Special Topics

Creek 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 6 key cities within the county (Sapulpa, Bristow, Kellyville, Mannford, Drumright, Mounds).

> **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.

City of Sapulpa has a comprehensive plan. There are direct goals and discussion of connecting the comprehensive plan with the hazard mitigation plan:

"Incorporate elements of the adopted Multi-Hazard Mitigation Plan (such as flood damage prevention) into the public safety program and land use planning program with comprehensive programs of coordination and cooperation between the public and private sectors." P. 22

- Incorporate the Multi-hazard Mitigation Plan into the land use and transportation planning program.
- Proactively seek and support initiatives for public and private funding for public safety programs and services.

Floodplain Management Goals:
1. Plan and prioritize the projects and provisions of the adopted Master Drainage Plans in the best interests of the public safety and welfare of all residents as funds are available.
2. Provide proper flood control in conjunction with stormwater drainage facilities to safeguard the citizenry and their property from the hazards of flooding, erosion, siltation and standing water. (p.28)

- Designate flood-prone areas as Development Sensitive and Conservation Areas and allow development only in accordance with the adopted flood damage prevention regulations and permitting requirements.

Clearly, planning in Sapulpa is working to be in alignment with the same principles outlined in the county HMP in order to protect the welfare of their community.

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. Creek County does have a Hazard Mitigation Plan.

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.

Creek County Hazard Mitigation Plan

The Creek HMP explored scenarios related to each major risk to the community based on probability of an event occurring and potential damages and losses. This HMP was particularly progressive in performing this analysis as well as looking at their vulnerable populations within this plan to focus some of their attention in preparedness and recovery.

This plan further explored development trends in the area:

"There are 43,005 parcels of property in County. Of these, 18,189 parcels are undeveloped. And of these 18,819 undeveloped parcels, 3737 are in the regulatory floodplain; 1130 residential, 65 commercial, and 1794 agricultural. Map Number 17 in Appendix 1 shows this information. It must be noted that no new building development will be added to the flood hazard because any new building will conform to the County's Flood Damage Prevention Ordinance, which the County will continue to vigorously enforce. It will be recommended to all new construction to investigate the shrink-swell potential of its soils, and design and construct the foundation with the soils' properties as a consideration." (p. 57)

Goals were also developed for all the hazard potential events:

"Goal 1 General: To protect vulnerable populations and critical facilities from hazards.
Objectives:

1. Minimize the loss of life and damage to property and infrastructure from natural and man-made disasters.
2. Increase public awareness of risks from hazards and implement measures that can be taken to protect families and property from disasters.
3. Reduce the risk and effects of hazards and minimize disruption in the county.
4. Identify and protect vulnerable populations from natural and man-made hazards.
5. Identify and protect critical county and community facilities from hazards so that they can continue their missions in the event of a disaster.

Goal 2 Flood Hazard: To reduce the risk of flood hazard in Creek County.
Objectives:

1. Identify buildings at risk from the 100-year regulatory flood.
2. Ensure that development does not increase flooding downstream or have off-site adverse impacts.
3. Identify and maximize the natural and beneficial uses of the floodplain.
4. Implement the best flood control measures to reduce vulnerability of flood-prone properties.

Goal 3 Tornado Hazard: To reduce the risk from tornados in Creek County
Objectives:

1. Encourage building of individual safe rooms and storm shelters.
2. Educate and encourage the building trades industry about construction standards that are adequate to withstand frequent high winds.

Goal 4 Hailstorm Hazard: To reduce the risk from hailstorms in Creek County.
Objectives:
1. Promote construction of hail resistant roofs.

Goal 5 Lightning Hazard: To reduce the risk from lightning in Creek County.
Objectives:
1. Reduce loss of life and property, and injury due to lightning by increased public awareness of measures to prevent and reduce damage, including warnings.

Goal 6 Winter Storm Hazard: To reduce the hazards from winter storms in Creek County.
Objectives:
1. Reduce property loss and community disruption due to severe winter cold and ice storms.

Goal 7 High Winds Hazard: To reduce the risk from high winds in Creek County.
Objectives:
1 Educate and encourage the building trades industry about construction standards that are adequate to withstand frequent high winds.

Goal 8 Drought Hazard: Reduce the economic impact of drought hazards to Creek County.
Objectives:
1. Reduce damage to property and building foundations due to drought by improving building codes.

Goal 9 Wildfire Hazard: To reduce the threat of wildfire hazards and their financial impact in Creek County.
Objectives:
1. Develop a County-wide fire response and support group to facilitate the provisioning of water to fires during large fires.

Goal 10 Expansive Soil Hazard: Reduce structure's susceptibility to soil movement.
Objectives:
1. Reduce damage to property and building foundations due to expansive soils by improving building codes.

Goal 11 Earthquake Hazard: To reduce the risk from earthquakes in Creek County.
Objectives:
1. Educate and encourage the building trades industry about earthquake resistant construction.

Goal 12 Hazardous Materials Hazard: To reduce the risk from hazardous material storage facilities around Creek County.
Objectives:
1. Protect the public from exposure from hazardous materials events from sites within the community. (pgs 58-59)

