Special Topics

Canadian 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 11 cities and towns within the county. There is one key city, El Reno, where the County seat resides. Towns included in the plan are Mustang, Piedmont, Calumet, Okarche, Union City, and Concho. Yukon, Geary, and the part of Oklahoma City in Canadian County opted not to be included in the County plan. **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 have their own comprehensive plans that have been adopted, though basic summaries are included as Appendices to the County's Comprehensive Plan.

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.

> Canadian County does have a Hazard Mitigation Plan. The plan was adopted in 2013 and accepted by FEMA.

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

The Canadian County Hazard Mitigation Plan has twelve goals for all natural hazards:

- Goal 1: Minimize loss of life and property from natural hazard events
- Goal 2: Protect public health and safety
- Goal 3: Increase public awareness of risk from natural hazards
- Goal 4: Reduce risk and effects of natural hazards
- Goal 5: Identify hazards and assess risk for Canadian County
- Goal 6: Ascertain historical incidence and frequency of occurrence
- Goal 7: Determine increased risk from specific hazards due to location and other factors
- Goal 8: Improve disaster prevention
- Goal 9: Improve forecasting of natural hazard events
- Goal 10: Limit building in high-risk areas
- Goal 11: Improve building construction to reduce the dangers of natural hazards
- Goal 12: Improve government and public response to natural hazard disasters

The following table is based on data from 1995 to 2009. Sources for the information include the National Climate Data Center, the National Response Center, the Oklahoma Geologic Survey, the Oklahoma Fire Marshal's Offices, and local sources.

Table 4–1: Summary of Damages

Hazard	Events	Total Property Dmg	Property Dmg/Event	Property Damage/Yr	Injuries	Injuries/ Event	Injuries/ Year	Deaths	Deaths/ Event	Deaths/ Year
Floods	30	$3,042,000	$101,400	$202,800	3	0.10	0.20	0	0	0
Tornadoes	34	$7,141,000	$210,029	$476,067	5	0.15	0.33	0	0	0
High Winds	73	$6,814,000	$93,342	$454,266	0	0	0	0	0	0
Lightning	9	$181,000	$20,111	$12,067	0	0	0	0	0	0
Hail	105	$501,000	$2,277	$33,400	0	0	0	0	0	0
Winter Storms	35	$524,430,000	$13,800,789	$34,962,000	1	0.03	0.07	0	0	0
Extreme Heat	4	$10,000	$2,000	$667	100	20	6.67	31	6.20	2.07
Drought	4	$32,495,000	$2,030,938	$2,166,333	4	0.25	0.26	0	0	0
Expansive Soils	Information not available									
Urban Fires[1]	1,059	$19,310,015	$18,234	$1,755,456	85	0.08	7.73	15	0.01	1.36
Wildfires[1]	2,141	$1,442,100	$674	$131,100	Information not available					
Earthquakes	28	Information not available			0	0	0	0	0	0
HazMat Events	21	Information not available								
Dam Failures	0	0	0	0	0	0	0	0	0	0
Transportation[2]	58	Information not available								

1. Fire data is based on the eleven-year period from 1999 through 2009, based on best available data from the Oklahoma State Fire Marshal's office.
2. Transportation data based on 13 year reporting period 1996-2009. Source: National Response Center

Table 4–2: Canadian County Hazard Vulnerability Ranking

Type of Hazard	Occurrence		Impact				Mitigation Activities	Resources		Total Score
	Historical	Probability	Human	Property	Infrastructure	Business		Internal	External	
Winter Storm/Ice Storm	5	5	2.6	3.6	4	4	2	2.5	2	5.8
Tornadoes	4	4	3.25	4	3	3	2	2.5	3	4.8
High Wind Events	5	5	1	3	3	2	1	3	4	4.4
Lightning	5	5	2	3	3	2	2	4	4	4.4
Hail	4.5	4.5	1	4	2	3	1	3	3	4.4
Urban (Structure) Fires	5	5	1	4	1	4	3.5	4	4	4.3
Expansive Soils	5	5	1	3	1	1	1	2	2	4.1
Heat, Extreme	5	5	2	1	1	1	1	3	4	3.6
Wildfires	4.5	4.5	1	2	2	2	2	3.5	4	3.5
Transportation Hazardous Materials Incidents	3	3	3	2	1	3	1	3	4	3.1
Drought	3	3	1.5	2	2	3	2	2	3	3.1
Fixed Site Hazardous Material Incidents	2	3	2.5	2	1	2	1	3	4	2.6
Flooding	3	3	1	2	3	2	3	4	4	2.6
Dam / Levee Failure	0	1	2	3	3	3	1	2	2	2.3
Earthquake	2	2	1	1	1	1	1	3	4	1.3

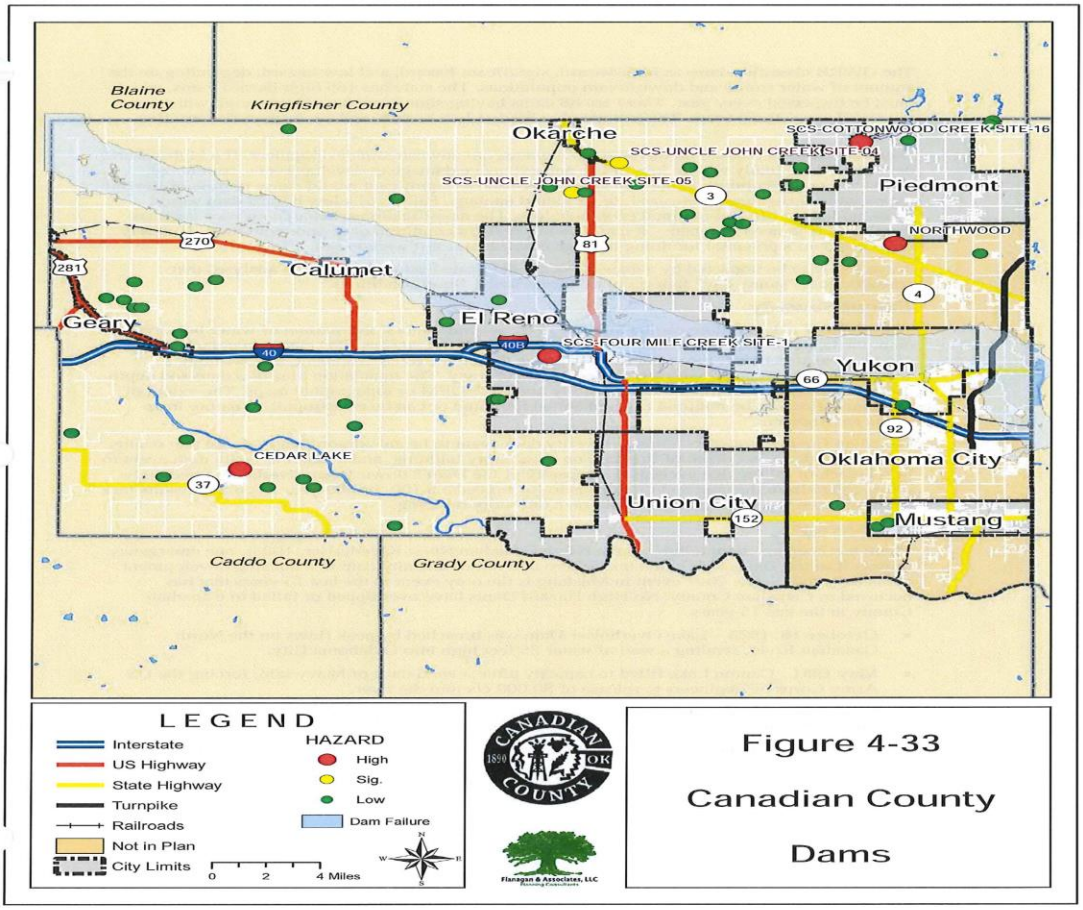
Table 4–3: Summary of Hazard Vulnerability Ranking Criteria

Summary:	This tool looks at an organization's or a community's vulnerability to the effects of various hazards. Using a scale of 0 to 5, the probability of occurrence and the impact potential are measured against mitigation activities and the resources available to respond to the hazard. The total is based on a formula that weighs risk heavily but provides credit for mitigation and response and recovery resources. The highest score possible is 7.8. The lower the total score, the lower the overall risk from the Hazard.
Instructions:	*Score each hazard based on a scale of 0 to 5 with 5 being the highest.* Ratings values: 1 = Low : 2-3 = Moderate : 4-5 = High
Historical Occurrence:	This is based on the number of occurrence in the last 20 years. Maximum is 5; if a new hazard, use 0.
Probability:	Score 0 if non-existent, 1 if less than 1%, 2 if less than 5%, 3 if less than 10%, 4 if less than 20%, and 5 if greater than 20%. Percents are based on the likelihood of an event occurring within a 15 year period of time. Probability is the likelihood an event will occur. History and probability are similar, but hazards that are newly developing, hazards where likelihood has increased or decreased based upon new developments or activities, or hazards with no historical information may need to be considered individually.
Impact:	Based on "worst-case scenario" - greatest possible impact should worst-case event occur. Maximum threat is the worst-case scenario of a hazard. Its impact is expressed in terms of human casualties, property loss, and business interruption/loss revenue issues. Secondary events need to be factored in where necessary. Assume maximum population when appropriate (for example, industrial park during peak work hours).
Internal/ External Resources:	Based on the resources available to the community internally, or to Mutual Aid agreements or other understandings with neighboring jurisdictions. May also include private resources available, such as corporate firefighting/hazmat teams or medical resources.
Analysis Results:	Extreme Vulnerability: Greater than 6.0 / Moderate Vulnerability : 2.5 to 4.0 High Vulnerability : 4.0 to 6.0 / Low Vulnerability : Less than 2.5

Dam Failure Risks

Historical Context: The Oklahoma Water Resources Board has classified 4 of the county's dams as High Hazard: the El Reno Lake Dam in El Reno, the Northwood Lake Dam and Cottonwood Creek Site 16 Dam near Piedmont, and the Cedar Lake Dam in the very southwest part of the county. Due to the County's flood risk, there are several dams that have been constructed along the rivers. "There has been one dam failure on the North Canadian River, one emergency release, and one failure of a minor amenity dam in a housing development."

Date	Location	General Description
10/16/1923	Lake Overholser Dam	Dam failure – failed due to peak flows on the North Canadian River and sent a 25ft high wall of water into Oklahoma City
5/1961	Canton Lake	Emergency release – the lake filled to capacity after days of heavy rain, forcing the US Army Corps of Engineers to release 80,000cfs into the river
5/2007	Spitler Lake Dam – Quail Lake Estates, Mustang	Amenity dam failure – failed during heavy rains. Damage cost was $20,000.



Mitigation Strategy / Recommendations from HMP: However, no high hazard dam failures have impacted Canadian County, and so it is not an anticipated event that will happen within the next 15 years. Still one of the County's main objectives is to "Analyze safety of existing high-risk dams and levees…and implement highest-priority measures to strengthen the structures and reduce risk."

Drought

Historical Context: "Canadian County has experienced four drought events in the past 15 years: 2000, 2001, 2005-2006, and 2011."

