e., city center), dependence on the County's major highways increases. Many of these critical transportation routes are highly susceptible to landslides and other geological hazards, posing potential risks to infrastructure, public safety, and emergency response capabilities.

Effects of Climate Change in Severity of Impacts: Climate change does not directly cause more frequent or intense landslides. However, it is expected to increase the conditions that can lead to landslides, such as heavier precipitation that saturates the ground and makes landslides more likely. As global average temperatures increase, evaporation increases, adding moisture into the atmosphere, which results in more precipitation.[249] Globally, heavy precipitation events are expected to increase as much as three (3) times the historical average by the end of the century.[250] In New York State, total annual precipitation has increased from 1901 to 2022 and is expected to continue increasing. Onondaga County is within the Central Lakes region of the New York State Climate Impacts Assessment, and annual precipitation in this region is projected to increase by 3% to 10% by the 2050s and 5% to 17% by the end of the century.[251]

Furthermore, as global average temperatures continue to increase, wildfire events could increase, reducing vegetative cover along steep slopes and destabilizing soils due to root system destruction. Increased rainfall intensity would also increase soil saturation on steep slopes. Under these future conditions, the County's assets located on or at the base of these steep slopes will have an increased risk of landslides. Additionally, roadways and other transportation infrastructure in these areas will be at increased risk of closure. Onondaga County is within the Central Lakes region of the New York State Climate Impacts Assessment, and the average annual temperature in this region is projected to increase by 4.6°F to 6.4°F by the 2050s and by 6.5°F to 11.7°F by the end of the century.[252]

Higher temperatures and the potential for heavy precipitation may alter water resource availability. The projection of the increase in average temperatures may lead to an increase in the frequency of drought conditions. *Refer to the Drought section of this Plan for more information on climate change impacts on droughts.* In some karst areas, land subsidence intensifies and increases during periods of drought. With an increase in drought events, land subsidence could increase. Additionally, sinkholes can result from changes to the water balance of an area, including over withdrawal of groundwater, diverting surface water from a large area and concentrating it in a single point,

[248] Onondaga County Real Property Services Database.
[249] Environmental Protection Agency. (n.d.). Climate Change Indicators: U.S. and Global Precipitation. Retrieved from https://www.epa.gov/climate-indicators/climate-change-indicators-us-and-global-precipitation.
[250] Denchak, M. (2019). Flooding and Climate Change: Everything You Need to Know. Retrieved from https://www.nrdc.org/stories/flooding-and-climate-change-everything-you-need-know.
[251] New York State Energy Research and Development Authority. (2023). New York State Climate Impacts Assessment: Projections Methodology Report (Appendix: Climate Change Projections Tables, Average Temperature and Precipitation – Central Lakes). Retrieved from https://nysclimateimpacts.org/wp-content/uploads/2024/01/Appendix-Projections_Tables-1.pdf.
[252] New York State Energy Research and Development Authority. (2023). New York State Climate Impacts Assessment: Projections Methodology Report (Appendix: Climate Change Projections Tables, Average Temperature and Precipitation – Central Lakes). Retrieved from https://nysclimateimpacts.org/wp-content/uploads/2024/01/Appendix-Projections_Tables-1.pdf.

artificially creating ponds of surface water, and drilling new water wells. These actions can also accelerate the natural processes of bedrock degradation, which can directly affect land subsidence.

4.6.5.7. FEMA NRI Expected Annual Loss Estimates

A landslide NRI EAL score and rating represent a community's relative level of expected building and population loss each year due to landslides when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-100** outlines the landslide EAL for Onondaga County.

Table 4-100. Landslide Expected Annual Loss *(FEMA National Risk Index)*

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$30,810	$175,468	n/a	$206,278	93.9	Very High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

The FEMA NRI does not assess land subsidence or mudboils.

4.6.5.8. FEMA Geological Hazards Risk Index Score

The landslide Risk Index score and rating represent a community's relative risk for landslide when compared to the rest of the United States. **Table 4-101** illustrates the landslide Risk Index rating and score for Onondaga County.

Table 4-101. Landslide Risk Index (FEMA National Risk Index)

Jurisdiction	Rating	Score
Onondaga County	Very High	92.2
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

The FEMA NRI does not assess land subsidence or mudboils.

Table 4-102 outlines the Geological Hazards Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

Table 4-102. Geological Hazards Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Landslide	1	3	6	12	21	13
Land Subsidence	1	3	6	12	21	13
Mudboils	1	3	6	12	21	13

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

4.6.6. Harmful Algal Bloom

4.6.6.1. Description

Algae can be found in a wide range of environments, including fresh water, oceans, hot springs, and even on land. Algae are a diverse group of species ranging from single-celled organisms to kelp seaweed that can grow to be over 50 yards long. Algae can be found in symbiotic relationships with other organisms, the most common being with corals and lichens. Large species of algae that appear to grow off the lake or sea floor are referred to as macroalgae, while smaller, microscopic species are referred to as microalgae. Microalgae can be free-floating in the water column as phytoplankton or can rest on the bottom of the water body as periphyton.

Due to their incredible diversity and shared characteristics with plants, the taxonomy of algae has been much discussed. Originally classified as plants, algae are now found in the kingdom Protista. Algae are further classified into groups, commonly based on pigmentation. Most species of green algae are only found in freshwater, while most species of red algae and brown algae are only found in saltwater. Brown algae are among the most complex forms of algae, while blue-green algae are among the simplest forms of algae. Also known as cyanobacteria (bacteria rather than true algae), blue-green algae are either single-celled or colonial. Blue-green algae are the most common form of algae to result in harmful algal blooms (HAB) in Onondaga County, impacting the County's lakes.

Algae blooms are caused by an excess of nutrients available in a body of water, resulting in a rapid growth and reproduction of algae in what is commonly referred to as a "bloom". Bodies of water that are impacted by high levels of nutrient runoff, whether naturally occurring or human-caused, can experience nutrient overloading and become more vulnerable to algal blooms.

Algae, like plants, photosynthesize, forming the basis of many aquatic and marine food chains. However, unlike plants, algae do not have roots for nutrient intake. Some species of macroalgae appear to have roots because they are attached to the bottom by a structure known as a holdfast, but the holdfast does not absorb and transfer nutrients in the same way that roots do. Instead, algae can draw their nutrients directly from the environment around them. Due to this phenomenon, high nutrients, warm temperatures, and low turbulence at the water's surface all increase the risk of harmful algal bloom (HAB) events.

As the base of the food chain in aquatic systems, phytoplankton populations are constantly threatened by herbivores. Phytoplankton species employ a variety of natural defenses to limit the amount of population destruction that unabated grazing by herbivores can cause. These may include regulation of population size and seasonal occurrence, growth of spiny exteriors, and the creation of toxins. More than 40 cyanobacterial species are confirmed or suspected to produce toxins.[253] When these populations of algae grow out of control and produce toxins or have harmful effects, it is typically referred to as a HAB. Contact with water containing HABs can cause various health effects, including diarrhea, nausea, vomiting, skin, eye, or throat irritation, allergic reactions, or breathing difficulties.[254]

Traditional methods of in-home treatment systems, such as boiling, disinfecting with chlorine/ultraviolet (UV), and water filtration units, are not effective in removing HABs and their toxins. Public water is always the best option for drinking, preparing food, cooking, washing, and bathing because water suppliers are required to treat, disinfect, and monitor their water supplies.[255] However, in many cases along the Finger Lakes, including Skaneateles Lake, public water supply is not an option, and the drilling of wells may not be possible due to space limitations. In

[253] Merck Manual. Karyn Bischoff. (2021). Algal Poisoning of Animals. Retrieved from https://www.merckvetmanual.com/toxicology/algal-poisoning/algal-poisoning-of-animals.
[254] New York State Department of Environmental Conservation. (n.d.). Harmful Algal Blooms (HABs) Background. Retrieved from https://dec.ny.gov/environmental-protection/water/water-quality/harmful-algal-blooms.
[255] Ibid.

addition, some public water supplies, such as the Skaneateles Lake intake, the primary drinking water source for the City of Syracuse, may be exempt from filtration requirements. Even after HAB abates, toxins released by algae can remain in the water column for weeks. Water treatment plants with filtration systems can remove variable amounts of microcystin from drinking water; however, up to 20% may escape treatment, sometimes leading to plant and water system closures.[256]

Numerous cases of seafood poisoning have been associated with the accumulation of toxins produced by algae in fish or shellfish, and with their subsequent ingestion by humans. These cases include paralytic shellfish poisoning, ciguatera fish poisoning, and amnesiac shellfish poisoning. The majority of these cases are from fish caught in coastal waters affected by HABs, but fish from lakes impacted by these blooms should not be consumed.

The presence of HABs will trigger official beach closures, drinking water restrictions, advisory signs, press releases, and notifications on websites such as the NYSDEC Harmful Algal Blooms Notifications Page.[257] This page posts weekly notifications from late spring through fall. Children and animals should be kept away from waters suspected of containing HABs, and fishing or eating fish should be prohibited. In Onondaga County, the primary threats from HABs are drinking water source contamination, recreational precautions (and associated economic impacts), and potential effects of toxin accumulation in fish for human consumption.

Identifying Harmful Algal Blooms

The appearance of HABs can vary greatly. According to the NYSDEC, colors can include shades of green, blue-green, yellow, brown, red, or white. The physical appearance of these blooms can include floating dots, clumps, and streaks on the water's surface. Some blooms can also resemble spilled paint on the water's surface or change the water's appearance to that of pea soup.

NYSDEC compiles and provides notifications of known HAB locations within the State when these are reported to NYSDEC HABs Program staff by local, state, and federal government personnel, trained monitors, and the public via the New York Harmful Algal Bloom System (NYHABS). **Table 4-103** lists the bodies of water that are monitored in Onondaga County or bordering the County.[258]

Table 4-103. NYSDEC Lakes Monitoring Program

Crooked lake	Oneida River
De Ruyter Reservoir	Otisco Lake
Hiawatha Lake	Skaneateles Lake
Jamesville Reservoir	Tully Lakes
Oneida Lake	

[256] Carmichael, W. W. and Evans, W. R. (1997). The Cyanotoxins. Retrieved from https://www.researchgate.net/profile/Wayne-Carmichael/publication/279948519_The_Cyanotoxins/links/5a9db015a6fdccff6d1a1752/The-Cyanotoxins.pdf.
[257] New York State Department of Environmental Conservation. (n.d.). Harmful Algal Blooms (HABs) Notifications Page. Retrieved from https://dec.ny.gov/environmental-protection/water/water-quality/harmful-algal-blooms/notifications.
[258] Ibid.

4.6.6.2. Location

Onondaga County has significant exposure and vulnerability to the HAB hazard, as described below.

- Shorelines of Onondaga County bodies of water with documented HABs may be easily accessible by the public, which can increase the chance of exposure. Many of the County's lakes are popular recreational lakes and support abundant lake use, tourism, and shoreline development.
- HABs are generally limited to lakes and ponds, but any surface water can experience HABs, as seen in prior events in the Oneida River.
- Locations that rely on surface water intake for drinking water are most exposed to the impacts of HABs:
    - Filtered water intake systems such as the Onondaga County Water Authority (OCWA) intake at Otisco Lake.
    - Private unfiltered water intake systems or public water intake systems that have received a filtration waiver. Skaneateles Lake is the primary source of drinking water for the City of Syracuse. Additionally, it provides drinking water to portions of the Town of DeWitt, the Town of Onondaga, the Town of Geddes, the Town of Camillus, the Town of Salina, the Town of Skaneateles, the Village of Skaneateles, the Village of Jordan, and the Village of Elbridge. Approximately 43 million gallons of water are drawn from the lake per day via two (2) 54-inch diameter steel intake pipes located 20 feet and 45 feet below the Lake's surface. Private shoreline owners may also draw directly from surface water supplies with unfiltered systems.

NYSDEC records indicate eight (8) bodies of water in Onondaga County have documented HABs in recent years. In total, these waterbodies have a combined 186.9 miles of shoreline, 89.2 miles of which are part of Onondaga County. **Table 4-104** breaks down the total shoreline miles per lake and the shoreline miles per lake in Onondaga County that have documented HABs in recent years.[259]

Table 4-104. Shoreline of Major Onondaga County Bodies of Water

Body of Water	Shoreline Total *(miles)*	Shoreline in Onondaga County *(miles)*	Surface Area *(acres)*
De Ruyter Reservoir	6.2	1.0	557.0
Hiawatha Lake	0.6	0.6	11.3
Jamesville Reservoir	4.1	4.1	224.0
Oneida Lake	77.2	15.9	50,894.0
Oneida River	18.0	18.0	820.2
Otisco Lake	15.0	15.0	1,877.0
Skaneateles Lake	34.0	24.6	8,960.0
Tully Lake/Crooked Lake	10.7	6.5	401.4
Total	**165.8**	**85.7**	**63,744.9**

[259] New York State Department of Environmental Conservation. (n.d.). Find Places to Go. Retrieved from https://dec.ny.gov/places.

4.6.6.3. Extent/Intensity

The NYSDEC uses visual observations, photographs, and laboratory sampling results to determine whether blooms are comprised of cyanobacteria (indicating a HAB) or other types of algae. The extent of a HAB is a rough estimate of the size of the bloom within the bodies of water.

Table 4-105 outlines the statuses NYHABS utilizes when bodies of water are being investigated for HABs.

Table 4-105. NYHABS Status (Investigating HAB)

Status	Description
Suspicious Bloom	NYSDEC staff have determined that the conditions meet the criteria for a cyanobacteria HAB based on visual observations and/or digital photographs. Laboratory analysis has not been conducted to confirm whether this suspicious bloom is a HAB. It is not known if toxins are present in the water.
Confirmed Bloom	NYSDEC staff determined that the conditions met the criteria for a HAB based on visual observations, digital photographs, and/or water sampling results.
High Toxins Bloom	Water sampling results have confirmed that toxins are present in enough quantities to potentially cause health effects if people and animals come in contact with the water through swimming or drinking.

Table 4-106 outlines the statuses NYHABS uses when a HAB has been confirmed.[260]

Table 4-106. NYHABS Status (Confirmed HAB)

Status	Description
Small Localized	The HAB affects a small area of the body of water, limited to one or several neighboring properties.
Large Localized	The HAB affects many properties within an entire cove, along a large segment of the shoreline, or in a specific region of the body of water.
Widespread or Lakewide	The HAB affects the entire body of water, a large portion of the lake, or most or all of the shoreline.
Open Water	The sample was collected near the center of the lake and may indicate that the bloom is widespread, with conditions possibly worse along shorelines or within recreational areas.

Wind currents can play a significant role in the concentration of algae floating at or near the water surface. Consistent winds can accumulate algae at downwind shorelines. Shorelines containing coves or other features that could capture floating algae may be more susceptible to HABs. In instances where HABs impact freshwater intakes, the extent may also include the area served by the impacted water utility or the private/residential intake.

4.6.6.4. Probability and Frequency

The probability of occurrence for HABs in Onondaga County is high because a significant hazard event is likely to occur annually. HABs are becoming increasingly common in Onondaga County due to warmer temperatures, but cannot be predicted with exact precision. Despite this uncertainty, the impact of HABs on the environment, public health, and local economies cannot be discounted.

4.6.6.5. Past Events

Table 4-107 outlines the HAB events within Onondaga County identified by the NYHABS in the last five (5) years (2019 – 2024). This table includes events specific to Onondaga County as well as events listed in neighboring

[260] New York State Department of Environmental Conservation. (n.d.). HAB Locations in New York State. Retrieved from https://dec.ny.gov/environmental-protection/water/water-quality/harmful-algal-blooms/notifications.

counties that are on a shared body of water. The NYSDEC began HAB testing and reporting for New York State bodies of water in 2012, but it is also possible that HAB events have taken place and gone unreported.[261]

Table 4-107. Harmful Algal Bloom in Onondaga County

Date	Body of Water	Bloom Type *(Maximum bloom that was documented.)*
July 14, 2023 – August 16, 2023	Jamesville Reservoir	Confirmed Bloom
July 2, 2023 – August 28, 2023	Onondaga Lake	Confirmed Bloom
June 10, 2023 – November 10, 2023	Otisco Lake	Confirmed Bloom:
July 13, 2022 – August 5, 2022	Jamesville Reservoir	Confirmed Bloom
July 7, 2022 – October 30, 2022	Otisco Lake	Confirmed Bloom
October 10, 2021 – October 10, 2021	Anthony's Cut Erie Canal	Confirmed Bloom
June 23, 2021 – August 4, 2021	Jamesville Reservoir	Confirmed Bloom
June 29, 2021 – October 14, 2021	Otisco Lake	Confirmed Bloom
July 1, 2021 – July 1, 2021	Unnamed Water (Baldwinsville)	Confirmed Bloom
August 6, 2020 – August 9, 2020	Jamesville Reservoir	Confirmed Bloom
July 11, 2019 – November 8, 2019	Hiawatha Lake	Suspicious Bloom
July 8, 2019 – August 14, 2019	Jamesville Reservoir	Confirmed Bloom
August 2, 2019 – August 2, 2019	Oneida River	Suspicious Bloom
July 12, 2019 – July 12, 2019	Onondaga Lake	Suspicious Bloom
June 27, 2019 – August 13, 2019	Otisco Lake	Confirmed Bloom

4.6.6.6. Vulnerability and Impacts

Life Safety and Public Health: There is 15% to 29% of the population that is exposed to HABs in Onondaga County, and it is likely to experience minimal adverse impacts to this hazard. The impacts of HABs on life safety and public health depend on several factors, including the severity of the event and whether residents and tourists have been exposed to waters suspected of containing a HAB. Routes of exposure include consumption, inhalation, and dermal exposure. The population living near or visiting waterbodies is at risk of exposure, as are those who use the waterbodies for recreation, fishing, and water supply. Contact with water containing HAB can cause various health effects, including diarrhea, nausea or vomiting; skin, eye, or throat irritation; and allergic reactions or breathing difficulties.[262]

Cyanobacteria blooms are among the most common freshwater HABs and have been identified by NYSDEC as present in Onondaga County HAB events. Exposure to cyanobacterial toxins in freshwater yields adverse health effects that can range from a mild skin rash to serious illness or, in rare circumstances, death. Acute illnesses caused by short-term exposure to cyanobacteria and cyanotoxins during recreational activities include hay fever-like

[261] New York State Department of Environmental Conservation. (2024). Harmful Algal Blooms by Waterbody Summary: Beginning 2019. Retrieved from https://data.ny.gov/Energy-Environment/Harmful-Algal-Blooms-by-Waterbody-Summary-Beginnin/95my-wijm/about_data.
[262] New York State Department of Health. (2024). Harmful Blue-Green Algae: Frequently Asked Questions. Retrieved from https://www.health.ny.gov/environmental/water/drinking/bluegreenalgae/faq.htm.

symptoms, skin rashes, and respiratory and gastrointestinal distress. Acute health effects caused by common cyanobacteria toxins include:[263]

- **Microcystin:** Abdominal pain, headache, sore throat, vomiting and nausea, dry cough, diarrhea, blistering around the mouth, and pneumonia.
- **Cylindrospermopsin:** Fever, headache, vomiting, and bloody diarrhea.
- **Anatoxin-a group:** Tingling, burning, numbness, drowsiness, incoherent speech, salivation, respiratory paralysis leading to death (experimental animals).

Underserved and At-Risk Population: The underserved and at-risk population exposed to HABs in Onondaga County is likely to experience minimal adverse/disproportionate impacts. Individuals in Onondaga County who rely on surface water intake for drinking water are the most at-risk population to the impacts of this hazard. Skaneateles Lake is the primary source of drinking water for the City of Syracuse and is accessed using an unfiltered system. Additionally, it provides drinking water to portions of the Town of DeWitt, the Town of Onondaga, the Town of Geddes, the Town of Camillus, the Town of Salina, the Town of Skaneateles, the Village of Skaneateles, the Village of Jordan, and the Village of Elbridge. Some recreational lakes (e.g., Skaneateles Lake) have shoreline housing, with many residents drawing directly from surface waters without filtration systems. The OCWA serves a large population in the County with water drawn from Otisco Lake and Lake Ontario, which is not located in Onondaga County but is also vulnerable to HABs. However, filtration systems are in place for both lakes.

Property Damage and Critical Infrastructure: HABs pose a significant threat to both public and private water supply in areas where water is drawn from surface water sources. To protect the water supply and avoid the need for costly filtration systems upgrade, water intakes may need to be relocated into deeper water, further from shorelines. HABs can contaminate water sources, necessitating temporary shutdowns of water treatment facilities, which in turn can disrupt the water supply to customers. Additionally, in areas near bodies of water, HABs may disrupt tourism, recreational, and water-based industries, indirectly affecting the maintenance and operation of structures in those areas.

The most common impact of HABs on critical facilities occurs when water intakes from affected surface waters must be shut down. Water treatment plants, such as the OCWA system at Otisco Lake, can remove varying amounts of microcystin from drinking water, but as much as 20% of these toxins may escape treatment, sometimes leading to plant closures.[264] Unfiltered systems, such as the Syracuse Department of Water system at Skaneateles Lake, are more vulnerable.

Economy: Quantifying the economic impacts of HAB events is challenging in Onondaga County. Nationally, these events have caused significant economic loss. For example, a 1976 red tide event in New Jersey was estimated to have caused losses of nearly $1 Billion (in 2000 dollars), and a 1997 outbreak of Pfiesteria in Chesapeake Bay is estimated to have resulted in $46 Million in lost seafood sales.[265] Each year, HABs cause about $82 Million in

[263] United States Environmental Protection Agency. (2024). What Are the Effects of HABs. Retrieved from https://www.epa.gov/habs/what-are-effects-habs.
[264] Carmichael, W. W. and Evans, W. R. (1997). The Cyanotoxins. Retrieved from https://www.researchgate.net/profile/Wayne-Carmichael/publication/279948519_The_Cyanotoxins/links/5a9db015a6fdccff6d1a1752/The-Cyanotoxins.pdf.
[265] D. Anderson. Et. al. Woods Hole Oceanographic Institution. (2000) Estimated Annual Economic Impacts from Harmful Algal Blooms (HABs) in the United States. Retrieved from https://www.whoi.edu/cms/files/Economics_report_18564_23050.pdf.

economic losses to the seafood, restaurant, and tourism industries.[266] The costs of these events were estimated mainly to result from closed fisheries or from impacts on consumer choices to purchase seafood.

Economic impacts on Onondaga County would primarily focus on the tourism sector and public drinking water infrastructure. News of the closure of a body of water can prompt tourists to avoid the area. Even after closures are lifted, negative public reactions can persist, continuing to impact tourism revenue and property values.

Swimming locations in Skaneateles Lake include Clift Park (public), Skaneateles Country Club (private), and Lourdes Camp (private). The Country Club also includes a golf course and an affiliated sailing club. Jamesville Reservoir and Oneida Lake also have swimming beaches, with another beach under consideration for Onondaga Lake, a centerpiece of the Onondaga County parks system. Recreational fishing is popular on Skaneateles and Oneida lakes, and several species can be caught for consumption. Other recreational activities in the area include hiking, boating, bird watching, and bicycling. Property values at lakefront properties, many of which are rentals, could also be affected. Waterfront properties are traditionally highly accessed, with Skaneateles Lake's shoreline housing generally the most highly accessed in the County.

More traditional economic impacts can include the costs of operating monitoring programs, shutdowns of water supplies and associated backup water source costs, and advanced drinking water treatment. A significant economic risk would be the loss of the current filtration waiver for the Lake Skaneateles water intake. This would trigger the need for a filtration plant that could cost $100 Million. In February 2019, the City of Syracuse requested $12 Million in partial initial funding from New York State to help the City extend its Skaneateles Lake water intake pipe.

Changes in Development and Impact of Future Development: Changes in development have increased the vulnerability of Onondaga County to HABs. Future development trends will minimally increase the impact of this hazard.

Projections provided by New York State's economic development agency indicate that the five (5) counties within the Central New York region could have 60,000 additional residents in 2040, which is above and beyond what the population would be at that time. Onondaga County, home to half of the population in the five (5) county area, is in a position to add approximately 30,000 new residents by 2040. An increase in population will require more housing. This is in part due to Micron's arrival in the County. HABs could affect areas of growth near waterbodies that are vulnerable to these events. As development increases, stormwater and runoff issues often arise, making HABs more likely in these areas.

As has occurred across the country after 1950, suburbanization has led to substantial growth in the Towns surrounding the City of Syracuse, at the expense of the City's population. While population is expected to continue to increase in the most suburbanized Towns and Villages, particularly with Micron's entry into the northern suburbs, the City of Syracuse has seen a resurgence of new housing and economic investment over the past two (2) decades. Over 60% of new housing units since 2000 have been constructed in the City, primarily as multi-family development.[267] This trend is also expected to continue as significant new investments are being made to facilitate new economic activity in urban areas. As outlined in the County's Comprehensive Plan, Plan Onondaga, the County continues to encourage development in areas already served by water and sewer infrastructure (e.g., Onondaga County Consolidated Sanitary District), and revitalization and reinvestment in existing built communities, rather than further expansion into rural and agricultural lands.

[266] National Oceanic and Atmospheric Administration, National Ocean Service. (2024). Why do harmful algal blooms occur? Retrieved from https://oceanservice.noaa.gov/facts/why_habs.html.
[267] Onondaga County Real Property Services Database.

Effects of Climate Change in Severity of Impacts: Climate change is expected to increase the frequency of HABs in Onondaga County. To understand the prevalence of HABs in the County, **Figure 4-21** illustrates HAB events reported since 2015, with the larger, deeper orange/yellow spots receiving more bloom reports.

Note: The data may be skewed by underreporting in lakes that have less citizen science reporting. This reporting and notification process has been made easier in New York since 2024 with the new NYHABS reporting platform. Similarly, **Figure 4-22** illustrates where and with what prevalence HAB advisories have been issued across Onondaga County since 2015.

Figure 4-21. Past Harmful Algal Bloom Events in Onondaga County

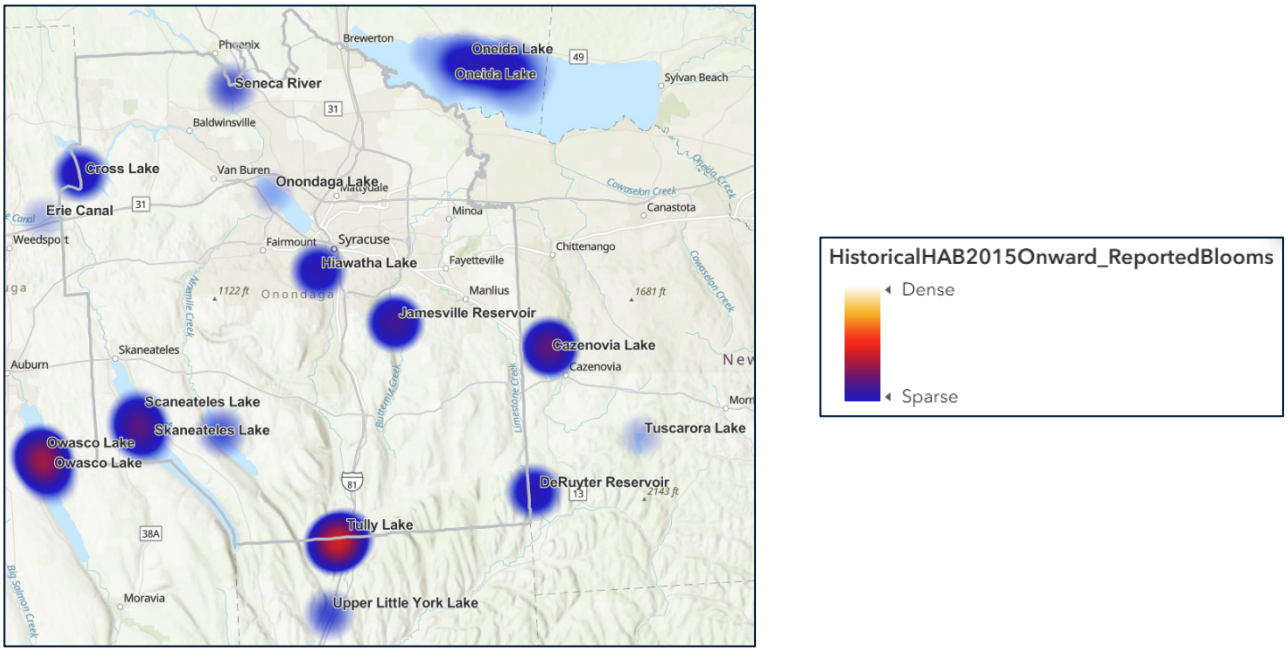
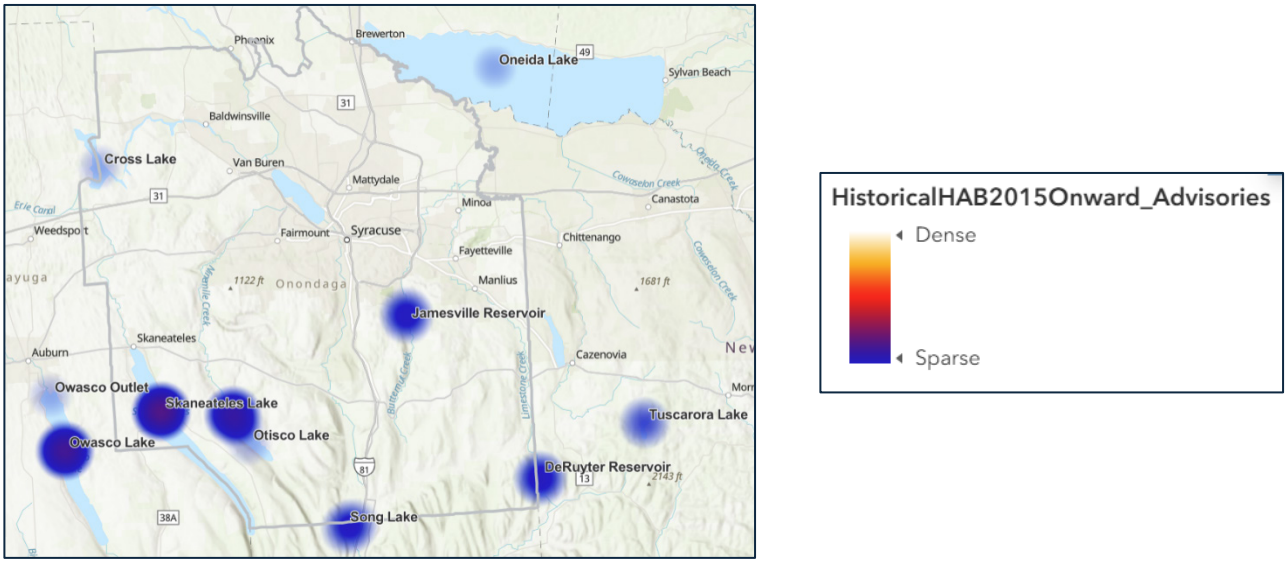


Figure 4-22. Past Harmful Algal Bloom Advisories in Onondaga County



The subsequent figures include datasets aggregated by Hydrologic Unit Code (HUC) 10 and HUC 12 watersheds. HUC boundaries are defined by USGS, and HUC 10s and HUC 12s represent two (2) different levels of granularity to these watersheds, with HUC 12s having the highest granularity.

Figure 4-23 and **Figure 4-24** illustrate the average daily high temperatures across the summer season (June, July, and August) from the mid-century model for HUC 10 and HUC 12, respectively. Across the watersheds that are contained by or pass through Onondaga County, the daily highs range between 75°F and 79°F. This represents approximately a 5°F increase over the historical model. This temperature increase could make this region more conducive to HAB events in the summer season, but also in the late spring and early fall seasons.

Figure 4-25 and **Figure 4-26** illustrate the average daily high temperatures across the spring season (March, May, and April) from the mid-century model for HUC 10 and HUC 12, respectively. Across the watersheds that are contained by or pass through Onondaga County, the daily highs range between 55°F and 58°F. Although these temperatures are still relatively cool when compared to ideal bloom temperatures, this is an average over the entire spring season and may not account for a more significant increase in temperatures in late spring. Like the summer season, this represents approximately a 5°F increase over the historical model.

Figure 4-27 and **Figure 4-28** illustrate the average daily high temperatures across the fall season (September, October, and November) from the mid-century model for HUC 10 and HUC 12, respectively. Across the watersheds that are contained by or pass through Onondaga County, the daily highs range between 59°F and 62°F. This represents approximately a 4°F increase over the region's historical period. This temperature increase suggests that HAB events could persist later into the fall, possibly lengthening the period of the year conducive to HABs.

Figure 4-23. Average Summer Daily High Temperature Within HUC 10 Watersheds in Onondaga County ***(RCP8.5: Mid-Century Model)***

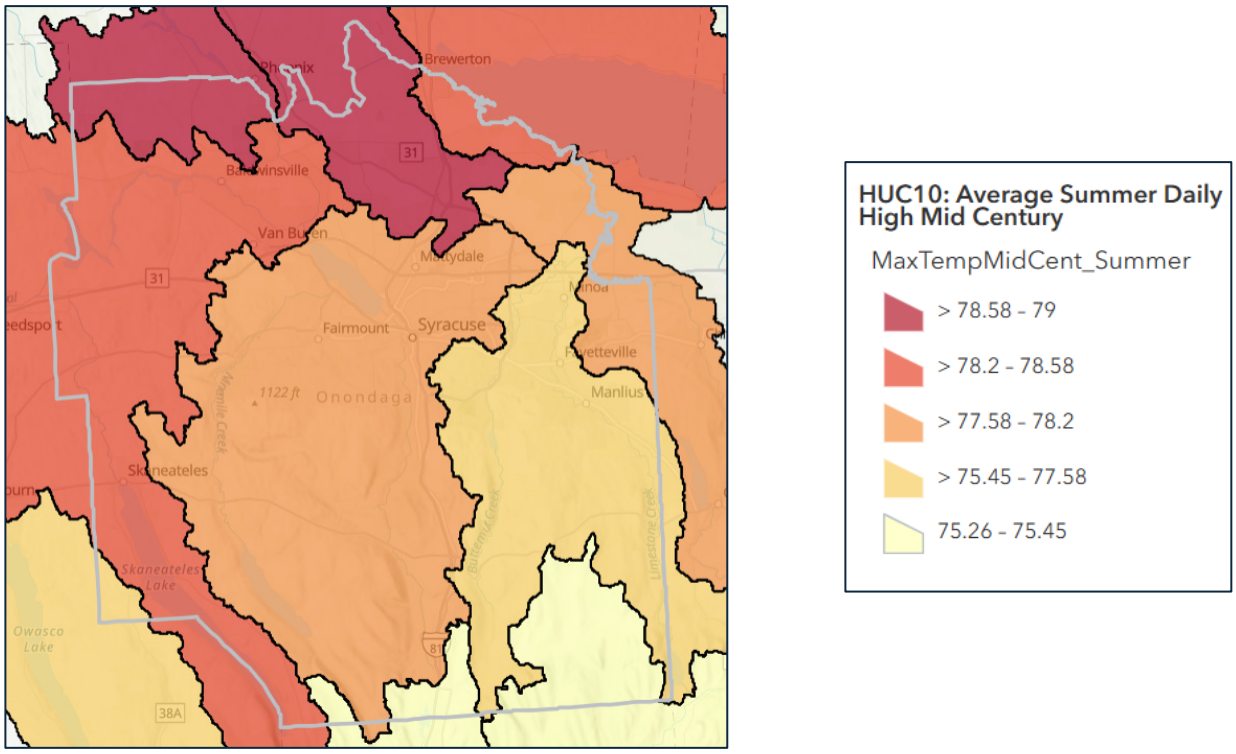


Figure 4-24. Average Summer Daily High Temperature Within HUC 12 Watersheds in Onondaga County ***(RCP8.5: Mid-Century Model)***

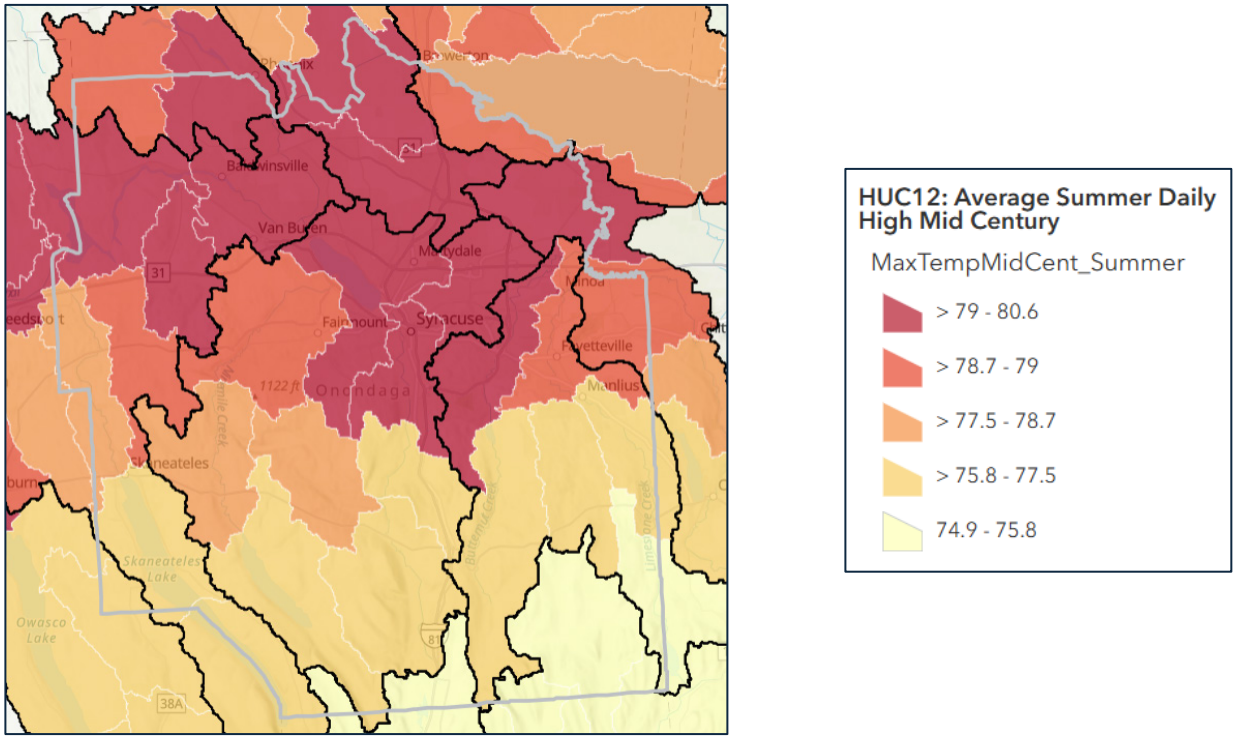


Figure 4-25. Average Spring Daily High Temperature Within HUC 10 Watersheds in Onondaga County *(RCP8.5: Mid-Century Model)*

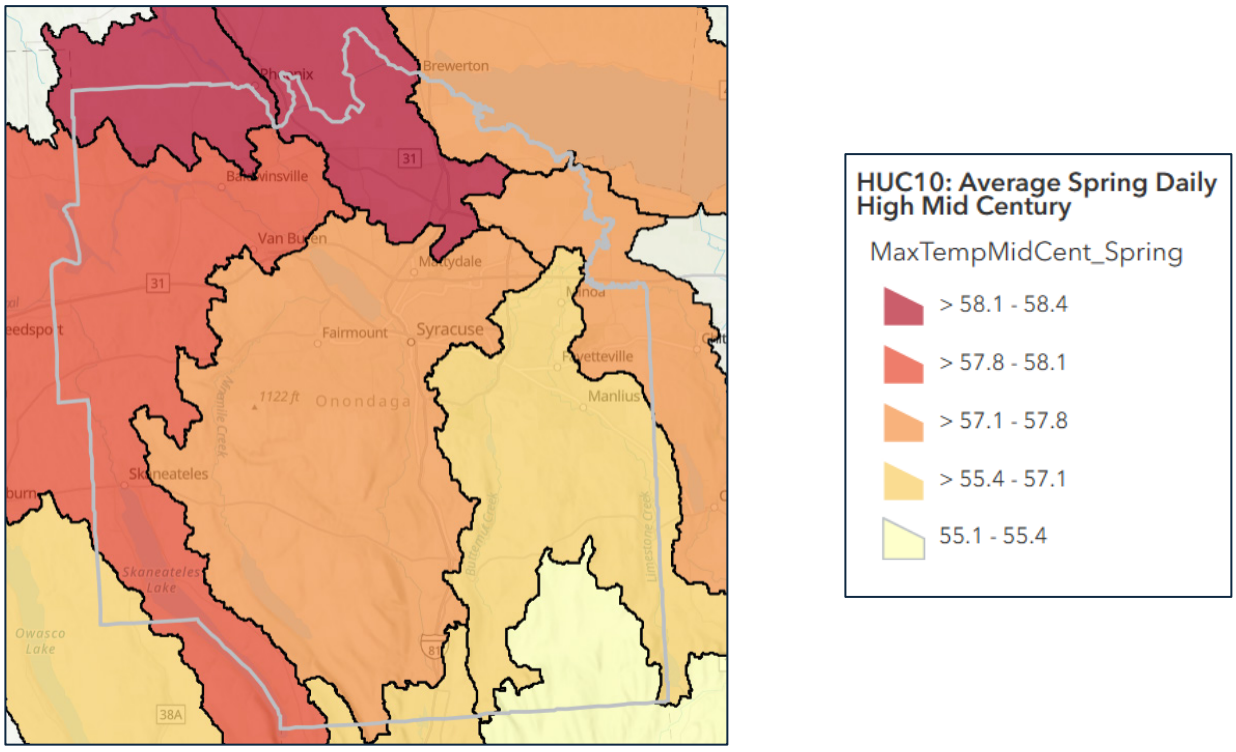


Figure 4-26. Average Spring Daily High Temperature Within HUC 12 Watersheds in Onondaga County *(RCP8.5: Mid-Century Model)*

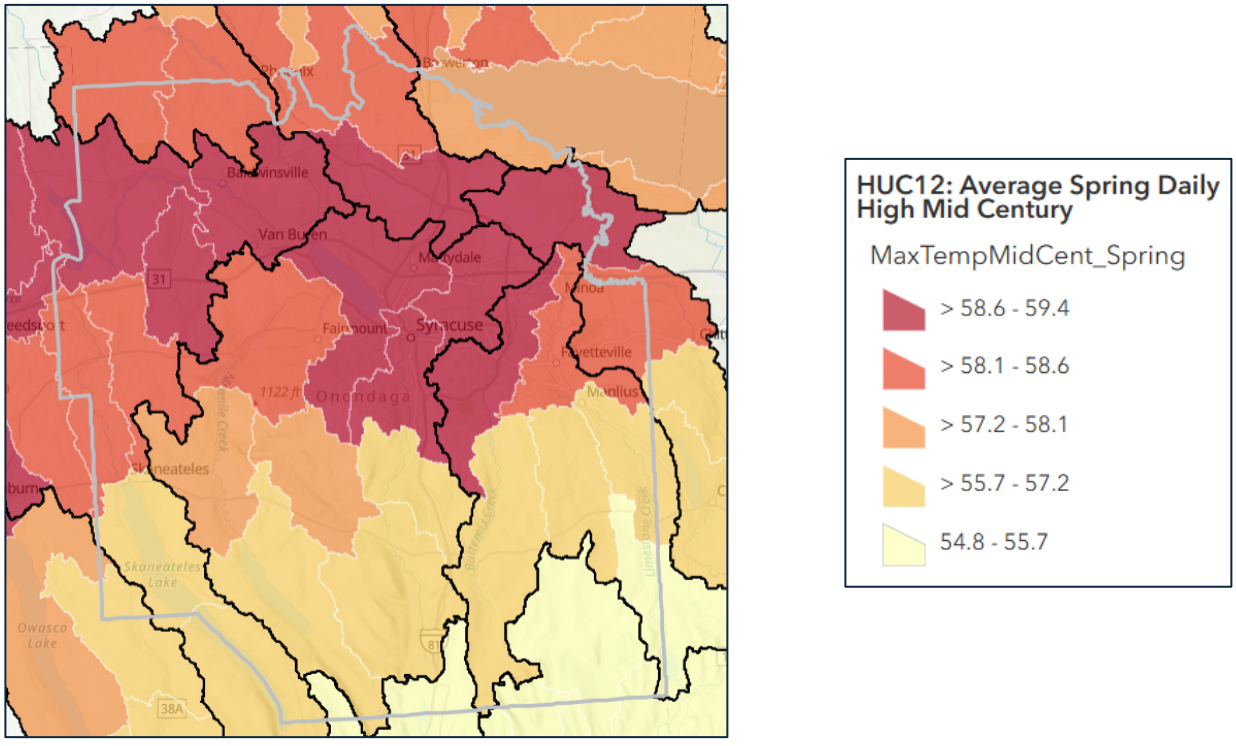


Figure 4-27. Average Fall Daily High Temperature Within HUC 10 Watersheds in Onondaga County
(RCP8.5: Mid-Century Model)

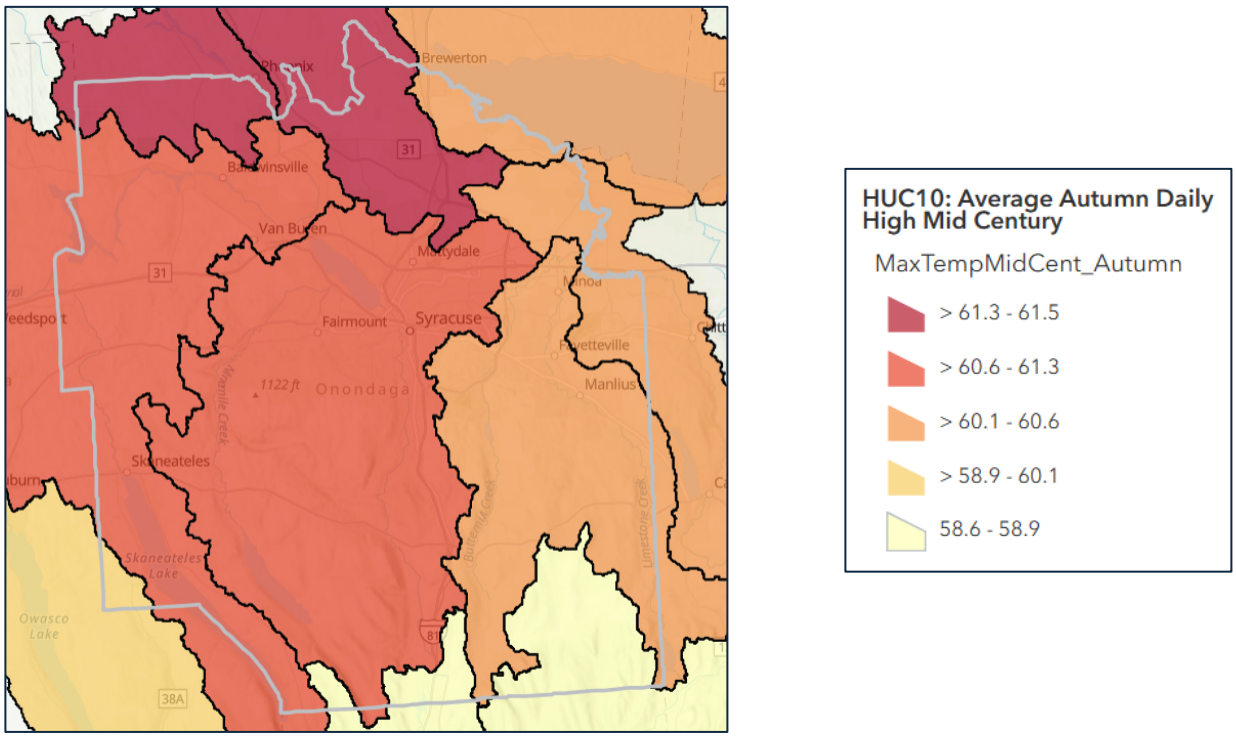


Figure 4-28. Average Fall Daily High Temperature Within HUC 12 Watersheds in Onondaga County
(RCP8.5: Mid-Century Model)

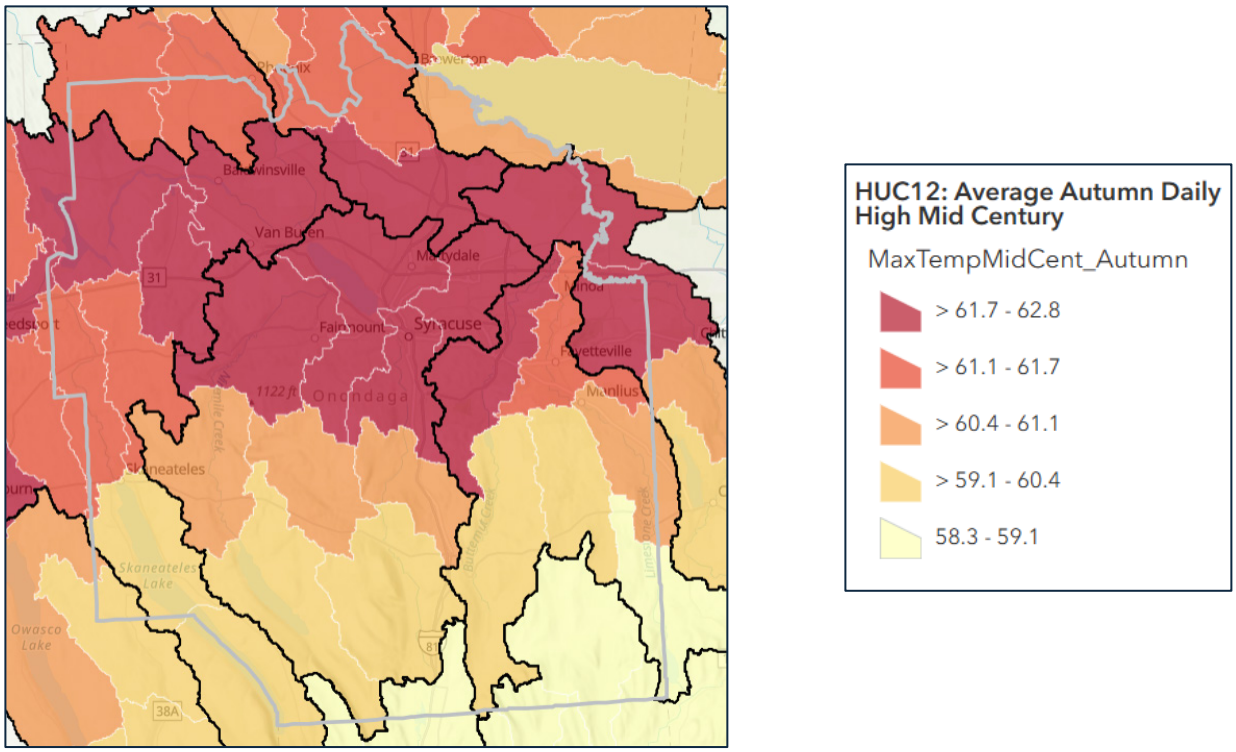


Figure 4-29 and **Figure 4-30** illustrate the projected change in total annual precipitation under the RCP4.5 scenario for HUC 10 and HUC 12, respectively. RCP4.5 represents a scenario in which human GHG emissions peak around 2040, then decline. The illustrated data shows minimal increases in precipitation across Onondaga County when compared to historical precipitation totals, ranging from less than one (1) inch to five (5) inches. The northern portion of the County is projected to see the more significant increase in precipitation, affecting runoff volumes in Oneida Lake, Oneida River, and Chittenango Creek watersheds the most. **Figure 4-31** and **Figure 4-32** illustrate the projected change in total annual precipitation under the RCP8.5 scenario for HUC 10 and HUC 12, respectively. RCP8.5 represents a worst-case scenario in which human GHG emissions continue to rise throughout the 21st century. This data shows a moderate increase in precipitation across the County, ranging between three (3) inches and nine (9) inches. As in the RCP4.5 scenario, the northern portion of the County is projected to see a larger increase in precipitation under the RCP8.5 scenario, affecting runoff volumes in Oneida Lake and the Oneida River most significantly.

Figure 4-29. Average Annual Precipitation Within HUC 10 Watersheds in Onondaga County
(Historical Model vs. RCP4.5 Scenario)

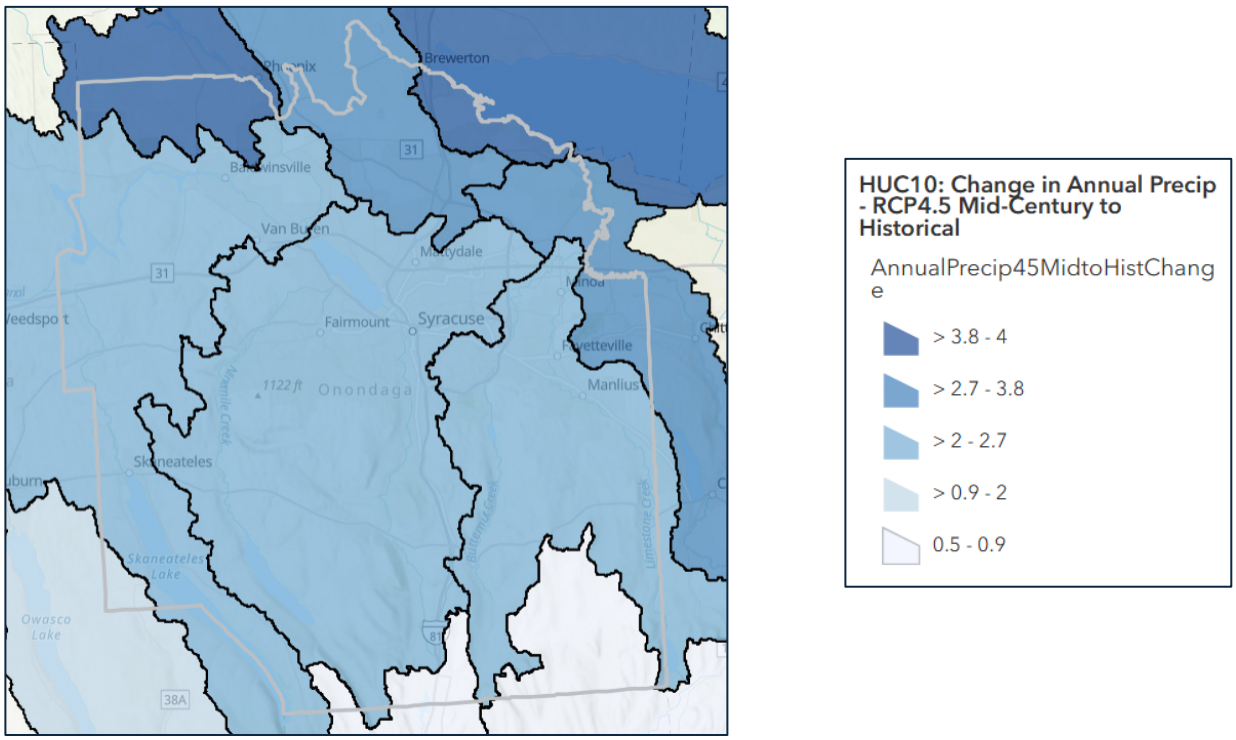


Figure 4-30. Average Annual Precipitation Within HUC 12 Watersheds in Onondaga County
(Historical Model vs. RCP4.5 Scenario)

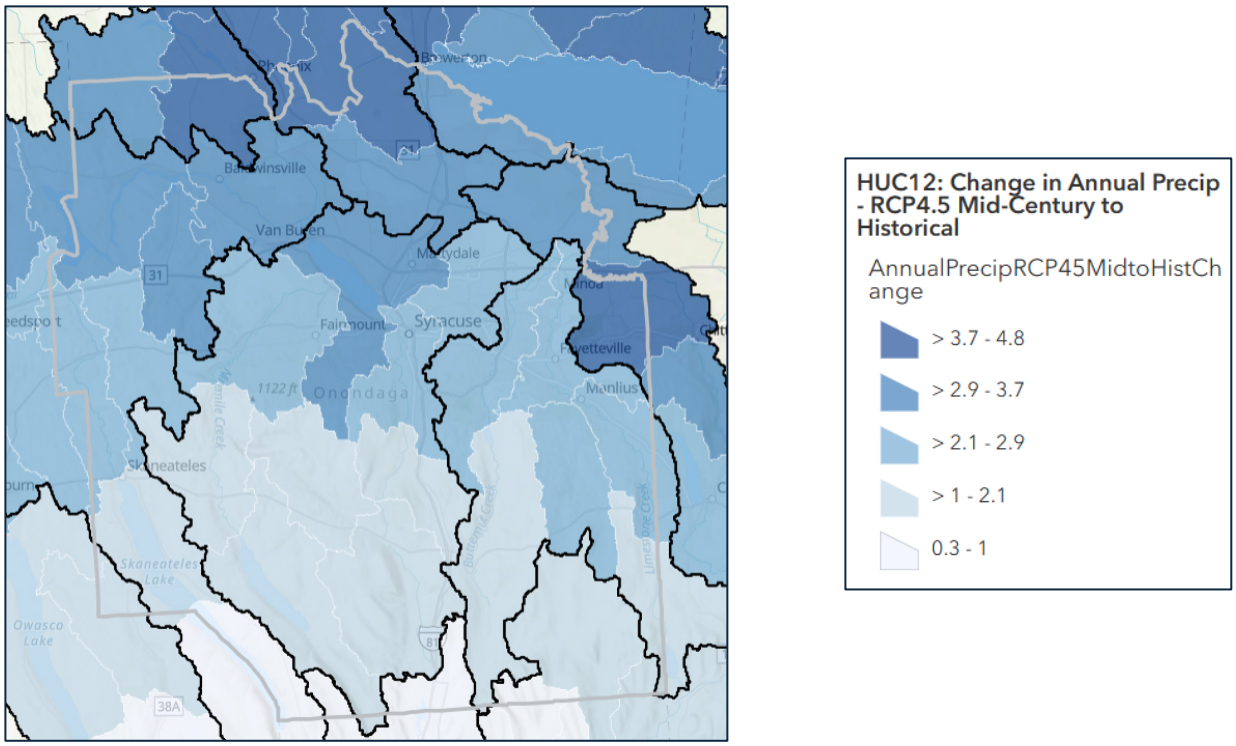


Figure 4-31. Average Annual Precipitation Within HUC 10 Watersheds in Onondaga County
(Historical Model vs. RCP8.5 Scenario)

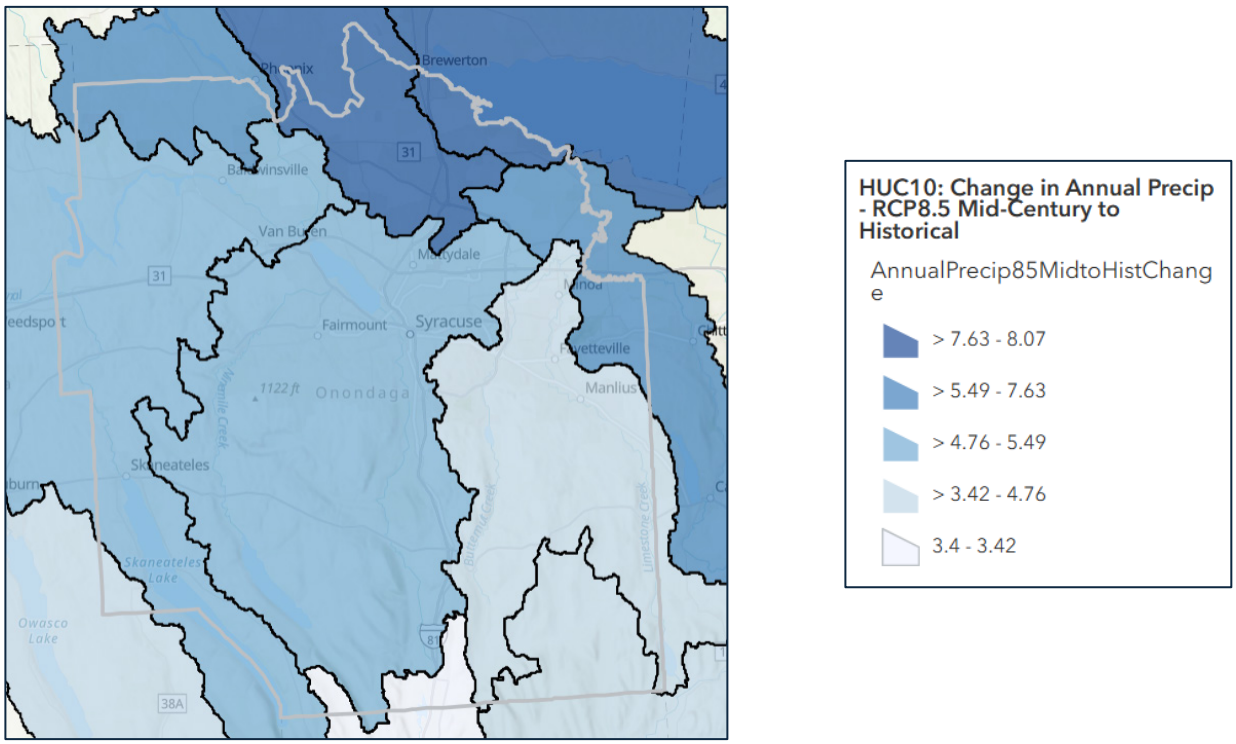
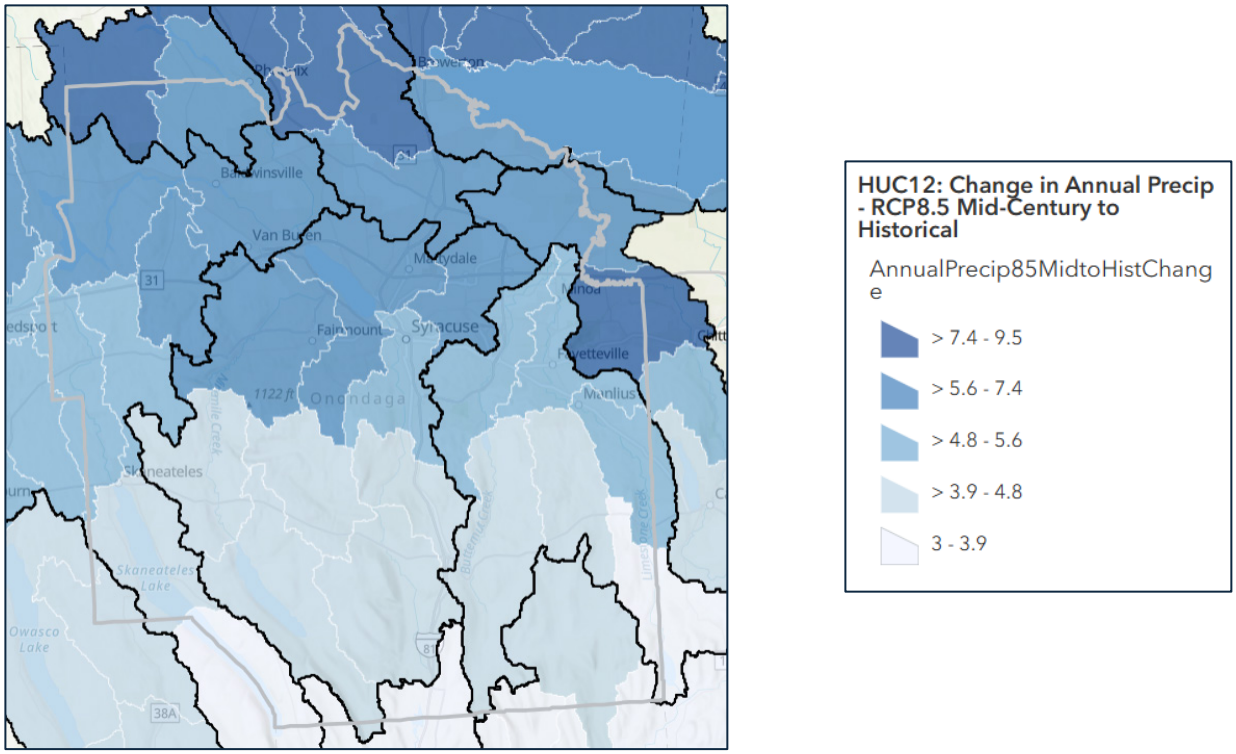


Figure 4-32. Average Annual Precipitation Within HUC 12 Watersheds in Onondaga County
(Historical Model vs. RCP8.5 Scenario)



4.6.6.7. FEMA NRI Expected Annual Loss Estimates

The FEMA NRI does not assess HABs.

