

Special Topics

Delaware 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 two key communities within the county including the cities of Grove and Jay.

Grove had a population of 6,623 in 2010 Census and, while it does not appear to have a comprehensive plan available, the Delaware County Hazard Mitigation Plan (HMP) denotes that Grove practices comprehensive planning. Jay had a population of 2,248 in the 2010 Census and also does not have a comprehensive plan available. Several smaller unincorporated towns exist within the county that are too small to warrant creation of a comprehensive plan. Overall, the county population was 41,487 in the 2010 Census. Of these smaller communities, the towns of Bernice, Colcord, Kansas, Oaks, West Siloam Springs were involved in gathering information for the county to prepare the Delaware County Hazard Mitigation Plan with assistance from the Grand Gateway Economic Development Association (GGEDA). GGEDA is a cooperative created by local governments in seven counties in Northeastern Oklahoma. The Delaware County HMP will cover the rest of the towns in the county as they do not have their own HMPs.

The other key plan for a city to manage, mitigate and plan for recovery related to disasters is a **Hazard Mitigation Plan (HMP)**. Often in 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. The Delaware County Hazard Mitigation Plan was adopted July 2nd, 2012 and is intended to be reviewed every two years and updated every five years. The City of Grove has its own HMP. The Delaware County HMP will cover the rest of the towns in

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.

For this county the Hazard Mitigation Plan contains the following historic data on disasters and damages in the county:

1. Mitigation Strategies – Goals and Objectives	
Goal 1	To increase countywide ability to communicate and respond quickly and efficiently to disasters.
Objective	By providing interconnected mobile telecommunications to all areas of Delaware County through a collaborative countywide effort.

Goal 2	To enhance public awareness and understanding of hazard mitigation.
Objective	By seeking methods to provide funding for trainers and materials to implement ongoing community and public education and hazards awareness programs.
Goal 3	To reduce the impact of repetitive flooding in flood-prone areas of Delaware County
Objective	By encouraging development and implementation of programs to purchase, remove, and inhibit development and construction in flood-prone areas, and by addressing at-risk transportation routes.
Goal 4	To develop and educate responders and health care providers regarding mitigation measures for specific hazards.
Objective	By providing training opportunities to these personnel.
Goal 5	To enhance pre-disaster and prevention activities.
Objective	By providing training and other educational opportunities for the public.

1.	Lead Department	Mitigation Measures	Priority
A	Mayors of each community	Purchase and install additional outdoor warning devices as some current devices are not reaching all areas of the communities due to growth that has caused expansion beyond the capabilities of the original devices.	HIGH
B	Emergency Management Director and Delaware County	Identify a site for, and install a new communications tower to allow dependable communications between the Emergency Operations Center and the communities within the county.	HIGH
C	Emergency Management Director and Red Cross	Prepare a public education and awareness campaign. Distribute awareness and safety literature addressing all hazards to citizens as inserts in utility bills.	HIGH
D	County Commissioners	Apply rip/wrap to roads at several locations throughout the county to prevent deterioration of the roadbed due to erosion caused by heavy rains.	
E	County Flood Plain Coordinator and Emergency Management Director	Host educational workshops regarding flood insurance and the NFIP for the citizens of Delaware County.	LOW
F	Emergency Management Director and County Commissioners	Develop and distribute digital mapping of appropriate areas which impact disaster mitigation and disaster recovery.	HIGH

G	Delaware County Emergency Management Director	Update County-wide Mutual Aid Agreements.	
H	School District Superintendents	Construct Safe Rooms in County Schools.	HIGH
I	Oklahoma Forestry Service	Educate the public regarding ways to mitigate damages from drought and wildfire, i.e., prescribed burning to reduce fuel.	
J	Oklahoma Forestry Service	Purchase equipment, personnel, and training to combat wildfires in the county.	
K	Individual Fire Chiefs, County Commissioners	Acquire equipment, protective clothing, and training to contain any hazardous materials spill that is likely to occur.	
L	Mayors of Colcord, Kansas, Oaks, West Siloam Springs	Encourage the Towns of Colcord, Kansas, Oaks, and West Siloam Springs to enroll into the National Flood Insurance Program and meet mitigation criteria for enrollment.	
M	County Commissioners	Apply for grants through the Oklahoma Department of Environmental Quality and the Solid Waste Institute for funds to remove tires that are collection and breeding avenues for mosquito and other varmints.	LOW
N	County Commissioners	Construct a storm safe structure to house the County Emergency Operations Center.	