Table 4–26: Casualties and Damages Caused by Drought from 1995 - 2009

Location	Events	Deaths	Injuries	Damage Events	Property/Crop Damages
Canadian County	4	0	4	4	$561,590,000
Oklahoma	6	0	4	6	$1,129,669,000

From NOAA National Climatic Data Center http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

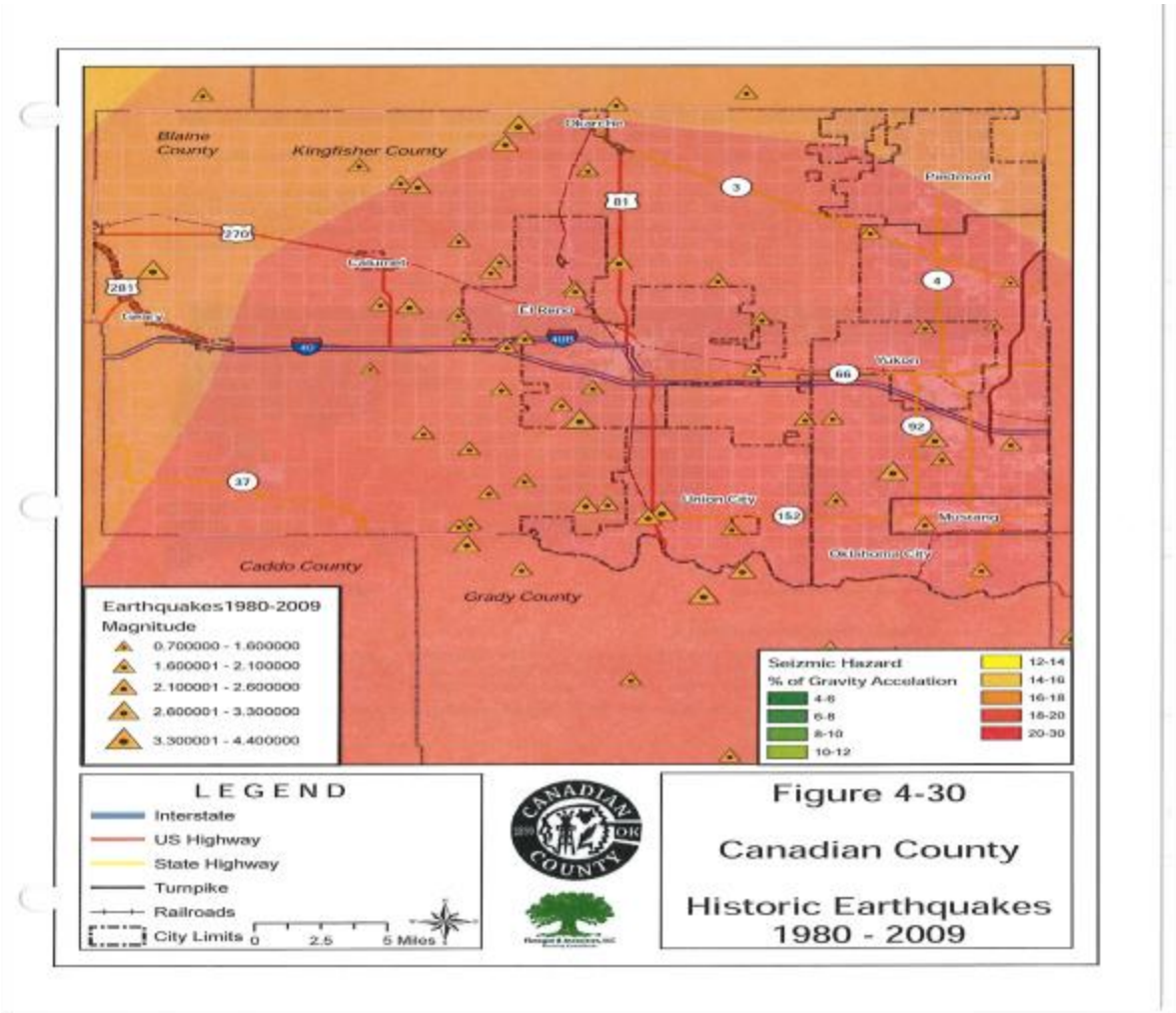
Date	Location	General Description
8/2000 – 9/2000	Southern and South Central OK	Unusually dry weather lasted 2 months. Agricultural losses: $600 million ($1 billion statewide).
7/2001	Western and North Central OK	Excessive heat and little rainfall. Heat-related illnesses killed 8 people and the county was included in a disaster declaration.
12/2005 – 1/2007	East Central and Southeast OK	High winds and dry soil conditions led to worst wildfire outbreak in Oklahoma history and the loss of half of the wheat crop and fish kills in Deep Fork River. Agricultural losses: $158 million.
1/2011 – 10/2011	All of OK	July was hottest month on record in Oklahoma and Canadian County. In El Reno it was 100°F every day but four.

Mitigation Strategy / Recommendations from HMP: "Although Canadian County's water supplies are…adequate to meet all but the most severe drought conditions, the jurisdiction will remain vulnerable to drought over the long term." Rely on Federal Government for relief in a severe drought. Future developments/renovations to buildings and infrastructure should consider expansive soils and wildfires as secondary effects of drought. Improve public awareness and identify and protect resources and critical infrastructure.

Earthquake

Historical Context: "Cleveland County is located in an area of low-level seismicity… Of the 28 events that have been reported between 2000 and 2009, 13 were in the vicinity of El Reno, 9 were near Calumet, 3 close to or in Union City, 2 near Mustang and 1 at Okarche."

Date	Location	General Description
12/28/1929	El Reno	4.0 magnitude, VI intensity
4/9/1952	El Reno	5.5 – 5.7 magnitude, VII intensity – caused by slippage along the Nemaha Fault, toppling chimneys, cracking bricks, and breaking windows and dishes. Felt as far away as Austin, TX and Des Moines, IA
9/10/2004	W Reno Rd and S Ranch Rd	3.4 magnitude
3/11/2010 – 3/12/2010	Union City	11 tremors within Canadian River basin – one 3.4 magnitude, IV intensity, and two 2.8 magnitude, III intensity



Mitigation Strategy / Recommendations from HMP: Based on the results of an earthquake scenario, where economic losses were estimated at $48.2 million, the County plans to "Establish emergency service protocols that adequately address response scenarios…" and structures and infrastructure built in the future should be designed to withstand earthquake damage as well as tornado and high wind damage.

Flood

Historical Context: Flooding poses a significant problem in the county. There are two main rivers that run through this area: the Canadian and North Canadian Rivers. Many creeks flow into these rivers. Sudden, heavy rains cause these rivers and creeks to swell, causing the county problems.

Table 4–9: Floods in Oklahoma and Canadian County from 1995-2009

Location	Events	Deaths	Injuries	Damage Events	Property Damage
Canadian County	30	0	3	9	$3,042,000
Oklahoma	1,971	25	25	355	$79,668,000

From NOAA National Climatic Data Center

Date	Location	General Description
5/10/1993	El Reno	Water level reached 21.12ft
6/25/2000	Piedmont	Heavy downpour inundated drainage basins, flooding much of the town, including Arrowhead Rd, Washington Ave, and Apache Rd NE.
3/4/2004 – 3/6/2004	Western Canadian County	Up to 6in of storm precipitation produced minor flooding on North Canadian River while the Canadian River was reported to have risen 6ft near Geary, OK.
8/19/2007 – 8/20/2007	County wide	Current flood record for North Canadian River: 23.33ft at El Reno. US Hwy 81 was closed near I-40 due to high water. OK Hwy 152 and OK Hwy 4 were both closed in Mustang. Many had to be rescued from stranded vehicles. Prong Bridge in Okarche had to be closed due to water flowing over it. In Piedmont, one car was swept off of banner Rd. Losses estimated near $100,000
8/19/2008	Eastern Canadian County	Greatest flooding occurred near NW 23rd St and Richland Ave to Hwy 66 and Banner Rd. Five people were rescued by boat – three from homes and two from cars. Many roads in Union City were flooded.
6/13/2010	Eastern Canadian County	Mustang Creek flooded after 10" of rain fell in the area. Cemetery Rd, SW 59th St, and 74th St were flooded in Mustang.

Mitigation Strategy / Recommendations from HMP: Canadian County regulates the FEMA SFHA, and buildings constructed today must meet NFIP minimum standards. As urban development continues, locations and building techniques should be closely examined. The County has an "aggressive and ongoing public awareness program" as well, and plans to "Expand mapping, regulations, and loss-prevention programs in areas with high risks…"

Hail

Historical Context: "Canadian County reported 105 hail events…between 1995 and 2009 with stones ranging in size from .75 inches to 3.0 inches in diameter causing $501,000 in reported damage. of these events, 30 separate hail storms had potentially damaging hail measuring 1.75 inches in diameter or larger."

Table 4–20: Casualties and Damages Caused by Hail from 1995 - 2009

Location	Events	Deaths	Injuries	Damage Events	Property Damage
Canadian County	105	0	0	2	$501,000
Oklahoma	12,722	0	2	239	154,564,000

Date	Location	General Description
4/30/1961	El Reno	7in hail fell 1mi SW of El Reno
8/17/1994	Okarche	4.5in, 2.75in, and 2.5in hail fell. The 4.5in hail fell 4mi SE of Okarche. Damage was $100,000.
5/25/1998	Okarche	2.5in hail damaged wheat crops and vehicles in Okarche, but no damage figures were reported
4/21/2004	Yukon	Baseball size hail fell in Yukon
4/30/2004	Piedmont	3in hail broke the windshields of 2 cars
4/24/2006	El Reno	2.75in hail fell north of El Reno
11/5/2008	Piedmont	2.5in hail reported 1mi south of Piedmont
5/23/2011	Okarche	2.5in and 2.75in hail damaged structures and crops

Mitigation Strategy / Recommendations from HMP: Construction of new structures should include plans to use impact-resistant materials when feasible. "Identify costs and benefits of loss prevention programs, such as covered vehicle parking…" and ordinances such as building codes.

High Winds

Historical Context: "Canadian County reported 73 high wind events from 1995 through 2009…that injured two people and did a total of $6,814,000 in damage. High wind is one of Canadian County's most frequent natural hazards."

Table 4–15: High Winds in Oklahoma and Canadian County for 1995 - 2009
From NOAA National Climatic Data Center

Location	Events	Deaths	Injuries	Damage Events	Property Damage
Canadian County	73	0	2	28	$6,814,000
Oklahoma	9,174	8	196	2,525	$959,603,000

NCDC does not separate community damages from county reports for High Winds, Thunderstorm Winds, and Strong Winds. The Oklahoma numbers are raw.

Date	Location	General Description
6/3/1995	Union City	High winds caused $5.5 million in damage
7/23/1995	El Reno, Yukon, and Mustang	El Reno and Yukon - $50,000 in damage Mustang - $50,000 in damage
8/2/1996	Okarche	3 mobile homes destroyed, 2 RVs and a cattle trailer overturned, 3 barns demolished, roof damage to schools, and many trees split or uprooted. Total of $130,000 in damage.
4/20/2000	El Reno	A 90'x120' section of a hospital roof was blown off, resulting in rain and wind damage to the interior of this part of the building and medical equipment. Estimate of $350,000 in damage.
8/26/2006	Mustang	64mph winds damaged one side of a two-story home, resulting in rain damage inside. Total of $100,000 in damage.
5/24/2011	El Reno	Highest wind gust of 151mph recorded by an Oklahoma Mesonet site produced by EF5 tornado

Mitigation Strategy / Recommendations from HMP: Encourages studies to determine if there is a correlation in risk associated with driving a lighter vehicle in dangerous weather conditions. Construction crews should exercise care in securing apparatus and supplies that could become wind-borne during storms. Any buildings undergoing expansion, renovation or rebuilding should consider following updated techniques. Underground conduits for utility lines should be considered, and vegetation should be well trimmed to limit falling debris. There should also be many access points to all areas for emergency services.