4.6.6.8. FEMA Harmful Algal Bloom Risk Index

The FEMA NRI does not assess HABs.

Table 4-108 outlines the Harmful Algal Bloom Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

Table 4-108. Harmful Algal Bloom Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Harmful Algal Bloom	3	9	10	22	41	60

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

4.6.7. Invasive Species and Infestation

4.6.7.1. Description

Invasive species are non-native species to the ecosystem of Onondaga County that can cause harm to the environment, the economy, and public health. Invasive species originate in many parts of the world and can be found in the form of aquatic or terrestrial species, and are one of the greatest threats to the State's biodiversity. Furthermore, invasive species can cause or contribute to:[268]

- Habitat degradation and loss.
- The loss of native fish, wildlife, and tree species.
- The loss of recreational opportunities and income.
- Impact on water quality.
- Crop damage and diseases to humans and livestock.
- Risks to public health and safety.

In addition to invasive species, Onondaga County identified tick and mosquito infestations as a concern due to the diseases they can carry and the spread of those diseases throughout the County. While a majority of the insects that cause the diseases are native to Onondaga County, the Steering Committee felt it was important to include them, as they pose risks similar to those of invasive species.

The list of invasive species in the region is expansive and constantly changing. For the purpose of this Plan update and as identified by the Steering Committee, the following invasive species will be discussed as they are considered to be the primary species of concern at the time of this Plan update.

- **Emerald Ash Borer:** The Emerald Ash Borer (EAB) was first discovered in the United States in 2002 in southeastern Michigan. It was first discovered in Randolph, New York (Cattaraugus County) in 2009, and in Onondaga County in 2013. This Asian beetle infests and kills North American ash species, including green, white, black, and blue ash, making all native ash trees susceptible to this insect. The insect is typically present from late May through early September, with June and July being the most common months. Signs of infection include tree canopy dieback and yellowing and browning of leaves. Most trees die within two (2) to four (4) years of becoming infested. The EAB is responsible for the destruction of over 50 million ash trees in the United States since its discovery.[269] Dutch Elm Disease has previously decimated ash trees, and few are likely to survive EAB infections unless treated with a pesticide.[270]
- **Hemlock Woolly Adelgid:** The Hemlock Woolly Adelgid (*Adelges tsugae*) is native to parts of Asia and was first discovered in New York in 1985. The Adelgid uses long mouthparts to extract sap and nutrients from hemlock foliage, which prevents free growth and causes needles to discolor from deep green to grayish green, then drop prematurely. The loss of new shoots and needles seriously impairs tree health. Infestation is usually fatal to the host after several years. From the first discovery of the Hemlock Woolly Adelgid in the Hudson Valley, the insect has spread north and west to the Catskills, the Capital Region, the Finger

[268] New York State Department of Environmental Conservation. (n.d.). Invasive Species. Retrieved from https://dec.ny.gov/nature/invasive-species.
[269] Invasive Species Center. Emerald Ash Borer (Agrilus Planipennis). Retrieved from https://www.invasivespeciescentre.ca/invasive-species/meet-the-species/invasive-insects/emerald-ash-borer/.
[270] Onondaga County. (2014). Onondaga County Ash Tree Management Strategy. Retrieved from http://www.ongov.net/environment/documents/CompAshTreeMgtStrategy.pdf.

Lakes, and other parts of western New York.[271] It was discovered in the Skaneateles Lake Watershed in May 2014 in the Town of Spafford.

Onondaga County is exploring possible management of Hemlock Woolly Adelgid and determining the level of threat the County faces. Potential management strategies include removing and treating trees or using introduced predators for biological control. Cornell Cooperative Extension has been working on a biological control species to combat this invasive species in the northeastern United States. Some of these controls were released in the Town of Skaneateles in 2014. Hemlock Woolly Adelgid differs from EAB in that Hemlock trees that have already been infected are still able to be treated.[272]

- **True Armyworm:** The True Armyworm (Pseudaletia unipuncta), also known as the common armyworm, is primarily a pest of plants in the grass family – forage, pasture, grasses and lawns, small grains, and corn. Young larvae appear smooth, cylindrical, pale green to brownish, while mature larvae are smooth and marked with two (2) orange, white-bordered strips on each side. The larvae range in size from 1/8 inch to 1.5 inches long. The insect spends winters in the south and flies north to New York State in the spring.[273]
- **Common Reed (Phragmites):** Common Reed (Phragmites australis) or Phragmites can quickly form dense stands of stems, which crowd out or shade native vegetation in inland and estuary wetland areas. It alters habitats by changing marsh hydrology, changing local topography, increasing brushfire potential, and outcompeting native plants above and below ground. Phragmites also produces mesoxalic acid, which is a toxin harmful to many plants.[274] The loss of native plant species can have staggering impacts on native fauna that rely on native vegetation for food and shelter, and can also affect biodiversity, water, soil quality, and resilience, potentially leading to the loss of entire ecosystems.
- **Eurasian Watermilfoil:** The Eurasian Watermilfoil is the most common and widely distributed aquatic invasive plant in New York State. It can be found in all watersheds throughout the State, including Onondaga County. It is a submerged aquatic plant that roots at the lake bottom and grows rapidly, creating dense beds and canopies. It is highly invasive and competes aggressively with native aquatic plants, thereby reducing diversity. Milfoil beds are poor spawning areas for fish, and excessive cover can lead to stunted fish populations. Dense surface mats can also interfere with boating, fishing, swimming, and other recreational water activities.[275]
- **Water Chestnut:** Water Chestnut is an aquatic invasive plant that is native to Eurasia and Africa, and it was introduced in the United States in the mid-1800s as an ornamental plant. This plant spreads by rosette and fruit, detaching from the stem and floating to other areas. This invasive plant can also cling to floating objects (e.g., boats, boat trailer pads, and fishing equipment). Water Chestnuts form dense mats of rooted vegetation, making it difficult to boat, kayak, canoe, or swim. The dense mats of this invasive species shade out native aquatic plants that provide food and shelter for native fish, birds, and insects. Additionally, decomposition of these dense mats reduces dissolved oxygen levels, potentially leading to fish deaths.[276]

[271] New York Invasive Species (IS) Information. (n.d.). Hemlock Woolly Adelgid. Retrieved from https://nyis.info/invasive_species/hemlock-woolly-adelgid/.
[272] Onondaga County Office of the Environment. (n.d.). Hemlock Woolly Adelgid. Retrieved from http://www.ongov.net/environment/hwa.html.
[273] Cornell Cooperative Extension. (n.d.). Armyworm. Retrieved from https://warren.cce.cornell.edu/natural-resources/invasive-pests/armyworm.
[274] Cornell Cooperative Extension. (n.d.). Terrestrial Plants. Retrieved from https://cceonondaga.org/environment/invasive-nuisance-species/terrestrial-plants/common-reed.
[275] Paul Smith's College Adirondack Watershed Institute. (n.d.). Eurasian Watermilfoil. Retrieved from https://www.adkwatershed.org/eurasian-watermilfoil.
[276] New York State Department of Environmental Conservation. (n.d.). Water Chestnut. Retrieved from https://dec.ny.gov/nature/animals-fish-plants/water-chestnut.

Each year, the County removes Water Chestnuts from bodies of water.[277] The Otisco Lake Preservation Association has routinely addressed Water Chestnut in Otisco Lake. In 2018, the Onondaga County Health Department chemically treated 90 acres of Water Chestnut infestations in the towns of Lysander, Van Buren, and Geddes, and the Village of Baldwinsville. The Great Lakes Restoration Initiative funds made available through NYSDEC have provided the bulk of the funding for Water Chestnut control. Some Finger Lakes Lake Ontario Watershed Protection Alliance (FLLOWPA) funds have also been used.

Furthermore, some invasive species serve as vectors for diseases, posing significant threats to public health, wildlife, livestock, and agriculture. These organisms can introduce or amplify the spread of pathogens, disrupting ecosystems and creating conditions for the emergence of new public health hazards. For the purpose of this Plan update, as identified by the Steering Committee, the following diseases will be discussed, as they are considered the primary concern at the time of this Plan update.

- **Tick-Borne Diseases:** Tick-borne diseases are bacterial or viral illnesses that spread to humans through infected ticks and are a major concern for Onondaga County. Ticks become infected by microorganisms when feeding on small, infected mammals (e.g., mice and voles). The most common tick-borne diseases in New York State include Lyme disease, Ehrlichia chaffeensis infection (Ehrlichiosis), Anaplasmosis, Rocky Mountain spotted fever, and Babesiosis. The native species of ticks found in the State that may carry disease-causing microorganisms are the deer tick, lone star tick, and the American dog tick. Other species, such as the long-horned tick, may soon spread into the County.
    - ***Lyme Disease*** is currently the most common tick-borne disease in Onondaga County. Lyme disease is an illness caused by infection with the bacterium Borrelia burgdorferi, which is carried by ticks. The infection can cause a variety of symptoms and, if left untreated, can be severe. Lyme Disease is spread to people by the bite of an infected tick. In New York State, the most commonly infected tick is the deer tick, which has become a significant concern for Onondaga County.[278]
- **Mosquito-Borne Diseases:** Mosquito-borne diseases are bacterial illnesses that spread to humans through infected female mosquitoes. Diseases of concern to Onondaga County include West Nile Virus (WNV) and Eastern Equine Encephalitis Virus (EEE). Various mosquito species are present in Onondaga County, which are known to transmit multiple pathogens, including WNV and EEE.[279]
    - ***West Nile Virus (WNV)*** is a mosquito-borne virus that is spread to humans by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Most people infected by WNV have no symptoms or experience mild flu-like symptoms. A small percentage of people infected with WNV will develop encephalitis (inflammation of the brain) or meningitis (inflammation of the lining of the brain and spinal cord). There is no human vaccine commercially available.

      Since 2000, WNV has been well established throughout Onondaga County, and it is considered endemic to the environment. The principal mosquito vector for WNV is members of the Culex species, which are typically abundant in urban areas and breed easily in artificial containers (e.g., birdbaths, discarded tires, buckets, clogged gutters, catch basins) and other standing water sources. However, WNV has also been detected in several other mosquito species in the County. Mosquitoes

[277] New York State Senate. (2022). Onondaga County Soil & Water begins water chestnut removal June 21 in Seneca River, Cross Lake. Retrieved from https://www.nysenate.gov/newsroom/in-the-news/2022/john-w-mannion/onondaga-county-soil-water-begins-water-chestnut-removal.
[278] New York State Department of Health. (2012). Ticks & Lyme Disease – A Guide for Preventing Lyme Disease. Retrieved from https://www.health.ny.gov/publications/2813/.
[279] New York State Department of Health. (2024). Mosquitoes and Disease. Retrieved from https://www.health.ny.gov/diseases/west_nile_virus/.

with WNV have been found in the State consistently each year since 2000, and a total of 490 human cases and 37 deaths have been confirmed statewide.[280]

- ***Eastern Equine Encephalitis (EEE)*** is a mosquito-borne virus that is spread to humans by the bite of an infected mosquito. Similar to WNV, EEE is maintained by a cycle of transmission between mosquitoes and birds. EEE in humans is rare and either results in a systemic infection with flu-like symptoms or in the more serious encephalitis. Approximately one-third of all people who contract the disease will die, while most survivors suffer brain damage. There is no human vaccine commercially available; however, an equine vaccine is available.

  EEE has been found in mosquitoes in Onondaga County since the early 1970s. The virus is usually found in the mosquito species Culiseta melanura, which typically breeds in freshwater swamps. In Onondaga County, EEE has been found predominantly in the Cicero Swamp area; however, positive findings have occasionally occurred outside of that area. Mosquitoes with EEE have been found recently for the first time in Onondaga County. Since 1971, a total of eight (8) documented human cases have resulted in death.[281]

- ***Asian Tiger Mosquito*** (Aedes albopictus) entered the United States in shipments of used tires from northern Asia in the mid-1980s. It can survive a wide range of climates and has spread rapidly from the point of first detection in the south central United States, and it is now widespread throughout the southern and eastern United States. The mosquito has been found in downstate New York but not in Central New York at this time. This mosquito species transmits a variety of mosquito-borne viruses, including dengue, chikungunya, yellow fever, and Zika.[282]

Mosquito Surveillance

During times of year when mosquito populations are active (summer through early fall), the Onondaga County Department of Health sets up and maintains 19 mosquito traps across the County. Every week, mosquitoes are collected from the traps, counted, and grouped by mosquito type. The number of mosquitoes collected in a given week may vary depending on weather conditions in the areas surrounding the trap sites. Furthermore, the total number of mosquitoes trapped in a given year varies with climate conditions (e.g., temperature, humidity, and rainfall). Over the last five (5) years, an average of 117,000 mosquitoes have been trapped annually.

Once mosquitoes are trapped and grouped into "pools", they are sent to the New York State Department of Health for virus testing. Each "pool" contains approximately 10-60 mosquitoes from a specific species, and approximately 50 "pools" are sent for testing weekly. A pool is considered positive even if only one (1) mosquito in the pool is detected with a virus.

The New York State Department of Health tests for more than 10 types of mosquito-borne viruses. In recent years, WNV and EEE have been detected more frequently in local mosquito populations, posing a particular concern for the County because of their implications for human health.[283]

[280] Ibid.
[281] Alba, F. (2023). For First Time This Year, Deadly EEE Virus Found in Mosquitoes in Onondaga County. Retrieved from https://www.syracuse.com/health/2023/08/for-first-time-this-year-deadly-eee-virus-found-in-mosquitoes-in-onondaga-county.html.
[282] University of California, Department of Entomology. (n.d.). Asian Tiger Mosquito. Retrieved from https://cisr.ucr.edu/invasive-species/asian-tiger-mosquito.
[283] Onondaga County Department of Health – Environmental Health. (2024). Mosquito Surveillance and Data. Retrieved from http://www.ongov.net/health/env/mosquitodata.html.

Mosquito Control

The Onondaga County Department of Health (OCHD), in cooperation with NYSDOH and NYSDEC, conducts aerial spraying in an attempt to interrupt the virus cycle in the mosquito population. Reducing the mosquito population, although temporary, can reduce the number available to transmit viruses to humans. The decision to spray is based on a number of factors, including the number of mosquitoes found in traps and the presence of the virus in the mosquito (WNV and EEE). The County will only conduct aerial spraying when a virus is present or when mosquito numbers and conditions indicate a public health threat. Residential areas are not targeted during aerial spraying. However, some residential neighborhoods around the Cicero Swamp are included on the spray map due to potential drift during spraying. The pesticide used for aerial mosquito spraying is Kontrol 30-30, which is specifically used to control adult mosquitoes in outdoor residential and recreational areas.

Truck spraying is not an effective way to kill mosquitoes in the Cicero Swamp. Spraying while driving around the perimeter of the Swamp will not penetrate deep enough into the wooded areas. However, when a mosquito virus is found in a trap, truck spraying is occasionally used in select neighborhood areas as a supplement to aerial spraying or in areas outside the Cicero Swamp.

OCHD will alert residents who live within the spray area before spraying. Residents will be informed by phone (e.g., the 911 emergency notification system), through media (e.g., television, radio, newspapers), and on the Health Department's website and Facebook. [284]

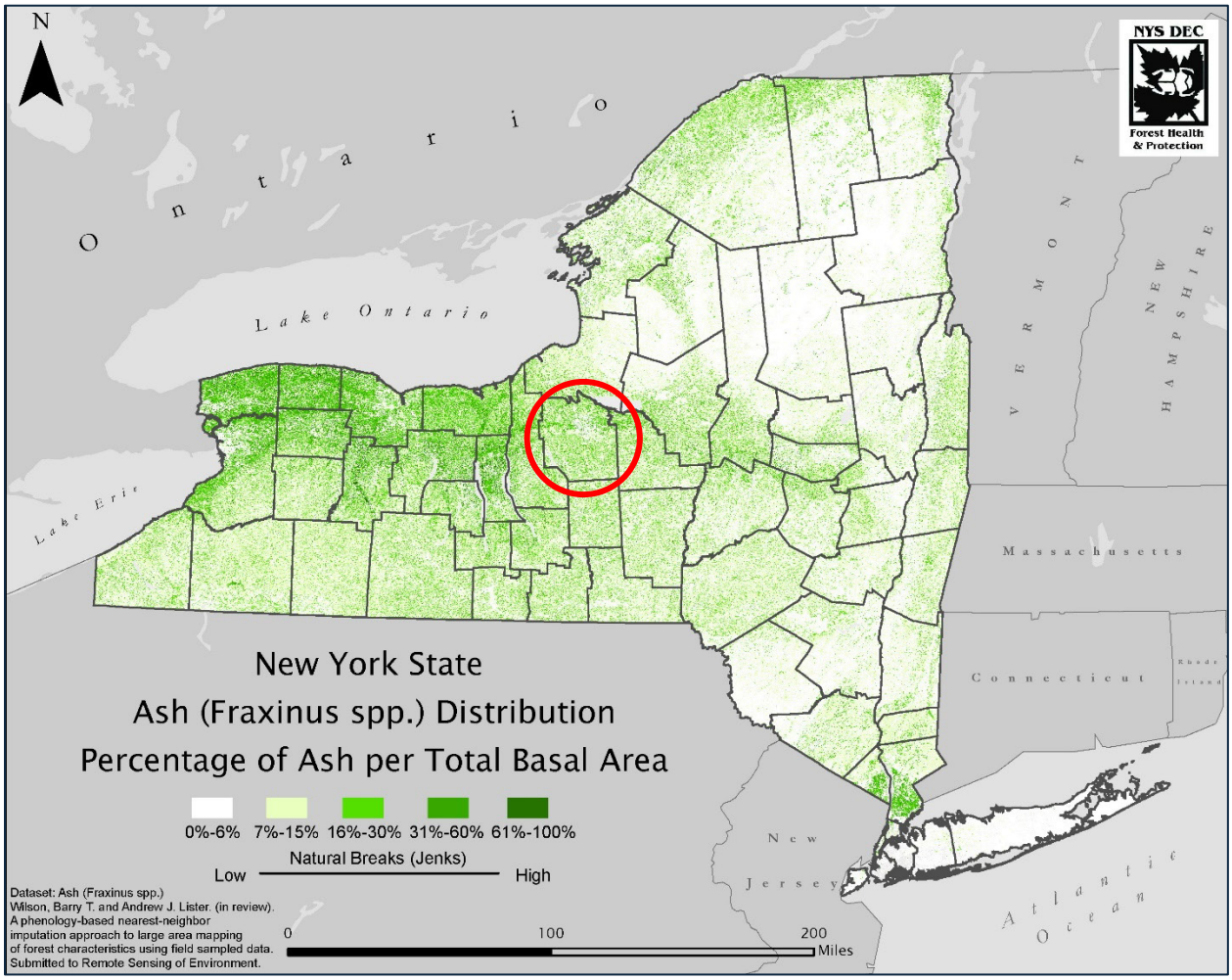
4.6.7.2. Location

Emerald Ash Borer

EAB feeds on all species of ash trees. **Figure 4-33** shows the distribution of ash trees per total basal area (area occupied by tree stems) in New York State and shows Onondaga County (circled in red) as having between 0% and 60% distribution of ash trees per basal area. The Onondaga County EAB Task Force is tasked with the identification and treatment of EAB and the protection of the County's ash trees. The Task Force estimates that approximately one (1) out of every nine (9) trees is an ash tree.

[284] Onondaga County Department of Health – Environmental Health. (2024). FAQs: Aerial Mosquito Spraying. Retrieved from http://www.ongov.net/health/env/mosquito-spraying-faq.html.

Figure 4-33. Ash Tree Distribution in New York

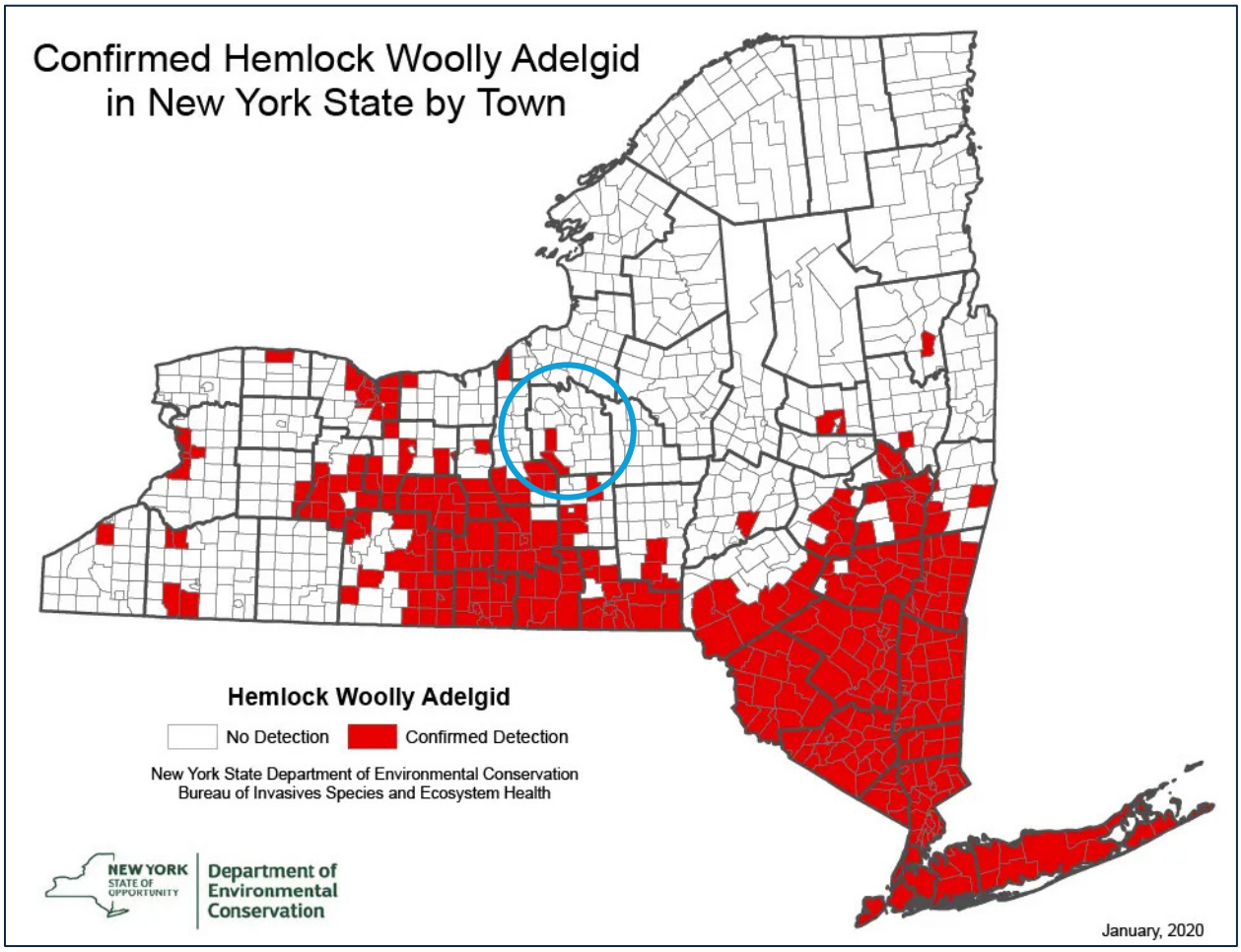


Hemlock Woolly Adelgid

Hemlock Woolly Adelgid lives and feeds on hemlock trees. It was first discovered in New York State in 1985 in the lower Hudson Valley and on Long Island. Since the initial infestation, it has continued to spread northward to the Capital Region and westward through the Catskill Mountains and the Finger Lakes Region into western New York. **Figure 4-34** shows confirmed locations of Hemlock Woolly Adelgid in the State, with southwestern portions of Onondaga County with confirmed infestation (towns of Marcellus, Spafford, and Skaneateles). Currently, 25 counties in New York State are infested with the hemlock woolly adelgid, including Onondaga County.[285]

[285] Adirondack.net. (n.d.). Hemlock Wooly Adelgid. Retrieved from https://www.adirondack.net/invasives-harmful-plants/hemlock-woolly-adelgid/.

Figure 4-34. Confirmed Hemlock Adelgid in New York



True Armyworm

True armyworm larvae have been found across New York State. This native species does not live through the winter in New York but flies north from southern states in the spring. However, armyworm moth migrations are somewhat sporadic, cyclic from year to year, and difficult to predict. True armyworms are primarily found in:[286]

- Grass or mostly grass hay fields, pastures.
- Corn fields that were later planted into grass fields, no-till or reduced tillage fields, fields with crop residue planted into a small grain (especially rye grass) cover crops.
- Corn fields with grassy weeds, quack grass, crabgrass, blue grass, and other perennials.
- Small grain fields.

Common Reed (Phragmites)

Common Reed can be found throughout New York State and Onondaga County. Any areas in or around creeks, culverts, wetlands, streams, and lakes in Onondaga County are susceptible to Common Reed infestations.

[286] Cornell Cooperative Extension. (2021). Invasive Pests: Armyworm. Retrieved from https://albany.cce.cornell.edu/environment/invasive-pests/armyworm.

Additionally, Common reed is common in areas with disturbed soil. Its dense growth is known to choke out natural vegetation and disrupt ecosystems.

Eurasian Watermilfoil

Eurasian Watermilfoil is found throughout New York State and Onondaga County. Milfoil has been observed on Skaneateles Lake, Otisco Lake, Onondaga Lake, Jamesville Reservoir, Seneca River, Oneida Lake, Mud Lake, Tully Lake, and the DeRuyter Reservoir. The Skaneateles Lake Association operates the Milfoil Project, which involves hand-harvesting milfoil and installing benthic matting to reduce the number of milfoil patches. To date, the Program has reduced the species' coverage on Skaneateles Lake to a level that now requires maintenance control.[287] Control programs are underway in Tully Lake, Otisco Lake, and the DeRuyter Reservoir.

Water Chestnut

Water Chestnut was first found in New York State around 1884 near Scotia in Schenectady County. NYSDEC reported that Water Chestnut is found in more than 40 counties across the State, including Onondaga County.[288] Water Chestnut was first found in Oneida Lake in 1999. As of 2002, Oneida Lake and the Three Rivers System were covered with more than 200 acres of Water Chestnut plants. Areas of heavy infestation include Ox Creek on the Oswego River and the Baldwinsville area of the Seneca River. Within the past few years, the Water Chestnut population has spread further in Oneida Lake.[289]

Tick-Borne Diseases

In 2022, over 63,000 cases of Lyme Disease were reported to the CDC by state health departments. In 2001, there were five (5) confirmed Lyme Disease cases in Onondaga County, and in 2022, there were 355 cases of Lyme Disease in the County.[290] Since deer is the largest vector contributing to the spread of Lyme Disease, the Syracuse-Onondaga County Urban Deer Task Force continues to research ways to reduce contact between humans and deer and the spread of the Disease. Furthermore, management efforts by the Task Force and several municipalities in the County have targeted deer populations. Cornell Cooperative Extension has proposed an Integrated Pest Management Strategy to bring together biological, cultural, mechanical, and chemical options to manage ticks. Management methods include inspection (i.e., tick surveillance), identification, analysis and planning, population reduction (i.e., physical, cultural, biological, and chemical controls), monitoring (i.e., survey and sample), and record keeping.[291]

Mosquito-Borne Diseases

WNV, EEE, and viruses transmitted by the Asian Tiger Mosquito (i.e., dengue, chikungunya, yellow fever, and Zika) can be detected anywhere in the Onondaga County region and affect the entire planning area. Anyone in the County who is exposed to infected mosquitoes is at risk of contracting any of these mosquito-borne diseases.

4.6.7.3. Extent/Intensity

The National Invasive Species Council (NISC) uses several key methodologies to measure the extent and intensity of invasive species, providing a comprehensive understanding of their impact on ecosystems, economies, and

[287] Skaneateles Lake Association. (2023). Milfoil Report. Retrieved from https://skaneateleslake.org/milfoil-project/milfoil-control-new/.
[288] New York State Department of Environmental Conservation. (n.d.). Water Chestnut. Retrieved from https://dec.ny.gov/nature/animals-fish-plants/water-chestnut.
[289] Central New York Regional Planning & Development Board. (n.d.). Regional Strategy for Addressing Water Chestnut. Retrieved from https://www.cnyrpdb.org/programs/env/reg/wc.asp.
[290] Centers for Disease Control and Prevention. (2024). Lyme Disease Case Map. Retrieved from https://www.cdc.gov/lyme/data-research/facts-stats/lyme-disease-case-map.html.
[291] Onondaga County Office of the Environment. (n.d.). The Deer Tick. Retrieved from http://www.ongov.net/environment/deertick.html.

biodiversity. The primary methods include tracking geographic range, population density, economic impacts, environmental consequences, and habitat occupancy. These measurements guide policy decisions and management efforts to mitigate the risks posed by invasive species.

- **Spatial Extent:** This involves mapping the geographic distribution of an invasive species to determine how far it has spread. Tools such as GIS and remote sensing help track invasion fronts and the overall spatial extent.
- **Population Density:** NISC assesses how abundant an invasive species is in a given area. This can include plant cover percentage for invasive plants or the number of individuals per cubic meter for aquatic species.
- **Economic Impact:** Invasive species can lead to significant economic damage. NISC measures the direct and indirect costs of infestations, including damage to agriculture, forestry, water systems, and native species.
- **Environmental Impact:** The presence of invasive species often leads to disruptions in ecosystems, including loss of biodiversity. This is measured by assessing changes in species richness and habitat degradation.
- **Habitat Occupancy:** Invasive species often dominate or displace native species, taking over critical habitats. This is measured as the percentage of ecosystems impacted by a particular species.

4.6.7.4. Probability and Impacts

The probability of occurrence for invasive species in Onondaga County is medium because a significant hazard event is likely to occur every 25 years. Based on historical documentation and given the overall impact of a changing climate, New York State is expected to undergo increased incidences of invasive species. Onondaga County faces the threat of invasive species that may pose secondary hazards and health risks to the County population if invasive species are not prevented, controlled, or eradicated.

4.6.7.5. Past Events

All of the invasive species listed in this Plan remain as ongoing occurrences throughout the County. Therefore, unlike other hazards (e.g., floods and blizzards), invasive species are not easily defined as "events". **Table 4-109** outlines the dates the invasive species were first reported in Onondaga County. Further details regarding invasive species and losses within the County are limited.

Table 4-109. Invasive Species in Onondaga County (1980 – 2024)

Year	Invasive Species	Details
1940s	Eurasian Watermilfoil	The Eurasian Watermilfoil was introduced into North America.
1970	Eastern Equine Encephalitis	EEE has been found in mosquitoes in Onondaga County since the early 1970s. Between 1971 and 2024, there have been 12 individuals in New York State who have been diagnosed with EEE, and seven (7) died. Before 2024, the last cases were in 2015.[292]
1999	Water Chestnut	Water Chestnut was first found in Oneida Lake in 1999.

[292] Onondaga County Department of Health. (2024). Eastern Equine Encephalitis (EEE). Retrieved from https://www.health.ny.gov/diseases/communicable/eastern_equine_encephalitis/.

Year	Invasive Species	Details
2000	West Nile Virus	The WNV has been found in mosquitoes in Onondaga County since 2000. Since it was first identified in New York State, the State has reported 1,189 cases of WNV, and 24 were in Onondaga County.[293] WNV has been well established throughout Onondaga County, and it is considered endemic in the environment.
2012	True Armyworm	An outbreak resulted in a USDA declaration.
2013	Emerald Ash Borer	The Emerald Ash Borer was first discovered in Onondaga County in 2013. First discovered in the United States in 2002 (southeastern Michigan) and in New York State in Randolph (Cattaraugus County) in 2009.
2014	Hemlock Woolly Adelgid	The Hemlock Woolly Adelgid was discovered in the Skaneateles Lake Watershed in May 2014, in the Town of Spafford. It is native to parts of Asia and was first discovered in New York in 1985.

Between 1953 and 2024, New York State was included in one (1) invasive species-related major disaster (DR) or emergency (EM) declaration classified as biological, and Onondaga County was included in the declaration, listed in **Table 4-110**.[294] The event was related to WNV.

Table 4-110. Disaster Declarations for Onondaga County

Disaster Number	Incident Period	Declaration Date	Incident Category	Title
EM-3155	May 22 – November 1, 2000	October 11, 2000	Biological	New York Virus Threat

The United States Department of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans available to producers suffering losses in those counties and in contiguous counties. Between 2019 and 2024, Onondaga County was not included in USDA disaster declarations related to invasive species. The most recent USDA disaster declaration for invasive species in Onondaga County occurred in 2012 due to an outbreak of the true armyworm.[295]

4.6.7.6. Vulnerability and Impacts

Life Safety and Public Health: Less than 14% of the population of Onondaga County is vulnerable (i.e., exposed) to invasive species and infestation events; and it is likely to experience minimal adverse impacts to this hazard.

Species that eventually destabilize soil, such as invasive insects that destroy plants or invasive plants that outcompete native vegetation but have less effective root systems, can increase runoff into waterbodies. This can lead to increased HABs and a negative impact on drinking water supplies. Soil destabilization can also increase the likelihood of mudslides on steep slopes.

Invasive species that kill trees (e.g., EAB, Hemlock Woolly Adelgid) can increase the likelihood of trees or branches falling on people or damaging critical utilities (e.g., power lines). An inventory of ash trees on County-owned land

[293] Centers for Disease Control and Prevention. (2024). Historic Data (1999-2023). Retrieved from https://www.cdc.gov/west-nile-virus/data-maps/historic-data.html.
[294] Federal Emergency Management Agency. (2024). Disaster Declarations for States and Counties. Retrieved from https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties.
[295] United States Department of Agriculture. (2024). Disaster Designation Information. Retrieved from https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index.

found that 46,730 ash trees are located in areas where tree limbs and tree trunks are likely to fall on people, structures (including critical infrastructure), trails, roads, parking lots, utilities, and other assets.[296]

WNV is the leading cause of mosquito-borne disease in the continental United States and is commonly spread by the bite of an infected mosquito. Cases mostly occur in the summer and fall seasons. Most people infected with the WNV do not feel sick or show symptoms. About one (1) in five (5) people who are infected develop a fever and other symptoms, and one (1) in 150 infected individuals develops a serious, fatal illness.[297] The EEE virus is a mosquito-borne virus transmitted to humans by the bite of an infected mosquito. Similar to WNV, EEE is maintained by a cycle of transmission between mosquitoes and birds. EEE in humans is rare and either results in a systemic infection with flu-like symptoms or in more serious encephalitis. Approximately one-third of all people who contract the disease will die, while most survivors suffer brain damage.[298] Individuals exposed to the Asian Tiger Mosquito may be at risk of dengue, chikungunya, yellow fever, and Zika. Furthermore, the Lyme disease bacteria are spread to humans through the bite of infected blacklegged ticks. Typical symptoms include fever, headache, fatigue, and a characteristic skin rash called erythema migrans. If left untreated, infection can spread to joints, the heart, and the nervous system.

Underserved and At-Risk Population: The underserved and at-risk population exposed to invasive species and infestation in Onondaga County is likely to experience minimal adverse/disproportionate impacts. The elderly population and people with suppressed immune systems are uniquely vulnerable to the effects of mosquito-borne and Lyme disease. Approximately 18.2% of the population in Onondaga County is 65 years old and over.[299] The following areas in Onondaga County have a high percentage of senior households – the villages of Minoa, Skaneateles, Liverpool, Elbridge, Marcellus Fayetteville, Tully, Solvay, and Fabius; the towns of Skaneateles, LaFayette, Geddes, Spafford, DeWitt, Salina, Otisco, Tully, Elbridge, Manlius, Marcellus, Camillus, and Pompey; and the City of Syracuse.[300] Furthermore, individuals who spend significant time outdoors are uniquely vulnerable because they have greater exposure to mosquitoes and ticks.

Property Damage and Critical Infrastructure: Less than $500,000 in property damage is expected from a single major invasive species and infestation event, or less than 5% of the property value within the jurisdiction. Property and critical infrastructure will not be directly affected by invasive species or infestations. However, as vegetation dies or becomes stressed and weakened by invasive species (e.g., EAB), buildings, utilities, roads, and other infrastructure are vulnerable to damage by falling trees and debris. Subsequently, dead vegetation increases the vulnerability to wildfires. Physical stresses on trees may also affect how trees respond to other natural hazards such as windstorms, drought, and ice storms.

The EAB and Hemlock Woolly Adelgid may cause catastrophic loss of ash and hemlock trees across public parks and forests, leading to stream bank instability, erosion, and increased sedimentation. Specifically, the hemlock tree is one of the few species well-suited to growing on steep slopes and helps stabilize the soil. Unstable slopes in areas with infected hemlock trees may increase the risk of ground failure impacting buildings, utilities, and infrastructure

[296] Onondaga County Office of the Environment. (2014). Onondaga County Ash Tree Management Strategy. Retrieved from http://www.ongov.net/environment/documents/CompAshTreeMgtStrategy.pdf.
[297] Centers for Disease Control and Prevention. (2024). About West Nile. Retrieved from https://www.cdc.gov/west-nile-virus/about/index.html.
[298] Alba, F. (2023). For First Time This Year, Deadly EEE Virus Found in Mosquitoes in Onondaga County. Retrieved from https://www.syracuse.com/health/2023/08/for-first-time-this-year-deadly-eee-virus-found-in-mosquitoes-in-onondaga-county.html.
[299] United States Census Bureau. (2023). DP05: ACS Demographic and Housing Estimates (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP05?g=050XX00US36067.
[300] Onondaga County. (2023). Plan Onondaga: A Comprehensive Plan for Onondaga County. Retrieved from https://plan.ongov.net/the-plan/.

downslope. In addition, a preponderance of dead tree limbs could increase the likelihood of downed trees on roadways and power lines during storms with strong winds/damaging winds.

Some invasive plants have been shown to destabilize soil due to high densities and shallow root systems, negatively impacting nearby buildings and septic systems. This could also lead to degraded water quality in water bodies following areas with steep slopes and destabilized soils. Other invasive plant species (e.g., phragmites) have been known to clog culverts and streams, increasing flood risk and compromising roads and pipes. In severe cases, invasive plants may also interrupt utilities by blocking the water intakes of treatment plants and power generation facilities.

Economy: The impacts of invasive species and infestations on the economy and the estimated dollar losses are difficult to measure and quantify. Costs associated with activities and programs implemented to conduct surveillance and management of invasive species have not been quantified in most available documentation. Other financial resources dedicated to addressing invasive species are allocated annually to NYSDEC, OCHD, Cornell Cooperative Extension, universities, and lake associations. Spreads of diseases will impact worker productivity as individuals miss work to recover or care for family members. Invasive species can impact crop yields, which can significantly impact the economy. In 2012, the County's crops were severely impacted by a true armyworm outbreak. According to the most recent Agricultural Census for Onondaga County, the County has 572 farms spread over 164,239 acres, all of which are vulnerable to the impacts of invasive species. The County's market value of agricultural products is over $271 Million.[301]

EAB can infect nursery stock and mature trees, potentially reducing the timber value of hardwood exports.[302] In 2010, the USDA Northern Research Station conducted computer simulations of EAB spread to estimate the costs of ash tree treatment, removal, and replacement (replanting) between 2009 and 2019. The simulations predicted an EAB infestation covering 25 states and assumed treatment, removal, and replacement of more than 17 million ash trees on developed land within established communities. The total costs were estimated at $10.7 Billion. This figure doubled when the model was reset to include developed land both outside and inside human communities.[303] The Onondaga County Ash Tree Strategy estimated a cost of $13.5 Million ($15.3 Million if paid through bonds) for ash tree management to combat EAB through tree removal and replacement, tree inoculation, and administrative costs, among other activities.[304]

Invasive species can have major impacts on the recreational value of natural lands. For example, phragmites reduce the recreational value of an area by creating dense, tall communities that can outcompete native vegetation and obscure views for birdwatchers, walkers, and hunters, and by the ability to cut the skin of these visitors. The Eurasian watermilfoil forms thick mats that block sunlight from reaching native plants below the surface, displacing native vegetation. The spread of this invasive species can reduce fish growth rates and prevent native waterfowl from feeding within infested bodies of water. Additionally, the thick mats on the water surface can impede boaters' travel through the bodies of water, deter swimmers, and diminish the appeal of the County's waterfront housing. In areas with major colonies, values of shoreline properties have been seen to decline, impacting homeowners and

[301] United States Department of Agriculture. (2024). 2022 Census of Agriculture County Profile: Onondaga County. Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/New_York/cp36067.pdf.
[302] Cook, W.E. and McCullough, D.G. (2007). Emerald Ash Borer and Your Woodland. Retrieved from https://www.emeraldashborer.info/documents/E-2943.pdf.
[303] Kovacs, K. F. et. al. (2010). Cost of Potential Emerald Ash Borer Damage in U.S Communities, 2009-2019. Retrieved from https://research.fs.usda.gov/treesearch/34370.
[304] Onondaga County Office of the Environment. (2014). Onondaga County Ash Tree Management Strategy. Retrieved from http://www.ongov.net/environment/documents/CompAshTreeMgtStrategy.pdf.

communities that rely on the taxation of these properties. Annual control of Eurasian watermilfoil costs the State approximately half a million dollars.[305]

Changes in Development and Impact of Future Development: Changes in development have increased the vulnerability of Onondaga County to invasive species and infestation, but not significantly. Future development trends will minimally increase the impact of this hazard.

Projections provided by New York State's economic development agency indicate that the five (5) counties within the Central New York region could have 60,000 additional residents in 2040, which is above and beyond what the population would be at that time. Onondaga County, home to half of the population in the five (5) county area, is in a position to add approximately 30,000 new residents by 2040. An increase in population will require more housing. This is in part due to Micron's arrival in the County. However, like other Upstate New York counties, Onondaga County's population is older and aging. The median age is 39, and approximately 30% of households in the County have someone who is 65 years old and over. Since the elderly are more vulnerable to mosquito-borne and tick-borne diseases, an aging population can increase the population's vulnerability to this hazard.

Effects of Climate Change in Severity of Impacts: Onondaga County will see increases in the average annual temperature and changes in precipitation patterns. In the Central Lakes region, which includes Onondaga County, annual precipitation is projected to increase 3% to 10% by the 2050s and 5% to 17% by the end of the century. The average annual temperature in this region is projected to increase by 4.6°F to 6.4°F by the 2050s and by 6.5°F to 11.7°F by the end of the century.[306] As annual average temperatures rise, the habitat range for insects, including mosquitoes, ticks, and armyworms, will expand. Furthermore, increases in the rate of WNV infections have been correlated with rising temperatures and increased precipitation. The increased average temperatures will allow insects to survive for longer periods throughout the year and extend the time during which populations are susceptible to infection by mosquito-borne diseases. In addition to allowing insects to survive for more extended periods, warmer temperatures will create a climate that enables invasive plant species to thrive for longer, potentially increasing their impact. Climate change may increase stress on crops, potentially increasing their susceptibility to damage from invasive species.

4.6.7.7. FEMA NRI Expected Annual Loss Estimates

The FEMA NRI does not assess invasive species.

4.6.7.8. FEMA Invasive Species Risk Index

The FEMA NRI does not assess invasive species.

Table 4-111 outlines the Invasive Species Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

[305] New York Invasive Species Information. (n.d.). Aquatic Plants: Eurasian Watermilfoil. Retrieved from https://nyis.info/species/eurasian-watermilfoil/.
[306] New York State Energy Research and Development Authority. (2023). New York State Climate Impacts Assessment: Projections Methodology Report (Appendix: Climate Change Projections Tables, Average Temperature and Precipitation – Central Lakes). Retrieved from https://nysclimateimpacts.org/wp-content/uploads/2024/01/Appendix-Projections_Tables-1.pdf.

Table 4-111. Invasive Species Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Invasive Species	3	9	7	18	34	51

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

4.6.8. Severe Weather

4.6.8.1. Description

For the purposes of this Plan, this section will include those hazards that are produced during severe thunderstorms (i.e., hail, strong winds, tornadoes) and tropical storms/hurricanes.

Severe Thunderstorm

A thunderstorm is a rain shower during which you hear thunder, and since thunder includes lightning, all thunderstorms include lightning. However, a thunderstorm is classified as severe when it contains one (1) or more of the following – hail one (1) inch or greater, winds gusting in excess of 58 mph, and/or a tornado.[307]

Included below are the hazards associated with a severe thunderstorm – hail, strong winds, and tornadoes. Each hazard is examined independently, but it is recognized that these could occur simultaneously.

Hail

Hail is a form of precipitation that consists of solid ice that forms inside thunderstorm updrafts. Hail forms inside a thunderstorm or other storms with strong updrafts of warm air and downdrafts of cold air. If an updraft picks up a water droplet, it can be carried well above the freezing level. Water droplets freeze when temperatures reach 32° F or below. As the frozen droplet begins to fall, it may thaw as it moves into warmer air toward the bottom of the thunderstorm, or the droplet might be picked up again by another updraft and carried back into the cold air and re-freeze. With each trip above and below the freezing level, the frozen droplet adds another layer of ice. The frozen droplet, with many layers of ice, falls to the ground as hail. Most hail is small and typically less than two (2) inches in diameter. The speed at which hail falls primarily depends on four (4) characteristics – hail size, friction between the hailstone and surrounding air, local wind conditions (horizontal and vertical), and the degree of melting of the hailstone. There is much uncertainty in the average speed hail falls; however, NOAA developed the estimates shown in **Table 4-112**.[308]

Table 4-112. Hail Speed Estimates

Hail Size *(inches)*	Fall Speed *(mph)*
Less than 1	9 – 25
1 – 1.75	20 – 40
2 – 4	44 – 72
Greater than 4	Over 100

Strong Winds/Damaging Winds

Wind begins with differences in air pressure and occurs through rough horizontal movement of air caused by uneven heating of the Earth's surface. Strong winds, also known as damaging winds, are classified as exceeding 58 mph and often originate from thunderstorms.[309] Most severe thunderstorm winds that cause damage at the ground are a result of outflow generated by the downdraft of a thunderstorm. **Table 4-113** outlines the different types of strong winds.[310]

[307] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Thunderstorm Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/.
[308] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Hail Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/hail/.
[309] Federal Emergency Management Agency. (n.d.). Strong Wind. Retrieved from https://hazards.fema.gov/nri/strong-wind.
[310] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Types of Damaging Winds. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/wind/types/.

Table 4-113. Types of Strong Winds

Type	Description
Straight-line Wind	The term is used to describe any thunderstorm wind that is not associated with rotation and is mainly used to differentiate it from tornadic winds.
Downdraft	A small-scale column of air that rapidly winds towards the ground.
Macroburst	An outward burst of strong winds at or near the surface with horizontal dimensions larger than 2.5 miles occurs when a strong downdraft reaches the surface. Macroburst winds may begin over a smaller area and then spread to a wider area, sometimes producing damage similar to that of a tornado. Although usually associated with thunderstorms, macrobursts can occur with showers too weak to produce thunder.
Microburst	A small, concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small (less than 2.5 miles across) and short-lived (five (5) to 10 minutes) with maximum wind speeds sometimes exceeding 100 mph. There are two (2) types of microbursts – wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
Gust Front	The leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the wind pushes air up above them, forming a shelf cloud or a detached roll cloud.
Derecho	A widespread, long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous downbursts and downburst clusters. By definition, if the wind damage swath extends more than 240 miles and includes wind gusts of at least 58 mph or greater along most of its length, then the event may be classified as a derecho.
Haboob	A wall of dust that is pushed out along the ground from a thunderstorm downdraft at high speeds.
** A **downburst** is a general term used to broadly describe macro and microbursts.*	

Tornado

A tornado is a narrow, violently rotating column of air that extends from a thunderstorm to the ground. A tornado is hard to see unless it forms a condensation funnel made up of water droplets, dust, and debris. Tornadoes are among the most violent phenomena in atmospheric storms, and atmospheric scientists continue to conduct research to better understand how they form. Tornadoes form mainly from two (2) types of thunderstorms – supercell and non-supercell.[311] **Table 4-114** outlines the types of tornadoes.[312]

Table 4-114. Types of Tornadoes

Type	Description
Supercell	The most common and destructive tornadoes occur from supercells. A supercell is a rotating thunderstorm with a well-defined radar circulation called a mesocyclone. Supercells can also produce damaging hail, severe non-tornadic winds, frequent lightning, and flash floods. The rotating updraft from a supercell is the key development for a tornado. One way a column of air can begin to rotate is from wind shear when winds at two (2) different levels above the ground blow at different speeds or in different directions. Once the updraft is rotating and fed by warm, moist air at ground level, a tornado can form.

[311] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Tornado Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/tornadoes/.
[312] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Types of Tornadoes. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/tornadoes/types/.

Type	Description
Non-Supercell	Nearly 20% of all tornadoes are associated with lines of strong thunderstorms called quasi-linear convective systems (QLCS). QLCS tornadoes frequently occur during the late night and early morning hours. These tornadoes, however, tend to be weaker and shorter-lived on average than those associated with supercell thunderstorms. NOAA's National Severe Storms Laboratory (NSSL) researchers are looking for ways to detect QLCS tornadoes more effectively.
Another type of non-supercell tornado is a landspout. A landspout is a tornado with a narrow, rope-like condensation funnel that forms while the thunderstorm cloud is still growing and there is no rotating updraft - the spinning motion originates near the ground.	

Tropical Storm/Hurricane

A tropical cyclone is a warm-core low pressure system without a front attached that develops over the tropical or subtropical waters with organized deep convection and a closed surface wind circulation (well-defined center).[313] Tropical depressions, tropical storms, and hurricanes are tropical cyclones in the Atlantic Basin, outlined in **Table 4-115**.

Table 4-115. Types of Tropical Cyclones

Type	Description
Tropical Depression	A tropical cyclone with maximum sustained surface winds of 38 mph or less.
Tropical Storm	A tropical cyclone with maximum sustained surface winds between 38 mph and 73 mph.
Hurricane	A tropical cyclone with maximum sustained surface winds of 74 mph or higher. The term hurricane is used for tropical cyclones in the Northern Hemisphere, east of the International Date Line and west of the Greenwich Meridian. Pacific tropical cyclones north of the Equator and west of the International Date Line are called typhoons.

Tropical cyclones begin as weather disturbances referred to as tropical waves. These tropical waves can develop in the Atlantic Ocean between the Lesser Antilles and the African coast or in the warm tropical waters of the Caribbean and Gulf of Mexico. As the storm organizes and has closed surface wind circulation, it is designated as a tropical depression. Tropical cyclones can move up the Atlantic coast of the United States, impacting the eastern seaboard, or move into the United States through the Gulf Coast states, bringing wind and rain as far north as New England before moving eastward offshore.

The following environmental conditions are expected for the development of a tropical cyclone:[314]

- Ocean water temperatures should be 80° F or higher throughout the depth of 150 feet.
- The atmosphere has to cool quickly enough to create instability that allows for moist convection.
- Relatively moist air near the mid-level of the atmosphere (at 16,000 feet).
- A minimum distance of at least 300 miles from the equator.
- A pre-existing near-surface disturbance.
- Vertical wind shear, the change of wind speed with height, between the surface and the upper troposphere, should be low (less than 23 mph).

The Atlantic Hurricane Season starts on June 1st and ends on November 30th. The peak threat to the Northeast coast occurs from late July through early October as the north Atlantic Ocean cools. Although Onondaga County is located

[313] National Oceanic and Atmospheric Administration. (n.d.). Tropical Cyclone Introduction. Retrieved from https://www.noaa.gov/jetstream/tropical/tropical-cyclone-introduction.
[314] Ibid.

inland, tropical storms and hurricanes (i.e., tropical cyclones) can significantly impact the County. Tropical cyclones pose a number of direct and indirect hazards beyond damaging winds. The primary related hazards include storm surge, wind, inland flooding, and tornadoes. One of the deadliest hazards associated with tropical cyclones is storm surge; however, due to Onondaga County's location, storm surge is not a concern for the County and has not been detailed in this profile.

4.6.8.2. Location

All of Onondaga County is exposed to severe thunderstorms (i.e., hail, strong winds, and tornadoes) and tropical storms/hurricanes. **Figure 4-35** illustrates hail events within Onondaga County that occurred between 1950 and 2024.

Figure 4-35. Onondaga County Hail History (1950 – 2024)

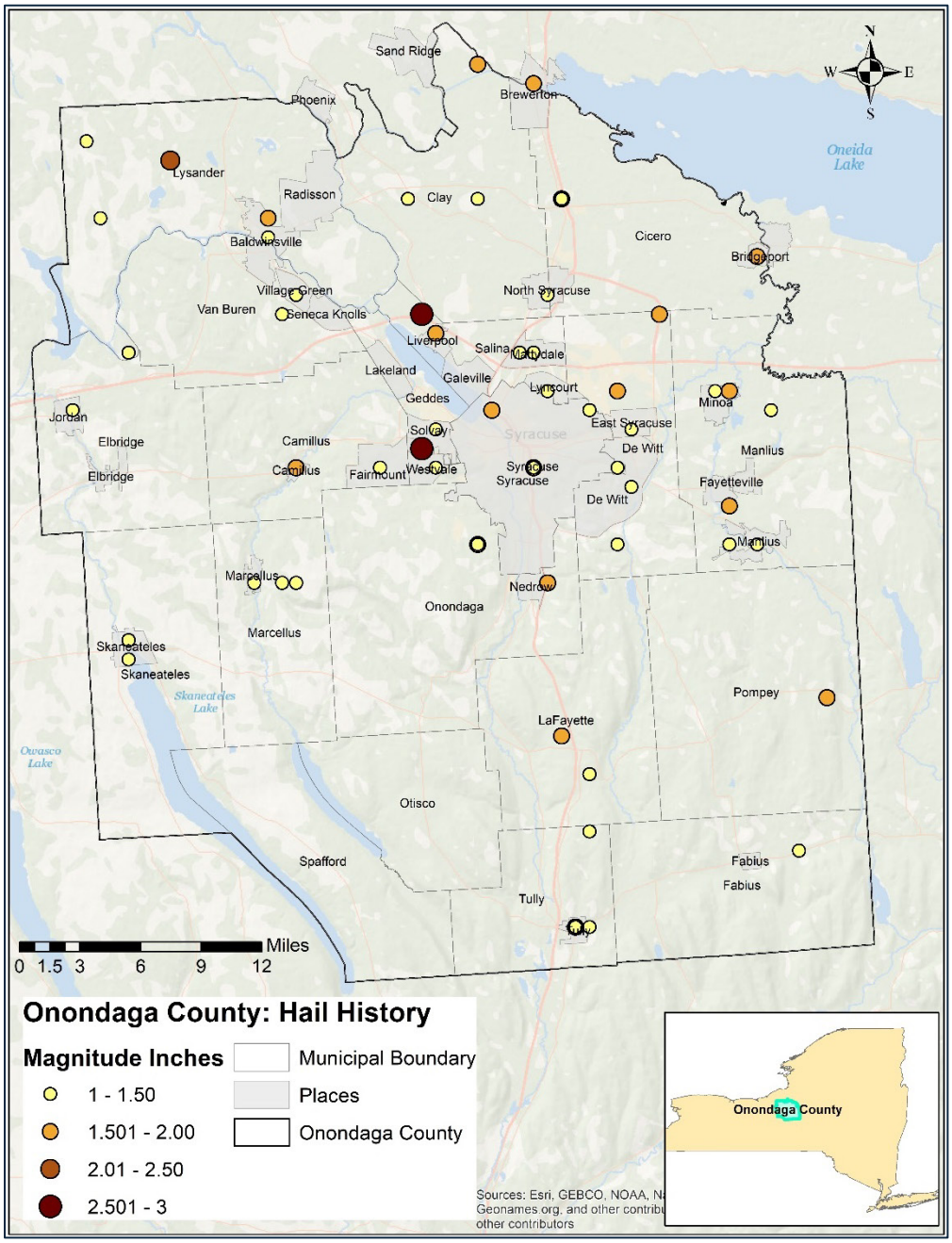


Figure 4-36 illustrates strong wind events within Onondaga County that occurred between 1950 and 2024.

Figure 4-36. Onondaga County Strong Wind History (1950 – 2024)

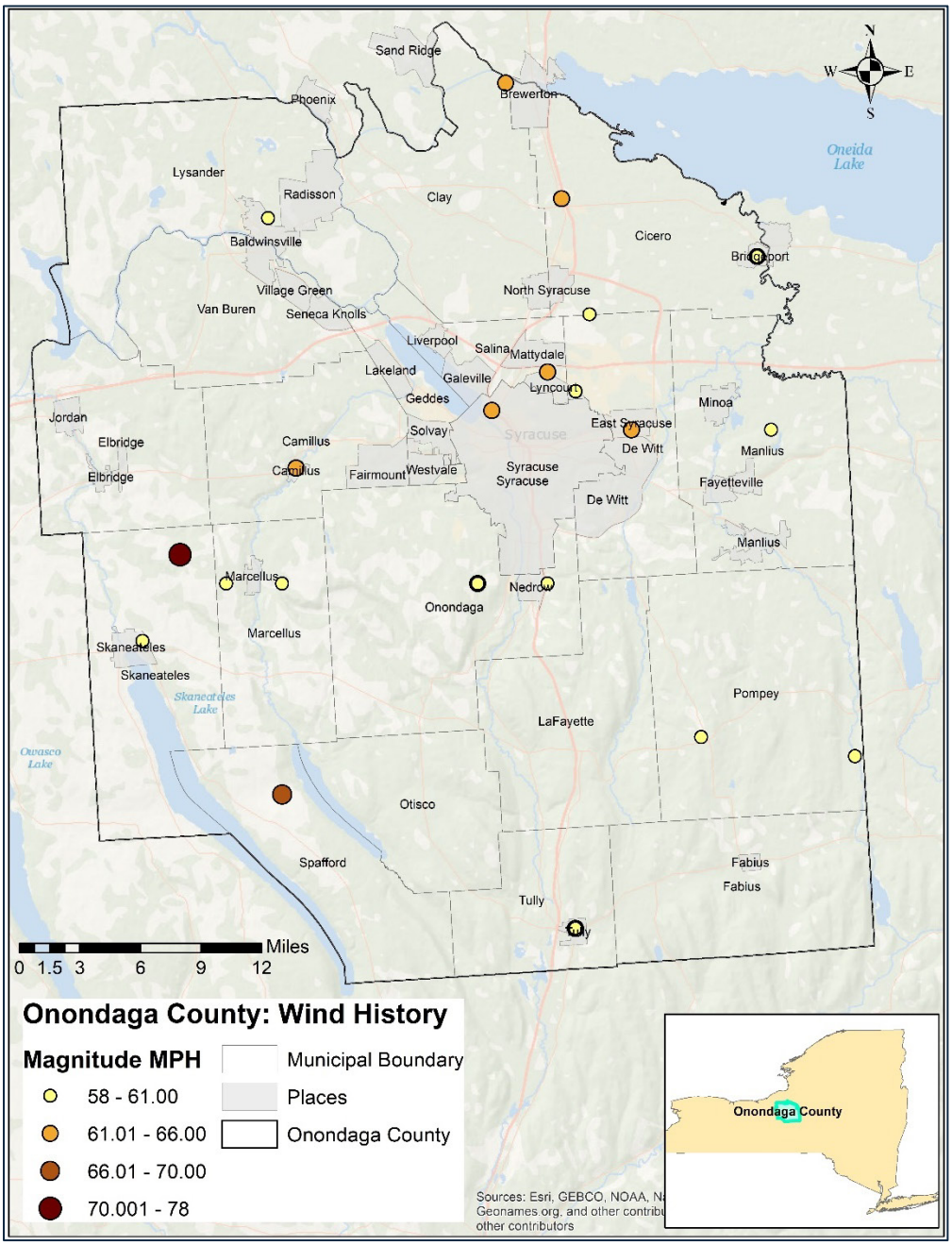


Figure 4-37 illustrates tornado events within five (5) miles of Onondaga County that occurred between 1950 and 2024.