Dam Failure Risk

There are 7 dams in Delaware County. None are designated as “high hazard” by the Oklahoma Water Resources Board meaning there are no occupied dwellings immediately downstream. Of the 7 dams, 3 are mentioned in the HMP. The Grand River Dam Authority (GRDA) operates two dams on the Grand River forming the Grand Lake of the Cherokees: the Pensacola Dam and the Disney Dam. The Robert S. Kerr Dam forms Lake Hudson. GRDA has a security, warning, and evacuation plan in place. In case of flooding or damage incident occurrence, GRDA’s emergency plan includes a warning and county-wide evacuation protocol. There is no history of failure of the dams in Delaware County.

Drought

No drought events were reported in the **Delaware County, Oklahoma** HMP for the reporting period of **01/01/1950 to 03/31/2005**.

Appendix A identified the following drought events:

- 1953-54 – Drought
- 1996 – Drought caused county-wide, pasture and crop damage.
- 1998 – Drought and army worms cause excessive crop damage.
- Jan/Feb 1996 – Drought/Wildfire
- Fall 2000 – Drought/Wildfire

- 2001 – Drought resulted in a 60 percent reduction in yield of hay, pastures and crops for a total of \$10 million in damages.

Temperature Extremes – Extreme Heat

No temperature extremes were reported in **Delaware County, Oklahoma** HMP for the reporting period of **01/01/1950** to **03/31/2005**.

Flood

There are two types of floods, both which can occur in Delaware County. First, flash floods, which result from localized heavy rain falls. Second, riverine floods occur after extended periods of rain over several days or weeks. Riverine floods generally can be forecast in advance, and proper precautions taken to save lives and mitigate some though certainly not all, property losses.

Per Appendix A, a flood in the **Spring of 2000** resulted from 17 inches of rain that washed out roads and bridges.

Delaware County has also experienced flooding following an EF-3 tornado and severe thunderstorm on May 22, 2011. Waters reached flood stage by May 23, 2011 (NOAA).

Delaware County, Oklahoma experienced 20 floods from **05/09/1993** to **07/03/2004** that resulted in \$85,000 in property damage from flash floods. No injuries or deaths were reported.

Hailstorm

Due to Oklahoma's rapidly changing climate, large-scale hailstorms are especially prevalent. All parts of Delaware County are equally vulnerable to hailstorms. **31 HAIL** event(s) were reported in **Delaware County, Oklahoma** between **05/08/1961** and **07/08/2004** with hail size of at least **1.5 inch(es)** and **168 HAIL** events between **01/01/1950** and **03/31/2005** with hail size of at least **0.5 inches**.

Since most hail losses are insured or go unreported, no loss figures are estimated for those events. In Delaware County, a total of \$24,000 in property damage was reported from hail damage. Appendix A identified a hail storm in 1993 that damaged cars and roofs.

Hazardous Materials Events

Delaware County's location makes it a transportation route. The only hazardous materials events to date involved tractor trailer accident spills and one gasoline spill from a boat. Spills can be potentially serious hazards in that they could result in contamination of one of the lakes in the area which are used for water supply for most of the county.

Lightning

Delaware County, Oklahoma reported **4 lightning** events from **12/03/1993** to **10/06/2002** that resulted in **1 death** and \$150,000 in property damage.

Tornado & Wind

Tornadoes and high winds are combined in profile because of similarities in potential damage and mitigation measures. All of Delaware County is equally susceptible to tornado and high wind damages.

Due to the County wide probability every structure has equal probability to be struck by a tornado or high wind.

10 Significant TORNADO(s) (F2 or intensity of greater) were reported in **Delaware County, Oklahoma** between **03/24/1954** and **05/08/1989**. No deaths, 3 injuries were reported over that extended time period. No deaths or injuries have occurred from Tornados since 1989.