Lightning

Historical Context: "Canadian County has reported nine lightning events between 1995 and 2009 that resulted in $181,000 in damage. In the reporting period 1959-2010, lightning claimed 99 casualties."

Table 4–16: Casualties and Damages Caused by Lightning from 1995-2009

Location	Events	Deaths	Injuries	Damage Events	Property Damages
Canadian County	9	0	0	9	$181,000
Oklahoma	374	11	76	301	$26,077,000

Source: From NOAA National Climatic Data Center
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

Date	Location	General Description
5/25/1998	Piedmont	Lightning started a house fire. Damage was $40,000.
4/13/1999	Yukon	Lightning started a house fire, damaging the attic and parts of the roof. Damage was $20,000.
6/24/2000	El Reno	Lightning caused equipment damage at the Police Department. Damage was $25,000.
6/11/2003	El Reno	Lightning struck the Masonic Temple causing $25,000 in damage
1/4/2005	Yukon	Lightning struck two oil tank batteries and started a fire, resulting in $75,000 in damage

Mitigation Strategy / Recommendations from HMP: Continue educating the public, including construction workers, on the hazards of lightning. It is recommended that buildings install surge protectors for electricity and phone lines. Moving above-ground utilities to underground should be considered top priority in the construction of new or renovation of facilities.

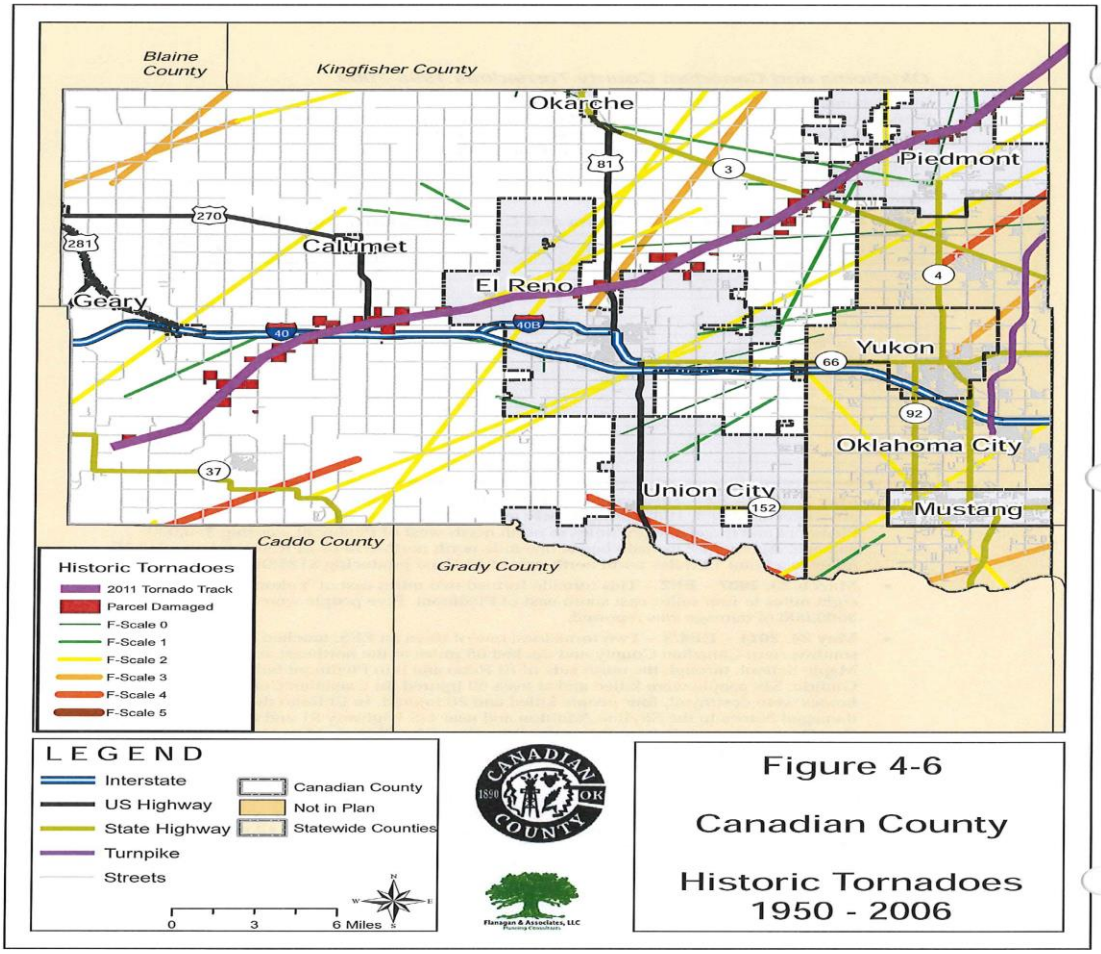
Tornadoes

Historical Context: In the last 15 years, Canadian County has been impacted by 34 tornadoes. About 70% of these were EF0 and EF1 and caused little damage. While less frequent, EF4 and EF5 tornadoes were the cause of 67% of tornado deaths.

Table 4–12: Tornadoes in Oklahoma and Canadian County from 1995 - 2009

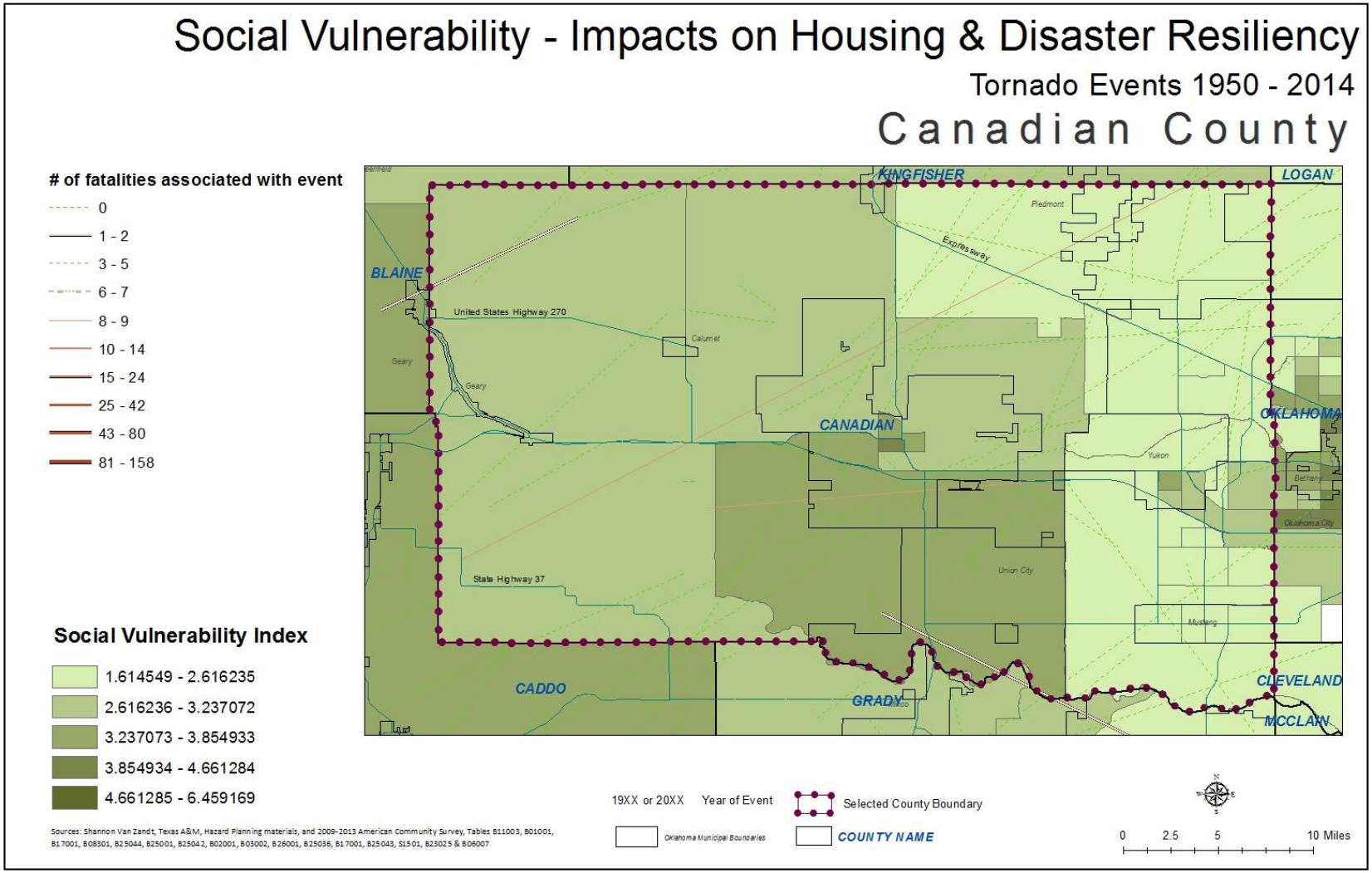
Location	Events	Deaths	Injuries	Damage Events	Property Damages
Canadian County – F0	15	0	0	5	$136,000
Canadian County – F1	15	0	0	14	$5,331,000
Canadian County – F2	4	0	5	4	$1,675,000
Canadian County – F3	0	0	0	0	0
Canadian County – F4	0	0	0	0	0
Canadian County – F5	0	0	0	0	0
Oklahoma – F0	589	0	14	136	$3,672,000
Oklahoma – F1	268	0	40	229	$50,104,000
Oklahoma – F2	93	5	88	81	$92,723,000
Oklahoma – F3	27	5	116	26	$403,211,000
Oklahoma – F4	7	29	514	7	$650,500,000
Oklahoma – F5	2	23	332	2	$540,000,000