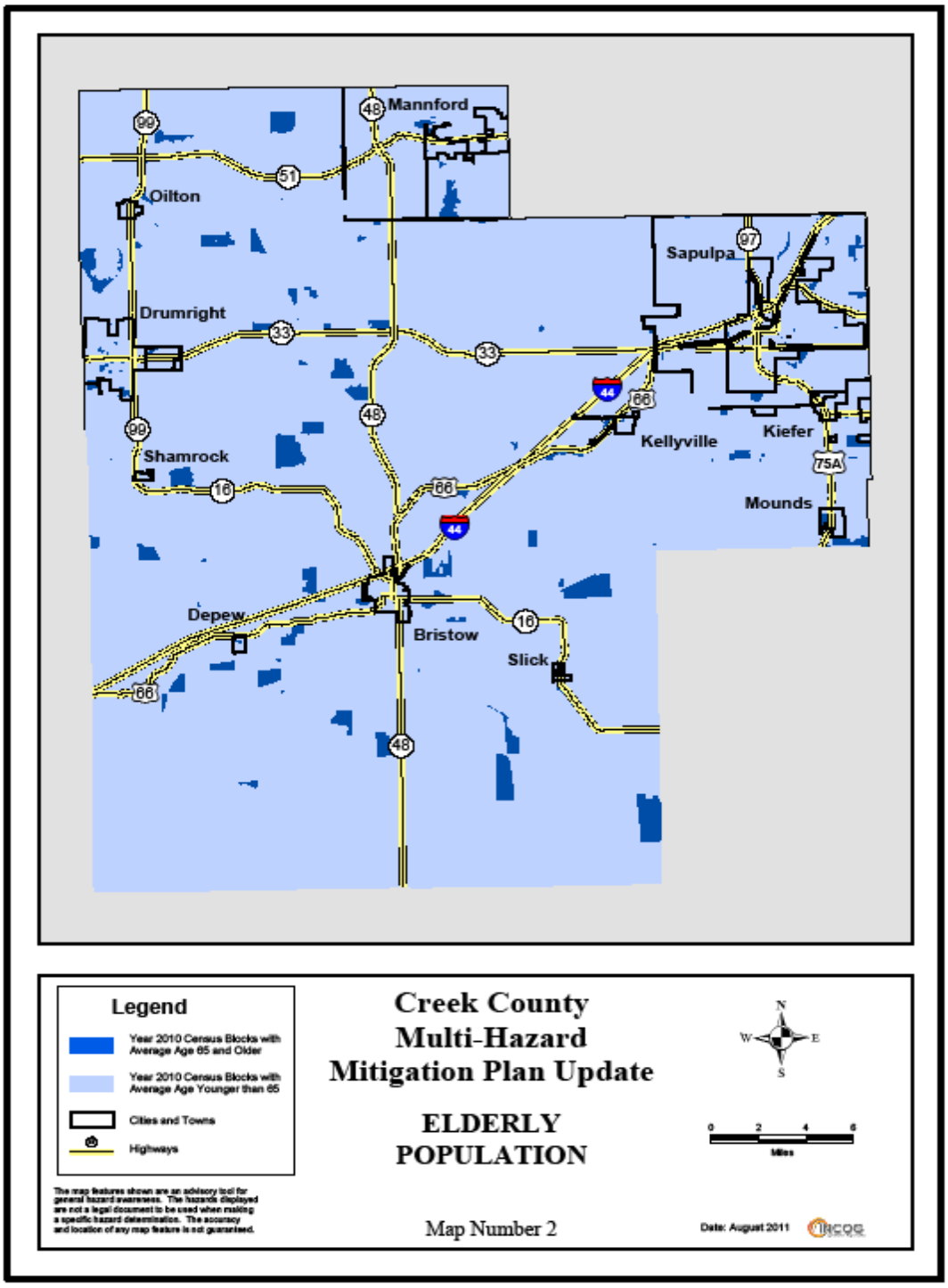
Prioritized list of projects to address goals in the HMP included:

1. Complete 911 addressing for all of the County
2. **Develop specific ideas for educating the public and businesses about hazards that can affect them, and methods of preparing for and minimizing the hazard event.**
3. Identify and plan for hazardous materials and incidents on major transportation routes through Creek County

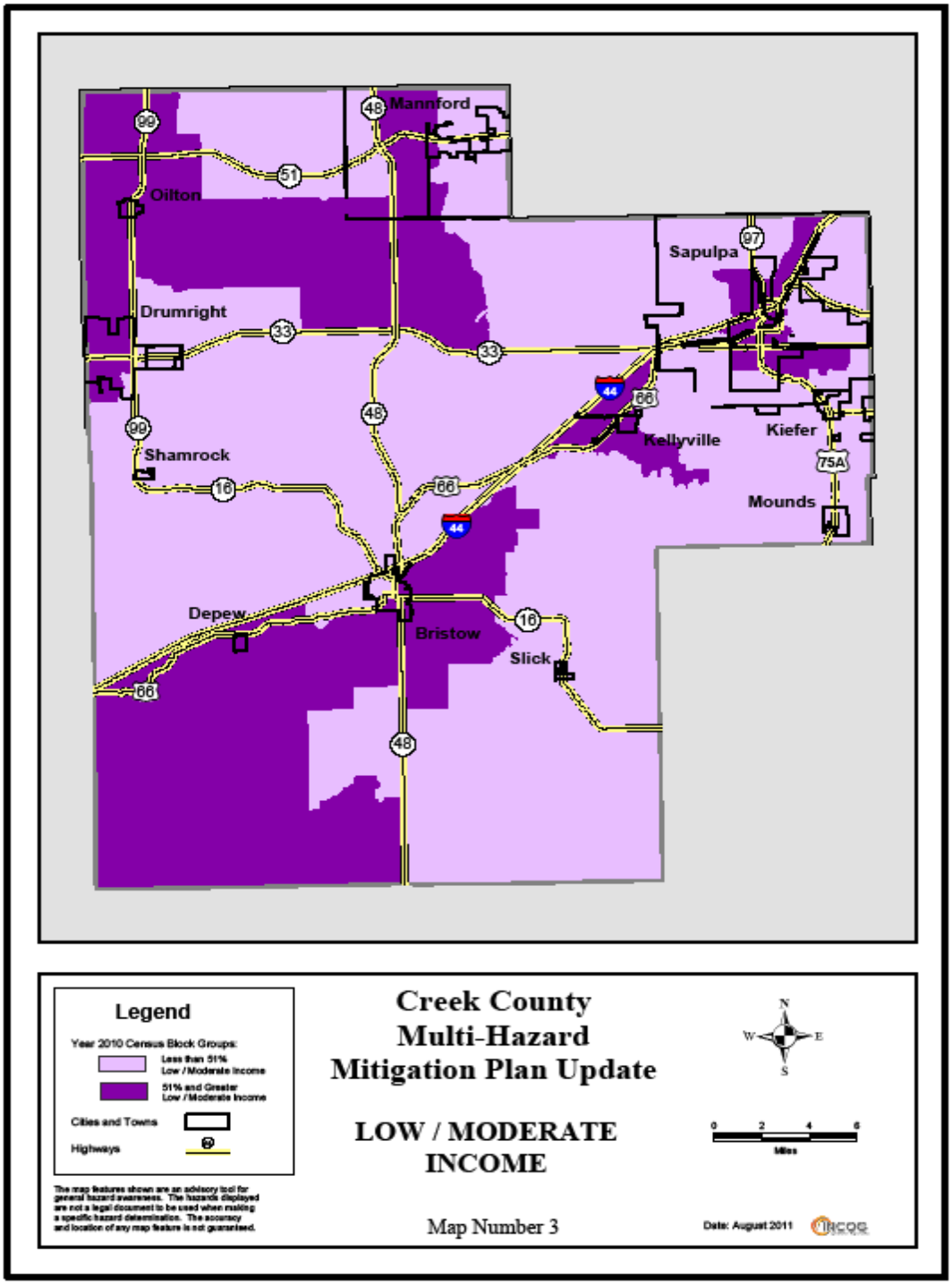
4. Develop a countywide fire response and support group to facilitate the provisioning of water to fire departments during large fires.
5. Build community partnerships involving local government leaders, civic, business and volunteer groups to work together.
6. **Acquire accurate or verify accuracy of existing flood plain maps and develop land use regulations to avoid construction in flood-prone locations.**
7. Inspect Creek County schools for tornado and high wind vulnerability.
8. Construct adequate bridges to pass 100-year regulatory flood without overtopping.
9. **Investigate voluntary pilot demonstration projects for mobile home communities providing a shelter and/or safe rooms for residents.**
10. Acquire and remove Repetitive Loss Properties and repeatedly flooded properties where acquisition is the most cost effective and desirable mitigation measure.

