

## Special Topics

## Kay County Disaster Resiliency Assessment

The purpose of this section is to assess at the county level key components of disaster resiliency. Housing location and quality as well as planning activities can help reduce impacts from disaster events and allow for faster recovery. Disasters can include tornadoes, extreme weather, high winds, as well as man-made events. These events may largely be inevitable, but the ability to reduce damage and casualties as well recovery can be improved with good planning.

### C.0 Comprehensive Plans & Hazard Mitigation Plans

There are 8 key cities within the county (Ponca City, Newkirk, Blackwell, Tonkawa, Kaw City, Braman, Nardin, Oklahoma, Kildare).

**Comprehensive plans** are the guiding documents for cities of various sizes to address key aspects of their community from land use, transportation, environment, housing, and economic development.

Ponca City has a comprehensive plan. The relevant sections of their plan were reviewed and goals of the plan consistent with this study included need for housing.

- Adequate Housing Needed for Growth – The plan identifies a lack of available housing for sale. (Ponca City Comprehensive Plan, 1.12)
- Notation on growth management to prevent: “Degradation of environmental resources such as floodplains, wetlands, habitat, vegetated areas, etc.” (3.19)
  - Policy 9: Preservation measures will be enacted to protect sensitive lands and conserve environmental resources. (3.21)

The other key plan for a city to manage, mitigate and plan for recovery related to disasters is a **Hazard Mitigation Plan** (or Emergency Management Plan). Often low density counties, the Hazard Mitigation Plan is done at the county level, though some cities may augment the county plan with a city plan.

Kay County does have a Hazard Mitigation Plan, but it is under review. Ponca City also has a HMP in draft form which was available for review for this study.

#### C.2.1.1. Historical Data on Natural Disasters and Other Hazards

Data on historical damages and casualties is typically collected as part of a **Hazard Mitigation Plan** preparation to determine the appropriate planning measures and actions to take before and after an event.

Hazards identified in the Ponca City HMP are summarized in the table (Ponca City HMP, 34):

**Hazards How and Why Identified**

HAZARD	HOW IDENTIFIED	WHY IDENTIFIED
Dam Failure/Levees	<ul style="list-style-type: none"> <li>➢ National Inventory of Dams</li> <li>➢ OWRB</li> <li>➢ FIRMS</li> <li>➢ ODEM</li> </ul>	<ul style="list-style-type: none"> <li>➢ Ponca City has three high hazard dams located within the boundaries. There are no levees listed for Ponca City.</li> </ul>
Drought	<ul style="list-style-type: none"> <li>➢ USGS</li> <li>➢ Water Department</li> <li>➢ Lake and pond levels</li> <li>➢ Dept. of Agriculture</li> </ul>	<ul style="list-style-type: none"> <li>➢ Low water levels at area ponds (including raw water supply reservoir) and lake</li> <li>➢ Low crop yields</li> </ul>
Earthquake	<ul style="list-style-type: none"> <li>➢ USGS</li> <li>➢ NCDC</li> <li>➢ State Hazard Mitigation Officer</li> </ul>	<ul style="list-style-type: none"> <li>➢ Low-level earthquakes measured by the Richter Scale have been recorded.</li> </ul>
Extreme Heat	<ul style="list-style-type: none"> <li>➢ Local News Stations</li> <li>➢ State Hazard Mitigation Officer</li> <li>➢ Local EMS</li> <li>➢ Local Fire Department</li> </ul>	<ul style="list-style-type: none"> <li>➢ Local EMS, Fire and Police Departments respond to numerous heat related calls each year during the elevated temperature period</li> </ul>
Flooding	<ul style="list-style-type: none"> <li>➢ Review of FIRMS</li> <li>➢ Risk Assessments</li> <li>➢ Public Input</li> <li>➢ OWRB</li> </ul>	<ul style="list-style-type: none"> <li>➢ History of flash floods</li> </ul>
Hail	<ul style="list-style-type: none"> <li>➢ Emergency Management Storm Watchers</li> <li>➢ NCDC</li> </ul>	<ul style="list-style-type: none"> <li>➢ Ponca City has records of past occurrences of frequent Thunderstorms including: Hail, Lightning, and High Wind</li> </ul>
High Wind	<ul style="list-style-type: none"> <li>➢ Emergency Management Storm Watchers</li> <li>➢ NCDC</li> </ul>	<ul style="list-style-type: none"> <li>➢ Ponca City has records of past occurrences of frequent Thunderstorms including: Hail, Lightning, and High Wind</li> </ul>
Lightning	<ul style="list-style-type: none"> <li>➢ Emergency Management Storm Watchers</li> <li>➢ NCDC</li> </ul>	<ul style="list-style-type: none"> <li>➢ Ponca City has records of past occurrences of frequent Thunderstorms including: Hail, Lightning, and High Wind</li> </ul>
Thunderstorm	<ul style="list-style-type: none"> <li>➢ Emergency Management Storm Watchers</li> <li>➢ NCDC</li> </ul>	<ul style="list-style-type: none"> <li>➢ Ponca City has records of past occurrences of frequent Thunderstorms including: Hail, Lightning, and High Wind</li> </ul>
Tornados	<ul style="list-style-type: none"> <li>➢ Emergency Management Storm watchers</li> <li>➢ NCDC</li> <li>➢ Local Citizens</li> </ul>	<ul style="list-style-type: none"> <li>➢ Kay County has records of past occurrence.</li> </ul>
Wildfires	<ul style="list-style-type: none"> <li>➢ Local Fire Department</li> <li>➢ Local Emergency Manager</li> <li>➢ NCDC</li> </ul>	<ul style="list-style-type: none"> <li>➢ Ponca City has reports of wildfires.</li> </ul>
Winter Storms	<ul style="list-style-type: none"> <li>➢ Local Emergency Manager</li> <li>➢ NCDC</li> <li>➢ Ponca City Public Works Dept</li> </ul>	<ul style="list-style-type: none"> <li>➢ Ponca City has history of winter storms.</li> </ul>