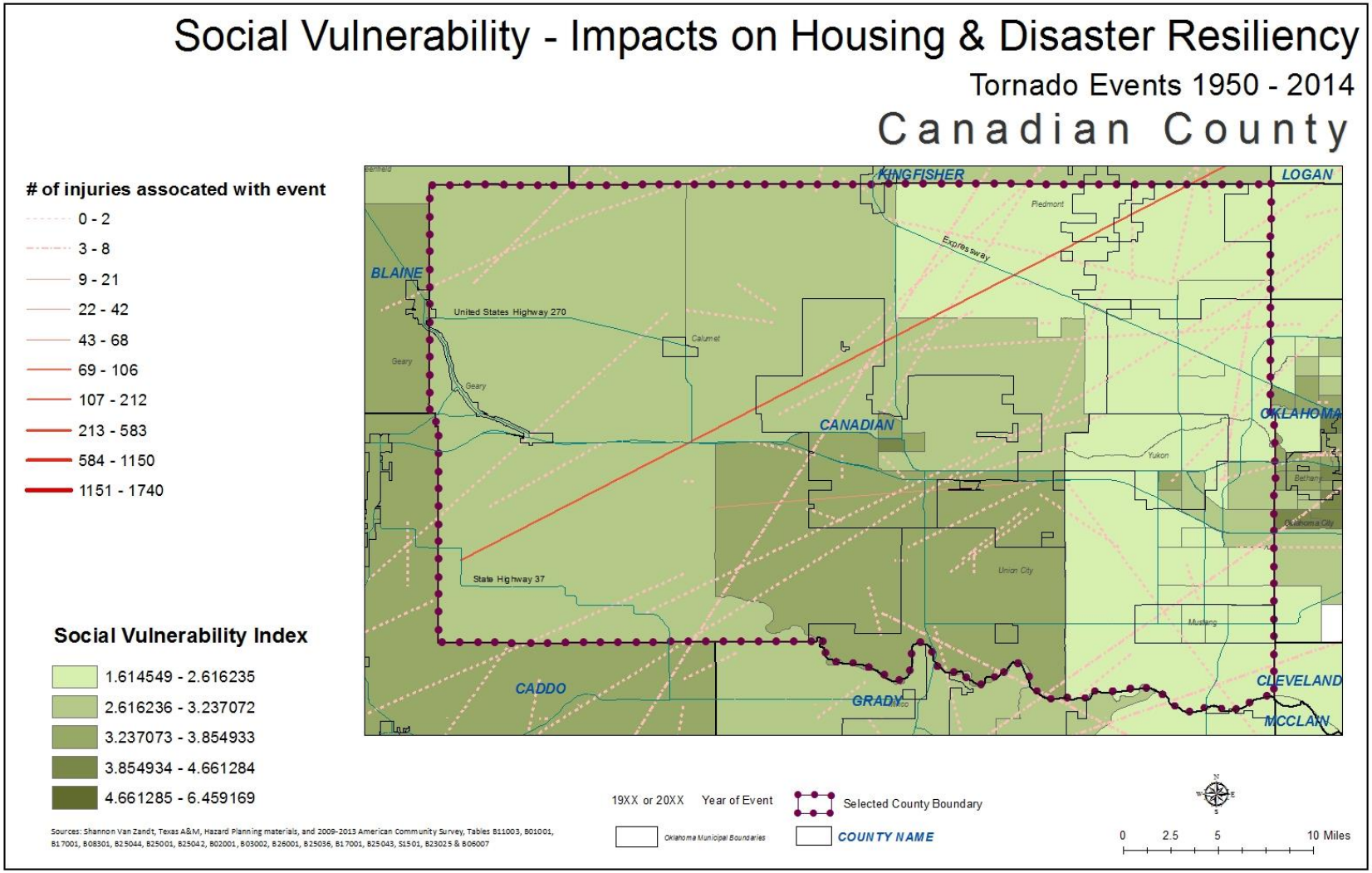
Date	Location	General Description
4/12/1945	Muskogee	102 people died in a series of tornadoes: 13 in Muskogee, 69 in Antlers, 8 at Tinker Air Force Base, 5 in Roland, 4 near Hulbert, 3 in Latimer County
5/25/1973	Union City	Tornado damaged 49 buildings, demolished 22 homes and 18 trailers, and injured 6 people. Damage cost $2million. This tornado was the first to leave a velocity signature on radar, providing a breakthrough in forecasting severe storms. Also the first tornado intercepted and photographed by storm chasers.
5/3/1999	Piedmont and El Reno	**F2 –** began 2mi west of Piedmont and traveled 8mi NNW. Damage cost $50,000. **F2** – began 1mi NNE of El Reno and traveled 16mi NNE. Damage cost $125,000.
3/29/2007	Yukon	**EF2** – formed 2mi east of Yukon and traveled 8mi, nearly reaching Piedmont. Five people were injured and damage cost $500,000.
5/24/2011	SW Canadian County	**EF4/5** – two tornadoes, one an EF4 and the other an EF5, traveled NE 65mi through the north side of El Reno and into Piedmont. Six people died, at least 60 injured, and homes in the Skyline Addition in El Reno were damaged.



Mitigation Strategy / Recommendations from HMP: Safe Rooms should meet or exceed FEMA specifications and windows, doors, and other exterior materials should be reinforced in new developments in Canadian County. Any facilities undergoing expansion, renovation, or rebuilding should consider following updated techniques. Uninterrupted communications and the protection of electronic data should be considered priorities and critical County facilities should be equipped with backup generators. Emergency responders should receive Community Emergency Response Teams training.

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.

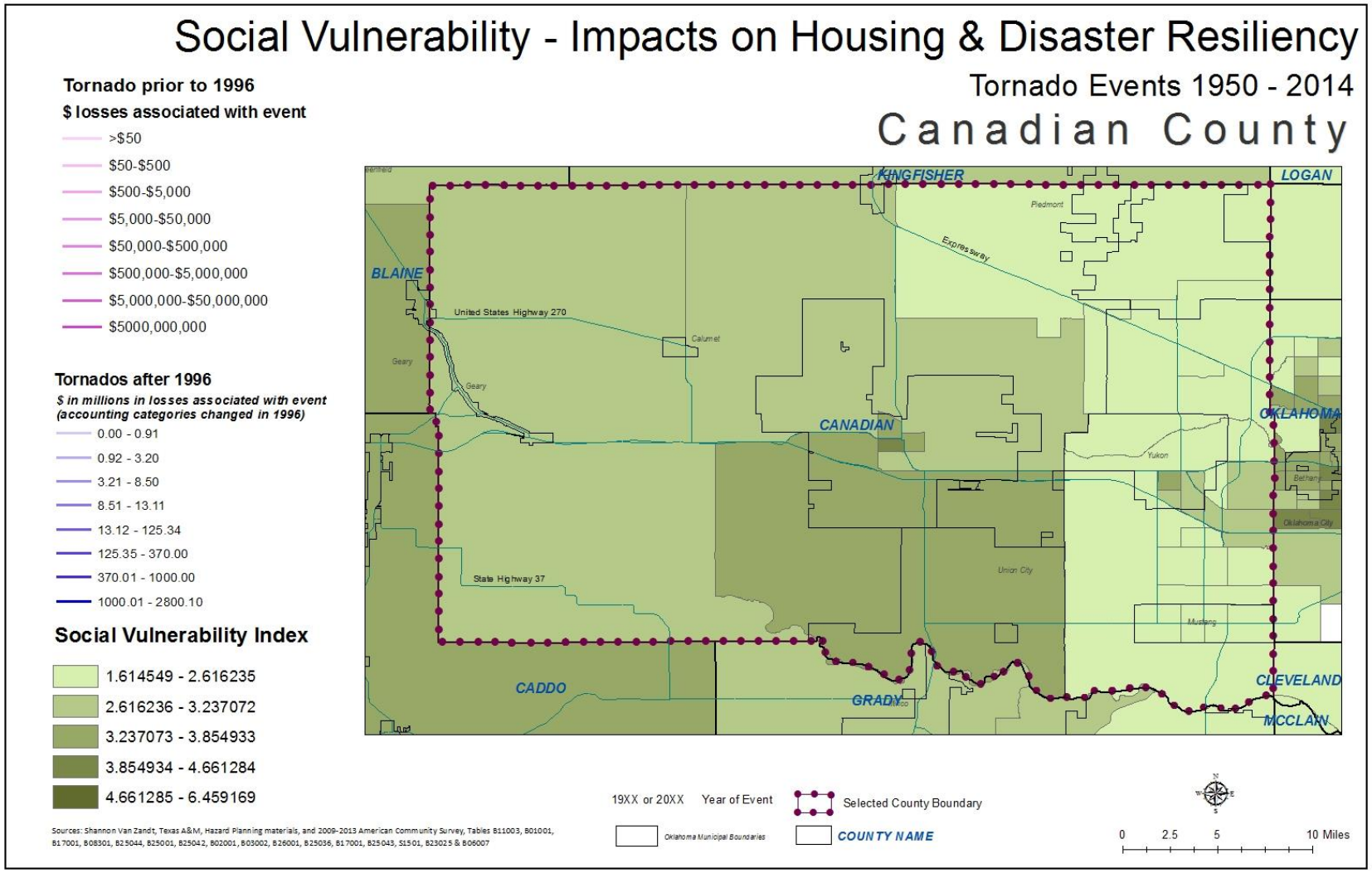

Social Vulnerability - Impacts on Housing & Disaster Resiliency
Tornado Events 1950 - 2014
Canadian County
# of fatalities associated with event
0
1 - 2
3 - 5
6 - 7
8 - 9
10 - 14
15 - 24
25 - 42
43 - 80
81 - 158
KINGFISHER
LOGAN
BLAINE
United States Highway 270
Expressway
Piedmont
Calumet
Geary
CANADIAN
OKLAHOMA
Yukon
Oklahoma City
State Highway 37
Union City
Mustang
CADDO
GRADY
CLEVELAND
MCCLAIN
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 2.5 5 10 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
Canadian 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
Social Vulnerability Index
1.614549 - 2.616235
2.616236 - 3.237072
3.237073 - 3.854933
3.854934 - 4.661284
4.661285 - 6.459169
KINGFISHER
LOGAN
BLAINE
United States Highway 270
Expressway
Piedmont
Calumet
Geary
CANADIAN
OKLAHOMA
Yukon
Edmond
Oklahoma City
State Highway 37
Union City
Mustang
CADDO
GRADY
CLEVELAND
MCCLAIN
19XX or 20XX Year of Event
Selected County Boundary
Oklahoma Municipal Boundaries
COUNTY NAME
0 2.5 5 10 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

Canadian County



Wildfires

Historical Context: "From 2000 to 2009 Canadian County fire departments made 1,838 wildfire runs that burned a total of 22,662 acres and did $1,129,720 in damage. By far the worst year, in terms of damage, was 2006, when 50 wildfires resulted in %593,350 in losses."

Table 4–37: Canadian County Wildfires, 2000-2009

Year	Wildfire Runs	Acres Burned	Losses
2000	245	1,551	43,320
2001	204	697	130,935
2002	238	992	122,310
2003	167	1,731	106,180
2004	171	706	47,985
2005	244	899	35,170
2006	50	3,970	593,350
2007	128	578	14,550
2008	233	1,130	28,920
2009	158	10,398	7,000
Total	1,838	22,662	1,129,720

Oklahoma State Fire Marshal

Fire Department	Date	Location	General Description
Calumet VFD	2006		Total of 41 wildfire runs that burned 5,070 acres and totaled $100,000 in damage. Of these, 14 burned <1 acre, and 20 burned ≥5 acres. Two fires were very large and are listed below:
	3/12/2006	OK Hwy 37 and Maple Rd	3,500 acres of brush and grass burned, causing $80,000 in damage. The fire burned for 27hrs.
	3/15/2006	SW 29th and Maple Rd	1,000 acres burned but no reported damage. The fire burned for 31hrs.
El Reno FD	2006		Total of 86 wildfire runs that burned 703 acres and caused $300 in damage. Most burned <1 acre, but 22 fires burned one or more acres. Two fires, listed below, burned over 100 acres:
	4/20/2006	Memorial Rd	100 acres burned for 8.5hrs
	7/4/2006	Black Kettle	350 acres burned for 9.5hrs
Mustang FD	2006		Total of 56 wildfire runs, though no acreage or values of losses were recorded
Okarche VFD	2006		Total of 26 wildfire runs that burned 465 acres and totaled $7,200 in damage. Of these, 14 burned >1 acre, most between 20 and 40 acres. One, listed below burned more than 100 acres:
	3/5/2006	Unspecified	120 acres of grass burned, causing $1,500 in damage. The fire burned for 2 ¾ hrs.
Piedmont VFD	2006		Total of 8 wildfire runs. Six were along Cimarron Rd and one on Edmond Rd.

