Special Topics

Caddo 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 14 key cities within the county (Anadarko, Fort Cobb, Binger, Carnegie, Hinton, Apache, Gracemont, Cement, Lookeba, Cyril, Eakly, Hydro, Bridgeport, Albert).

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. None of the cities in Caddo County have their own comprehensive plans that have been adopted.

Based on the review of the existing and available comprehensive plans for the area, it is recommended that any future comprehensive planning work done include coordination and goals to address disaster resiliency.

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.

> Caddo County does not have a current Hazard Mitigation Plan. The last HMP was adopted in 2003 and has since expired and been archived.

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

The 2003 Hazard Mitigation Plan for the County stated four goals:

1. Protection from loss of life and personal injury
2. Protection of critical facilities and infrastructure
3. Protection of personal property and reduction of economic injury due to hazards
4. Minimize the costs of disaster response

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

Dam Failure Risks

> **Historical Context:** “104 dams exist in Caddo County, of which 3 are high-hazard dams and 3 are significant hazard dams.” “The greatest impact of the failure of Fort Cobb dam would be the loss of the public water supply storage space.” No estimate of potential damage provided.

DAM NAME	HAZARD	OWNER	RIVER
CHICKASHA LAKE	HIGH	CITY OF CHICKASHA	SPRING CREEK
FORT COBB	HIGH	BUREAU OF RECLAMATION	COBB CREEK, POND CREEK
SOUTHWESTERN POWER STATION NO.3	HIGH	PUBLIC SERVICE CO OF OKLA	LEAPER CR
NRCS-FORT COBB LATERALS SITE-101	SIGNIFICANT	SOUTH CADDO CONS DIST	TR-WASHITA RIVER
NRCS-SUGAR CREEK SITE-025	SIGNIFICANT	SOUTH CADDO CONS DIST	KOHNOOSKY CREEK
NRCS-SUGAR CREEK SITE-044	SIGNIFICANT	SOUTH CADDO CONS DIST	LOST CR

Mitigation Strategy / Recommendations from HMP: Nothing suggested

Drought

Historical Context: "Drought will not cause significant damage to buildings, infrastructure and critical facilities."

Mitigation Strategy / Recommendations from HMP: Use historic low rainfall in water supply planning. Enforce water rationing when necessary and consider cloud seeding.

Earthquake

Historical Context: "Earthquakes have not caused significant damage in Caddo County. Oklahoma Geological Survey's Oklahoma Seismograph Network located 138 earthquakes in Caddo County from 1977 through 2002. The strongest earthquake in Caddo County since 1977 was M 2.7." "Earthquakes of the magnitude and intensity expected (M5) will not cause significant damage to buildings, infrastructure and critical facilities."

Earthquakes events in Caddo County since 1977			
Date	Mag	deg (N)	Dig (w)
MAR 23, 1979	1.8	35.3610	-98.1080
SEP 22, 1982	2.2	34.8940	-98.4290
MAY 16, 1990	1.6	35.3250	-98.4640
OCT 04, 1992	2.5	35.1990	-98.4400
NOV 22, 1993	1.4	35.2840	-98.5380
FEB 05, 1994	1.4	34.9460	-98.1550
DEC 13, 1994	2.1	34.8680	-98.4710
APR 05, 1995	1.9	35.0500	-98.2330
SEP 26, 1996	1.2	34.9280	-98.1750
JUN 18, 2000	2.2	34.9170	-98.1862
SEP 22, 2001	2.2	35.2264	-98.2151

Mitigation Strategy / Recommendations from HMP: Inspect roads, bridges, buildings and dams after an earthquake event.

Flood

Historical Context: "Thirteen flood events were recorded in Caddo County since 1992" of which 12 were flash floods. The HMP defines two types of flooding: general rain flooding and flash flooding. Caddo County "…had 2 reported losses and received payments totaling $47,328 during the years 1978 through 2001." The County acquired nine homes southwest of Apache that were subject to frequent flooding and demolished them as part of a Hazard Mitigation Grant Program project. None of the County's critical facilities are within the 100-year floodplain.

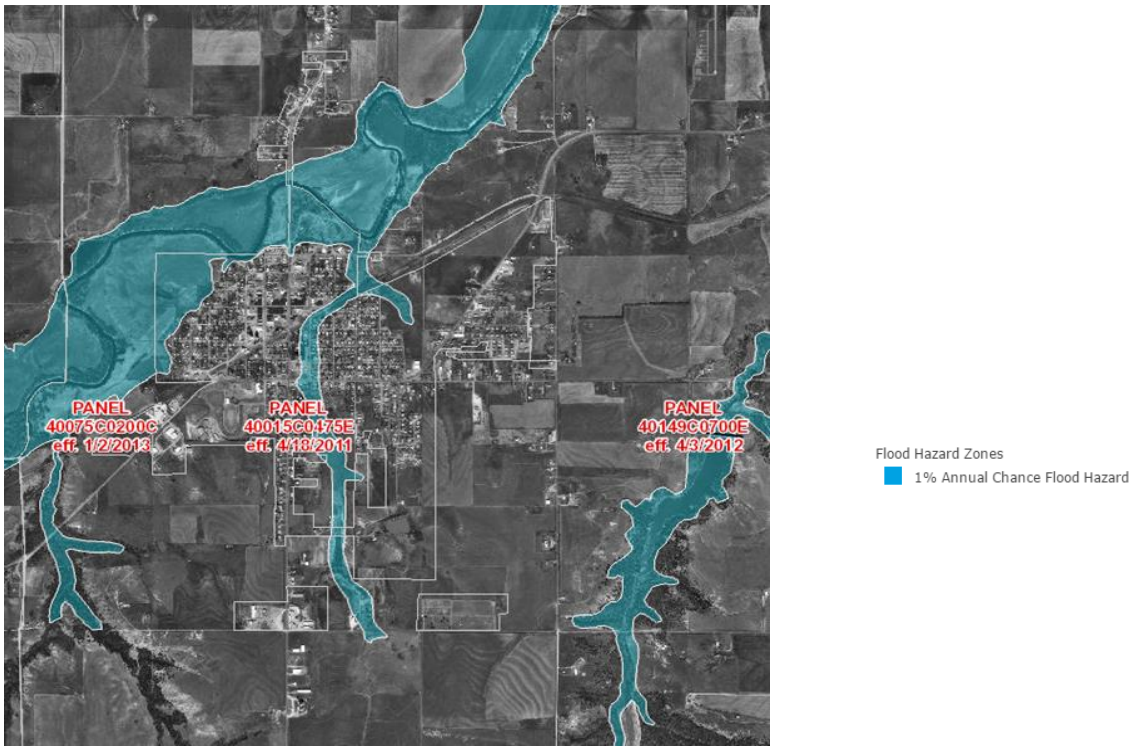
Flood Insurance Policy Statistics as of 12/31/2002		
Community Name	Policies In-force	Insurance In-force
Caddo County	11	$583,000
Anadarko	7	$479,200
Apache	49	$1,171,800
Carnegie	3	$89,000
Fort Cobb	2	$145,400
Hydro	1	$250,000
County Totals	73	$2,718,400