Figure 3: Hazards Identified (Table)

(Ponca City HMP, 34)

In the HMP, the identified risks were also assessed for their probability of causing harm to their area:

### Hazard Probability Matrix

Hazard Event	Ponca City	School District #71	County data used
Dam Failure/ Levees	U	U	<input type="checkbox"/>
Drought	L	L	<input checked="" type="checkbox"/>
Earthquake	U	U	<input checked="" type="checkbox"/>
Extreme Heat	U	U	<input checked="" type="checkbox"/>
Flooding	H	U	<input type="checkbox"/>
Hail	H	H	<input type="checkbox"/>
High Wind	L	L	<input type="checkbox"/>
Lightning	U	U	<input type="checkbox"/>
Thunderstorms	H	H	<input type="checkbox"/>
Tornados	L	L	<input checked="" type="checkbox"/>
Wildfires	U	U	<input type="checkbox"/>
Winter storms	H	H	<input checked="" type="checkbox"/>

Figure 4: Hazard Probability Matrix (Table)

(Ponca City HMP, 37)

As noted in the above table, flooding, hail, thunderstorms and winter storms have the highest probability of occurrence in the area.

The number of events in the area was also summarized in the following table:

### Hazard History

Ponca City, Oklahoma Recorded Hazard Events Since 1998 By the National Climatic Data Center	
Hazards	Events in Kay County
	2005 to 2015
Dam Failure	0
Drought (County only data)	4
Earthquake (since 2005) 3.0 or Greater	2
Extreme Heat	2
Flood/Flash Flood	15
Hail	98
High Wind	7
Lightning (2005-2009)	1
Thunderstorms	132
Tornado	9
Wildfire	0
Winter Storms	13

**Note: Not all hazard events are reported to the NCDC.**

\* Information from USGS

\*\* Information from Local Fire Department

Figure 5: Hazard History (Table)

(Ponca City HMP, 37)

Dam Failure

There has not been a dam failure in Ponca City but there are three “High Hazard” dams located within the city borders (Ponca Lake, Kaw Lake and Cremers Park Regional Detention Pond )(p 42).