Union City VFD	2006		Total of 11 wildfire runs that burned 1,034 acres and did $43,000 in damage.
	3/15/2006	Caddo Jake Bridge and 59th St	350 acres of forest and wildland burned, causing $2,000 in damage. The fire burned for 26 ¼ hrs
	3/15/2006	37th and Maple Rd	320 acres of forest and wildland burned, causing $12,500 in damage. The fire burned for 3.5hrs.
	4/13/2006	Maberry and 44th St	350 acres of forest and wildland burned, causing $17,000 in damage. The fire burned for 5.5hrs

Mitigation Strategy / Recommendations from HMP: Developers and homeowners should be made aware of how construction materials and landscaping measures can reduce vulnerability. Facilities should be appropriately located and built with fire-resistant building and landscape practices. Removal of Eastern Red Cedar trees should be considered.

Urban Fires

Historical Context: "During the 10 year period from 2000 to 2009…Canadian County reported a total of 813 structural fires, 15 fatalities, 75 injuries, and approximately $16.95 million in fire damage…"

Table 4–31: Canadian County Urban Fire Damages 2000-2009

Year	Single Family		Apartment		Mobile Homes		Other Residential		Office/ Commercial		Warehouse/ Industrial		Total	
	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg
2000	59	$797,600	9	$13,625	6	$145,000	1	$0	4	$150,300	11	$2,149,800	90	$3,256,325
2001	71	$896,020	5	$20,210	7	$5,450	2	$500	3	$3,000	9	$24,600	97	$949,780
2002	92	$1,079,900	5	$5,500	3	$41,100	4	$46,100	7	$21,550	9	$64,500	120	$1,258,650
2003	47	$1,014,100	9	$17,000	0	$0	1	$10,000	3	$7,000	7	$85,000	67	$1,133,100
2004	66	$412,585	10	$60,650	4	$128,200	0	$0	4	$38,000	12	$170,000	96	$809,435
2005	70	$2,647,400	11	$217,060	3	$92,500	1	$0	3	$5,000	10	$156,300	98	$3,118,260
2006	16	$618,200	2	$25,500	1	$0	0	$0	0	$0	2	$1,750	21	$645,450
2007	68	$1,660,155	4	$340,000	2	$7,500	1	$0	0	$0	3	$12,100	78	$2,019,755
2008	52	$1,003,885	4	$1,388,000	3	$27,000	2	$17,500	3	$72,510	7	$38,000	71	$2,546,895
2009	59	$718,185	6	$1,700	2	$7,200	0	$0	2	$1,200	6	$49,000	75	$777,285
Totals	600	$10,848,030	65	$2,089,245	31	$453,950	12	$74,100	29	$298,560	76	$2,751,050	813	$16,514,935

Source: Oklahoma State Fire Marshal

Table 4–32: Canadian County Urban Fire Damages in Critical Facilities 2000-2009

Year	Nursing		Childcare		Hospitals		Correctional		School/ University		Public Assembly		Total	
	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg
2000	1	$10	0	$0	0	$0	1	$0	1	$0	1	$0	4	$10
2001	1	$0	0	$0	0	$0	0	$0	1	$100	1	$500	3	$600
2002	0	$0	0	$0	0	$0	0	$0	0	$0	5	$7,500	5	$7,500
2003	0	$0	0	$0	0	$0	0	$0	3	$31,500	9	$196,500	12	$228,000
2004	1	$0	0	$0	0	$0	0	$0	1	$500	1	$75,000	3	$75,500
2005	6	$10,500	0	$0	0	$0	0	$0	0	$0	0	$0	6	$10,500
2006	0	$0	0	$0	0	$0	0	$0	0	$0	1	$45,000	1	$45,000
2007	0	$0	0	$0	1	$0	0	$0	2	$50,000	5	$13,700	8	$63,700
2008	1	$100	0	$0	0	$0	0	$0	1	$0	0	$0	2	$100
2009	1	$0	0	$0	0	$0	0	$0	0	$0	0	$0	1	$0
Totals	11	$10,610	0	$0	1	$0	1	$0	9	$82,100	23	$338,200	45	$430,910

Table 4–33: Canadian County Urban Fire Injuries & Deaths 2000-2009

Year	Civilian Injuries	Civilian Deaths	Firefighter Injuries	Firefighter Deaths	Total Injuries	Total Deaths
2000	3	2	5	0	8	2
2001	5	1	3	0	8	1
2002	3	0	4	0	7	0
2003	2	0	2	0	4	0
2004	10	4	2	0	12	4
2005	8	4	3	0	11	4
2006	5	0	0	0	5	0
2007	3	4	4	0	7	4
2008	6	0	4	0	10	0
2009	3	0	0	0	3	0
Totals	48	15	27	0	75	15

Source: Oklahoma State Fire Marshal

Mitigation Strategy / Recommendations from HMP: All facilities should plan for the possibility of water shortages in event of a fire. Another main problem is the age of structures and distance from fire protection facilities, though no solution was offered. The HMP also called to "Establish or expand emergency services protocols…to include equipment, training, and exercise scenarios for high-impact events."

Winter Storms

Historical Context: "During the period 1995 through 2009, Canadian County reported 35 ice and snow events…which did a total of $524.4 million in property damage in Canadian and neighboring counties."

Table 4–22: Casualties and Damages Caused by Winter Storms, 1995 - 2009

Location	Events	Deaths	Injuries	Damage Events	Property Damages
Canadian County	35	0	1	7	524,430,000
Oklahoma	447	2	7	67	$732,234,000

Source: National Climatic Data Center

Date	Location	General Description
12/25/2000 – 12/26/2000		4-8in of snow, sleet and freezing rain fell in 26 counties, including Canadian County. The freezing rain accumulations were about 1in thick. Falling trees and ice damaged homes and vehicles, and 170,000 people across the state were without power for nearly a week.
1/30/2002	El Reno	Freezing rain fell for 12 to 24hrs with ice accumulations of 1-2in. The worst of the ice damage occurred in a 60mi wide band from Blackwell to El Reno, Minco and Oklahoma City. Many residencies were without power for days and some went 6 weeks without power. Total damage was estimated at $301 million.
12/9/2007 – 12/12/2007		Freezing rain caused ice accumulations of 1in. The storm caused the worst power outage in Oklahoma history, and electrical crews from dozens of states worked 12hr shifts to restore power. Fallen power lines also sparked more than 100 structure fires. The local economy suffered due to the timing of the storm on a busy shopping weekend and the pecan crop loss was estimated at $25 million. Storm cleanup cost about $200 million. There were also 27 deaths due to the storms.

Mitigation Strategy / Recommendations from HMP: The placement of trees and large shrubs should ensure a reduced risk of power line interference. Burying electric power lines and backup power systems for facilities should be considered.

Extreme Heat

Historical Context: "Canadian County has experienced 4 excessive heat events in the past 15 years, and five in the past 18 years: in 1994, 1999, 2001, 2006 and 2011."

Table 4–24: Casualties and Damages Caused by Extreme Heat

Location	Events	Deaths	Injuries	Damage Events	Property Damages
Canadian County	4	31	100	1	$10,000
Oklahoma	47	91	157	1	$10,000

Source: National Climatic Data Center

Date	Location	General Description
8/17/1999	El Reno	Temperatures rose into the 90s in mid-July and remained there through early September. A woman in El Reno died in her home on this date.
7/2001 – 8/2001	Yukon	Temperatures remained in the 90s and low 100s until 8/25. A man collapsed at a house in Yukon and died later at the hospital. In July, 8 people died from the heat in Oklahoma City, Edmond, Stillwater, and Lawton.

6/2006 – 8/2006	Yukon	Temperatures rose in June and remained in the 100s for most of July and August. One man died in Yukon on June 20th and 18 more people had died by the end of the heat wave. I-40 and many other streets buckled in the County.
6/2011 – 8/2011		Temperatures rose into the 100s on 58 days, reaching 110°F on 7/9, 8/5 and 8/6. July average temperature was 102.5°F and August average temperature was 102.2°F and El Reno, Piedmont, Yukon, Mustang, and Union City were moved to water rationing.

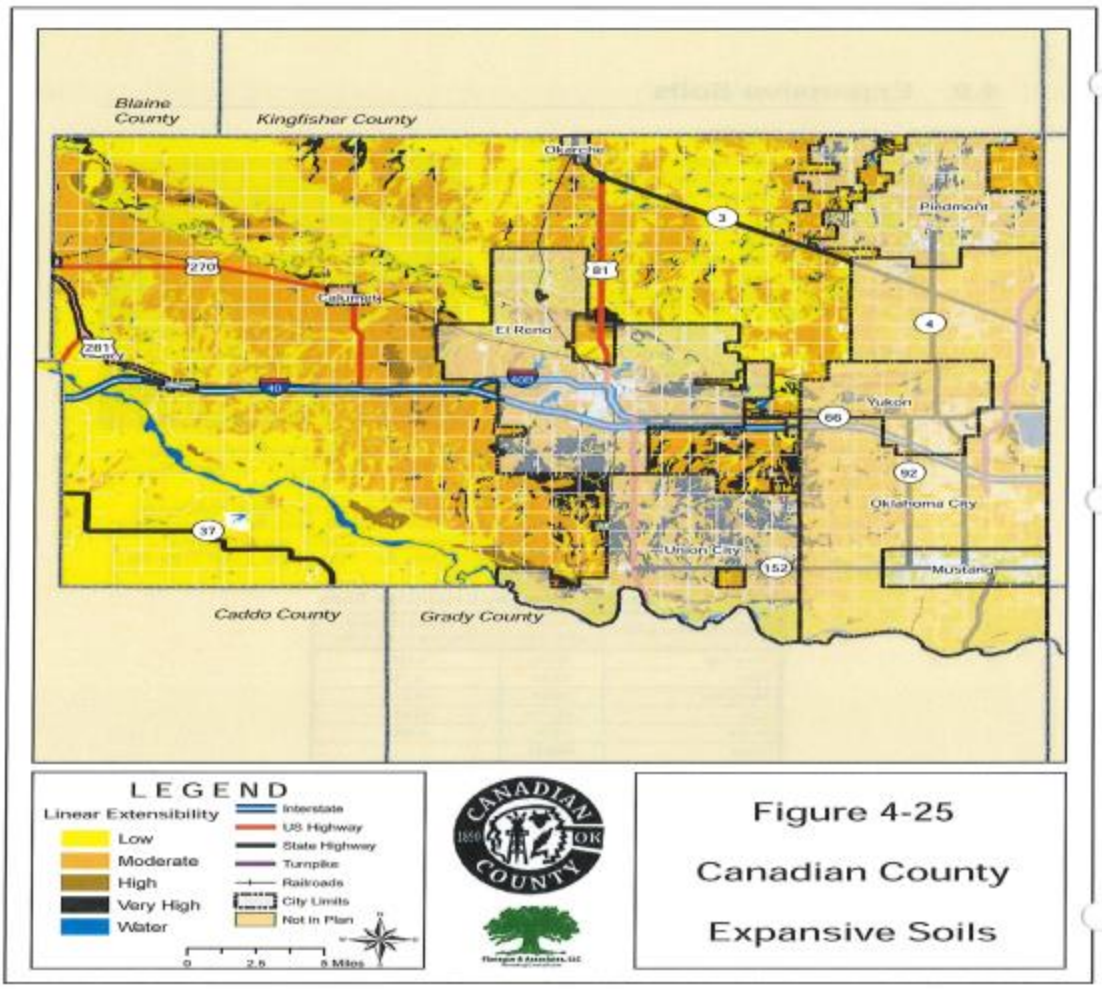
Mitigation Strategy / Recommendations from HMP: Ensure that the vulnerable population (elderly, fixed income, compromised health situations, and homeless) are informed about available resources and how to avoid extreme heat illnesses. Facilities should consider backup systems for power. Heat alerts should be issued in a timely manner.