Figure 4-37. Onondaga County Tornado History (1950 – 2024)

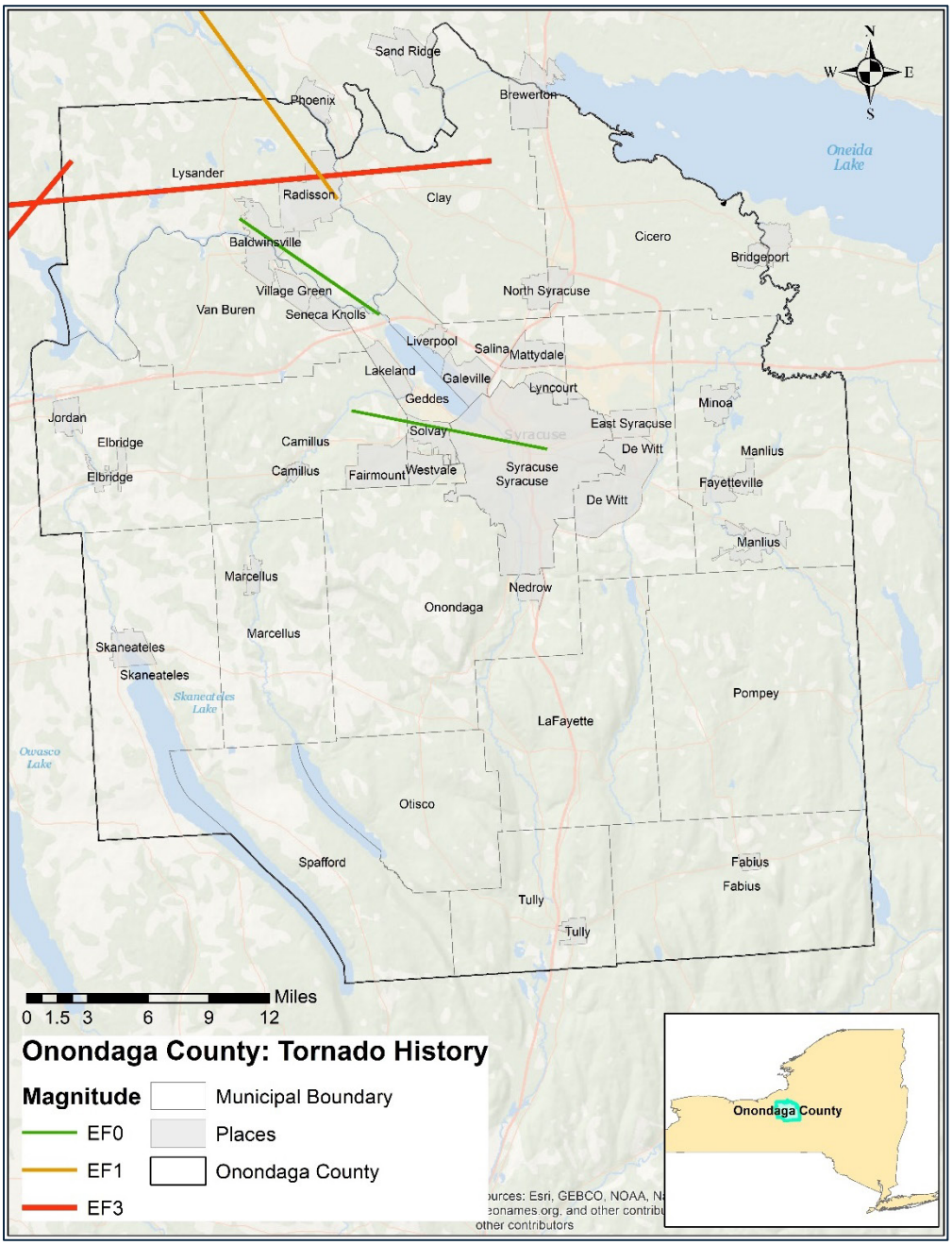
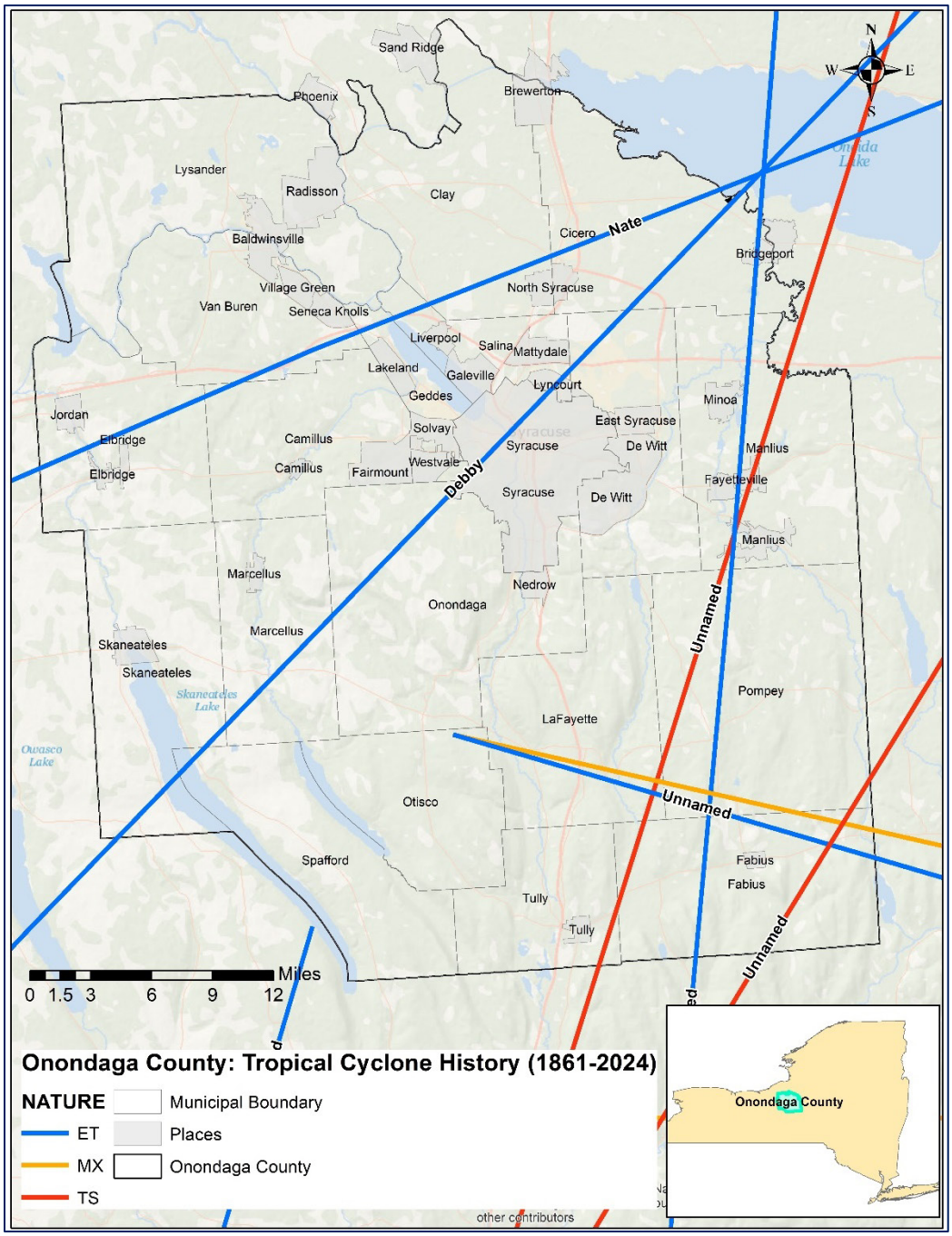


Figure 4-38 illustrates tropical storm/hurricane tracks within Onondaga County that occurred between 1861 and 2024. The "MX" (orange track) on the map is a tropical cyclone system with conflicting reports from different agencies on its type (e.g., tropical depression versus extratropical storm).

Figure 4-38. Onondaga County Tropical Storm/Hurricane History (1861 – 2024)



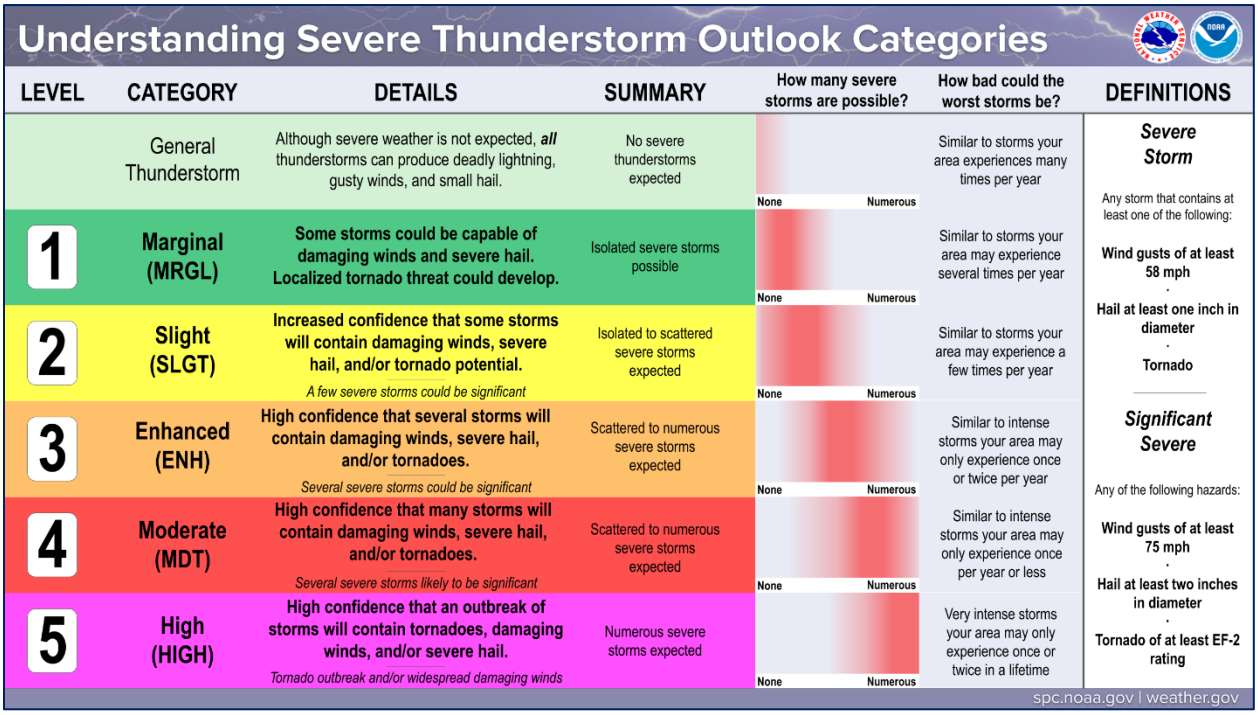
4.6.8.3. Extent/Intensity

Severe weather can be life-threatening and can cause substantial damage to infrastructure and property. The extent of damage caused by severe weather depends on the type of severe weather, its strength, and its location.

Severe Thunderstorm

The NWS Storm Prediction Center (SPC) uses five (5) categories to describe the risk of severe thunderstorms when issuing Severe Thunderstorm Outlooks. The categorical forecast specifies the severe thunderstorm threat via numbers, descriptive labeling, and colors. All thunderstorm categories imply lightning and the potential for flooding. **Figure 4-39** illustrates SPC severe thunderstorm outlook categories.

Figure 4-39. SPC Severe Thunderstorm Categories



Hail can vary in shape and size, and only the very large hailstones pose a serious risk to life safety. NWS reports hail size by comparing the hailstone with a traditional object to size conversion for assessment and translation of severe hail reports. **Table 4-116** lists the traditional conversion of hail size descriptions.[315]

Table 4-116. Converting Traditional Hail Size Description

Hail Size *(inches)*	Object Analog Reported
0.25	Pea
0.50	Mothball
0.75	Penny
0.88	Nickel
1.00	Quarter
1.50	Walnut, Ping Pong
1.75	Golf Ball
2.50	Tennis Ball

[315] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Hail Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/hail/.

Hail Size *(inches)*	Object Analog Reported
2.75	Baseball
3.00	Teacup
4.00	Softball
4.50	Grapefruit

The Beaufort Wind Scale was developed to estimate and report wind speeds when a measuring apparatus is unavailable (e.g., in open seas). It was invented in the 1805 by Sir Francis Beaufort of the British Navy as a way to interpret with conditions at sea. Since then, the scale has been modified to include the effects on land. **Table 4-117** outlines the 13 force classifications that comprise the Beaufort Wind Scale.[316]

Table 4-117. Beaufort Wind Scale

Force	Wind *(knots)*	Classification	Appearance of Wind Effects	
			On the Water	***On Land***
0	< 1	Calm	Sea surface smooth and mirror-like.	Calm, smoke rises vertically.
1	1 – 3	Light Air	Scaly ripples and no foam crests.	Smoke drift indicates wind direction and still wind vanes.
2	4 – 6	Light Breeze	Small wavelets, crests glassy, and no breaking.	Wind felt on face, leaves rustle, and vanes begin to move.
3	7 – 10	Gentle Breeze	Large wavelets, crests begin to break, and scattered whitecaps.	Leaves and small twigs constantly moving, and light flags extended.
4	11 – 16	Moderate Breeze	Small waves of one (1) to four (4) feet becoming longer with numerous whitecaps.	Dust, leaves, and loose paper lifted, and small tree branches move.
5	17 – 21	Fresh Breeze	Moderate waves of four (4) to eight (8) feet taking longer form, many whitecaps, and some spray.	Small trees and leaves begin to sway.
6	22 – 27	Strong Breeze	Larger waves of eight (8) to 13 feet, whitecaps are common, and more spray.	Larger tree branches moving and whistling in wires.
7	28 – 33	Near Gale	Sea heaps up, waves are 13 to 19 feet, white foam streaks off breakers.	Whole trees moving and resistance felt walking against wind.
8	34 – 40	Gale	Moderately high waves (18 to 25 feet) of greater length, edges of crests begin to break into spindrift, and foam blown in streaks.	Twigs breaking off trees and generally impede progress.
9	41 – 47	Strong Gale	High waves (23 to 32 feet), sea begins to roll, dense streaks of foam, and spray may reduce visibility.	Slight structural damage occurs, and slate blows off roofs.
10	48 – 55	Storm	Very high waves (29 to 41 feet) with overhanging crests, sea white with densely blown foam, heavy rolling, and lowered visibility.	Seldom experienced on land, trees broken or uprooted, and considerable structural damage.
11	56 – 63	Violent Storm	Exceptionally high waves (37 to 52 feet), foam patches cover sea, and visibility more reduced.	--

[316] National Weather Service. (n.d.). Beaufort Wind Scale. Retrieved from https://www.spc.noaa.gov/faq/tornado/beaufort.html.

Force	Wind *(knots)*	Classification	Appearance of Wind Effects	
			On the Water	***On Land***
12	> 63	Hurricane	Air filled with foam, waves over 45 feet, sea completely white with driving spray, and visibility greatly reduced.	See Saffir-Simpson Hurricane Wind Scale.

Tornado rating, based on the Enhanced Fujita Scale (EF Scale), is assigned after tornado-related damage is surveyed. The EF Scale is based on the estimated wind speeds and related damage. **Table 4-118** outlines the EF Scale. When tornado damage is surveyed, it is compared to a list of Damage Indicators and Degrees of Damage, which help estimate the range of wind speeds the tornado likely produced. The EF Scale was revised from the original Fujita Scale and became operational in February 2007.[317]

Table 4-118. Enhanced Fujita Scale

EF Rating	3 Second Gust *(mph)*
0	65 – 85
1	86 – 110
2	111 – 135
3	136 – 165
4	166 – 200
5	Over 200

The NWS SPC is responsible for issuing severe thunderstorm and tornado watches as conditions warrant. While the NWS Binghamton, New York Forecast Office is responsible for issuing severe thunderstorm and tornado warnings, as well as gale wind advisories. **Table 4-119** outlines severe weather advisories.[318]

Table 4-119. National Weather Service Severe Weather Advisories

Type	Description
Severe Thunderstorm Watch	Issued by the NOAA SPC when conditions are favorable for the development of severe thunderstorms in and close to the watch area. The size of the watch can vary depending on the weather situation. Severe thunderstorm watches are usually issued for a duration of four (4) to eight (8) hours. They are normally issued well in advance of the actual occurrence of severe weather.
Severe Thunderstorm Warning	Issued by the local NWS Forecast Office when either a severe thunderstorm is indicated by radar, or a spotter reports a thunderstorm producing hail one (1) inch or larger in diameter and/or winds equal to or exceeding 58 mph. Severe thunderstorm warnings are usually issued for a duration of one (1) hour. They can be issued without a Severe Thunderstorm Watch already in effect. Severe thunderstorms can produce tornadoes with little or no advance warning.
Tornado Watch	Issued by the SPC when conditions are favorable for the development of tornadoes in and close to the watch area. The size of the watch can vary depending on the weather situation. Tornado watches are usually issued for a duration of four (4) to eight (8) hours. They are normally issued well in advance of the actual occurrence of tornadoes.
Tornado Warning	Issued by the local NWS Forecast Office when either a tornado is indicated by radar or sighted by spotters. Tornado warnings are usually issued for a duration of around 30 minutes. They can be issued without a Tornado Watch already in effect

[317] National Weather Service. (n.d.). The Enhance Fujita Scale (EF Scale). Retrieved from https://www.weather.gov/oun/efscale.
[318] National Weather Service. (n.d.). National Weather Service Glossary. Retrieved from https://w1.weather.gov/glossary/.

Type	Description
Gale Watch	Issued by the local NWS Forecast Office for locations along the water when one (1) or both of the following conditions is possible to begin within 36 hours and is not directly associated with a tropical cyclone – sustained winds of 34 to 47 knots (39 to 55 mph) or frequent gusts (duration of two (2) or more hours) between 34 to 47 knots (39 to 55 mph).
Gale Warning	Issued by the local NWS Forecast Office for locations along the water when one (1) or both of the following conditions is expected to begin within 36 hours and is not directly associated with a tropical cyclone – sustained winds of 34 to 47 knots (39 to 55 mph) or frequent gusts (duration of two (2) or more hours) between 34 to 47 knots (39 to 55 mph). At this point, the vessel needs to be secured at port.

Tropical Storm/Hurricane

Hurricane intensity is measured utilizing the Saffir-Simpson Hurricane Wind Scale. The Saffir-Simpson Scale is a five (5) category rating based only on a hurricane's maximum sustained wind speed, which estimates the potential for property damage. Other hazards (e.g., storm surge, rainfall, tornadoes) are not considered in this Scale. It is important to note that all hurricanes are capable of producing storm surge, heavy rainfall, and tornadoes. Due to Onondaga County's location, storm surge is not a concern for the County and will not be detailed in this profile. **Table 4-120** outlines the Saffir-Simpson Hurricane Wind Scale.[319]

Table 4-120. Saffir Simpson Hurricane Wind Scale

Category	Sustained Winds *(mph)*	Types of Damage Due to Hurricane Winds
1	74 – 95	**Very dangerous winds will produce some damage.** Well-constructed frame homes could sustain damage to the roof, shingles, vinyl siding, and gutters. Large tree branches will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles will likely result in power outages that could last several days.
2	96 – 110	**Extremely dangerous winds will cause extensive damage.** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted, blocking numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 *(major)*	111 – 129	**Devastating damage will occur.** Well-constructed framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 *(major)*	130 – 156	**Catastrophic damage will occur.** Well-constructed framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, and power poles will be downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 *(major)*	157 or higher	**Catastrophic damage will occur.** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

NHC is responsible for issuing watches and warnings when a tropical cyclone threatens an area. **Table 4-121** outlines the tropical cyclone outlooks, advisories, watches, and warnings issued by NHC, as conditions warrant.

[319] National Hurricane Center. (n.d.). Saffir-Simpson Hurricane Wind Scale. Retrieved from https://www.nhc.noaa.gov/aboutsshws.php.

Table 4-121. National Hurricane Center Tropical Cyclone Advisories

Type	Description
Tropical Weather Outlook	A discussion of significant areas of disturbed weather and their potential for development during the next seven (7) days. The Outlook includes a categorical forecast of the probability of tropical cyclone formation during the first 48 hours and during the seven (7) day forecast period. These are also available in graphical versions.
Tropical Cyclone Public Advisory	Contains a list of all current coastal watches and warnings associated with an ongoing or potential tropical cyclone, a post-tropical cyclone, or a subtropical cyclone. It also provides the cyclone position, maximum sustained winds, current motion, and a description of the hazards associated with the storm.
Tropical Storm Watch	Issued when tropical storm conditions (maximum sustained winds of 39 to 73 mph) are possible within the specified area within 48 hours.
Tropical Storm Warning	Issued when tropical storm conditions (maximum sustained winds of 39 to 73 mph) are possible within the specified area within 36 hours.
Hurricane Watch	Issued when hurricane conditions (maximum sustained winds of 74 mph or greater) are possible within the specified area. NHC issues hurricane watches 48 hours before the arrival of tropical storm force winds. This is because it may not be safe to prepare for a hurricane once winds reach tropical storm force.
Hurricane Warning	Issued when hurricane conditions (maximum sustained winds of 74 mph or greater) are possible within the specified area. NHC issues hurricane warnings 36 hours before the arrival of tropical storm force winds.
Extreme Wind Warning	Issued when extreme sustained winds of a major hurricane (115 mph or greater), usually associated with the eyewall, are expected to begin within an hour.

Severe thunderstorms and tropical storms/hurricanes can produce heavy rainfall that can lead to flooding, which can be unexpected and leave a small window for evacuation if required. The NWS Binghamton, New York Forecast Office is responsible for issuing flood advisories and Flash Flood Warnings Impact-Based Warnings for events that occur within approximately six (6) hours of heavy rainfall in Onondaga County. *Refer to the Flood section of this Plan for more information on the warning time during a heavy rainfall event.*

4.6.8.4. Probability and Frequency

The probability of occurrence of severe weather in Onondaga County is dependent on the type of severe weather. For example, severe weather events in Onondaga County are often associated with hail from severe thunderstorms. Each hazard probability of occurrence is listed below.

- The probability of occurrence for severe thunderstorms in Onondaga County is high because a significant hazard event is likely to occur annually.
- The probability of occurrence for hail in Onondaga County is low because a significant hazard event is likely to occur within 100 years.
- The probability of occurrence for strong winds in Onondaga County is high because a significant hazard event is likely to occur annually.
- The probability of occurrence for tornadoes in Onondaga County is low because a significant hazard event is likely to occur within 100 years.
- The probability of occurrence for tropical storms/hurricanes in Onondaga County is low because a significant hazard event is likely to occur within 100 years.

The hail annualized frequency value represents the average number of recorded hail hazard occurrences, in event days, per year over the period of record (34 years). **Table 4-122** outlines the annualized frequency for hail, based on FEMA NRI data, for Onondaga County.

Table 4-122. Hail Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(1986 – 2021)*	Annualized Frequency
Onondaga County	85	2.5 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

The strong wind annualized frequency value represents the average number of recorded strong wind hazard occurrences, in event days, per year over the period of record (34 years). **Table 4-123** outlines the annualized frequency for strong winds, based on FEMA NRI data, for Onondaga County.

Table 4-123. Strong Wind Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(1986 – 2021)*	Annualized Frequency
Onondaga County	49	1.4 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

The tornado annualized frequency value represents the average number of recorded tornado hazard occurrences, in event days, per year over the period of record (72 years). **Table 4-124** outlines the annualized frequency for tornadoes, based on FEMA NRI data, for Onondaga County.

Table 4-124. Tornado Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(1950 – 2021)*	Annualized Frequency
Onondaga County	11	0.1 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

The hurricane annualized frequency value represents the average number of recorded hurricane hazard occurrences, in event days, per year over the period of record (171 years). **Table 4-125** outlines the annualized frequency for hurricanes, based on FEMA NRI data, for Onondaga County.

Table 4-125. Tornado Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(1851 – 2021)*	Annualized Frequency
Onondaga County	2	0.0 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

4.6.8.5. Past Events

Table 4-126 documents past hail, strong wind, and tornado (i.e., severe thunderstorms), tropical depression, tropical storms, and hurricane events from 1950 through December 2024 in Onondaga County based on data collected from the NCEI database.

Table 4-126. Severe Weather Events in Onondaga County (1950 – 2024)

Type	Total Occurrences *(1950 – 2024)*	Fatalities	Injuries	Property Damage	Crop Damage
Hail *(1-inch or greater)*	45	0	3	$125,000	$10,000

Type	Total Occurrences *(1950 – 2024)*	Fatalities	Injuries	Property Damage	Crop Damage
Hail *(less than 1-inch)*	40	0	0	$10,000	$5,000
Strong Wind	140	1	2	$3.1 Million	$0
Tornado	8	0	5	$5.3 Million	$0
Tropical Depression	0	0	0	$0	$0
Tropical Storm	0	0	0	$0	$0
Hurricane	0	0	0	$0	$0
Total	**193**	**1**	**10**	**$8.5 Million**	**$10,000**

Includes the following NCEI event types – High Wind and Thunderstorm Wind.
Hail that is one (1) inch or greater is classified as severe.

Table 4-127 highlights four (4) significant severe weather events in Onondaga County within the past five (5) years. The events outlined in **Table 4-126** may not include events that resulted in heavy rainfall and flooding. *Refer to the Flood section of this Plan for more information on events that resulted in heavy rainfall and flooding.*

Table 4-127. Significant Severe Weather Events in Onondaga County

Date	Type	Description
July 13, 2022	Strong Wind	A shortwave trough brought scattered thunderstorms to central New York. The environment was unstable enough to produce a couple of severe thunderstorms. A strong thunderstorm began to strengthen just northwest of Skaneateles at around 5:30 PM, eventually producing a microburst. The most significant damage occurred northwest of Marcellus, where large healthy trees near the center of the microburst were snapped near the base or halfway up, along with damage to siding and gutters on a couple of houses, indicating winds near 90 mph. A barn on the corner of Stump Road and Townline Road had some metal roof sheeting torn off and was displaced a couple of hundred yards from the origin. A fallen tree near the eastern edge of the microburst destroyed a structure. There was approximately $50,000 in damages.
July 30, 2019	Strong Wind	A slow moving cold front and an upper level trough moved through central New York during the afternoon and early evening of July 30th. This sparked a round of severe thunderstorms across the area, which brought down large trees and caused significant damage to a residence and utility poles. There was approximately $15,000 in damages.
May 19, 2019	Strong Wind	A slow moving warm front moved through central New York during the afternoon of May 19th, sparking a late afternoon round of strong to severe thunderstorms along and behind the front. Strong thunderstorms downed trees and power lines in the Syracuse area and caused minor damage to a small building in Solvay. There was approximately $45,000 in damages.
January 1, 2019	Strong Wind	A major winter storm tracked from the eastern Great Lakes to northern New England during the morning of January 1st. This storm brought damaging wind gusts to Onondaga County during the morning hours, knocking down trees and power lines. There was damage to the roofs of three (3) buildings at the New York State Fairgrounds in Solvay. The Syracuse Airport reported a maximum wind gust of 64 mph at 5:34 AM. There was approximately $20,000 in damages.

All data was obtained from the NCEI Storm Events Database: https://www.ncdc.noaa.gov/stormevents/. Per the definition of strong winds in this Plan, the NCEI data used was under the following event types – Thunderstorm Wind and High Wind.

Between 1953 and 2024, FEMA included New York State in 51 severe weather-related major disasters (DR), or emergency (EM) declarations classified as one or a combination of the following disaster types – severe storms, tornado, tropical storm, and hurricane. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Onondaga County was included in six (6) of these severe storm-related declarations, listed in **Table 4-128**.[320]

Table 4-128. Disaster Declarations for Onondaga County

Disaster Number	Incident Period	Declaration Date	Incident Category	Title
DR-4625	August 18 – 19, 2021	October 8, 2021	Hurricane	Remnants of Tropical Storm Fred
EM-3351	October 27 – November 8, 2012	October 28, 2012	Hurricane	Hurricane Sandy
DR-1564	August 13 – September 16, 2004	October 1, 2004	Severe Storm	Severe Storms and Flooding
DR-1534	May 13 – June 17, 2004	August 3, 2004	Severe Storm	Severe Storms and Flooding
DR-1335	May 3 – August 13, 2000	July 21, 2000	Severe Storm	Severe Storms
DR-1244	September 7, 1998	September 11, 1998	Severe Storm	Severe Weather

4.6.8.6. Vulnerability and Impacts

Life Safety and Public Health: The entire population of Onondaga County is vulnerable to severe thunderstorms, hail, strong winds/damaging winds, and tropical storms/hurricanes, but less than 14% of the population is vulnerable to tornadoes. The population that is vulnerable to these severe weather events will likely experience minimal adverse impacts to severe thunderstorms, hail, and strong winds/damaging winds, but will likely experience some adverse impacts to tornadoes and tropical storms/hurricanes.

The impacts of severe weather on life safety and public health depend on the type of severe weather. Nonetheless, impacts can be life-threatening. Under the right conditions, rainfall from thunderstorms can cause flash flooding, killing more people each year than hurricanes, tornadoes, or lightning. Additionally, large hail (e.g., the size of a softball) can fall at speeds of over 100 mph and cause significant damage to an individual, property, and livestock.[321] Strong winds/damaging winds can impact structures and infrastructure, resulting in large areas with power and communication outages as they can knock down power and communication lines, roads can become impassible because of debris, and signs, roofing material, and loose objects that are left outside can become airborne, causing injuries, serious accidents to people, or loss of life. Furthermore, severe weather events can displace residents or require temporary or long-term shelter.

Underserved and At-Risk Population: The underserved and at-risk population exposed to severe weather in Onondaga County is likely to experience minimal adverse/disproportionate impacts to severe thunderstorms, hail, and strong winds/damaging winds, but it is likely to experience some adverse impacts to tornadoes and tropical storms/hurricanes.

[320] Federal Emergency Management Agency. (2024). Disaster Declarations for States and Counties. Retrieved from https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties.
[321] National Oceanic and Atmospheric Administration, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Thunderstorm Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/.

The underserved and at-risk population is uniquely vulnerable due to a number of factors, including their physical and financial ability to respond during a severe weather event and the location and construction quality of their housing. These groups include, but are not limited to, race and ethnic minorities, low-income population, the elderly population, and those with access and functional needs. The low-income population and minorities are more likely to reside in high flood-prone areas and less likely to have insurance. Additionally, low-income populations are less likely to evacuate in response to warning systems and are more likely to evaluate their risk and decide to evacuate based on the net economic impacts on their families. Race and ethnic minorities may have limited access to information and resources designed to prevent or mitigate severe weather risk due to language or cultural differences. The elderly and individuals with access and functional needs are more likely to seek or need medical attention that may not be available due to isolation during a severe weather event, and they may have more difficulty evacuating, especially if they live alone.[322] Additionally, individuals without adequate warning of the event (i.e., limited access to modern communications) are also uniquely vulnerable to this hazard. **Table 4-129** summarizes the vulnerable and at-risk population for severe weather in Onondaga County.

Table 4-129. Underserved and At-Risk Population

Category	Estimate	Percent
Population in Poverty (i.e., low-income population)[323]	62,884	13.9%
Uninsured Population[324]	15,532	3.3%
Senior (65 years old and over)[325]	85,781	18.2%
Children (5 years old and under)[326]	25,989	5.5%
Race and Ethnic Minorities[326]		
Black or African American	50,946	10.8%
American Indian and Alaska Native	2,530	0.5%
Asian	18,728	4.0%
Native Hawaiian and Other Pacific Islander	261	0.1%
Two (2) or More Races	32,714	6.9%
Some Other Race Alone	8,301	1.8%
Hispanic or Latino	27,105	5.7%

Property Damage and Critical Infrastructure: The entire total assessed property, infrastructure, and resources value in Onondaga County is vulnerable (i.e., exposed) to severe thunderstorms, hail, strong winds/damaging winds, and tropical storms/hurricanes, but less than 9% is vulnerable to tornadoes. More than $500,000, but less than $5 Million in property damage is expected from a single major strong winds/damaging winds, tornado, or tropical storm/hurricane event, or damages are expected to occur to 5%, but less than 15%, of the property value within the County. Less than $500,000 in property damages is expected from a single major severe thunderstorm or hail event, or less than 5% of the property value within the County.

[322] United States Environmental Protection Agency. (2021). Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. Retrieved from https://www.epa.gov/cira/social-vulnerability-report.
[323] United States Census Bureau. (2023). S1701: Poverty in the Past 12 Months (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S1701?g=050XX00US36067.
[324] United States Census Bureau. (2023). S2701: Selected Characteristics of Health Insurance Coverage in the United States (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S2701?g=050XX00US36067.
[325] United States Census Bureau. (2023). DP05: ACS Demographic and Housing Estimates (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP05?g=050XX00US36067.
[326] Ibid.

Although the entire Onondaga County property is vulnerable to multiple severe weather events, properties that are structurally compromised or in particularly vulnerable locations are more susceptible to their impacts. For example, those in higher elevations and on ridges may be more prone to wind damage. Manufactured homes and properties in poor condition, or located closer to overhead power lines and large trees, may be more vulnerable to damage.

Building construction plays a major role in the extent of damage resulting from severe weather events. Due to differences in construction, residential structures generally are more susceptible to wind damage than commercial and industrial structures. In general, wood and masonry buildings, regardless of occupancy class, tend to experience more damage than concrete or steel buildings. High rise buildings are also very vulnerable structures. Mobile homes are the most vulnerable to damage, even if tied down, and offer little protection to people inside. In Onondaga County, approximately 1.2% of the occupied housing units are manufactured homes.[327]

The Department of Housing and Urban Development defines manufactured homes as movable dwellings, eight (8) feet or wider and 40 feet or more long, designed to be towed on its own chassis, with transportation gear integral to the unit when it leaves the factory, and without the need for a permanent foundation.[328] Manufactured homes include multi-wide and expandable manufactured homes but exclude travel trailers, motor homes, and modular housing. Due to their lightweight, often unanchored design, manufactured housing is extremely vulnerable to strong winds and is generally the most damaged.

Utility infrastructure could suffer damage from strong winds associated with falling tree limbs or other debris, resulting in the loss of power or other utility services. Power outages can impact residents, critical facilities, and business operations. Interruptions in heating or cooling utilities can affect the underserved population (e.g., children, elderly, individuals with access and functional needs) who are particularly vulnerable to temperature-related health impacts. Furthermore, power outages can impact other public utilities, including potable water, wastewater treatment, and communications. In addition to public water services, property owners with private wells may not have access to potable water until power is restored. A lack of power in emergency facilities (e.g., police, fire, EMS, hospitals) will inhibit a community's ability to respond effectively to an event and maintain the safety of its citizens.

Economy: Severe weather also impacts the economy. Impacts include loss of business function, damage to inventory, relocation costs, wage loss, and rental loss due to the repair or replacement of buildings. The number and cost of weather and climate disasters in the United States continue to increase, resulting in a greater financial impact.[329] Severe weather accounts for more than 50% of all billion-dollar weather/climate disasters in the United States since 1980. From the 27 confirmed weather/climate disaster events that occurred in 2024 within the United States, 17 were severe storms, and five (5) were tropical storms/hurricanes.[330] Agriculture can be significantly impacted by severe weather, resulting in decreased crop yields and increased production costs. Since agriculture is a major economic driver for the County, any impact on the agricultural sector can impact the County's economy. Furthermore, transportation systems can be severely impacted by severe weather. Disruption from debris blocking transportation routes, physical damage to transportation resources and critical infrastructure due to hail, strong winds, and/or tornadoes, can cause major disruptions to the County's economy.

[327] United States Census Bureau. (2022). S2504: Physical Housing Characteristics for Occupied Housing Units (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S2504?g=050XX00US36067.
[328] United States Census Bureau. (2022). Manufactured Housing Survey (MHS) Frequently Asked Questions (FAQs). Retrieved from https://www.census.gov/programs-surveys/mhs/about/faq.html.
[329] Smith, A. B. (2025). 2024: An Active Year of U.S. Billion-Dollar Weather and Climate Disasters. Retrieved from https://www.climate.gov/news-features/blogs/beyond-data/2024-active-year-us-billion-dollar-weather-and-climate-disasters.
[330] National Centers for Environmental Information. (2025). Billion-Dollar Weather and Climate Disasters: Overview. Retrieved from https://www.ncei.noaa.gov/access/billions/.

Changes in Development and Impact of Future Development: Changes in development have minimally increased the vulnerability of Onondaga County to severe weather (i.e., severe thunderstorms, hail, strong winds/damaging winds, tornadoes, and tropical storms/hurricanes). Future development trends will minimally increase the impact of severe weather within Onondaga County.

Projections provided by New York State's economic development agency indicate that the five (5) counties within the Central New York region could have 60,000 additional residents in 2040, which is above and beyond what the population would be at that time. Onondaga County, home to half of the population in the five (5) county area, is in a position to add approximately 30,000 new residents by 2040. An increase in population will require more housing. This is in part due to Micron's arrival in the County.[331] Since most of the County's population is vulnerable to severe weather, increasing the population and development will increase the County's overall vulnerability to severe weather events.

Effects of Climate Change in Severity of Impacts: Assessing how climate change impacts severe thunderstorms (i.e., hail, strong winds, tornadoes) is challenging because these are complex, short-lived, and local. Furthermore, it remains unclear how the wind shear that generates a tornado's spin is affected by climate change. One way to understand the effects of climate change on severe weather (i.e., severe thunderstorms) is to examine how it is affecting convective available potential energy (CAPE). CAPE is the amount of energy available for warm, rising air (needed for thunderstorm formation). Higher CAPE values indicate greater energy available in the atmosphere, increasing the potential for thunderstorm development. Annually, high CAPE value days have become more frequent in the eastern United States, but less frequent in the western United States, depending on the season. Since 1979, the annual thunderstorm potential (change of days with high CAPE) in Onondaga County has increased by over 40 days per year. Although the impacts of climate change on severe thunderstorms remain unclear, on average, the frequency of severe weather conditions continues to increase in the northeast.[332]

As global average temperatures continue to rise, ocean surface temperatures and atmospheric moisture will increase, two (2) vital ingredients for tropical cyclone formation. Models show that although the frequency of tropical cyclones may not be impacted by climate change, their intensity will be. It is expected that more tropical cyclones will undergo rapid intensification. Furthermore, because warmer air holds more moisture, an increase in tropical cyclone rainfall rates is expected by 2100, resulting in heavier rainfall at landfall.[333] Additionally, some studies suggest that climate change slows the forward speed of tropical cyclones (i.e., tropical depressions, tropical storms, and hurricanes).[334] In New York State, the frequency of strong wind/damaging wind events is expected to increase, and the severity of tropical storms/hurricanes is expected to increase. Furthermore, tropical storms/hurricanes are expected to shift farther north into the northeastern United States.[335]

4.6.8.7. FEMA NRI Expected Annual Loss Estimates

A hail NRI EAL score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to hail when compared to the rest of the United States. The EAL score is positively

[331] Onondaga County. (2024). Onondaga County Housing Needs Assessment. Retrieved from https://plan.ongov.net/wp-content/uploads/2024/06/OnondagaHousing_JUNE2024_FINAL.pdf.
[332] Climate Central. (2022). Changing Thunderstorm Potential. Retrieved from https://www.climatecentral.org/climate-matters/changing-thunderstorm-potential.
[333] Colbert, A. (2022). A Force of Nature: Hurricanes in a Changing Climate. Retrieved from https://climate.nasa.gov/news/3184/a-force-of-nature-hurricanes-in-a-changing-climate/.
[334] Chung, M.V. et. al. (2021). Climate Change is Probably Increasing the Intensity of Tropical Cyclones. Retrieved from https://www.climate.gov/news-features/understanding-climate/climate-change-probably-increasing-intensity-tropical-cyclones.
[335] New York State Energy Research and Development Authority. (2023). Extreme Events. Retrieved from https://nysclimateimpacts.org/explore-the-assessment/new-york-states-changing-climate/nysc-extreme-events/.

associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-130** outlines the hail EAL for Onondaga County.

Table 4-130. Hail Expected Annual Loss ***(FEMA National Risk Index)***

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$20,563	$36,313	$710	$57,586	41.3	Relatively Moderate
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

A strong wind NRI EAL score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to strong winds when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-131** outlines the strong wind EAL for Onondaga County.

Table 4-131. Strong Wind Expected Annual Loss ***(FEMA National Risk Index)***

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$942,649	$1.6 Million	$12,813	$2.6 Million	95.5	Very High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

A tornado NRI EAL score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to tornadoes when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-132** outlines the tornado EAL for Onondaga County.

Table 4-132. Tornado Expected Annual Loss ***(FEMA National Risk Index)***

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$3.6 Million	$1.5 Million	$958	$5.1 Million	87.5	Very High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

A hurricane NRI EAL score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to hurricanes when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-133** outlines the hurricane EAL for Onondaga County.

Table 4-133. Hurricane Expected Annual Loss *(FEMA National Risk Index)*

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$32,916	$1.7 Million	$76,323	$1.8 Million	71.9	Relatively High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

4.6.8.8. FEMA Severe Weather Risk Index Score

The hail Risk Index score and rating represent a community's relative risk for hail when compared to the rest of the United States. **Table 4-134** illustrates the hail Risk Index rating and score for Onondaga County.

Table 4-134. Hail Risk Index (FEMA National Risk Index)

Jurisdiction	Rating	Score
Onondaga County	36.9	Relatively Low
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability, and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

The strong wind Risk Index score and rating represent a community's relative risk for strong winds when compared to the rest of the United States. **Table 4-135** illustrates the strong wind Risk Index rating and score for Onondaga County.

Table 4-135. Strong Wind Risk Index (FEMA National Risk Index)

Jurisdiction	Rating	Score
Onondaga County	94.4	Very High
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability, and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

The tornado Risk Index score and rating represent a community's relative risk for tornadoes when compared to the rest of the United States. **Table 4-136** illustrates the tornado Risk Index rating and score for Onondaga County.

Table 4-136. Tornado Risk Index (FEMA National Risk Index)

Jurisdiction	Rating	Score
Onondaga County	86.1	Very High
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability, and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

The hurricane Risk Index score and rating represent a community's relative risk for hurricanes when compared to the rest of the United States. **Table 4-137** illustrates the hurricane Risk Index rating and score for Onondaga County.

Table 4-137. Hurricane Risk Index (FEMA National Risk Index)

Jurisdiction	Rating	Score
Onondaga County	73.7	Relatively High
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability, and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

Table 4-138 outlines the severe weather Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

Table 4-138. Severe Weather Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Strong Winds/Damaging Winds	3	12	16	16	44	63
Severe Thunderstorm	3	9	16	14	39	57
Tropical Storm/Hurricane	1	9	16	24	49	27
Hail	1	6	16	14	36	21
Tornado	1	6	6	22	34	20

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

4.6.9. Wildfire

4.6.9.1. Description

Wildfires are unplanned fires that occur in wildlands (e.g., forests, rangelands, or grasslands) and are nearly impossible to prevent and difficult to control.[336] Free-burning fires can occur whenever combustible fuel (e.g., grasses, shrubs, trees, dead leaves) in the presence of oxygen at an extremely high temperature becomes gas (flames are the visual indicator of heated gas). Smoldering fires can occur with lower temperature heat sources and, over time, can reach ignition temperature when rapid fire growth occurs. Wildfires can be ignited by natural occurrences (e.g., lightning strike) or by human causes (e.g., unattended campfire, debris burning, or arson). In 2022, 87% of wildfires in the United States were ignited by humans, suggesting they could have been prevented.[337] However, weather conditions and topography determine wildfire behavior. Wind, high temperatures, and low humidity create a perfect environment for wildfires to spread; furthermore, flames burn faster when moving uphill than downhill.

Wildfires can be classified into three (3) different classes, listed in **Table 4-139**, and it is common to have all three (3) types of fire.[338]

Table 4-139. Types of Wildfires

Type	Description
Ground Fires	Mostly burn in decayed roots below ground and in the duff layer, which is comprised of dead plant materials (e.g., leaves, bark, needles, and twigs). Ground fires are sustained by glowing combustion (without flames) and go undetected for an extended period of time because they produce little to no smoke and spread slowly.
Surface Fires	Burn loose needles, moss, lichen, herbaceous vegetation, shrubs, small trees, and saplings that are located at or near the surface of the ground, mostly by flaming combustion. Surface fires can grow in intensity to scorch or consume the forest canopy, a characteristic that is seen in crown fires depending on the following – amount of surface fuel (high), fuel moisture content (low), slope and/or wind speed (high), resultant surface flame length (high), height of the base of tree crowns (small), and density and compactness of tree crowns (tight).
Crown Fires	Usually ignited by a surface fire, crown fires burn forest canopy fuels, including live and dead foliage/ branches, lichens on trees, and tall shrubs that lie well above the surface fuels. Crown fires can be passive (involving the burning of individual trees or small groups of trees, often called torching) or active (also referred to as running crown fires) and present a solid wall of flame from the surface through the canopy fuel layers, as seen in the photo below.

Wildfires are a natural part of the ecosystem, but they become a hazard when they get out of control in developed areas, resulting in property loss, injuries, or loss of life. The wildfire risk in the United States has increased over the last few decades, driven by the encroachment of residences and other structures into the wildland environment and the growing number of people living in wildland areas.

In the northeast United States, wildfires are more likely to occur during droughts or dry spells in the spring and early summer. Wildfire season usually begins in March and ends in late November, with most wildfires occurring in April and May because most tree and ground vegetation is dry during this time, making it highly flammable.[339]

[336] United States Department of Agriculture. (n.d.). Wildfire. Retrieved from https://www.climatehubs.usda.gov/taxonomy/term/398.
[337] United States Forest Service. (n.d.). About Wildfires. Retrieved from https://smokeybear.com/en/about-wildland-fire.
[338] Northwest Fire Science Consortium. (n.d.). What are Types of Fire? Retrieved from https://www.nwfirescience.org/sites/default/files/publications/Types%20of%20Fire.pdf.
[339] The Northeast States Emergency Consortium. (n.d.). Fires. Retrieved from https://nesec.org/fires/.

Wildfire Smoke

A wildfire outside Onondaga County can affect the area with wildfire smoke, even when the incident is taking place thousands of miles away. Wildfire smoke is a complex mixture of gaseous pollutants (e.g., carbon monoxide), hazardous air pollutants (e.g., polycyclic aromatic hydrocarbons), water vapor, and particle matter (i.e., particle pollution), the main component of wildfire smoke and the principal threat to public health. Particulate matter (PM) in wildfire smoke is much finer than in urban air pollution, with the bulk of wildfire smoke PM less than one (1) micrometer in diameter.[340] Wildfire smoke is highly variable in space and time. The concentration and the composition of wildfire smoke can be different from fire to fire, and the composition of a smoke plume changes as the plume ages (i.e., as it moves in the atmosphere).[341]

Wildfire smoke poses a significant risk to the public, especially vulnerable populations (e.g., respiratory conditions or disease, cardiovascular diseases, children and adolescents, older adults, pregnant women, outdoor workers, socio-economic status). A reason wildfire smoke may have different health effects than general urban pollution is that its components may have distinct effects on the body. When wildfire smoke mixes with urban air pollution, the health hazard can increase. For example, in urban areas where pollutant concentrations are already elevated and considered "unhealthy", the addition of wildfire smoke can push them to hazardous levels.

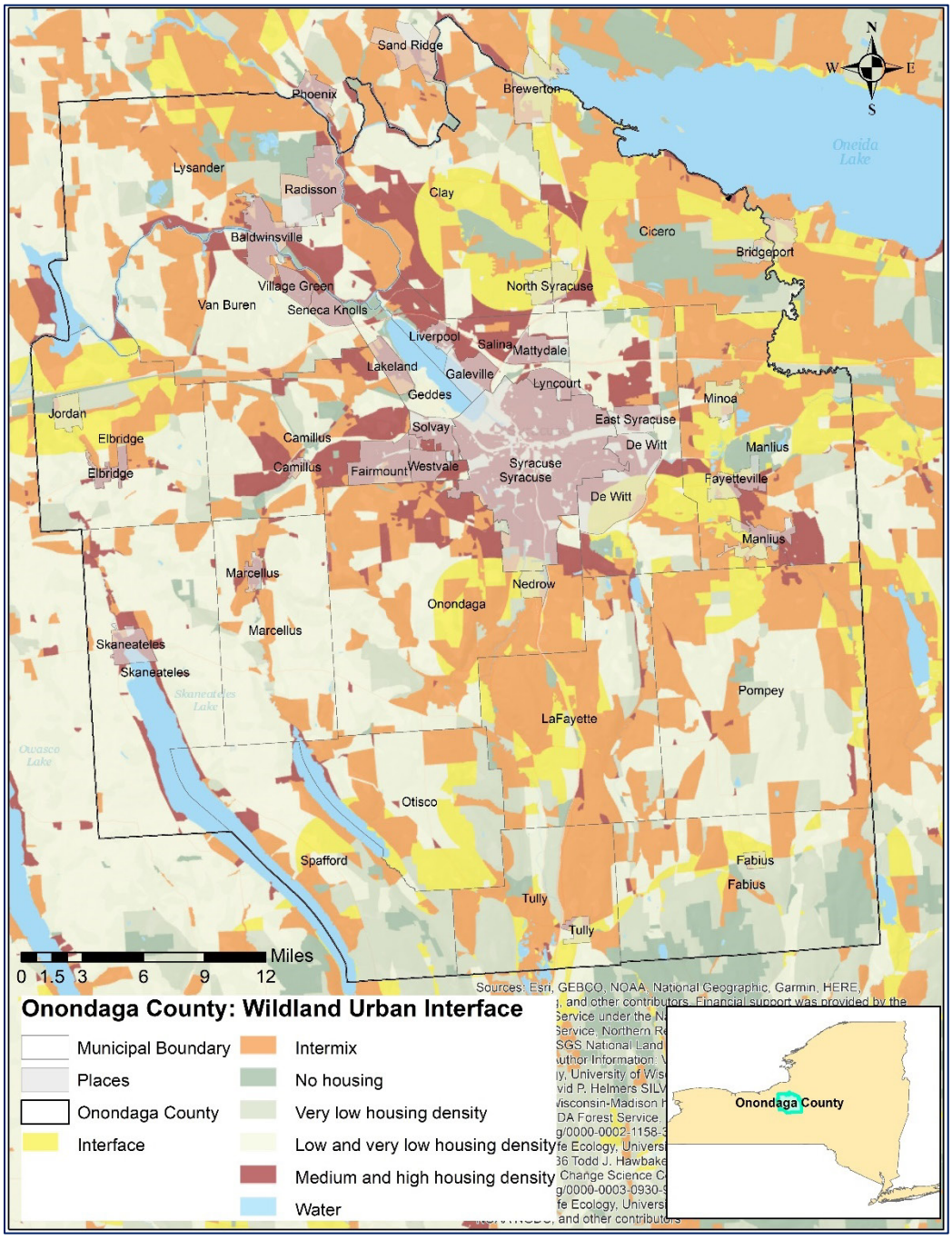
The CDC recognizes wildfire smoke as a public health hazard, and the New York State Hazard Mitigation Plan acknowledges wildfire smoke as a natural hazard (under the wildfire hazard).

4.6.9.2. Location

Wildfires damage thousands of acres of natural resources every year in New York State; however, the majority of the State has a low to minimal risk of wildfires. Areas that are comprised of heavily wooded areas, densely populated shrubs, or large expanses of brush are more wildfire-prone than areas with sparse vegetation. The wildland urban interface (WUI) is the area where the built environment meets or mixes with undeveloped wildland, posing a significant risk to humans.[342] In the United States, communities continue to expand, and subsequently, WUI continues to grow by approximately two (2) million acres per year, which results in an increased overall risk.[343] Approximately 28% of the housing units in Onondaga County are within the WUI, and between 1990 and 2020, there was a 26.3% change in housing units within the WUI area of the County.[344] **Figure 4-40** illustrates the WUI areas in Onondaga County.

[340] United States Environmental Protection Agency. (2024). Why Wildfire Smoke is a Health Concern. Retrieved from https://www.epa.gov/wildfire-smoke-course/why-wildfire-smoke-health-concern.
[341] BC Centre for Disease Control. (2014). Guidance for BC Public Health Decision Makes During Wildfire Smore Events. Retrieved from http://www.bccdc.ca/resource-gallery/Documents/Guidelines%20and%20Forms/Guidelines%20and%20Manuals/Health-Environment/WFSG_BC_guidance_2014_09_03trs.pdf.
[342] New York State Division of Homeland Security and Emergency Services. (2023). New York State Hazard Mitigation Plan. Retrieved from https://mitigateny.org/.
[343] U.S. Fire Administration. (2022). Wildland Urban Interface: A Look at Issues and Resolutions. Retrieved from https://www.usfa.fema.gov/downloads/pdf/publications/wui-issues-resolutions-report.pdf.
[344] USDA Forest Service Northern Research Station. (2023). Understanding the Wildland Urban Interface (1990-2020). Retrieved from https://storymaps.arcgis.com/stories/6b2050a0ded0498c863ce30d73460c9e.

Figure 4-40. Onondaga County Wildland Urban Interface



4.6.9.3. Extent/Intensity

Wildfires are considered a natural and necessary component of wildland ecology. As a result, wildfires are not considered a significant hazard unless their movement threatens lives, homes, communities, critical infrastructure, and natural and cultural resources.

The NYSDEC Division of Forest Protection divided the State into 10 Fire Danger Rating Areas (FDRA) for describing wildfire potential and risk. The FDRA are defined by areas of similar vegetation, climate, and

topography, and in conjunction with the agency's regional boundaries, NWS fire weather zones, political boundaries, and fire history. Onondaga County is part of two (2) FDRAs – the northern part of the County is in the Lake Ontario Plains FDRA, and the southern part of the County is located in the Leatherstocking FDRA. When the fire danger rating is high or above in one (1) or two (2) of the FDRA, the NYSDEC Division of Forest Protection issues a daily fire danger warning. **Table 4-140** defines NYSDEC's fire danger ratings.[345]

Table 4-140. NYSDEC Fire Danger Ratings

Rating Class		Description
	Red Flag	A short-term, temporary warning, indicating the presence of a dangerous combination of temperature, wind, relative humidity, fuel, or drought conditions which can contribute to new fires or rapid spread of existing fires. A Red Flag Warning can be issued at any Fire Danger level.
	Low	Fuels do not ignite readily from small firebrands, although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open-cured grasslands may burn for a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
	Moderate	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur, but it is not persistent. Fires are not likely to become serious, and control is relatively easy.
	High	All fine dead fuels ignite readily, and fires start easily from most causes. Unattended brushes and campfires are likely to escape. Fires spread rapidly, and short-distance spotting is common. High intensity burning may develop on slopes or in areas with concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
	Very High	Fires start easily from various causes and, once ignited, spread rapidly and increase in intensity quickly. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics (e.g., long-distance spotting, fire whirls) when they burn into heavier fuels.
	Extreme	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. A direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.

Additionally, when weather conditions are conducive to wildfire ignition, the NWS local Forecast Office issues a series of advisories. **Table 4-141** outlines the fire advisories issued by NWS as conditions warrant.[346]

Table 4-141. National Weather Service Fire Advisories

Type	Description
Fire Weather Watch	Issued to alert land managers and the public that upcoming weather conditions (e.g., a combination of strong winds and low humidity, dry and unstable air mass, and/or lightning) could result in extensive wildland fire occurrence or extreme fire behavior. It is issued when critical fire weather conditions are possible but not imminent or occurring.

[345] New York State Department of Environmental Conservation. (n.d.). Fire Danger Map. Retrieved from https://dec.ny.gov/environmental-protection/wildfires/fire-danger-map.
[346] National Weather Service. (n.d.). Understanding Wildfire Warnings, Watches and Behavior. Retrieved from https://www.weather.gov/safety/wildfire-ww.

Type	Description
Red Flag Warning	Issued, in conjunction with land management agencies, to alert land managers to an ongoing or imminent critical fire weather pattern (e.g., combination of strong winds and low humidity, dry and unstable air mass, and/or lightning). It is issued when fire conditions are ongoing or expected to occur shortly.
Extreme Fire Behavior	Issued when a wildfire is likely to run out of control. It is often hard to predict because fires tend to behave erratically and sometimes dangerously. To issue this alert, one (1) or more of the following criteria must be met – moving fast (i.e., high rate of spread), prolific crowning and/or spotting, presence of fire whirls, and/or strong convection column.

Even if a wildfire is not occurring in Onondaga County, wildfire smoke can affect the region's visibility and air quality. Wildfire smoke is a mix of gases and fine particles from burning vegetation, building materials, and other materials. The Air Quality Index (AQI) is used by the United States Environmental Protection Agency (EPA) for communicating air quality (i.e., wildfire smoke). The AQI is divided into six (6) color-coded categories, listed in **Table 4-142**, and provides statements for each category that describe air quality in an area, which groups of the population may be affected, and steps people can take to reduce their exposure to air pollution.[347]

Table 4-142. Air Quality Index for Ozone and Particle Pollution

Daily AQI Color	Levels of Concern	Value of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert. The risk of health effects is increased for everyone.
Maroon	Hazardous	301 or higher	Health warning of emergency conditions. Everyone is more likely to be affected.
EPA establishes an AQI for five (5) major air pollutants regulated by the Clean Air Act. Each of these pollutants has a national air quality standard set by EPA to protect public health – ground-level ozone, particle pollution (also known as particulate matter, including PM2.5 and PM10), carbon monoxide, sulfur dioxide, and nitrogen dioxide.			

4.6.9.4. Probability and Frequency

The probability of occurrence for a wildfire in Onondaga County is low because a significant hazard event is likely to occur within 100 years. On average, the annual probability of a wildfire in Onondaga County is greater than 6% of the counties in the United States and greater than 21% of the counties in New York.[348] According to the New York State Hazard Mitigation Plan, tracking of long-range movement of wildfire smoke across the United States indicates that New York State is subject to low levels of wildfire smoke. The short-term likelihood of wildfire smoke reaching the State and Onondaga County is difficult to forecast because it depends on the probability that a major wildfire will generate enough smoke to reach long distances and a favorable weather pattern to move the smoke into the State at ground level.

[347] AirNow. (n.d.). Air Quality Index (AQI) Basics. Retrieved from https://www.airnow.gov/aqi/aqi-basics/.
[348] Wildfire Risk to Communities. (n.d.). New York: Onondaga County. Retrieved from https://wildfirerisk.org/explore/overview/36/36067/.

The wildfire annualized frequency value represents the modeled frequency of wildfire hazard occurrences, in event days, per year. **Table 4-143** outlines the annualized wildfire frequency in Onondaga County, based on FEMA NRI data.

Table 4-143. Wildfire Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(2021 Dataset)*	Annualized Frequency
Onondaga County	n/a	0.003% chance per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

4.6.9.5. Past Events

In the last five (5) years, Onondaga County has not experienced any wildfire events. However, in June 2023, over 250 wildfires were burning in Quebec, Canada, causing smoke to drift into Onondaga County and the rest of the northeastern United States, reducing air quality to hazardous levels. A nearly stationary low pressure system near Maine and the Canadian Maritime Provinces produced persistent northerly winds directing the wildfire smoke into portions of the northeastern United States. In addition to reduced air quality, visibility was also affected. Tens of millions of people were under air quality alerts between June 6 and 7, 2023; however, the worst day was June 7th.[349] This event resulted in economic losses across the State as flights were cancelled, restaurants and businesses closed, outdoor activities were cancelled, and many events (e.g., sporting events) were cancelled.[350]

Between 1953 and 2024, there have been no major disaster (DR) or emergency (EM) declarations in New York State related to wildfires. However, the State has experienced wildfire events that did not result in a presidential declaration or cause damage documented and reimbursed through FEMA's disaster recovery programs.[351]

4.6.9.6. Vulnerability and Impacts

Life Safety and Public Health: Less than 9% of the population is exposed to wildfire in Onondaga County, and it is likely to experience minimal adverse impacts to this hazard. Wildfires can pose additional threats to life safety and health, including impacts on water and air quality. Wildfires can severely affect water quality through soil erosion, increased flooding, and the flow of debris containing potential contaminants.[352] Wildfire smoke and ash can travel for miles, affect communities not directly impacted by the wildfires, and reduce air quality to unhealthy levels. The population exposed to wildfire smoke can have significant health effects, which can range from eye and respiratory tract irritation to more serious disorders (e.g., reduced lung function, bronchitis, exacerbation of asthma and heart failure, and premature death).[353]

Underserved and At-Risk Population: The underserved and at-risk population exposed to wildfire in Onondaga County is likely to experience minimal adverse/disproportionate impacts to this hazard. This population includes, but is not limited to, low-income families, the elderly, individuals with disabilities, and those without adequate access to emergency transportation resources. These groups may not have access to accurate and timely information due to limited internet access, language barriers, and living in isolated areas. Therefore, critical wildfire advisories

[349] National Weather Service New York, NY Forecast Office. (2023). June 7, 2023 Wildfire Smoke Event. Retrieved from https://storymaps.arcgis.com/stories/cf05c50f058a40e99c2da54ec098a40a.
[350] New York State Division of Homeland Security and Emergency Services. (2023). New York State Hazard Mitigation Plan. Retrieved from https://mitigateny.org/.
[351] Ibid.
[352] United States Environmental Protection Agency. (2023). Wildfires and Water Quality Research. Retrieved from https://www.epa.gov/water-research/wildfires-and-water-quality-research.
[353] United States Environmental Protection Agency. (2025). Wildland Fire Research: Health Effects Research. Retrieved from https://www.epa.gov/air-research/wildland-fire-research-health-effects-research.

may not reach these groups in a timely manner, which results in higher injury and mortality rates within these communities. Additionally, in the event of an evacuation order, those without access to transportation may be unable to evacuate. Low-income populations are less likely to evacuate in response to warning systems and more likely to evaluate their risk and decide to evacuate based on the net economic impacts on their families. Furthermore, low-income families are less likely to have insurance.

Although everyone in Onondaga County is vulnerable to wildfire smoke, the elderly, children, individuals with pre-existing respiratory and cardiovascular disease, outdoor workers, and pregnant women are uniquely vulnerable. These groups are at higher risk of the health effects associated with wildfire smoke exposure. Short-term exposure (i.e., over a few days) can cause irritation to the eyes and respiratory tract, respiratory symptoms (e.g., coughing, phlegm, wheezing, difficulty breathing), respiratory effects (e.g., bronchitis, reduced lung function, increased risk of asthma exacerbation and aggravation of other lung diseases, increased risk of emergency room visits and hospital admissions), cardiovascular effects (e.g., heart failure, heart attack, stroke, increased risk of emergency room visits and hospital admissions), and increased risk of premature death. Cumulative short-term exposure (i.e., over multiple days to a few weeks) can reduce lung function, and studies have not evaluated the health effects attributed to wildfire smoke exposure over multiple wildfire seasons (i.e., long-term exposure).[354] **Table 4-144** summarizes the vulnerable and at-risk population for wildfires in Onondaga County.

Table 4-144. Underserved and At-Risk Population

Category	Estimate	Percent
Population in Poverty (i.e., low-income population)[355]	62,884	13.9%
Uninsured Population[356]	15,532	3.3%
Senior (65 years old and over)[357]	85,781	18.2%
Children (5 years old and under)[358]	25,989	5.5%

Property Damage and Critical Infrastructure: Less than $500,000 in property damage is expected from a single major wildfire event, or less than 5% of the property value within Onondaga County. In Onondaga County, on average, homes (including all housing units such as single-family homes, condominiums, apartments, and other residences) face a greater risk than those in 6% of counties in the United States. Therefore, the likelihood of wildfires affecting homes in the County is low.[358]

When a wildfire is in the immediate vicinity, it can cause severe damage to all property and infrastructure along its path. The critical infrastructure sector (e.g., transportation, communications, power and gas services, and water supply) can be disrupted or damaged as a result of wildfires. Electrical systems can be destroyed or forced to shut down in order to prevent further damage. Emergency services can become severely overwhelmed during a wildfire event, impacting response times and overall effectiveness. For example, law enforcement is called for traffic and evacuation assistance, paramedics are required for impacted communities and shelters, and hospitals are at risk of

[354] United States Environmental Protection Agency. (2025). Wildfire Smoke and Your Patients' Health. Retrieved from https://www.epa.gov/wildfire-smoke-course/health-effects-attributed-wildfire-smoke.
[355] United States Census Bureau. (2023). S1701: Poverty in the Past 12 Months (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S1701?g=050XX00US36067.
[356] United States Census Bureau. (2023). S2701: Selected Characteristics of Health Insurance Coverage in the United States (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S2701?g=050XX00US36067.
[357] United States Census Bureau. (2023). DP05: ACS Demographic and Housing Estimates (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP05?g=050XX00US36067.
[358] Wildfire Risk to Communities. (n.d.). Onondaga County: Risk to Homes. Retrieved from https://wildfirerisk.org/explore/risk-to-homes/36/36067/.

evacuation or could become overwhelmed due to heightened service needs.[359] Additionally, wildfires can create conditions that block or prevent access and can isolate residents and emergency service providers.

Economy: Even if a wildfire event is not occurring in Onondaga County, wildfire smoke can travel from miles away and affect air quality in the County. This occurred in June and July of 2023 during the record-setting wildfires in Canada. This event resulted in economic losses across the State as flights were cancelled, restaurants and businesses closed, outdoor activities were cancelled, and many events (e.g., sporting events) were cancelled.[360] Agriculture can be significantly impacted by wildfire, resulting in crop and livestock losses, reduced crop yields and livestock production, and increased production costs. Wildfires and wildfire smoke can reduce income for farmers and businesses, as well as for retailers and others who provide goods and services to farmers. Subsequently, this leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue. Since agriculture is a significant economic driver in the County, any impact on the agricultural sector can impact the County's economy.

Changes in Development and Impact of Future Development: Changes in development have minimally increased the vulnerability of Onondaga County to wildfires. Future development trends will minimally increase the impact of wildfire within Onondaga County.

Projections provided by New York State's economic development agency indicate that the five (5) counties within the Central New York region could have 60,000 additional residents in 2040, which is above and beyond what the population would be at that time. Onondaga County, home to half of the population in the five (5) county area, is in a position to add approximately 30,000 new residents by 2040. An increase in population will require more housing. This is in part due to Micron's arrival in the County.[361] Changes in development are not expected to increase the County's vulnerability to wildfires. However, the entire population, including the future population, is vulnerable to wildfire smoke.