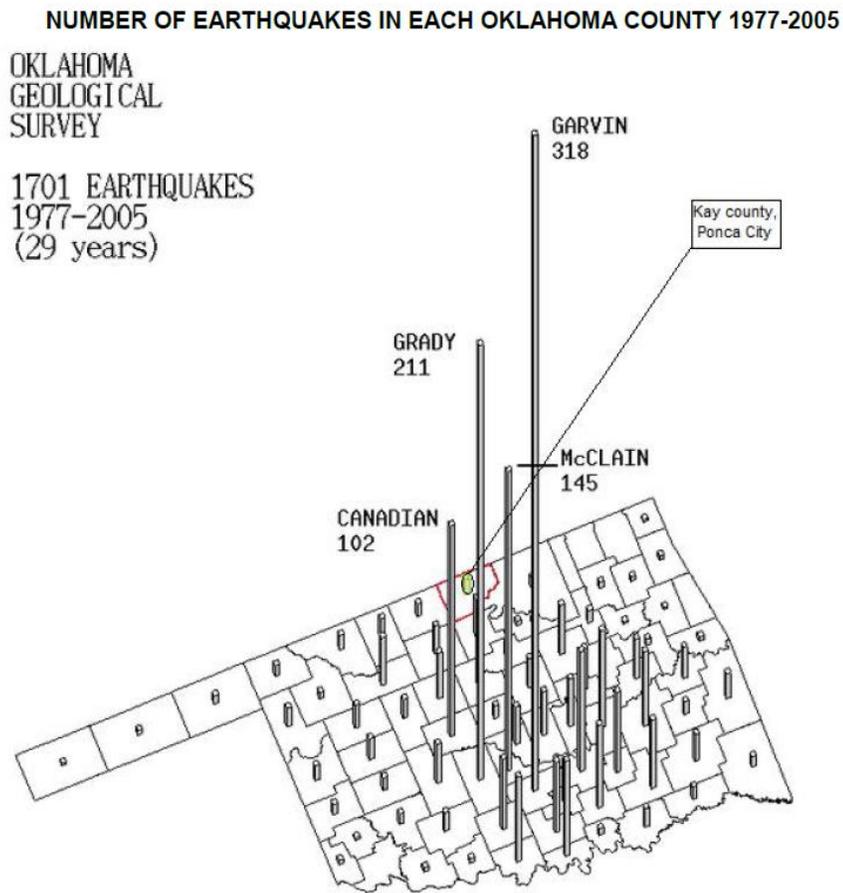


Figure 7: Ponca City Dam Failure Overview(Map)

**Areas in Blue : Projected downstream path in the event of Dam Failure.**

Earthquakes

While this is listed as unlikely for the area or as a lower probability, increased earthquakes in the state continue to be studied and of concern. The Ponca City HMP included this informative visual on historical earthquakes:



(Ponca City HMP, p. 54)

### Flooding

There have been 15 flooding incidents in Ponca City. The HMP elaborates on locations and extent of damage:

“Ponca City has minor drainage backup around watersheds throughout the city. During heavy rain events, the city has several creeks, watersheds and tributaries that are located throughout the city, these areas fill the banks and overflow into nearby communities (Ponca City HMP, p.66)

Various Previous Occurrences For Flooding <small>Source: NCDC</small>	
April 29, 2012	Widespread street flooding occurred from near Tonkawa to Ponca City. Several inches of water forced the closure of several city streets and county roads, and also caused some automobiles to stall. I-35 also had about 6 to 8 inches of water running over it north-northwest of Tonkawa. Some of the water entered residences on the west side of Ponca City.
March 20, 2007	Heavy rainfall totals of 3 to 7 inches over northern Kay County during the morning hours of March 20 produced flash flooding in the area. At 1200 CST, the Kay County emergency manager reported that flash flooding from along Turkey Creek had covered and closed Oklahoma State Highway 11 four miles northeast of Ponca City and one miles east of the intersection with U.S. Highway 77. The powerful forces of the floodwaters damaged a temporary low water crossing on OK State Highway 11, tearing a 10-foot-wide section from the highway and damaging culverts under the highway. A cold front moved into the northwest third of Oklahoma during the afternoon of the 19th before stalling during the early evening hours. As an upper level storm system approached the southern plains, moist air from the Gulf of Mexico began spreading north into Oklahoma. Scattered showers and thunderstorms formed over north central Oklahoma late on the 19th. Several of these thunderstorms became severe, producing large hail and flooding rainfall. After midnight, the stationary front became a warm front and lifted to the north. Additional thunderstorms developed in western and northwest Oklahoma. Several of these thunderstorms also became severe with large hail and very heavy rainfall. Flooding was reported in several areas of northern Oklahoma.
April 26, 2006	Heavy rainfall amounts of 2.5 to 5 inches produced flash flooding during the late evening of April 28 in Kay County where Ponca City law enforcement reported numerous residential roads closed due to high water on the west side of Ponca City at 9:05 pm CST.
September 18, 2002	Numerous streets were covered with water. A large line of strong to severe thunderstorms developed over western Oklahoma during the late afternoon of the 18th and moved eastward as the evening progressed. Mangum, in Greer County, sustained structural damage inside the city limits, and there were two, brief, weak tornadoes verified over northern Oklahoma. One tornado formed near Nash in Grant County, while the other formed near Braman in Kay County. Both tornadoes were rated F0.

Several mitigation strategies to address channels and culverts that have potential for backup during heavy rains are planned as part of stormwater master plan. The Ponca City Stormwater Master Plan has mapped all the impacted structures subject to flooding and have identified structural improvements to reduce impacts.(Ponca City HMP, p. 82).

Tornados

Estimated Types and Numbers of Existing Structures Affected by an F-3 Tornado Ponca city					
Type of Structure	Number of Structures	Severe Damages	Moderate Damage	Population in Hazard Area	Total Damages
Residential	2,127	\$127,632,000	\$25,526,400	5,184	\$153,158,400
Commercial	293	\$1,770,517,000	\$345,070,850	3,016	\$2,115,587,850
School Dist.	4	\$45,365,379	\$9,073,076	1,183	\$54,438,455
Government (City)	11	\$66,268,892	\$13,252,650	273	\$79,521,542
<b>TOTAL</b>	<b>2,435</b>	<b>\$2,009,783,272</b>	<b>\$401,956,654</b>	<b>9,392</b>	<b>\$2,411,739,926</b>