Bolded items above are clearly connected to building housing in the appropriate locations to avoid repeated flooding and the county is exploring ways to protect vulnerable populations such as those living in mobile homes.

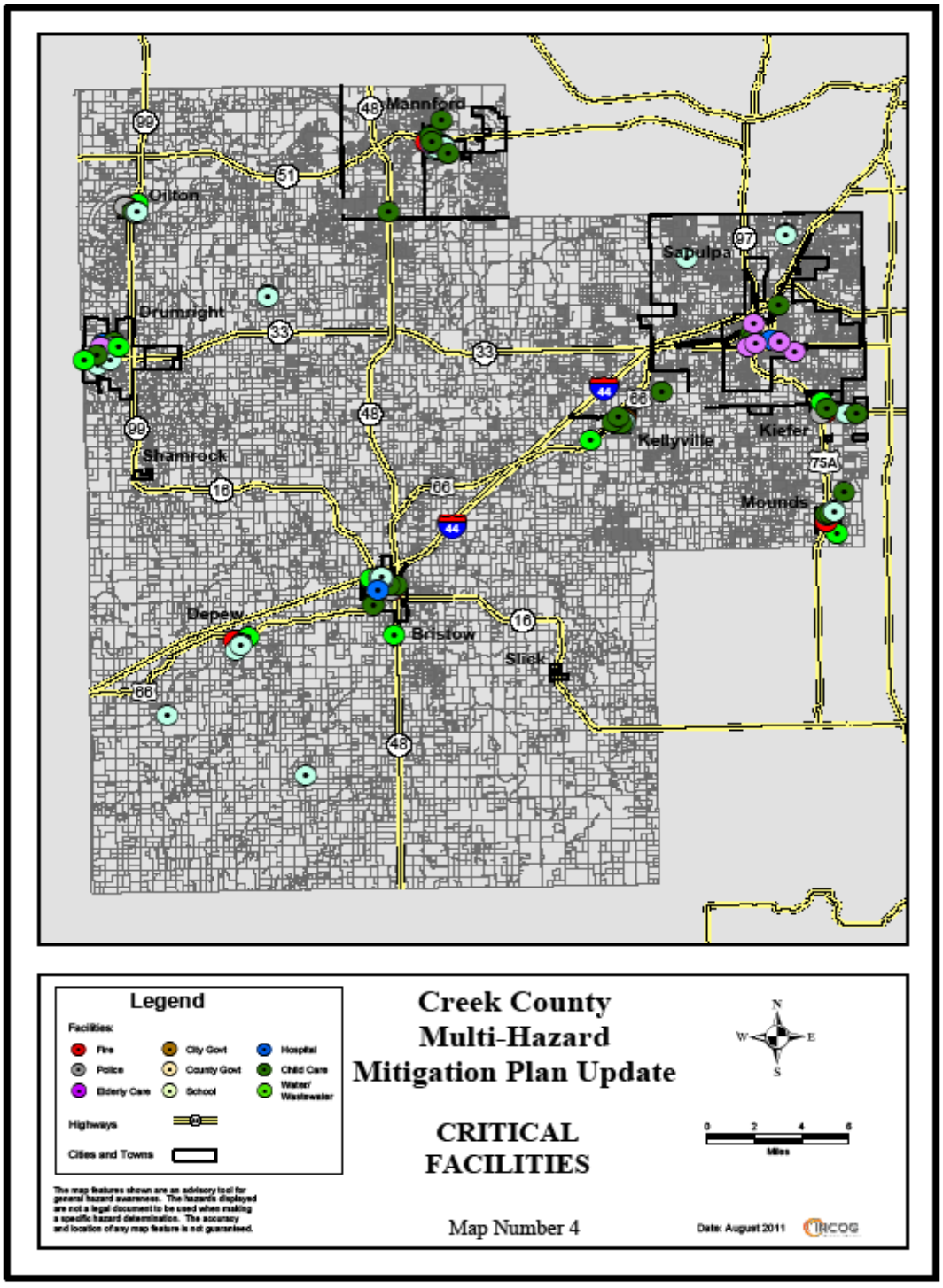
As mentioned previously, this HMP provided analysis and attention to their vulnerable populations and mapped these areas:



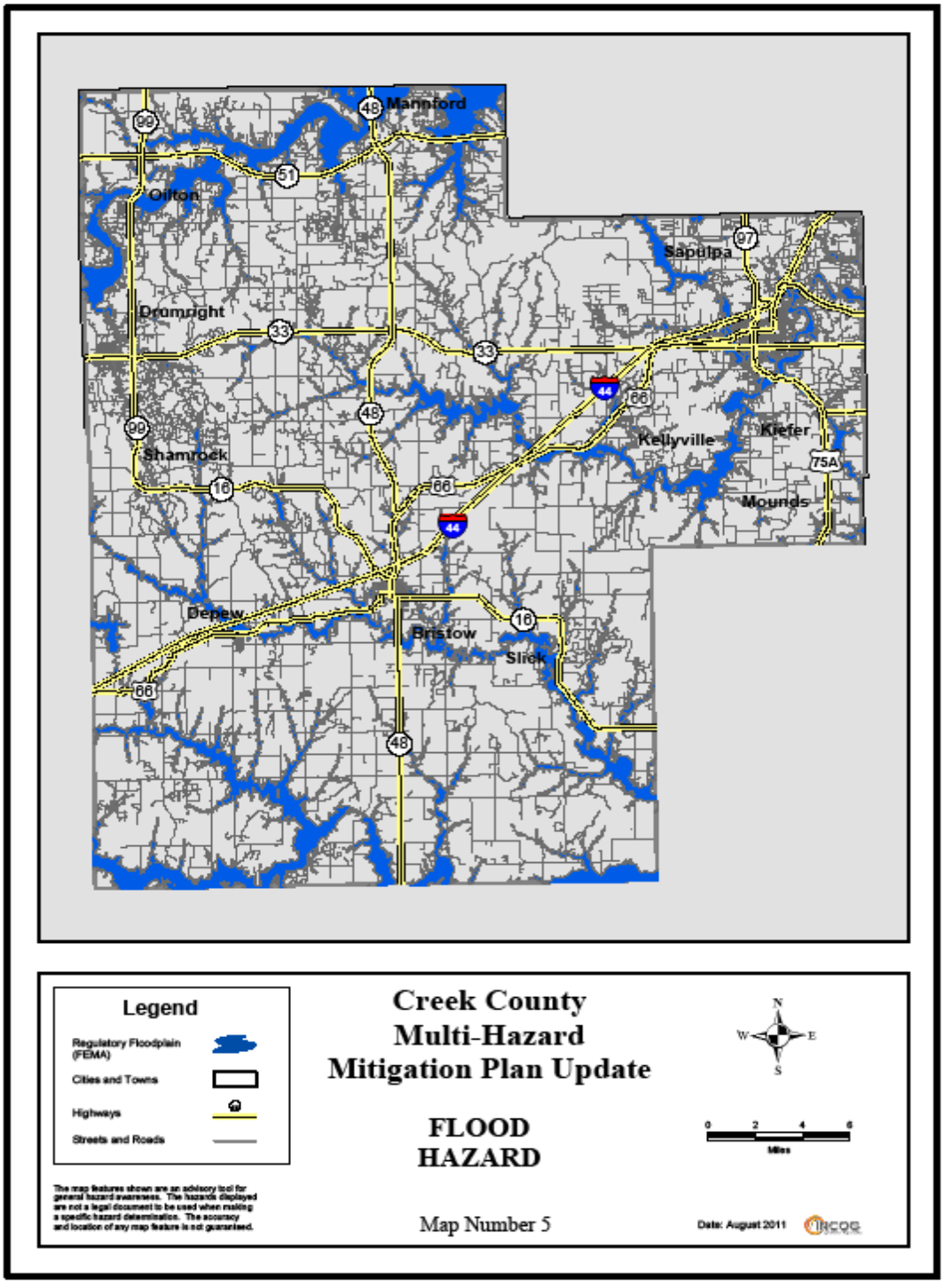
(Creek County HMP, p. 96)



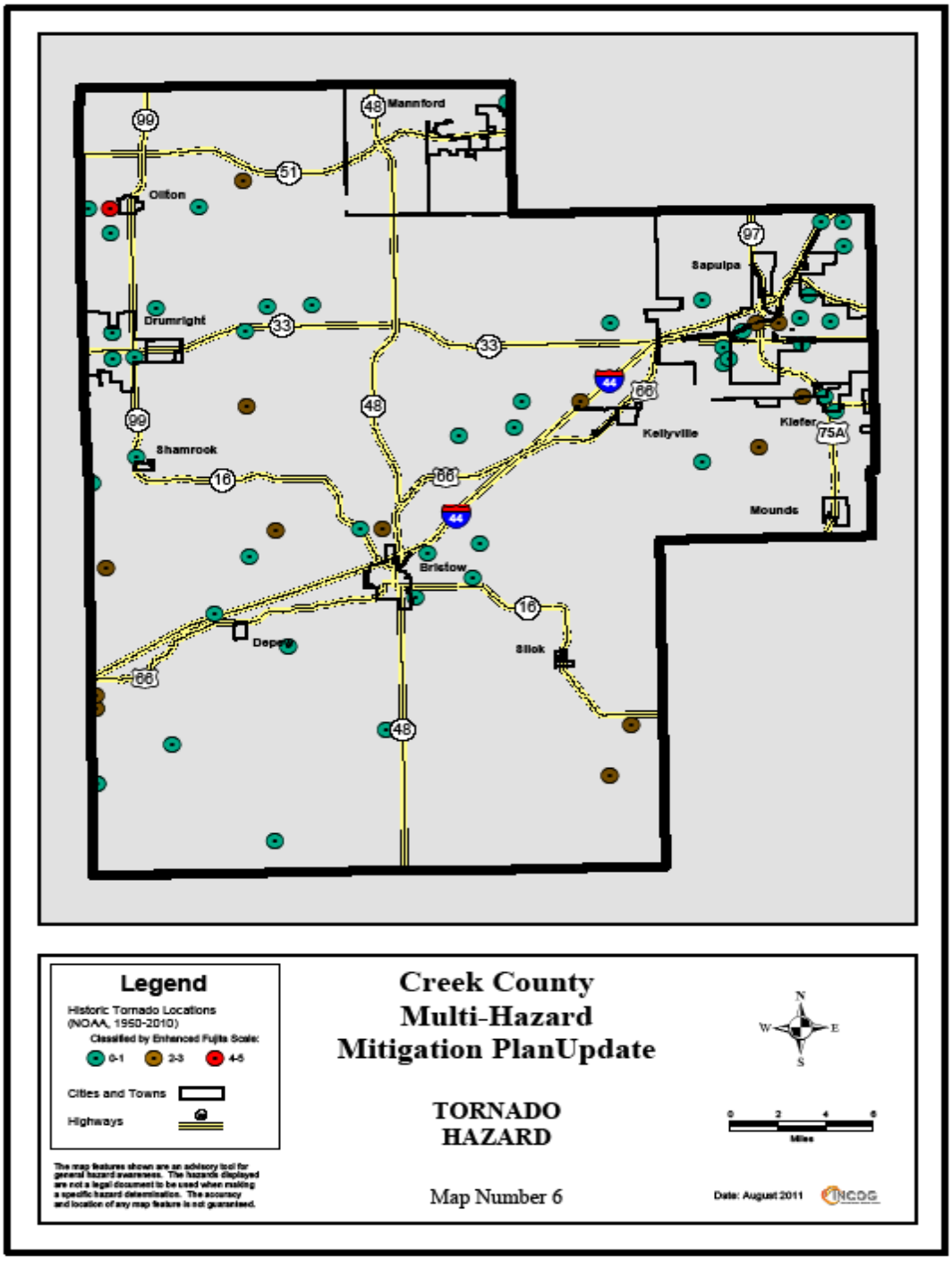
(Creek County HMP, p. 97)