Effects of Climate Change in Severity of Impacts: Wildfires are directly impacted by climate change. As average temperatures increase, so does the rate of evaporation in dense wilderness areas, causing soil and vegetation to dry at a faster rate and become more flammable. The Central Lakes region, which includes Onondaga County, average annual temperature within this region is projected to increase 4.6°F to 6.4°F by the 2050s and 6.5°F to 11.7°F by the end of the century. The annual precipitation is projected to increase 3% to 10% by the 2050s and 5% to 17% by the end of the century.[362] According to the 2023 New York State Hazard Mitigation Plan, information about climate change impacts on wildfire in New York State is limited.[363] In many states, such as California, climate change will lead to more frequent and intense wildfires, but New York State is not expected to experience a significant change. Some studies project that the Northeast's fire season will begin earlier and last longer. However, the risk of air

[359] Cybersecurity & Infrastructure Security Agency. (n.d.). Critical Infrastructure Sectors. Retrieved from https://www.cisa.gov/topics/critical-infrastructure-security-and-resilience/extreme-weather-and-climate-change/wildfires.
[360] New York State Division of Homeland Security and Emergency Services. (2023). New York State Hazard Mitigation Plan. Retrieved from https://mitigateny.org/.
[361] Onondaga County. (2024). Onondaga County Housing Needs Assessment. Retrieved from https://plan.ongov.net/wp-content/uploads/2024/06/OnondagaHousing_JUNE2024_FINAL.pdf.
[362] New York State Energy Research and Development Authority. (2023). New York State Climate Impacts Assessment: Projections Methodology Report (Appendix: Climate Change Projections Tables, Average Temperature and Precipitation – Central Lakes). Retrieved from https://nysclimateimpacts.org/wp-content/uploads/2024/01/Appendix-Projections_Tables-1.pdf.
[363] New York State Division of Homeland Security and Emergency Services. (2023). New York State Hazard Mitigation Plan. Retrieved from https://mitigateny.org/.

quality impacts (i.e., wildfire smoke) will increase as wildfire frequency and severity increase elsewhere in the United States and Canada.[364]

Table 4-145 outlines the wildfire associated climate indicators for Onondaga County projected through the end of the century.[365]

Table 4-145. Future Climate Indicators for Onondaga County

Indicators	Modeled History *(1976 – 2005)*	Early Century *(2015 – 2044)*		Mid Century *(2035 – 2064)*		Late Century *(2070 – 2099)*	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min – Max	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*	*Min – Max*
Precipitation							
Days per year with no precipitation *(Dry Days)*	**128 days**	**131 days**	**131 days**	**132 days**	**134 days**	**133 days**	**137 days**
	124 – 131	121 – 143	124 – 147	121 – 141	122 – 147	122 – 149	116 – 159
Maximum number of consecutive dry days	**8 days**	**9 days**	**9 days**	**9 days**	**9 days**	**9 days**	**10 days**
	7 – 9	7 – 10	8 – 11	8 – 10	7 – 12	8 – 11	7 – 12
Days per year with precipitation *(Wet Days)*	**238 days**	**234 days**	**234 days**	**233 days**	**231 days**	**232 days**	**228 days**
	234 – 241	222 – 244	218 – 241	224 – 244	218 – 243	216 – 243	206 – 249
Temperature Thresholds							
Annual days with maximum temperature greater than 90°F	**3 days**	**12 days**	**13 days**	**18 days**	**24 days**	**25 days**	**52 days**
	3 – 6	4 – 23	5 – 21	6 – 35	9 – 43	8 – 51	16 – 91
Annual days with maximum temperature greater than 100°F	**0 days**	**0 days**	**0 days**	**1 days**	**2 days**	**2 days**	**9 days**
	0 – 0	0 – 2	0 – 2	0 – 6	0 – 8	0 – 6	0 – 36

4.6.9.7. FEMA NRI Expected Annual Loss Estimates

A wildfire NRI EAL score, and rating represent a community's relative level of expected building, population, and agriculture loss each year due to wildfires when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-146** outlines the wildfire EAL for Onondaga County.

[364] New York State Energy Research and Development Authority. (2024). New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate (Extreme Events Section). Retrieved from https://nysclimateimpacts.org/explore-the-assessment/new-york-states-changing-climate/nysc-extreme-events/.
[365] Climate Mapping for Resilience and Adaptation. (n.d.). Climate Mapping for Resilience and Adaptation Assessment Tool. Retrieved from https://livingatlas.arcgis.com/assessment-tool/explore/details.

Table 4-146. Wildfire Expected Annual Loss *(FEMA National Risk Index)*

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$6,297	$69,537	$17	$75,852	61.0	Relatively High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

4.6.9.8. FEMA Wildfire Risk Index Score

The wildfire Risk Index score and rating represent a community's relative risk for wildfires when compared to the rest of the United States. **Table 4-147** illustrates the wildfire Risk Index rating and score for Onondaga County.

Table 4-147. Wildfire Risk Index (FEMA National Risk Index)

Jurisdiction	Rating	Score
Onondaga County	Relatively Moderate	57.5
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

Table 4-148 outlines the wildfire Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

Table 4-148. Wildfire Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Wildfire	1	3	6	14	23	14

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

4.6.10. Winter Weather

For the purposes of this Plan, this section will include winter storms (i.e., blizzards, lake effect storms, ice storms, nor'easters), and cold waves/extreme cold. Each hazard is examined independently, but it is recognized that these can occur simultaneously.

4.6.10.1. Description

Winter Storms

A winter storm is a weather event in which the main types of precipitation are snow, sleet, or freezing rain, and it can be a combination of heavy snow, blowing snow, and dangerous wind chills.[366] **Table 4-149** describes each of the three (3) types of winter weather precipitation.[367]

Table 4-149. Types of Winter Precipitation

Type	Description
Snow	Most of the precipitation that falls in the wintertime begins as snow because the top layer of the storm is usually cold enough to create snowflakes. Snowflakes are a collection of ice crystals that cling to each other as they fall towards the ground. Precipitation continues to fall as snow when the temperature remains at or below 32°F from the cloud base to the ground.
Sleet	Occurs when snowflakes only partially melt when they fall through a shallow layer of warm air. These slushy drops refreeze as they then fall through a deep layer of freezing air above the surface, and eventually reach the ground as frozen raindrops that bounce on impact.
Freezing Rain	Occurs when snowflakes descend into a warmer layer of air and melt completely. When these liquid water drops fall through another thin layer of freezing air just above the surface, they do not have enough time to refreeze before reaching the ground. Because they are "supercooled," they instantly refreeze upon contact with anything at or below 32°F, creating a glaze of ice on the ground, trees, power lines, and other objects.

A winter storm requires three (3) basic ingredients – cold air, lift, and moisture.[368]

- **Cold Air** that is below freezing (less than 32°F) must be present in the clouds and near the ground to make snow and ice.
- **Lift** is needed to raise moist air to form the clouds and cause precipitation. For example, when warm air collides with cold air, the warm air is forced to rise over the cold dome; the boundary between the warm and cold air masses is called a front.
- **Moisture** is needed to form clouds and precipitation. A source of moisture can be air blowing across the body of water (e.g., a large lake, ocean).

Some winter storms are large enough to immobilize an entire region, while others may affect only a single community. Winter storms typically are accompanied by low temperatures, strong winds, freezing rain, sleet, and heavy snowfall. The aftermath of a winter storm can have an impact on a community or region for days, weeks, or even months, potentially causing cold temperatures, flooding, closed and blocked roadways, downed utility lines,

[366] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Winter Weather Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/winter/.
[367] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Types of Winter Weather. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/winter/types/.
[368] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Winter Weather Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/winter/.

and power outages. In Onondaga County, winter storms include snowstorms, blizzards, lake effect snow, and ice storms. Additionally, cold waves/extreme cold temperatures are associated with winter weather, but can occur without a winter storm.

Snowstorms

A storm where precipitation falls as snow is called a snowstorm. Snowflakes, a collection of frozen ice crystals, form as water vapor condenses into water droplets and freezes. The ice crystals stick together as they fall to the ground, forming snowflakes. During the winter months, most precipitation forms as snow within the clouds because the temperature at the top of a storm is cold enough to produce snowflakes. If the temperature between the cloud and the ground remains at or below freezing (32°F), the precipitation will fall as snow.

A snow flurry is a snowstorm with no accumulation beyond a light dusting. A snow shower is a brief snowstorm in which snow falls at varying intensities, with some accumulation. If snow showers are accompanied by strong gusts of wind and snow accumulation, these are called snow squalls.

Blizzards

Even though heavy snowfall and severe cold often accompany blizzards, they are not required.[369] NWS defines a blizzard as a storm with winds greater than 35 mph, accompanied by falling or blowing snow, resulting in visibility of 0.25 miles or less. These conditions must be predominant for at least three (3) hours for the snowstorm to be considered a blizzard. Extremely cold temperatures are often associated with blizzard conditions, but are not a formal part of the definition. Usually, blizzard conditions build up on the northwest side of a powerful snowstorm. The difference between the lower pressure in the storm and the higher pressure to the west creates a tight pressure gradient, resulting in strong winds, which cause the blowing snow, which reduces the visibility. When strong winds pick up snow that has already fallen, it is called a ground blizzard.[370]

Lake Effect Storms

Lake effect storms are not low pressure systems. Unlike most snowstorms, which form as a result of a low pressure system lifting moist air into the atmosphere, lake effect storms form due to the abundance of moisture from the Great Lakes. As cold, dry air from the north (often originating in Canada) moves over the unfrozen, relatively warm Great Lakes, it picks up large amounts of water vapor, which then condenses and falls as heavy snowstorms in the areas south and east of the Lakes.[371] These storms can produce two (2) to three (3) inches of snow per hour, or more.

The direction of the wind plays a key role in determining which areas will receive the lake effect snow. For example, heavy snow can be falling in a location while being sunny in another location a mile away. The physical geography of land and water is also important.[372]

Nor'easter

A nor'easter is a storm that occurs along the East Coast; its name comes from the fact that the winds over the coastal area are typically from the northeast. These storms may occur at any time of year, but are most frequent and severe between September and April. Usually, nor'easters develop in the latitudes between Georgia and New Jersey, within 100 miles east or west of the East Coast. These storms progress generally northeastward and typically attain maximum intensity near the New England and the Maritime Provinces of Canada. These types of storms nearly

[369] Ibid.
[370] University Corporation for Atmospheric Research. (n.d.). Blizzards. Retrieved from https://scied.ucar.edu/learning-zone/storms/blizzards.
[371] University Corporation for Atmospheric Research. (n.d.). Winter Storms. Retrieved from https://scied.ucar.edu/learning-zone/storms/winter-storms.
[372] National Weather Service. (n.d.). What is a Lake Effect Snow? Retrieved from https://www.weather.gov/safety/winter-lake-effect-snow.

always bring precipitation in the form of heavy rainfall or snow, as well as winds of gale force, rough seas, and, occasionally, coastal flooding.

The East Coast is an ideal region for nor'easter development. In the winter months, the polar jet stream carries cold Arctic air south across the plains of Canada and the United States, then eastward towards the Atlantic Ocean, where warm air from the Gulf of Mexico and the Atlantic tries to move northward. The warmer Gulf Stream waters keep coastal waters relatively mild during winter, which in turn helps warm the cold air above the water. This difference in temperature between the warm air over water and the cold air over land serves as fuel for nor'easters.[373]

Ice Storm

An ice storm is a storm that results in at least 0.25 inches of ice accumulation on exposed surfaces (i.e., a significant accumulation of freezing rain lasting several hours or more). These storms create extremely hazardous driving and walking conditions. Additionally, the accumulation of ice on trees, power lines, and communication towers can bring them down, causing severe damage. **Table 4-150** outlines additional ice-related hazards.[374]

Table 4-150. Ice-Related Hazards

Type	Description
Black Ice	It is a deadly driving hazard. Black ice is patches of ice on roadways or other transportation surfaces that are not easily seen because they are often clear with black road surfaces. It is more prevalent in the morning, after snow melts on roadways and then freezes overnight. Black ice can also form when roadways are slick from rain, and the temperature drops to freezing.
Ice Jams	Long, cold waves can cause rivers and lakes to freeze. A rise in the water level or a thaw breaks the ice into large chunks, which become jammed at human-made and natural obstructions. Ice jams can act as dams, causing severe flooding. *Floods are addressed separately in this Plan.*
Frost	Frost is the formation of thin ice crystals on the ground or other surfaces in the form of scales, needles, feathers, or fans. Frost develops under conditions similar to dew, except the temperatures of the Earth's surface and earthbound objects fall below 32°F. As with the term "freeze," this condition is primarily significant during the growing season. If a frost period is sufficiently severe to end the growing season or delay its start, it is commonly called a "killing frost." Because frost primarily results from radiational cooling, it often occurs with a thermometer reading in the mid-30s.

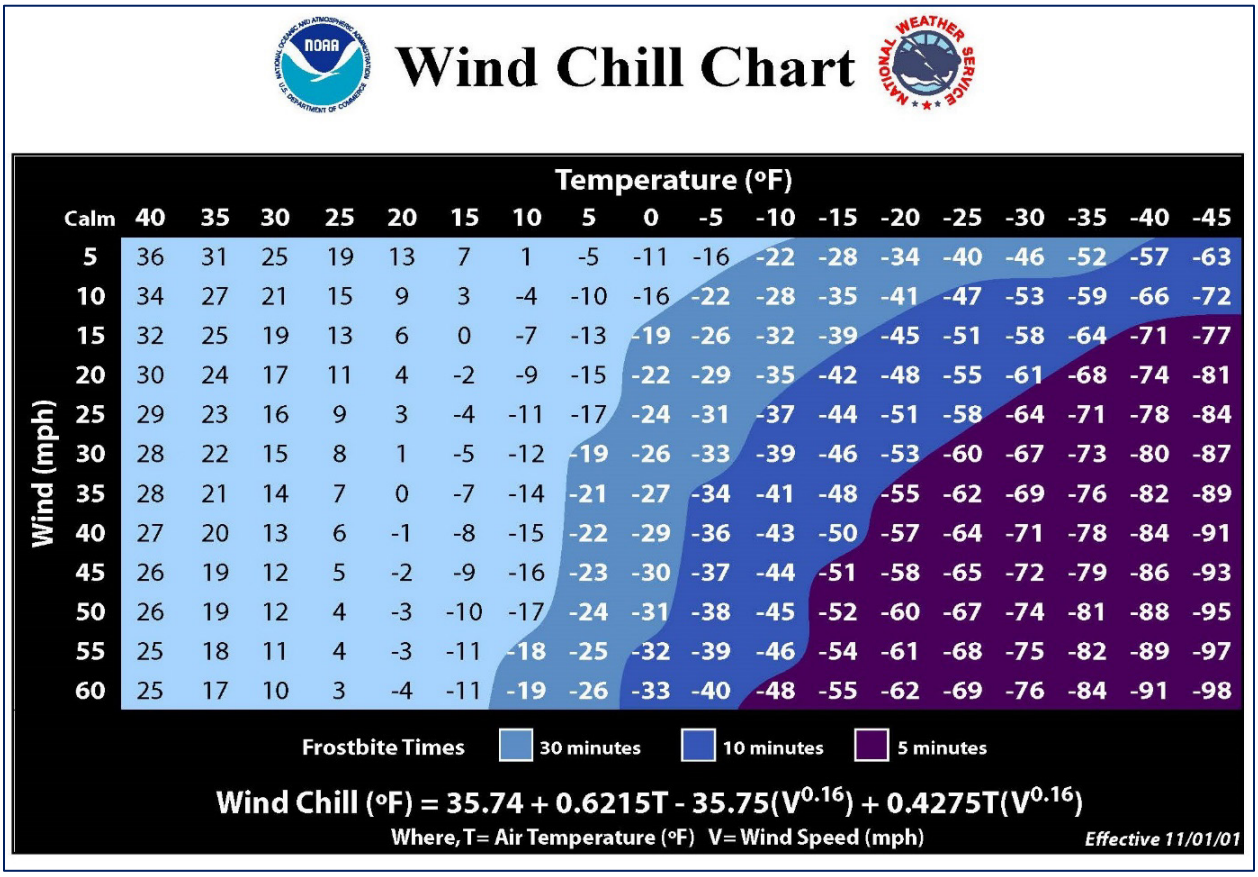
Cold Wave/Extreme Cold

Cold waves are rapid temperature drops within 24 hours and/or when extremely low temperatures are expected to persist for an extended period. The temperatures classified as cold waves are determined by the local NWS Forecast Office and depend on location.[375] The Wind Chill Index is a measure of how cold it really feels when there is wind and low temperatures. It considers the human body's heat loss to its surroundings during cold, windy weather.[376]

The wind chill index helps determine when dangerous conditions develop that could lead to frostbite and hypothermia.[377] **Figure 4-41** illustrates the NWS Wind Chill Chart.

[373] National Weather Service. (n.d.). What is a Nor'easter? Retrieved from https://www.weather.gov/safety/winter-noreaster.
[374] National Weather Service. (n.d.). Ice Storms. Retrieved from https://www.weather.gov/safety/winter-ice-frost.
[375] Federal Emergency Management Agency. (2023). Cold Wave. Retrieved from https://hazards.fema.gov/nri/winter-weather.
[376] National Weather Service. (n.d.). Wind Chill Chart. Retrieved from https://www.weather.gov/safety/cold-wind-chill-chart.
[377] Ibid.

Figure 4-41. National Weather Service Wind Chill Chart



4.6.10.2. Location

All of Onondaga County is susceptible to and experiences winter weather. The City of Syracuse is typically among the top 10 cities in the country for annual snowfall.

4.6.10.3. Extent/Intensity

Often called the "deceptive killer", winter weather can be life-threatening and cause substantial damage to infrastructure, property, and agriculture. Furthermore, many deaths are attributed to indirect effects of winter weather (e.g., icy roads increase traffic accidents). The extent of damage caused by winter weather depends on its type, intensity, and location.

The NWS Binghamton, New York Weather Forecast Office is responsible for issuing winter weather advisories, as conditions warrant. **Table 4-151** outlines the winter weather advisories.[378]

Table 4-151. National Weather Service Winter Weather Advisories

Type	Description
Winter Weather Advisory	Issued when snow, blowing snow, ice, sleet, or a combination of these wintry elements is expected, but conditions should not be hazardous enough to meet warning criteria. Be prepared for winter driving conditions and possible travel difficulties.

[378] National Weather Service. (n.d.). Winter Weather Warnings, Watches, and Advisories. Retrieved from https://www.weather.gov/safety/winter-ww.

Type	Description
Winter Storm Watch	Issued when conditions are favorable for a significant winter storm event (e.g., heavy sleet, heavy snow, ice storm, heavy snow and blowing snow, or a combination of events).
Winter Storm Warning	Issued for a significant winter weather event, including snow, ice, sleet, or blowing snow, or a combination of these hazards. Travel will become difficult or impossible in some situations.
Blizzard Warning	Issued for frequent gusts greater than or equal to 35 mph accompanied by falling and/or blowing snow, frequently reducing visibility to less than 1/4 mile for three (3) hours or more. A Blizzard Warning means severe winter weather conditions are expected or occurring. Falling and blowing snow, strong winds, and poor visibility are likely, leading to whiteout conditions and making travel extremely difficult.
Lake Effect Snow Advisory	Issued for widespread or localized lake effect snowfall accumulation (and blowing snow) remaining below warning criteria. Expect lake effect snow showers, and assume travel will be difficult in some areas. Some localized snow bands will be intense enough to produce several inches in a few areas, leading to sudden reductions in visibility.
Lake Effect Snow Warning	Issued when widespread or localized lake induced snow squalls or heavy showers are expected to produce significant snowfall accumulation. Lake effect snow usually develops in narrow bands and impacts a limited area. These bands can produce very heavy snow, leading to sudden reductions in visibility. Driving conditions may become hazardous at times.
Ice Storm Warning	Usually issued for ice accumulation of around 1/4 inch or more. This amount of ice accumulation will make travel dangerous or impossible, and it is likely to lead to snapped power lines and falling tree branches.

The Winter Storm Severity Impact Index (WSSI) is a tool that assists NWS operational forecasters in maintaining situational awareness of the possible significance of weather-related impacts based upon the current official forecast. Additionally, it helps enhance communication with external partners (e.g., emergency managers, public safety officials), the media, and the general public about the expected severity of potential societal impacts from winter weather hazards and their distribution. **Table 4-152** outlines the WSSI impact definitions.[379]

Table 4-152. National Weather Service Winter Storm Severity Index

Index		Description
	Winter Weather Area	**Expect Winter Weather.** • Winter driving conditions. Drive Carefully.
	Minor Impacts	**Expect a few inconveniences to daily use.** • Winter driving conditions. Use caution while driving.
	Moderate Impacts	**Expect disruptions to daily use.** • Hazardous driving conditions. Use extra caution while driving. • Closures and disruptions to infrastructure may occur.
	Major Impacts	**Expect considerable disruptions to daily use.** • Dangerous or impossible driving conditions. Avoid travel if possible. • Widespread closures and disruptions to infrastructure may occur.
	Extreme Impacts	**Expect substantial disruptions to daily use.** • Extremely dangerous or impossible driving conditions. Travel is not advised. • Extensive and widespread closures and disruptions to infrastructure may occur. • Life-saving actions may be needed.

NCEI is developing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from one (1) to five (5) and is based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with

[379] National Weather Service. (2023). Winter Storm Severity Index (WSSI): Product Description Document. Retrieved from https://www.wpc.ncep.noaa.gov/wwd/wssi/WSSI_PDD_2022-23.pdf.

population, including societal impacts (based on the 2000 Census). The NCDC has analyzed and assigned RSI values to over 500 storms since 1900. **Table 4-153** outlines the five (5) RSI categories.[380]

Table 4-153. Regional Snowfall Index

Category	RSI Value	Description
1	1 – 3	Notable
2	3 – 6	Significant
3	6 – 10	Major
4	10 – 18	Crippling
5	18 +	Extreme

A cold wave is likely to accompany winter weather events. However, extreme cold can occur due to varying atmospheric conditions and may not always coincide with obvious cold-weather events (e.g., winter storms, ice storms). When significant cold temperatures are expected, the NWS Binghamton, New York Forecast Office issues wind chill, freeze, and frost advisories, watches, and warnings. **Table 4-154** outlines the cold weather products issued by the local NWS Forecast Office.

Table 4-154. National Weather Service Cold Weather Advisories

Type	Description
Cold Weather Advisory	Issued when seasonably cold air temperatures or wind chill values, but not extremely cold values, are expected or occurring.
Extreme Cold Watch	Issued when dangerous cold air, with or without wind, is **possible**.
Extreme Cold Warning	Issued when dangerously cold air, with or without wind, is **expected**.
Freeze Watch	Issued when there is a potential for significant, widespread freezing temperatures within the next 24 to 36 hours. A freeze watch is issued in the autumn until the end of the growing season and in the spring at the start of the growing season.
Freeze Warning	Issued when temperatures are forecasted to go below 32°F for an extended period of time. This temperature threshold kills some types of commercial crops and residential plants. A hard freeze is when temperatures are below 28°F.

4.6.10.4. Probability and Frequency

The probability of occurrence for winter weather (i.e., blizzards, lake effect storms, nor'easters, ice storms) in Onondaga County is high because a significant event is likely to occur annually. The planning area can expect to experience exposure to some type of winter weather event at least annually.

The winter weather annualized frequency value represents the average number of recorded winter weather hazard occurrences, in event days, per year over the period of record (16.9 years). **Table 4-155** outlines the annualized frequency of winter weather in Onondaga County, based on FEMA NRI data.

Table 4-155. Winter Weather Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(2005 – 2021)*	Annualized Frequency
Onondaga County	154	9.5 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

[380] NOAA, National Center for Environmental Information. (n.d.). Regional Snowfall Index (RSI). Retrieved from https://www.ncei.noaa.gov/access/monitoring/rsi/.

The ice storm annualized frequency value represents the average number of recorded ice storm hazard occurrences, in event days, per year over the period of record (67.1 years). **Table 4-156** outlines the annualized frequency of ice storms in Onondaga County, based on FEMA NRI data.

Table 4-156. Ice Storm Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(1946 – 2024)*	Annualized Frequency
Onondaga County	98	1.5 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

The probability of occurrence for cold wave/extreme cold in Onondaga County is medium because a significant hazard event is likely to occur within 25 years. The planning area can expect to experience exposure to a cold wave/extreme cold event at least annually.

The cold wave annualized frequency value represents the average number of recorded cold wave hazard occurrences, in event days, per year over the period of record (16.9 years). **Table 4-157** presents the annualized frequency of cold waves for Onondaga County, based on FEMA NRI data.

Table 4-157. Cold Wave Annualized Frequency for Onondaga County *(FEMA National Risk Index)*

Jurisdiction	Events on Record *(2005 – 2021)*	Annualized Frequency
Onondaga County	17	1.1 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

4.6.10.5. Past Events

Table 4-158 documents winter weather (i.e., blizzards, lake effect storms, nor'easter, ice storms) and cold wave/extreme cold from 1950 through 2024 in Onondaga County based on data collected from the NCEI database. Notably, on the afternoon of April 4, 2003, widespread freezing rain began in Onondaga County. In the evening, colder air spread further south in the Finger Lakes and the northern Susquehanna region. Ice accumulation ranged from 0.25 to 0.5 inches, with several locations recording up to one (1) inch. The severe ice storm left tens of thousands of customers without power for up to a week. Approximately $7.0 Million in damages was reported, and a State of Emergency and a presidential declaration (DR-1467) were issued for Onondaga County.

Table 4-158. Winter Weather Events in Onondaga County (1950 – 2024)

Type	Total Occurrences *(1950 – 2024)*	Fatalities	Injuries	Property Damage	Crop Damage
Blizzard	0	0	0	$0	$0
Cold Wave/Extreme Cold	4	0	0	$0	$0
Heavy Snow	84	1	1	$618,000	$0
Ice Storm	7	0	0	$7.0 Million	$0
Lake Effect Snow	45	0	0	$55,000	$0
Sleet	0	0	0	$0	$0
Winter Storm	24	0	0	$0	$0
Winter Weather	2	0	0	$0	$0
Total	**174**	**1**	**1**	**$7.7 Million**	**$0**

The NOAA-NCEI database reports winter weather events from 1996 to present; therefore, the information presented does not include events that occurred before 1996.

According to the NCEI Storm Events database, there have been no significant severe winter weather events in Onondaga County in the past five (5) years.

Between 1953 and 2024, FEMA included New York State in 23 winter weather-related major disaster (DR), or emergency (EM) declarations classified as one or a combination of the following disaster types – snowstorms and severe ice storm. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Onondaga County was included in two (2) of these winter weather-related declarations, listed in **Table 4-159**.[381]

Table 4-159. Disaster Declarations for Onondaga County

Disaster Number	Incident Period	Declaration Date	Incident Category	Title
DR-1467	April 3, 2003 – April 5, 2003	May 12, 2003	Severe Ice Storm	New York Ice Storm
DR-3107	March 13, 1993 – March 17, 1993	March 17, 1993	Snowstorm	New York Severe Blizzard

The United States Department of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans available to producers suffering losses in those counties and in contiguous counties. Between 2012 and 2024, Onondaga County has been included in the following nine (9) USDA disaster declarations in relation to severe winter weather, listed in **Table 4-160**.[382]

Table 4-160. USDA Disaster Designation (2019 – 2024)

Designation Number	Date	Description
S5698	April 22, 2024 – April 27, 2024	Frost and Freeze.

[381] Federal Emergency Management Agency. (2024). Disaster Declarations for States and Counties. Retrieved from https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties.
[382] United States Department of Agriculture. (2024). Disaster Designation Information. Retrieved from https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index.

Designation Number	Date	Description
S5485	May 14, 2023 – May 25, 2023	Frost and Freeze.
S4903	April 1, 2020 – June 1, 2020	Frost and Freeze.
S4904	April 15, 2020 – June 1, 2020	Freeze

4.6.10.6. Vulnerability and Impacts

Life Safety and Public Health: The entire population of Onondaga County is vulnerable to winter weather (i.e., winter storms and cold waves/extreme cold). The population that is vulnerable to these winter weather events will likely experience some adverse impacts to this hazard.

A large number of deaths that occur due to winter weather are not directly related to the weather itself. For example, people die in traffic accidents due to ice on the roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to cold. Injuries related to ice and snow occur in automobiles (70%), among people caught out in the storm (25%), and primarily among males over 40 years old.[383] Additionally, winter weather can create slippery, icy conditions, increasing the risk of slips and falls that can result in fractures and head trauma. Hazardous driving conditions caused by snowfall and icy roads increase the risk of vehicle accidents, leading to injuries and fatalities. Heavy ice and snow accumulation can weigh down trees and communication and power lines, which can result in extensive power outages. Subsequently, power outages result in a loss of heat in residences and businesses.[384] If heat is unavailable for an extended period during a winter weather event, individuals are exposed to extremely cold temperatures even indoors.

Hypothermia and frostbite are both dangerous conditions that can happen when a person is exposed to extremely cold temperatures. Hypothermia occurs when the body loses heat faster than it produces it, leading to lower body temperatures. Those at a higher risk for hypothermia include, but are not limited to, older adults with inadequate food, clothing, or heating, babies sleeping in cold bedrooms, and people who remain outdoors for extended periods of time (e.g., houseless individuals, hikers).[385] Frostbite is a type of injury caused by freezing, and it can permanently damage the body.[386]

Underserved and At-Risk Population: The underserved and at-risk population exposed to winter weather in Onondaga County is likely to experience some adverse/disproportionate impacts. This population faces unique vulnerabilities and impacts from winter weather events and includes, but is not limited to, children, the elderly, low-income families, outdoor workers, and the homeless population. Children are more vulnerable to cold waves/extreme cold events because they are less able to regulate their body temperature, and exposure to extreme cold can quickly lead to hypothermia. Infants are uniquely vulnerable to hypothermia because of their large body surface area, small amount of subcutaneous fat, and decreased ability to shiver.[387] Furthermore, children are more likely to play outside and may lack the judgment to stay warm in extreme cold. The elderly are uniquely vulnerable due to their body's decreased ability to regulate temperature and are more likely to have chronic medical conditions

[383] National Oceanic and Atmospheric Administration, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Winter Weather Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/winter/.
[384] National Weather Service. (n.d.). Ice Storms. Retrieved from https://www.weather.gov/safety/winter-ice-frost.
[385] Centers for Disease Control and Prevention. (2024). Preventing Hypothermia. Retrieved from https://www.cdc.gov/winter-weather/prevention/index.html.
[386] Centers for Disease Control and Prevention. (2024). Prevent Frostbite. Retrieved from https://www.cdc.gov/winter-weather/prevention/preventing-frostbite.html.
[387] American Academy of Pediatrics. (2024). Extreme Temperatures: Disaster Management Resources. Retrieved from https://www.aap.org/en/patient-care/disasters-and-children/disaster-management-resources-by-topic/extreme-temperatures.

and to take prescription medication that affects the body's ability to control temperature. Extreme cold can exacerbate chronic medical conditions (e.g., diabetes, thyroid problems, arthritis, Parkinson's disease) because these individuals may be less likely to sense or respond to changes in temperature and may be taking medications that can increase the effects of cold temperatures.[388] Low-income families may not have the financial means to install heating systems, making it harder to stay warm, comfortable, and healthy during periods of extreme cold. Additionally, there is a correlation between low-income and poor health outcomes and preexisting health conditions among the low-income population. Low-income individuals may be uninsured and are less likely to seek medical attention if they become ill. Outdoor workers include, but are not limited to, agriculture, construction, building maintenance, and landscaping. This population is significantly vulnerable to cold waves/extreme cold events because these jobs, often physically intense, require them to be outside and expose them to the risk of cold-related illnesses (e.g., hypothermia, frostbite). Furthermore, outdoor work may be halted during cold weather, which can cause significant economic hardship. The homeless population is uniquely vulnerable because of a lack of shelter and exposure to winter weather and extreme cold temperatures. Additionally, the elderly have an increased risk of injuries and death from falls and overexertion from attempts to clear snow and ice.

The population living in isolated areas is uniquely vulnerable because, if roads become inaccessible, assistance will be delayed, and if communication systems are disrupted, this population will be unable to call for assistance. Winter weather can cause power outages, which can be life-threatening to those dependent on electricity for life support. Furthermore, individuals without adequate warning of winter weather (i.e., limited access to modern communication) are uniquely vulnerable.

Table 4-161 summarizes the vulnerable and at-risk population for winter weather in Onondaga County.

Table 4-161. Underserved and At-Risk Population

Category	Estimate	Percent
Population in Poverty (i.e., low-income population)[389]	62,884	13.9%
Uninsured Population[390]	15,532	3.3%
Senior (65 years old and over)[391]	85,781	18.2%
Children (5 years old and under)[392]	25,989	5.5%

Property Damage and Critical Infrastructure: 10% to 24% of the total assessed property, infrastructure, and resources value in Onondaga County is vulnerable (i.e., exposed) to winter weather. Less than $500,000 in property damages is expected from a single major winter weather event, or less than 5% of the property value within the County.
Properties that are not in adequate structural conditions or in particularly vulnerable locations may be uniquely vulnerable to significant roof and structural damage, which can result in a collapse if ice and snow accumulate.

Winter weather can severely impact critical infrastructure and property by damaging and destroying buildings and equipment. These damages include frozen electrical equipment, cracked water pipes, dangerous/damaged roads,

[388] National Institute on Aging. (2024). Cold Weather Safety for Older Adults. Retrieved from https://www.nia.nih.gov/health/safety/cold-weather-safety-older-adults.
[389] United States Census Bureau. (2023). S1701: Poverty in the Past 12 Months (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S1701?g=050XX00US36067.
[390] United States Census Bureau. (2023). S2701: Selected Characteristics of Health Insurance Coverage in the United States (2023: ACS 5-Year Estimates Subject Tables). Retrieved from https://data.census.gov/table/ACSST5Y2023.S2701?g=050XX00US36067.
[391] United States Census Bureau. (2023). DP05: ACS Demographic and Housing Estimates (2023: ACS 5-Year Estimates Data Profiles). Retrieved from https://data.census.gov/table/ACSDP5Y2023.DP05?g=050XX00US36067.

damaged bridges, and damaged aircraft systems.[392] Full functionality of critical facilities (e.g., police, fire, medical facilities) is essential for response operations during and after a winter weather event. These critical facility structures are largely constructed of concrete and masonry; therefore, they should only suffer minimal structural damage from winter weather events.

The electrical infrastructure may fail during winter weather events due to damaged or destroyed power lines and poles. Snow and ice can weigh down trees, which can fall and damage communication and power lines, as well as other infrastructure. This can cause power outages, leaving individuals without electricity and heat for an extended period. Between 2000 and 2023, snow, ice, and freezing rain accounted for 23% of the weather-related power outages in the United States.[393] The transportation infrastructure is also vulnerable to winter weather. For example, roadways can be damaged over time by salt application and by intermittent freezing and thawing. Severe snowfall requires clearing roadways and alerting citizens to dangerous conditions; after the winter season, resources for road maintenance and repair are needed.

Economy: The cost of snow and ice removal and road repairs from the freeze-thaw process can drain local financial resources. Another impact on the economy is commuting into or out of the area for work or school. Power outages can prevent the commuter population from traveling to work within and outside the County. Depending on the severity of a storm, the State, County, or municipalities can implement travel advisories or restrictions. With these advisories and restrictions in place, businesses and government offices may be forced to close, resulting in revenue losses.

The communities in Onondaga County spend significant resources treating the roadways before and after winter weather events. The City of Syracuse implemented a sidewalk-clearing program on major roadways to allow students, workers, and other commuters to walk safely to their destinations. Historically, many commuters were forced to walk in the streets while sidewalks remained covered with snow.

Changes in Development and Impact of Future Development: Changes in development have minimally increased the vulnerability of Onondaga County to winter weather (i.e., winter storms and cold waves/extreme cold). Future development trends will minimally increase the impact of winter weather within Onondaga County.

Projections provided by New York State's economic development agency indicate that the five (5) counties within the Central New York region could have 60,000 additional residents in 2040, which is above and beyond what the population would be at that time. Onondaga County, home to half of the population in the five (5) county area, is in a position to add approximately 30,000 new residents by 2040. An increase in population will require more housing. This is in part due to Micron's arrival in the County.[394] Increasing the population and development could minimally increase the County's overall vulnerability to winter events. However, current New York State land use and building codes incorporate standards that address and mitigate snow accumulation. Some local municipalities in Onondaga County have implemented the following activities to eliminate loss of life and property, and infrastructure damage during winter weather events:

- Remove snow from roadways and sidewalks.
- Remove dead trees and trim trees/brush from roadways to lessen falling limbs and trees.
- Ensure proper road signs are visible and installed properly.

[392] Cybersecurity & Infrastructure Security Agency. (n.d.). Extreme Cold. Retrieved from https://www.cisa.gov/topics/critical-infrastructure-security-and-resilience/extreme-weather-and-climate-change/extreme-cold.
[393] Climate Central. (2024). Weather-related Power Outages Rising. Retrieved from https://www.climatecentral.org/climate-matters/weather-related-power-outages-rising.
[394] Onondaga County. (2024). Onondaga County Housing Needs Assessment. Retrieved from https://plan.ongov.net/wp-content/uploads/2024/06/OnondagaHousing_JUNE2024_FINAL.pdf.

- Bury electrical and telephone utility lines to minimize downed lines.
- Remove debris/obstructions in waterways and develop routine inspections/maintenance plans to reduce potential flooding (after the snow melts).
- Replace substandard roofs of critical facilities to reduce exposure to airborne germs or mold resulting from leakage.
- Purchase and install backup generators in shelter and critical facilities to provide essential services to residents.
- Install cell towers in areas where limited telecommunication is available to increase emergency response and cell phone coverage.

Effects of Climate Change in Severity of Impacts: Future projections of winter weather can be complex to clearly delineate because climate projection science is not yet granular enough to explain the behavior of all storms. However, a few important factors have been analyzed when considering potential trends in future winter weather – winter seasonal temperatures (average daily high and average daily low across the season), changes in average winter precipitation, and changes in maximum daily precipitation.

Figure 4-42 illustrates the average daily low temperatures across the winter season (December, January, and February) in the historical model. The data indicate that the average daily low temperature ranged from 16°F to 18°F across the entire County. Although this is not a particularly large range, the coldest areas are projected along the southern edge of the County. In contrast, the City of Syracuse is projected to be the warmest area in the County.

Figure 4-43 illustrates the average daily low temperatures across the winter season in the mid-century model. The data indicate that average daily low temperatures are projected to increase by approximately 23.5°F. This is a significant shift in daily low temperatures, projected to continue throughout the century, suggesting a less reliable cold winter across Onondaga County.

Figure 4-42. Winter Average Daily Low Temperature *(Historical Model)*

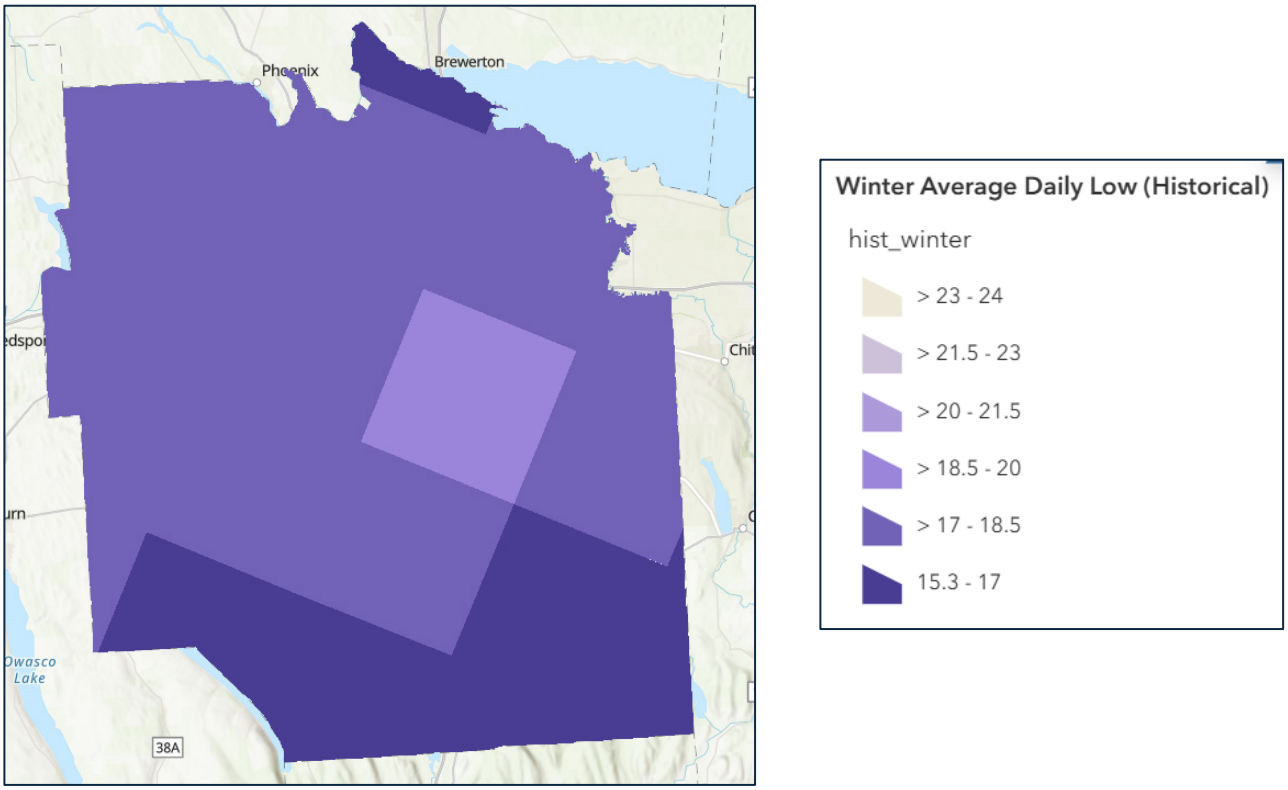


Figure 4-43. Winter Average Daily Low Temperature *(RCP8.5: Mid-Century Model)*

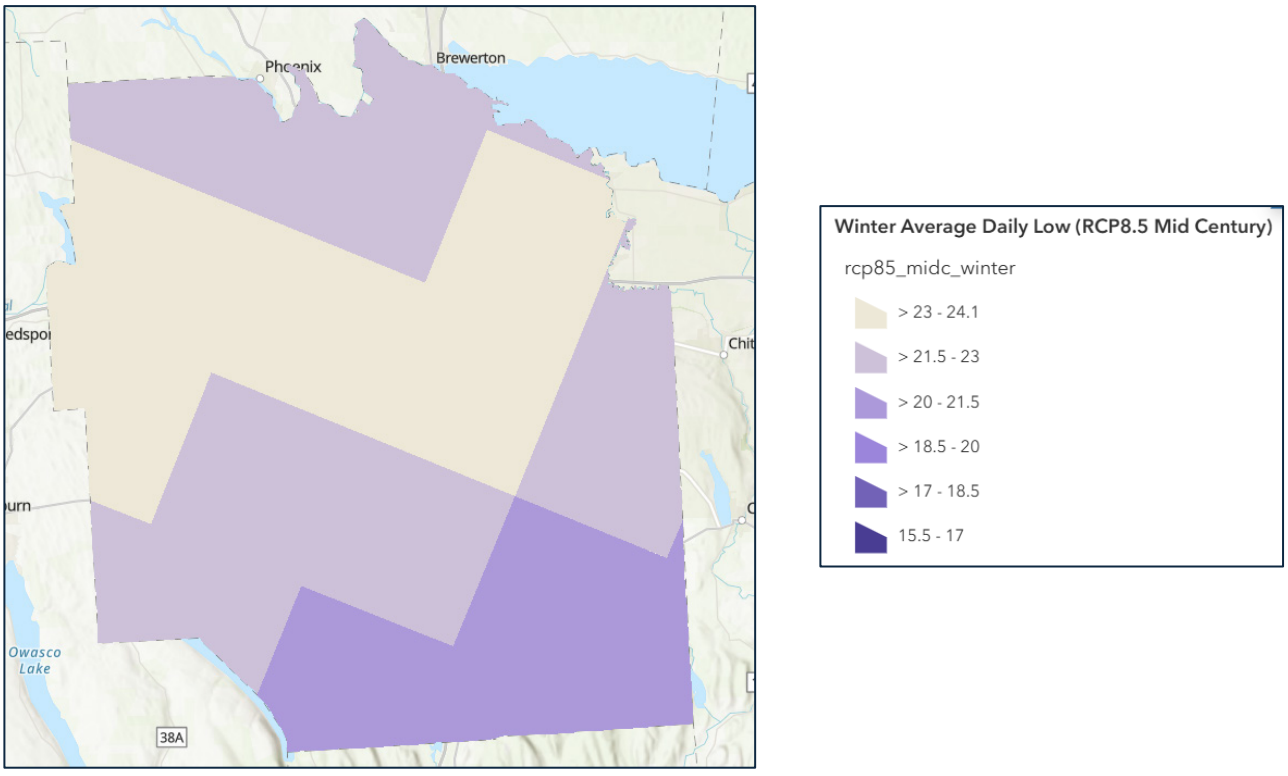


Figure 4-44 illustrates the average daily high temperatures across the winter season in Onondaga County in the historical model. The data indicates that the average daily high temperature will remain just slightly below freezing temperatures. The historical model suggests that a significant number of days during the winter season remained above 32°F.

Figure 4-45 illustrates the average daily high temperatures across the winter season in the mid-century model. The data indicates that average daily high temperatures are projected to increase by approximately 3.5°F, bringing the County's average daily high temperatures slightly above freezing (35°F). This could begin to shift the impact and prevalence of freeze-thaw cycles within the region. A freeze-thaw cycle occurs when the air temperature drops low enough to freeze water (32°F), then increases enough for it to thaw again.[395] Although extremely cold temperatures will continue to occur during the winter season, the models do not indicate that extreme cold weather events will significantly become more severe by mid-century in Onondaga County.

[395] GLISA. (n.d.). Freeze-Thaw Cycles. Retrieved from https://glisa.umich.edu/resources-tools/climate-impacts/freeze-thaw-cycles/.

Figure 4-44. Winter Average Daily High Temperature *(Historical Model)*

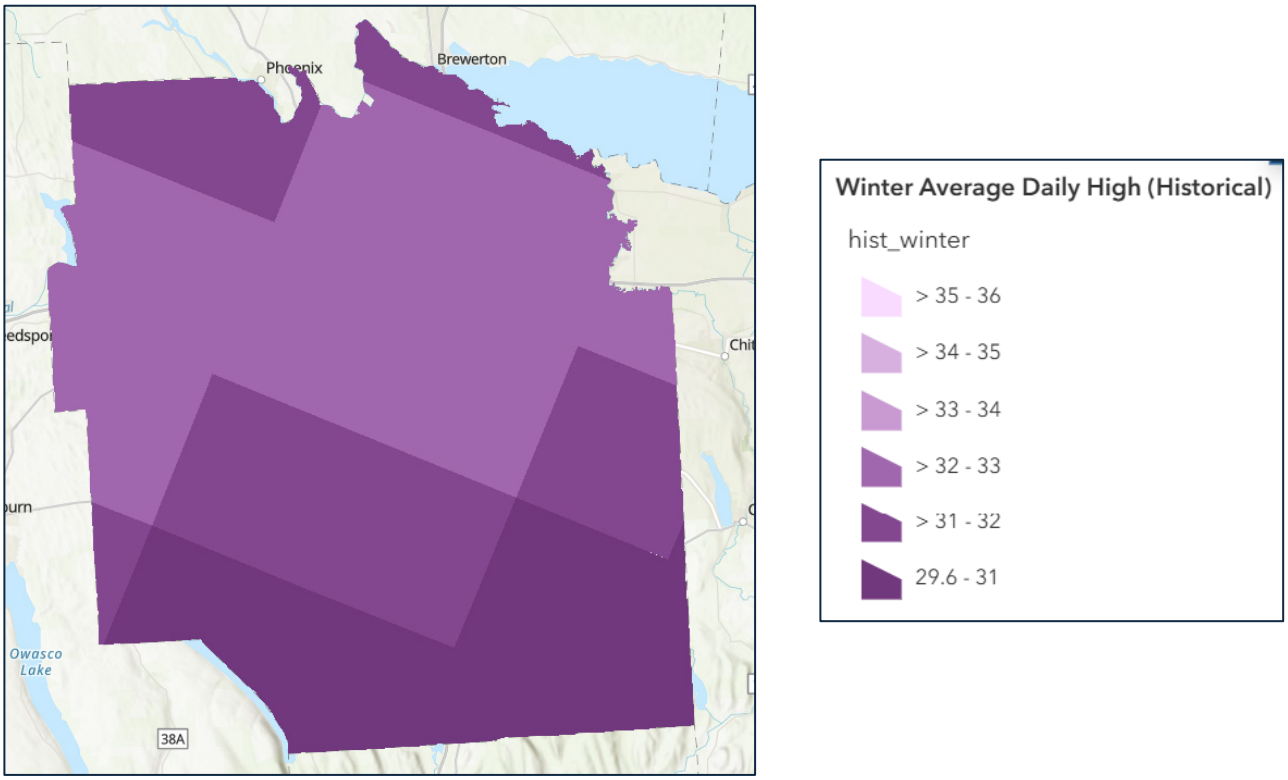


Figure 4-45. Winter Average Daily High Temperature *(RCP8.5: Mid-Century Model)*

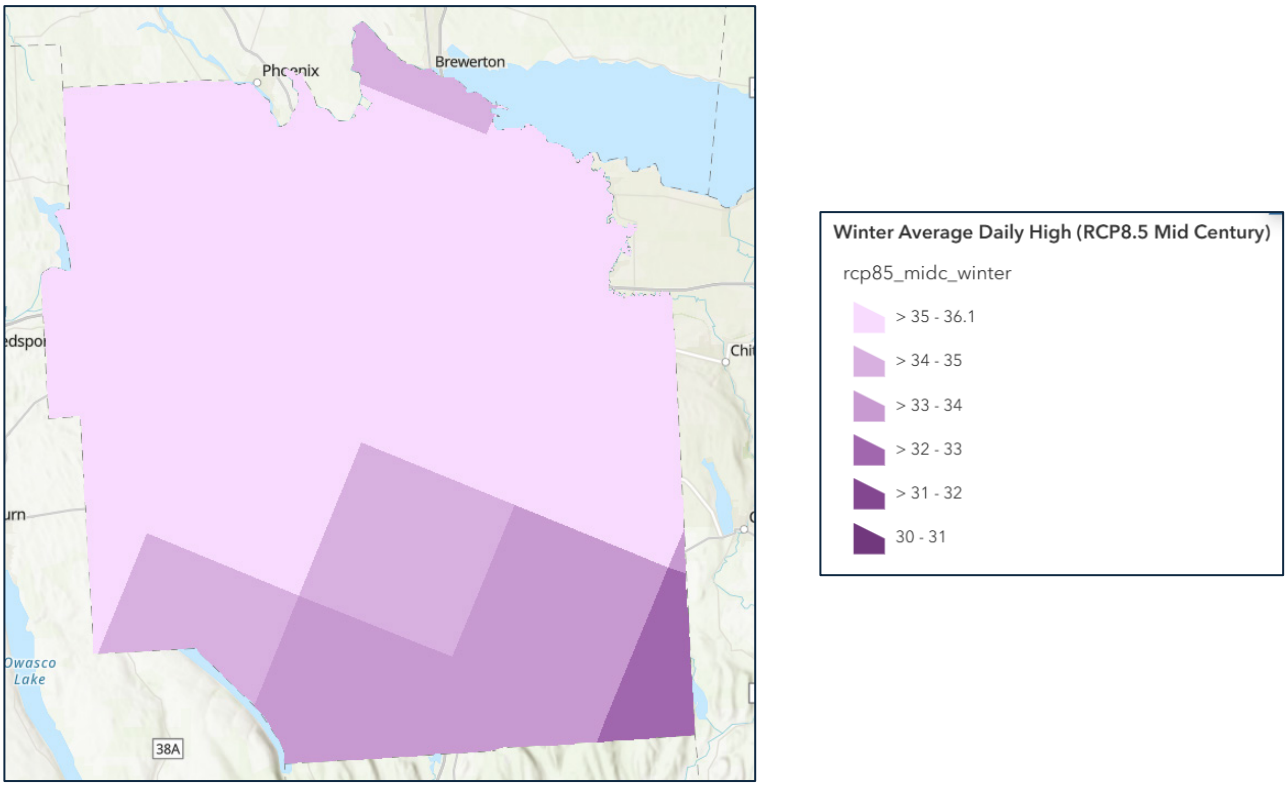


Figure 4-46 illustrates the projected change in average winter precipitation from the historical model to the mid-century model. The data indicates an increase in the seasonal average between 6% and 9%. Although the projected increase should be considered for future planning, it is not significantly higher than the national trend. Additionally, as winters warm, it is important to consider the possibility that less winter precipitation will fall as snow as the century progresses. When considering the percent change in average winter precipitation, it is beneficial to consider the percent change in maximum single-day precipitation. **Figure 4-47** illustrates the percent change in maximum single-day winter precipitation from the historical model and the mid-century model. The northeast and northwest parts of the County are showing an increase in the maximum single-day precipitation, while the rest of the County is showing a decrease. This suggests that Onondaga County is less likely to see a meaningful shift in winter storm output than other areas in the United States. To account for the increase in the average winter precipitation seen in **Figure 4-46** and the less significant positive change shown in **Figure 4-47**, it is possible that winter storms in this area will become more frequent.

Figure 4-46. Percent Change in Average Winter Precipitation
(Historical Model vs. RCP8.5:Mid-Century Model)

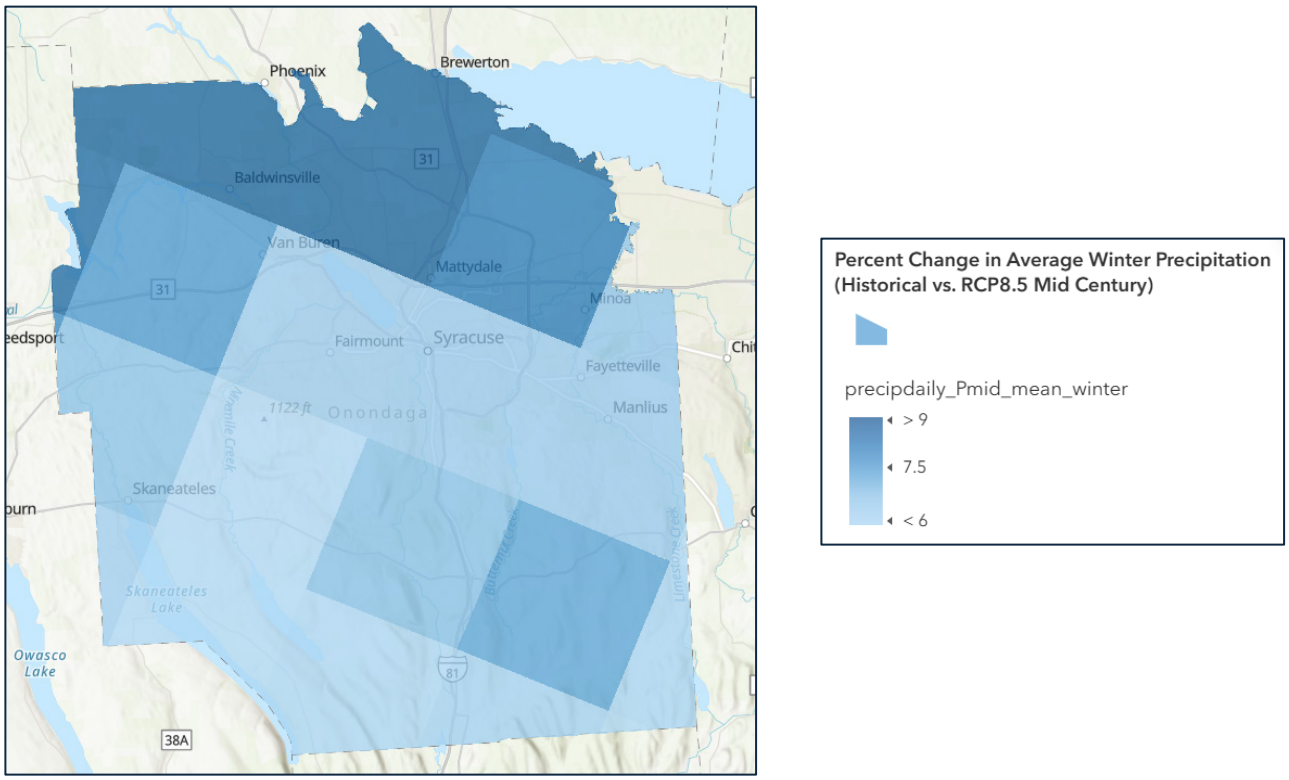
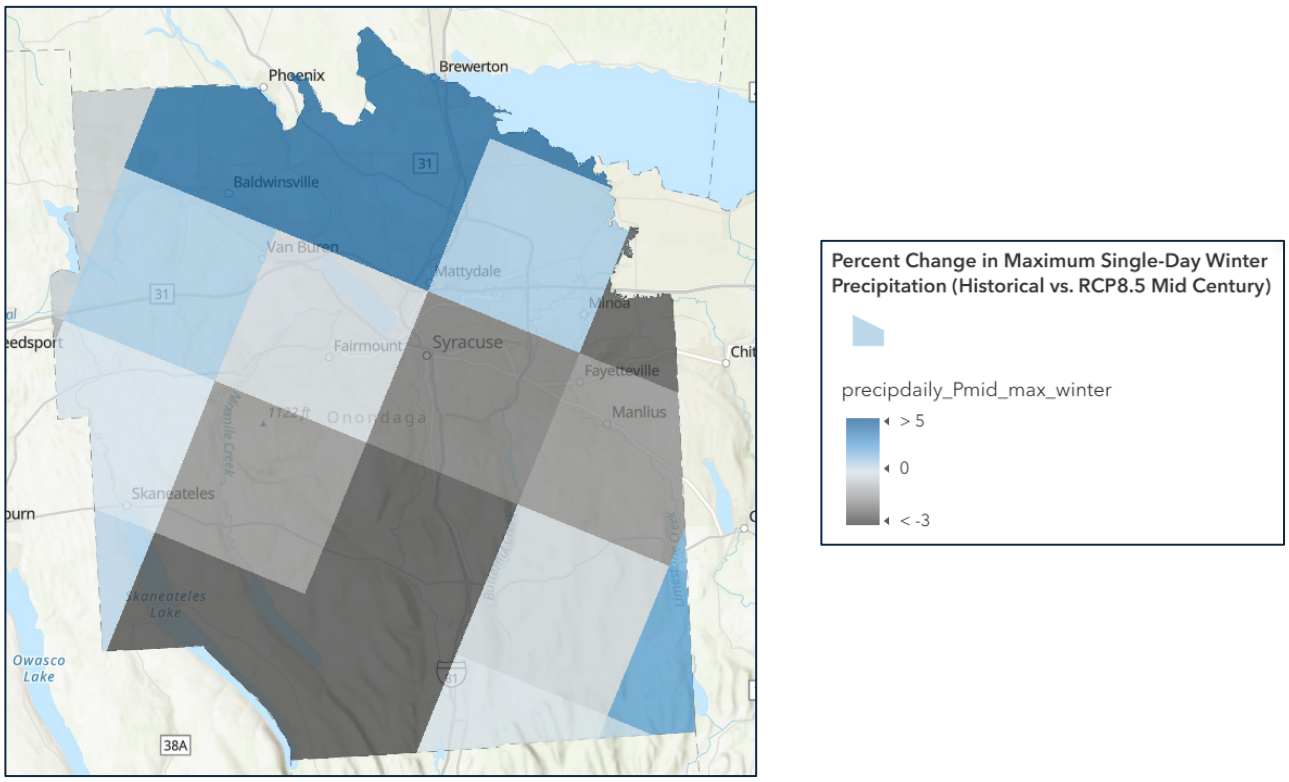


Figure 4-47. Percent Change in Maximum Single-Day Winter Precipitation
(Historical Model vs. RCP8.5:Mid-Century Model)



According to the New York State Climate Impacts Assessment, the Central Lakes region, which includes Onondaga County, is projected to experience an average annual temperature increase of 4.6°F to 6.4°F by the 2050s and 6.5°F to 11.7°F by the end of the century.[396] In New York State, it is projected that there will be less snowfall, less snow cover and accumulation, and a shorter snow season. However, lake effect snow could increase in the next few decades as the Great Lakes get warmer and freeze less often. Lake effect snow typically occurs when the Great Lakes are unfrozen, and it forms when cold air moves over warmer lake waters, causing moisture to evaporate and rise. This moisture then cools and condenses into clouds, often resulting in heavy snowfall. Nonetheless, it is projected that precipitation will fall as rain instead of snow by the end of the century. Snow cover is also crucial for the State's ecosystems. For example, less snow melting in the spring tends to result in lower water levels in streams and some wetlands, affecting the species that rely on them.[397]

Warming winter temperatures are reducing snow cover and shortening the snow season, impacting the winter recreational industry, which contributes millions of dollars annually to the State's economy. The industry is becoming increasingly reliant on artificial snowmaking as a short-term way to adapt.[398]

[396] New York State Energy Research and Development Authority. (2023). New York State Climate Impacts Assessment: Projections Methodology Report (Appendix: Climate Change Projections Tables, Average Temperature and Precipitation – Central Lakes). Retrieved from https://nysclimateimpacts.org/wp-content/uploads/2024/01/Appendix-Projections_Tables-1.pdf.
[397] New York State Energy Research and Development Authority. (2024). New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate (Precipitation Section). Retrieved from https://nysclimateimpacts.org/explore-the-assessment/new-york-states-changing-climate/nysc-precipitation/.
[398] New York State Department of Environmental Conservation. (2023). Climate Change Impacts on New York State. Retrieved from https://dec.ny.gov/sites/default/files/2023-12/climatechangeimpacts.pdf.

4.6.10.7. FEMA NRI Expected Annual Loss Estimates

A winter weather NRI EAL score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to winter weather when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-162** outlines the winter weather EAL for Onondaga County.

Table 4-162. Winter Weather Expected Annual Loss *(FEMA National Risk Index)*

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$13,262	$227,880	$124	$241,265	85.3	Very High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

An ice storm NRI EAL score and rating represent a community's relative level of expected building and population loss each year due to ice storms when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. **Table 4-163** outlines the ice storm EAL for Onondaga County.

Table 4-163. Ice Storm Expected Annual Loss *(FEMA National Risk Index)*

Jurisdiction	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
Onondaga County	$229,484	$755,173	n/a	$984,657	94.4	Very High
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).						

4.6.10.8. FEMA Winter Weather Risk Index Scores

The winter weather Risk Index score and rating represent a community's relative risk for winter weather when compared to the rest of the United States. **Table 4-164** illustrates the winter weather Risk Index rating and score for Onondaga County.

Table 4-164. Winter Weather Risk Index *(FEMA National Risk Index)*

Jurisdiction	Rating	Score
Onondaga County	83.1	Very High
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).		

The ice storm Risk Index score and rating represent a community's relative risk for ice storms when compared to the rest of the United States. **Table 4-165** illustrates the ice storm Risk Index rating and score for Onondaga County.

Table 4-165. Ice Storm Risk Index (FEMA National Risk Index)

Jurisdiction	Rating	Score
Onondaga County	93.7	Very High

Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience (Expected Annual Loss x Social Vulnerability / Community Resilience = Risk Index).

Table 4-166 outlines the winter weather Total Risk Score for Onondaga County, based on the Risk Assessment Methodology, as defined in this Plan. Additional details on how the Total Risk Score was calculated can be found in Section 4.3 of the Risk Assessment Methodology in this Plan.