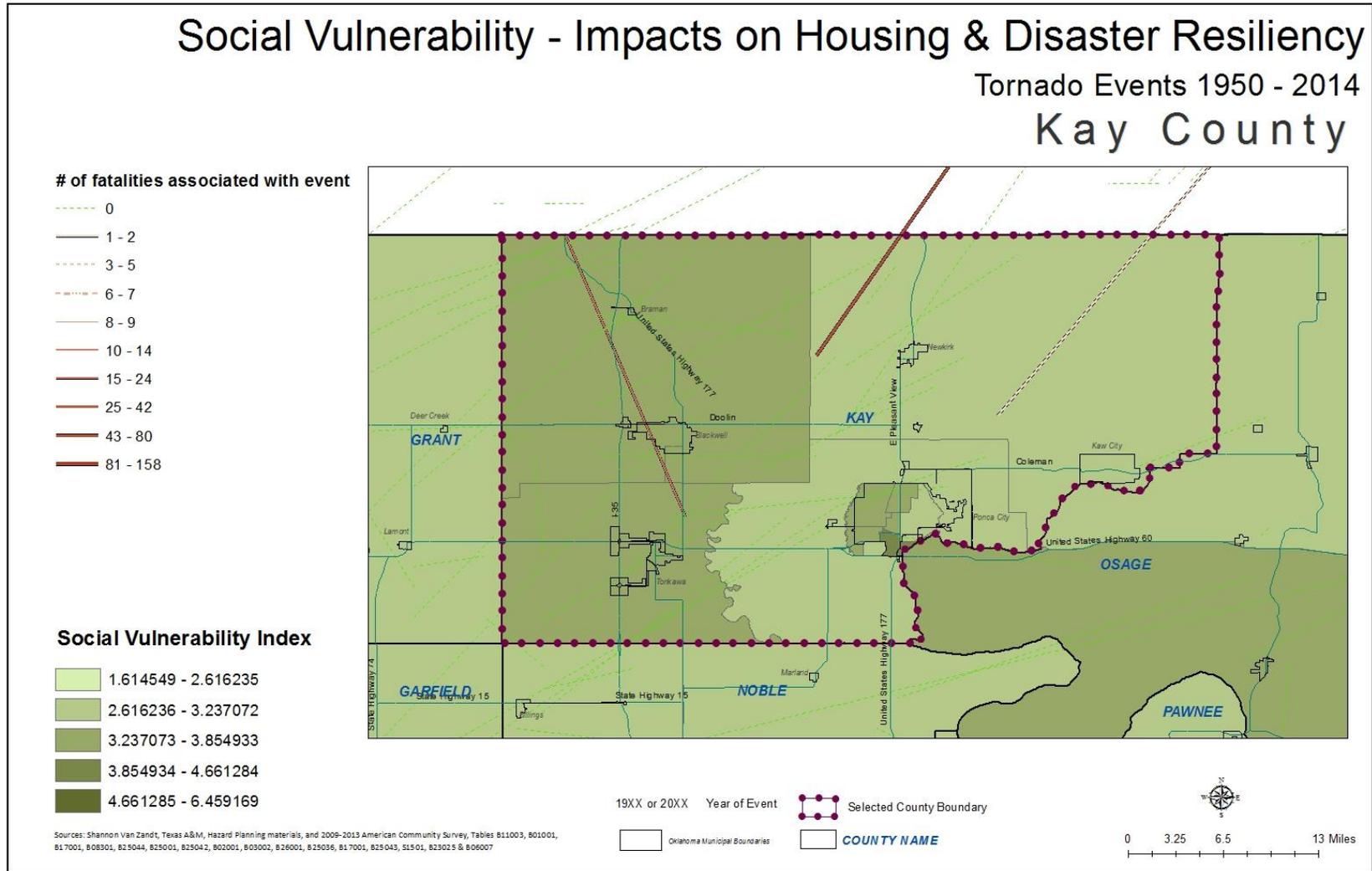
NOAA data shows the following historic data on disaster events for the county:

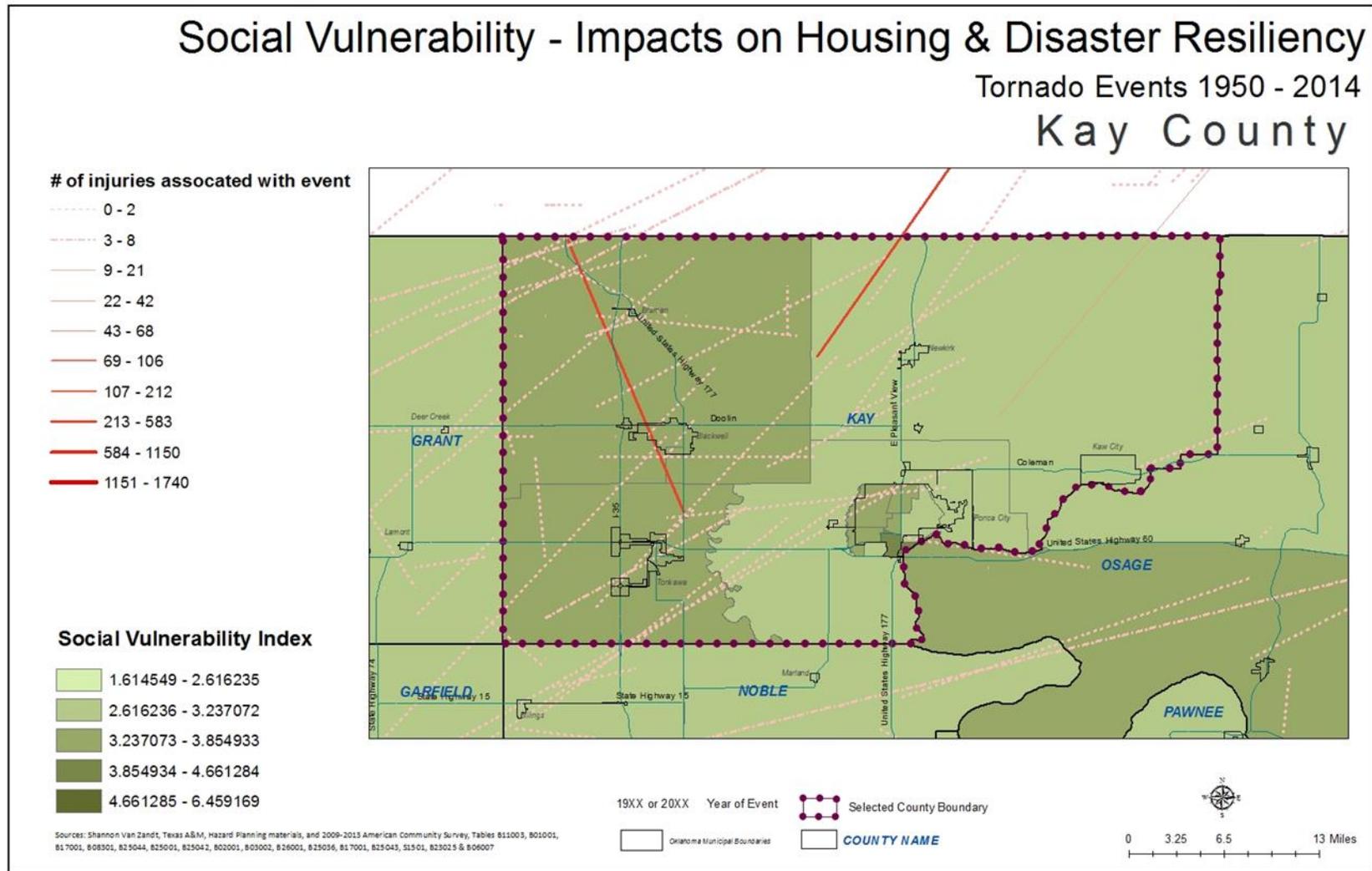
Kay County – Tornados

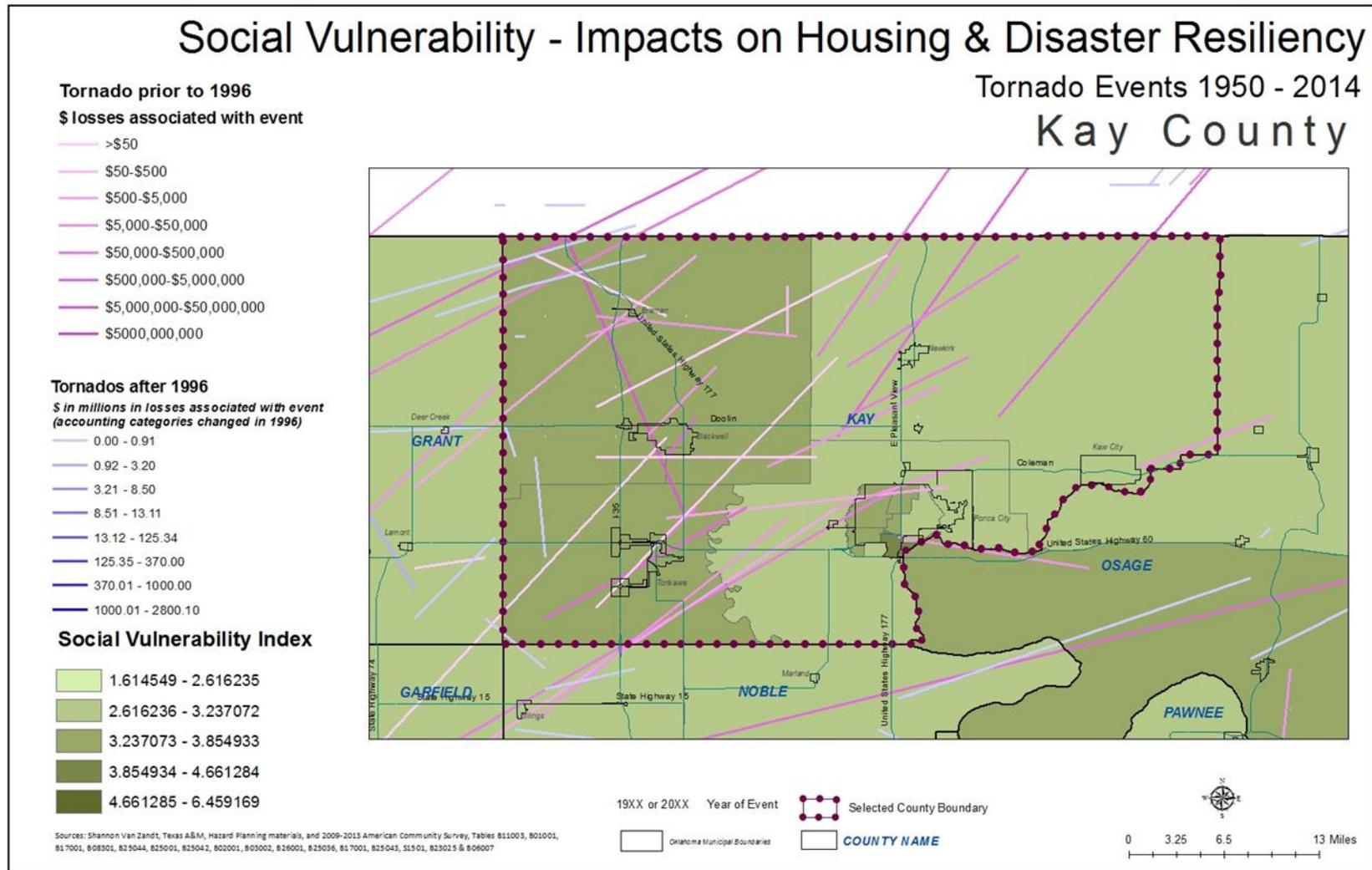
Historic data on tornados between 1950-2014 there are 92 tornados documented. There were 604 injuries that occurred connected to these tornados, with 553 of those injuries happening in the 1955 tornado. There were 102 fatalities connected to tornadoes during this time period, 100 of which occurred in the 1955 tornado. Property losses between 1950-1996 ranged from \$5,720,156.00 to



\$57,201,800.00. (The accounting methods used for losses changed in 1996.) The losses estimated between 1996-2014 was \$5,120,000.00







**C.2.1.2; C.2.1.6; C.2.1.7;C.2.1.8 Shelters from Disaster Event**

The Ponca City HMP notes as part of the development trends that many permits for storm shelters are being filed (p.121) and that the development is somewhat concentrated to the northeast side of the city.

The City of Ponca City does not maintain public storm shelters. At this time there are no buildings that meet the construction specifications established by Texas Tech University's Wind Science and Engineering Department, and adopted by FEMA. (Ponca City website)

Ponca City maintains an online shelter registry: <http://www.myponcacity.com/shelter/index.php>

**C.2.1.3 Public Policy and Governance to Build Disaster Resiliency****C.2.1.4 Local Emergency Response Agency Structure**

If no Hazard Mitigation Plan/Disaster Recovery Plan / Action Plan/Disaster Resilience Plan/Emergency Management Plan are prepared, updated, and monitored the recommendation for this county is to apply for funding and complete a Hazard Mitigation Plan with FEMA.

The structure for response and to address any perceived vulnerabilities in the county is included in the Hazard Mitigation Plan. [Cite section in the plan that are relevant]

**C.2.1.5 Threat & Hazard Warning Systems**

Ponca City maintains radio-controlled outdoor warning sirens, and has access to a cable override system for notifications. Ponca City installed 4 new sirens in 2007.

**Social Vulnerability**

Based on the research work done by the Texas A&M University Hazard Reduction and Recovery Center, an added component is being included in this section. Social vulnerability can place households at a further disadvantage during and after a disaster. This analysis is assessing for the county the levels of social vulnerability based on demographic indicators to highlight ‘hotspots’ or counties that have higher social vulnerability. That combined with Hazard Mitigation Plans – or lack thereof – can highlight places where additional work is needed to reduce impacts on households.