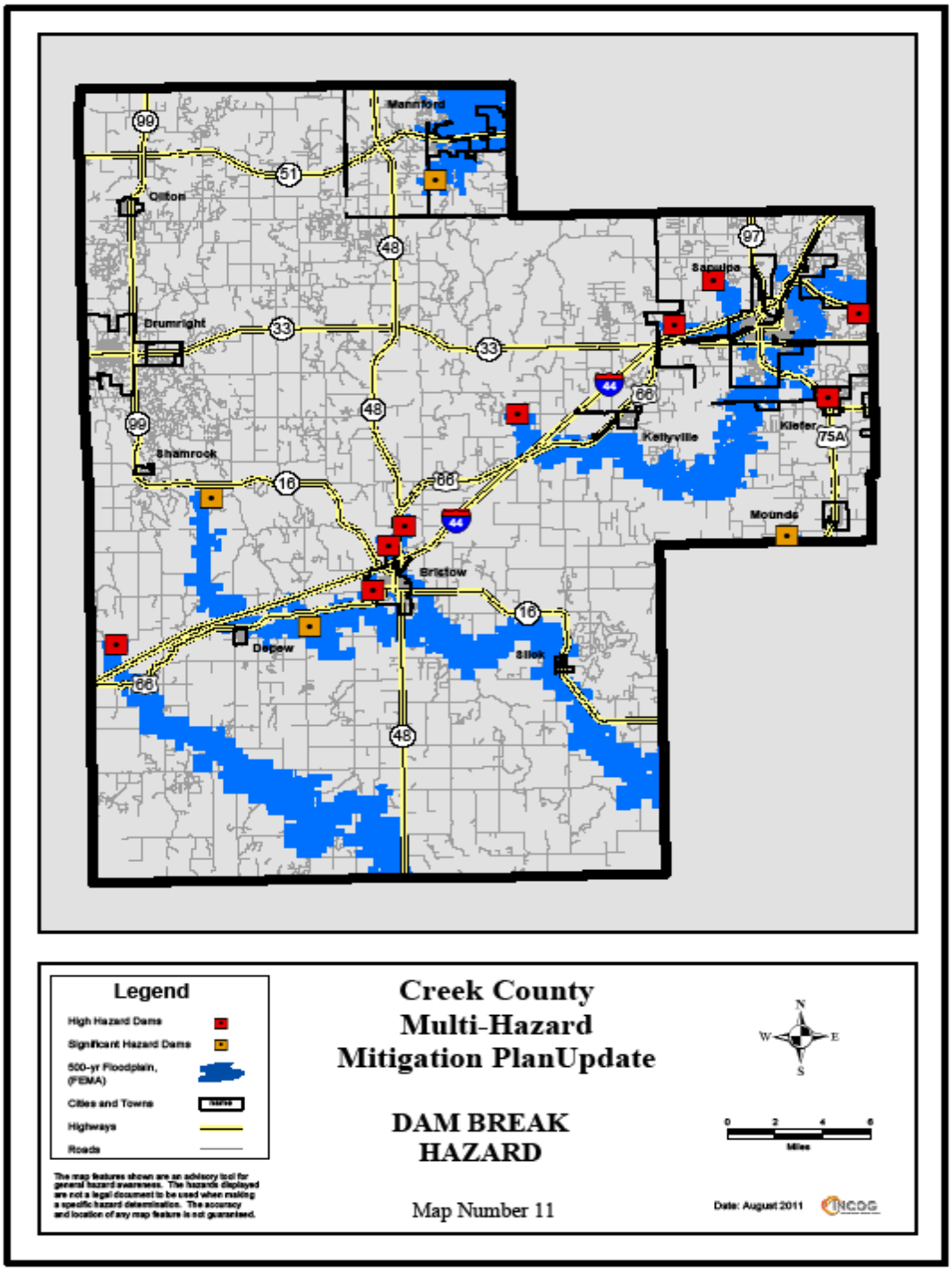
(Creek County HMP, p. 98)



(Creek County HMP, p. 99)



(Creek County HMP, p. 100)



(Creek County HMP, p. 105)

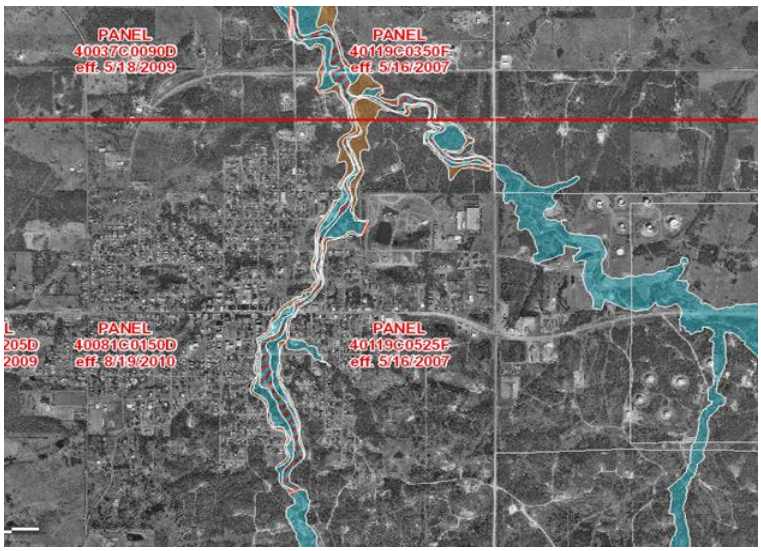
Sapulpa Hazard Mitigation Plan
Mitigation Measures

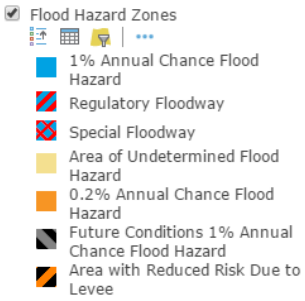
The following are the top ten high priority mitigation measures defined by the Sapulpa Hazard Mitigation Planning Committee.

- Floods - Implement structural and non-structural flood mitigation measures for flood-prone properties as recommended in the basin-wide master drainage plans and by FEMA.
- Floods - Eliminate Storm-water infiltration and inflow (I&I) into the sanitary sewer system.
- Floods - Obtain and install flood level monitoring equipment in Polecat and Rock Creeks.
- Floods - Launch an automatic monitoring and warning system for spot flooding.
- Floods - Acquire and remove Repetitive Loss Properties and repeatedly flooded properties where the community's Repetitive Loss and master drainage plans identify acquisition to be the most cost effective and desirable mitigation measure.
- General - Develop a Sapulpa debris management program.
- Tornadoes & High Winds - Provide Safe Rooms in Fire and Police stations to protect first responders.
- Tornadoes & High Winds - Investigate building codes and incentives for adequacy for tornadoes and high winds.
- Extreme Heat - Develop a heat response plan for Sapulpa.
- Urban Fires - Replace/continue replacing inadequately sized water lines with lines of sufficient size to provide proper fire protection to annexed and existing areas.

To supplement the information already provided in the HMPs, this data was prepared for the counties for this study to look at historical tornado fatalities, injuries, and property losses.