Per Appendix A, the following tornadoes occurred in Delaware County, Oklahoma:

- 1943 – Tornado in the towns of Bernice and Grove with numerous injuries and deaths.
- 1971 – Tornado in the towns of Bernice and Grove resulted in **3 deaths**.
- 1984 – Tornado in Delaware County resulted in the loss of homes.
- Spring 1992 – Tornado in Delaware County resulted in the loss of many homes.
- 1993 – Tornado

A search of the NOAA website identified additional tornadoes with records going back to 1904 that indicated 16 tornadoes resulting in 12 deaths and 256 injuries over a 107-year history resulting in an average of 0.15 tornadoes per year. NOAA also identified an additional EF-3 tornado occurred in Delaware County on May 22, 2011.

Thunderstorms and high winds accounted for one additional injury and a total of \$1.157 million in property damage.

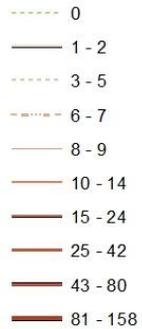
For all the county profiles for this study we are providing maps of the historic tornados mapped over the developed social vulnerability index. This is in addition to the data prepared and summarized from the HMP in this section.

Social Vulnerability - Impacts on Housing & Disaster Resiliency

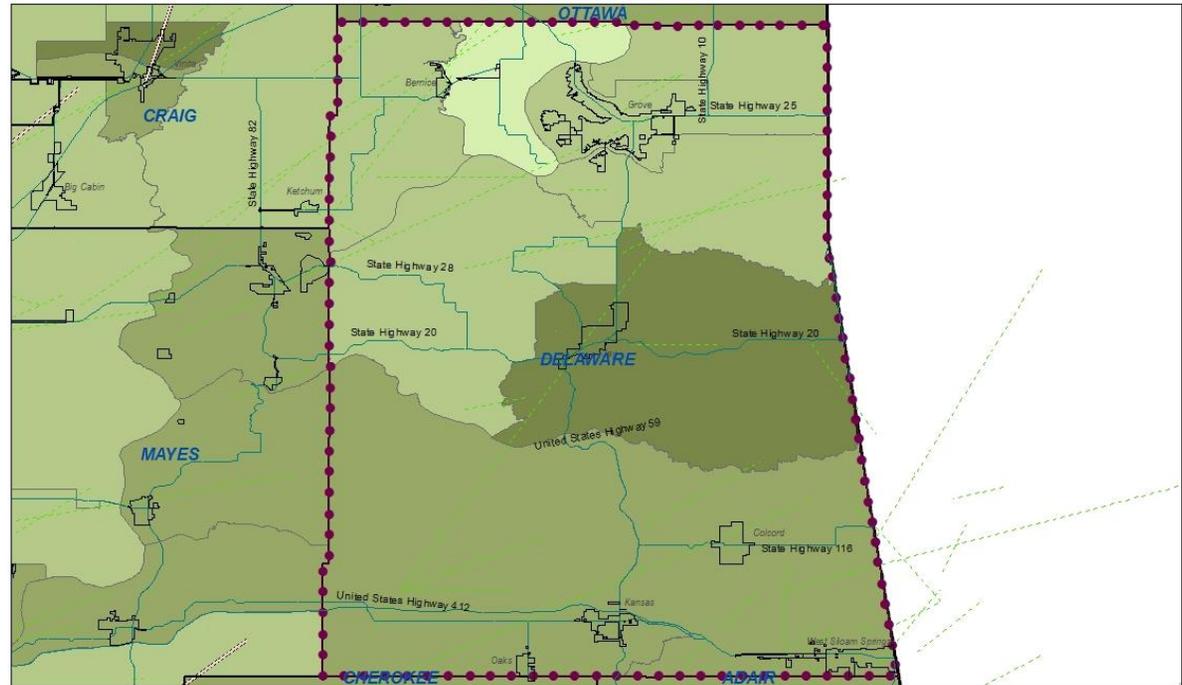
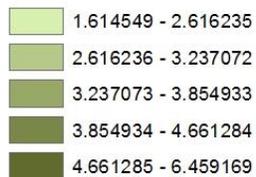
Tornado Events 1950 - 2014