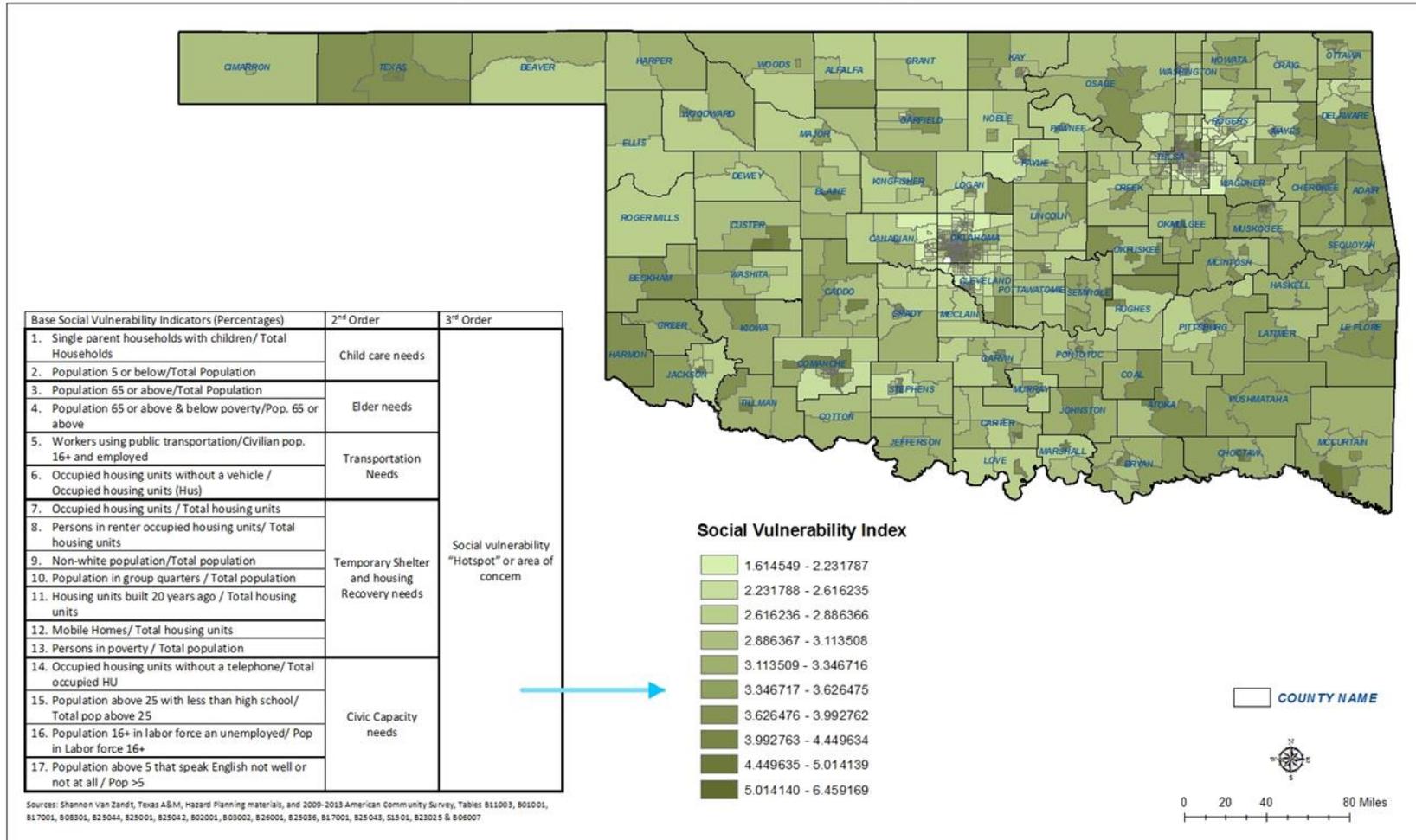
<b>Social Vulnerability Analysis - Kay County</b>			
<b>Base Social Vulnerability Indicators (%)</b>		<b>2nd Order</b>	<b>3rd Order</b>
1.) Single Parent Households	15.98%	0.231	<b>3.351 Social Vulnerability 'Hotspot' or Area of Concern</b>
2.) Population Under 5	7.10%	(Child Care Needs)	
3.) Population 65 or Above	17.22%	0.252	
4.) Population 65 or Above & Below Poverty Rate	7.99%	(Elder Needs)	
5.) Workers Using Public Transportation	0.36%	0.061	
6.) Occupied Housing Units w/o Vehicle	5.74%	(Transportation Needs)	
7.) Housing Unit Occupancy Rate	84.93%	2.538 (Temporary Shelter and Housing Recovery Needs)	
8.) Rental Occupancy Rate	30.07%		
9.) Non-White Population	23.06%		
10.) Population in Group Quarters	2.16%		
11.) Housing Units Built Prior to 1990	89.39%		
12.) Mobile Homes, RVs, Vans, etc.	6.05%		
13.) Poverty Rate	18.17%		
14.) Housing Units Lacking Telephones	2.96%	0.269 (Civic Capacity Needs)	
15.) Age 25+ With Less Than High School Diploma	13.70%		
16.) Unemployment Rate	7.94%		
17.) Age 5+ Which Cannot Speak English Well or Not At All	2.30%		

Sources: Shannon Van Zandt, Texas A&M, Hazard Planning materials, and 2009-2013 American Community Survey, Tables B11003, B01001, B17001, B08301, B25044, B25001, B25042, B02001, B03002, B26001, B25036, B17001, B25043, S1501, B23025 & B06007