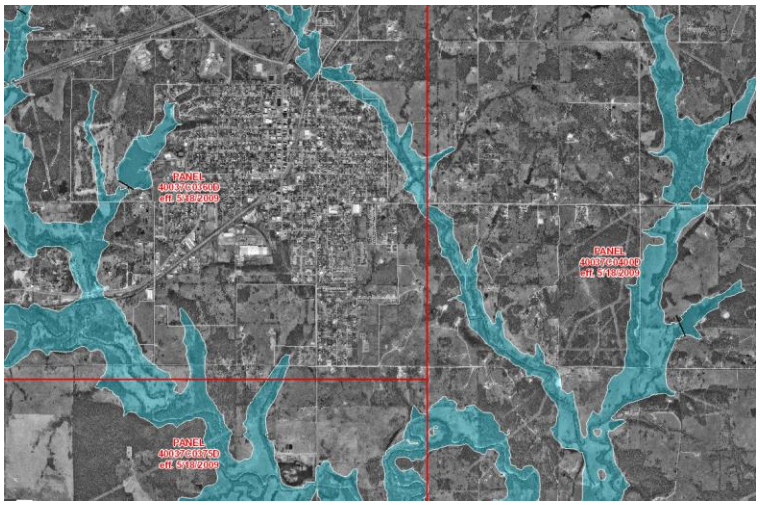
Drumright

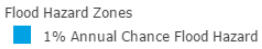




FEMA's National Flood Hazard Layer http://fema.maps.arcgis.com/

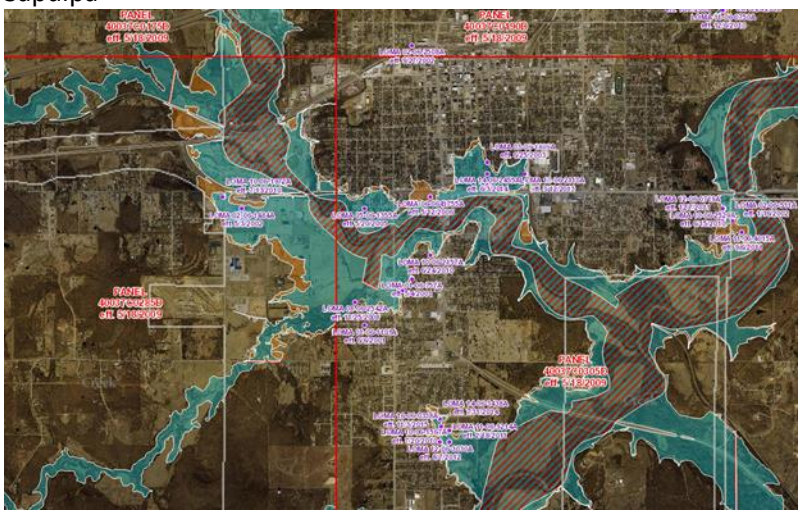
Bristow

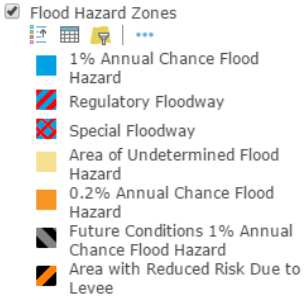




FEMA's National Flood Hazard Layer http://fema.maps.arcgis.com/

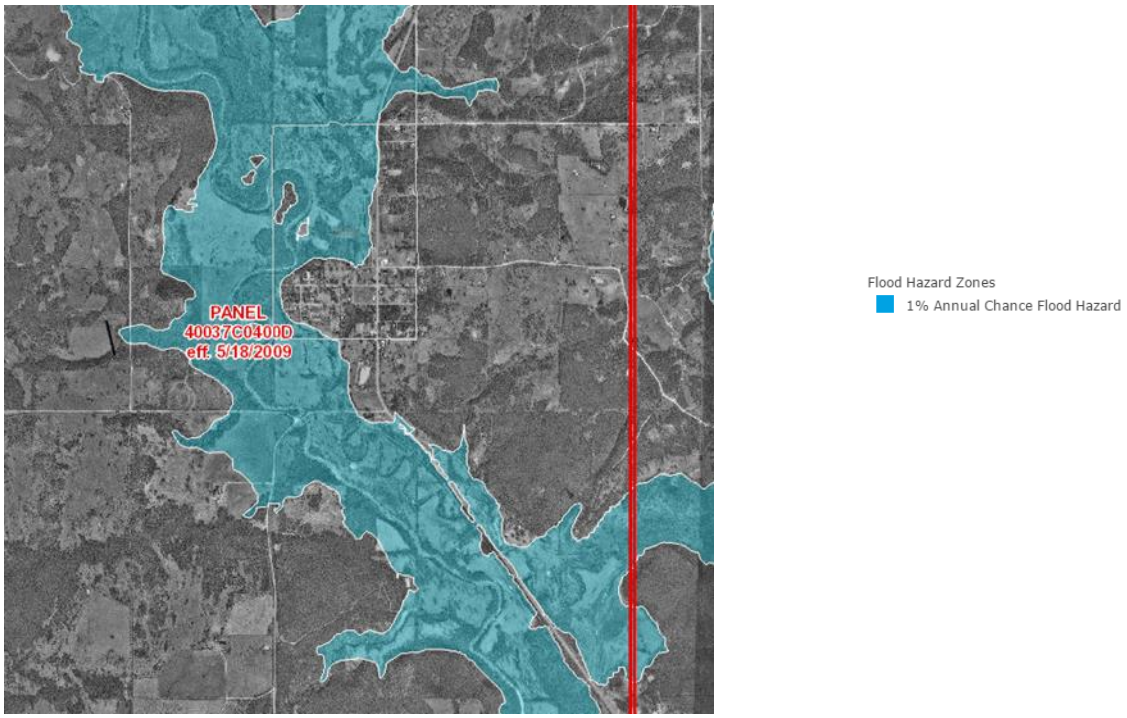
Sapulpa





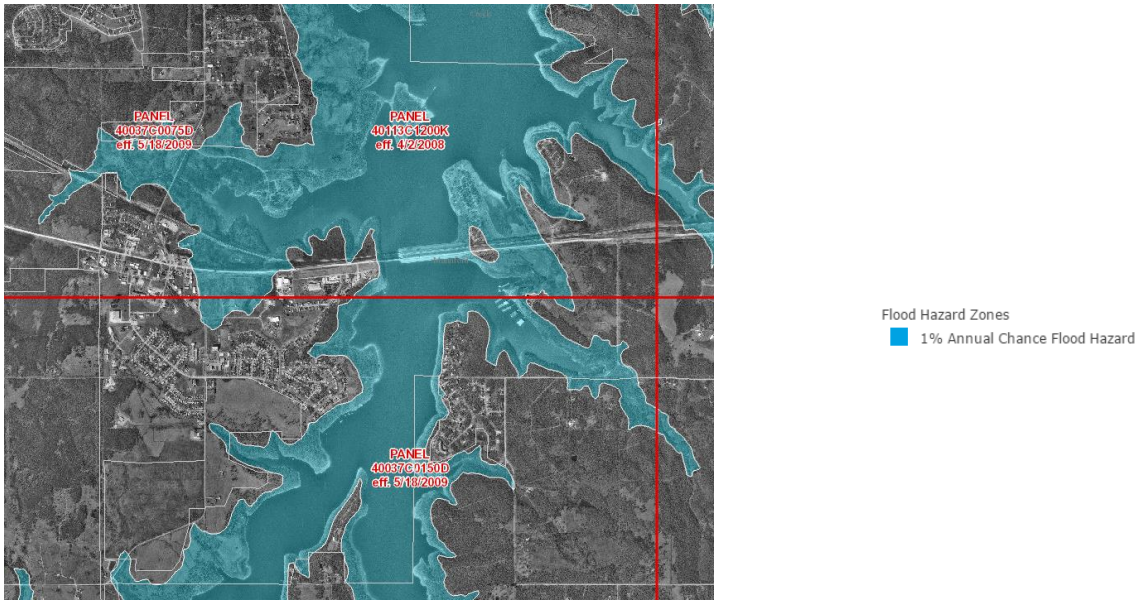
FEMA's National Flood Hazard Layer http://fema.maps.arcgis.com/