Delaware County

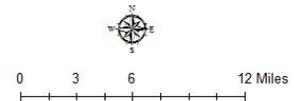
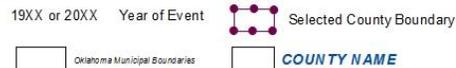
of fatalities associated with event

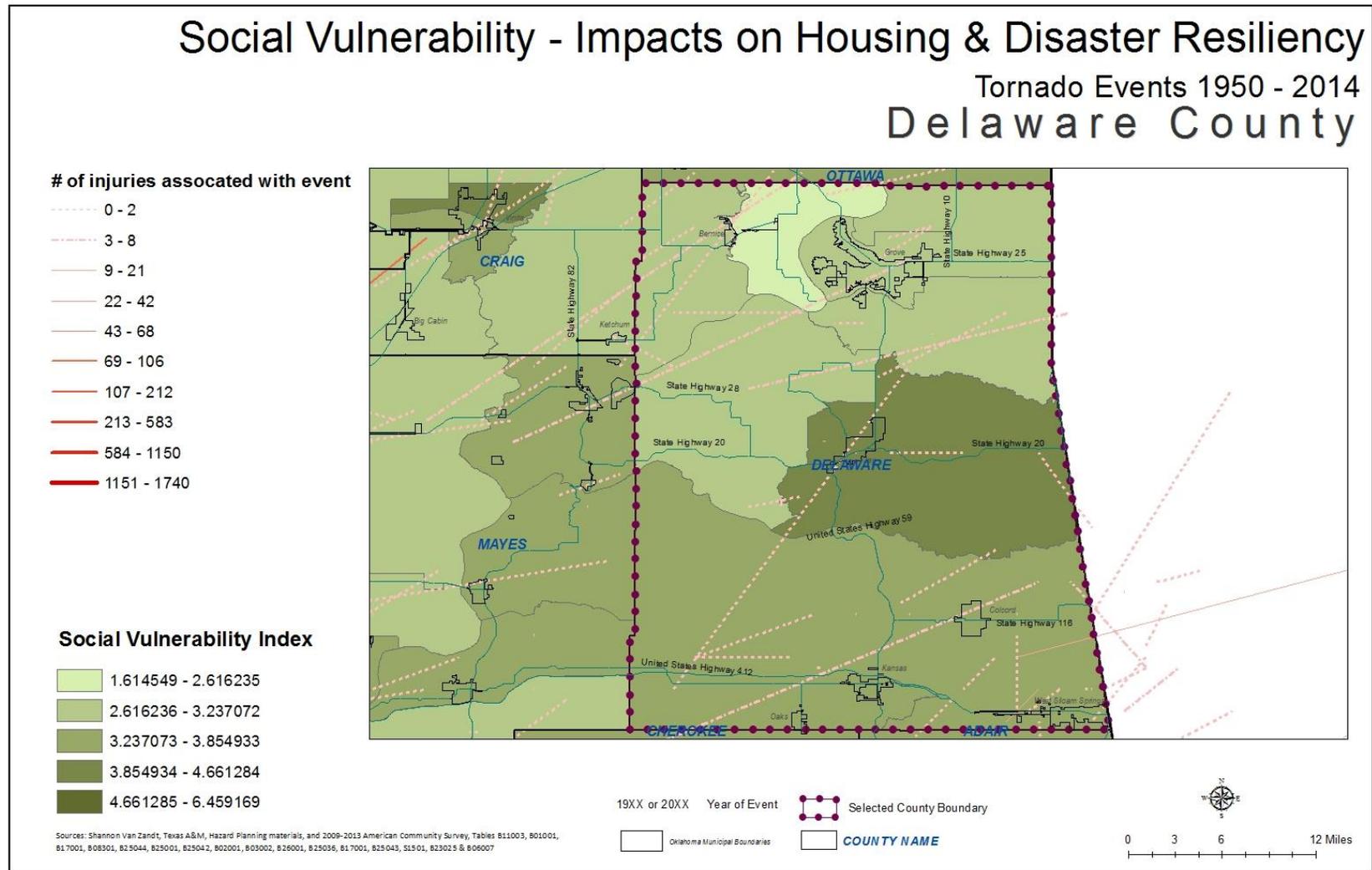


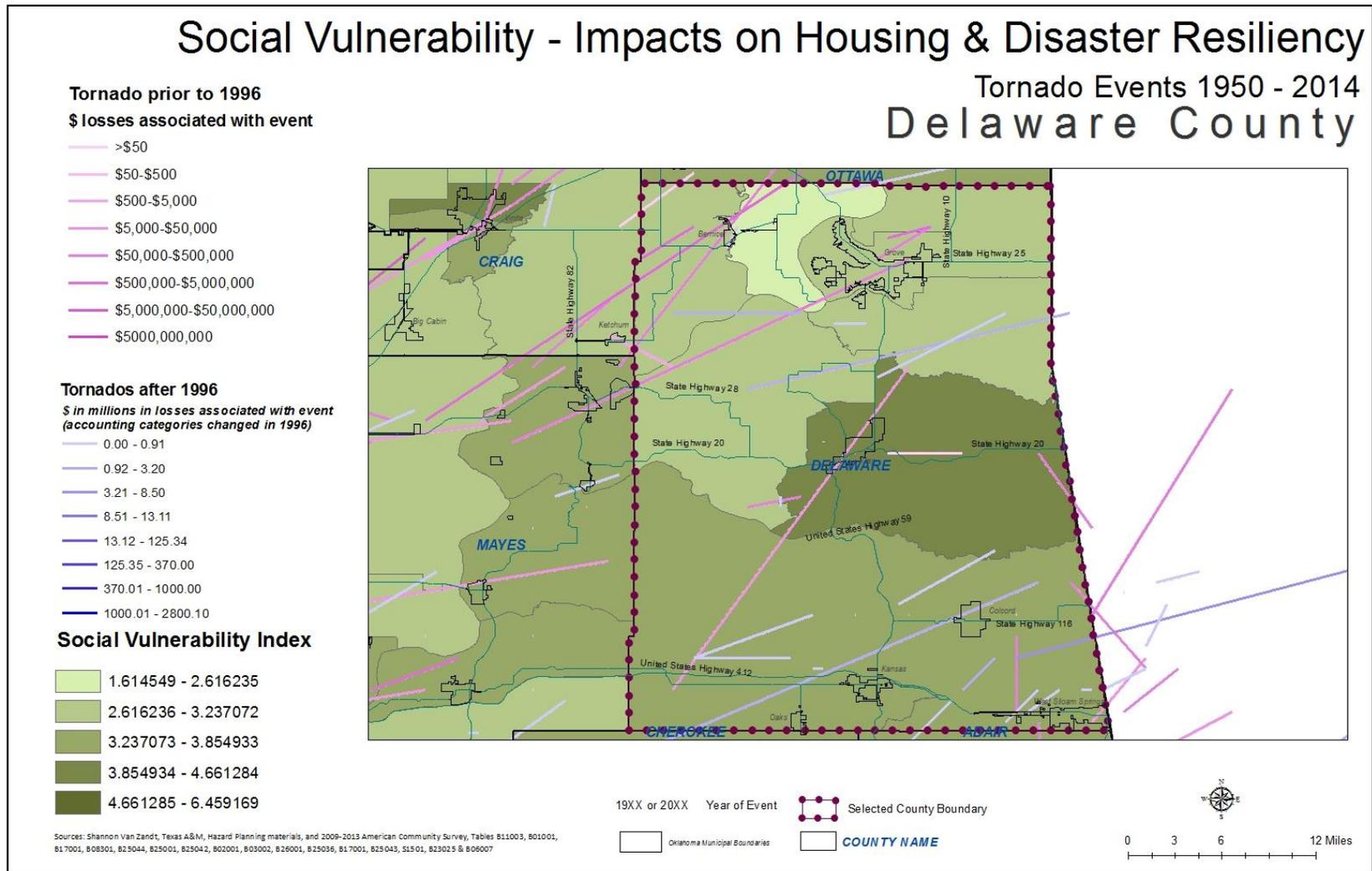
Social Vulnerability Index



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, B23023 & B06007







Water Outage

Appendix A of the **Delaware County, Oklahoma** HMP identified a water outage for the town of Colcord that lasted for 10 days during 2001.