Vulnerability to Flooding				
Structures	Number	Estimated Value	Damage rate	Potential Loss
Housing units	26	$ 1.59 million	50%	$.079 million
Other buildings	0	$0		$0
Critical facilities	0	$0		$0
Infrastructure	0	Not estimated		Not estimated

Date	Location	General Description
6/23/1948 – 6/24/1948	Hydro	20in of rain in a few hours led to 11 drownings on Hwy66 near Hydro

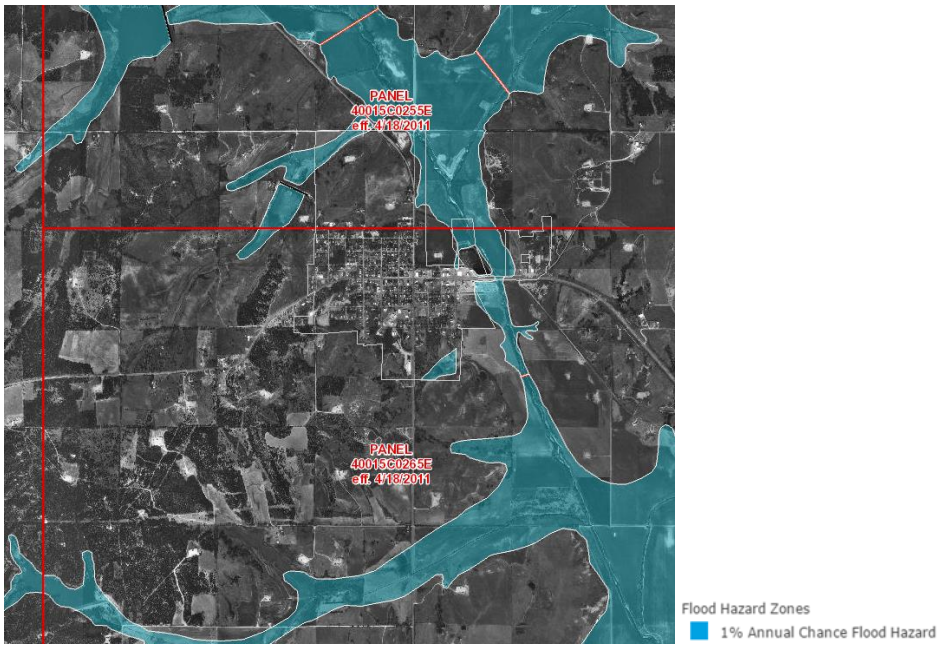
Mitigation Strategy / Recommendations from HMP: Public warnings and goals to raise roads subject to flooding. Acquire and demolish or relocate flood prone structures and advise builder of flood hazards and restrict or require elevation of new structures being built in flood zones.

Carnegie



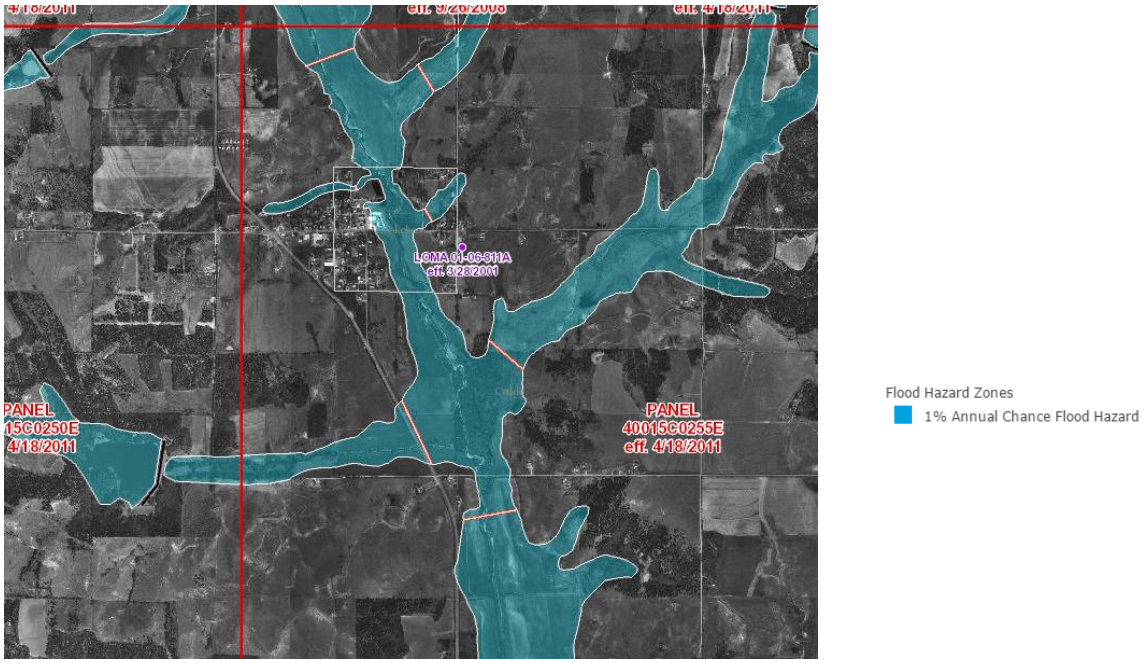
FEMA's National Flood Hazard Layer http://fema.maps.arcgis.com/

Binger



FEMA's National Flood Hazard Layer http://fema.maps.arcgis.com/

Lookeba



FEMA's National Flood Hazard Layer http://fema.maps.arcgis.com/

Hail

Historical Context: "National Climatic Data Center statistics record 1.5 inch or larger hail events in the Caddo County on 50 days during the 20 year period ending June 30, 2003." No estimate of potential damage provided.