Table 4-166. Winter Weather Total Risk Score

Hazard Event	Probability	Consequence				Total Risk
	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score*
Winter Weather (Blizzards, Lake Effect Snow, Nor'easter, Ice Storm)	3	12	14	21	47	67
Cold Wave/Extreme Cold	2	12	14	21	47	48

Consequence: *Sum of all weighted factors.*
Extent: *Sum of the weighted Extent factors.*
Vulnerability: *Sum of the weighted Vulnerability factors.*
Impact: *Sum of the weighted Impact factors.*
Total Risk Score *= Probability x Consequence*
** Normalized to 100*

Total Risk Score Legend

Classification	Probability Factor	Extent	Vulnerability	Impact	Consequence Score	Total Risk Score
Low (L)	1	0 – 6	0 – 6	0 – 12	0 – 24	0 – 24
Medium (M)	2	7 – 12	7 – 12	13 – 26	25 – 50	25 – 54
High (H)	3	13 – 18	13 – 18	27 – 39	51 – 75	55 and above

*The **legend**—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors. The **Total Risk Score** is a measure of Probability and Consequence.*

CHAPTER 5. MITIGATION STRATEGY

The heart of a Hazard Mitigation Plan is the Mitigation Strategy, which serves as the long-term blueprint for reducing the potential losses identified in the Hazard Risk Assessment. The Mitigation Strategy describes how the community will accomplish the overall purpose of the planning process. In this section, mitigation goals and objectives were reevaluated and updated, and mitigation actions were updated, identified, evaluated, and prioritized.

5.1. MITIGATION GOALS

The Hazard Identification and Risk Assessment section of this Plan identified that Onondaga County is prone to 10 natural hazards (**Table 4-1**). The Steering Committee and community stakeholders understand that although hazards cannot be eliminated, the many communities within Onondaga County can work together toward building disaster-resilient communities. **Table 5-1** lists five (5) goals and 19 objectives. The goals represent the County's long-term strategic vision for achieving successful mitigation efforts. The associated objectives are specific strategies and steps identified to assist the communities in attaining the listed goals.

Table 5-1. Onondaga County Mitigation Goals and Objectives

Goal 1	
Protect life, property, and the environment.	
Objectives	
1.A	Address repetitive and severe repetitive loss properties throughout the County.
1.B	Protect and maintain community lifelines, critical facilities, and infrastructure.
1.C	Identify flood and other natural hazard areas.
1.D	Improve detection, warning, and communication systems.
1.E	Pursue federal and state assistance toward the improvement of facilities and infrastructure.
1.F	Develop, maintain, strengthen, and promote the enforcement of ordinances, regulations, and other mechanisms that facilitate sustainable construction standards.
1.G	Integrate risk reduction concepts, policies, and projects into existing local and regional planning and implementation mechanisms (e.g., comprehensive plans, climate action plans, codes, and capital improvement plans).
Goal 2	
Increase understanding and awareness of natural hazard risk.	
Objectives	
2.A	Develop and implement additional education and outreach programs to increase public awareness of hazard areas and the risks associated with hazards, and to educate the public, including underserved and underrepresented groups, on specific, individual, and household preparedness activities with the overall goal of reducing general public dependency on disaster response and recovery support services.
2.B	Implement mitigation actions that enhance the capabilities of the County and communities to better profile and assess exposure to hazards and participate in state and local programs and efforts that focus on practices that support or enhance resiliency.
2.C	Work with municipalities, provide tools, partnership opportunities, funding resources, and current government initiatives to assist in implementing mitigation activities, including promoting awareness among homeowners, renters, and businesses about available insurance coverage for natural hazards.
2.D	Encourage property owners to take preventive measures in areas particularly vulnerable to hazards.

Goal 3	
Promote resiliency throughout the County.	
Objectives	
3.A	Promote resilient and sustainable land development practices to improve the ability to recover and bounce back faster from the impacts of natural hazard events.
3.B	Develop and maintain adequate services and utilities to serve the County's population and business.
3.C	Develop business and government continuity plans to decrease potential local economic losses.
3.D	Reduce or eliminate hazard risks throughout the County. This would decrease recovery time and social dislocation, as well as family and individual stress.
3.E	Encourage building and rebuilding practices that address resilience through higher standards and sustainable design to resist the impacts of natural hazards and to reinvest in existing infrastructure rather than expanding the urbanized area.
Goal 4	
Protect the environment and natural resources.	
Objectives	
4.A	Promote the continued use of natural systems to reduce long-term hazard-related costs and maximize hazard mitigation effectiveness, to include sustainable flood and erosion control projects, reduction of nutrient loading in water systems, and activities that demonstrate resiliency practices.
4.B	Protect and preserve environmentally sensitive and critical areas.
4.C	Continue to preserve, protect, and acquire open space.
4.D	Incorporate hazard considerations into land use planning and natural resource management.
Goal 5	
Promote and support partnerships.	
Objectives	
5.A	Create, maintain, and enhance collaborative efforts, including inter-jurisdiction and inter-agency communication, coordination, and partnerships, and other identified stakeholders involved with natural hazard management to promote resiliency.
5.B	Engage public agencies, citizens, neighborhood groups, non-profit organizations, groups that represent underserved and underrepresented individuals, businesses, and industry to implement mitigation actions more effectively.
5.C	Encourage shared services in acquiring, maintaining and providing emergency services and equipment.
Goal 6	
Enhance disaster preparedness, response, and recovery.	
Objectives	
6.A	Enact policies to prioritize and implement mitigation actions and/or projects designed to benefit community lifelines, essential facilities, services, and infrastructure.
6.B	Coordinate and integrate hazard mitigation actions with existing local emergency operations plans.
6.C	Identify the need for, and acquire, any special emergency services, training, equipment, facilities, and infrastructure to enhance response capabilities for specific hazards.
6.D	Review and improve, if necessary, emergency traffic routes and evacuation routes; and communicate such routes to the public and communities via the County's emergency notification system, social media, and news media outlets.
6.E	Ensure continuity of governmental operations, emergency services, and essential facilities at the local level during and immediately after disaster and hazard events.
6.F	Support County Emergency Management functions as the central venue for community preparedness requirements and response efforts.

5.2. MITIGATION STRATEGIES AND ACTIONS

Onondaga County assessed 51 hazard mitigation actions, including actions from FEMA guidance documents, the 2019 Onondaga County Hazard Mitigation Plan, and suggestions from participating communities and their respective stakeholders, during a series of workshops and public meetings held throughout the County in July 2024. Supporting documentation for stakeholders and public engagement can be found in **Appendix B** and **C**, respectively. A summary of Onondaga County's mitigation actions status is listed in **Table 5-2,** and all mitigation actions can be found in **Appendix A**.

Note: The mitigation actions outlined in this Plan are designed only to address those natural hazards that received a risk ranking of *medium* or *high* during the hazard risk assessment (**Table 4-21**). Hazards that ranked *low* (earthquakes, geological hazards, and wildfires) may not have specific mitigation actions detailed in this document.

Mitigation actions and updates for each plan participant can be found in their respective annex.

Table 5-2. Onondaga County Mitigation Action Summary

Status	Mitigation Action Total
Continuous	24
In Progress/Not Yet Completed	5
No Progress/Not Yet Started	3
New	11
TOTAL	**43**
Complete	4
Discontinued	4

Mitigation Actions per Hazard			
Drought	14	Harmful Algal Bloom	19
Earthquake	N/A	Invasive Species and Infestation *(Emerald Ash Borer, Hemlock Woolly Adelgid, True Armyworm, Common Reed (Phragmites), Eurasian Watermilfoil, Water Chestnut, Tick-Borne Diseases, Mosquito-Borne Diseases)*	18
Heat Wave/Extreme Heat	16	Severe Weather *(severe thunderstorms – hail, strong winds, tornadoes, hurricane/tropical storm, nor'easter)*	28
Flood *(riverine, flash/urban, ice jam, dam and levee failure)*	32	Wildfire *(wildfire smoke)*	N/A
Geological Hazards *(landslides, land subsidence, mudboils)*	8	Winter Weather *(blizzards, heavy snow, ice storms, cold wave/extreme cold)*	13

5.2.1. Action Status

FEMA requires that all existing mitigation actions (i.e., actions that were identified in previous plan updates) be reviewed and updated. The County and each plan participant reviewed their jurisdiction's existing mitigation actions and provided a status for each action, as outlined in **Table 5-3**. The actions that were indicated as *Continuous*, *In Progress/Not Yet Completed*, and *No Progress/Not Yet Started* have been carried forward in the County's updated mitigation strategy. Those actions identified as *Complete* have been included in this Plan update for tracking purposes, but will be removed in the next Plan update. Actions marked as *Discontinued* were also included in this Plan update with a brief explanation stating why the action is no longer needed; these will be removed in the next Plan update.

Additional actions were identified during this Plan update through review of the updated hazard risk assessment, input from County departments, other regional agencies, and public and stakeholder outreach. The actions that were added during this Plan update are identified as *New*.

Table 5-3. Project Status Parameters

Project Status	Description
Continuous	These ongoing actions were included in the previous update and have no definitive end. During this Plan update, the ongoing mitigation actions were modified and/or amended, as needed, to better define the action.
In Progress/Not Yet Completed	These actions were included in the previous update and are underway during this Plan update. These actions are in progress but have not been completed.
No Progress/Not Yet Started	These actions were included in the previous update but have not been started. During this Plan update, these mitigation actions were modified and/or amended, as needed, to better define the action.
Complete	Completed actions since the previous plan iteration.
Discontinued	These actions are no longer relevant or applicable because other mitigation actions addressed the mitigating need, or the hazard vulnerability changed, resulting in reduced risk. **Note:** If an action has been *Discontinued*, a brief explanation has been provided.
New	These actions were included for the first time in the 2025 Plan update.

5.3. MITIGATION ACTION PLAN

The Mitigation Action Plan helps prioritize mitigation initiatives based on a benefit cost analysis of the proposed actions and their associated costs. Additionally, the Action Plan provides the framework for implementing and administering the proposed actions and initiatives by Onondaga County and each plan participant over the next five (5) years. The parameters (i.e., estimated cost, benefits, timeline, and prioritization) that will be used for the prioritization and benefit cost analysis of each mitigation action are outlined in this section.

5.3.1. Mitigation Action Estimated Timeline

Mitigation actions must specify the timeline for completion of the project upon implementation. Although providing exact completion dates is preferred, this is not always feasible for all mitigation actions. As a result, timelines were categorized into estimated ranges, such as 1 to 3 months, within 6 months, 1 to 5 years, or over 5 years. Furthermore, mitigation actions identified as *Continuous* were assigned an estimated timeline of *Ongoing*.

5.3.2. Mitigation Action Prioritization

Mitigation actions are required to be prioritized. For this Plan update, the mitigation actions will be prioritized and evaluated using a modified STAPLEE+E (Social, Technical, Administrative, Political, Legal, Economic, Environmental, and Equity) mitigation action evaluation methodology based on a set of evaluation criteria suited to the purposes of hazard mitigation strategy evaluation. This method provides a systematic approach that considers the opportunities and constraints of implementing a particular mitigation action.

The Steering Committee applied an action evaluation and prioritization methodology, which includes an expanded set of 15 criteria, as outlined in **Table 5-4**, to include the consideration of cost effectiveness, availability of funding, anticipated timeline, and whether the action addresses multiple hazards.

Table 5-4. Prioritization Score

Criteria	Description
Life Safety	How effective will the action be at protecting lives and preventing injuries?
Property Protection	How significant will the action be at eliminating or reducing damage to structures and infrastructure?
Cost-Effectiveness	Are the costs to implement the project or initiative commensurate with the benefits achieved?
Technical	Is the mitigation action technically feasible? Is it a long-term solution? Eliminate actions that, from a technical standpoint, will not meet the goals.
Political	Is there overall public support for the mitigation action? Is there political will to support it?
Legal	Does the jurisdiction have the authority to implement the action?
Fiscal	Can the project be funded under existing program budgets (i.e., is this initiative currently budgeted for)? Or would it require a new budget authorization or funding from another source, such as grants?
Environmental	What are the potential environmental impacts of the action? Will it comply with environmental regulations?
Social	Will the proposed action adversely affect one segment of the population? Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower-income people?
Administrative	Does the jurisdiction have the personnel and administrative capabilities to implement the action and maintain it, or will outside help be necessary?
Multi-Hazard	Does the action reduce the risk to multiple hazards?
Timeline	Can the action be completed in less than 5 years (within our planning horizon)?
Local Champion	Is there a strong advocate for the action or project among the jurisdiction's staff, governing body, or committees that will support the action's implementation?
Other Local Objectives	Does the action advance other local objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of other plans and programs?
Equity	Do you agree or disagree that the mitigation action is consistent and systematically fair (i.e., Does not create an opportunity for unequal distribution of resources; racism; affect a particular segment of the population, including communities of color, communities that face discrimination based on sex, sexual orientation or gender identity, persons with disabilities, persons who identify with a certain religion, persons with Limited English Proficiency, or rural communities, etc.)?

Each plan participant was required to assign a numeric rank for each of the 15 evaluation criteria, defined as follows:

- 1 = Highly Effective or Feasible
- 0 = Neutral
- -1 = Ineffective or Nor Feasible

The numerical results were totaled to help identify the implementation priority (low, medium, or high) for each mitigation action, as outlined in **Table 5-5**. While this provided a consistent, systematic methodology to support the evaluation and prioritization of mitigation actions, plan participants may have additional considerations that could influence their overall prioritization of mitigation actions.

Table 5-5. Implementation Priority

Implementation Priority	Prioritization Score
Low	1 – 5
Medium	6 – 10
High	11 – 15

5.3.3. Mitigation Action Benefit Cost Review

The action plan prioritization must focus on maximizing benefits through a benefit cost analysis of proposed projects and their associated costs. Cost-effectiveness is one of the criteria to be applied during the evaluation and prioritization of all actions comprising the overall mitigation strategy.

Although the ideal approach is to provide definitive cost figures (e.g., dollar amounts) for each mitigation action, this is often not feasible without detailed project scoping or engineering studies. Therefore, a review of the apparent benefits versus the apparent costs of each project was performed. Parameters were established for assigning subjective ratings (i.e., high, medium, and low) to the costs and benefits of these projects. When estimates of costs and benefits were available, the ratings outlined in **Table 5-6** were utilized.

Table 5-6. Estimated Cost (Numerical Estimates) Parameters

Rating	Parameter
Low	Less than $10,000
Medium	$10,000 to $100,000
High	Greater than $100,000
The estimated costs presented include the total project estimation. This can include administrative, construction (e.g., engineering, design, and permitting), and maintenance costs.	

When quantitative estimates of costs and benefits were unavailable, qualitative ratings were obtained using the definitions outlined in **Table 5-7** and **Table 5-8**.

Table 5-7. Estimated Cost (Qualitative) Parameters

Rating	Parameter
Low	The project could be funded under the existing budget. The project is part of or can be part of an existing, ongoing program.
Medium	The project could be implemented with existing funding, but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
High	Existing funding levels are not adequate to cover the costs of the proposed project, and implementation would require an increase in revenue through an alternative source (e.g., bonds, grants, and fee increases).

Table 5-8. Benefits Parameters

Rating	Parameter
Low	Long-term benefits of the project are difficult to quantify in the short term.
Medium	The project will have a long-term impact on the reduction of risk exposure to life and property, or will provide an immediate reduction in the risk exposure to property.
High	The project will have an immediate impact on the reduction of risk exposure to life and property.
Benefits are the savings from losses avoided attributed to project implementation. These can include life safety, structure and infrastructure damage, loss of service or function, and economic and environmental damage and losses.	

Using this analysis, projects with positive benefit versus cost ratios (e.g., high over high, high over medium, medium over low, etc.) are considered cost-effective.

If Onondaga County seeks financial assistance through FEMA's Hazard Mitigation Assistance programs, a detailed benefit cost analysis may be required as part of the planning process. Further, more thorough analysis (e.g., the FEMA Benefit-Cost Analysis model process) will be performed when funding applications are prepared. The Hazard Mitigation Steering Committee and plan participants are committed to implementing mitigation strategies with benefits that exceed costs.

Projects not seeking financial assistance through federal grant programs may not require this sort of analysis. Therefore, the Steering Committee and each plan participant reserve the right to define benefits in accordance with parameters that meet the needs, goals, and objectives of this Plan.

5.4. CHANGES IN PRIORITY

A community's mitigation priorities may change over time for a number of reasons. Addressing these changes allows a community to redirect actions that reflect current conditions, including financial and political realities, as well as changes in conditions or priorities following disaster events. Changes in the priority of a Hazard Mitigation Plan are often dynamic and reflect evolving risk understanding, resource availability, and community needs. This helps ensure that the Plan remains relevant and effective in reducing the community's vulnerability to the hazards identified in the Plan. Onondaga County has identified the following changes in priorities for the 2025 Hazard Mitigation Plan:

- There were no changes to the previous mitigation goals and objectives. However, minor updates were made to further emphasize identifying and implementing inclusive actions that reduce vulnerability for residents and visitors in Onondaga County, including the underserved population.
- There was one (1) new plan participant – Town of Otisco.
- All mitigation actions from the previous Plan iteration were updated, and a more concerted effort to achieve equitable outcomes for all communities, including underserved communities and socially vulnerable populations, has been implemented.
- The 2019 Onondaga County Hazard Mitigation Plan did not identify heat wave/extreme heat and wildfire (wildfire smoke) as hazards of concern. These hazards have been included as hazards of concern for the 2025 Hazard Mitigation Plan update due to previous occurrences within the County and to input from members of the Steering Committee, the Planning Partnership, and the public during the Public Meeting. Wildfire smoke was added as a sub-hazard because the County acknowledges that a wildfire outside Onondaga County can impact the area with smoke. Furthermore, the CDC recognizes wildfire smoke as a public health hazard, and the 2023 New York State Hazard Mitigation Plan acknowledges wildfire smoke as a natural hazard (under wildfire).

- There were some notable changes to the hazard risk ranking.
    - The new methodology includes 14 factors (versus six (6) in the 2019 update), which align with FEMA's risk assessment criteria. *Refer to Section 4.3 for further details on the 2025 risk assessment methodology.*
    - Geological Hazards were ranked individually and not as a whole category. Landslides, land subsidence, and mudboils were ranked individually, even though these are grouped under the geological hazard profile.
    - Severe weather hazards were ranked individually and not as a whole category. Severe thunderstorms, hail, strong winds/damaging winds, tornadoes, and tropical storms/hurricanes were ranked individually, even though these are grouped under severe weather in the hazard profile.
    - Cold wave/extreme cold and winter weather were ranked individually, even though cold wave/extreme cold is grouped under winter weather in the hazard profile.
    - Flood hazards were ranked individually and not as a whole category. Urban/flash flood, riverine/creek flooding, ice jam, and dam and levee failure were ranked individually, even though these are grouped under flood in the hazard profile.
    - In the 2025 ranking, urban/flash flood and riverine/creek or ice jam are ranked as a high risk (the entire flood hazard was ranked medium in the previous ranking), drought is ranked medium (ranked high in the previous ranking), all geological hazards are ranked low (ranked medium in the previous ranking), HABs are ranked high (ranked high in the previous ranking), and invasive species are ranked high (ranked high in the previous ranking).

CHAPTER 6. PLAN MAINTENANCE

Plan maintenance means keeping the plan accurate, current, and relevant over the five (5) year approval period. The Plan is a living document that guides actions over time, and consistently documenting the process facilitates the next plan update. Establishing a maintenance plan recognizes that conditions evolve over time. Not only is there a need to track progress on mitigation strategy implementation, but new information may become available, and disaster events may occur. The hazard mitigation plan needs to be revisited at regular intervals to keep it relevant, and the Core Planning Team needs to decide how it will be executed. At a minimum, this must be done every five (5) years, but it should also be done after major disaster events or if new conditions significantly change hazard risk.

6.1. MONITORING, EVALUATING, AND UPDATING THE PLAN

To ensure the Onondaga County Hazard Mitigation Plan continues to provide an appropriate path for risk reduction throughout the County, it is necessary to monitor, evaluate, and update this document. The Hazard Mitigation Coordinator, part of the Onondaga County Department of Planning staff, is assigned to manage the maintenance, evaluation, and update of the Plan during its performance period.

6.1.1. Monitoring

The Hazard Mitigation Coordinator will manage monitoring the status of the Plan and gathering mitigation action status reports from the appropriate entities (i.e., county department, agencies, and participating jurisdictions). On an annual basis, beginning one (1) year after the plan adoption, the Hazard Mitigation Coordinator will engage county departments, agencies, and participating jurisdictions responsible for the implementation of the mitigation actions outlined in this Plan. This will be accomplished by contacting the participating members responsible for initiating and/or overseeing the mitigation actions and requesting that they review and update the progress of their respective mitigation strategies. For the purposes of this section of the Plan, participating members include county departments and agencies designated as lead agencies in mitigation actions, as well as plan participants with designated annexes in this Plan.

It is anticipated that all participating jurisdictions will update the progress of the mitigation plan annually. This process encourages participants to refine mitigation strategies and advance the implementation of mitigation actions. Additionally, jurisdictions will document efforts to obtain funding and any obstacles or challenges encountered in implementing actions. Each plan participant should be expected to document the following:

- Any grant applications filed on behalf of the participating jurisdiction.
- Hazard events and losses that occurred within the jurisdiction.
- Additional (i.e., new) mitigation actions believed to be appropriate and feasible.
- Public and stakeholder input.

6.1.2. Evaluating

Evaluation of the hazard mitigation plan is an assessment of whether the planning process and actions have been effective, if the mitigation goals are being achieved, and whether changes are needed. The Hazard Mitigation Coordinator will consult with the participating members to evaluate the effectiveness of the plan implementation and to reflect changes that could affect mitigation priorities or available funding. The status of the Hazard Mitigation Plan will be discussed and documented with the participating members.

The Hazard Mitigation Coordinator will ask the participating members to assess progress toward meeting the Plan's goals and objectives. These evaluations will assess the following:

- Goals and objectives address current and expected conditions.
- Changes to the nature or magnitude of the hazard risks.
- Current resources are appropriate for implementing the Hazard Mitigation Plan, and if different or additional resources are available.
- Actions were cost-effective.
- Schedules and budgets are feasible.
- Implementation problems, such as technical, political, legal, or coordination issues with other agencies, are present.
- Outcomes have occurred as expected.
- Changes in county, city, town, or village resources impacted plan implementation (e.g., funding, personnel, and equipment).
- New agencies, departments, and/or staff should be added, including other local governments as defined under FEMA's Local Mitigation Planning Policy Guide.

Throughout the five (5) year period, the Hazard Mitigation Coordinator will evaluate how other programs and policies have conflicted or augmented planned or implemented measures, and shall identify policies, programs, practices, and procedures that could be modified to accommodate mitigation actions. Other programs and policies can include those that address:

- Economic development
- Environmental preservation
- Historic preservation
- Redevelopment
- Health and safety
- Recreation
- Land use and zoning
- Public education and outreach
- Transportation

Refer to Section 3.10 of this Plan for further details on how the County has integrated hazard mitigation principles, risk information, and mitigation actions into other County plans and how the County intends to potentially integrate this hazard mitigation plan into existing and new planning mechanisms.

The Plan will be evaluated and revised following any major disasters (i.e., presidential disaster declarations), to determine if the recommended actions remain relevant and appropriate. The hazard risk assessment will also be revisited to determine whether any changes are necessary based on the pattern of disaster damage, and whether the data listed in this Plan have been collected to facilitate the risk assessment. This is an opportunity to increase the community's resilience to disasters and build a stronger, better community.

6.1.2.1. Implementation and Integration Through Existing Plans and Programs

Hazard mitigation practices must be incorporated within existing plans, projects, and programs. Therefore, the involvement of all departments, private non-profits, private industry, and appropriate jurisdictions is necessary in order to find mitigation opportunities within existing or planned projects and programs. To execute this, the Steering Committee will assist in coordinating resources for the mitigation actions and provide strategic outreach to implement them, ensuring they meet the goals and objectives identified in this Plan. The information on hazard, risk, vulnerability, and mitigation included in this Plan update is based on the best science and technology available at the time this Plan was completed. Plan integration consists of the incorporation of hazard mitigation into other relevant planning mechanisms (e.g., general planning and capital improvement planning).

The Hazard Mitigation Plan is essential to understanding the hazards facing Onondaga County. The resulting prioritized list of hazards is used across the suite of Onondaga County and local jurisdictions' plans and community partner organizations, thus creating a shared understanding of the hazards facing the County.

The results of this Plan will be incorporated into ongoing planning efforts throughout the County. Onondaga County, its municipalities, and special districts will update zoning plans and related ordinances, as necessary, and as part of regularly scheduled updates. Each plan participant will be responsible for updating and integrating elements of the Plan into the community's own respective community plans and ordinances.

Refer to Section 3.10 of this Plan for further details on how the County has integrated hazard mitigation principles, risk information, and mitigation actions into other County plans and how the County intends to potentially integrate this hazard mitigation plan into existing and new planning mechanisms. All participating jurisdictions outline existing and potential integration of hazard mitigation principles into their local planning mechanisms within each jurisdictional annex.

6.1.2.2. Continued Public Engagement

The Onondaga County Department of Planning, Hazard Mitigation Steering Committee, and participating jurisdictions are dedicated to involving the public directly in the review and updates of the Plan. The public will have the opportunity to provide feedback on the Plan throughout its performance period, including revisions and updates. The appropriate County departments, cities, towns, villages, and special districts will keep copies of the Plan.

To further facilitate continued public engagement, Onondaga County will ensure the following:

- Onondaga County Department of Planning will keep a copy of the Plan readily available in the office for review and comment by the public. The Plan will also be maintained on the County's website.
- Encourage municipalities and special districts to include and maintain links to the Plan on their respective websites.
- The Onondaga County Department of Planning and the Department of Emergency Management will conduct outreach (in person and through social media) after a disaster event to remind members of the public of the importance of mitigation and to solicit mitigation ideas to be included in the Plan.

Public meetings will be held when deemed necessary by the Steering Committee. The meetings will provide a forum for the public to express concerns, opinions, or new alternatives, which can then be included in the Plan. The Onondaga County Department of Planning, with support from the Steering Committee, will be responsible for using appropriate resources to publicize the public meetings and maintain public involvement.

6.1.2.3. The Five-Year Action Plan

This section outlines the implementation agenda that the Hazard Mitigation Steering Committee, led by the Onondaga County Department of Planning, should follow five (5) years after adoption of this Plan, and then every five (5) years thereafter.

The Steering Committee will consider the following action plan for the five (5) year planning cycle. It should be noted that the schedule in **Table 6-1** can be modified as necessary and does not include any meetings and/or activities that would be necessary following a disaster event (e.g., reconvening the Hazard Mitigation Steering Committee within 90 days of a disaster or emergency to determine what mitigation projects should be prioritized during the community recovery). If an emergency meeting of the Hazard Mitigation Steering Committee is called, this proposed schedule may be adjusted to accommodate any new needs.

Table 6-1. Five-Year Action Plan

Year 0	
2025	Update the 2019 Hazard Mitigation Plan and submit it to New York State and FEMA Region 2 for approval.
Year 1	
2026	• Work on mitigation actions. • Onondaga County Department of Planning will stay in contact with its key stakeholders and plan participants to keep track of project status. • Encourage Plan integration efforts. • Discuss opportunities for Plan integration with other planning documents. • Discuss recent hazard events. • Update the status of projects. • Identify additional hazards of concern that should be considered for the next update, if any, and provide an update and obtain input on mitigation projects occurring within the community from the Steering Committee and plan participants.
Year 2	
2027	• Work on mitigation actions. • Onondaga County Department of Planning will stay in contact with its key stakeholders and plan participants to keep track of project status. • Encourage Plan integration efforts. • Discuss opportunities for Plan integration with other planning documents. • Discuss recent hazard events. • Update the status of projects. • Identify additional hazards of concern that should be considered for the next update, if any, and provide an update and obtain input on mitigation projects occurring within the community from the Steering Committee and plan participants.

Year 3	
2028	• Work on mitigation actions. • Onondaga County Department of Planning will stay in contact with its key stakeholders and plan participants to keep track of project status. • Encourage Plan integration efforts. • Apply for hazard mitigation grant funds (e.g., HMGP) to update the next iteration of the Hazard Mitigation Plan. • Discuss opportunities for Plan integration with other planning documents. • Discuss recent hazard events. • Update the status of projects. • Identify additional hazards of concern that should be considered for the next update, if any, and provide an update and obtain input on mitigation projects occurring within the community from the Steering Committee and plan participants.
Year 4	
2029	• Work on mitigation actions. • Onondaga County Department of Planning will stay in contact with its key stakeholders and plan participants to keep track of project status. • Encourage Plan integration efforts. • Begin the update process for the 2025 Hazard Mitigation Plan and conduct a series of meetings with stakeholders, plan participants, and the public.
Year 5	
2030	• Update the 2025 Hazard Mitigation Plan and submit it to the New York State Department of Homeland Security and Emergency Services and FEMA Region 2 for approval • Repeat.

6.1.3. Plan Update

FEMA requires the Plan to be reviewed, revised, and updated every five (5) years to remain eligible for certain Federal disaster assistance and hazard mitigation funding programs (e.g., Hazard Mitigation Grant Program)

The Onondaga County Department of Planning will be responsible for contacting the Steering Committee members and organizing the update process. Members of the Steering Committee will be responsible for the update on the progress of the mitigation strategies in the Plan. Additionally, the goals and actions will be reviewed by the Steering Committee to determine their relevance to changing situations in the County and to changes in Federal policy, and to ensure they address current and expected conditions. Furthermore, the Steering Committee will review the hazard risk assessment portion of the Plan to determine whether this information should be updated or modified in light of any new data. The organizations responsible for the various action items will report on the status of the projects, the success of various implementation processes, difficulties encountered, the success of coordination efforts, and which strategies should be revised or removed.

The Onondaga County Department of Planning, along with the Steering Committee, will be responsible for leading the five (5) year update of the Plan. Also, the Onondaga County Department of Planning will notify all stakeholders and plan participants when changes have been made. Upon completion, the Plan will be updated and submitted to NYSDHSES and to FEMA Region 2 for review and approval.

APPENDIX A. MITIGATION ACTIONS

This Appendix includes the mitigation actions developed to address the risks and vulnerabilities to the hazards identified in this Plan. This Plan serves only to recommend mitigation measures based on the potential for risk reduction and available funding. Implementation of mitigation actions is dependent on risk reduction priorities, feasibility, and available funding. It is also dependent on the cooperation and support of the jurisdiction and/or department responsible for each action item.

Onondaga County agreed on **43** mitigation actions that apply to the jurisdiction's properties for which it has jurisdictional responsibility and authority. Four (4) mitigation actions were discontinued, and four (4) mitigation actions were completed. A summary of the County's mitigation actions status is listed in **Table A-1**.

Note: The mitigation actions outlined in this Plan are designed only to address those natural hazards that received a risk ranking of *medium* or *high* during the hazard risk assessment (**Table 4-21**). Hazards that ranked *low* (earthquakes, geological hazards, and wildfires) may not have specific mitigation actions detailed in this document.

Table A-1. Onondaga County Mitigation Actions Summary

Status	Mitigation Action Total
Continuous	24
In Progress/Not Yet Completed	5
No Progress/Not Yet Started	3
New	11
TOTAL	**43**
Complete	4
Discontinued	4

Mitigation Actions per Hazard			
Drought	14	Harmful Algal Bloom	19
Earthquake	N/A	Invasive Species and Infestation *(Emerald Ash Borer, Hemlock Woolly Adelgid, True Armyworm, Common Reed (Phragmites), Eurasian Watermilfoil, Water Chestnut, Tick-Borne Diseases, Mosquito-Borne Diseases)*	18
Heat Wave/Extreme Heat	16	Severe Weather *(severe thunderstorms – hail, strong winds, tornadoes, hurricane/tropical storm, nor'easter)*	28
Flood *(riverine, flash/urban, ice jam, dam and levee failure)*	32	Wildfire *(wildfire smoke)*	N/A
Geological Hazards *(landslides, land subsidence, mudboils)*	8	Winter Weather *(blizzards, heavy snow, ice storms, cold wave/extreme cold)*	13

Mitigation Action	Conduct and facilitate community education and outreach for residents and businesses to promote and effect natural hazard risk reduction, including: • Enhance the Onondaga County Hazard Mitigation Plan website as a current source for the latest version of this Plan, annual plan review, hazard mitigation grant announcements, and related mitigation guidance and resources. Promote public awareness of hazard mitigation planning activities and provide a venue for ongoing public and stakeholder input. • Contact each municipality to encourage them to provide and maintain links to the Onondaga County Hazard Mitigation Plan website. • Prepare and distribute information to municipalities and the public, for distribution directly to flood vulnerable property owners and neighborhood associations, explaining the availability of mitigation grant funding to mitigate their properties, and instructing them on how they can learn more and implement mitigation. • Use and encourage use of website resources, social media, and newsletters to better educate the public on flood insurance, the availability of hazard mitigation grant funding, and personal natural hazard risk reduction measures. • Encourage municipal work with neighborhood associations, civic, and business groups to disseminate information on flood insurance and the availability of hazard mitigation grant funding.

Action Number	OC-1	**Goal(s) Addressed**	1, 2, 3, 4, 5, 6	**Prioritization Score**	15/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Provide public outreach hazard mitigation information to municipalities, agencies, and other neighborhood organizations for distribution.		

Mitigation Action	Actively support and participate in the implementation, monitoring, maintenance, and updating of this Hazard Mitigation Plan, as outlined and defined in Volume 1.				
Action Number	OC-2	**Goal(s) Addressed**	1, 2, 3, 4, 5, 6	**Prioritization Score**	15/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Department of Emergency Management, Onondaga County Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Support municipal compliance and good standing with the National Flood Insurance Program (NFIP) through implementation and enforcement of floodplain management requirements that, at a minimum, meet the NFIP requirements. These include: • Participating in flood hazard identification efforts (e.g., Flood Insurance Rate Maps). • Providing public assistance to help communities understand NFIP requirements and floodplain management regulations. • Facilitating information sharing of flood-related information among municipal partners and stakeholders. • Integrating floodplain management considerations into County planning reviews.				
Action Number	OC-3	**Goal(s) Addressed**	1, 2, 3, 4, 5, 6	**Prioritization Score**	15/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Severe Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Department of Emergency Management		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Develop, enhance, and implement the County's existing emergency plans.				
Action Number	OC-4	**Goal(s) Addressed**	1, 6	**Prioritization Score**	15/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Emergency Management	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Department of Planning		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Develop, enhance, and maintain mutual aid agreements with surrounding counties and the New York State Division of Homeland Security and Emergency Services.				
Action Number	OC-5	**Goal(s) Addressed**	1, 5, 6	**Prioritization Score**	15/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Emergency Management	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Tully Farms Road Culvert Replacement: Replace culvert to increase capacity and improve flow of water.				
Action Number	OC-6	**Goal(s) Addressed**	1, 3	**Prioritization Score**	9/15
Year Added to Plan	2019	**Timeline** *(estimated)*	1 Year	**Implementation Priority**	Medium
Hazard(s) Mitigated	Flood, Severe Weather				
Project Status	In Progress/Not Yet Completed	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Transportation	**Supporting Agency / Organization** *(If applicable)*	U.S. Fish & Wildlife		
Additional Participating Jurisdictions *(If applicable)*	New York State Department of Environmental Conservation, Onondaga Nation				
Estimated Cost	Medium	**Potential Funding Source**	General Fund (Staff Time), HMGP, FMA, U.S. Fish & Wildlife Grant		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Promote the Flood Mitigation Task Force, which may serve as a tool to improve coordination and communication for regional water level management.				
Action Number	OC-7	**Goal(s) Addressed**	1, 4, 5	**Prioritization Score**	11/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Severe Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Flood Mitigation Task Force	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Office of the Environment, Onondaga County Soil & Water Conservation District		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Medium	**Potential Funding Source**	General Fund (Staff Time), New York State Canal Corporation Funds		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Water management decisions are not well coordinated among stakeholders, and there is a need for a more coherent and comprehensive water level management system in the basin.		

Mitigation Action	Encourage community members to use the NYAlert emergency notification system to get notified by the Onondaga County government about emergency situations, with special instructions to residents in specific neighborhoods, as needed.				
Action Number	OC-8	**Goal(s) Addressed**	1, 2, 6	**Prioritization Score**	15/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Emergency Management	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Participate and support the Stream Team Program, offered by the Onondaga County Soil & Water Conservation District, to assist in the removal of debris and log jams in stream sections that are vulnerable to flooding.				
Action Number	OC-9	**Goal(s) Addressed**	1, 3, 5	**Prioritization Score**	13/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated		Flood			
Project Status		Continuous	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		High			
Lead Agency / Organization	Onondaga County Soil & Water Conservation District		**Supporting Agency / Organization** *(If applicable)*	N/A	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	**2025:** In 2022, a consultant was hired to train all staff and other agency guests on the fundamentals of stream bed and baulk stabilization. Additionally, the New York State Association of Conservation Districts hired the consultant to provide the same service/support to New York State SWCD staff.		

Mitigation Action	Keep and maintain a geo-referenced list and information on critical facilities, natural resources, environmentally sensitive areas, and hazard-prone areas.				
Action Number	OC-10	**Goal(s) Addressed**	1, 2, 3, 4, 5, 6	**Prioritization Score**	13/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Geological Hazards, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Planning (GIS)	**Supporting Agency / Organization** *(If applicable)*	Central NY Regional Planning and Development Board, Onondaga County Department of Emergency Management, E911, Onondaga County Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Encourage the incorporation of conservation subdivision principles into the subdivision review process, and collaborate with existing agencies and organizations to develop open space strategies and conservation standards for new development projects.				
Action Number	OC-11	**Goal(s) Addressed**	1, 3, 4, 5	**Prioritization Score**	13/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Geological Hazards				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Central New York Regional Planning and Development Board, Onondaga County Soil & Water Conservation District, Onondaga County Office of the Environment, Onondaga County Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Increase hazard resilience of new development and retrofitting of existing communities for resilience		

Mitigation Action	Encourage municipalities to adopt comprehensive plans and land use regulations (e.g., zoning) that address natural hazard areas in order to foster comprehensive development principles.				
Action Number	OC-12	**Goal(s) Addressed**	1, 3, 4, 5	**Prioritization Score**	13/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Geological Hazards, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Central New York Regional Planning and Development Board, Onondaga County Planning Board, Onondaga County Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time), Onondaga County Town Planning Grants, New York State Smart Growth Grant		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Increase hazard resilience of new development and retrofitting of existing communities for resilience. In 2022, a new funding program was established by Onondaga County Executive, to cost-share in the development of comprehensive plans, zoning updates, and town/municipal center master plans.		

Mitigation Action	Authorize the Onondaga County Planning Board to review subdivisions under New York State General Municipal Law (GML) 239.				
Action Number	OC-13	**Goal(s) Addressed**	1, 3, 4	**Prioritization Score**	14/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated		Flood, Geological Hazards			
Project Status		Continuous	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		High			
Lead Agency / Organization	Onondaga County Planning Board		**Supporting Agency / Organization** *(If applicable)*	Onondaga County Department of Planning	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Increase hazard resilience of new development and retrofitting of existing communities for resilience		

Mitigation Action	Collaborate with existing agencies and organizations to develop open space strategies and conservation standards to be met by new development projects.				
Action Number	OC-14	**Goal(s) Addressed**	N/A	**Prioritization Score**	N/A
Year Added to Plan	2013	**Timeline** *(estimated)*	N/A	**Implementation Priority**	N/A
Hazard(s) Mitigated		Flood			
Project Status		Discontinued	If *Discontinued*, provide reason.	This mitigation action has been consolidated with mitigation action OC-11 to eliminate redundancy and streamline implementation efforts.	
Benefits *(Loss Avoided)*		N/A			
Lead Agency / Organization	Onondaga County Department of Planning		**Supporting Agency / Organization** *(If applicable)*	Central New York Regional Planning and Development Board, Onondaga County Soil & Water Conservation District, Onondaga County Office of the Environment	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	N/A	**Potential Funding Source**	N/A		
Critical Facility *(Critical Facility located in 1% floodplain?)*	N/A	**Additional Details** *(optional)*			

Mitigation Action	Promote public awareness of hazard mitigation planning activities and provide a venue for ongoing public and stakeholder input.				
Action Number	OC-15	**Goal(s) Addressed**	N/A	**Prioritization Score**	N/A
Year Added to Plan	2013	**Timeline** *(estimated)*	N/A	**Implementation Priority**	N/A
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Discontinued	If *Discontinued*, provide reason.	This mitigation action has been consolidated with mitigation action OC-1 to eliminate redundancy and streamline implementation efforts.		
Benefits *(Loss Avoided)*	N/A				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Department of Emergency Management; Onondaga County Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	N/A	**Potential Funding Source**	N/A		
Critical Facility *(Critical Facility located in 1% floodplain?)*	N/A	**Additional Details** *(optional)*			

Mitigation Action	Encourage municipalities to establish an additional zoning layer within identified natural hazard areas.				
Action Number	OC-16	**Goal(s) Addressed**	N/A	**Prioritization Score**	N/A
Year Added to Plan	2013	**Timeline** *(estimated)*	N/A	**Implementation Priority**	N/A
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Discontinued	If *Discontinued*, provide reason.	This mitigation action has been consolidated with mitigation action OC-12 to eliminate redundancy and streamline implementation efforts.		
Benefits *(Loss Avoided)*	N/A				
Lead Agency / Organization	N/A	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	N/A	**Potential Funding Source**	N/A		
Critical Facility *(Critical Facility located in 1% floodplain?)*	N/A	**Additional Details** *(optional)*			

Mitigation Action	Develop and implement a countywide comprehensive plan to foster environmental protection, comprehensive development practices, and natural hazard risk management.				
Action Number	OC-17	**Goal(s) Addressed**	N/A	**Prioritization Score**	N/A
Year Added to Plan	2013	**Timeline** *(estimated)*	N/A	**Implementation Priority**	N/A
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Geological Hazards, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Complete	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	N/A				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	N/A	**Potential Funding Source**	N/A		
Critical Facility *(Critical Facility located in 1% floodplain?)*	N/A	**Additional Details** *(optional)*	**2025:** The county comprehensive plan, Plan Onondaga, was completed and adopted by the County Legislature in 2023.		

Mitigation Action	Provide technical assistance to the highway departments with stream assessments, preliminary designs/concepts, construction inspection assistance, and hydroseeding disturbed areas after construction.				
Action Number	OC-18	**Goal(s) Addressed**	1, 4, 5	**Prioritization Score**	13/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated		Flood, Severe Weather			
Project Status		Continuous	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		High			
Lead Agency / Organization	Onondaga County Soil & Water Conservation District		**Supporting Agency / Organization** *(If applicable)*	N/A	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Revegetate with hydroseed/bale chopper of over 50 miles of road ditches and other critical areas on public properties.				
Action Number	OC-19	**Goal(s) Addressed**	1, 4, 5	**Prioritization Score**	13/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated		Flood, Severe Weather			
Project Status		Continuous	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		High			
Lead Agency / Organization	Onondaga County Soil & Water Conservation District		**Supporting Agency / Organization** *(If applicable)*	N/A	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time), New York State Water Quality Improvement Project (WQIP) Program Funds		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	**2025:** OCSWCD received grants from the New York State WQIP Road 19 to continue this work and to purchase a new straw blower.		

Mitigation Action	Support potential mitigation actions identified in the 2006 Beartrap-Ley Creek Drainage District Study.				
Action Number	OC-20	**Goal(s) Addressed**	1, 2, 3, 4, 5, 6	**Prioritization Score**	13/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated		Flood, Severe Weather			
Project Status		Continuous	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		High			
Lead Agency / Organization	Onondaga County Department of Water Environment Protection		**Supporting Agency / Organization** *(If applicable)*	Onondaga County Office of the Environment, Beartrap-Ley Creek Drainage District	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Assist and support municipalities with training opportunities for municipal planning and zoning officials.				
Action Number	OC-21	**Goal(s) Addressed**	2, 5	**Prioritization Score**	14/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Geological Hazards, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Planning Federation, Onondaga County Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	**2025:** The Onondaga County Planning Federation Annual Symposium for Planning and Zoning officials, planners, code enforcement officers, among others is held annually and it includes programming on hazard mitigation, resilience, and environmental protection.		

Mitigation Action	Participate in regional, county, and/or state level projects and programs to develop improved structure and facility inventories and hazard datasets to support enhanced risk assessment efforts. Such programs may include developing a detailed inventory of critical facilities based upon FEMA's Comprehensive Data Management System (CDMS), which could be used for various planning and emergency management purposes, including, but not limited to: • Support the performance of enhanced risk and vulnerability assessments for hazards, including flooding, earthquake, wind, and geological hazards. • Support state, county, and local planning efforts, including mitigation (i.e., updates to the State Hazard Mitigation Plan), comprehensive emergency management, debris management, and land use.				
Action Number	OC-22	**Goal(s) Addressed**	1, 5, 6	**Prioritization Score**	14/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Geological Hazards, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Emergency Management	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Improved structural and facility inventories could incorporate flood, wind, and seismic specific parameters (e.g., first floor elevations, roof types, structure types based on FEMA-154 (Rapid Visual Screening of Buildings for Potential Seismic Hazards) methodologies, or Rapid Observation of Vulnerability and Estimation of Risk (ROVER)). It is recognized that these programs will likely need to be initiated and supported at the Regional and/or State level, and will likely require training, tools, and funding provided at the regional, state, and/or federal level.		

Mitigation Action	Request FEMA to conduct a mitigation workshop targeting those communities with significant numbers of flood vulnerable properties, and Repetitive Loss (RL), and Severe Repetitive Loss (SRL) properties. This workshop should address the specific interests and concerns of flood vulnerable communities in the County, such as: • Gaining a better understanding of the available mitigation grant programs, including the procedural requirements of a RL and SRL community under this program. • Understanding how flood vulnerable, RL, and SRL communities can enhance their efforts to encourage and support property owners to mitigate their properties, • Understanding how flood vulnerable, RL and SRL communities can best leverage existing data, information and studies (e.g., NFIP data) to target specific properties for mitigation. • Learning what resources are available to conduct/complete Repetitive Loss Area Analyses and gather critical data (e.g., structure elevations) to screen and move properties through the applicable mitigation grant programs.				
Action Number	OC-23	**Goal(s) Addressed**	1, 2, 3, 4, 5, 6	**Prioritization Score**	14/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated		Flood, Severe Weather			
Project Status		Continuous	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		High			
Lead Agency / Organization	Onondaga County Department of Emergency Management		**Supporting Agency / Organization** *(If applicable)*	N/A	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Identify order of magnitude costs for county-sponsored structural and infrastructure mitigation actions identified in Volume 1 of the Onondaga County Hazard Mitigation Plan and identify the mitigation benefits associated with each of these actions.				
Action Number	OC-24	**Goal(s) Addressed**	1, 2, 3, 4, 5, 6	**Prioritization Score**	15/15
Year Added to Plan	2013	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated		Drought, Heat Wave/Extreme Heat, Flood, Geological Hazards, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather			
Project Status		Continuous	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		High			
Lead Agency / Organization	Onondaga County Department of Emergency Management		**Supporting Agency / Organization** *(If applicable)*	N/A	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	An updated project prioritization for county-sponsored projects shall be provided as part of the first-year annual review and update. Further, work with members of the ongoing mitigation planning committee and project implementation leads to completing a similar effort for local initiatives identified in each jurisdictional annex.		

Mitigation Action	Abbey Road Drainage: Cross culvert/streamway realignment along Abbey Road and potentially upstream parcels in the Town of Onondaga.				
Action Number	OC-25	**Goal(s) Addressed**	1	**Prioritization Score**	12/15
Year Added to Plan	2019	**Timeline** *(estimated)*	4 to 5 Years	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Severe Weather, Winter Weather				
Project Status	No Progress/Not Yet Started	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Transportation	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (Staff Time), HMGP, Transportation Improvement Program (TIP) Funds		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	The Project is in the scoping phase, and it is yet to be designed. Stormwater flow related erosion from nearby hillside affecting residential properties, right of way, and road base, in vicinity of the 3700-3900 block of Abbey Road in the Town of Onondaga. The intention is to mitigate roadway and drainage infrastructure impacts from large stormwater flows, reduce potential flooding threats to residences along Abbey Road.		

Mitigation Action	Tully Farms Road Bank Stabilization: Upsize the bank adjacent to energy flows and/or alter stream channel alignment.				
Action Number	OC-26	**Goal(s) Addressed**	1	**Prioritization Score**	12/15
Year Added to Plan	2013	**Timeline** *(estimated)*	4 to 5 Years	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Severe Weather, Winter Weather				
Project Status	In Progress/Not Yet Completed	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Department of Transportation	**Supporting Agency / Organization** *(If applicable)*	U.S. Fish & Wildlife		
Additional Participating Jurisdictions *(If applicable)*	New York State Department of Environmental Conservation, Onondaga Nation				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time), HMGP, Transportation Improvement Program (TIP) Funds, U.S. Fish & Wildlife Grant		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	The existing stream channel is eroding the roadside embankment threatening the stability and alignment of the road edge.		

Mitigation Action	Conduct an analysis of each county-owned critical facility to determine the elevation of the facility, assess the facility's risks, and identify mitigation measures (as necessary).				
Action Number	OC-27	**Goal(s) Addressed**	1, 2, 6	**Prioritization Score**	10/15
Year Added to Plan	2019	**Timeline** *(estimated)*	4 to 5 Years	**Implementation Priority**	High
Hazard(s) Mitigated		Flood, Severe Weather			
Project Status		No Progress/Not Yet Started	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		Medium			
Lead Agency / Organization	Onondaga County Department of Water Environment Protection		**Supporting Agency / Organization** *(If applicable)*	N/A	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (Staff Time), HMGP, New York State Water Quality Improvement Project (WQIP) Program Funds		
Critical Facility *(Critical Facility located in 1% floodplain?)*	Yes	**Additional Details** *(optional)*	There are county-owned critical facilities located within the 500-year floodplain. These facilities are exposed to flooding, resulting in subsequent structural damage, losses, and impacts to operations.		

Mitigation Action	Countywide Forest Management Plan: Develop and implement a Forest Management Plan to address forest management policies, invasive species (identification of invasive species and prior invasive impact areas), stream corridor plans, public access, and protection of critical facilities within forests.				
Action Number	OC-28	**Goal(s) Addressed**	2, 3, 4	**Prioritization Score**	8/15
Year Added to Plan	2019	**Timeline** *(estimated)*	2 Years	**Implementation Priority**	Medium
Hazard(s) Mitigated		Invasive Species and Infestation, Severe Weather			
Project Status		In Progress/Not Yet Completed	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		Medium			
Lead Agency / Organization	Central New York Regional Planning and Development Board, Onondaga County Office of the Environment, Cornell Cooperative Extension of Onondaga County	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Soil & Water Conservation District, Onondaga County Department of Transportation		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (County Funding Allocation and General Staff Time), New York State Department of Environmental Conservation Funds, USDA Funding for Regional Assessment		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	**2025:** Onondaga County has recently conducted a Tree Canopy Assessment for the Towns of Cicero, Clay, Lysander, and Van Buren. This Assessment is being incorporated into a Regional Tree Canopy Assessment to be prepared by the Central New York Regional Planning and Development Board; Cornell Cooperative Extension of Onondaga County is also conducting municipal tree inventory work.		

Mitigation Action	Three Rivers and Cross Lake Water Chestnut Management: Remove Water Chestnut mats to prevent accidental drowning, nutrient build up, and dangers with water recreation.				
Action Number	OC-29	**Goal(s) Addressed**	4	**Prioritization Score**	11/15
Year Added to Plan	2019	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Invasive Species and Infestation				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Soil & Water Conservation District, Onondaga County Health Department	**Supporting Agency / Organization** *(If applicable)*	Finger Lakes – Lake Ontario Watershed Protection Alliance; Onondaga County Office of the Environment, Lake Associations		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	Buckeye Pipeline Settlement – Environmental Benefit Funds, Onondaga County Dedicated Funding; General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	**2025:** Invasive Water Chestnut covers approximately 360 acres of the Seneca River system of Onondaga County. OCSWCD hired Cayuga County SWCD to harvest the largest concentration of Water Chestnut in Cross Lake and Baldwinsville with two (2) 11 feet wide harvested boats. Additionally, private harvest boats were hired by the County SWCD to harvest smaller critical Water Chestnut. Mechanical harvesting, hand pulling and spraying of 230 acres is in progress.		

Mitigation Action	Acquire and install backup power (e.g., generator) at the North Area Maintenance Facility to ensure continuity of operations during winter weather and other weather-related hazards.				
Action Number	OC-30	**Goal(s) Addressed**	N/A	**Prioritization Score**	N/A
Year Added to Plan	2019	**Timeline** *(estimated)*	N/A	**Implementation Priority**	N/A
Hazard(s) Mitigated	Severe Weather, Winter Weather				
Project Status	Complete	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	N/A				
Lead Agency / Organization	Onondaga County Department of Transportation	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	N/A	**Potential Funding Source**	N/A		
Critical Facility *(Critical Facility located in 1% floodplain?)*	N/A	**Additional Details** *(optional)*			

Mitigation Action	Address Harmful Algal Blooms in Skaneateles Lake, Jamesville Reservoir, Otisco Lake, and all other bodies of water throughout Onondaga County.				
Action Number	OC-31	**Goal(s) Addressed**	1, 2, 4	**Prioritization Score**	12/15
Year Added to Plan	2019	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Harmful Algal Bloom				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Office of the Environment	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Soil & Water Conservation District, City of Syracuse, New York State Department of Environmental Conservation		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Medium	**Potential Funding Source**	General Fund (Staff Time), HMGP, New York State Environmental Facilities Corporation Grants, New York State Water Quality Improvement Project (WQIP) Program Funds, Lake Association, Winding Way Homeowners Association, New York State Department of State		

Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Harmful Algal Blooms contain cyanobacteria, which can produce toxins and other harmful components that can pose a public health risk to people and animals through ingestion, skin contact, or inhalation. Skaneateles Lake is a drinking water source for the City of Syracuse. **2025:** *Skaneateles Lake*: City of Syracuse continues to collaborate with farmers and highway departments to keep soil on the land and nutrients in the soil to help protect water quality. Remediation of sedimentation on private properties on Skaneateles Lake. *Jamesville Reservoir*: HAB Planning/Engineering Study is currently underway. *Otisco Lake*: Aquatic Invasive Species harvesting; purchase of a mechanical harvester and subsidizing harvesting opportunities are planned, and the Otisco Lake Watershed Management Plan is underway.

Mitigation Action	Develop and implement invasive species and infestation mitigation activities.				
Action Number	OC-32	**Goal(s) Addressed**	N/A	**Prioritization Score**	N/A
Year Added to Plan	2019	**Timeline** *(estimated)*	N/A	**Implementation Priority**	N/A
Hazard(s) Mitigated		Invasive Species and Infestation			
Project Status		Discontinued	If *Discontinued*, provide reason.	Identified specific mitigation actions for invasive species and infestation.	
Benefits *(Loss Avoided)*		N/A			
Lead Agency / Organization	Onondaga County Health Department		**Supporting Agency / Organization** *(If applicable)*	Cornell Cooperative Extension, Onondaga County Office of the Environment	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	N/A	**Potential Funding Source**	N/A		
Critical Facility *(Critical Facility located in 1% floodplain?)*	N/A	**Additional Details** *(optional)*			

Mitigation Action	Mudboils Planning and Directional Drilling Project: Limit sediment discharge to Onondaga Creek from mudboils to improve surface water quality.				
Action Number	OC-33	**Goal(s) Addressed**	1, 5	**Prioritization Score**	13/15
Year Added to Plan	2019	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Geological Hazards				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Office of the Environment	**Supporting Agency / Organization** *(If applicable)*	New York State Department of Environmental Conservation, Onondaga Nation, Onondaga Environmental Institute		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (Staff Time), HMGP, Onondaga Environmental Institute Grants		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Tully mudboils are artesian pressure wells that have sprung up in multiple locations within Tully Valley, causing extreme sedimentation and fish die off in Onondaga Creek, as well as ground failure issues related to landslides and other pressurized failures throughout the Valley. **2025:** Directional drilling and localized treatment of sediment are set to begin. Honeywell has donated/returned over 1,000 acres of land in the mudboils area and Onondaga Creek to the Onondaga Nation for conservation purposes. The Onondaga Environmental Institute is monitoring beaver dams for natural sediment/flood control.		

Mitigation Action	Livestock Water Management: Identify and develop livestock water management backup water supplies/cost-effective alternatives for farmers during drought events.				
Action Number	OC-34	**Goal(s) Addressed**	1, 3	**Prioritization Score**	5/15
Year Added to Plan	2019	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	Low
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Soil & Water Conservation District	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Medium	**Potential Funding Source**	General Fund (Staff Time), New York State Department of Agriculture and Markets Funds, New York State Department of Environmental Conservation Funds		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	In the past, dairy farmers on the hilltops of Otisco and Skaneateles Lake watersheds had to resort to hauling and/or pumping water to resupply farm drinking water ponds. Additionally, there is a little pond water reserve for fire suppression in rural communities. **2025:** Grants from New York State have been secured to build ponds/provide additional water supply resources for the agricultural producers with livestock.		

Mitigation Action	Extension of Skaneateles Lake Intake 2: Extend the water supply to be drawn from a depth of approximately 60 feet (the City's shallowest water intake is located at a depth of 20 feet). The extended length will allow for a greater margin of safety, affording chlorine gas injected at the water intake additional contact time to inactivate microcystin.				
Action Number	OC-35	**Goal(s) Addressed**	1, 3	**Prioritization Score**	13/15
Year Added to Plan	2019	**Timeline** *(estimated)*	5 Years	**Implementation Priority**	High
Hazard(s) Mitigated	Harmful Algal Bloom				
Project Status	In Progress/Not Yet Completed	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	City of Syracuse Water Department	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Health Department		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (Staff Time), HMGP, New York State Environmental Facilities Corporation Grants		
Critical Facility *(Critical Facility located in 1% floodplain?)*	Yes	**Additional Details** *(optional)*	The relatively shallow Intake 2 is experiencing low but detectable levels of cyanotoxins during the late summer months. This project would help with turbidity issues. **2025:** Planning continues amongst the stakeholder group, and funding is being pursued.		

Mitigation Action	Install a water filtration system for the Skaneateles Lake water supply.				
Action Number	OC-36	**Goal(s) Addressed**	1, 3	**Prioritization Score**	13/15
Year Added to Plan	2019	**Timeline** *(estimated)*	5 Years	**Implementation Priority**	High
Hazard(s) Mitigated	Harmful Algal Bloom				
Project Status	In Progress/Not Yet Completed	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	City of Syracuse Water Department	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Health Department		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (Staff Time), HMGP, New York State Environmental Facilities Corporation Grants		
Critical Facility *(Critical Facility located in 1% floodplain?)*	Yes	**Additional Details** *(optional)*	Skaneateles Lake is currently a Filtration Avoidance (FA) supply. If the State deems it necessary due to harmful algal blooms, turbidity, or other issues, there is a risk of losing FA. **2025:** Planning continues amongst the stakeholder group, and funding is being pursued.		

Mitigation Action	Conduct an engineering study to install a chlorination boost station in the Village of Jordan.				
Action Number	OC-37	**Goal(s) Addressed**	N/A	**Prioritization Score**	N/A
Year Added to Plan	2019	**Timeline** *(estimated)*	N/A	**Implementation Priority**	N/A
Hazard(s) Mitigated	Harmful Algal Bloom				
Project Status	Complete	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	N/A				
Lead Agency / Organization	Onondaga County Health Department	**Supporting Agency / Organization** *(If applicable)*	Village of Jordan Department of Public Works		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	N/A	**Potential Funding Source**	N/A		
Critical Facility *(Critical Facility located in 1% floodplain?)*	N/A	**Additional Details** *(optional)*			

Mitigation Action	Incorporate climate change projections in County planning and engineering projects for climate resilience.				
Action Number	OC-38	**Goal(s) Addressed**	1, 2, 3	**Prioritization Score**	14/15
Year Added to Plan	2019	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Office of the Environment	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Department of Planning, Onondaga County Physical Services Department		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Information on current climate change projections is available from the following sources: Northeast Regional Climate Center's Intensity Duration Frequency Curves for New York State, Cornell University's Climate Change Facts, New York State Energy Research and Development Authority's ClimAid Report and 2014 updated climate projections, New York State Department of Environmental Conservation's Climate Smart Communities program, and New York State Community Risk and Resiliency Act.		

Mitigation Action	Become a Climate Smart Community through the New York State Climate Smart Communities Program.				
Action Number	OC-39	**Goal(s) Addressed**	N/A	**Prioritization Score**	N/A
Year Added to Plan	2019	**Timeline** *(estimated)*	N/A	**Implementation Priority**	N/A
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Complete	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	N/A				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	N/A	**Potential Funding Source**	N/A		
Critical Facility *(Critical Facility located in 1% floodplain?)*	N/A	**Additional Details** *(optional)*			

Mitigation Action	Encourage and support (when necessary) municipalities to participate in the Climate Smart Communities Program.				
Action Number	OC-40	**Goal(s) Addressed**	1, 2, 3, 5, 6	**Prioritization Score**	14/15
Year Added to Plan	2019	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	Continuous	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Pursue bronze status in the New York State Climate Smart Communities by implementing projects to mitigate against and to make the County more adaptive to climate change-related impacts.				
Action Number	OC-41	**Goal(s) Addressed**	1, 2, 3, 5, 6	**Prioritization Score**	15/15
Year Added to Plan	2025	**Timeline** *(estimated)*	1 Year	**Implementation Priority**	High
Hazard(s) Mitigated	Drought, Heat Wave/Extreme Heat, Flood, Harmful Algal Bloom, Invasive Species and Infestation, Severe Weather, Winter Weather				
Project Status	New	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Department of Planning	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Office of the Environment		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	**2025:** Onondaga County passed a resolution to establish itself as a Climate Smart Community. *Refer to mitigation action OC-41.*		

Mitigation Action	Install splash pads at critical locations and obtain provisions for cooling centers to provide the public with relief during extreme heat events and alternate sources of water-based recreation in the event of a harmful algal bloom event.				
Action Number	OC-42	**Goal(s) Addressed**	1, 3, 6	**Prioritization Score**	8/15
Year Added to Plan	2025	**Timeline** *(estimated)*	1 to 5 Years	**Implementation Priority**	Medium
Hazard(s) Mitigated	Heat Wave/Extreme Heat, Harmful Algal Bloom				
Project Status	New	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Parks	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Office of the Environment		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Medium	**Potential Funding Source**	General Fund (Staff Time)		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Address forest tree loss as a result of invasive species by identifying, prioritizing, planting, and restoring trees on County-owned land to sequester carbon and provide shade (e.g., during extreme heat events). Additionally, encourage municipalities and private property owners to plant and restore trees.				
Action Number	OC-43	**Goal(s) Addressed**	1, 2, 3, 4, 5	**Prioritization Score**	14/15
Year Added to Plan	2025	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Heat Wave/Extreme Heat, Invasive Species and Infestation				
Project Status	New	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Office of the Environment	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Parks, Municipalities		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Medium	**Potential Funding Source**	General Fund (Staff Time), New York State's Environmental Protection Fund (EPF) grants, New York State Energy Research and Development Authority (NYSERDA) grants		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Encourage and promote a regional consortium to address Water Chestnut across New York State, Barge Canal communities, and homeowner organizations along the Seneca River and Three Rivers.				
Action Number	OC-44	**Goal(s) Addressed**	1, 2, 3, 4, 5	**Prioritization Score**	13/15
Year Added to Plan	2025	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Invasive Species and Infestation				
Project Status	New	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Office of the Environment	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Soil & Water Conservation District, Finger Lakes PRISM		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (Staff Time), New York State Environmental Protection Fund		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Install redundant power supply for sewage pump stations throughout the County to ensure service is not disrupted during extreme weather events.				
Action Number	OC-45	**Goal(s) Addressed**	1, 2, 3, 4, 5, 6	**Prioritization Score**	12/15
Year Added to Plan	2025	**Timeline** *(estimated)*	Over 5 Years	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Severe Weather, Winter Weather				
Project Status	New	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Department of Water Environment Protection	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Office of the Environment		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (Staff Time), HMGP, Environmental Facilities Corporation Grants, Water Quality Improvement Project (WQIP) Program Funds		
Critical Facility *(Critical Facility located in 1% floodplain?)*	Yes	**Additional Details** *(optional)*			

Mitigation Action	Harden current sewage pump stations using FEMA Base Flood Elevation (BFE) mapping, and ensure future sewage pump stations are built to BFE standards to protect from flooding.				
Action Number	OC-46	**Goal(s) Addressed**	1, 3, 4, 6	**Prioritization Score**	12/15
Year Added to Plan	2025	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Severe Weather, Winter Weather				
Project Status	New	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Department of Water Environment Protection	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (Staff Time, Sewer Funds), HMGP, Capital Improvement Funds, Environmental Facilities Corporation Grants, Water Quality Improvement Project (WQIP) Program Funds		
Critical Facility *(Critical Facility located in 1% floodplain?)*	Yes	**Additional Details** *(optional)*	These measures are included in all current and planned future capital improvement projects.		