Wild and Forest Fires

No wild or forest fires were reported in the **Delaware County, Oklahoma** HMP during the reporting period of **01/01/1950** to **03/31/2005**.

Appendix A identified a wildfire in November 1989 that resulted in loss of property, crops and forest.

Winter Storms

Appendix A of the **Delaware County, Oklahoma** HMP identified the following:

- A winter ice/snow storm in March 1989 with heavy snowfall in which 100+ chicken houses were lost and a total of \$1 million in damages.
- A winter snowstorm in 1992 caused the loss of truss structures.
- A winter ice/snow storm on December 25, 2000 caused county-wide destruction including damage to chicken houses and to wildlife.
- A winter ice storm in 2001 caused damage to roads and power lines in excess of \$10 million.

Per Appendix B of the HMP, 12 heavy snow events and 5 ice storms from **11/25/1993** to **12/09/1993** that resulted in \$22,000 in property damage.

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

The HMP for Delaware County states that there is currently only one public storm shelter in Delaware County located in the community of Bernice. The lack of community shelters is in part due to age and hazard risk of the older facilities that were previously used as shelters. There are currently no safe room facilities at any of the Delaware County school buildings. Each school has a disaster safety and evacuation plan in effect. Information on FEMA's Safe Room Grants has been disseminated to Delaware County school superintendents. These important safety items currently fall short of the desired county goal. There is no specific discussion about direct measures to provide safe rooms or shelters for lower income, multifamily, or HUD units.

The HMP states that proper sheltering is encouraged and recommends developing informational printed material for educational programs to alert citizens to the appropriate procedures for sheltering in the community storm shelter. Safe rooms and underground tornado shelters are encouraged, yet the plan states that in-home sheltering in the area has been examined by the Delaware County Hazardous Mitigation Plan Committee (DCHMPC) and found to be inadequate. Citizen interest is on the rise. The DCHMPC recognizes that having information on the locations of in-home shelters would be extremely useful to Emergency Response Personnel and of special importance in the rural areas of the county.

Mitigation Project H of the HMP calls for encouraging the inclusion of safe rooms in any future construction of school buildings. The school district superintendents are to take the lead.

C.2.1.3 Public Policy and Governance to Build Disaster Resiliency

The State of Oklahoma has not granted to counties broad regulatory powers to enact and enforce building codes, building inspections, subdivision regulations and growth management initiatives. Delaware County does have power to regulate all platting of land, all construction of dwelling units or commercial or industrial structures and all future development within a delineated floodplain area, except land held in trust by the United States for Native Americans.

C.2.1.4 Local Emergency Response Agency Structure

The Hazard Mitigation Plan prioritized mitigation actions and addressed how the actions will be implemented and administered, including the responsible department, existing and potential resources and timeframe to complete each action.

C.2.1.5 Threat & Hazard Warning Systems

Within the mitigation measures of the HMP, the Mayors of each of the incorporated communities are tasked with ensuring that additional outdoor warning devices are purchased and installed (Mitigation Project A). The Emergency Management Director will ensure that an additional communications tower is installed as funding is available (Mitigation Project B).

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.