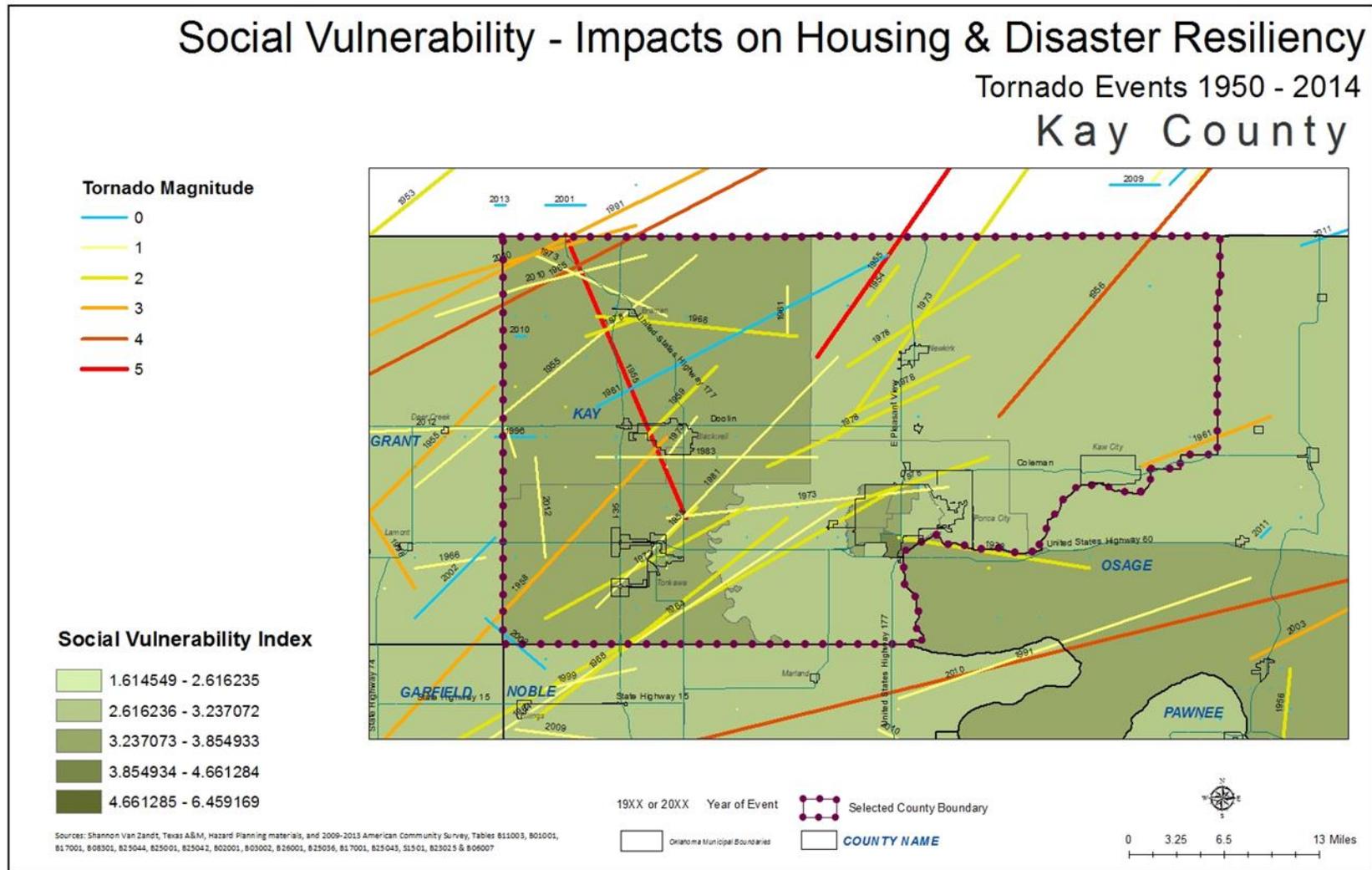




# Social Vulnerability - Impacts on Housing & Disaster Resiliency



Sources: Shannon Van Zandt, Texas A&M, Hazard Planning materials, and 2009-2013 American Community Survey, Tables B11003, B01001, B17001, B08301, B25044, B25001, B25042, B02001, B03002, B26001, B25036, B17001, B25043, S1501, B23025 & B06007



Social vulnerability combined with the devastating impacts of a natural or man-made disaster can compound a household's ability to recover and in fact can place those individuals at an even greater gap or disadvantage prior to the event (Shannon Van Zandt, Texas A&M, Hazard Planning).

This county falls about average per this index for social vulnerability for the county per this index for social vulnerability when comparing as a county to other counties in the state. The western census tract of the county (Braman, Blackwell, and Tonkawa) has increased social vulnerability factors and as noted on the tornado maps a history of tornados in this area.

Recommendations for this county:

- Continue to update and maintain the county HMP and include attention to areas within the county that in addition to physical vulnerability may have compounding social vulnerability factors.
- Efforts to strengthen building codes related to tornadoes and natural disasters should be considered.
- Planning for shelters from disaster events for multifamily, HUD and LIHTC units, in addition to all housing in the community should be incorporated with any effort to increase housing.