Mitigation Action	Harden current wastewater treatment plants using FEMA Base Flood Elevation (BFE) mapping, and ensure future wastewater treatment plants are built to BFE standards to protect from flooding.				
Action Number	OC-47	**Goal(s) Addressed**	1, 3, 4, 6	**Prioritization Score**	12/15
Year Added to Plan	2025	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Flood, Severe Weather, Winter Weather				
Project Status	New	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	Medium				
Lead Agency / Organization	Onondaga County Department of Water Environment Protection	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (Staff Time, Sewer Funds), HMGP, Capital Improvement Funds, Environmental Facilities Corporation Grants, Water Quality Improvement Project (WQIP) Program Funds		
Critical Facility *(Critical Facility located in 1% floodplain?)*	Yes	**Additional Details** *(optional)*	These measures are included in all current and planned future capital improvement projects.		

Mitigation Action	Mow and manage invasive species in Otisco Lake, the Three Rivers (i.e., Oneida River, Seneca River, and Oswego River), and other affected waterbodies throughout the County, to help preserve aquatic ecosystems.				
Action Number	OC-48	**Goal(s) Addressed**	1, 3, 4	**Prioritization Score**	12/15
Year Added to Plan	2025	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated		Invasive Species and Infestation			
Project Status		New	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		High			
Lead Agency / Organization	Onondaga County Health Department		**Supporting Agency / Organization** *(If applicable)*	Onondaga County Office of the Environment, Onondaga County Soil & Water Conservation District, Otisco Lake Preservation Association	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	High	**Potential Funding Source**	General Fund (County Allocation), New York State Environmental Protection Fund		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Improve and restore riparian shorelines, ditches, wetlands, drainage swales, and ponds to prevent erosion and reduce nutrient loading, which reduces the probability of Harmful Algal Blooms and E. Coli blooms.				
Action Number	OC-49	**Goal(s) Addressed**	1, 3, 4	**Prioritization Score**	12/15
Year Added to Plan	2025	**Timeline** *(estimated)*	Ongoing	**Implementation Priority**	High
Hazard(s) Mitigated	Harmful Algal Bloom				
Project Status	New	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Onondaga County Soil & Water Conservation District	**Supporting Agency / Organization** *(If applicable)*	Onondaga County Office of the Environment, Onondaga County Parks		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Low	**Potential Funding Source**	General Fund (Staff Time), New York State Environmental Protection Fund		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Harmful Algal Blooms and E-Coli Blooms in bodies of water result in shutdowns of recreational activities (e.g., swimming).		

Mitigation Action	Install emergency generators to the radio tower sites to ensure radio tower continuity of operations and expedite emergency communications during an extreme weather event.				
Action Number	OC-50	**Goal(s) Addressed**	1, 3, 6	**Prioritization Score**	9/15
Year Added to Plan	2025	**Timeline** *(estimated)*	6 Months to 1 Year	**Implementation Priority**	Medium
Hazard(s) Mitigated	Severe Weather, Winter Weather				
Project Status	New	If *Discontinued*, provide reason.	N/A		
Benefits *(Loss Avoided)*	High				
Lead Agency / Organization	Emergency Communications (E911)	**Supporting Agency / Organization** *(If applicable)*	N/A		
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Medium	**Potential Funding Source**	HMGP, FEMA Public Assistance		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*			

Mitigation Action	Restore the shoreline at Oneida Shores Park to mitigate shoreline flooding and erosion.				
Action Number	OC-51	**Goal(s) Addressed**	1, 2, 3, 4, 5	**Prioritization Score**	15/15
Year Added to Plan	2025	**Timeline** *(estimated)*	4 to 5 Years	**Implementation Priority**	High
Hazard(s) Mitigated		Flood, Harmful Algal Bloom			
Project Status		New	If *Discontinued*, provide reason.	N/A	
Benefits *(Loss Avoided)*		Medium			
Lead Agency / Organization	Onondaga County Office of the Environment		**Supporting Agency / Organization** *(If applicable)*	Onondaga County Parks	
Additional Participating Jurisdictions *(If applicable)*	N/A				
Estimated Cost	Medium	**Potential Funding Source**	General Fund (Staff Time), HMGP, New York State Environmental Facilities Corporation Grants, New York State Water Quality Improvement Project (WQIP) Program Funds		
Critical Facility *(Critical Facility located in 1% floodplain?)*	No	**Additional Details** *(optional)*	Restoration of the shoreline and reducing flooding and shoreline erosion at Onondaga County's Oneida Shores Park is consistent with the proposed recommendations in the Oneida Lake 9 Element Plan, expected to be completed in 2026.		

APPENDIX B. STAKEHOLDER ENGAGEMENT

Onondaga County engaged with various stakeholders on multiple occasions, including the Steering Committee, during meetings, workshops, and one on one meetings. These stakeholders assisted in identifying hazards, assessing risks and vulnerability, recording critical facilities, and developing and prioritizing mitigation actions in addition to sharing technical data, reports, and studies. Onondaga County understands the importance of stakeholder engagement and that its contribution strengthens the content and outcomes of this Hazard Mitigation Plan.

B.1. STAKEHOLDER AND JURISDICTION INTRODUCTORY WEBINARS

A series of two (2) Stakeholder and Jurisdiction Introductory webinars was conducted virtually at the beginning stages of the 2025 Onondaga County Hazard Mitigation Plan update. All potential plan participants and stakeholders (i.e., county and municipal representatives) were invited to participate in one (1) webinar. The purpose of this webinar was to provide valuable information regarding the FEMA Hazard Mitigation Program directive and, more importantly, demonstrate how participating in this Plan will enable each jurisdiction's eligibility for FEMA's Hazard Mitigation Assistance grant programs. The meeting agenda and sign in sheets for each webinar session are below.

Webinar Agenda



July 8, 2024 – Webinar (Session 1) Sign In Sheets

2024 Onondaga County Hazard Mitigation Plan Update
Introductory Webinar – Session 1
Location: GoToWebinar

Introductory Webinar (Session 1) Date: July 8, 2024				
Name	**Organization**	**Title**	**E-mail**	**Phone**
Yahiritza D. Álvarez	Integrated Solutions Consulting	Senior Consultant	Yahiritza.Alvarez@i-s-consulting.com	[redacted]
Daiko Abe	Integrated Solutions Consulting	Director of Operations	Daiko.Abe@i-s-consulting.com	[redacted]
Jeff Harrop	Onondaga County Department of Planning	Planner II	JeffHarrop@ongov.net	[redacted]
Lisa Schmidt	City of Syracuse	Risk & Safety Manager	lschmidt@syr.gov	[redacted]
Jansen Cassales	Village of Manlius	Fire Chief	jansen.cassales@manliusfire.com	[redacted]
Steven Procopio	Town of Cicero	Director of Codes Enforcement	sprocopio@cicerony.gov	[redacted]
Russell Houck	City of Syracuse	Facilities Engineer	rhouck@syr.gov	[redacted]
Jeff Brown	OCWA - Central New York's Water Authority	Executive Director	jbrown@ocwa.org	[redacted]
Harold Gilfus	Village of Jordan	Code Enforcement	HaroldGilfus@yahoo.com	[redacted]
Douglas Miller	Town of DeWitt	Engineer	dougmiller@millerengineers.com	[redacted]
Ellison McMahon	Onondaga County Department of Planning	Planner I	EllisonMcMahon@ongov.net	[redacted]
Gregory Sgromo	Town of Geddes	Engineer	gsgromo@dunnandsgromo.com	[redacted]
Jason Hoy	Town of Van Buren	Town Engineer	engineer@townofvanburen.com	[redacted]
John Champagne	Village of Minoa	Deputy Mayor	jchampagne@villageofminoa.com	[redacted]

1

2024 Onondaga County Hazard Mitigation Plan Update
Introductory Webinar – Session 1
Location: GoToWebinar

Introductory Webinar (Session 1) Date: July 8, 2024				
Name	**Organization**	**Title**	**E-mail**	**Phone**
Richard Waterman	Village of Camillus	Mayor	Dickwaterman1@gmail.com	[redacted]

2

July 10, 2024 – Webinar (Session 2) Sign In Sheets

2024 Onondaga County Hazard Mitigation Plan Update
Introductory Webinar – Session 2
Location: GoToWebinar

Introductory Webinar (Session 2) Date: July 10, 2024				
Name	**Organization**	**Title**	**E-mail**	**Phone**
Yahiritza D. Álvarez	Integrated Solutions Consulting	Senior Consultant	Yahiritza.Alvarez@i-s-consulting.com	[redacted]
Daiko Abe	Integrated Solutions Consulting	Director of Operations	Daiko.Abe@i-s-consulting.com	[redacted]
Jeff Harrop	Onondaga County Department of Planning	Planner II	JeffHarrop@ongov.net	[redacted]
Beth Smith	City of Syracuse Water Department	Management Analyst	bsmith@syrgov.net	[redacted]
Brenton White	Town of DeWitt Police Department	Acting Chief	bwhite@townofdewitt.com	[redacted]
Bruce Stebbins	Village of Baldwinsville	Mayor	mayor@baldwinsville.org	[redacted]
Chris Shields	Village of East Syracuse	Director of Code Enforcement	cshields@villageofeastsyracuse.com	[redacted]
Floyd Duger	Town of Elbridge	Councilor	fduger@aol.com	[redacted]
Geoffrey Miller	Onondaga County Water Authority	Executive Director of Operations	gmiller@ocwa.org	[redacted]
John Houser	Town of Marcellus	Codes Officer	jhouser@marcellusny.com	[redacted]
John Smith	Town of Onondaga	Highway Superintendent	JSmith@townofonondaga.gov	[redacted]
John T. Deer	Town of Manlius	Town Supervisor	jdeer@townofmanlius.org	[redacted]
Kate Fiorello	Town of Cicero	Town Engineer	kfiorello@cicerony.gov	[redacted]
Kelly Caramanna	Onondaga County Water Authority	Director of Safety	kcaramanna@ocwa.org	[redacted]

1

2024 Onondaga County Hazard Mitigation Plan Update
Introductory Webinar – Session 2
Location: GoToWebinar

Introductory Webinar (Session 2) Date: July 10, 2024				
Name	**Organization**	**Title**	**E-mail**	**Phone**
Lorene Dadey	Village of East Syracuse	Mayor	ldadey@villageofeastsyracuse.com	[redacted]
Mary Robinson	City of Syracuse	City Engineer	mrobison@syr.gov	[redacted]
Michael J. Schreyer	Town of Camillus Police Department	Chief of Police	mschreyer@townofcamillus.com	[redacted]
Paul Stacey	Village of Marcellus	Codes Enforcement Officer	codes@villageofmarcellus.com	[redacted]
Robert Brandt	City of Syracuse Water Department	Deputy Commissioner	robertbrandt@syr.gov	[redacted]
Robert Herrmann	Town of Skaneateles	Codes Enforcement Officer	rherrmann@townofskaneateles.com	[redacted]
Stephen Pitoniak	Town of Lafayette	Chief Safety Officer	lamar1@twcny.rr.com	[redacted]
Tim Dobrovosky	Town of Skaneateles	Highway Superintendent	tdobrovosky@townofskaneateles.com	[redacted]

2

B.2. STEERING COMMITTEE MEETING

Approximately 19 Steering Committee members were part of the Hazard Mitigation Plan update process. **Table 1-3** in Section 1.4.2 of this Plan outlines the Steering Committee's roles and responsibilities, as well as its members by jurisdiction/organization, name, and position title. The first Steering Committee Meeting for the 2025 Onondaga County Hazard Mitigation Plan update was held on June 25, 2024, and used the agenda outlined in this section to guide the discussion. The sign in sheet for the Steering Committee Meeting can be found in this section.

Steering Committee Meeting Agenda



Steering Committee Meeting Sign In Sheet

2024 Onondaga County Hazard Mitigation Plan Update
Steering Committee Meeting #1
Location: GoToWebinar

Hazard Mitigation Steering Committee Meeting #1 Date: June 25, 2024				
Name	**Organization**	**Title**	**E-mail**	**Phone**
Yahiritza D. Álvarez	Integrated Solutions Consulting	Senior Consultant	Yahiritza.Alvarez@i-s-consulting.com	[redacted]
Daiko Abe	Integrated Solutions Consulting	Director of Operations	Daiko.Abe@i-s-consulting.com	[redacted]
Jeff Harrop	Onondaga County Department of Planning	Planner II	JeffHarrop@ongov.net	[redacted]
Megan Costa	Onondaga County Department of Planning	Planner	MeganCosta@ongov.net	[redacted]
Don Jordan	Onondaga County Department of Planning	Executive Director	DonJordan@ongov.net	[redacted]
Shannon Harty	Onondaga County Water Environmental Protection	Commissioner	ShannonHarty@ongov.net	[redacted]
Damian Ulatowski	Town of Clay	Supervisor	supervisor@townofclay.org	[redacted]
Joe Nicoletti	Town of Clay	Highway Superintendent	JNicoletti@townofclay.org	[redacted]
Mark Territo	Town of Clay	Planning Commissioner	MTerrito@townofclay.org	[redacted]
Dan Wears	Onondaga County Department of Emergency Management	Commissioner of Emergency Management	DanWears@ongov.net	[redacted]
Michael Alexander	Syracuse Metropolitan Transportation Council	Senior Transportation Planner	MAlexander@smtcmpo.org	[redacted]
Bob Jacobs	New York State Department of Environmental Conservation (Region 7)	Regional Emergency Response Coordinator	Robert.Jacobs@dec.ny.gov	[redacted]
Jeffrey Till	Onondaga County Health Department (Environmental Health)	Deputy Director	JeffreyTill@ongov.net	[redacted]

1

2024 Onondaga County Hazard Mitigation Plan Update
Steering Committee Meeting #1
Location: GoToWebinar

Hazard Mitigation Steering Committee Meeting #1 Date: June 25, 2024				
Name	**Organization**	**Title**	**E-mail**	**Phone**
Frank Moses	Skaneateles Lake Association	Executive Director	Frank.Moses@skaneateleslake.org	[redacted]
James D'Agostino	Syracuse Metropolitan Transportation Council	Director	HDAgostino@smtcmpo.org	[redacted]
JoAnne Spoto Decker	Onondaga County Department of Adult and Long Term Care Services	Commissioner	JoanneDecker@ongov.net	[redacted]
Mario Colone	Syracuse Metropolitan Transportation Council	Program Manager	MColone@smtcmpo.org	
Matthew Snyder	Oneida Lake Association, Inc.	President	President@oneidalakeassociation.org	[redacted]
Richard Waterman	Village of Camillus	Mayor	DickWaterman1@gmail.com	[redacted]
Brian Kelley	Onondaga County Parks	Commissioner	BrianKelley@ongov.net	[redacted]
Marty Voss	Onondaga County Department of Transportation	Commissioner	MartyVoss@ongov.net	[redacted]

2

B.3. STAKEHOLDER WORKSHOP

Two (2) Stakeholder Workshops were held in the Onondaga County Department of Emergency Management Training Room on July 22, 2024, and July 23, 2024. The workshops allowed each local planning team to collaborate with the Onondaga County Department of Planning to identify local hazards and areas of concern, review previously identified mitigation actions, develop future mitigation projects, prioritize mitigation projects moving forward, and update their jurisdiction's annex of the 2025 Onondaga County Hazard Mitigation Plan. The workshop agenda and sign in sheets are in this section. All participating jurisdictions attended at least one (1) of the workshops.

July 22, 2024 – Stakeholder Workshop (Session 1) Agenda

Onondaga County, New York
2024 Hazard Mitigation Plan Update
Stakeholder Workshop

Date:
Monday, July 22, 2024

Time:
1:30 PM – 4:30 PM

Location:
Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Agenda

- Welcome, Introductions, and Opening Remarks
- Hazard Mitigation Planning Overview
  - Overview of mitigation: Why mitigate?
  - How the mitigation plan can benefit my community/district
  - Overview of key mitigation plan elements & plan process
  - New FEMA guidance that will affect the 2024 update
- Hazard Summary Review
- Hazard Risk Assessment *(Exercise 1)*
- Mitigation Strategy and Mitigation Goals
- Hazard Mitigation Public Survey
- Mitigation Funding Opportunities and Programs
- Jurisdiction Annex *(Exercise 2)*
  - Existing Mitigation Actions
  - Capability Assessment
- New Mitigation Actions *(Exercise 3)*
- Plan Participation and Adoption
- Next Steps
- Closing Remarks

1

July 22, 2024 – Stakeholder Workshop (Session 1) Sign In Sheets

2024 Onondaga County Hazard Mitigation Plan Update
Stakeholder Workshop – Session 1
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Stakeholder Workshop (Session 1)
Date: July 22, 2024

Name	Organization	Title	E-mail	Phone
Dick Waterman	Village of Camillus	MAYOR	DICK.WATERMAN1@GMAIL.COM	[redacted]
Beth Smith	Syracuse Water Mgmt	Am.	Bsmith@syr.gov	[redacted]
Jesse Spaulding	Town of Otisco	Councilman	Jesse5p3@gmail.com	[redacted]
Stephen Bryant	Village of Jordan / Jordan Fire Dept	Assistant Chief	JFD24270@outlook.com	[redacted]
Chris Shields	Village of East Syracuse	Director of Code Enforcement	cshields@villageofeastsyracuse.com	[redacted]
Douglas Blumer	Town of Elbrise	Town Board	blumerdoug@yahoo.com	[redacted]
Floyd Dueer	Town of Elbridge	Councilor Town Board	fdueer@aol.com	[redacted]
Tyler Knapp	Town of Otisco	Town Board	tylerthomasknapp@gmail.com	[redacted]
Kevin Rode	Town of Lysander	Town Supervisor	krode@townoflysander.org	[redacted]
John Fatcheric	Town of Camillus	Town Supervisor	JFATCHERIC@TOWNOFCAMILLUS.COM	[redacted]
Geoff Miller	Onondaga County Water	Executive Director of Operations	gmiller@ocwa.org	[redacted]
Mary E. Robison	City of Syracuse - Engineering	City Engineer	mrobison@syr.gov	[redacted]
William Alley	Town of Camillus Parks	Maintenance Supervisor	BAlley@camillusny.gov	[redacted]

1

2024 Onondaga County Hazard Mitigation Plan Update
Stakeholder Workshop – Session 1
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Stakeholder Workshop (Session 1)
Date: July 22, 2024

Name	Organization	Title	E-mail	Phone
Allen Yager	Town of Lysander	Town Engineer	engineer@townoflysander.org	[redacted]
Kelly Caramanna	OCWA	Dir. of Safety	kcaramanna@ocwa.org	[redacted]
Bill McConnell	Town of Lafayette	Supervisor	WMMACH@aol.com	[redacted]
Robert Brandt	City of Syracuse	Commissioner	Robertbrandt@syr.gov	[redacted]
Ed Ware	Village of N Syracuse	Superintendent	dpw@northsyracuseny.org	[redacted]
Kristy Harris	"	Assistant Engineer	kharris@chasolutions.com	[redacted]
Kate Fiorello	Town of Cicero	Town Engineer	Kfiorello@cicerony.gov	[redacted]
Chris Woznica	T/o Cicero	Highway Supt	CWOZNICA@CICERONY.GOV	[redacted]
DAVID CHRISTIAN	T/o CICERO	HWY FOREMAN	dchristian@cicerony.gov	[redacted]
Harry DeCarlo	Village of Solvay	Clerk-Treasurer	hdecarlo@villageofsolvay.com	[redacted]
Chuck McAuliff	Village of Baldwinsville	Supt	cmcauliff@baldwinsville.org	[redacted]
Bruce Stebbins	" "	Mayor	mayor@baldwinsville.org	[redacted]
Stacy Finney	Village of Liverpool	Mayor	Mayor@villageofliverpool.org	[redacted]
Russell Houck	City of Syracuse	ENGINEER	~~[illegible]~~ rhouck@syr.gov	[redacted]

1

2024 Onondaga County Hazard Mitigation Plan Update
Stakeholder Workshop – Session 1
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Stakeholder Workshop (Session 1)
Date: July 22, 2024

Name	Organization	Title	E-mail	Phone
Tom Nicoletti	Town of Clay	Highway Superintendent	TNicoletti@Townof Clay.org	[redacted]
DANIEL WLATOWSKI	TOWN OF CLAY	SUPERVISOR	SUPERVISOR@TOWN OF CLAY.ORG	[redacted]
STEVE PROCOPIO	TOWN OF CICERO	DIRECTOR CODES ENFORCEMENT	SPROCOPIO@CICERONY.GOV	[redacted]
DOUG MILLER	TOWN OF DEWITT	ENGINEER	DOUGMILLER@MILLERENGINEERS.COM	[redacted]
Christopher Perdue	Town of Onondaga	Code Enforcement Offic	cperdue@townofonondaga.gov	[redacted]
John Houser	Town of Marcellus	Codes	jhouser@marcellusny.com	[redacted]
Dan Wears	OC Emer Mgmt	Director	danielwears@ongov.net	
Megan Costa	Co Planning	Asst Dir		
Jeff Harrop	"	Planner		

2

July 23, 2024 – Stakeholder Workshop (Session 2) Agenda

Onondaga County, New York
2024 Hazard Mitigation Plan Update

Stakeholder Workshop

Date:
Tuesday, July 23, 2024

Time:
9:00 AM – 12:00 PM

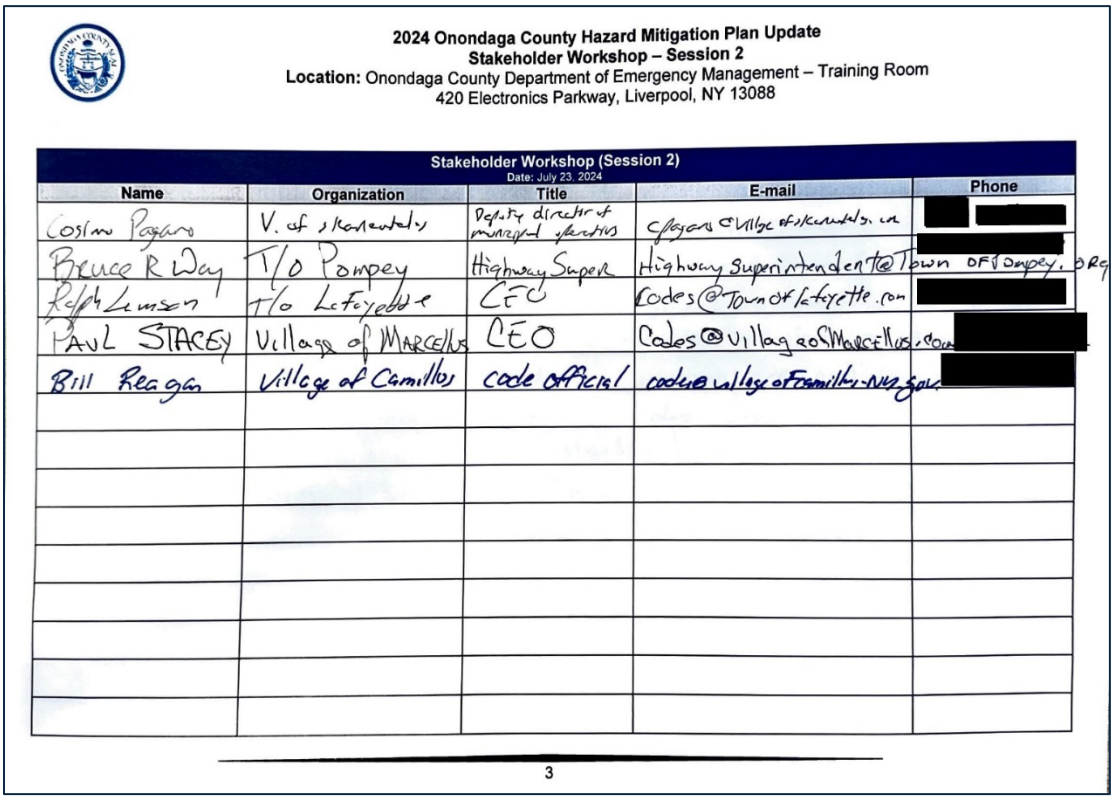
Location:
Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Agenda

- Welcome, Introductions, and Opening Remarks
- Hazard Mitigation Planning Overview
  - Overview of mitigation: Why mitigate?
  - How the mitigation plan can benefit my community/district
  - Overview of key mitigation plan elements & plan process
  - New FEMA guidance that will affect the 2024 update
- Hazard Summary Review
- Hazard Risk Assessment *(Exercise 1)*
- Mitigation Strategy and Mitigation Goals
- Hazard Mitigation Public Survey
- Mitigation Funding Opportunities and Programs
- Jurisdiction Annex *(Exercise 2)*
  - Existing Mitigation Actions
  - Capability Assessment
- New Mitigation Actions *(Exercise 3)*
- Plan Participation and Adoption
- Next Steps
- Closing Remarks

1

July 23, 2024 – Stakeholder Workshop (Session 2) Sign In Sheets

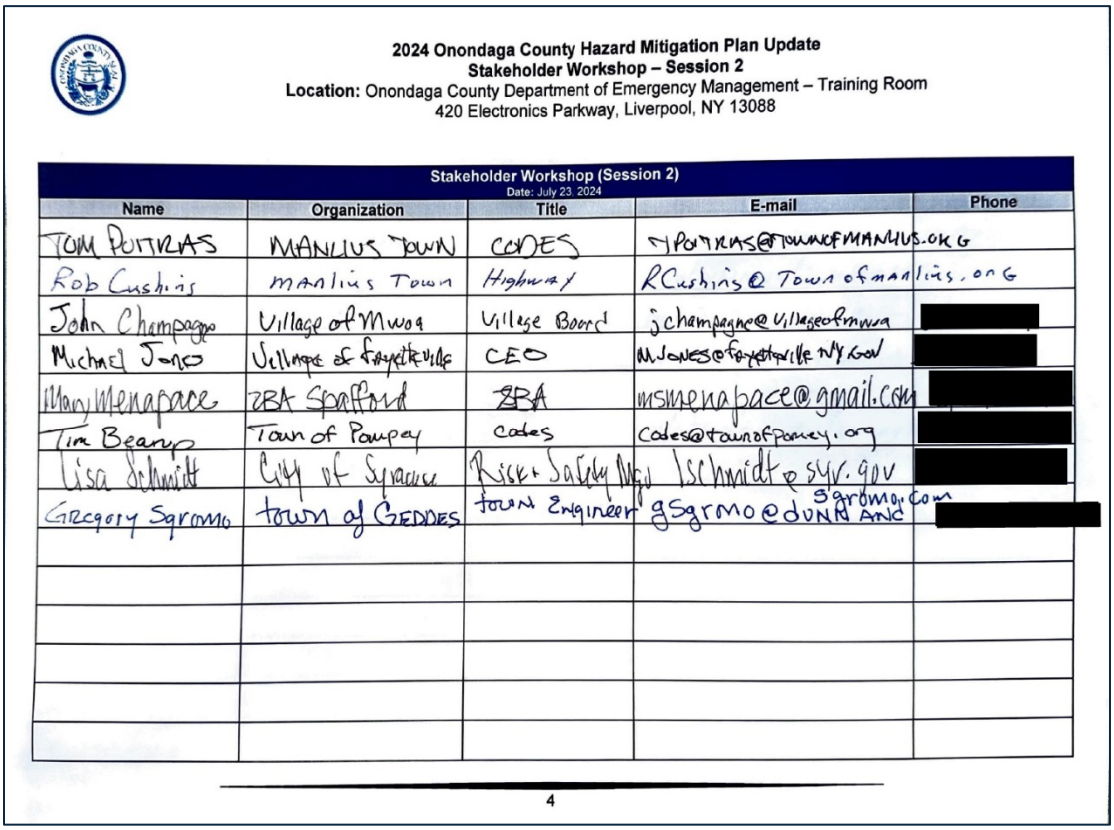


2024 Onondaga County Hazard Mitigation Plan Update
Stakeholder Workshop – Session 2
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Stakeholder Workshop (Session 2)
Date: July 23, 2024

Name	Organization	Title	E-mail	Phone
Cosimo Pagano	V. of Skaneateles	Deputy director of municipal operations	cpagano@villageofskaneateles.com	[redacted]
Bruce R Way	T/O Pompey	Highway Super	Highway Superintendent@Town OF Pompey.ORG	[redacted]
Ralph Lemson	T/o Lafayette	CEO	Codes@TownOfLafayette.com	[redacted]
PAUL STACEY	Village of MARCELLUS	CEO	Codes@VillageOfMarcellus.com	[redacted]
Bill Reagan	Village of Camillus	code official	codes@villageofcamillus.nyz.gov	[redacted]

3



2024 Onondaga County Hazard Mitigation Plan Update
Stakeholder Workshop – Session 2
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Stakeholder Workshop (Session 2)
Date: July 23, 2024

Name	Organization	Title	E-mail	Phone
TOM POITRAS	MANLIUS TOWN	CODES	TPOITRAS@TOWNOFMANLIUS.ORG	
Rob Cushing	manlius Town	Highway	RCushing@TownofManlius.org	
John Champagne	Village of Minoa	Village Board	jchampagne@villageofminoa	[redacted]
Michael Jones	Village of Fayetteville	CEO	MJones@fayettevillenygov	[redacted]
Mary Menapace	ZBA Spafford	ZBA	msmenapace@gmail.com	[redacted]
Tim Beamp	Town of Pompey	Codes	codes@townofpompey.org	[redacted]
Lisa Schmidt	City of Syracuse	Risk+ Safety Mgr	lschmidt@syr.gov	[redacted]
Gregory Sgromo	town of GEDDES	town Engineer	gSgromo@dunn And sgromo.com	[redacted]

4

2024 Onondaga County Hazard Mitigation Plan Update
Stakeholder Workshop – Session 2
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Stakeholder Workshop (Session 2)
Date: July 23, 2024

Name	Organization	Title	E-mail	Phone
Bill Reagan	Village of Liverpool	Code official	codes@villageofliverpool.org	[redacted]
Paul Whorrall	Village of Manlius	MAYOR	paulw@manlius-village.org	[redacted]
Brenton White	T/DeWitt	Acting chief	bwhite@townofdewitt.com	[redacted]
Robert Herrmann Jr	Town of Skaneateles	CEO	rherrmann@townofskaneateles.com	[redacted]
Tim Paborovsky	"		tdoborovsky@townofskaneateles.com	[redacted]
Mark Lafaver	Town of Salina	Code official	mlafaver@salina.ny.us	[redacted]
Ellison McMahon	Onondaga County	Planner I	ellison.mcmahon@ongov.net	

1

2024 Onondaga County Hazard Mitigation Plan Update
Stakeholder Workshop – Session 2
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Stakeholder Workshop (Session 2)
Date: July 23, 2024

Name	Organization	Title	E-mail	Phone
Mark Manley	Village of Solvay	Village Eng	mmanley@cscos.com	[redacted]
Tom Petteredi	Village of Minoa	D.P.W Supt	minoadpw@twcny.rr.com	[redacted]
Tom Posella	Village of Skaneateles	Director	dno@villageofskaneateles.com	[redacted]
Jason Hoy	T Van Buren	Engineer	engineer@townofvanburen.com	[redacted]
Randy Hughes	V/o East Syracuse	Sup	rhughes@Villageofeastsyracuse.com	[redacted]
Jake Dishaw	City of Syracuse	Dep. Comm of Codes	jdishaw@syr.gov	[redacted]
John Smith	Town of Onondaga	Highway Superintendent	Jsmith@townofonondaga.org	[redacted]
Dennis Bobbette	Town of Fabius	Highway Supt	DBobbette@yahoo.com	[redacted]
Ryan Shiel	City of Syracuse	Director of Code Enf	RShiel@syr.gov	[redacted]
Larry Nestell	Town of Spafford	Code Enforcement/Zoning	spaffordcodes@gmail.com	[redacted]
Chris Sherwood	Village of Manlius	DPW Super	CHRISS@MANLIUVILLAGE.ORG	[redacted]

5

2024 Onondaga County Hazard Mitigation Plan Update
Stakeholder Workshop – Session 2
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Stakeholder Workshop (Session 2)
Date: July 23, 2024

Name	Organization	Title	E-mail	Phone
John Deer	Town of Manlius	Supervisor	JDeer@townofmanlius.org	[redacted]

1




Hazard Mitigation
Planning Meeting
Training Room 1















B.4. COUNTY DEPARTMENT WORKSHOP

A separate workshop for the Onondaga County departments was held in the Onondaga County Department of Emergency Management Training Room on October 1, 2024. Similar to the Stakeholder Workshop mentioned in Section B.3 of this Plan, this workshop allowed each department to work with the Onondaga County Department of Planning to review local hazards, identify areas of concern, review previously identified mitigation actions, develop future mitigation projects (i.e., mitigation actions), and prioritize mitigation projects moving forward. The workshop agenda and sign in sheets are in this section.

October 1, 2024 – County Department Workshop Agenda

Onondaga County, New York
2024 Hazard Mitigation Plan Update
County Department Meeting

Date:
Tuesday, October 1, 2024

Time:
1:00 PM – 2:30 PM

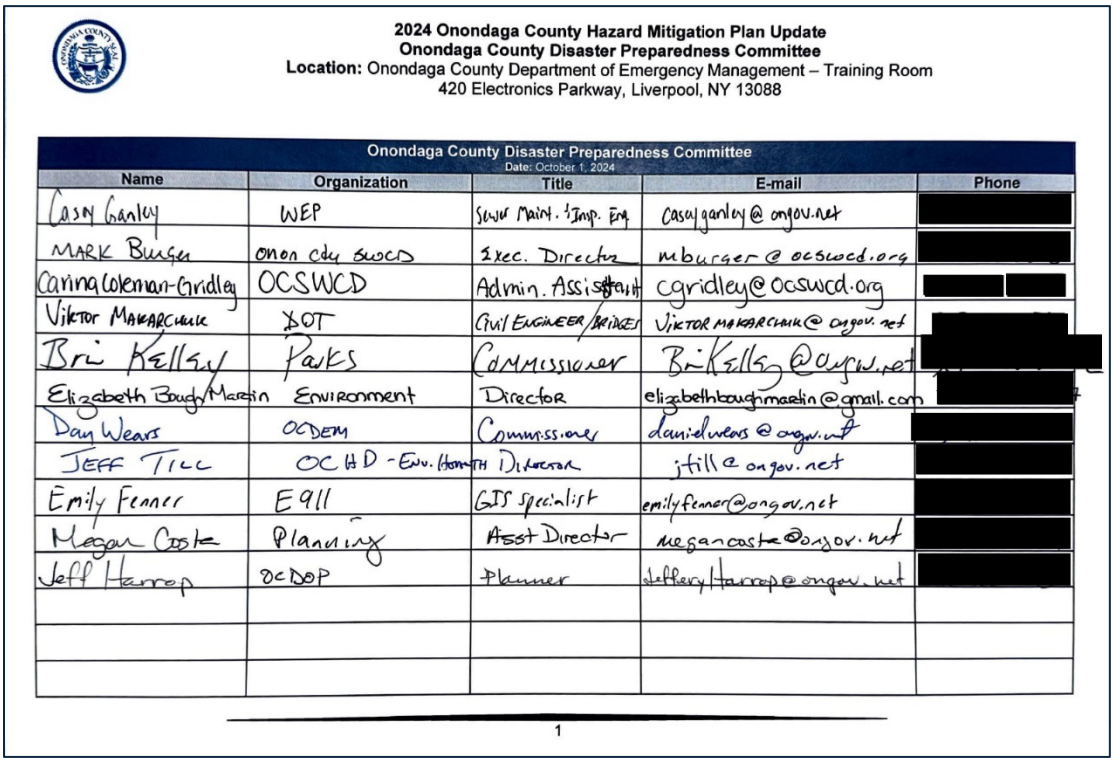
Location:
Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Agenda

- Welcome, Introductions, and Opening Remarks
- Onondaga County Hazard Mitigation Plan Overview
- Hazard Mitigation Planning Overview
- Hazard Mitigation Public Survey
- Hazard List Summary
- Hazard Risk Assessment
- Mitigation Goals
- Mitigation Actions
  - Existing Mitigation Actions Update
  - New Mitigation Actions
- Closing Remarks

1

October 1, 2024 – County Department Workshop Sign In Sheet



2024 Onondaga County Hazard Mitigation Plan Update
Onondaga County Disaster Preparedness Committee
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Onondaga County Disaster Preparedness Committee
Date: October 1, 2024

Name	Organization	Title	E-mail	Phone
Casey Ganley	WEP	Sewer Maint. & Imp. Eng	caseyganley@ongov.net	[redacted]
MARK Burger	onon cty SWCD	Exec. Director	mburger@ocswcd.org	[redacted]
Carina Coleman-Gridley	OCSWCD	Admin. Assistant	cgridley@ocswcd.org	[redacted]
Viktor Makarchuk	DOT	Civil Engineer/Bridges	Viktor.makarchuk@ongov.net	[redacted]
Bri Kelley	Parks	Commissioner	Bri.Kelley@ongov.net	[redacted]
Elizabeth Baughman Martin	Environment	Director	elizabethbaughmartin@gmail.com	[redacted]
Dan Wears	OCDEM	Commissioner	danielwears@ongov.net	[redacted]
JEFF TILL	OCHD - Env. Health	Director	jtill@ongov.net	[redacted]
Emily Fenner	E911	GIS Specialist	emilyfenner@ongov.net	[redacted]
Megan Costa	Planning	Asst Director	megancosta@ongov.net	[redacted]
Jeff Harrop	OCDOP	Planner	JefferyHarrop@ongov.net	[redacted]

1

B.5. DISASTER PREPAREDNESS COMMITTEE

The Onondaga County Disaster Preparedness Committee (DPC)'s main purpose is to form partnerships between public and private organizations to enhance everyone's ability to prepare for and respond to large-scale disasters and emergencies. The DPC meets quarterly, and one (1) meeting a year serves dually as the Local Emergency Planning Committee (LEPC) meeting. The Hazard Mitigation Plan update was presented and discussed during the October 1, 2024, quarterly meeting. **Table B-1** lists the DPC members by jurisdiction/organization and name. Additionally, the sign in sheets for the October 1, 2024, meeting can be found in this section. The information presented during the DPC quarterly meeting was shared with the entire Committee, including those who were unable to attend, providing an opportunity for review and comment.

Table B-1. Disaster Preparedness Committee Members List

Name	Agency/Organization
Bobbi Alcock	Onondaga County Health Department
Michael Alexander	Syracuse Metropolitan Transportation Council
Janet Dauley Altwarg	Long Term Care Executive Council of CNY
Stacey Ball	SOS Bones
Joe Bick	St. Joseph's Health
Kelly Billion	New York State Department of Transportation
Justin Blanchard	New York State Department of Transportation
Michael Block	United Methodist Church
Kaitlin Bolan	Fresenius Medical Care
Edward Bragg	Sysco Foods, LLC
DJ Breweter	Syracuse City School District
Aaron Buchta	Onondaga County Soil & Water Conservation District
Kelly Caramanna	Onondaga County Water Authority
Kenneth Case	American Medical Response
Michael Chappell	New York State Department of Environmental Conservation
Jeff Chrissley	174th ARFF
Kristina Clark	United Methodist Committee on Relief
Chelsea Clarke	Onondaga County Department of Emergency Management
Mark Colesante	New York State Police
Stephen Coonradt	Lockheed Martin
Julie Corn	Onondaga Department of Emergency Communications – 911
Tom Corp	Byrne Diary
Megan Costa	Onondaga County Department of Planning
John Costello	Sysco Foods, LLC
Dave Cowburn	Onondaga County Department of Emergency Management
Natalina Crouse	Fresenius Kidney Care – St. Joseph's Dialysis, Liverpool Dialysis
Michael Crowell	Manlius Town Police
Renee Cuda	Specialists One Day Surgery
Dan Culican	Amazon Fulfillment Center
Elton Davis	Syracuse Fire Department
Brian DeRochie	Syracuse Academy of Science

Name	Agency/Organization
Joshua Doughtery	Onondaga County Health Department
Stephen Drake	Onondaga County Water Authority
Christopher Dunham	State University of New York (SUNY) Upstate
Timothy Dwyer	Lotte Biologics
James Edmonds	Air Force Military Auxiliary Radio System
John Edwards	RACES
Brian Ehret	Onondaga County Medical Examiner's Office
William Fleming	Byrne Dairy
Jessice Fletcher	OCM BOCES
Aaron Forbes	New York State Police
Steve Fortino	Crouse
Joshua Fowler	New York State Police
James Galu	United States Department of Agriculture
Travis Glazier	National Grid
Christopher Gorman	National Grid
Don Grevelding	Onondaga Department of Emergency Communications – 911
Greg Haberlau	OCM BOCES
Mary Haines	National Grid
Don Jordan	Syracuse-Onondaga County Planning Agency
William Karnadi	Syracuse University
Megan Kash	New York State Department of Health
Aaron Keddy	Civilian
Matthew Kelly	Onondaga County Medical Examiner's Office
Eric LaBarge	Lotte Biologics
Sue Liquori	Loretto/PACE NY
Louie Longo	Onondaga County Department of Emergency Management
Jesse Mackey	Fresenius Medical Care
Brad Marmon	Upstate Medical University
Aniska Massard	Fresenius Medical Care
Matt McShea	Wegmans
Geoffrey Miller	Onondaga County Water Authority
Anthony Mondello	Walgreens
Branda Muhammad	FORCE
Keith Muhammad	FORCE
Brent Naylor	Sysco Foods, LLC
Dave Newman	CSX
Doug North	American Red Cross
Chadd O'Hora	New York State Park Police
Ellyn Ostrander	Fresenius Kidney Care
Derick Owens	Cybersecurity & Infrastructure Security Agency
Nick Pagano	Syracuse Fire Department
Gerald Payne	Onondaga County Department of Emergency Management

Name	Agency/Organization
John Perkins	RACES
Susan Pope	American Red Cross of Central and Northern New York
Marcus Porter	Fresenius Kidney Care
Carolyn Revercomb	Onondaga County Medical Examiner's Office
Rob Rivera	American Red Cross
John Rossiter	Syracuse University Fire and Life Safety
Gwendolyn Sanders	National Grid
Sue-Lynn Sanson	Fresenius Kidney Care
John Sardino	Syracuse University
Jason Segerlind	Savage Services
Dave Sensinger	Crouse Hinds
Donia Schanthal	Sysco Foods, LLC
Carrie Schmid	Gentiva
Anthony Scuderi	New York Air National Guard – 174th Attack Wing
Leea Sinay	National Grid
Ann Smith	New York State Department of Health
Paul Smyth	Syracuse University Ambulance
Amber Stevens	New York State Department of Transportation
Christine Stork	Upstate Medical University
Mark Swing	Civil Air Patrol
Rick Teneyck	Salvation Army
Chris Travis	Onondaga County Soil & Water Conservation District
Jeffrey VanBeveren	Onondaga County Department of Emergency Management
Martin Voss	Onondaga County Department of Transportation
Spencer Wankum	Anheuser-Busch
Daniel Wears	Onondaga County Department of Emergency Management
Robert Whitehead	Onondaga County Department of Emergency Management
Chad Whitney	New York State Police
Rick Wille	Wegmans
Brian Williams	Syracuse Police Department
Ronald Williams	Occupational Safety and Health Administration
Tim Winderl	New York State Electric and Gas
Kirk Wolfgang	Lottee Biologics
Michael Woolson	Crouse
Dave Zeleznock	Anheuser-Busch
Mark Zoanetti	Onondaga County Department of Emergency Management

October 1, 2024 – Disaster Preparedness Committee Meeting Sign In Sheets

2024 Onondaga County Hazard Mitigation Plan Update
Onondaga County Disaster Preparedness Committee
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Onondaga County Disaster Preparedness Committee
Date: October 1, 2024

Name	Organization	Title	E-mail	Phone
John Perkins	RACES	Radio Officer	JP 96166@gmail.com	[redacted]
Michael Woolcan	Crouse Health	EPC	MichaelWoolcan@crouse.org	[redacted]
Mike Bloch	UMCOR	worker	mrb2065@Gmail.com	[redacted]
Kristina Clark	UMCOR	Coordinator	KristinaClark@UMCUMC.org	[redacted]
Tom Corp	Byrne Dairy	EMS Director	tcorp@byrne1933.com	[redacted]
Tim Dwyer	LOTTE Biologics	Assoc. Director, Security	timothy.dwyer@lottebiologics.com	[redacted]
MARK BURGER	onon cty SWCD	Exec. Director	Mburger@ocswcd.org	[redacted]
Codie Corso	Wegmans (Asset Protection)	Department Manager	Codie.Corso@wegmans.com	[redacted]
Jon Derenbacher	Wegmans (Asset Protection)	Division Manager	Jonathan.Derenbacher@Wegmans.com	[redacted]
JEFF VANBEVEREN	OCDEM	DIRECTOR OF EMS	JEFFREYVANBEVEREN@ONTOV.NET	[redacted]
Robert Whitehead	OCDEM	Senior Planner	robert.whitehead@onjov.net	[redacted]
Geoffrey Miller	OCWA	Exec. Director of Operations	gmiller@ocwa.org	[redacted]
Kelly Caramanna	OCWA	Dir. of Safety	Kcaramanna@ocwa.org	[redacted]
Dan Wears	OCDEM	Commissioner	danielwears@ongov.net	[redacted]

1

2024 Onondaga County Hazard Mitigation Plan Update
Onondaga County Disaster Preparedness Committee
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Onondaga County Disaster Preparedness Committee
Date: October 1, 2024

Name	Organization	Title	E-mail	Phone
Chris Gorman	National Grid.	Mgr.	christopher.gorman@nationalgrid.com	[redacted]
Megan Costa	Onondaga Co. Planning	Asst Director	megancosta@ongov.net	[redacted]
Josh Dougherty	Onondaga Co. Health	Prog Coord II	Joshua.Dougherty@ongov.net	[redacted]
Tim Winderl	NYSEG	Program Mngr.	tfwinderl@NYSEG.com	[redacted]
Michael Chappell	NYSDEC Forest Rangers	Forest Ranger 1	michael.chappell@dec.ny.gov	[redacted]
Leea Lattanzio (Sirag)	National GRID	Senior Specialist	leea.lattanzio@nationalgrid.com	[redacted]
Anthony Sanderi	174 ATKW / NY ANG	Emergency mgr	Anthony.Sanderi.1@us.af.mil	[redacted]
Robert Rivera	American Red Cross	Gov. Operations	rob.rivera@redcross.org	[redacted]
Gerald Payne	Onondaga Co. Emergency Management	Director - Fire	geraldpayne@ongov.net	[redacted]

2

B.6. WHOLE COMMUNITY

Onondaga County provided key stakeholders with opportunities to participate in the planning process. This included, but was not limited to, sharing information and input to inform the Plan's content; assisting with targeted outreach and engagement, especially for the underserved communities; and reviewing and providing feedback on the Plan during the public comment period. Stakeholders are individuals or groups that a mitigation action or policy affects, and involving them in the planning process helps obtain support for the Plan and identify barriers to conducting hazard mitigation.

The following stakeholder types were provided with an opportunity to be part of the planning process.

- Local and regional agencies involved in hazard mitigation activities (e.g., public works, emergency management, local floodplain administration, and GIS departments).
- Agencies that have the authority to regulate development (e.g., zoning, planning, community and economic development departments, building officials, planning commissions, and other elected officials).
- Neighboring communities (e.g., adjacent local governments, including special districts and tribes, that are affected by similar hazard events. They also may share a mitigation action or project that crosses jurisdictional boundaries).
- Businesses, academia, and other private interests (e.g., private utilities, chambers of commerce, dam owners, local or regional educational centers within the jurisdiction, or major employers that sustain community lifelines).
- Nonprofit organizations, including community-based organizations that work directly with and/or provide support to underserved communities and socially vulnerable populations (e.g., faith-based organizations, disability agencies or non-governmental organizations, rural support agencies, health and social services departments, housing agencies, and housing advocacy groups.

The stakeholders who were provided an opportunity to participate in the planning process, including the review and feedback on the draft Plan, for the Onondaga County Hazard Mitigation Plan, are listed below in no particular order.

Local and Regional Agencies	
174th Attack Wing	Onondaga County Health Department
Cybersecurity and Infrastructure Security Agency (CISA)	Onondaga County Department of Planning
Central New York (CNY) Regional Transportation Authority	Onondaga County Department of Transportation
Empire State Development	Onondaga County Emergency Management
Local Emergency Planning Committee and Disaster Preparedness Committee	Onondaga County GIS
National Weather Service	Onondaga County Medical Examiner's Office
New York State Agriculture and Markets	Onondaga County Office of Diversity and Inclusion
New York State Department of Environmental Conservation	Onondaga County Office of the Environment
New York State Division of Homeland Security and Emergency Services	Onondaga County Soil and Water Conservation District
New York State Department of Health	Onondaga County Water Authority
New York State Department of Transportation	Onondaga County Department of Water Environment Protection
New York State Police	Onondaga Nation

Local and Regional Agencies	
New York State Thruway Authority	Syracuse Metropolitan Transportation Council
Onondaga County Department of Emergency Communications (Emergency Communications – 911)	Syracuse Regional Airport Authority
Onondaga County Adult and Long Term Care Services	

Agencies that have Authority to Regulate Development	
Onondaga County Legislature	
Note: *Regulatory authorities in Onondaga County are regulated by each municipality. All 35 municipalities participated in the planning process for this Plan update.*	

Neighboring Communities	
Cayuga County (Department of Planning and Economic Development, and Office of Emergency Services)	Empire State Development
Cortland County (Planning Department, and Emergency Response and Communications)	Madison County (Planning Department and Office of Emergency Management)
City of Syracuse Water Department	Oswego County (Office of Planning and Community Development, and Emergency Management)

Nonprofit Organizations	
American Red Cross	Onondaga County Community Development Division
Cornell Cooperative Extension of Onondaga County	Onondaga County Department of Social Services
FORCE NY	Onondaga County Health Department
Home Headquarters	United Methodist Committee on Relief
New York Association of Long Term Care Administrators	United Methodists of Upstate New York

Business, Academia, and Other Private Organizations	
Amazon Emergency Preparedness	Maxim Healthcare
American Medical Response of Central New York	National Grid
Anheuser Busch	New York State Electric and Gas
Arctic Glacier	OCM Boces
Association of Towns	Oneida Lake Association
Association of Mayors	Otisco Lake Preservation Association
Byrne Dairy	Poison Control, SUNY Upstate
CenterState CEO	Radio Amateur Civil Emergency Service
Central New York (CNY) Regional Planning and Development Board	Savage Services
Central New York (CNY) Stormwater Coalition	Science Academy of New York
Civil Air Patrol	Skaneateles Lake Association
Crouse Hospital	St. Joseph's Hospital
CSX	SU Ambulance, Syracuse University
Dot Foods	SUNY Upstate
Fresenius Healthcare	Syracuse Orthopedic Specialists

Business, Academia, and Other Private Organizations	
Gentiva	Syracuse University
Lockheed Martin	Syracuse University Environmental Finance Center
Loretto Healthcare	Sysco
Lotte Biologics	Walgreens
Manufacturers Association of Central New York (MACNY)	Wegmans Security

APPENDIX C. PUBLIC ENGAGEMENT

The mitigation planning process promotes awareness of hazard risks and continues the conversation about the community's safety and resilience. A hazard mitigation plan generates additional community support when it accurately reflects the community's values and priorities, which will lead to the successful implementation of the mitigation actions and projects identified in this Plan.

Federal regulations for mitigation plan approval require that stakeholders and the general public be given opportunities to be involved in the plan's development and update process. Input from community members can strengthen the content and outcomes of the hazard mitigation plan. Furthermore, the plan must state continued public engagement as the plan is conducted during its lifetime.

A public outreach strategy outlines what the community aims to achieve through outreach efforts. Additionally, it identifies who to involve in the process and how and when to engage the community effectively. Onondaga County stakeholders and the public were given a number of opportunities to be involved throughout the planning process. Opportunities were provided via a public survey, in-person public meetings, and public engagement activities to review the Plan draft (i.e., public comment period).

Survey results, public meeting documentation (i.e., agendas, sign in sheets, and photos), and public comment period outreach activities are included in this section.

How Public Input was Incorporated into the Plan

Information and feedback gained through the public survey, public meetings, and public comment period provided valuable data to validate and confirm the risk assessment findings and potential mitigation strategies. Specifically, feedback from the public during the public meetings provided greater insight into the public's concerns regarding specific hazards and their impacts. The public also offered specific initiatives they believed would enhance the County's and its residents' resilience.

Survey results helped validate the hazards included in the Plan, the hazard ranking process, and areas where the County and jurisdictions could further improve outreach and education efforts. Open-ended responses, specifically regarding their experience with damages from past hazards, helped to validate hazard-specific impact data in Chapter 4 of this Plan. These and related findings helped the Core Planning Team and local planning teams identify meaningful mitigation projects.

After the public comment period ended, no feedback forms were received from the public and stakeholders. However, to keep the Plan current after it is approved, the County will ensure that the public remains involved in the Plan and in how it is conducted. Refer to Section C.4 of this Plan for further details on continued public engagement.

C.1. PUBLIC MEETING

Onondaga County Department of Planning hosted a public meeting on July 22, 2024. This meeting allowed the County to introduce the Plan update, identify additional hazards of concern to be included, if any, and provide input on the various mitigation measures intended to eliminate or reduce the negative impact of those hazards.

During the Public Meeting, forms were provided to each participant to identify and describe how the identified hazards for Onondaga County have impacted (or could impact) their place of residence and/or work, municipality, or organization. Additionally, participants were asked to provide mitigation actions/ideas and to identify additional hazards of concern. Although highly encouraged, these forms were voluntary and confidential. The public meeting agenda, sign in sheet, and form samples can be found in this section.

July 22, 2024 – Public Meeting Agenda

Onondaga County, New York
2024 Hazard Mitigation Plan Update
Public Meeting

Date:
Monday, July 22, 2024

Time:
5:00 PM – 6:00 PM

Location:
Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Agenda

Welcome, Introductions, and Opening Remarks

Hazard Mitigation Overview

Hazard Mitigation Benefits

Hazard Mitigation Planning Overview

Hazard Mitigation Public Survey

Hazard List Summary

Hazard Risk Assessment *(Exercise 1)*

Hazard Assessment Form *(Exercise 2)*

Mitigation Goals

Mitigation Actions/Ideas *(Exercise 3)*

Closing Remarks

1

July 22, 2024 – Public Meeting Sign In Sheet

2024 Onondaga County Hazard Mitigation Plan Update
Public Meeting
Location: Onondaga County Department of Emergency Management – Training Room
420 Electronics Parkway, Liverpool, NY 13088

Public Meeting
Date: July 22, 2024

Name	Organization	Title	E-mail	Phone
Janet Rahbaum	—	—	janet.rahbaum@aol.com	[redacted]
Liz Schmitt			liz.dunne.schmitt@gmail.com	[redacted]
Ed Schmitt			eschmitt@twcny.rr.com	[redacted]
J. Arnie Deeks				
Robert Deeks			rdeeks3@twcny.rr.com	[redacted]
Aaron McKeon	CNY RPDB		amckeon@cnyrpdb.org	[redacted]

1





Hazard Assessment Form

Hazard Assessment Form
Exercise 2 Handout

Name: *(Optional)* _____ **E-mail:** *(Optional)* _____

Neighborhood/ Jurisdiction _____ **Phone Number:** *(Optional)* _____

Instructions: *Please use this form to identify and describe how the hazards below have impacted (or could impact) your place of residence/work, municipality, or organization. Please be as specific as possible.*

Exposure and vulnerability to certain hazards **affect the entire County**. In other words, these hazards can affect the entire County (e.g., earthquake) or happen anywhere within the County (e.g., severe weather). The following hazards fall into this category: communicable diseases/pandemic, drought, earthquake, severe weather, winter weather, and volcanic activity. Although the entire County may be vulnerable to these hazards, their impacts may vary based on existing community conditions (e.g., underserved, or functional access needs populations may be more susceptible based on certain conditions, vulnerabilities, or needs). **Please indicate the hazards in which your jurisdiction or special district is uniquely vulnerable and provide a brief explanation.**

☐ My place of residence/work, community and/or organization is NOT uniquely vulnerable to any hazards that affect the entire County. Check the box if this applies to you.

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Drought. Indicate the location(s) of concern and its potential impacts.

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Earthquakes. Indicate specific buildings or structures in your community that are seismically unreinforced or prone to collapse.

Page **1** of **4**

Hazard Assessment Form
Exercise 2 Handout

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Extreme Heat. Indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard.

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Severe Storms (e.g., thunderstorm, hail, strong winds, tornado, hurricane/tropical storm, nor'easter). Indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard (e.g., manufactured homes).

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Severe Winter Weather (e.g., blizzards, heavy snow, ice storm, cold wave/extreme cold). Indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard (e.g., higher elevations with large stands of trees or power lines).

Page **2** of **4**

Hazard Assessment Form
Exercise 2 Handout

Exposure and vulnerability to certain hazards are **geographically defined**. In other words, these hazards tend to affect certain areas in your community (i.e., riverine-based flooding). The following hazards fall into this category: avalanche, dam and levee failure, flood, landslides, and wildfire.

Please indicate the hazards in which your jurisdiction, special district, or organization is uniquely vulnerable and provide a brief explanation.

☐ My place of residence/work, community, and/or organization is NOT uniquely vulnerable to any hazards that are geographically defined. Check the box if this applies to you.

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Flooding (e.g., riverine, flash/urban, ice jam, dam and levee failure). Indicate how a specific intersection, and/or subdivision repeatedly floods. If applicable, indicate the dam and/or levee of concern, and describe how a failure of the dam and/or levee could impact your community. What structures/homes and roadways reside in the inundation area?

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Geological Hazards (e.g., landslide, land subsidence, mudboils). Indicate location(s) of concern and unique vulnerabilities/issues.

Page **3** of **4**

Hazard Assessment Form
Exercise 2 Handout

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Harmful Algal Bloom. Indicate location(s) of concern and unique vulnerabilities/issues.

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Invasive Species and Infestation (e.g., Emerald Ash Borer, Hemlock Woolly Adelgid, True Armyworm, Common Reed (Phragmites), Eurasian Watermilfoil, Water Chestnut, Tick-Borne Diseases, Mosquito-Borne Diseases). Indicate location(s) of concern and unique vulnerabilities/issues.

Please describe how your residence/work or municipality/organization is uniquely vulnerable to Wildfires (Wildfire Smoke). Indicate the area of concern and describe how wildfire could impact your community or key infrastructure vulnerable to wildfire.

Page 4 of **4**

New Mitigation Action Form

New Mitigation Action/Idea
Exercise 3 Handout

*Please complete **one (1) form for <u>each</u> proposed mitigation action/idea** with as much detail as possible.*

Name: *(optional)* _____ **E-mail:** *(optional)* _____

Neighborhood/ Jurisdiction: _____ **Phone Number:** *(optional)* _____

New Mitigation Action/Idea (Proposed Solution to a Risk or Concern)

Please describe.

Benefit *(Problem this Mitigation Action/Idea will address)*

Please describe the benefits this mitigation action/idea will offer to your community and/or organization.