Mitigation Strategy / Recommendations from HMP: Encourage stronger roofs in critical facilities and personal properties.

High Winds

Historical Context: "National Climatic Data Center storm event statistics record 104 high thunderstorm wind events in Caddo County during the 20-year period ending June 30, 2003. One person was injured in those events. Reported damage was $0.8 million."

Vulnerability to Thunderstorm High Winds					
Structures	Number	Estimated Value	Damage rate	Potential damage	Expected Loss (50%)
Housing units	7153	$ 170.1 million	10%	$17.0 million	$8.5 million
Other buildings	Not estimated				
Critical facilities	4	$10.2	0%	$0	$0
Infrastructure	Not estimated				

Date	Location	General Description
5/71997	Binger	Estimated 90mph winds caused widespread damage and one injury.

Mitigation Strategy / Recommendations from HMP: Nothing suggested.

Lightning

Historical Context: Nothing specific about Caddo County, but "Lightning killed 88 people and injured 243 others in Oklahoma during the period 1959-1994." No estimate of potential damage provided.

Date	Location	General Description
9/3/2001	Apache	Lightning struck a storage facility at Sexton Office Supplies that caused a fire that destroyed 4 buildings.

Mitigation Strategy / Recommendations from HMP: Stop outside events when cloud-to-ground lightning is expected. Continue public education on the dangers of lightning. Consider grounding electrical equipment in critical facilities and infrastructure.

Tornadoes

Historical Context: "National Climatic Data Center statistics storm events record 21 significant tornado days in Caddo County since 1950. On those 21 days, 32 tornados killed three persons and caused injury to 111 others and did $14 million of property damage."

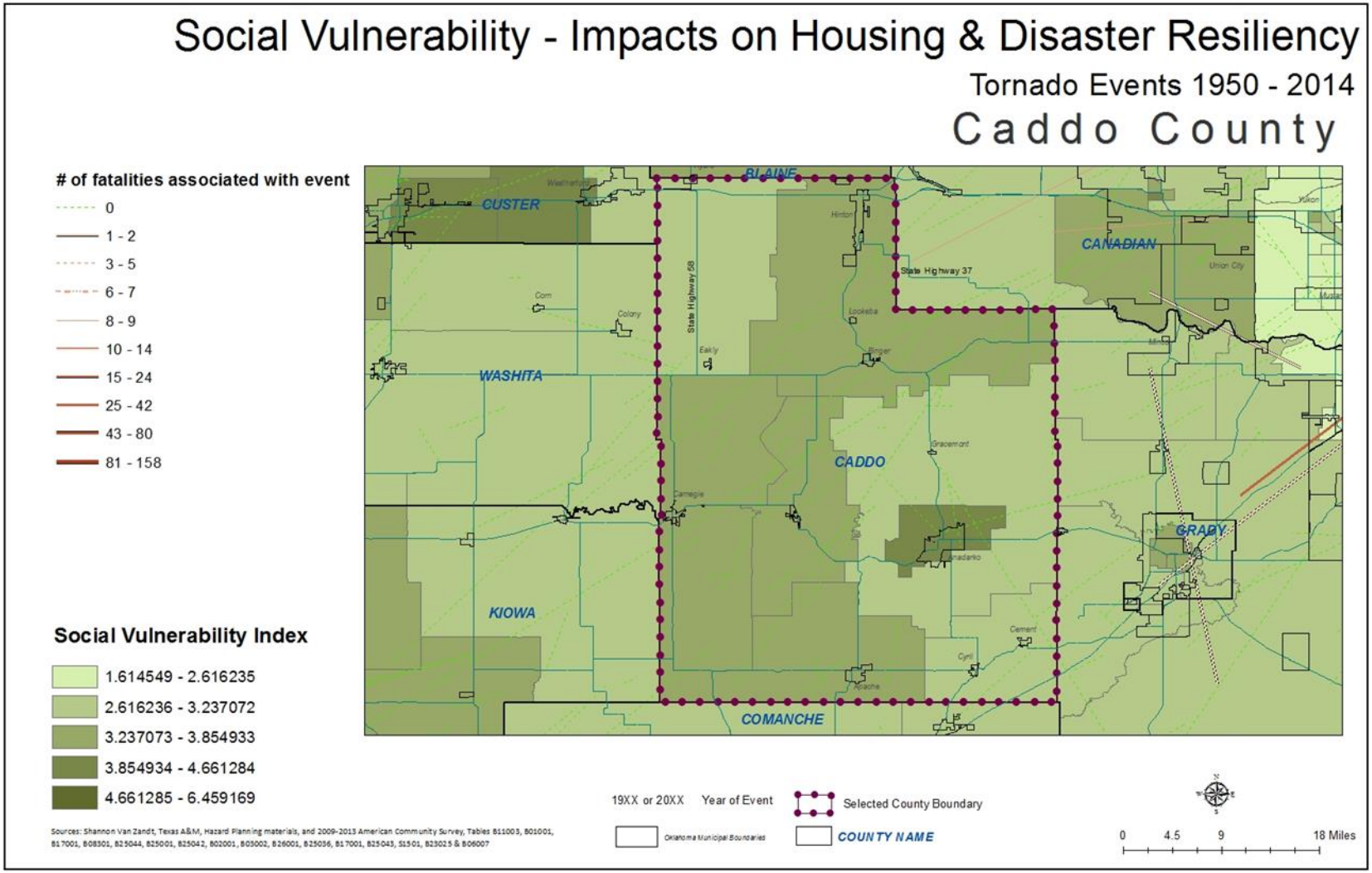
Vulnerability to F2 or greater Tornados					
Structures	Number	Estimated Value	Damage rate	Potential damage	Expected Loss (0.42%)
Housing units	7153	$ 170.1 million	80%	$136.5 million	$572,000
Other buildings	Not estimated				
Critical facilities	4	$20.6	20%	$4.1 million	$17,000
Infrastructure	Not estimated				