Expansive Soils

Historical Context: "The history of Canadian County's expansive soil hazard is difficult to track, since the County does not specifically monitor damage to structures from expansive soils. The County treats all such damage as a maintenance issue. Based on this data, there is no record of exactly how many expansive soil events have occurred in the past.

Table 4–27: Canadian County Expansive Soils

Expansive Potential	Area (Sq. Mi.)	Percent of Total County Land Area
Very High	50.26	5.56%
High	24.42	2.7%
Moderate	370.6	41.01%
Low	441.26	48.83%
Water	17.07	1.89%
Total	**903.61**	



Mitigation Strategy / Recommendations from HMP: Damage to structures built during a period of drought followed by rains. The use of PVC or HDPE piping could reduce some of the impact of expansive soils on pipelines. "Explore options for loss-mitigation…including building codes and code-plus options."

Transportation Events

Historical Context: "The National Response Center (NRC) lists 32 highway transportation releases, 14 railroad incidents (five involving the release of hazardous materials), and 13 pipeline releases of hazardous substances. There were no aircraft incidents reported for Canadian County in the NRC's data base."

Table 4–49: Canadian County Transportation Events 1996-2005

Date	Location	Nearest City	Suspected Responsible Party	Material
Truck/Highway Transport Spills				
04/17/10	Oil dumped by vehicles at construction site	Banner	Duit Construction	Unknown oil
04/13/09	150-200 35-gal. containers dumped near landfill	El Reno	Unknown	Sodium nitrate
03/25/09	Load shift damages drum, releasing product	OKC	SAIA Motor Freight	Benzaldehyde
03/04/09	300 gal. Sodium hypochlorite spilled from damaged tote	Calumet	Halliburton	Sodium hypochlorite
10/20/08	Open vent valve on truck from operator error	Mustang	Hamm & Phillips	Oily water
03/18/08	20 gal. spilled into ditch from tank due to pump failure	Yukon	BCM Oklahoma	Diesel fuel
08/13/07	15 gal. spilled from portable tank onto roadway	Piedmont	Sonoco Pipeline	Crude oil
12/23/05	Converted bus blew engine spilling oil	El Reno	Private party	Motor oil
06/26/05	20 gal. spilled onto roadway	El Reno	Cal-Cleve, Ltd.	Misc. paints, varnishes
06/22/05	Trucks dumping oil from equipment	El Reno	Cactus Drilling	Unknown oil
06/21/05	Eight 55-gal. drums with unknown chemical dug up	Mustang	Unknown	Unknown chemical
11/25/03	Tote fell from truck and was struck by another truck	Union City	Schlumberger	Friction reducer
12/26/02	2 barrels spilled onto gravel due to equipment failure	OKC	Enogex	NG condensate
12/05/02	Weld on acid tank failed, spilling 150 gallons of acid	OKC	OG&E	Sulfuric acid
07/06/02	5 gal. container and 2 batteries dumped on ground	Mustang	Superior Ready Mix	Battery acid
09/18/01	Truck turns over rupturing saddle tank	Mustang	Marathon Transport	Oil, fuel
07/21/01	3 gal. spilled onto roadway from portable tank	Yukon	Consolid.ated Freightway	Cleaning liquid
07/01/01	22 gal. spilled onto roadway	El Reno	Cal-Cleve, Ltd.	Misc. paints, varnishes
06/01/01	1 gal. flammable liquids spilled onto roadway	El Reno	Cal-Cleve, Ltd.	Flammable liquid
04/07/01	1 gal. spilled onto roadway	El Reno	Cal-Cleve, Ltd.	Misc. paints, varnishes
10/18/00	Valve on ammonia storage tank releasing material	Union City	El Reno Grain	Anhydrous ammonia
07/17/00	Truck spilled gasoline from fuel tank	Yukon	Leroy Lightle Trucking	Unleaded gasoline
05/01/00	Car collides with truck causing spill of 200 gal.	El Reno	Domino Transport	Unleaded gasoline
06/14/99	10 gal. paint and varnishes spilled onto roadway	El Reno	Jevic Transport.	Misc. paints, varnishes
12/29/98	5 gal. spilled from truck	Calumet	YRC Inc.	Dichloromethane
10/16/98	84 gal. spilled onto roadway	El Reno	Koch Pipeline	Crude Oil
07/07/98	1,335 gal. spilled from tanker truck hit by car	Mustang	Red Rock Distrib.	Gasoline
03/05/98	42 gal. spilled onto roadway	El Reno	Koch Pipeline	Crude oil
09/12/96	Tanker truck, one vehicle accident	OKC	Oklahoma Tank Line	Oil, diesel
01/26/96	168 gal. spilled from portable tank on truck	El Reno	Koch Resources	Crude oil
09/07/95	3 gal. wood preservative spilled onto roadway	El Reno	Consolidated Freightway	Wood preservative
Railroad Release				
07/28/09	Truck and train collision, truck driver killed	Union City	Union Pacific	Oil, diesel fuel
06/20/09	Truck and train collision causes releases from both	El Reno	Union Pacific	Oil, diesel
12/06/06	Lubrication oil discharged from train in Jones yard	El Reno	Union Pacific	Misc. oil
05/15/06	Train and car collision at railroad crossing	Yukon	Union Pacific	Non-release
04/20/06	Train derailment	El Reno	Union Pacific	Non-release
03/07/06	Train/vehicle collision at crossing, derailment, 1 fatality	Yukon	Union Pacific	Oil, diesel fuel
12/02/05	Locomotive and 10 cars derailed, causes unknown	Union City	Union Pacific	Unknown
02/15/05	Train and car collision at Woodson St. crossing	El Reno	Union Pacific	Non-release
02/25/02	Unknown number of cars derailed from freight train	Union City	Union Pacific	Sulfuric acid
10/18/01	10 cars derailed from a train carrying rock	Concho	Union Pacific	Aggregate
12/31/99	23 empty rail cars derailed	Concho	Union Pacific	Non-release
03/13/99	Car collides with train at Morgan Rd. crossing	OKC	Union Pacific (?)	Non-release
08/14/98	11 cars derailed from freight train	El Reno	Union Pacific (?)	Non-release
12/12/96	Southbound train and car collision	El Reno	Union Pacific (?)	Non-release
Pipeline Spills				
10/11/07	Third party strikes 16" pipeline with digger	OKC	Centurion Pipeline	Crude oil
04/23/07	Pipeline corrosion causes leak into pond	Geary	Plains Pipeline	Crude oil
05/23/06	10" pipeline leaks into dry creek	Okarche	Duke Field Serv.	Condensate, water
02/06/06	Equipment failure releases 20 barrels into North Canadian tributary	Geary	Plains Pipeline	Crude oil, water
01/10/05	Pin hole leak in 6" pipeline due to corrosion	El Reno	ONEOK Field Serv.	Crude oil, NG condensate
07/30/04	Pipeline break	El Reno	Enogex	Natural gas
02/28/03	Frozen pipe causes break and release	OKC	Duke Field Serv.	Crude oil, water
03/07/02	Backhoe damages pipeline	Yukon	Unknown	Carbon dioxide
01/10/01	Release from natural gas pipeline	El Reno	ONEOK Field Serv.	NG condensate
07/17/00	Third party cuts into 4" plastic pipeline	OKC	OK Natural Gas	Natural gas
05/14/99	Corrosion results in pipeline leak	Piedmont	GPM Gas Corp.	Natural gas
10/08/97	Fire in NG distribution line during maintenance	Canadian Co.	GPM Gas Corp.	NG condensate
07/18/97	Slop oil storage tank hit by lightning	Piedmont	GPM Gas Corp.	NG condensate

Mitigation Strategy / Recommendations from HMP: "Identify needs for and implement additional emergency operations plans and services to facilitate response to potential mass casualty transportation incidents, including emergency alerts, evacuation plans, and exercises."

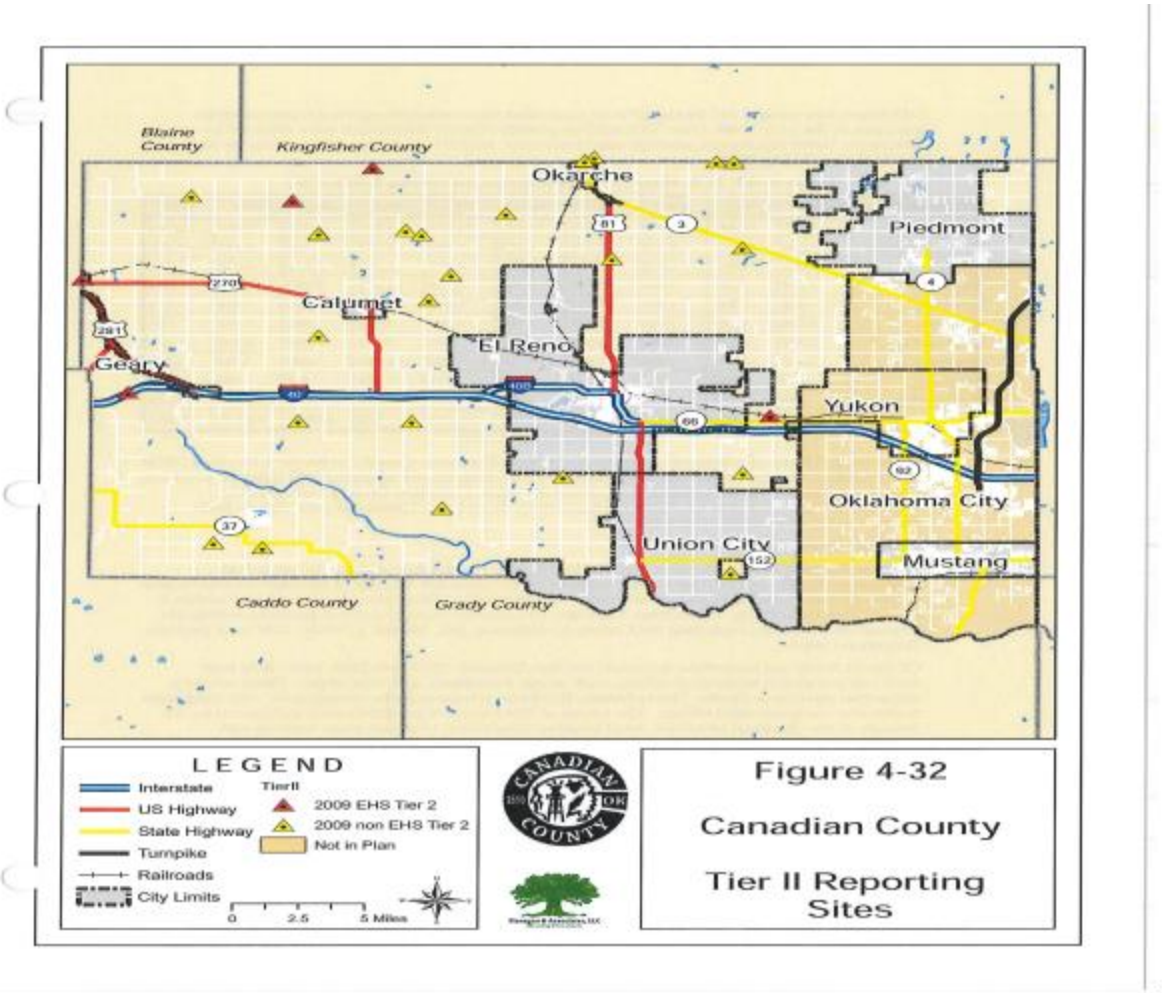
Fixed Site Hazardous Material Events

Historical Context: "In Canadian County, the majority of hazardous materials events are due to the production and/or transportation of hydrocarbons, or their use in manufacturing processes. There were 9 fixed site hazardous material events in Canadian County in the period from 2000 to 2010… Almost half occurred at the Xenox facility…"