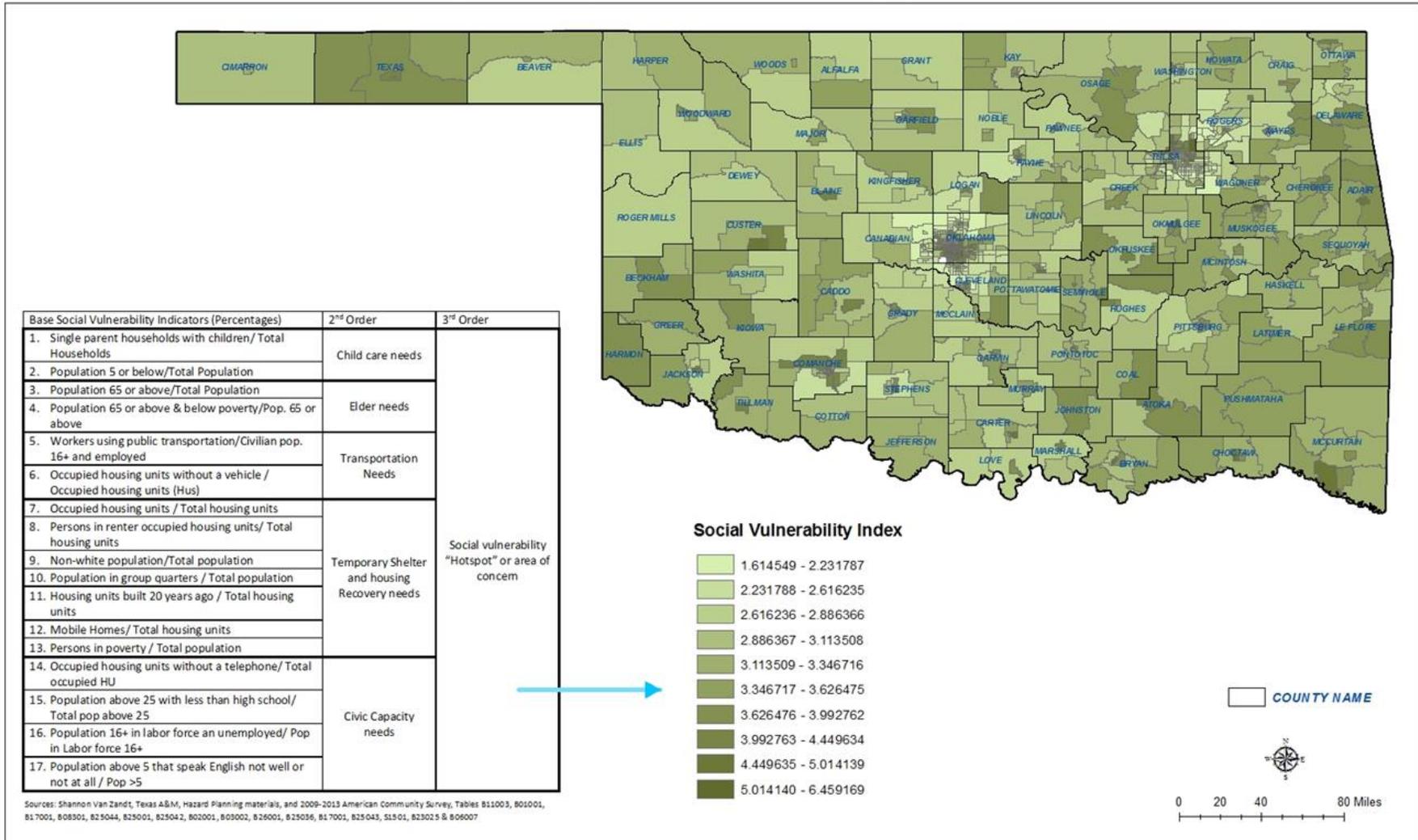
Social Vulnerability Analysis - Delaware County

Base Social Vulnerability Indicators (%)		2nd Order	3rd Order
1.) Single Parent Households	10.35%	0.156	3.11 Social Vulnerability 'Hotspot' or Area of Concern
2.) Population Under 5	5.21%	(Child Care Needs)	
3.) Population 65 or Above	21.13%	0.304	
4.) Population 65 or Above & Below Poverty Rate	9.28%	(Elder Needs)	
5.) Workers Using Public Transportation	0.05%	0.039	
6.) Occupied Housing Units w/o Vehicle	3.88%	(Transportation Needs)	
7.) Housing Unit Occupancy Rate	67.02%	2.333 (Temporary Shelter and Housing Recovery Needs)	
8.) Rental Occupancy Rate	22.23%		
9.) Non-White Population	34.41%		
10.) Population in Group Quarters	1.12%		
11.) Housing Units Built Prior to 1990	61.15%		
12.) Mobile Homes, RVs, Vans, etc.	26.19%		
13.) Poverty Rate	21.23%		
14.) Housing Units Lacking Telephones	1.92%	0.278 (Civic Capacity Needs)	
15.) Age 25+ With Less Than High School Diploma	15.40%		
16.) Unemployment Rate	8.95%		
17.) Age 5+ Which Cannot Speak English Well or Not At All	1.50%		

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



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Social Vulnerability - Impacts on Housing & Disaster Resiliency