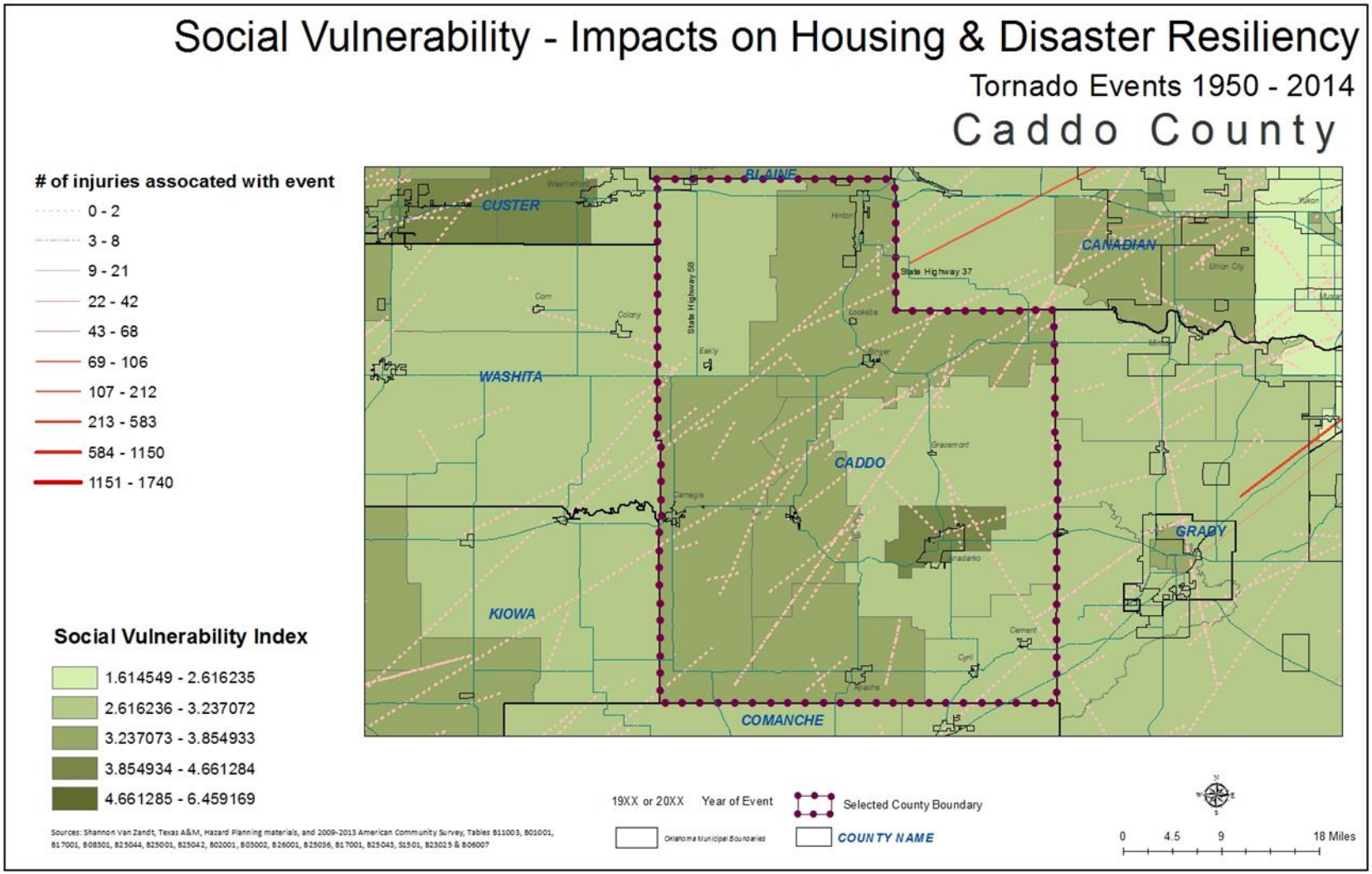
Mitigation Strategy / Recommendations from HMP: Public warnings and provide and publicize storm shelters in schools, nursing homes, etc. Encourage private storm shelters in homes.

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.

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

Historic data on tornados between 1950-2014 there are 92 tornados documented. There were 235 injuries that occurred connected to these tornados, with 26 of those injuries happening in the 2013 tornado. There were 20 fatalities connected to tornadoes during this time period, 8 of which occurred in 2013. Property losses between 1950-1996 ranged from $7,959,051.00 to $79,590,550.00. (The accounting methods used for losses changed in 1996.) The losses estimated between 1996-2014 was $6,670,000.00.