"

Table 4–42: Canadian County Fixed Site Hazardous Materials Events

Date	Incident	Location	Responsible Party	Nearest City	Medium Affected	Released Material
05/23/11	Tornado strikes NG pipeline facility	I-40 & Calumet Rd.	Nature	Calumet	Air	Natural gas
01/06/11	Reactor releases Butadiene and Styrene	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene, Styrene
04/12/10	Mining dust stirred up by trucks on site	OK Hwy 66 & Gregory Rd.	Canadian CPI Pipe	Yukon	Air	Mining dust
02/12/08	Butadiene released from vent stack	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene
12/06/07	Release of drilling mud	10 W. Karns Rd.	Devon Energy	Calumet	Water	Oil drilling mud
05/09/07	Tornado damaged transformer	2300 Holloway Ave.	OGE	El Reno	Water	Polychlorinated Biphenyls
07/28/05	Release of Butadiene from resin reactor	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene
12/10/01	Dumping of caustic soda, lime and sulfa	320 Piedmont Rd. N.	R B Pet Products	Piedmont	Land	Sulfur
06/26/01	House explosion	704 S. Mayhan	Unknown	El Reno	Air	Natural gas
03/19/01	Glycol unit caught fire	Yukon	Duke Energy	Yukon	Air	Glycol
11/13/00	Reactor contents emptied into pit	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene
09/19/99	Pit shop vault problem releases Butadiene	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene
04/02/99	Hazmat waste tank overflows	100 N. Mustang Rd.	Xerox	Yukon	Air	Volatile compound
12/10/98	Release from resin plant	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene
11/20/98	Release from resin plant	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene
10/31/98	Resin plant reactor catastrophic seal failure	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene
09/19/98	Dumping refrigerants	12825 SW 58th	Allied Refrigeration	Mustang	Air	Refrigerants
08/16/98	Dumping paint thinners on ground	13448 Lake Shore Dr.	Resident	Piedmont	Land	Paint, thinners
05/20/97	Compressor leak	10 mi. N of El Reno	Delhi Gas Pipeline	El Reno	Land	Oil, lubricant
11/20/97	Pump seal failure on tank	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene
02/08/97	Resin plant over-pressurization	100 N. Mustang Rd.	Xerox	Yukon	Air	Butadiene
04/22/96	Oil tank struck by lightning causing fire	11200 NW 10th St.	Kerr-McGee	Yukon	Water	Crude oil
11/19/95	Oil from well leaked into stream			Union City		Crude oil
06/08/95	Drums of oil found in creek	3606 E. Elm St.	Unknown		Water	Methanol



Mitigation Strategy / Recommendations from HMP: "Provide for necessary construction, renovation, retrofitting or refurbishment to protect against Tier 2 releases of hazardous chemicals in appropriate government buildings." New construction should minimize risks to their occupants caused by hazardous materials. Emergency services should plan emergency alerts and evacuation plans for HazMat events

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

Nowhere in the documents is there a mention of how many shelters are in the County, though they are discussed a few times in sections pertaining to tornadoes. For example, it was pointed out that schools using hallways as shelters could result in loss of life due to the wind tunnel effect. The Hazard Mitigation Plan calls on two mitigation measures for tornado shelters in Chapter 6:

- "15. Provide employee shelters/safe-rooms at critical facilities, such as 911 Center, fire stations and police stations to protect first responders."
- "17: Install Safe-Rooms in new and retrofit existing Schools." – in Banner Public Schools, Calumet PS, Darlington PS, El Reno PS, Maple PS, Mustang PS, Okarche PS, Piedmont PS, Union City PS, Canadian Valley Tech, Redlands Community College

C.2.1.3 Public Policy and Governance to Build Disaster Resiliency

Canadian County does not have a planning commission and therefore does not have a comprehensive plan for unincorporated areas of the County. The County also does not enforce building codes however individual towns do follow the up to date regulations. The County does not have planning or zoning regulations in these areas with the exception of the floodplain regulations adopted in 1999. The County has been a member of the National Flood Insurance Program since 1987.

The following towns and institutions have reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact them: Canadian County, Calumet, Okarche, Union City, El Reno, and Piedmont; the public school districts of Banner, Calumet, Darlington, El Reno, Maple, Mustang, Okarche, Piedmont, and Union City; and the post-secondary educational institutions of Canadian Valley Technology Center District No. 6 and Redlands Community College.

The Hazard Mitigation Plan calls to adopt three different shelter- and generator-specific policies and ordinances in Chapter 6 to:

- 19. Register safe rooms and create a GIS data base to locate these in the event of a disaster
- 21. Require new mobile home parks to provide storm shelters/safe rooms for their residents.
- 27. Require a generator pad and wiring/transfer switches for elder care facilities and nursing homes to accommodate a generator.

C.2.1.4 Local Emergency Response Agency Structure

The Hazard Mitigation Plan covers a wide array of mitigation measures, covering everything from storm shelters/safe rooms to public awareness and education to suggestions to adopt ordinances.

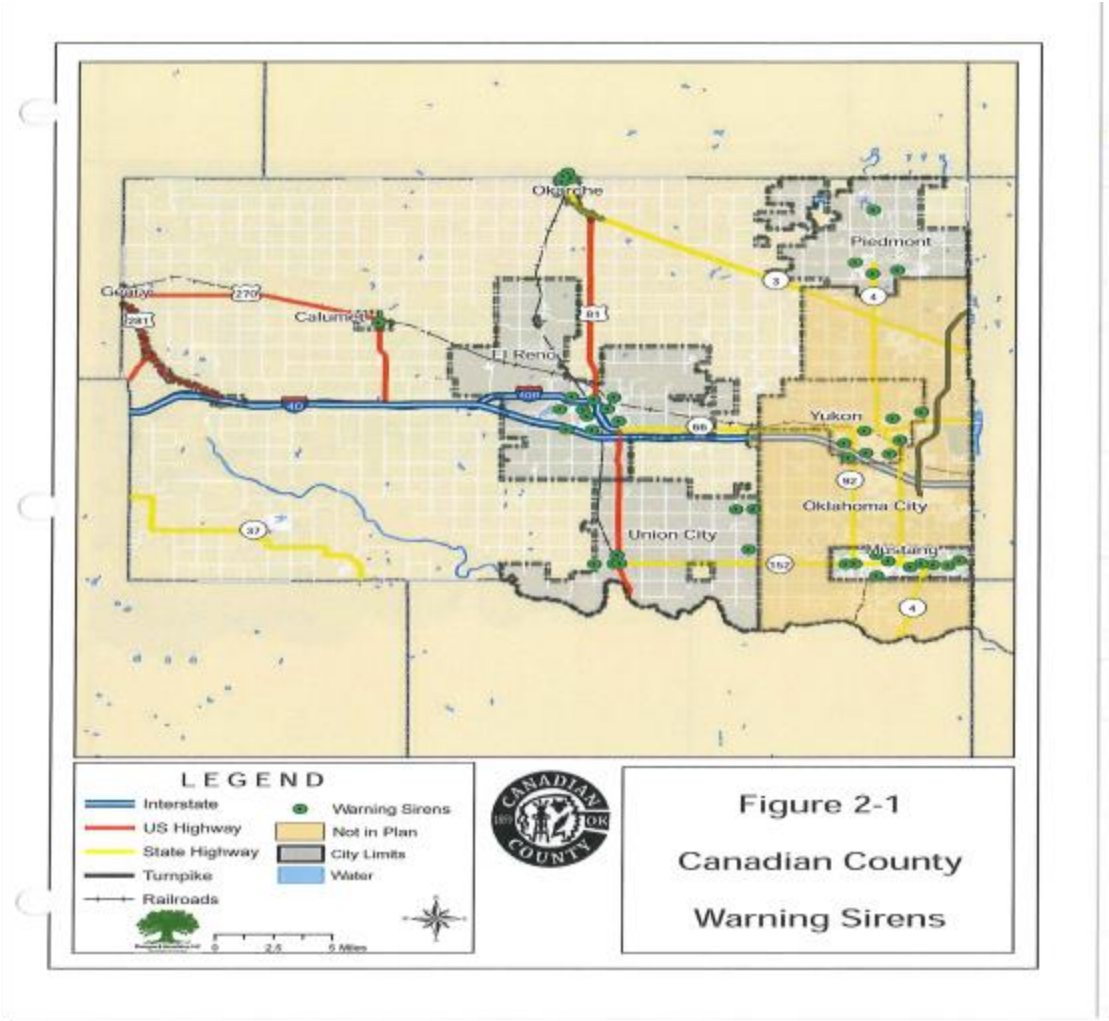
Canadian County has an Emergency Operations Plan in place, stating that the Sheriff's Department assists with storm spotting and the Emergency Manager provides damage assessment. It also mentions that there is no EOP in place for the unincorporated areas of the County.

C.2.1.5 Threat & Hazard Warning Systems

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

- ☐ Outdoor Sirens
- ☐ 2-1-1 system
- ☐ NOAA radio
- ☐ Television
- ☐ Oklahoma Mesonet
- ☐ National Warning System (NAWAS)
- ☐ SkyWarn
- ☐ Oklahoma Law Enforcement Telecommunications System (OLETS)
- ☐ Newspapers (for educational purposes)

The County – not including Oklahoma City – has a total of 28 sirens that exist in urban areas. These can be electronically activated by authorized personnel such as fire fighters, Emergency Management Directors, or Civil Defense Directors.


Okarche
Piedmont
Geary
Calumet
El Reno
Yukon
Oklahoma City
Union City
Mustang
LEGEND
Interstate
US Highway
State Highway
Turnpike
Railroads
Warning Sirens
Not in Plan
City Limits
Water
Figure 2-1
Canadian County
Warning Sirens

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.

