



8



# HOUSING RESILIENCY

# Overview

## What is Housing Resiliency and Vulnerability?

Climate-related impacts are expected to grow in frequency and severity into the future, threatening the built environment in communities across the nation and world. The City of Keene has already experienced major impacts from natural hazards, particularly flooding which caused significant damage in both 2005 and 2012. Housing resiliency refers to the ability of the City's housing stock to withstand and recover from future climate-related impacts.

Part of ensuring the resiliency of the City's housing stock is to identify the most vulnerable housing in Keene. Vulnerability includes not only properties that are directly in harm's way, but also includes the nature of those properties (e.g., condition and quality). It also includes identifying the households at-risk of managing and recovering from climate-impacts such as low-income households and senior households.

This section identifies the vulnerability of residential properties in the City of Keene to assess the need for action to address housing resiliency and to prioritize certain types of properties and areas found to be most vulnerable.

## Housing Vulnerability to Flooding

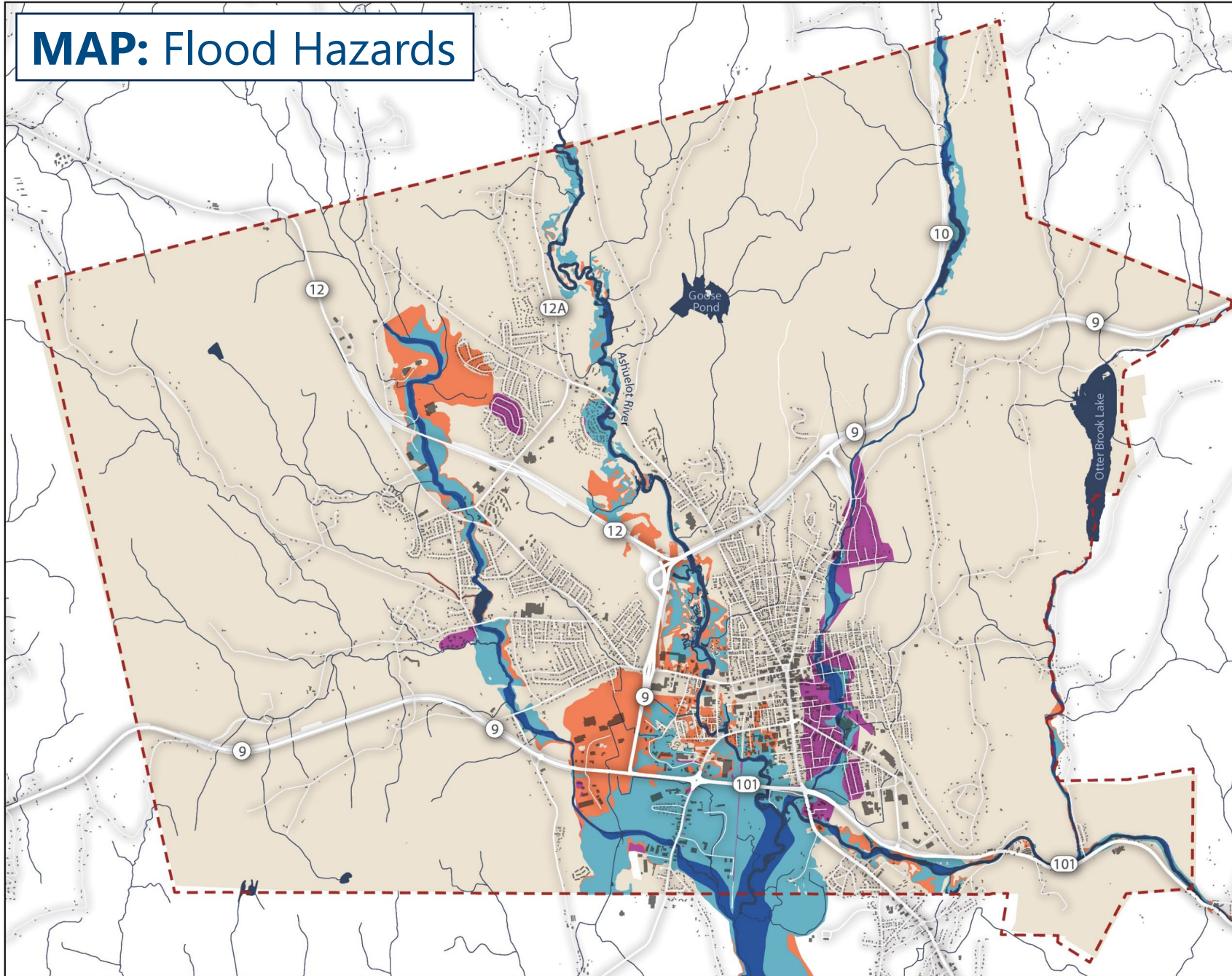
The most pressing housing resiliency issue in Keene is the susceptibility of housing to flood events. The Ashuelot River runs through the heart of the community putting many homes in harm's way. There are some homes found directly in the regulatory floodway of the river and other streams in