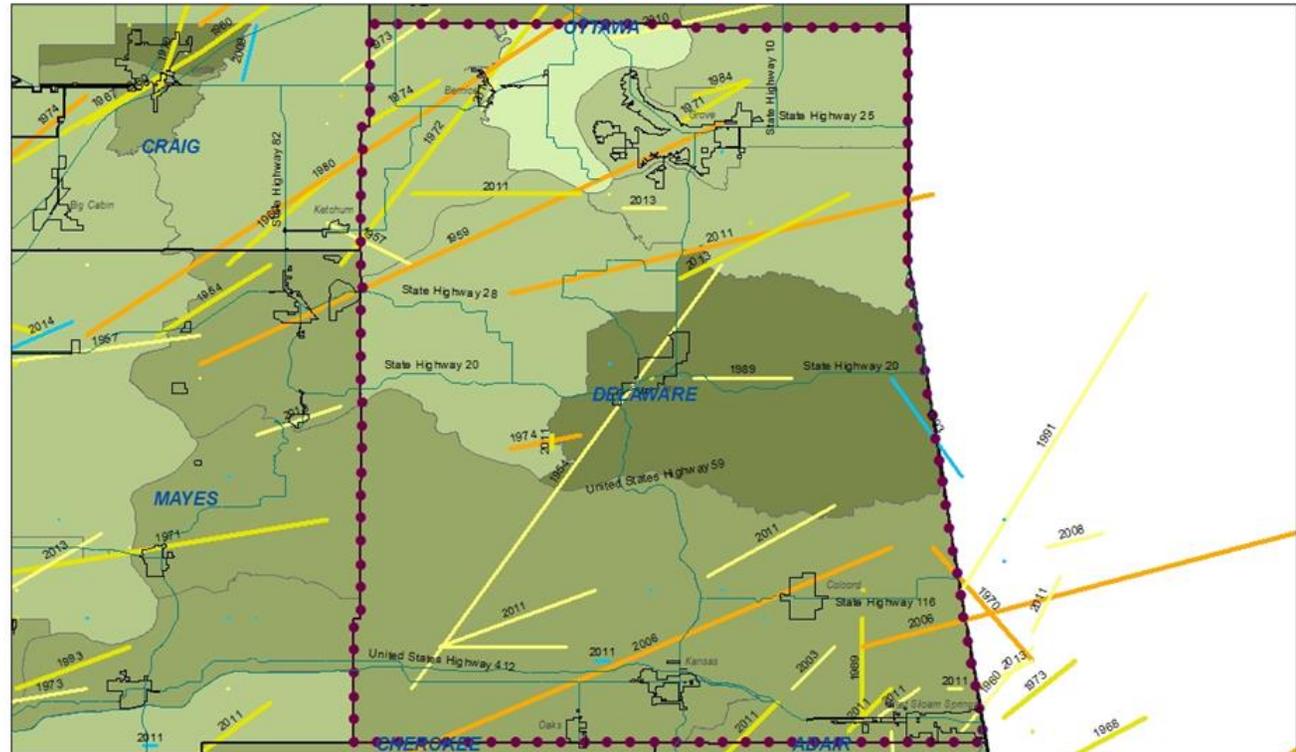
Tornado Events 1950 - 2014

Delaware County

Tornado Magnitude

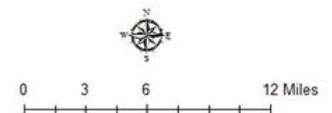


Social Vulnerability Index



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19XX or 20XX Year of Event
 Selected County Boundary
 Oklahoma Municipal Boundaries
 COUNTY NAME



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 below the state score per this index for social vulnerability when comparing as a county to other counties in the state (low score means less social vulnerability issues). However, the Town of Delaware and the area to the east of the town, fall in an elevated socially vulnerable census tract. This may mean people living in this area may be more negatively impacted by a disaster event given their current needs.

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.
- As recommended in the FEMA approval document, provide potential dollars loss estimates to vulnerable structures for each hazard profiled except flood and earthquake (Grove HMP).
- Provide methodology for all other hazards profiled (Grove HMP).
- Provide general overview of land uses and more detailed information of future land use and development trends (Grove HMP).