Social Vulnerability - Impacts on Housing & Disaster Resiliency
Tornado Events 1950 - 2014
Caddo County
# of fatalities associated with event
0
1 - 2
3 - 5
6 - 7
8 - 9
10 - 14
15 - 24
25 - 42
43 - 80
81 - 158
BLAINE
CUSTER
CANADIAN
WASHITA
CADDO
GRADY
KIOWA
COMANCHE
State Highway 58
State Highway 37
Social Vulnerability Index
1.614549 - 2.616235
2.616236 - 3.237072
3.237073 - 3.854933
3.854934 - 4.661284
4.661285 - 6.459169
19XX or 20XX Year of Event
Selected County Boundary
Oklahoma Municipal Boundaries
COUNTY NAME
0 4.5 9 18 Miles
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
Tornado Events 1950 - 2014
Caddo County
# of injuries assocated with event
0 - 2
3 - 8
9 - 21
22 - 42
43 - 68
69 - 106
107 - 212
213 - 583
584 - 1150
1151 - 1740
BLAINE
CUSTER
CANADIAN
WASHITA
CADDO
GRADY
KIOWA
COMANCHE
State Highway 58
State Highway 37
Social Vulnerability Index
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Selected County Boundary
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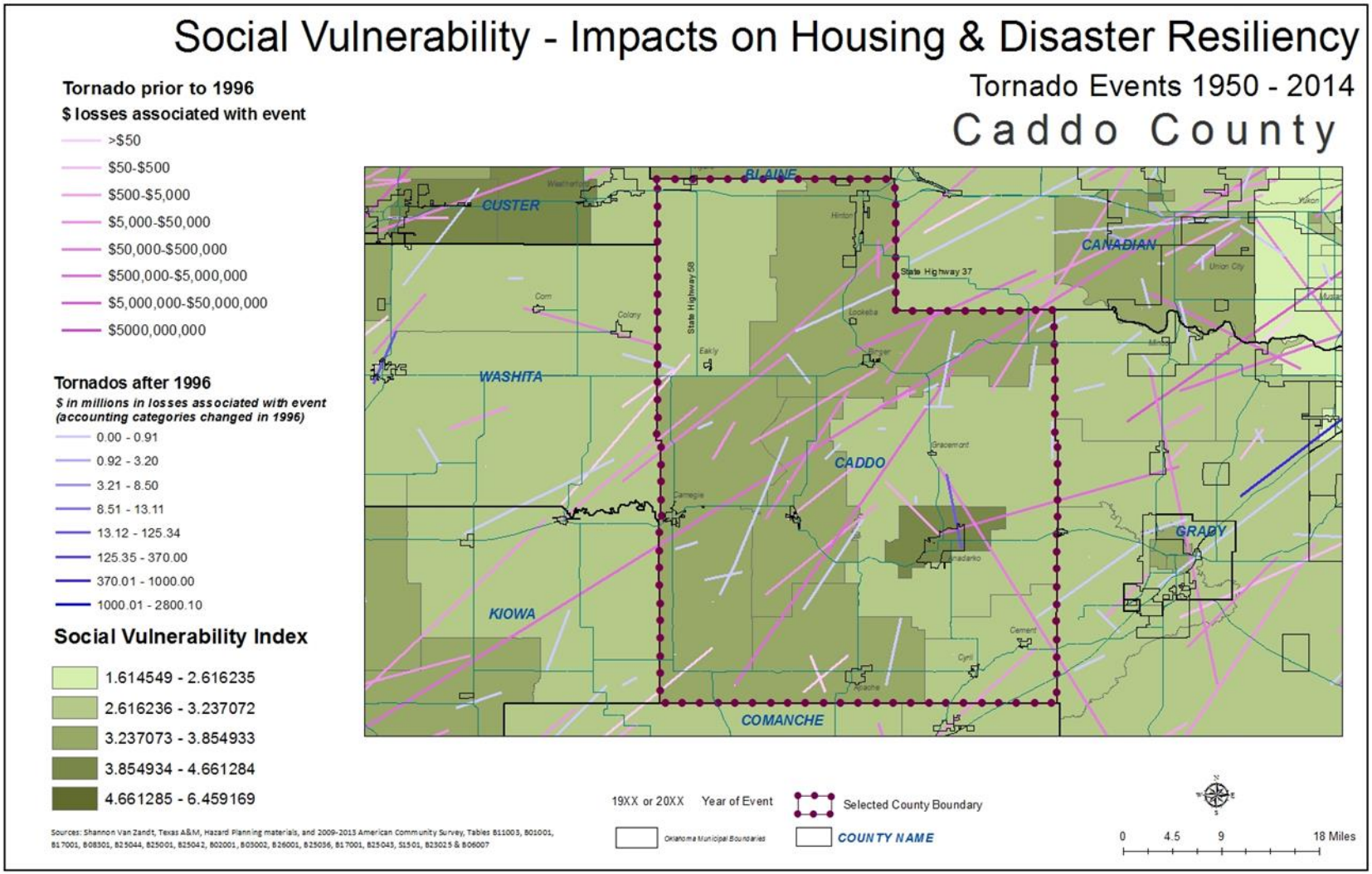
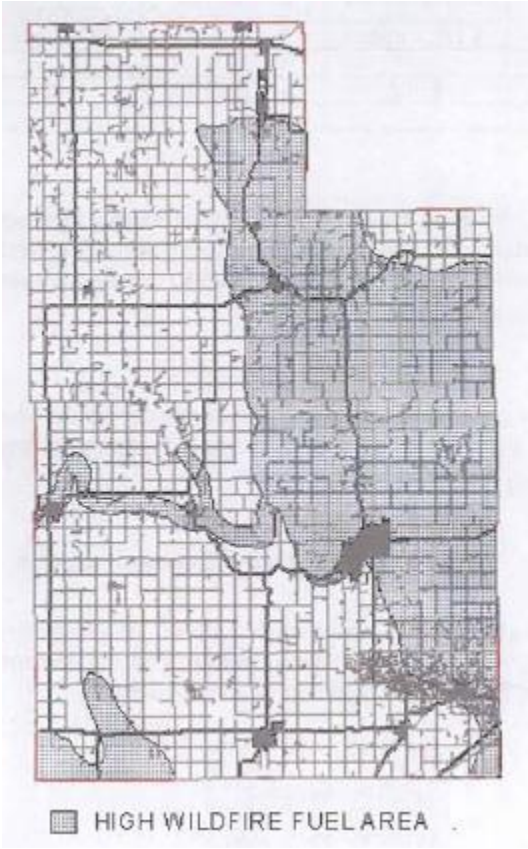
Social Vulnerability - Impacts on Housing & Disaster Resiliency



Wildfires

Historical Context: "There are 10 rural fire departments and 8 small town fire departments in Caddo County." "Almost 40% of Caddo County soils will support plants that create high fuel load for wildfires…Structures in those areas are at greater risk to wildfire…" No estimate of potential damage provided.



Mitigation Strategy / Recommendations from HMP: Evacuate homes that are in the wildfire danger. Control vegetation and be sure there is enough water for fire suppression.

Winter Storms

Historical Context: "The entire county is equally vulnerable to winter storms." No historic events listed and no estimate of potential winter storm damage provided.

Mitigation Strategy / Recommendations from HMP: Provide public warnings and water, food and shelter to those without power during the storm. Provide backup generators for vital services and consider moving electric lines underground. Clear snow from highways and spread salt and sand on iced highways.