*Flooding on Kirk Court in Keene. Photo by Paul Miller. Source: The Keene Sentinel*

Keene where flooding poses the greatest danger. Many more homes are found within designated floodplain areas, including areas with a 1% annual chance of flooding and with a 0.2% chance of annual flooding. These areas are shown on the map on the following page. In addition to these FEMA regulated areas, the City has a history of major flooding that extends beyond those areas, representing additional places of critical flooding-risk. These flood risk areas are used as the basis of the vulnerability analysis discussed in the following section.

# MAP: Flood Hazards



## LEGEND

- FEMA Flood Risk**
  - Floodway
  - 1% Annual Flood Risk
  - 0.2% Annual Flood Risk
- History of Flooding
- Surface Water
- Rivers & Streams
- Building Footprints
- City of Keene



# Housing Vulnerability Index

## Overview and Methodology

The Housing Vulnerability Index analysis scores each residential property (parcel) based on a set of criteria related to flood vulnerability, housing condition, and sociodemographic characteristics. The scores were weighted based on relative importance with flood vulnerability being the criteria with the greatest weight. These weighted scores are shown in the table to the right.

**Flood Vulnerability:** The residential properties located within FEMA regulated areas were identified using Geographic Information System (GIS) analysis using FEMA data and city property tax records. Additional data was provided by the City of Keene indicating areas of the City that flooded in 2005 and 2012.

**Housing Condition:** Homes in greater disrepair are more vulnerability in their ability to withstand and recover from flood events. City property tax records classify the condition of properties and while this classification is an imperfect representation of condition, those properties classified as poor or very poor were used as the best available data. Additionally, the age of housing was also considered as another proxy measure of housing quality and condition, albeit an imperfect measure.