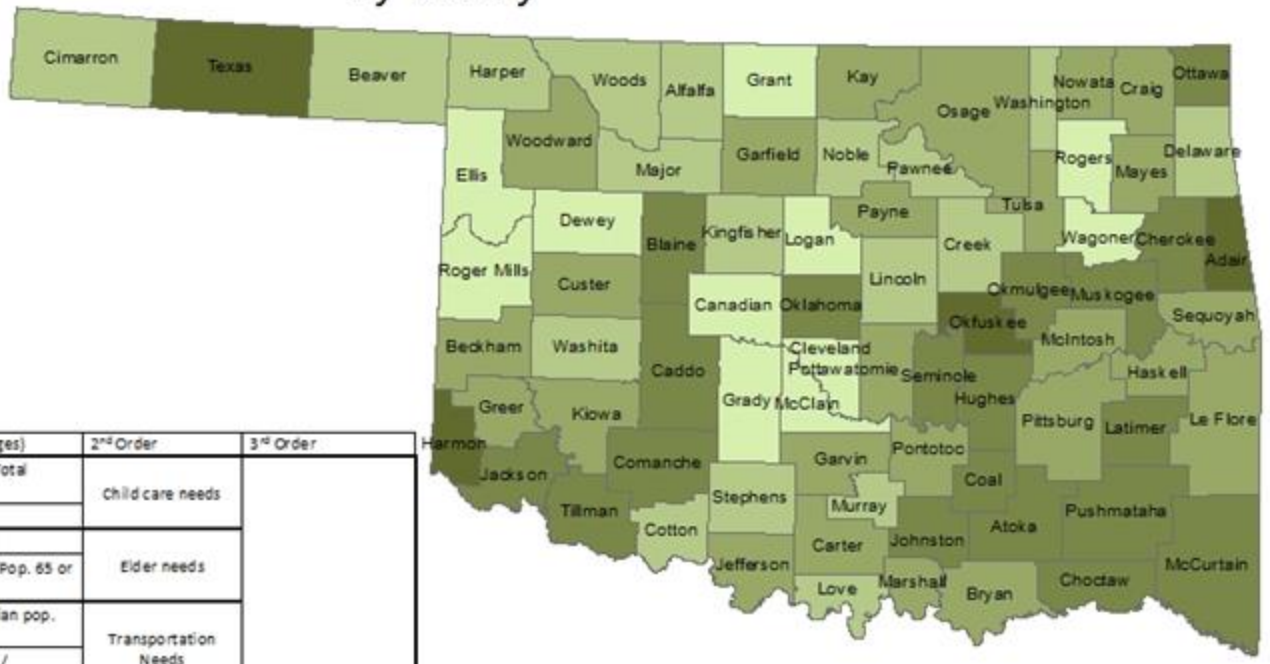
Social Vulnerability Analysis - Canadian County

Base Social Vulnerability Indicators (%)		2nd Order	3rd Order
1.) Single Parent Households	11.95%	0.192 (Child Care Needs)	**2.634 Social Vulnerability 'Hotspot' or Area of Concern**
2.) Population Under 5	7.20%		
3.) Population 65 or Above	11.33%	0.159 (Elder Needs)	
4.) Population 65 or Above & Below Poverty Rate	4.58%		
5.) Workers Using Public Transportation	0.14%	0.033 (Transportation Needs)	
6.) Occupied Housing Units w/o Vehicle	3.14%		
7.) Housing Unit Occupancy Rate	91.00%	2.069 (Temporary Shelter and Housing Recovery Needs)	
8.) Rental Occupancy Rate	22.74%		
9.) Non-White Population	20.87%		
10.) Population in Group Quarters	1.92%		
11.) Housing Units Built Prior to 1990	57.40%		
12.) Mobile Homes, RVs, Vans, etc.	5.94%		
13.) Poverty Rate	7.00%		
14.) Housing Units Lacking Telephones	1.47%	0.181 (Civic Capacity Needs)	
15.) Age 25+ With Less Than High School Diploma	8.60%		
16.) Unemployment Rate	5.20%		
17.) Age 5+ Which Cannot Speak English Well or Not At All	2.86%		

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,

Legend

Social Vulnerabiity "Hot Spots"

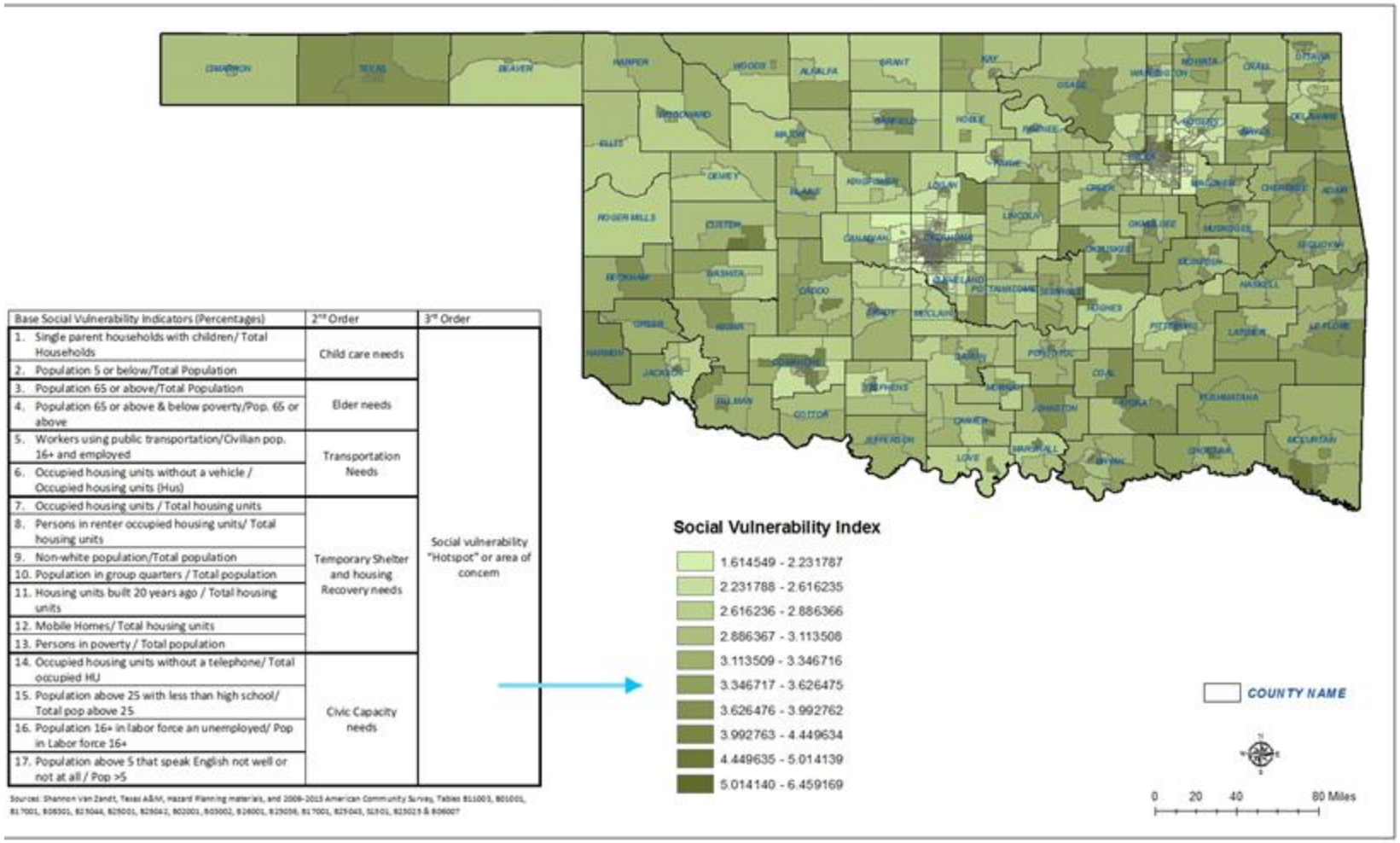
- 2.6340 - 2.9760
- 2.9761 - 3.2170
- 3.2171 - 3.4180
- 3.4181 - 3.6370
- 3.6371 - 3.9500

0 25 50 100 Miles

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		

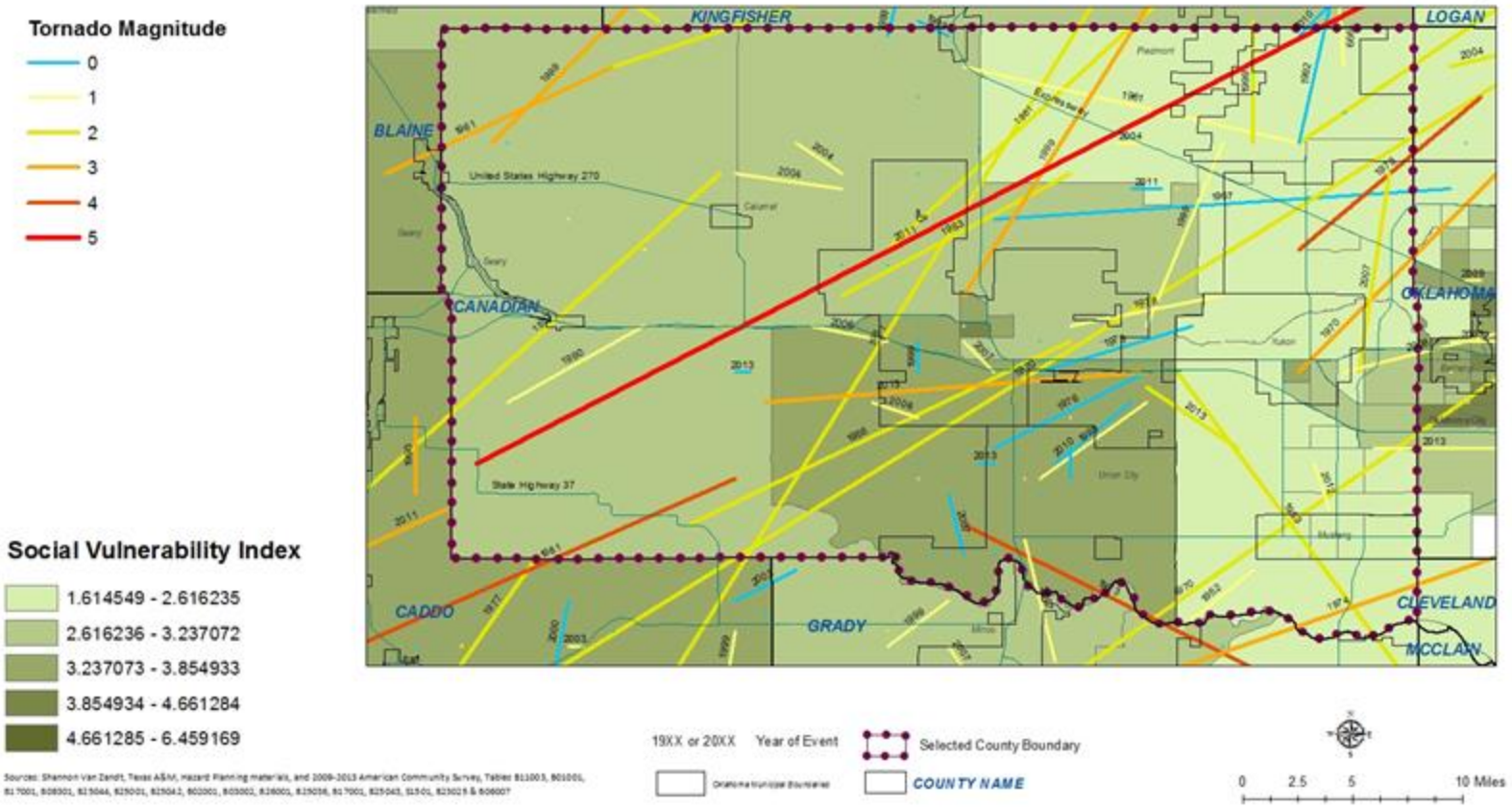
Sources: Shannon Van Zandt, Texas A&M, Hazard Planning materials, and 2009-2013 American Community Survey, Tables B11003, B01001, B17001, B08301, B21044, B25001, B25042, B02001, B03002, B26001, B25036, B17001, B25043, S1501, B23023 & B06007



Social Vulnerability - Impacts on Housing & Disaster Resiliency

Tornado Events 1950 - 2014

Canadian County



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 falls below the average or the state score per this index for social vulnerability when comparing as a county to other counties in the state. Central census tracts have increased social vulnerability and attention to these areas during an event as well as part of recovery efforts could be helpful.

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.