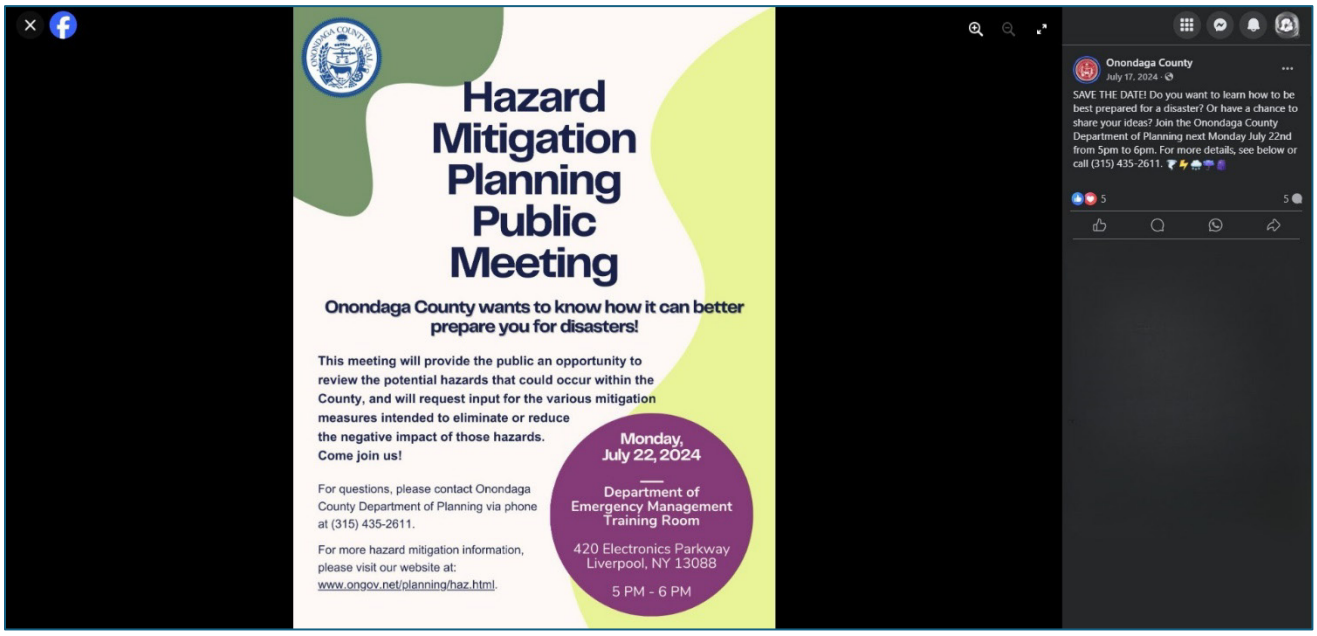
Mitigation Hazards

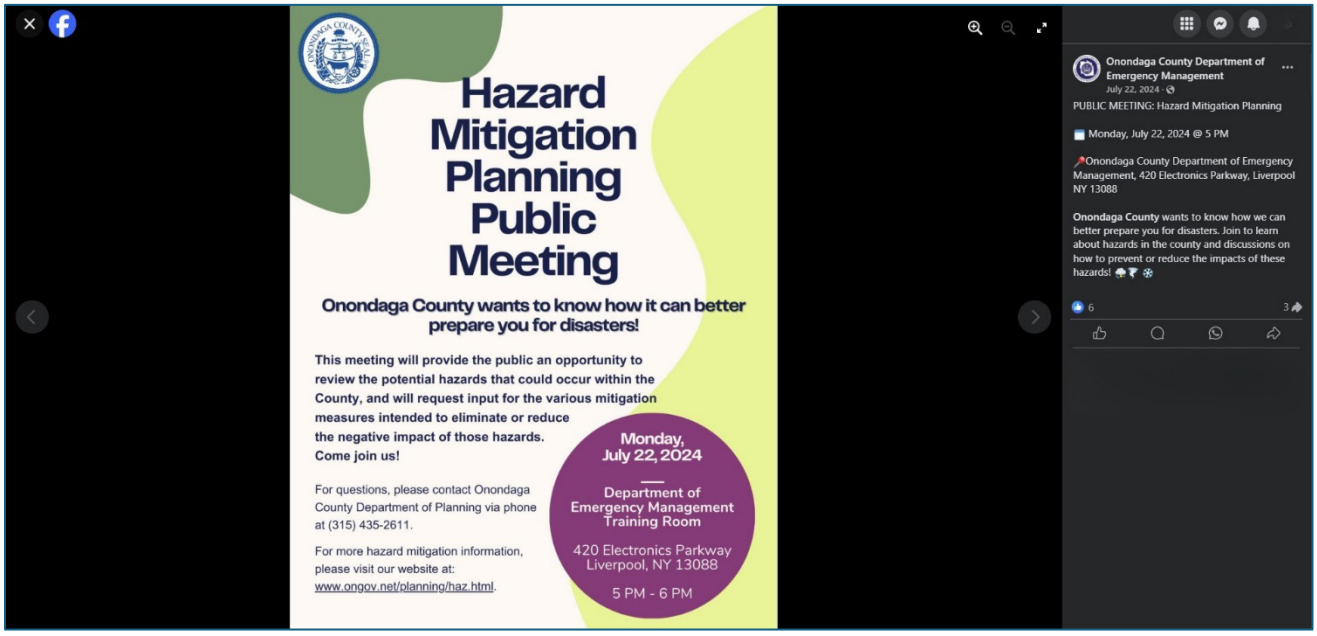
*Place an **X** by the hazard this action/idea will mitigate. Please select **<u>all that apply</u>**.*

	Drought		**Harmful Algal Bloom**
	Earthquake		**Invasive Species and Infestation** *(Emerald Ash Borer, Hemlock Woolly Adelgid, True Armyworm, Common Reed (Phragmites), Eurasian Watermilfoil, Water Chestnut, Tick-Borne Diseases, Mosquito-Borne Diseases)*
	Heat Wave / Extreme Heat		**Severe Storm** *(thunderstorm, hail, strong winds, tornado, hurricane/tropical storm, nor'easter)*
	Flood *(riverine, flash/urban, ice jam, dam and levee failure)*		**Severe Winter Weather** *(blizzards, heavy snow, ice storms, cold wave/extreme cold)*
	Geological Hazards *(landslides, land subsidence, mudboils)*		**Wildfire**

Page **1** of **1**

Public Meeting Outreach Samples





Department of Planning

J. Ryan McMahon II , County Executive
Troy W. Waffner, Planning Director

ongov.net



Connect with Onondaga County

How May We Help You? | Where Can I Find? | ENHANCED BY Google | Select Language

- Planning Home
- County Planning Board
- County Planning
- GIS
- Addressing
- Links
- Contact Us

2024 Five-Year Update

Onondaga County Multi-Jurisdictional Hazard Mitigation Plan

The Onondaga County Department of Planning is leading the 2024 five year update of the Onondaga County Multi-Jurisdictional Hazard Mitigation Plan for the County and its municipalities.
The Plan was originally adopted by the Onondaga County Legislature and participating municipalities in 2013, and updated in 2019.
Hazard mitigation, or pre-disaster planning, provides an opportunity to identify key local actions to be taken to reduce or eliminate the long-term risk to human life and property from natural hazards. It is also a wise investment because FEMA cites that every $1 spent on hazard mitigation before a natural disaster impacts a community saves $6 on future disaster losses.
The primary hazards of concern to Onondaga County identified in the 2019 update include drought, earthquake, flooding, geological hazards (i.e., landslide, land subsidence, mudboils), harmful algal blooms, invasive species and infestation, severe storms, and winter storms. The 2024 update will also likely include extreme heat and wildfire as new hazards of concern.
Ultimately, this Plan will identify mitigation projects and actions that will be implemented to reduce vulnerability and enable communities to become more resilient to disasters. The Federal Government requires local and state governments to have a FEMA-approved Hazard Mitigation Plan, as established by the Disaster Mitigation Act of 2000, in order to qualify for hazard mitigation assistance grant funds. These programs are critical sources of Federal funding, especially for a community that intends to proactively initiate mitigation projects using mitigation grant dollars.

Survey



Onondaga County residents and businesses can also help the County update its Multi-Jurisdictional Hazard Mitigation Plan and other emergency preparedness plans by participating in a voluntary online survey. Feedback from the confidential 10-minute survey will enable Onondaga County and its municipalities to better serve residents and businesses before, during, and after an emergency or disaster.
Those who live or work in Onondaga County are encouraged to share their experiences, knowledge, and concerns about local hazards by participating in the brief public survey. To complete the survey, please go to: s.alchemer.com/s3/OnondagaCountyMJHMPSurvey.
Information provided in Onondaga County's community preparedness survey will help the County and local communities create strategies and implement actions to reduce future risk of death, injuries, and property damage from hazards. The public will also have an opportunity to review and provide comments on the draft Plan before it is submitted to the State of New York and FEMA for review.

Public Meeting

A Public Meeting is scheduled for Monday, July 22, 2024, at 5:00 p.m. in the Onondaga County Department of Emergency Management Training Room located at 420 Electronics Parkway, Liverpool, NY. Members of the public are invited to attend the meeting to ask questions and learn more about hazard mitigation.



Click here for more information.





Onondaga County Hazard Mitigation Plan Documents

Citizen Preparedness Survey Results

Press Release

FEMA Hazard Mitigation Assistance Grants Summary Sheet

C.2. PUBLIC SURVEY

The 2024 Onondaga County Hazard Mitigation Questionnaire (i.e., Public Survey) opened in July 2023. The Survey was distributed and promoted through a variety of methods, such as social media (e.g., Facebook, Instagram, Twitter), press releases, and county public events. Community organizations and plan participants were critical in connecting county and city residents with the Survey, and Onondaga County Department of Planning used their broad-based distribution lists of community stakeholders to disseminate the Survey to residents and employees. Ultimately, respondents for this Survey were selected among those who volunteered to participate. No special weighting was applied to reflect the County's demographic composition.

As part of this Survey, Steering Committee members, community representatives, and members of the public were asked to rate each of the hazards in terms of perceived risk. Furthermore, they were asked to rate "mitigation importance" for each of the identified hazards in the Plan. The information gathered from this survey was used to inform the hazard risk prioritization process and to ensure the Plan adequately addressed the public's concerns and priorities.

The Survey included 30 multiple choice and open-ended questions. In total, 131 respondents participated in the Public Survey. To ensure all data could be accurately correlated, only the completed (in its entirety) survey was used in this report. In some situations, the respondent chose not to answer one (1) or more questions, which explains the discrepancies in the total number of responses per question. **Table C-1** provides a breakdown of the Survey responses.

Table C-1. Public Survey Response Summary

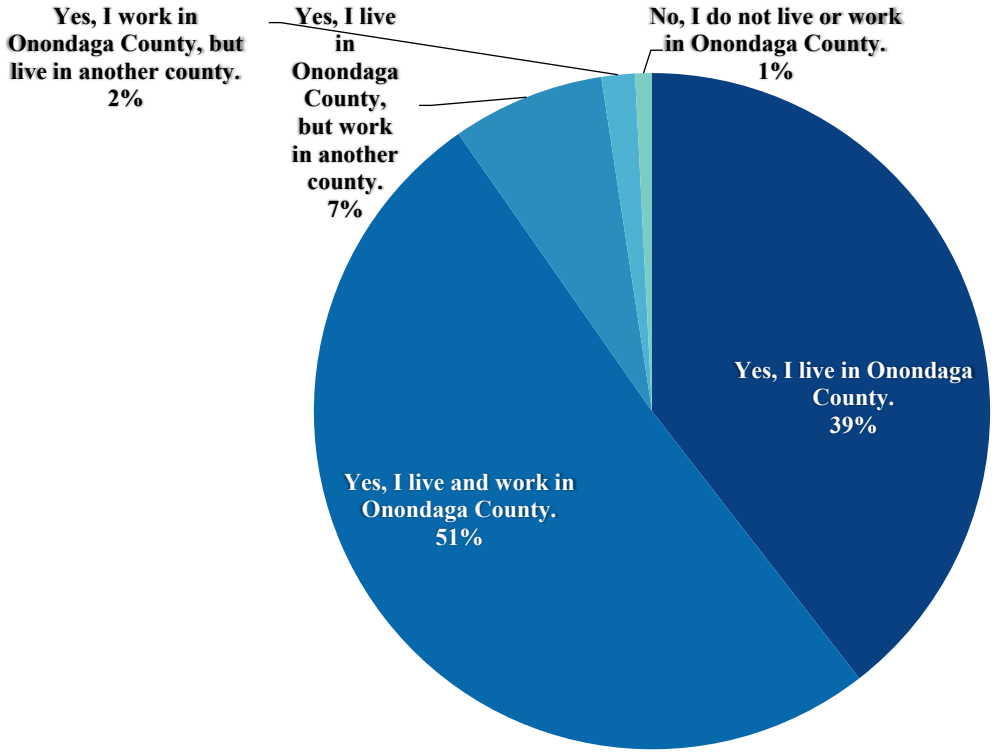
Survey Status	Total
Completed	89
Partial	41
Disqualified*	1
TOTAL	**131**

**A survey response is Disqualified when the respondent selects "No, I do not live or work in Onondaga County." for question 1.*

Public Survey Results

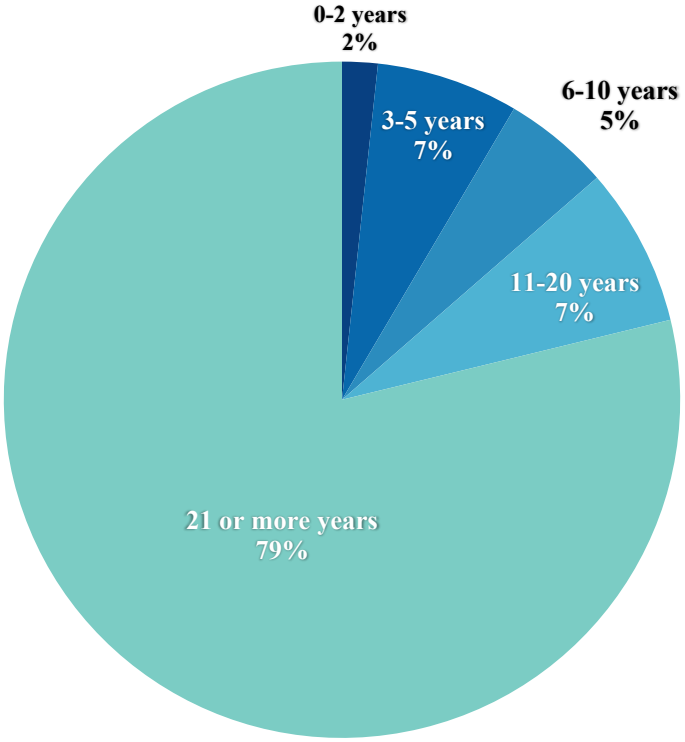
NOTE: *This is the redacted version of the Survey. Open-ended responses from the public were NOT included in this version to ensure confidentiality and privacy.*

Question 1: Do you live and/or work in Onondaga County? Please select the best answer that applies to your current situation.



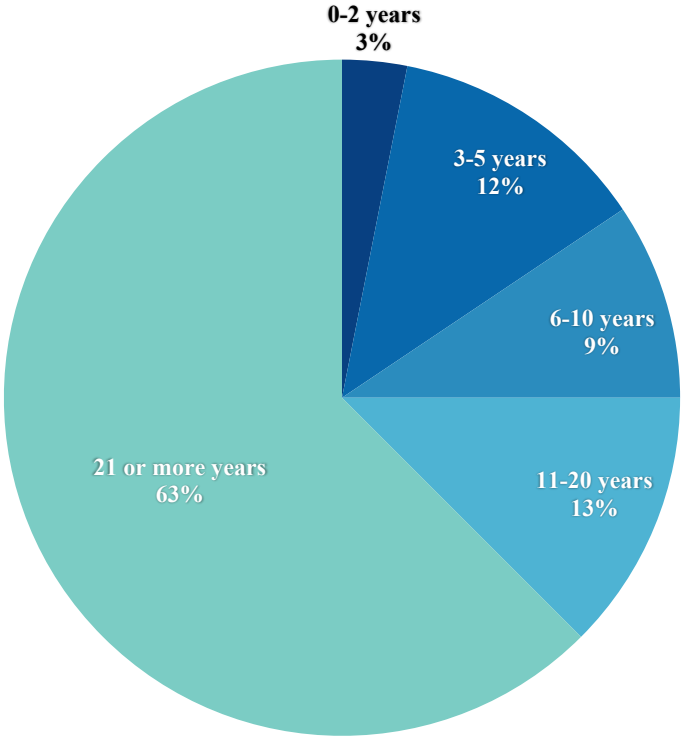
Value	Percent	Total Responses
Yes, I live in Onondaga County.	39.5%	49
Yes, I live and work in Onondaga County.	50.8%	63
Yes, I live in Onondaga County, but work in another county.	7.3%	9
Yes, I work in Onondaga County, but live in another county.	1.6%	2
No, I do not live or work in Onondaga County.	0.8%	1
	TOTAL	**124**

Question 2: Approximately how many years have you lived in Onondaga County?



Value	Percent	Total Responses
0-2 years	1.7%	2
3-5 years	6.8%	8
6-10 years	5.1%	6
11-20 years	7.6%	9
21 or more years	78.8%	93
I do not know	0.0%	0
	TOTAL	**118**

Question 3: Approximately how many years have you worked in Onondaga County?



Value	Percent	Total Responses
0-2 years	3.1%	2
3-5 years	12.5%	8
6-10 years	9.4%	6
11-20 years	12.5%	8
21 or more years	62.5%	40
I do not know	0.0%	0
	TOTAL	**64**

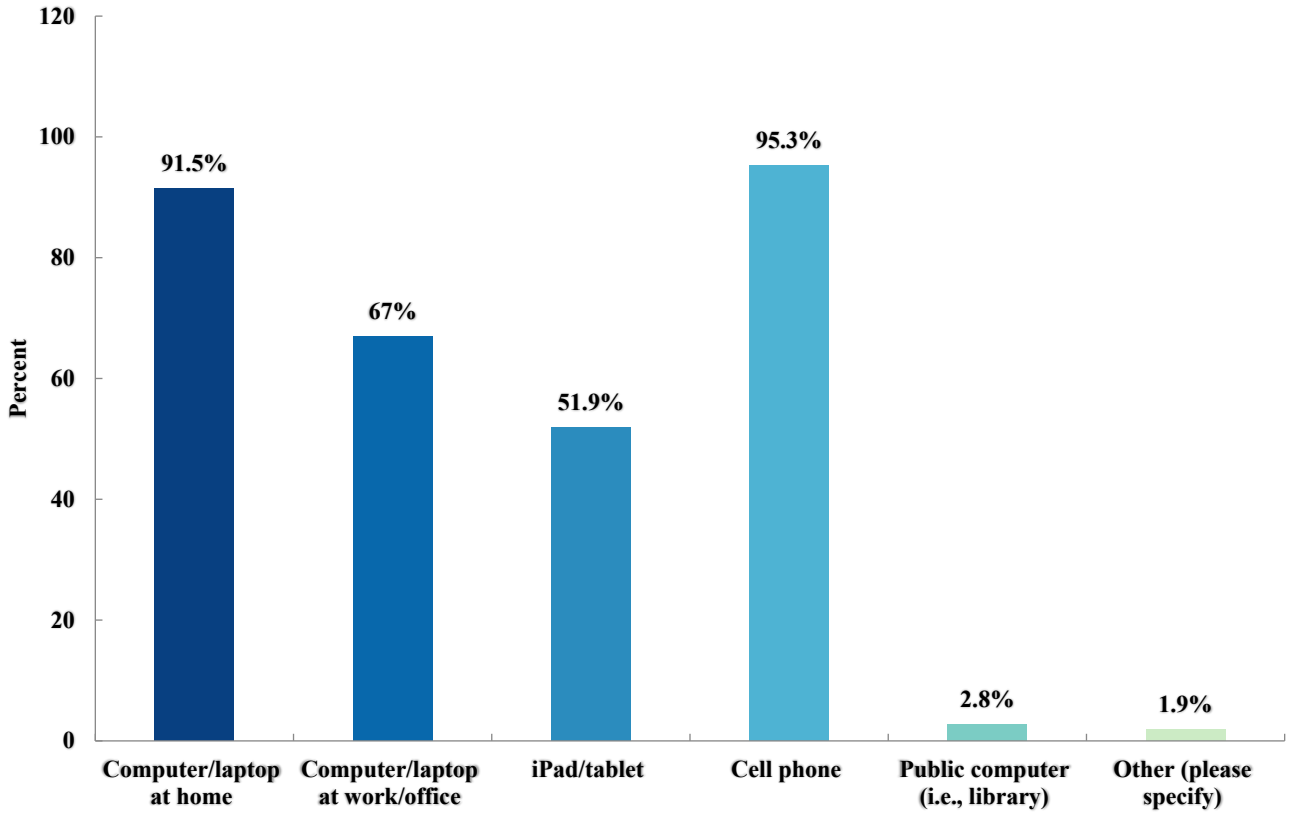
Question 4: Please indicate which community in Onondaga County you live in.

Community	Percent	Total Responses
Town of LaFayette	28.3%	32
Town of Tully	12.4%	14
Town of Elbridge	8.8%	10
Town of Cicero	8.8%	10
Town of Clay	6.2%	7
Town of Otisco	6.2%	7
Town of Geddes	2.7%	3
Town of Pompey	2.7%	3
Town of Skaneateles	2.7%	3
Village of Skaneateles	2.7%	3
Town of Onondaga	1.8%	2
Village of Baldwinsville	1.8%	2
Village of Fayetteville	1.8%	2
Village of Manlius	1.8%	2
Village of Solvay	1.8%	2
City of Syracuse	0.9%	1
Town of Camillus	0.9%	1
Town of DeWitt	0.9%	1
Town of Lysander	0.9%	1
Town of Manlius	0.9%	1
Town of Marcellus	0.9%	1
Town of Salina	0.9%	1
Town of Spafford	0.9%	1
Village of Elbridge	0.9%	1
Village of Jordan	0.9%	1
Village of Minoa	0.9%	1
	TOTAL	**113**

Question 5: Please indicate which community in Onondaga County you work in.

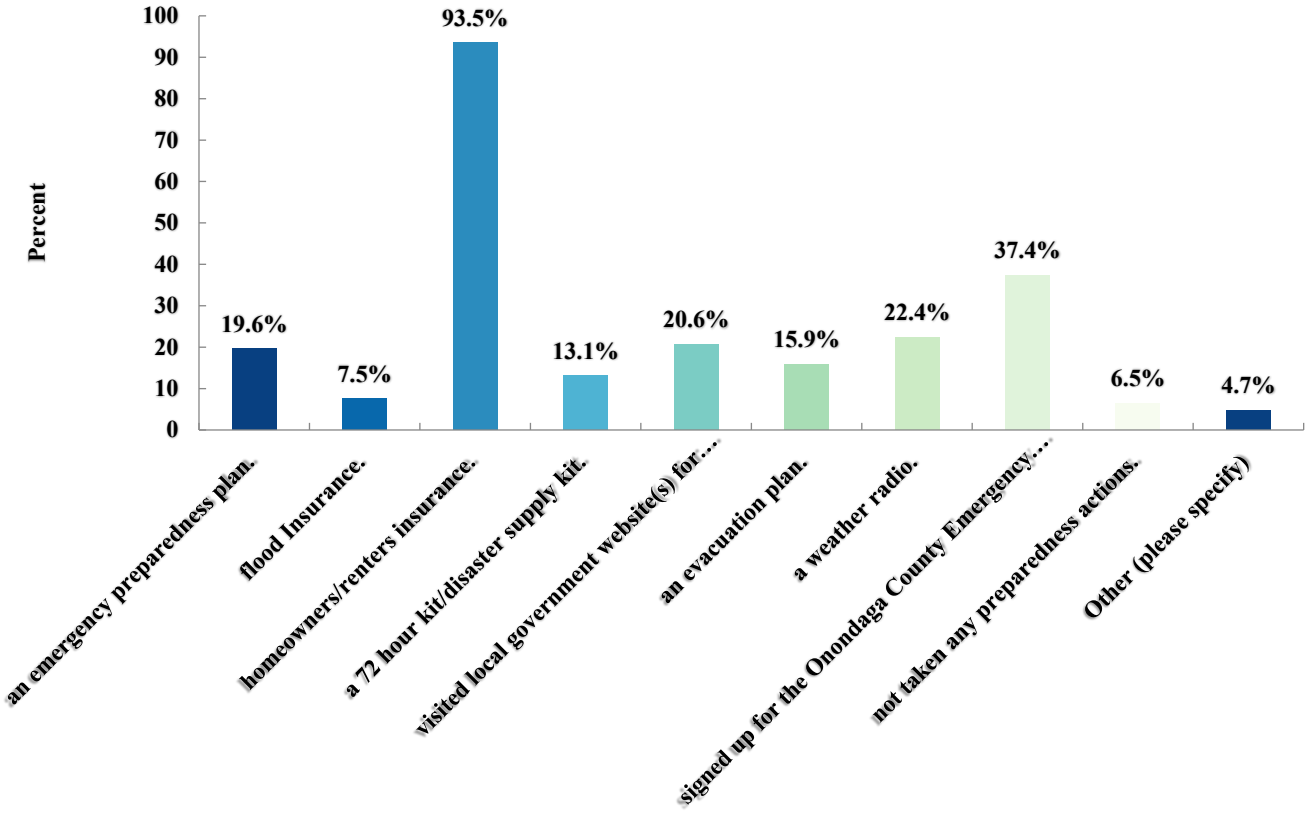
Community	Percent	Total Responses
City of Syracuse	32.8%	21
Town of LaFayette	18.8%	12
Town of DeWitt	9.4%	6
Town of Tully	7.8%	5
Town of Salina	6.3%	4
Town of Cicero	4.7%	3
Town of Elbridge	4.7%	3
Town of Clay	3.1%	2
Town of Otisco	3.1%	2
Village of Fayetteville	3.1%	2
Town of Onondaga	1.6%	1
Village of Elbridge	1.6%	1
Village of Liverpool	1.6%	1
Village of Solvay	1.6%	1
TOTAL		**64**

Question 6: Please indicate what type of device(s) you use to access the internet. Select ALL that apply.



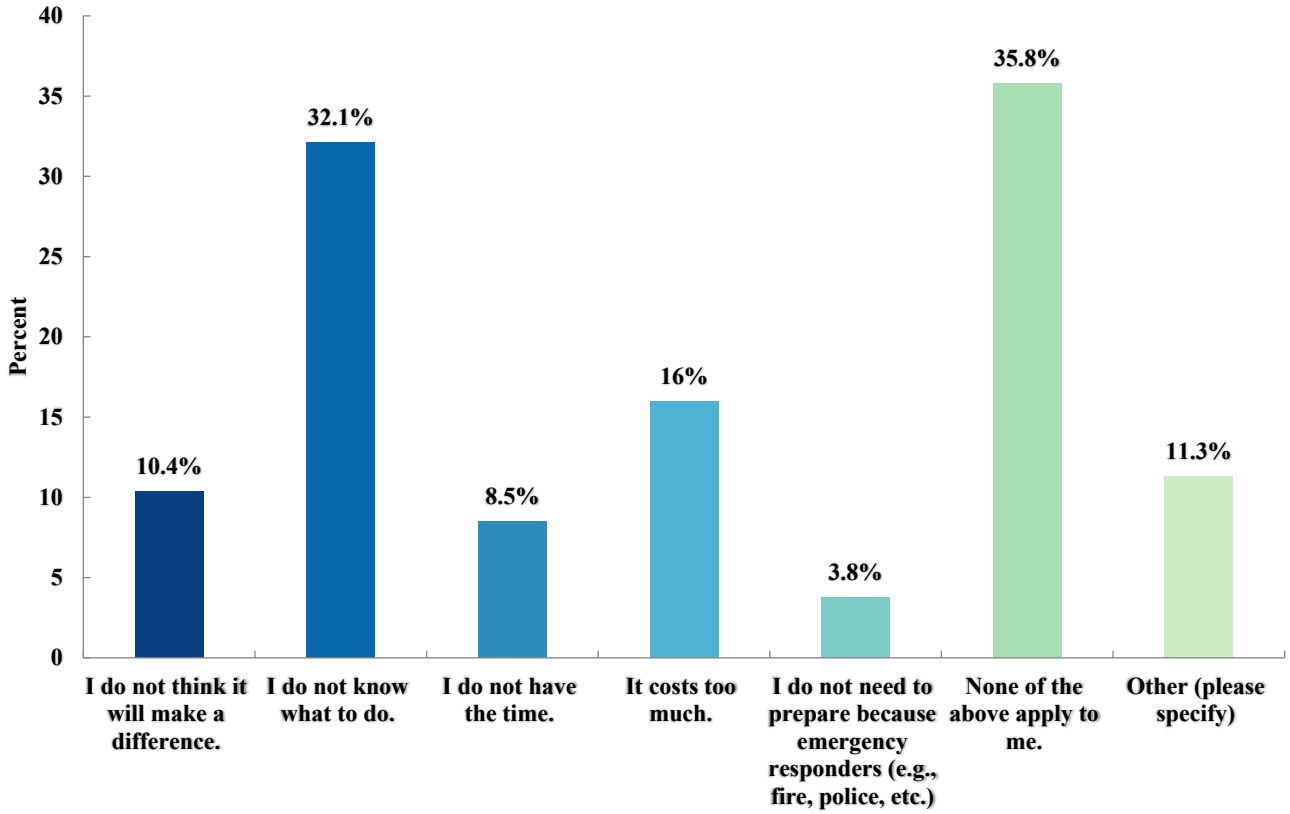
Value	Percent	Total Responses
Computer/laptop at home	91.5%	97
Computer/laptop at work/office	67.0%	71
iPad/tablet	51.9%	55
Cell phone	95.3%	101
Public computer (i.e., library)	2.8%	3
I do not have access to the internet	0.0%	0
I Do Not Know	0.0%	0
Other (please specify)	1.9%	2

Question 7: Please indicate those activities you have done to prepare for emergencies and disasters. Please select ALL that apply. I have…



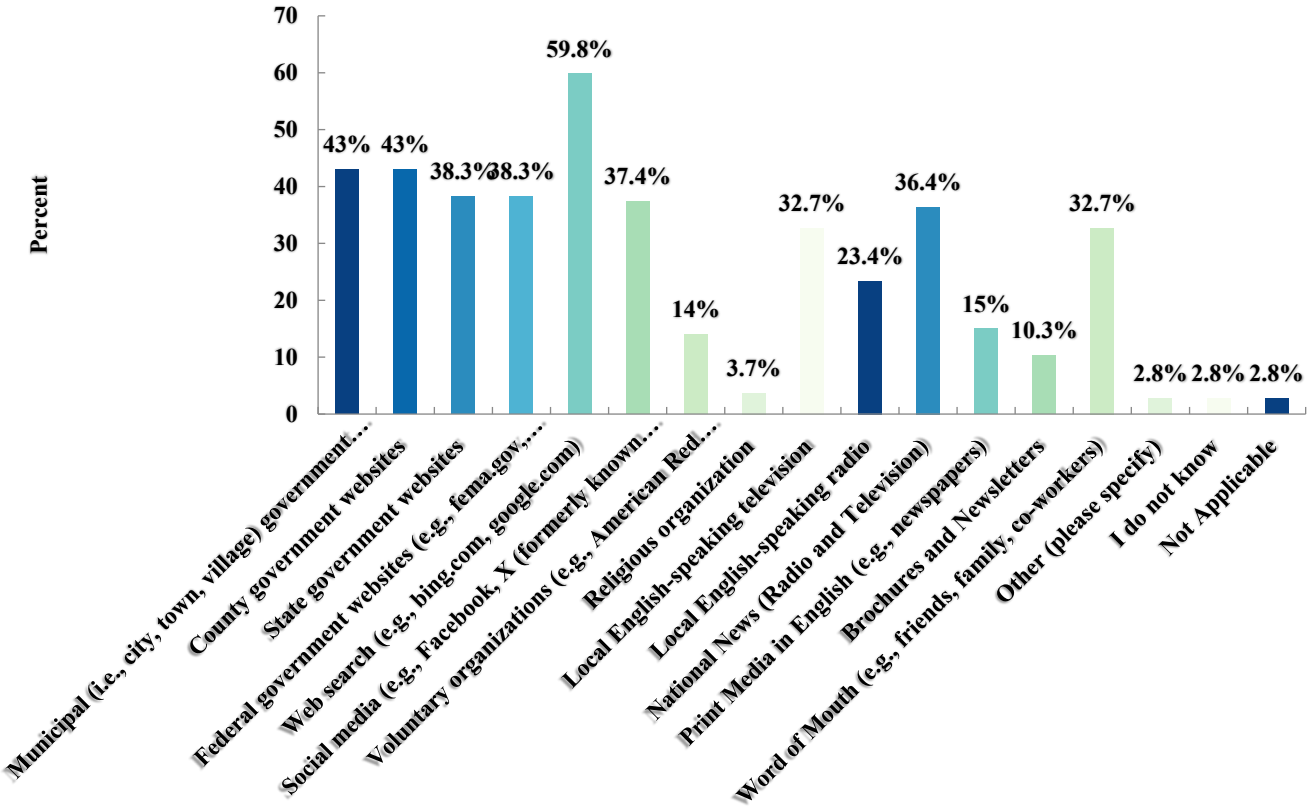
Value	Percent	Total Responses
an emergency preparedness plan.	19.6%	21
flood Insurance.	7.5%	8
homeowners/renters' insurance.	93.5%	100
a 72 hour kit/disaster supply kit.	13.1%	14
visited local government website(s) for emergency preparedness information.	20.6%	22
an evacuation plan.	15.9%	17
a weather radio.	22.4%	24
signed up for the Onondaga County Emergency Notification System (via NY Alert)	37.4%	40
not taken any preparedness actions.	6.5%	7
Other (please specify)	4.7%	5

Question 8: Have any of the reasons below prevented you from pursuing additional preparedness activities? Please select ALL that apply.



Value	Percent	Total Responses
I do not think it will make a difference.	10.4%	11
I do not know what to do.	32.1%	34
I do not have the time.	8.5%	9
It costs too much.	16.0%	17
I do not need to prepare because emergency responders (e.g., fire, police, etc.) will help me during an emergency.	3.8%	4
None of the above apply to me.	35.8%	38
Other (please specify)	11.3%	12

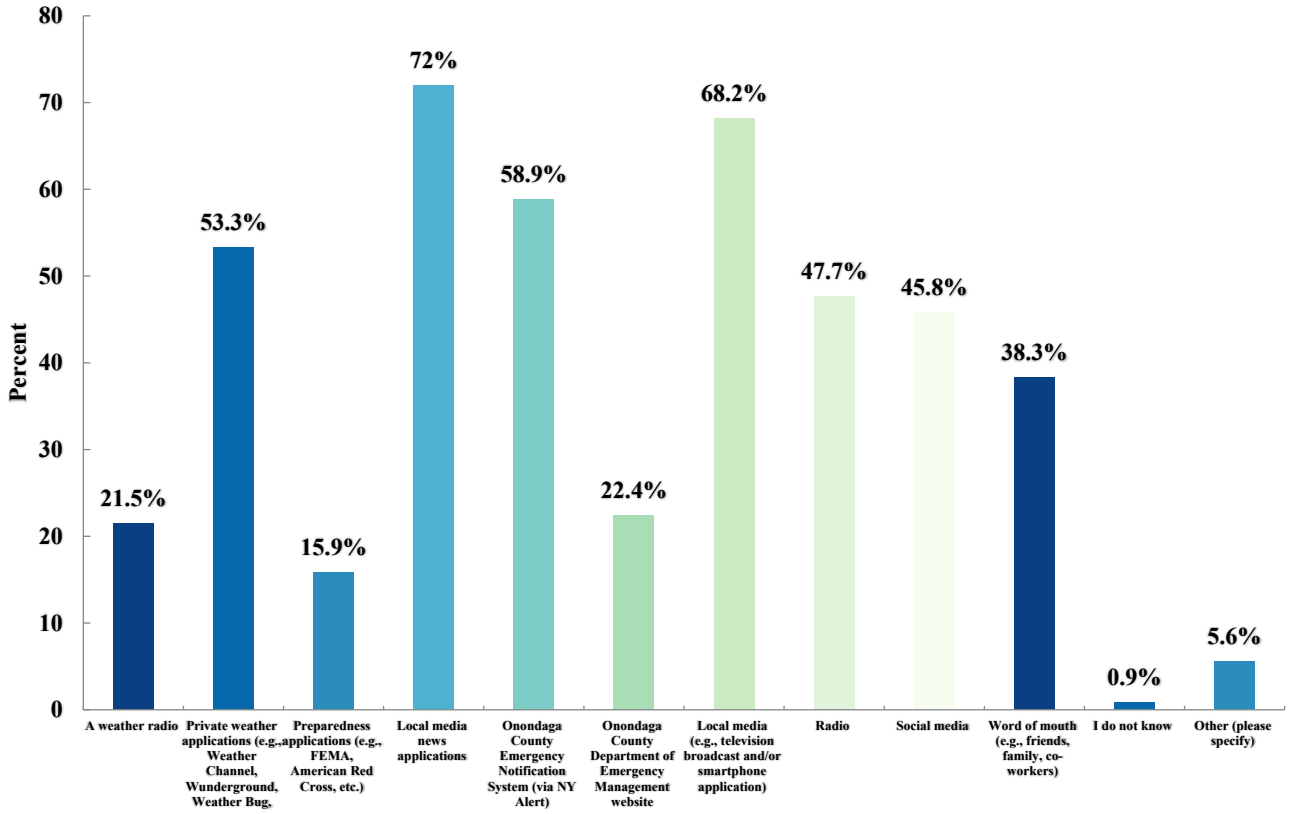
Question 9: Please indicate where you go to obtain emergency and disaster preparedness related information? Please select ALL that apply.



Value	Percent	Total Responses
Municipal (i.e., city, town, village) government websites	43.0%	46
County government websites	43.0%	46
State government websites	38.3%	41
Federal government websites (e.g., fema.gov, Ready.gov)	38.3%	41
Web search (e.g., bing.com, google.com)	59.8%	64
Social media (e.g., Facebook, X (formerly known as Twitter), etc.)	37.4%	40
Voluntary organizations (e.g., American Red Cross, Salvation Army, etc.)	14.0%	15
Religious organization	3.7%	4
Local English-speaking television	32.7%	35
Local English-speaking radio	23.4%	25
Local Spanish-speaking television	0.0%	0
Local Spanish-speaking radio	0.0%	0
National News (Radio and Television)	36.4%	39
Print Media in English (e.g., newspapers)	15.0%	16
Print Media in Spanish (e.g., newspapers)	0.0%	0
Brochures and Newsletters	10.3%	11

Value	Percent	Total Responses
Word of Mouth (e.g., friends, family, co-workers)	32.7%	35
I do not know	2.8%	3
Not Applicable	2.8%	3
Other (please specify)	2.8%	3

Question 10: Please indicate how you expect to receive alerts and information during an emergency. Please select ALL that apply.



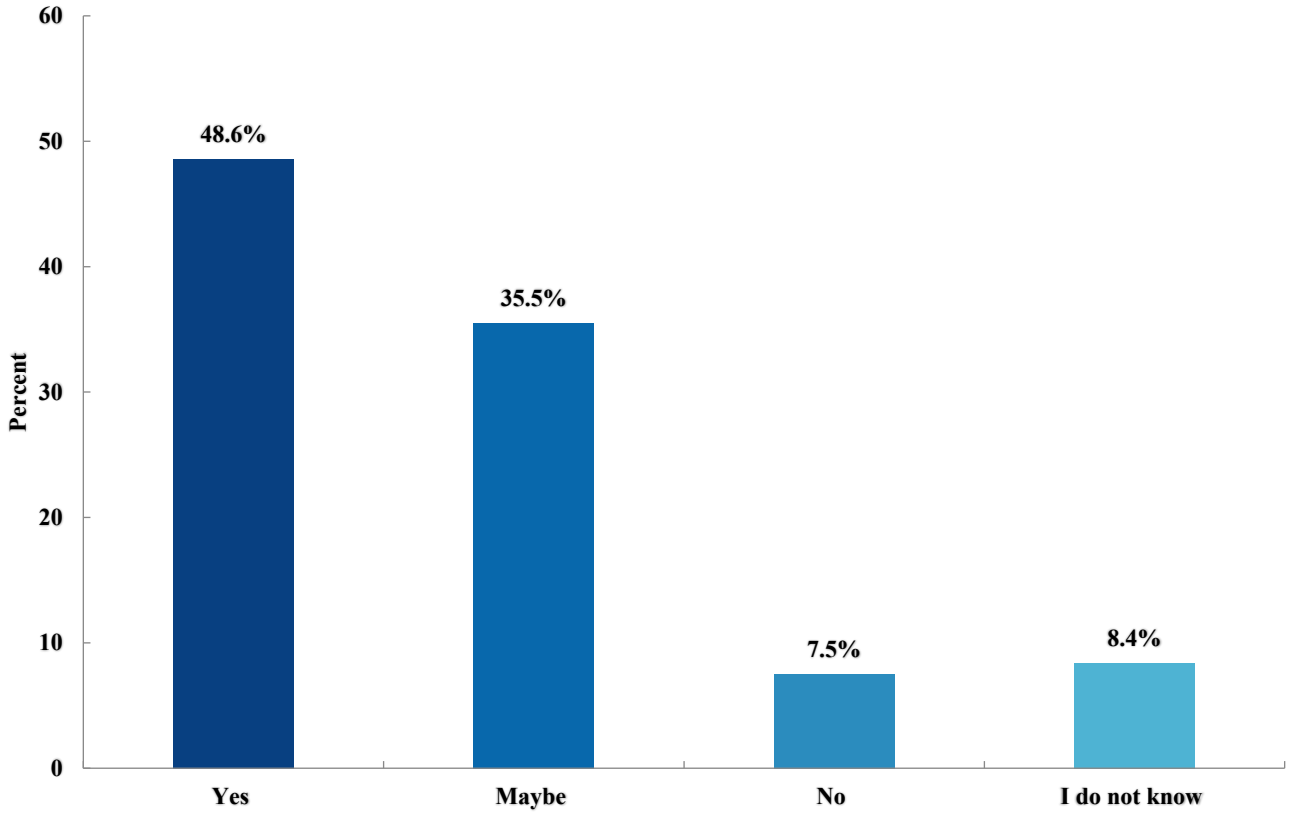
Value	Percent	Total Responses
A weather radio	21.5%	23
Private weather applications (e.g., Weather Channel, Wunderground, Weather Bug, AccuWeather, etc.)	53.3%	57
Preparedness applications (e.g., FEMA, Red Cross, etc.)	15.9%	17
Local media news applications	72.0%	77
Onondaga County Emergency Notification System (via NY Alert)	58.9%	63
Onondaga County Department of Emergency Management website	22.4%	24
Local media (e.g., television broadcast and/or smartphone application)	68.2%	73
Radio	47.7%	51
Social media	45.8%	49
Word of mouth (e.g., friends, family, co-workers)	38.3%	41
I do not know	0.9%	1
Other (please describe)	5.6%	6

Question 11: Would you agree or disagree with the following statements?

Value	Strongly Disagree		Disagree		Neither Agree or Disagree		Agree		Strongly Agree		I Do Not Know		Total Responses
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	
Onondaga County is providing the services necessary to prepare me for a disaster.	5	4.7%	5	4.7%	48	44.9%	19	17.8%	4	3.7%	26	24.3%	107
I am familiar with Onondaga County's website and can easily obtain information about emergencies and disasters.	6	5.6%	23	21.5%	23	21.5%	31	29.0%	9	8.4%	15	14.0%	107
During times of emergency, information is provided in a language or format I can understand.	3	2.8%	1	0.9%	17	15.9%	42	39.3%	35	32.7%	9	8.4%	107
I can easily obtain emergency information in times of crisis.	4	3.8%	6	5.7%	22	20.8%	53	50.0%	7	6.6%	14	13.2%	106

Question 12: Please indicate how Onondaga County can better assist you in preparing for emergencies and disasters (e.g., provide preparedness materials in my language). REDACTED

Question 13: If a disaster (i.e., severe thunderstorm, blizzard) impacted Onondaga County, knocking out electricity and running water, would your household be able to manage on its own for at least three (3) days?



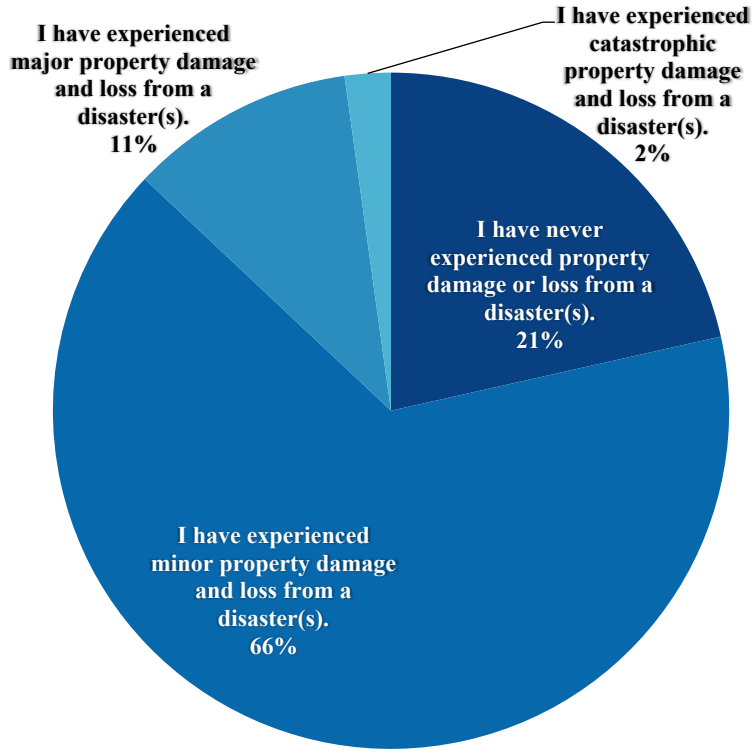
Value	Percent	Total Responses
Yes	48.6%	52
Maybe	35.5%	38
No	7.5%	8
I do not know	8.4%	9
	TOTAL	**107**

Question 14: Do you believe that your household and/or place of business might ever be threatened by the following hazards? Please rate what hazards present the greatest risk.

Low Risk: Low impact on threat to life and property damage.
Medium Risk: Medium impact on threat to life and property damage.
High Risk: High impact on threat to life and property damage.

Value	Low Risk		Medium Risk		High Risk		Not Applicable		Total Responses
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	
Drought	66	72.5%	21	23.1%	4	4.4%	0	0.0%	91
Earthquake	79	84.9%	11	11.8%	2	2.2%	1	1.1%	93
Heat Wave/Extreme Heat	23	24.7%	50	53.8%	20	21.5%	0	0.0%	93
Flood *(riverine, flash/urban, ice jam, dam and levee failure)*	40	43.5%	29	31.5%	22	23.9%	1	1.1%	92
Geological Hazards *(landslides, land subsidence, mudboils)*	54	58.7%	16	17.4%	19	20.7%	3	3.3%	92
Harmful Algal Bloom	49	52.7%	21	22.6%	18	19.4%	5	5.4%	93
Invasive Species and Infestation *(Emerald Ash Borer, Hemlock Woolly Adelgid, True Armyworm, Common Reed (Phragmites), Eurasian Watermilfoil, Water Chestnut, Tick-Borne Diseases, Mosquito-Borne Diseases)*	16	17.4%	34	37.0%	42	45.7%	0	0.0%	92
Severe Weather *(severe thunderstorms – hail, strong winds, tornadoes – hurricane/tropical storm)*	3	3.2%	27	29.0%	62	66.7%	1	1.1%	93
Winter Weather *(winter storms – snowstorms, blizzards, lake effect storm,, ice storms, nor'easter – cold wave/extreme cold)*	2	2.2%	24	25.8%	65	69.9%	2	2.2%	93
Wildfire *(Wildfire Smoke)*	64	69.6%	20	21.7%	7	7.6%	1	1.1%	92

Question 15: Please select the answer that best describes your experience.



Value	Percent	Total Responses
I have never experienced property damage or loss from a disaster(s).	21.5%	20
I have experienced minor property damage and loss from a disaster(s).	65.6%	61
I have experienced major property damage and loss from a disaster(s).	10.8%	10
I have experienced catastrophic property damage and loss from a disaster(s).	2.2%	2
	TOTAL	**93**

Question 16: If you have experienced any damage(s) or injury(ies) from a disaster, please list the hazard(s) that caused the damages/losses and/or injuries (e.g., flooding, strong winds, snow). REDACTED

Question 17: If you have experienced any damage(s) or injury(ies) from a disaster, please indicate where this occurred (e.g., my home, on a roadway or intersection, at work, on vacation, etc.). REDACTED

Question 18: If you have experienced any damage(s) or injury(ies) from a disaster, please describe the damages and/or injuries. (e.g., house flooded, roof was damaged, vehicle was damaged, broken bones, lacerations, etc.). REDACTED

Question 19: Based on YOUR PERCEPTION of your jurisdiction's hazards, to what degree of emphasis would you expect your jurisdiction to mitigate the following hazards?

Definition: *Hazard mitigation is any sustainable action that reduces or eliminates long-term risk to people and property from future disasters. Hazard mitigation includes long-term solutions that reduce the impact of disasters in the future.*

No Mitigation Needed: *No mitigation on this hazard is expected or needed.*
Low Priority: *This hazard should be mitigated, but is not a high priority compared to other hazards.*
Medium Priority: *It is important to mitigate this hazard.*
High Priority: *It is a high priority to emphasize mitigation for this hazard.*

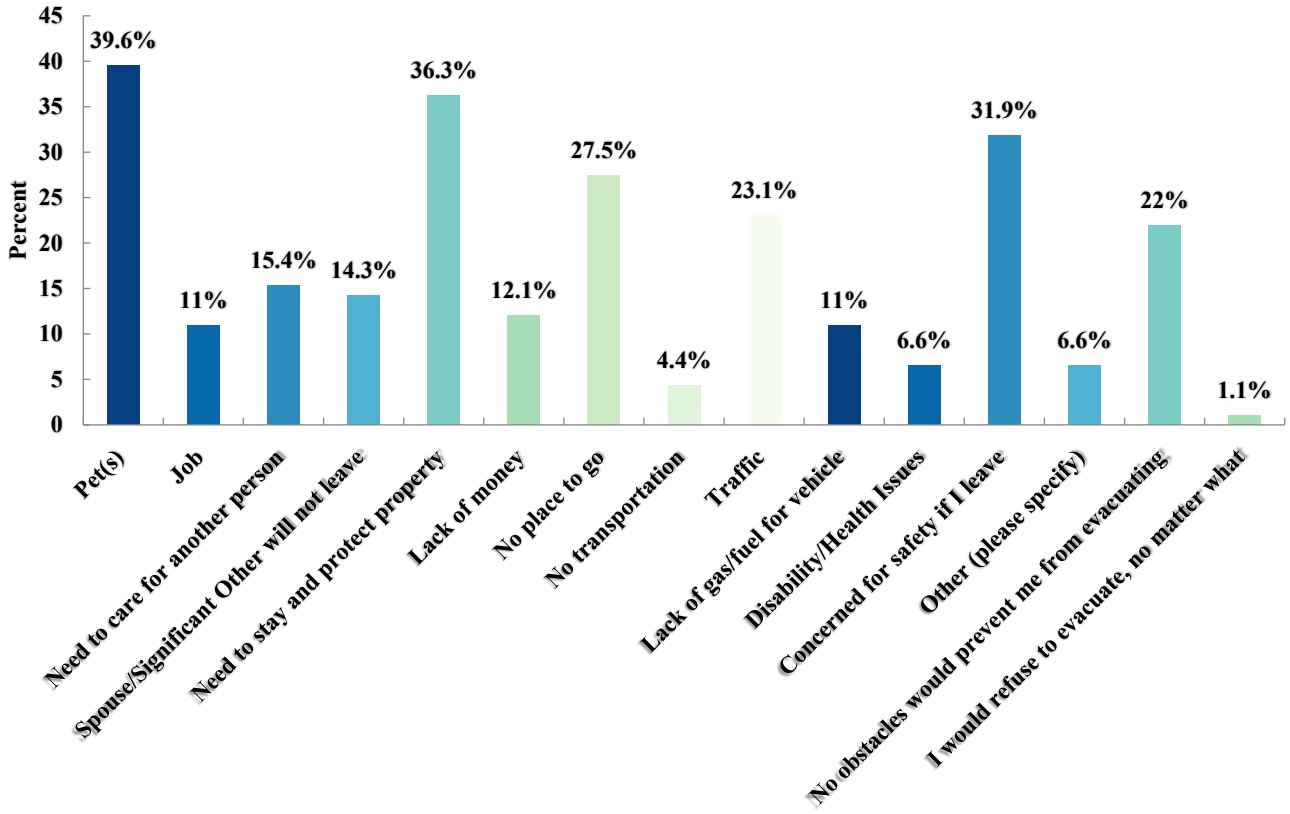
Value	No Mitigation Needed		Low Priority		Medium Priority		High Priority		Total Responses
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	
Drought	23	25.8%	43	48.3%	16	18.0%	7	7.9%	89
Earthquake	34	37.8%	41	45.6%	8	8.9%	7	7.8%	90
Heat Wave/Extreme Heat	5	5.6%	25	27.8%	33	36.7%	27	30.0%	90
Flood *(riverine, flash/urban, ice jam, dam and levee failure)*	5	5.6%	15	16.5%	36	39.6%	35	38.5%	91
Geological Hazards *(landslides, land subsidence, mudboils)*	16	17.8%	34	37.8%	16	17.8%	24	26.7%	90
Harmful Algal Bloom	12	13.2%	30	33.0%	29	31.9%	20	22.0%	91
Invasive Species and Infestation *(Emerald Ash Borer, Hemlock Woolly Adelgid, True Armyworm, Common Reed (Phragmites), Eurasian Watermilfoil, Water Chestnut, Tick-Borne Diseases, Mosquito-Borne Diseases)*	5	5.5%	17	18.7%	36	39.6%	33	36.3%	91
Severe Weather *(severe thunderstorms – hail, strong winds, tornadoes – hurricane/tropical storm)*	1	1.1%	10	11.1%	27	30.0%	52	57.8%	90
Winter Weather *(winter storms – snowstorms, blizzards, lake effect storm,, ice storms, nor'easter – cold wave/extreme cold)*	1	1.1%	8	9.0%	24	27.0%	56	62.9%	89
Wildfire *(wildfire smoke)*	15	16.7%	39	43.3%	24	26.7%	12	13.3%	90

Question 20: OPTIONAL: Please provide specific recommendations for mitigation in your area. For example, please indicate the hazard(s) in which your community/location is uniquely vulnerable and provide a brief explanation of the possible solutions (i.e., mitigation) that would address the issue(s). REDACTED

Question 21: If an evacuation was ordered for your area, please indicate how likely you would be to do the following.

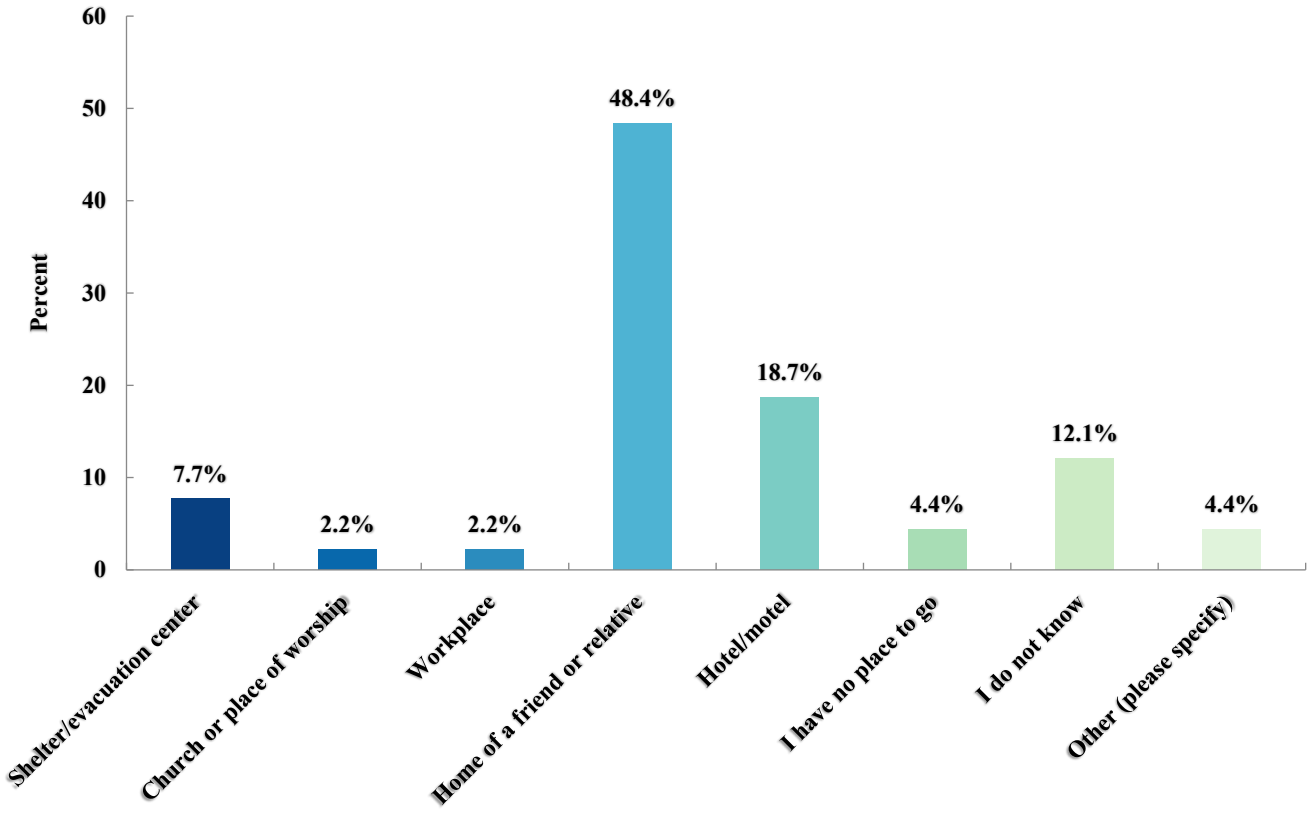
Value	Very Unlikely		Unlikely		Unsure or I Do Not Know		Likely		Very Likely		Not Applicable		Total Responses
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	
Immediately evacuate as instructed.	4	4.4%	7	7.7%	20	22.0%	38	41.8%	22	24.2%	0	0.0%	91
I would first consult with family and friends outside my household before making a decision to evacuate.	1	1.1%	8	9.2%	13	14.9%	39	44.8%	24	27.6%	2	2.3%	87
Wait and see how bad the situation is going to be before deciding to evacuate.	4	4.5%	24	27.3%	19	21.6%	33	37.5%	8	9.1%	0	0.0%	88
I refuse to evacuate, no matter what.	49	56.3%	22	25.3%	10	11.5%	2	2.3%	1	1.1%	3	3.4%	87

Question 22: What might prevent you from leaving your place of residence if there was an evacuation order? Please select ALL that apply.



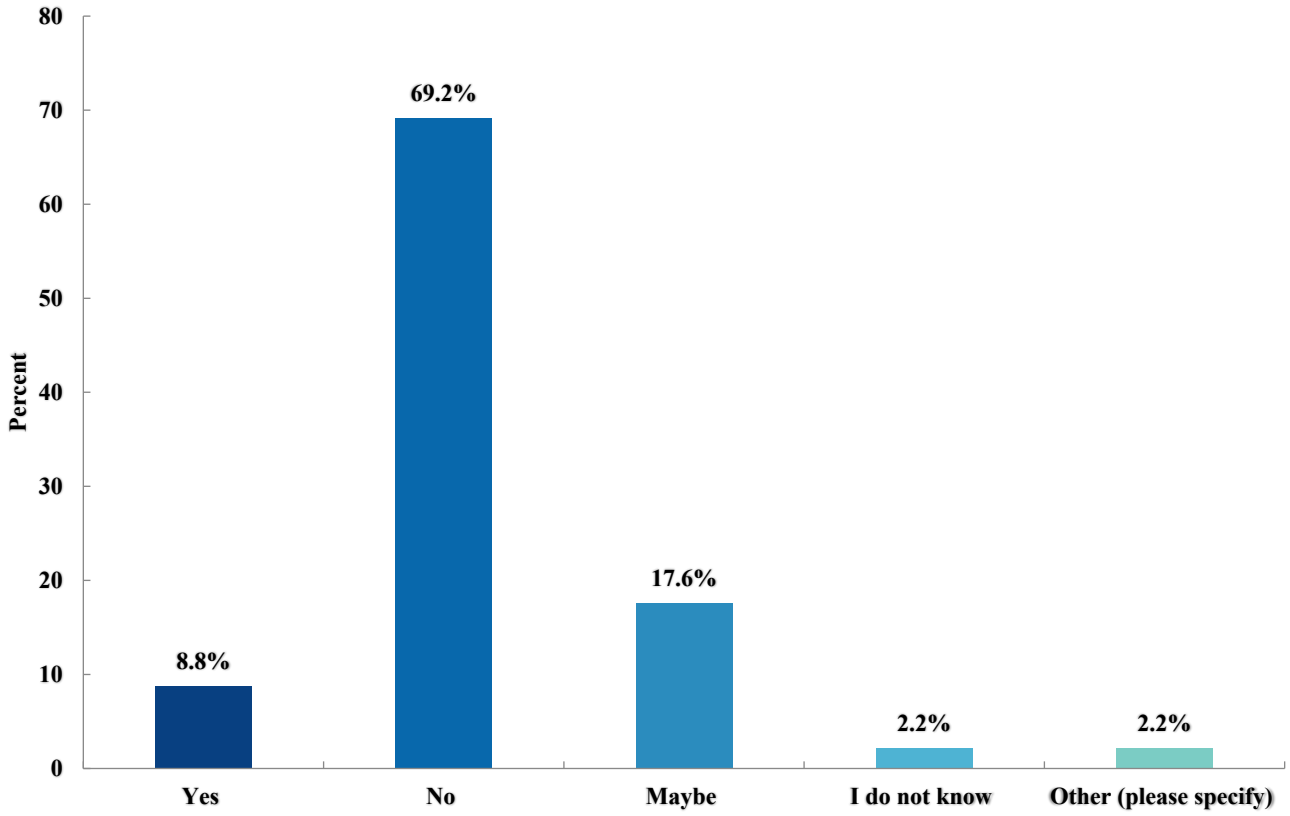
Value	Percent	Total Responses
Pet(s)	39.6%	36
Job	11.0%	10
Need to care for another person	15.4%	14
Spouse/Significant Other will not leave	14.3%	13
Need to stay and protect property	36.3%	33
Lack of money	12.1%	11
No place to go	27.5%	25
No transportation	4.4%	4
Traffic	23.1%	21
Lack of gas/fuel for vehicle	11.0%	10
Disability/Health Issues	6.6%	6
Concerned for safety if I leave	31.9%	29
No obstacles would prevent me from evacuating	22.0%	20
I would refuse to evacuate, no matter what	1.1%	1
Other (please specify)	6.6%	6

Question 23: If you were to evacuate, where would you most likely stay? Please select the best answer.



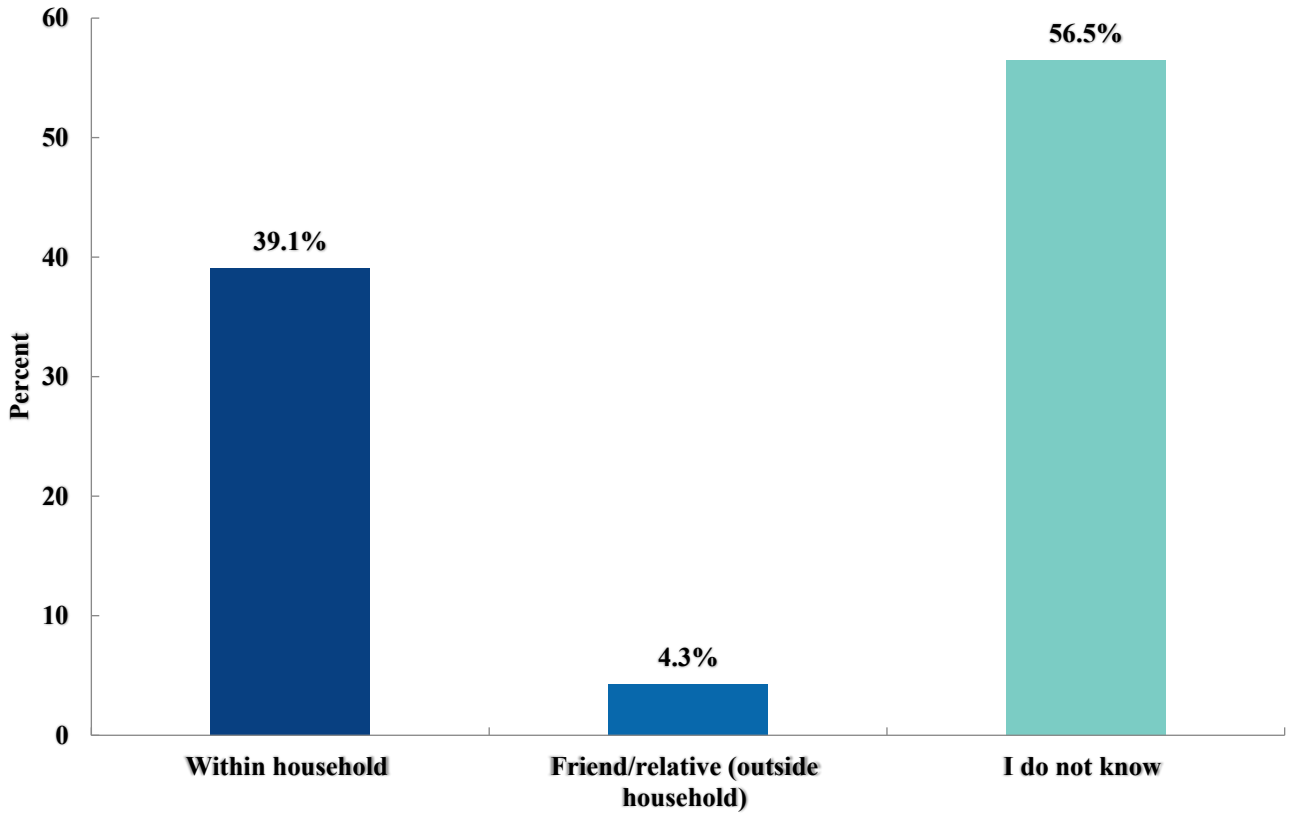
Value	Percent	Total Responses
Shelter/evacuation center	7.7%	7
Church or place of worship	2.2%	2
Workplace	2.2%	2
Home of a friend or relative	48.4%	44
Hotel/motel	18.7%	17
I have no place to go	4.4%	4
I do not know	12.1%	11
Other (please specify)	4.4%	4
	TOTAL	**91**

Question 24: In an evacuation, would you or anyone in your household require special assistance?