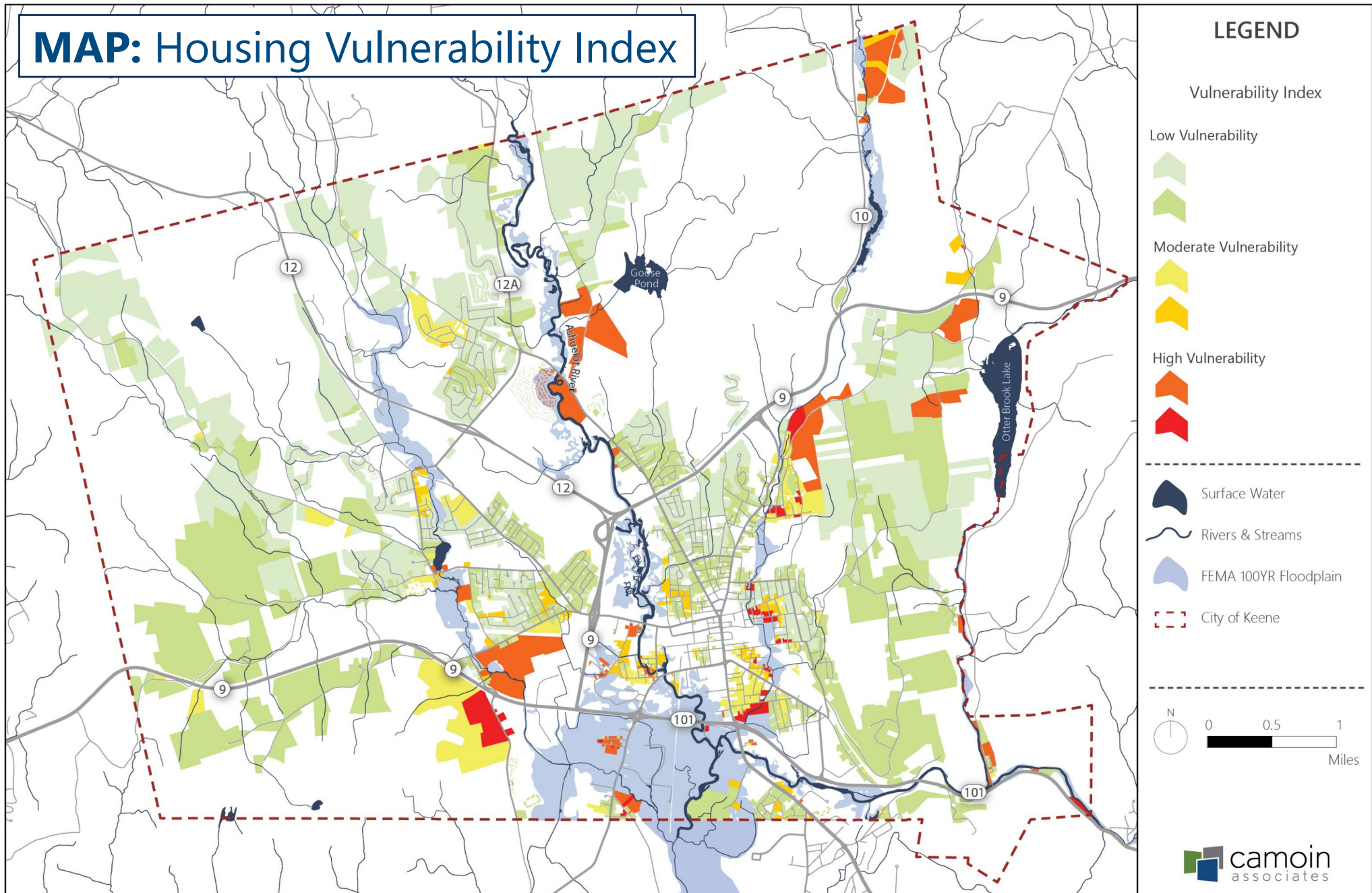
**Sociodemographic:** Housing occupied by low-income households and seniors increase the vulnerability of housing as these residents typically have less ability to invest in properties to prevent flood damage and less resources available to fully recover when significant damage does occur. Demographic data is only available at the block group level and residential properties falling into block groups with high and moderate concentrations of poverty and high concentrations of senior households were scored additional points.

Additional Methodology information can be found in Appendix C.