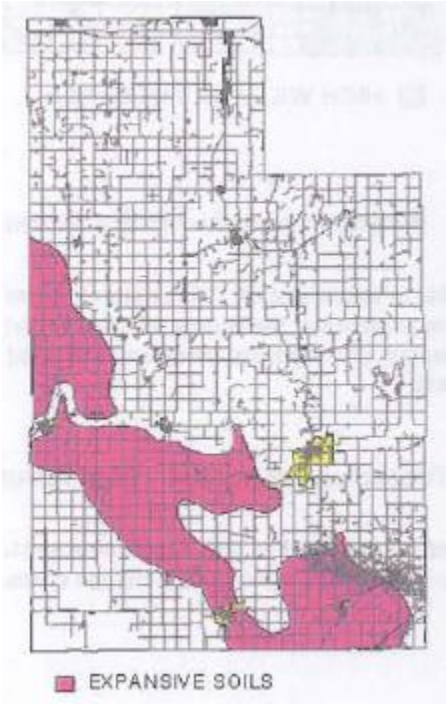
Extreme Heat

Historical Context: "Extreme heat will not cause significant damage to buildings and critical facilities. It does occasionally damage roads." No estimate of potential damage provided.

Mitigation Strategy / Recommendations from HMP: Ensure "frail people" have working air conditioners or fans during heat waves. Enforce water rationing when needed.

Expansive soils

Historical Context: "Structures built on the Tillman soils, which are located in the southwestern portion of Caddo County, are vulnerable, but the damage occurs gradually…" No estimate of potential damage provided.



Mitigation Strategy / Recommendations from HMP: Design buildings to withstand the worst possible scenario. Educate building owners/occupants about the soil and its potential.

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

It is not certain how many shelters and tornado sirens are in the County from the Hazard Mitigation Plan, though it recommends publicizing public shelters at the school, nursing homes, etc.

Caddo County has an online storm shelter registry: http://www.caddocounty911.org/storm-shelter-registration

C.2.1.3 Public Policy and Governance to Build Disaster Resiliency

The 2003 Hazard Mitigation Plan calls for a set of 11 actions to take place:

Floods

1. Develop a baseline for existing development in floodplains
2. County Floodplain Board to determine if new residential buildings in the Special Flood Hazard Area have their lowest floor at or above base flood elevation
3. Integration of E-911 addressing with floodplain management
4. Flood warnings, barricades and evacuation

Tornadoes

5. Tornado and severe thunderstorm weather watch and warnings

Ice storms

6. Identify priority locations for generators for emergency electric power

Wildfire

7. Rural Fire Department support
8. Control burn association

Earthquakes

9. Inspection of damage after earthquake
10. Inspection of conservation district flood control dams

Other

11. Hazard mitigation and response committee

C.2.1.4 Local Emergency Response Agency Structure

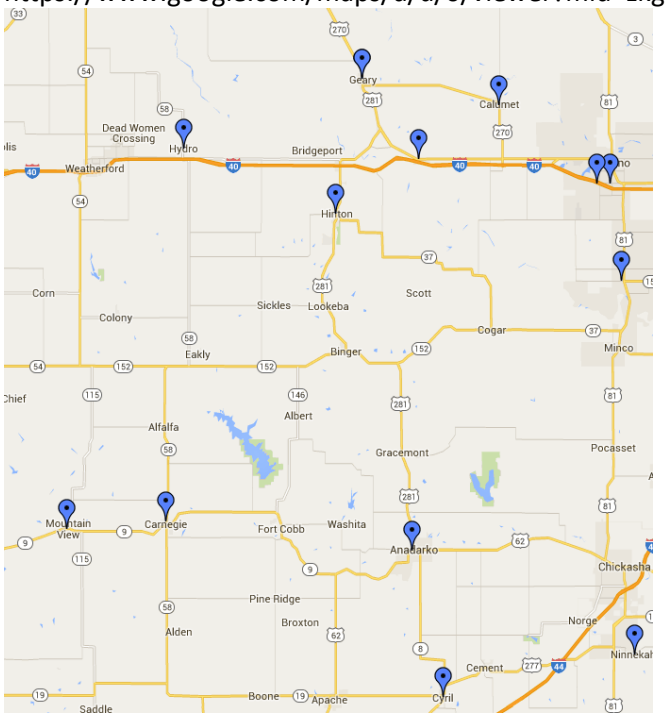
Information not available.

C.2.1.5 Threat & Hazard Warning Systems

The identified Threat & Hazard Warning Systems for Caddo County include:

- ☐ Sirens
- ☐ Emergency Responders and related Emergency Broadcasts

Google Mapped sirens in Oklahoma:
https://www.google.com/maps/d/u/0/viewer?mid=zkgp3PmLxLzg.kXQeGF45FpQg&hl=en



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.

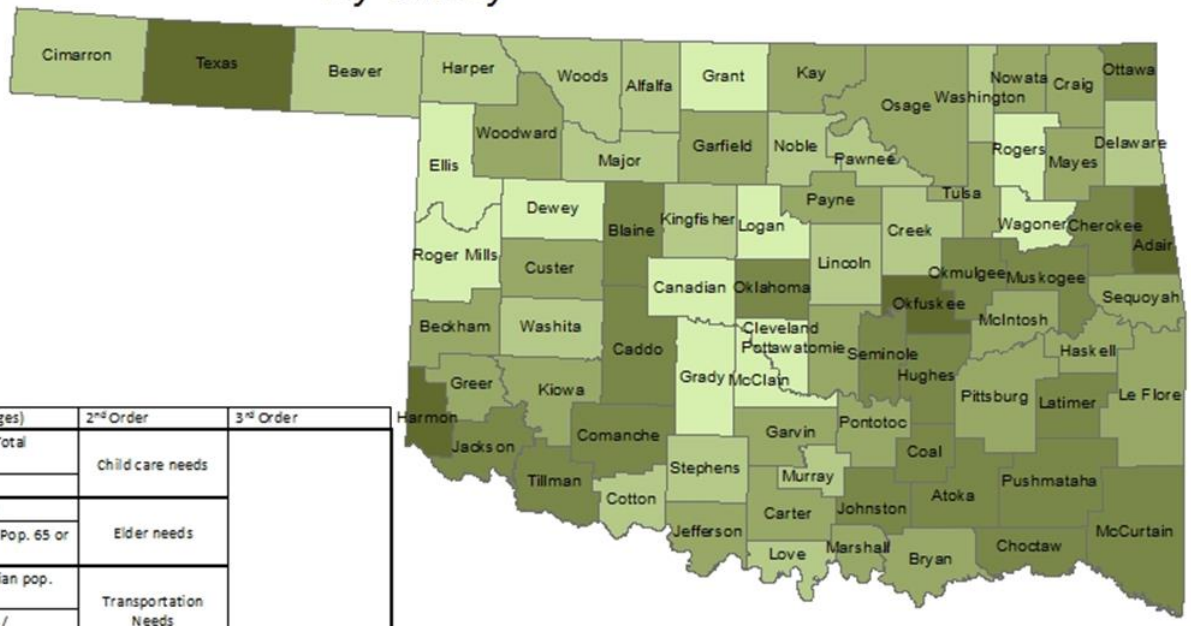
Social Vulnerability Analysis - Caddo County