Value	Percent	Total Responses
Yes	8.8%	8
No	69.2%	63
Maybe	17.6%	16
I do not know	2.2%	2
Other (please specify)	2.2%	2
	TOTAL	**91**

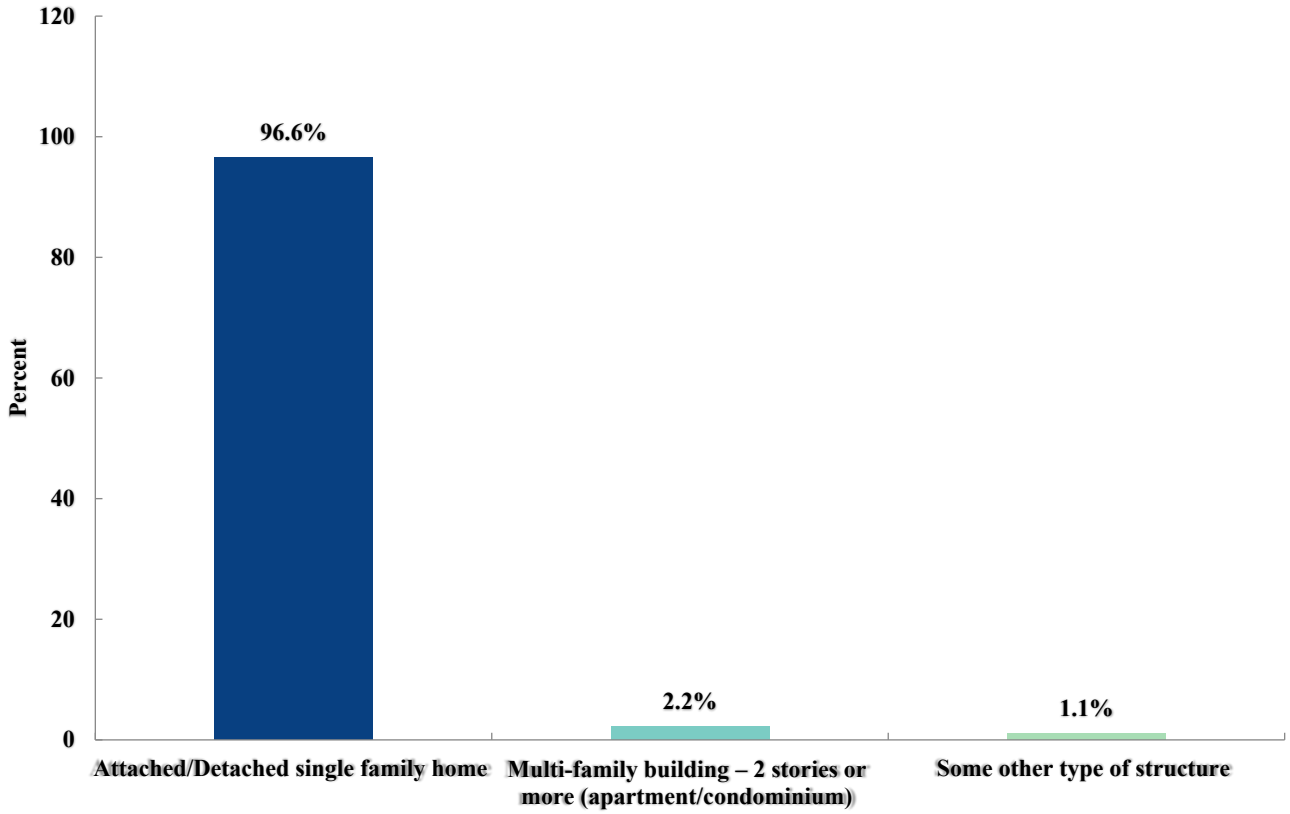
Question 25: If yes, who would provide assistance?



Value	Percent	Total Responses
Within household	39.1%	9
Friend/relative (outside household)	4.3%	1
Outside Agency	0.0%	0
I do not know	56.5%	13
Not applicable	0.0%	0
Other (please specify)	0.0%	0
	TOTAL	**23**

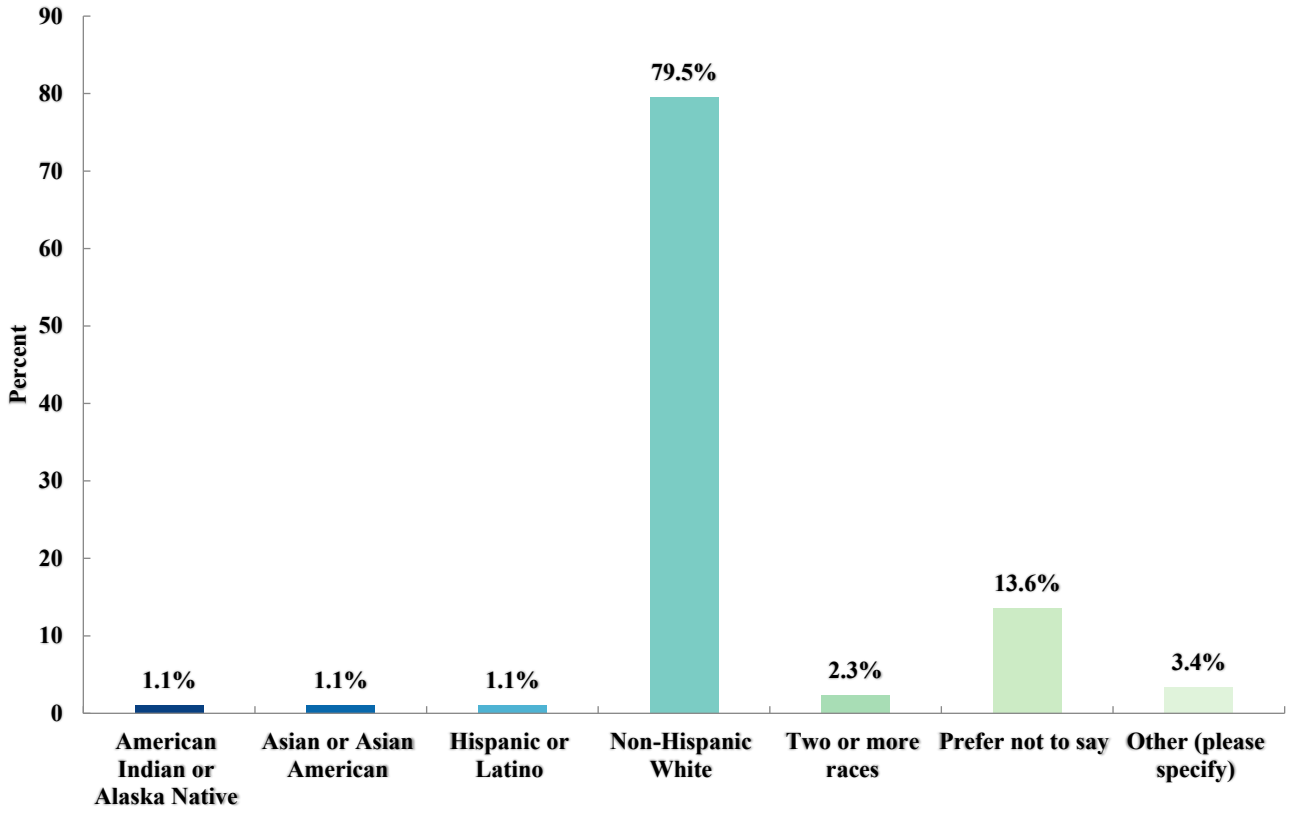
Question 26: If applicable, please indicate what kind of outside assistance your household may need during an evacuation (e.g., transportation, medical, etc.). **REDACTED**

Question 27: Which best describes your living arrangement?



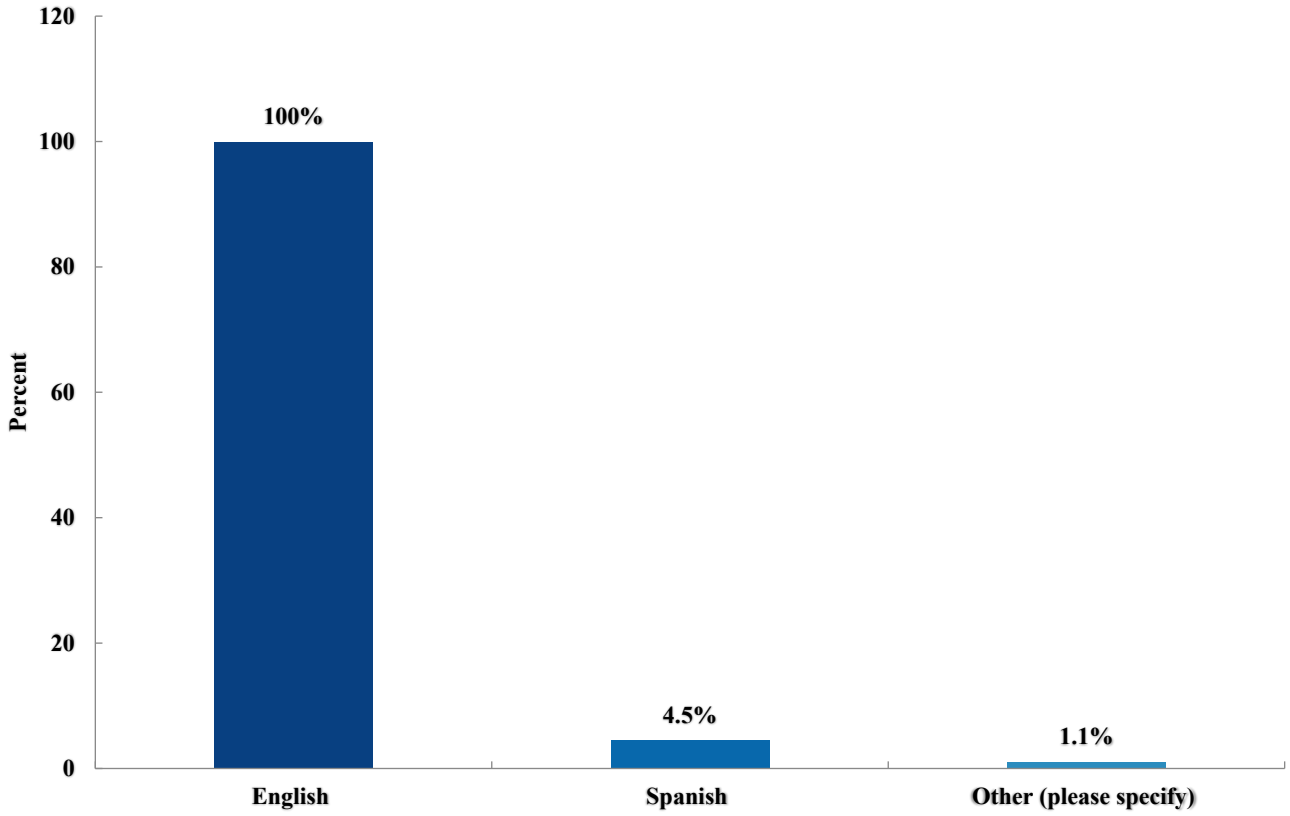
Value	Percent	Total Responses
Attached/Detached single family home	96.6%	86
Duplex, triplex, fourplex, six-plex home	0.0%	0
Multi-family building – 2 stories or more (apartment/condominium)	2.2%	2
Mobile home	0.0%	0
Manufactured home	0.0%	0
Recreational vehicle (RV)	0.0%	0
Some other type of structure	1.1%	1
I do not know	0.0%	0
Place not meant for habitation (e.g., a vehicle, an abandoned building, bus/train/subway station/airport or anywhere outside)	0.0%	0
Other (please specify)	0.0%	0
	TOTAL	**89**

Question 28: Which of the following best describes your race/ethnicity? Please select ALL that apply.



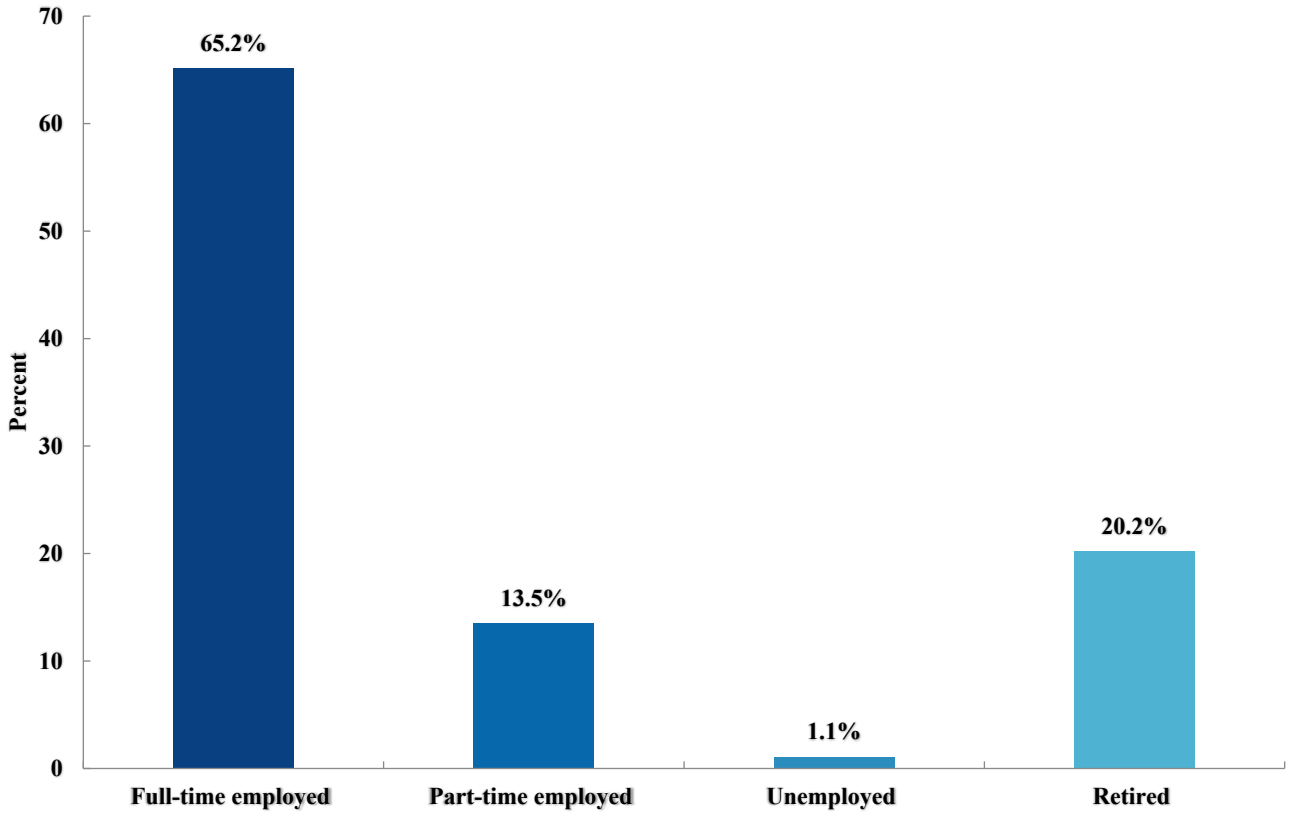
Value	Percent	Total Responses
American Indian or Alaska Native	1.1%	1
Asian or Asian American	1.1%	1
Black or African American	0.0%	0
Hawaiian or Other Pacific Islander	0.0%	0
Hispanic or Latino	1.1%	1
Non-Hispanic White	79.5%	70
Two or more races	2.3%	2
Prefer not to say	13.6%	12
Other (please specify)	3.4%	3

Question 29: Please indicate the language(s) spoken in your household. Please select ALL that apply.



Value	Percent	Total Responses
English	100.0%	89
Spanish	4.5%	4
Other (please specify)	1.1%	1

Question 30: What is your employment status?



Value	Percent	Total Responses
Full-time employed	65.2%	58
Part-time employed	13.5%	12
Unemployed	1.1%	1
Retired	20.2%	18
Homemaker	0.0%	0
Intern	0.0%	0
Full-time student	0.0%	0
Part-time student	0.0%	0
TOTAL		**89**

Public Survey Social Media Posts





C.3. PUBLIC COMMENT PERIOD

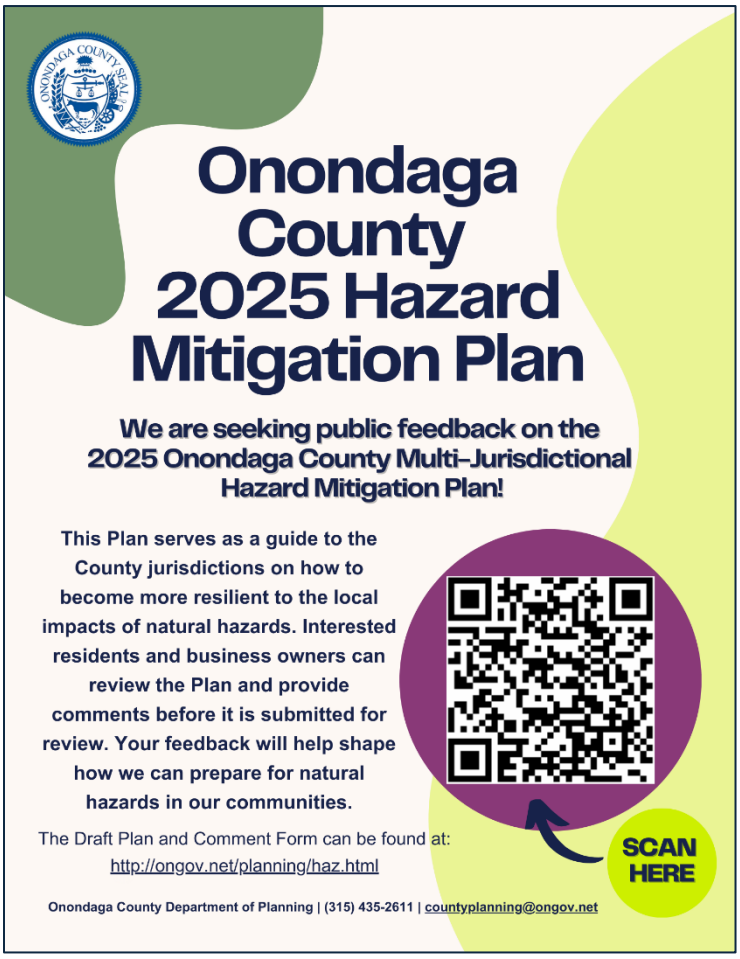
Once the draft Plan was completed, the public was given an opportunity to review and provide feedback on Volume 1 (Countywide Planning Elements) and each jurisdictional annex before submitting the Plan to NYS DHSES and FEMA. The countywide public comment period began on May 1, 2025, and went through May 30, 2025 (30 days). Prior to the public comment period, the Core Planning Team held a strategy meeting with all plan participants, which served as a brainstorming session and helped determine the public outreach goals and appropriate outreach methods for the public comment period. Subsequently, the Core Planning Team developed a public outreach toolkit that included sample social media taglines, flyers, and infographics that stakeholders and plan participants could share with the community during the public comment period.

Onondaga County Department of Planning coordinated with its county departments and participating jurisdictions to ensure that the public had an opportunity to learn about the Plan, mitigation actions planned for their communities, and additional ways to get involved in the planning process.

The public comment period printed materials, website posts, and social media posts samples are included in this section.

Public Outreach Toolkit

Flyers, infographics, and social media taglines were developed to promote the public comment period. These materials were shared with all plan participants, stakeholders, and Steering Committee members to support coordinated outreach and maximize public engagement.





Onondaga County Hazard Mitigation Webpage

The Onondaga Department of Planning maintains the Hazard Mitigation Plan webpage year-round to inform the public and stakeholders about hazard mitigation planning. Throughout the public comment period, the public was directed to this website.

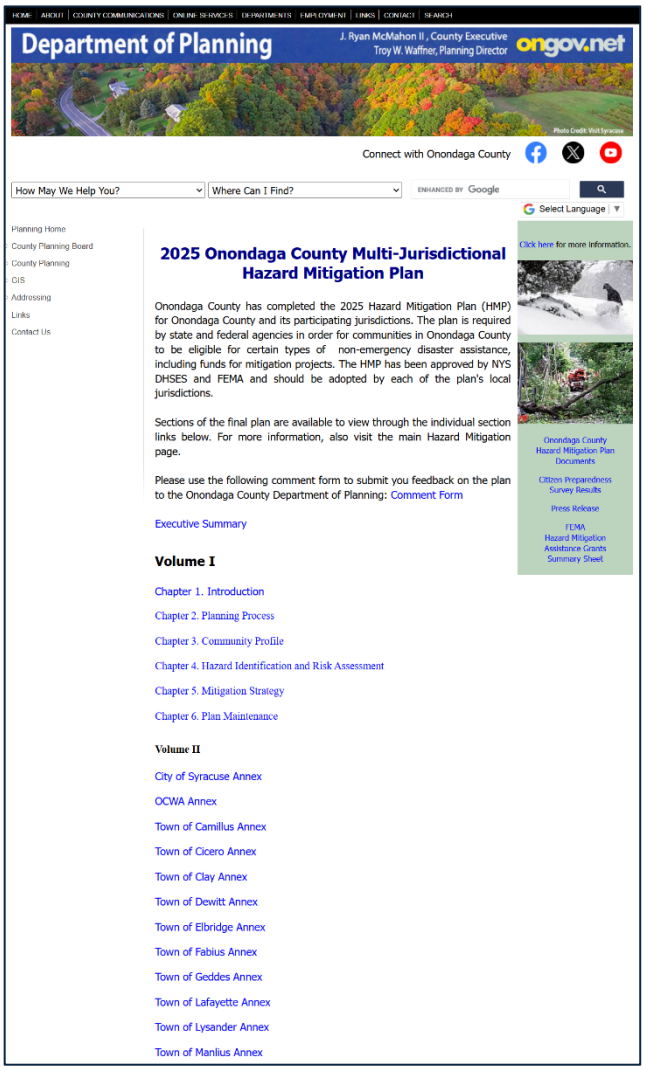
URL: ongov.net/planning/haz.html



Onondaga County 2025 Hazard Mitigation Plan Webpage

At the beginning of the 2025 Hazard Mitigation Plan update, the Onondaga County Department of Planning developed a dedicated website to support the planning process. Throughout the update, the County used the website to share updates and information with the general public and stakeholders. During the public comment period, the County posted Volume 1 and all annexes, along with an online comment form, to facilitate feedback collection.

URL: http://ongov.net/planning/2025OnondagaCountyMulti-JurisdictionalHazardMitigationPlan.html





Onondaga County Hazard Mitigation Plan Press Release

The press release was sent directly to Syracuse Post-Standard/Syracuse.com, Eagle Newspaper (a network of local papers), Spectrum, three (3) major TV news channels, County Legislators, municipal representatives, and posted to social media.



County of Onondaga
Office of the County Executive
J. Ryan McMahon II
County Executive
ongov.net

MEDIA RELEASE
For Immediate Release: 5.12.2025
Contact: Justin Sayles (315) 435-3516

County Executive McMahon Invites Onondaga County Residents to Participate in Multi-Jurisdictional Hazard Mitigation Plan Update

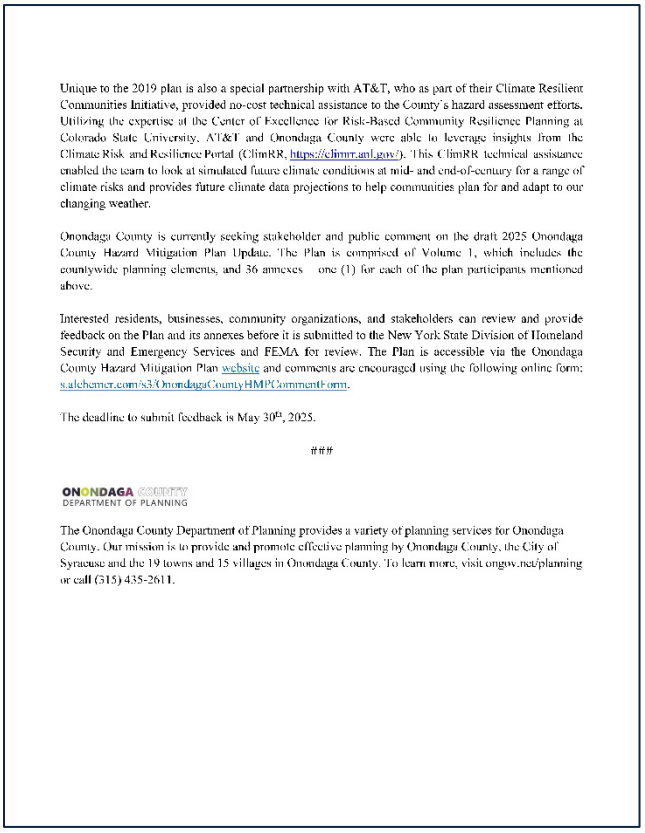
Review & feedback welcome on 2025 draft update

SYRACUSE, N.Y. Onondaga County Department of Planning invites residents, businesses, community organizations, and stakeholders to review and provide feedback on the 2025 Draft Update of the Onondaga County Multi-Jurisdictional Hazard Mitigation Plan.

The countywide Hazard Mitigation Plan forms the foundation of a countywide strategy to reduce natural disaster losses and break the cycle of disaster damage, reconstruction, and repetitive damage. In addition to minimizing risks to the population, the Federal Emergency Management Agency (FEMA) cites that *every $1 spent on hazard mitigation before a natural hazard occurs saves $6 on future disaster losses after the fact.*

The Plan assesses risks the County faces from 10 identified natural hazards and outlines strategies the County, municipalities (i.e., cities, towns, and villages) and special districts have identified for reducing the impact of these hazards. The Onondaga County Department of Planning has led the planning effort on behalf of, and with participation from, each of the County's 19 towns, 15 villages, the City of Syracuse, Onondaga County government, and the Onondaga County Water Authority (OCWA). Each jurisdiction will adopt the plan upon completion.

The plan was originally adopted by the Onondaga County Legislature and participating jurisdictions in 2013 and updated in 2019. The United States government requires local and state governments to have a NYS and FEMA-approved Hazard Mitigation Plan in order to qualify for hazard mitigation assistance grant dollars. These programs are critical sources of Federal funding, especially for a community that aims to proactively initiate mitigation projects using mitigation grant dollars.



Unique to the 2019 plan is also a special partnership with AT&T, who as part of their Climate Resilient Communities Initiative, provided no-cost technical assistance to the County's hazard assessment efforts. Utilizing the expertise at the Center of Excellence for Risk-Based Community Resilience Planning at Colorado State University, AT&T and Onondaga County were able to leverage insights from the Climate Risk and Resilience Portal (ClimRR, https://climrr.anl.gov/). This ClimRR technical assistance enabled the team to look at simulated future climate conditions at mid- and end-of-century for a range of climate risks and provides future climate data projections to help communities plan for and adapt to our changing weather.

Onondaga County is currently seeking stakeholder and public comment on the draft 2025 Onondaga County Hazard Mitigation Plan Update. The Plan is comprised of Volume 1, which includes the countywide planning elements, and 36 annexes – one (1) for each of the plan participants mentioned above.

Interested residents, businesses, community organizations, and stakeholders can review and provide feedback on the Plan and its annexes before it is submitted to the New York State Division of Homeland Security and Emergency Services and FEMA for review. The Plan is accessible via the Onondaga County Hazard Mitigation Plan website and comments are encouraged using the following online form: s.alchemer.com/s3/OnondagaCountyHMPCommentForm.

The deadline to submit feedback is May 30th, 2025.

###

ONONDAGA COUNTY
DEPARTMENT OF PLANNING

The Onondaga County Department of Planning provides a variety of planning services for Onondaga County. Our mission is to provide and promote effective planning by Onondaga County, the City of Syracuse and the 19 towns and 15 villages in Onondaga County. To learn more, visit ongov.net/planning or call (315) 435-2611.

Onondaga County Libraries

Onondaga County recognizes that not all residents have readily available internet access. Therefore, the County partnered with Onondaga County Public Libraries to make printed comment forms available. Instructions were also provided to help residents access the Plan using library computers. Additionally, for added convenience, residents had the option to mail their completed forms.

ONONDAGA COUNTY
DEPARTMENT OF PLANNING

J. Ryan McMahon, II, County Executive
Troy Waffner, Director

May 1, 2025

Onondaga County Public Libraries

To Whom It May Concern,

Onondaga County along with its 35 towns and villages, the City of Syracuse, and the Onondaga County Water Authority has recently updated the 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan (the Plan). The Plan identifies and assesses risks faced by the county from 10 natural hazards and outlines strategies that the County, municipalities, and special districts have identified for reducing the impact of these hazards.

Onondaga County is seeking public review and comment of this Plan and we are asking you to assist us in distributing this information to the public. The review and comment period runs from May 1 through May 30, 2025.

Enclosed with this letter you will find a flyer announcing the public review and comment period for the Onondaga County 2025 Hazard Mitigation Plan. We ask that you please post multiple copies of this flyer around your library at entrances, computer terminals, and any other gathering spaces. The flyer includes a QR code which will direct people to the County's hazard mitigation web page where they are able to access the Plan. The flyer also provides the website for the Plan for those individuals who are unable to utilize the QR code.

Also enclosed is a copy of the comment form. We ask that you provide a copy of the comment form upon request by any member of the public who does not have access to the online comment form.

Lastly, we ask that you assist us in providing a hard-copy of any portion of the plan upon request to members of the public who do not have access to the on-line plan. To request a hard-copy of the Plan or any portion thereof, please contact the undersigned at 315.435.2673. We will print the desired portion of the Plan and put it in County distribution to and for retention by your library. You may also contact the undersigned if you have any questions regarding this matter.

Thank you.

Sincerely,

Jeff Harrop
Planner, Onondaga County Department of Planning

Carnegie Building, 335 Montgomery St., 1st Floor, Syracuse, NY 13202
www.ongov.net/planning · (315) 435-2611 · countyplanning@ongov.net

Public Comment Review – Comment Form
2025 Multi-Jurisdictional Onondaga County Hazard Mitigation Plan

Name *(optional)*: _____

E-mail *(optional)*: _____ **Phone Number** *(optional)*: _____

Onondaga County and its jurisdictions (i.e., city, towns, villages, special districts) are completing a five (5) year update of the **Onondaga County Multi-Jurisdictional Hazard Mitigation Plan (HMP)**.

This Plan is an effort to make your community more resilient, to provide a basis for identifying and managing natural hazards, and to meet federal, state, and local requirements for hazard mitigation grant funding.

The Plan identifies and assesses risks the County faces from natural hazards, and outlines strategies the County and jurisdictions have identified for reducing the impacts of these hazards.

Public involvement is a key part of this update process, and we encourage residents to review the Plan and share their feedback. Participate in this update process by following the instructions below:

1. Access and view the draft Plan via the following webpage: ongov.net/planning/haz.html. ***You can use one of the library computers!***
2. Provide comments by completing this Form. *If you prefer to complete the online comment form, you can access it via the link above.*
3. If you complete this hard copy form, mail to: **Onondaga County Department of Planning**
   Carnegie Building
   335 Montgomery Street, 1st Floor
   Syracuse, NY 13202

We appreciate your interest and feedback!

Identify the jurisdiction for which you will provide comments/feedback. *Select One*
If you are providing feedback for more than one location, please complete another form.*

- ☐ Volume 1 (Countywide Planning Elements)
- ☐ City of Syracuse
- ☐ Town of Camillus
- ☐ Town of Cicero
- ☐ Town of Clay
- ☐ Town of DeWitt
- ☐ Town of Elbridge
- ☐ Town of Fabius
- ☐ Town of Geddes
- ☐ Town of LaFayette
- ☐ Town of Lysander
- ☐ Town of Manlius
- ☐ Town of Marcellus
- ☐ Town of Onondaga
- ☐ Town of Otisco
- ☐ Town of Pompey
- ☐ Town of Salina
- ☐ Town of Skaneateles
- ☐ Town of Spafford
- ☐ Town of Tully
- ☐ Town of Van Buren
- ☐ Village of Baldwinsville
- ☐ Village of Camillus
- ☐ Village of East Syracuse
- ☐ Village of Elbridge
- ☐ Village of Fabius
- ☐ Village of Fayetteville
- ☐ Village of Jordan
- ☐ Village of Liverpool
- ☐ Village of Manlius
- ☐ Village of Marcellus
- ☐ Village of Minoa
- ☐ Village of North Syracuse
- ☐ Village of Skaneateles
- ☐ Village of Solvay
- ☐ Village of Tully
- ☐ Onondaga County Water Authority

Page **1** of **2**

Public Comment Review – Comment Form
2025 Multi-Jurisdictional Onondaga County Hazard Mitigation Plan

Please identify the section of the Hazard Mitigation Plan for which you will provide comment(s)/feedback. *(e.g., Section 2, Subsection 2.1 (page 2-4)*

Section:

Comment(s):

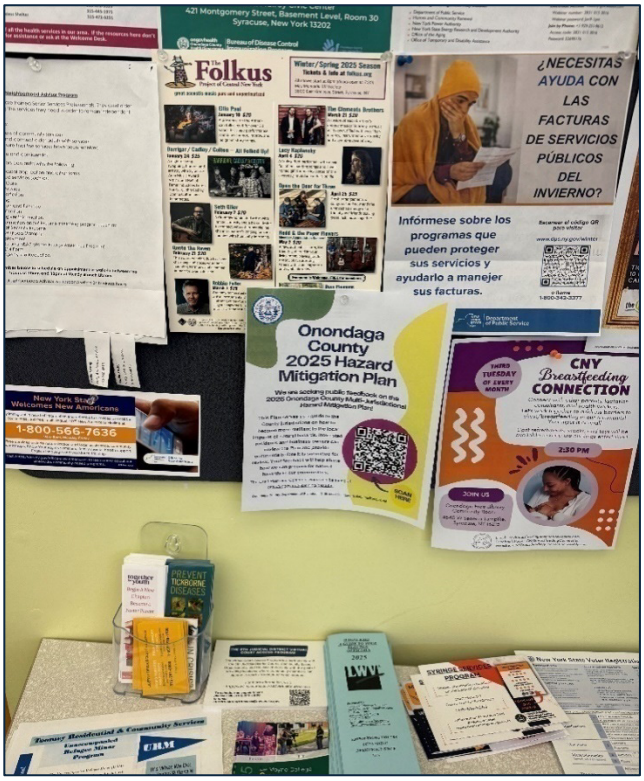
Section:

Comment(s):

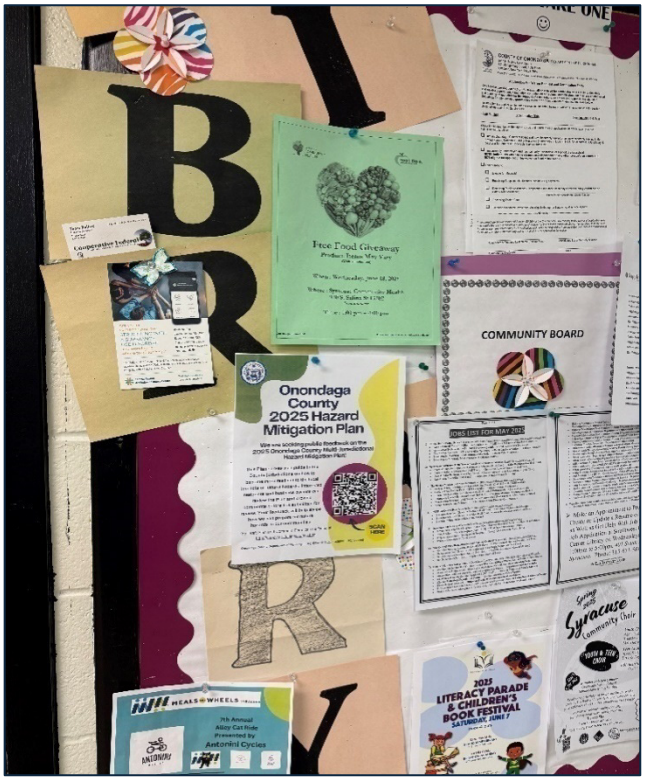
Any additional comment(s)/feedback?

Page **2** of **2**

Mundy Branch Library



Syracuse Community Connections Branch Library



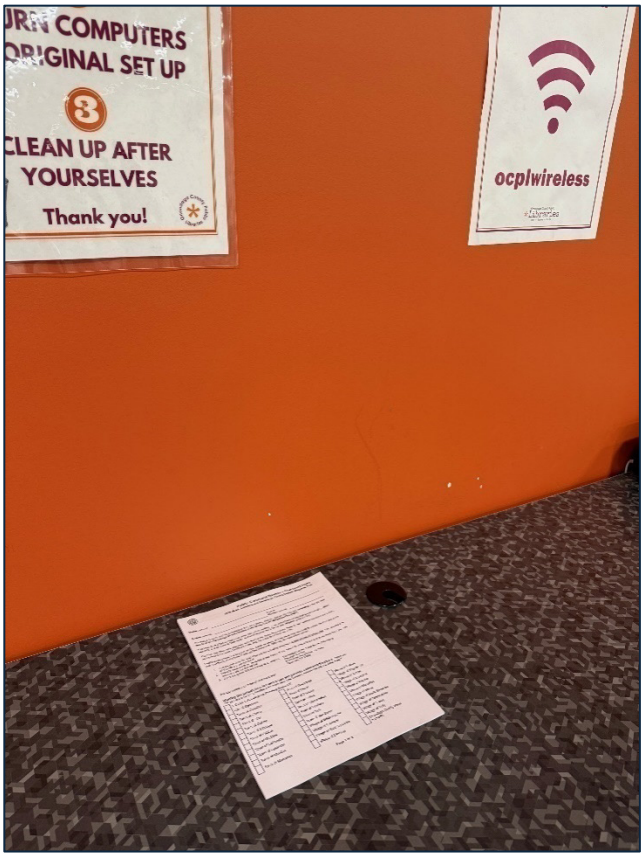
Beauchamp Branch Library



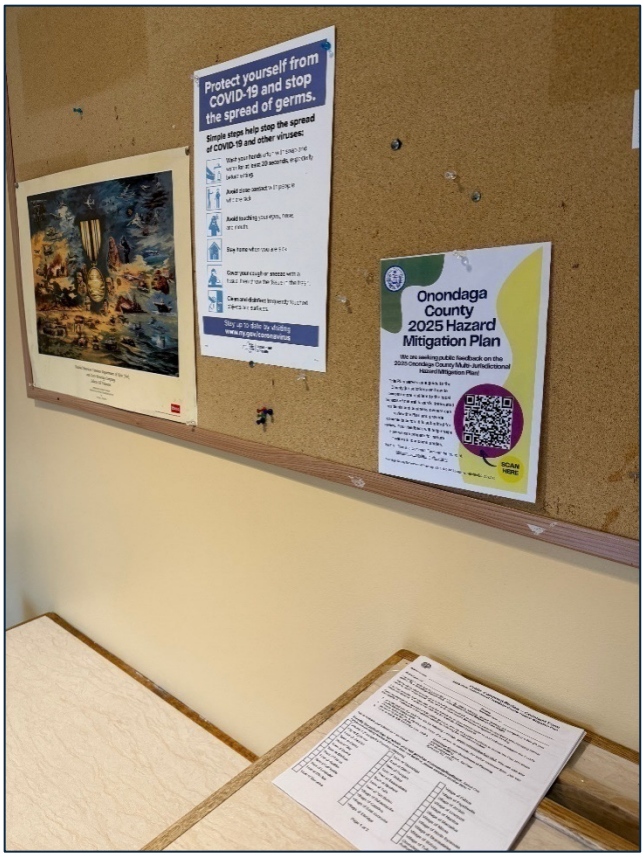
Liverpool Public Library



Main County Library

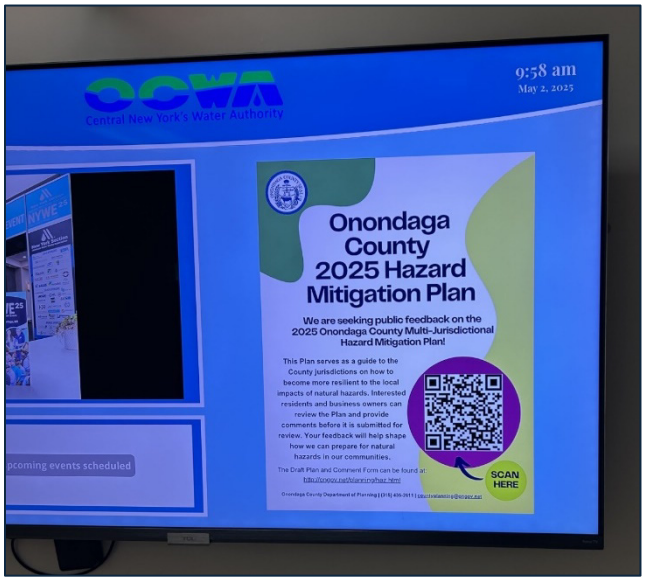


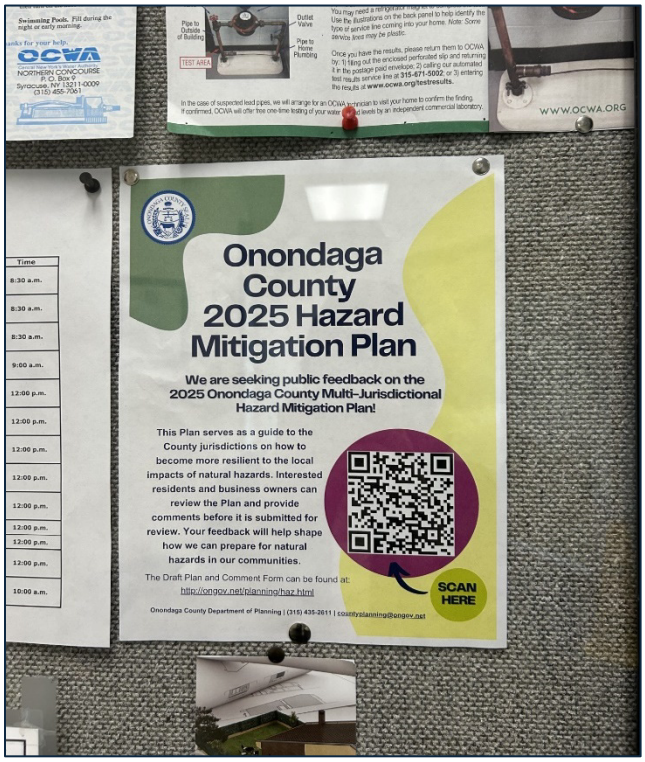
Civic Center

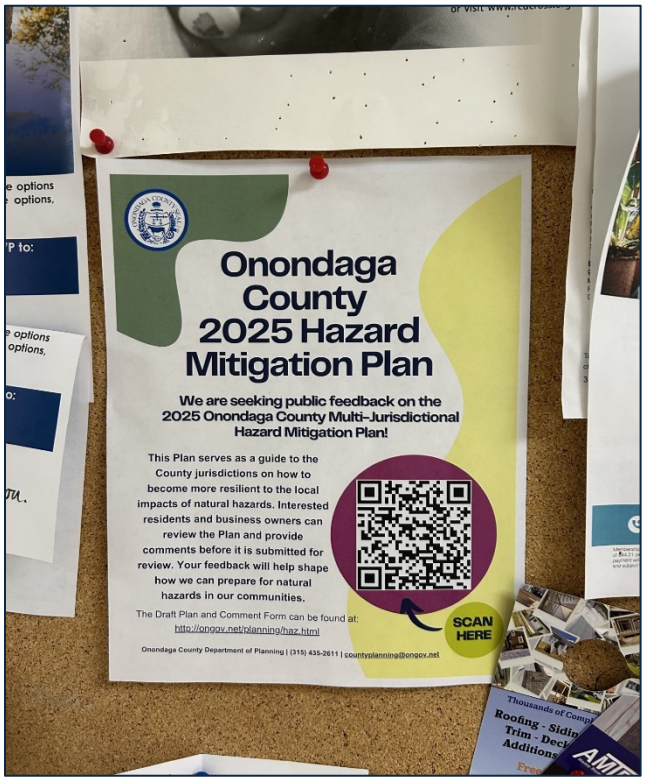


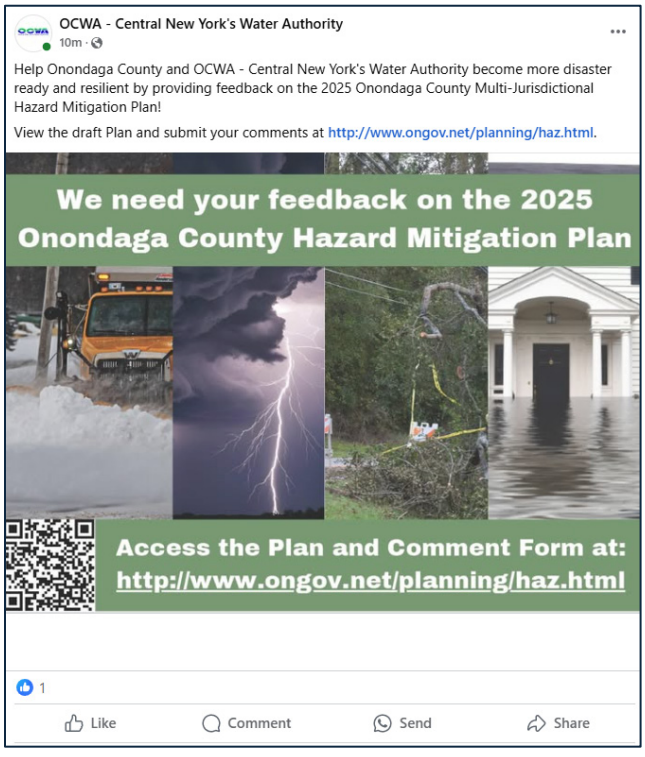
Public Comment Period Outreach

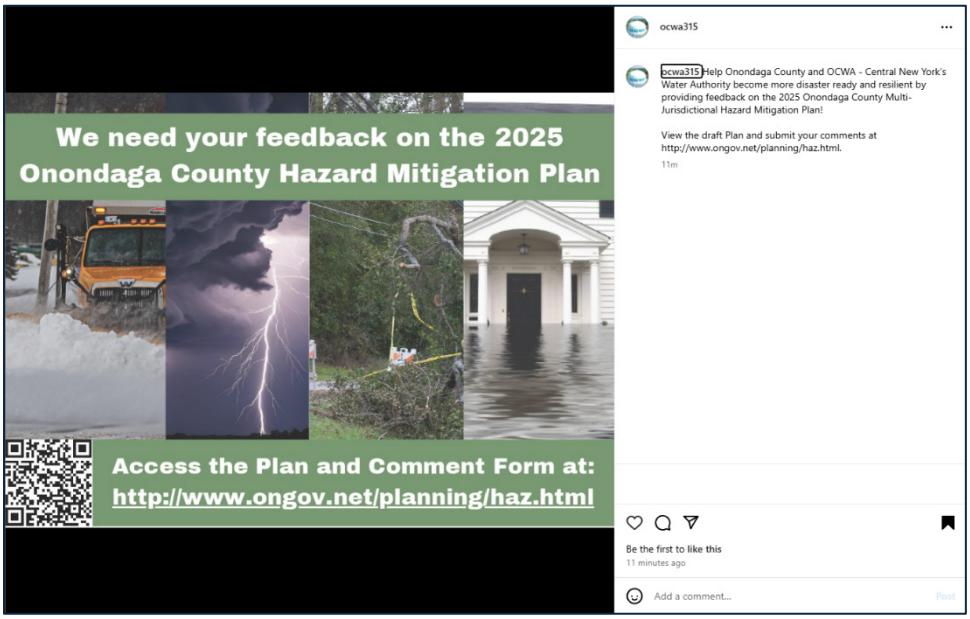
Onondaga County Water Authority Outreach







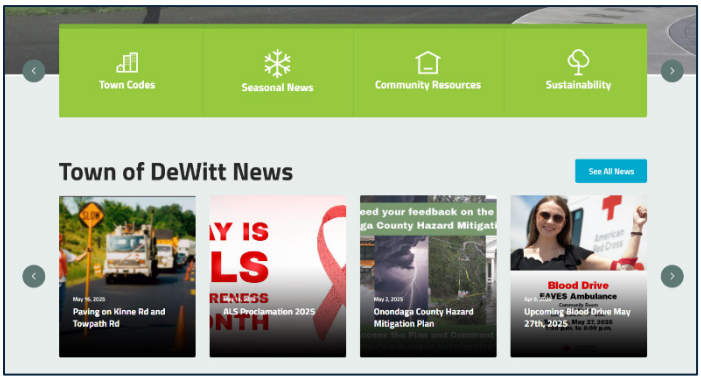



We need your feedback on the 2025
Onondaga County Hazard Mitigation Plan
Access the Plan and Comment Form at:
http://www.ongov.net/planning/haz.html
ocwa315
ocwa315 Help Onondaga County and OCWA - Central New York's Water Authority become more disaster ready and resilient by providing feedback on the 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan!
View the draft Plan and submit your comments at http://www.ongov.net/planning/haz.html.
11m
Be the first to like this
11 minutes ago
Add a comment...
Post

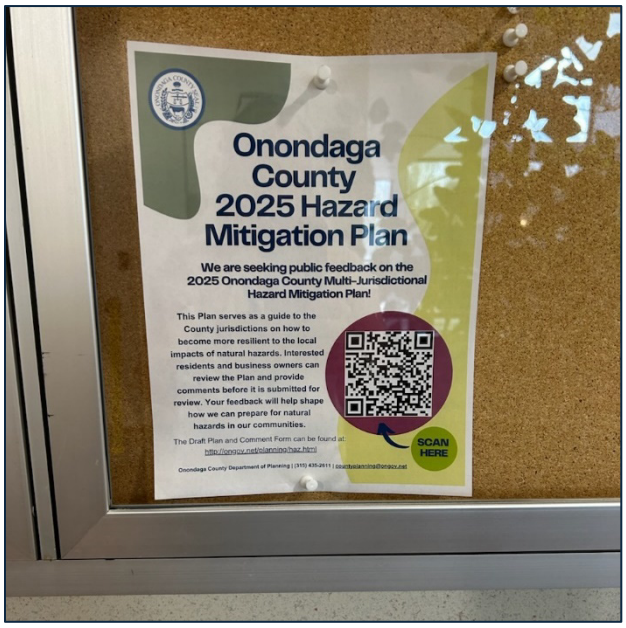

OCWA
Central New York's Water Authority
About
Pay Bill
Customer Service
Water Quality
Governance
Projects
Employment
OCWA and Onondaga County Seek Public Feedback on 2025 Hazard Mitigation Plan
Previous
OCWA and Onondaga County Seek Public Feedback on 2025 Hazard Mitigation Plan
In an effort to make your community more disaster ready and resilient, Onondaga County and OCWA – Central New York's Water Authority are seeking public feedback on the 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan. This Plan serves as a guide to the County and its jurisdictions on how to become more resilient to the impacts of natural hazards. Interested residents and business owners have until May 31, 2025 to review and provide comments on the Plan before it is submitted to the State and FEMA for review and approval.
The 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan is comprised of Volume 1, which covers the countywide planning elements, and 36 annexes – one (1) for each municipality and OCWA. The draft Plan (Volume 1 and annexes) is available for download at: http://www.ongov.net/planning/haz.html.
Please use the following comment form to submit your feedback on the Plan to the Onondaga County Department of Planning:
s.alchemer.com/s3/OnondagaCountyHMPCommentForm.
Your feedback will help shape the 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan.
Public Comment Flyer
We need your feedback on the 2025 Onondaga County Hazard Mitigation Plan
Access the Plan and Comment Form at:
http://www.ongov.net/planning/haz.html
Hazard Mit Public Comment Infographic

Town of DeWitt Outreach

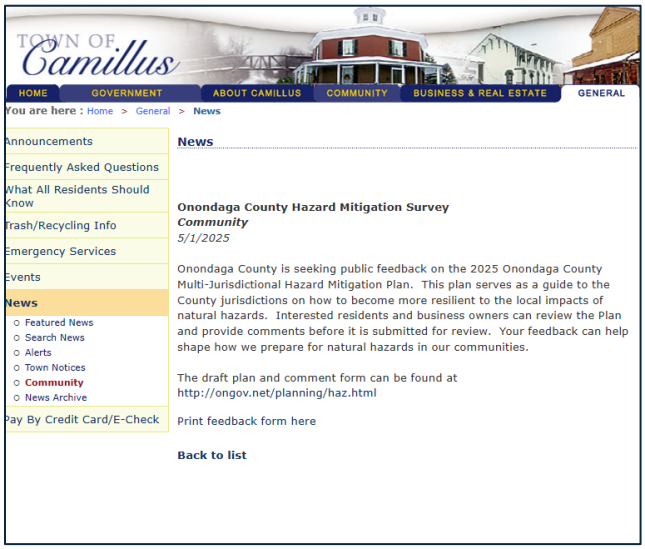




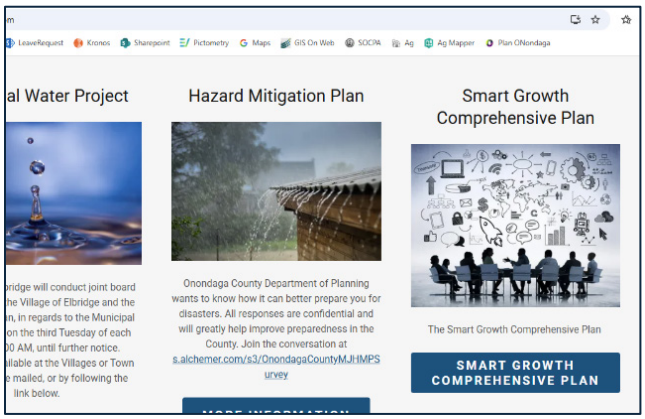




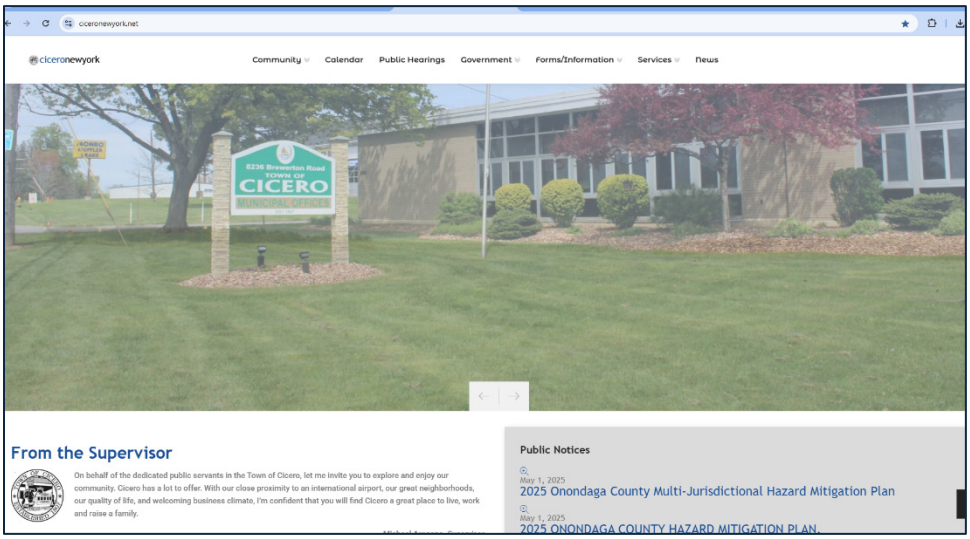
Town of Camillus Outreach



Town of Elbridge Outreach

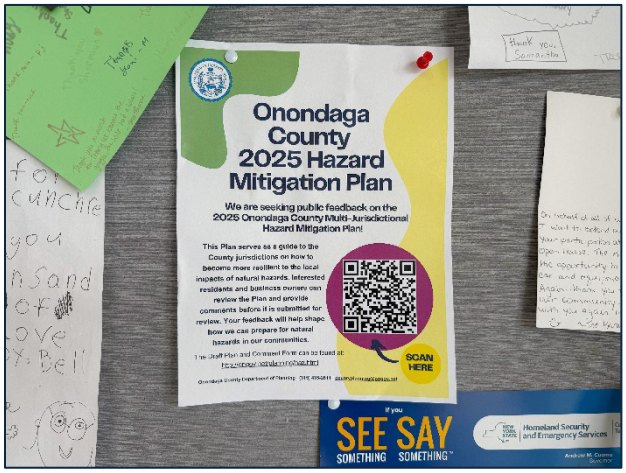


Town of Cicero Outreach

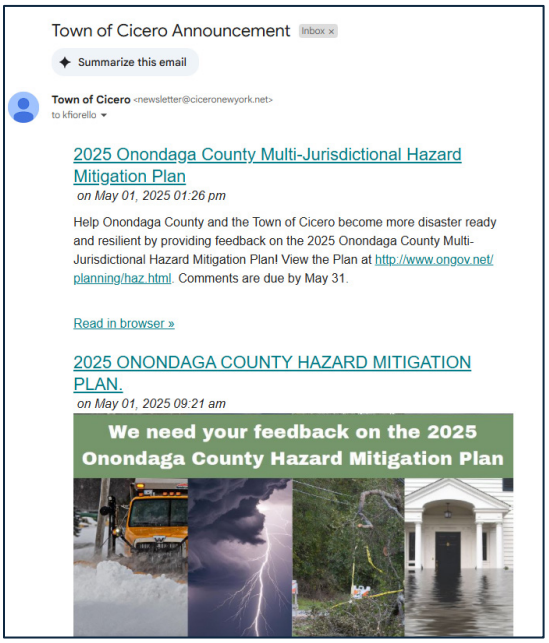


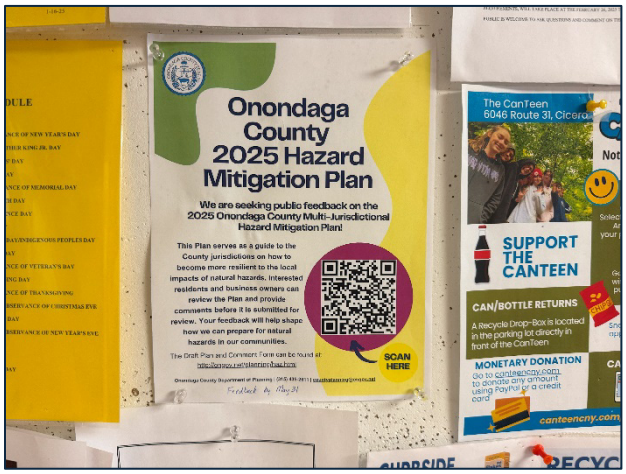

Town of Cicero, NY
23h
We need your feedback on the 2025 Onondaga County Hazard Mitigation Plan
Access the Plan and Comment Form at:
http://www.ongov.net/planning/haz.html


Onondaga County 2025 Hazard Mitigation Plan

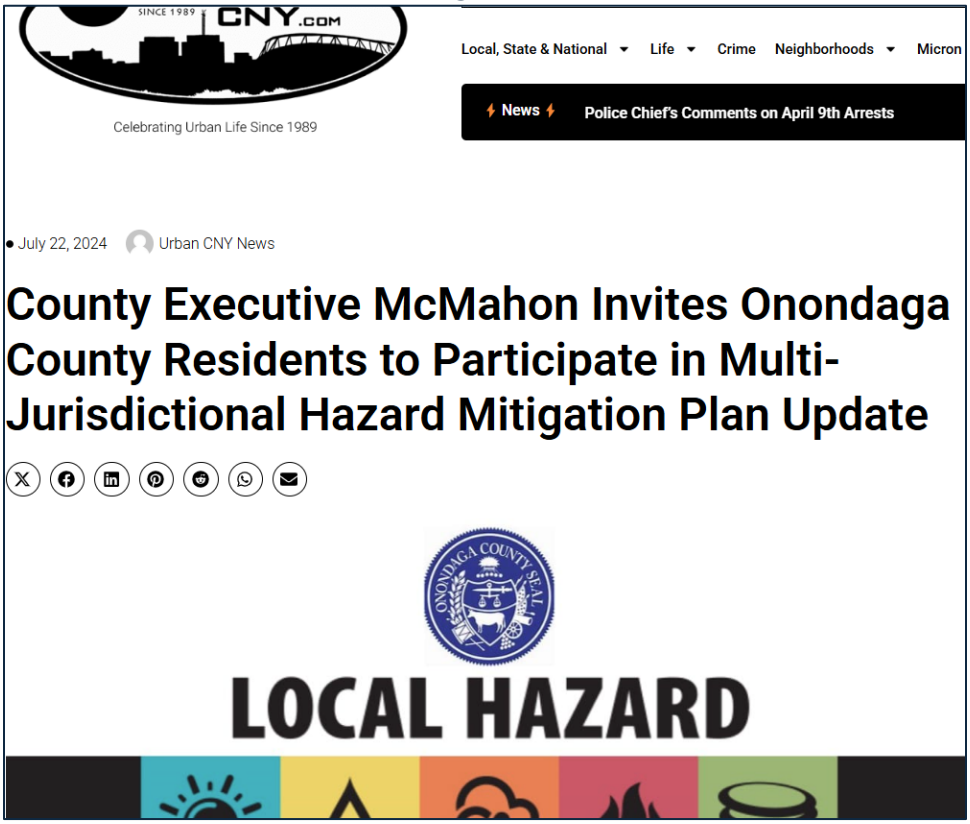

Onondaga County 2025 Hazard Mitigation Plan
We are seeking public feedback on the 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan!
SCAN HERE
SEE SAY
SOMETHING SOMETHING


CREDIT CARD
Onondaga County 2025 Hazard Mitigation Plan
GRIEF SUPPORT GROUP
All are welcome.
HELP US SAVE THE
SCHOOL!


Town of Cicero Announcement
Inbox
Summarize this email
Town of Cicero <newsletter@ciceronewyork.net>
to kfiorello
2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan
on May 01, 2025 01:26 pm
Help Onondaga County and the Town of Cicero become more disaster ready and resilient by providing feedback on the 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan! View the Plan at http://www.ongov.net/planning/haz.html. Comments are due by May 31.
Read in browser »
2025 ONONDAGA COUNTY HAZARD MITIGATION PLAN.
on May 01, 2025 09:21 am
We need your feedback on the 2025 Onondaga County Hazard Mitigation Plan


Onondaga County 2025 Hazard Mitigation Plan
We are seeking public feedback on the 2025 Onondaga County Multi-Jurisdictional Hazard Mitigation Plan!
SCAN HERE
The CanTeen
6046 Route 31, Cicero
SUPPORT THE CANTEEN
CAN/BOTTLE RETURNS
MONETARY DONATION
canteencny.com

Urban CNY Organization Outreach



C.4. CONTINUED PUBLIC ENGAGEMENT

In order to keep the Plan current after it is approved, it is important to ensure that the public continues to be involved in the Plan and how it is conducted. To ensure continued public engagement, Onondaga County will ensure the Plan is available on the County's Hazard Mitigation webpage after it has been approved to allow the public an opportunity to provide continual feedback and input. Additionally, Onondaga County will provide documents and all relevant posting materials (e.g., social media content, flyers, and other digital products) for posting on municipal and jurisdictional websites, for display in public buildings, and for use on other public-facing platforms. As future needs and concerns arise, or if the public would like to provide feedback on the latest version of the Onondaga County Plan, the public is invited to use the comment form on the website to submit comments.

County Hazard Mitigation Webpage: www.ongov.net/planning/haz.html

Comment Form: s.alchemer.com/s3/OnondagaCountyHMPCommentForm

Incorporating hazard mitigation into other planning efforts can help the public learn about mitigation and its importance to their communities. Onondaga County will continue to collaborate with its stakeholders to ensure that the public has an opportunity to learn about the Plan, mitigation actions planned for their communities, and ways to get involved. Hazard mitigation will be part of the County's community outreach strategy, including, but not limited to, public meetings, community events, social media, and public surveys throughout the year. Furthermore, the County will continue to ensure equitable outreach by working with other departments, non-profits, and agencies that collaborate with underserved communities throughout the County.

APPENDIX D. PLAN ADOPTION

[Placeholder for adoption documentation after State and FEMA Approval.]