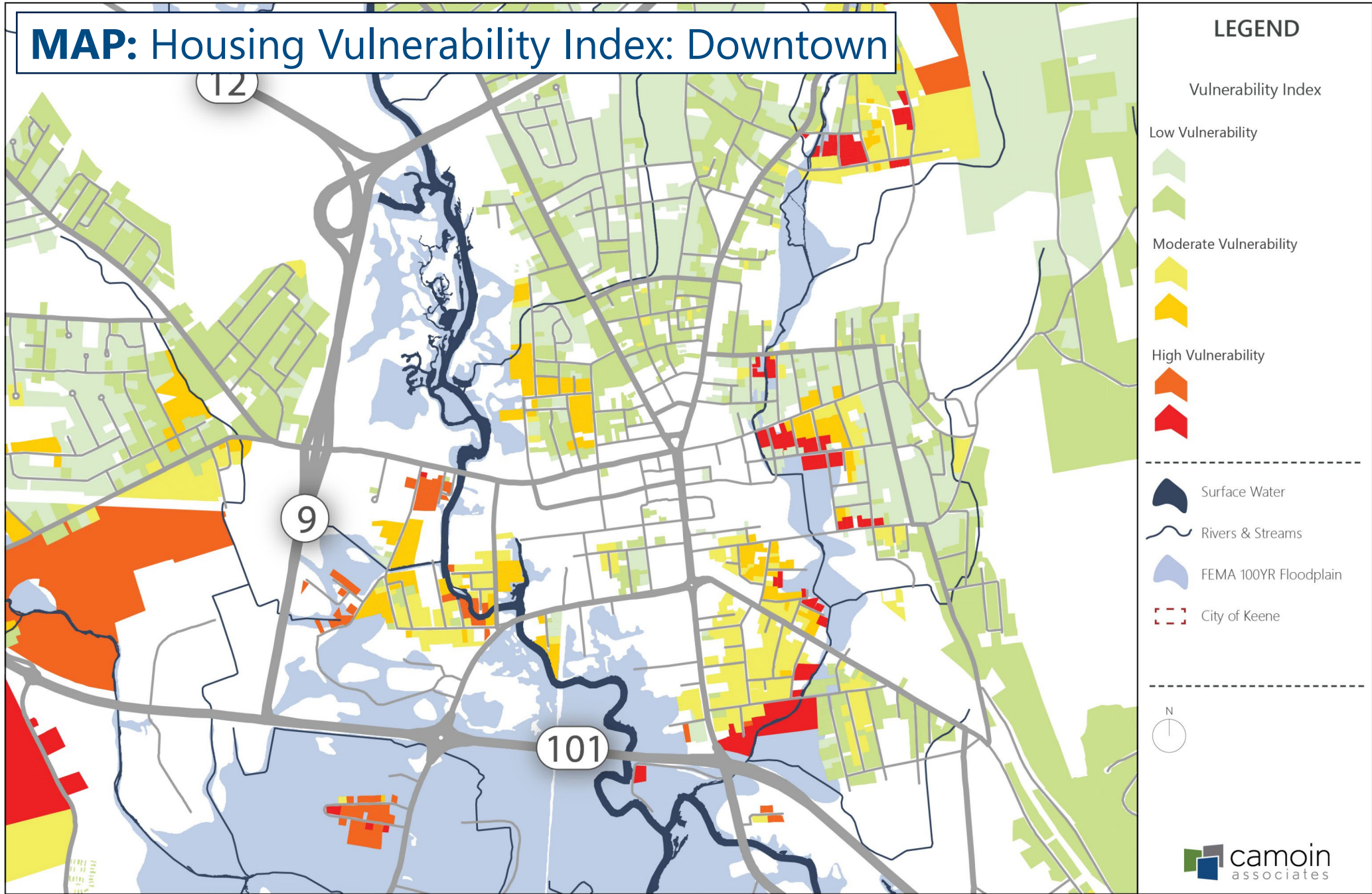
### City of Keene: Housing Vulnerability Index Criteria and Scoring

<b>1. Flood Vulnerability</b>		<b>Points</b>
Located in FEMA Floodway		4
Located in FEMA 100-Year Floodplain		3
Located in FEMA 500-Year Floodplain		2
In area flooded in 2005		1.5
In area flooded in 2012		1.5
<b>Maximum Score</b>		<b>7</b>
<b>2. Housing Condition</b>		<b>Points</b>
Housing condition classified as poor or very poor		1
Built prior to 1940		0.5
Built 1940-1960		0.25
<b>Maximum Score</b>		<b>1.5</b>
<b>3. Sociodemographic</b>		<b>Points</b>
Located in High Senior Concentration Census Block Group		0.5
Located in High Poverty Census Block Group (greater than 15%)		0.5
Located in Moderate Poverty Census Block Group (10-15%)		0.25
<b>Maximum Score</b>		<b>1</b>
<b>Overall Maximum Possible Score</b>		<b>9.5</b>

# MAP: Housing Vulnerability Index



# MAP: Housing Vulnerability Index: Downtown



## Discussion of Results

Out of 6,200 residential properties in the City of Keene included in the analysis, 395 (6.4%) were found to be highly vulnerable. An additional 15.9% of residential properties (984) were found to have moderate vulnerability. Overall, the results indicate that a substantial portion of the City's housing stock is vulnerable to flooding hazards and recovery from such events.

The analysis also indicates that highly vulnerable properties tend to be clustered in similar areas and neighborhoods. Therefore, area-wide and neighborhood level interventions may be appropriate to help improve housing resiliency.

While many of the residential properties that ranked highest in vulnerability are single family properties, many small multi-family properties were also found to be highly vulnerable. This suggests that different approaches to improving resiliency for the highest priority parcels may be needed for both homeowners and rental (landlord-owned) properties.

### Vulnerability Index by Number of Residential Properties - City of Keene

Vulnerability Index	Number of Properties	Percent of Properties
Low Vulnerability	4,821	77.8%
Moderate Vulnerability	984	15.9%
High Vulnerability	395	6.4%
<b>Total</b>	<b>6,200</b>	<b>100%</b>

Source: City of Keene/Camoin Associates