Base Social Vulnerability Indicators (%)		2nd Order	3rd Order
1.) Single Parent Households	12.65%	0.197 (Child Care Needs)	**3.563 Social Vulnerability 'Hotspot' or Area of Concern**
2.) Population Under 5	7.07%		
3.) Population 65 or Above	14.73%	0.279 (Elder Needs)	
4.) Population 65 or Above & Below Poverty Rate	13.12%		
5.) Workers Using Public Transportation	0.30%	0.062 (Transportation Needs)	
6.) Occupied Housing Units w/o Vehicle	5.91%		
7.) Housing Unit Occupancy Rate	77.77%	2.715 (Temporary Shelter and Housing Recovery Needs)	
8.) Rental Occupancy Rate	29.21%		
9.) Non-White Population	41.04%		
10.) Population in Group Quarters	6.30%		
11.) Housing Units Built Prior to 1990	82.87%		
12.) Mobile Homes, RVs, Vans, etc.	13.71%		
13.) Poverty Rate	20.60%		
14.) Housing Units Lacking Telephones	2.22%	0.31 (Civic Capacity Needs)	
15.) Age 25+ With Less Than High School Diploma	16.80%		
16.) Unemployment Rate	10.20%		
17.) Age 5+ Which Cannot Speak English Well or Not At All	1.75%		

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 Index

By County



Levels of Social Vulnerability Analysis

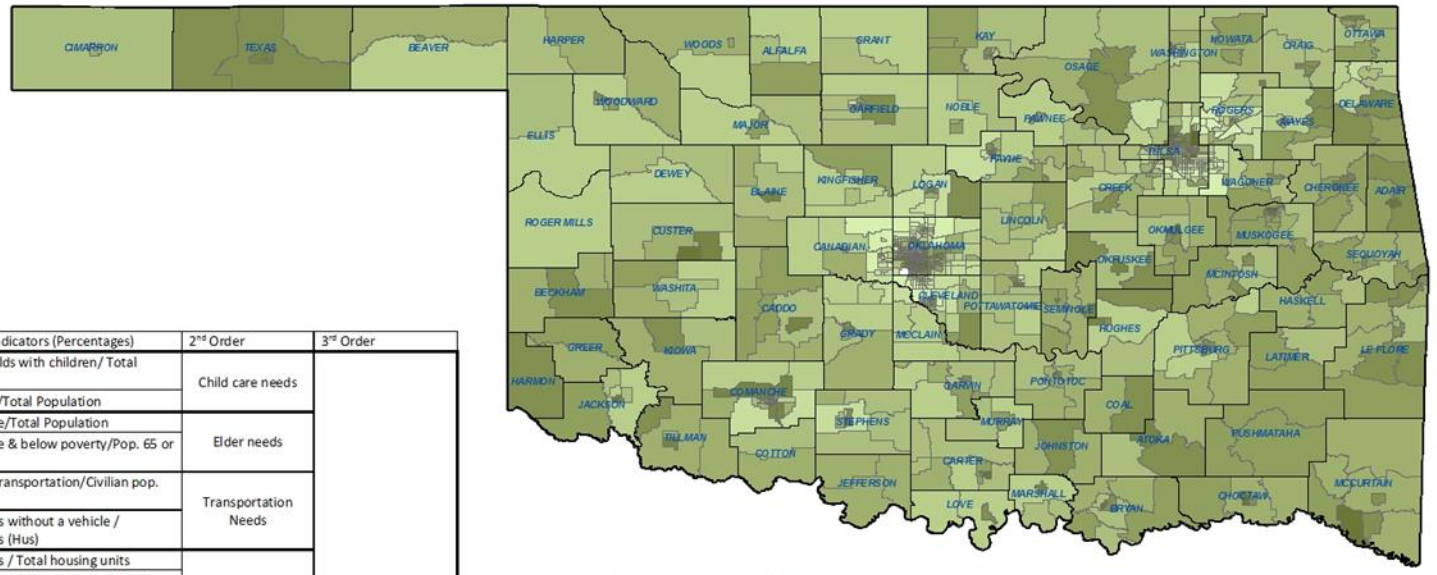
Base Social Vulnerability Indicators (Percentages)	2nd Order	3rd Order
1. Single parent households with children/ Total Households	Child care needs	Social vulnerability "Hotspot" or area of concern
2. Population 5 or below/Total Population		
3. Population 65 or above/Total Population	Elder needs	
4. Population 65 or above & below poverty/Pop. 65 or above		
5. Workers using public transportation/Civilian pop. 16+ and employed	Transportation Needs	
6. Occupied housing units without a vehicle / Occupied housing units (Hus)		
7. Occupied housing units / Total housing units	Temporary Shelter and housing Recovery needs	
8. Persons in renter occupied housing units/ Total housing units		
9. Non-white population/Total population		
10. Population in group quarters / Total population		
11. Housing units built 20 years ago / Total housing units		
12. Mobile Homes/ Total housing units		
13. Persons in poverty / Total population		
14. Occupied housing units without a telephone/ Total occupied HU	Civic Capacity needs	
15. Population above 25 with less than high school/ Total pop above 25		
16. Population 16+ in labor force an unemployed/ Pop in Labor force 16+		
17. Population above 5 that speak English not well or not at all / Pop >5		

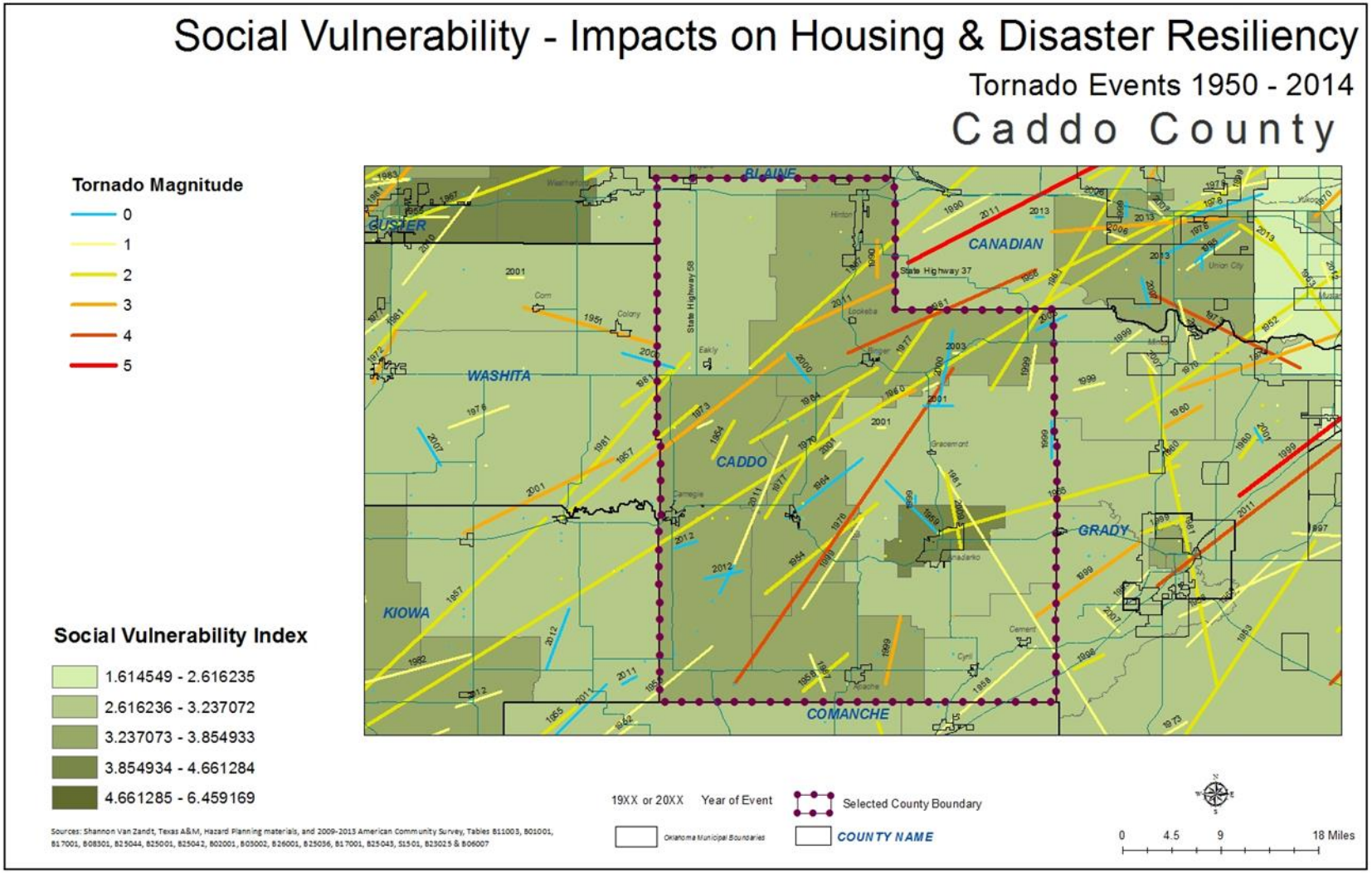
Source: Shannon VanZandt, Texas A&M, Hazard Planning materials; 2009-2013 American Community Survey, Tables B11003, B01001, B17001,

Social Vulnerability - Impacts on Housing & Disaster Resiliency

Base Social Vulnerability Indicators (Percentages)	2nd Order	3rd Order
1. Single parent households with children/ Total Households	Child care needs	Social vulnerability "Hotspot" or area of concern
2. Population 5 or below/Total Population		
3. Population 65 or above/Total Population	Elder needs	
4. Population 65 or above & below poverty/Pop. 65 or above		
5. Workers using public transportation/Civilian pop. 16+ and employed	Transportation Needs	
6. Occupied housing units without a vehicle / Occupied housing units (Hus)		
7. Occupied housing units / Total housing units	Temporary Shelter and housing Recovery needs	
8. Persons in renter occupied housing units/ Total housing units		
9. Non-white population/Total population		
10. Population in group quarters / Total population		
11. Housing units built 20 years ago / Total housing units		
12. Mobile Homes/ Total housing units		
13. Persons in poverty / Total population		
14. Occupied housing units without a telephone/ Total occupied HU	Civic Capacity needs	
15. Population above 25 with less than high school/ Total pop above 25		
16. Population 16+ in labor force an unemployed/ Pop in Labor force 16+		
17. Population above 5 that speak English not well or not at all / Pop >5		

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
Tornado Events 1950 - 2014
Caddo County
Tornado Magnitude
0
1
2
3
4
5
BLAINE
CUSTER
CANADIAN
WASHITA
CADDO
GRADY
KIOWA
COMANCHE
State Highway 58
State Highway 37
Social Vulnerability Index
1.614549 - 2.616235
2.616236 - 3.237072
3.237073 - 3.854933
3.854934 - 4.661284
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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 great gap or disadvantage prior to the event (Shannon Van Zandt, Texas A&M, Hazard Planning).

This county has an elevated score per this index for social vulnerability when comparing as a county to other counties in the state. Looking at the census tract level, the Anadarko area and a corridor from southwest to northeast of the county have particularly higher scores for social vulnerability. Combine that with the tornados, as one physical hazard or event that occurs, people in these areas may have additional difficulties during an event due to transportation and family needs. Additionally recovery for socially vulnerable populations can be slow and may require additional outside assistance.

Recommendations for this county:

- 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.