Slick



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

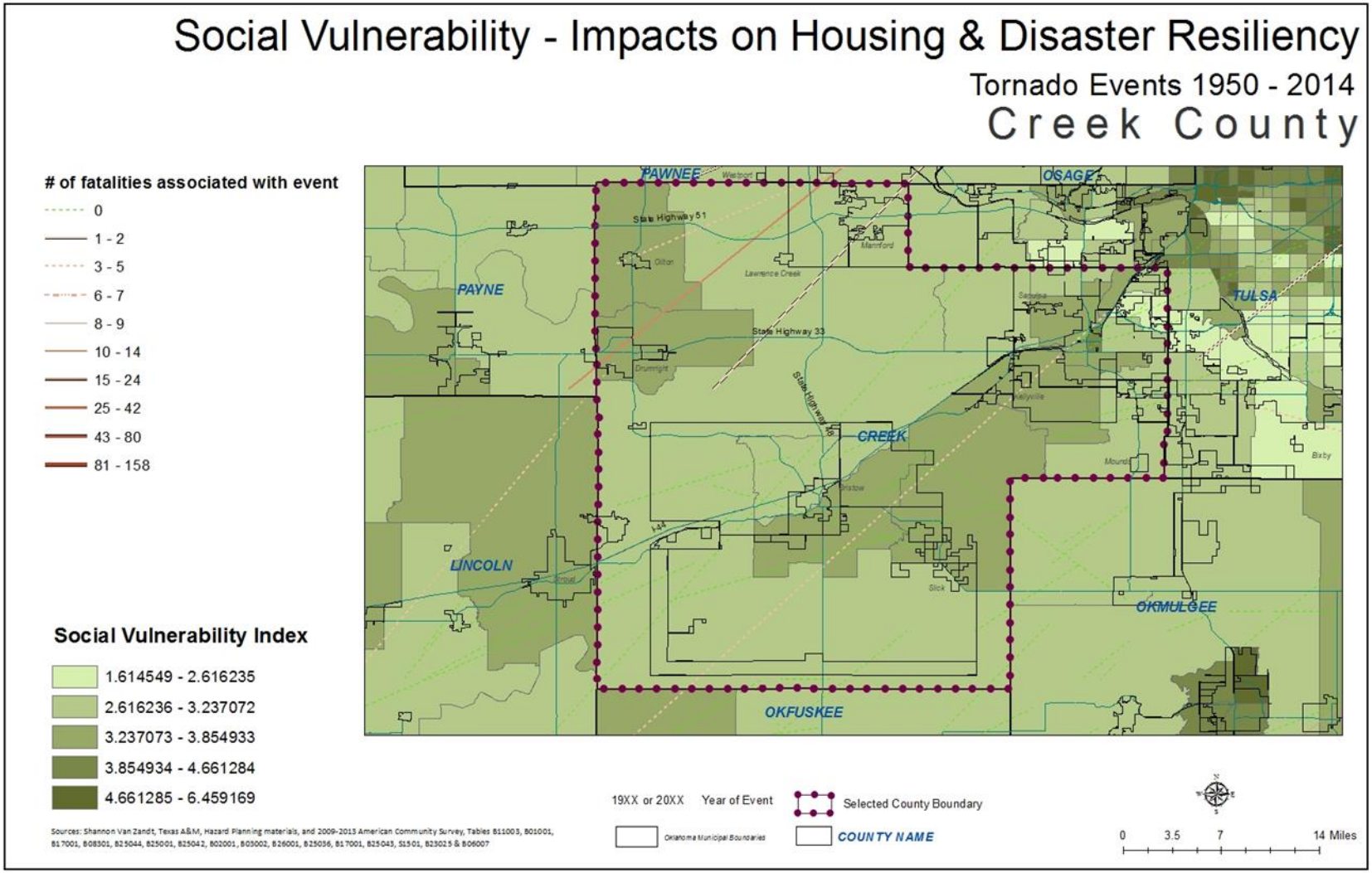
Mannford

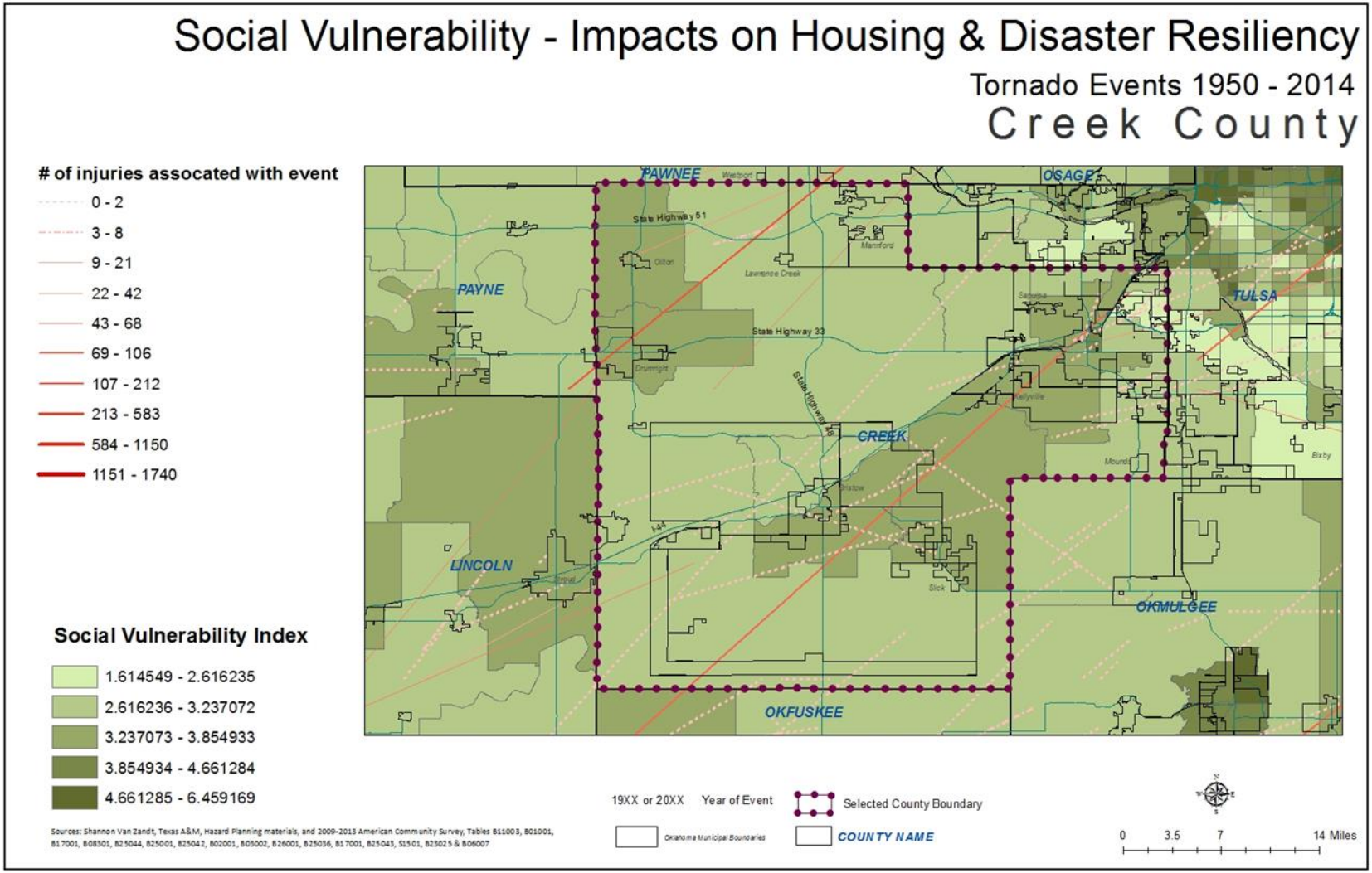


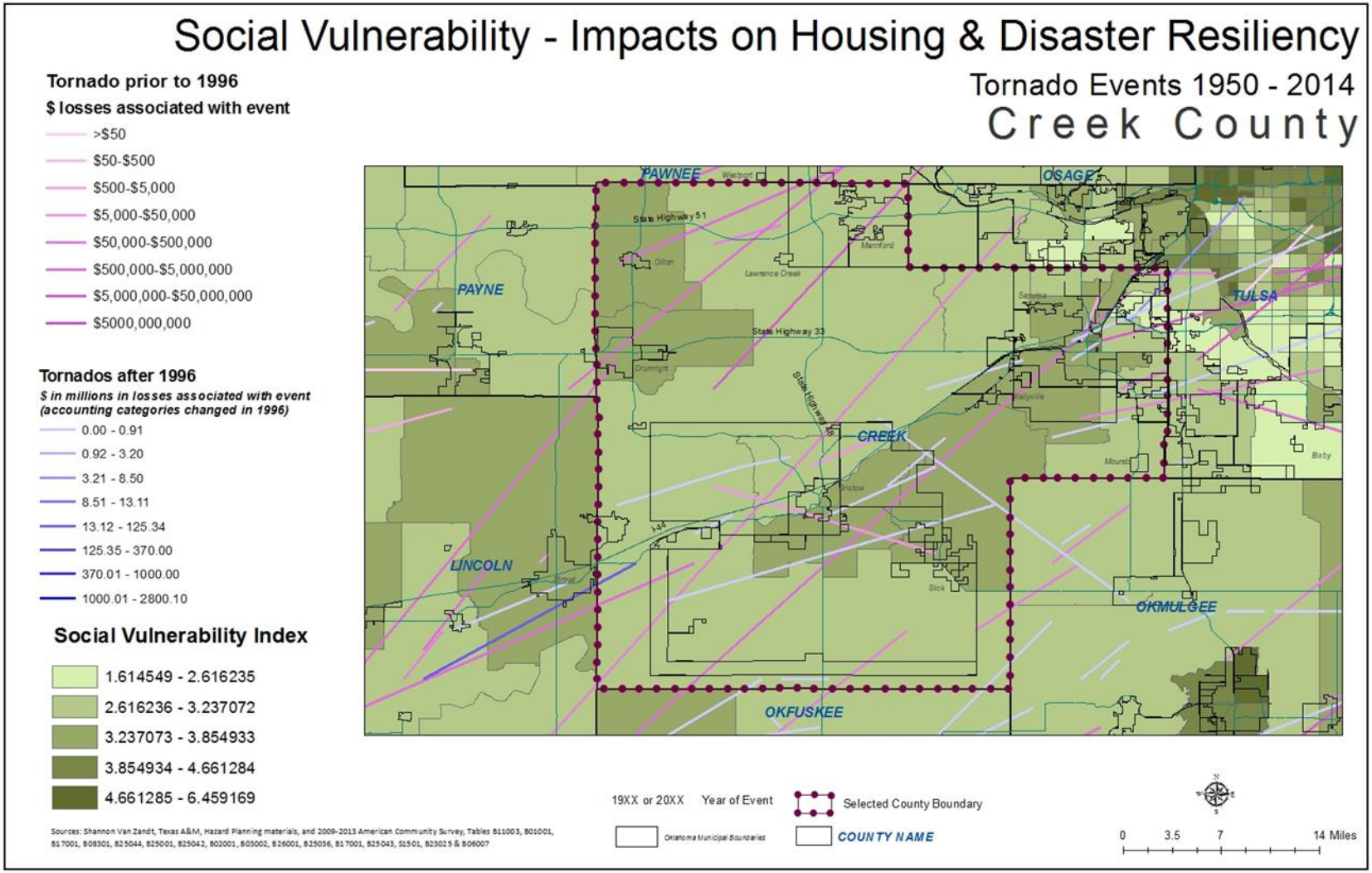
FEMA's National Flood Hazard Layer http://fema.maps.arcgis.com/

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

Historic data on tornados between 1950-2014 there are 64 tornados documented. There were 526 injuries that occurred connected to these tornados, with 13 of those injuries happening in the 1999 tornado and 150 injuries related to the 1974 tornado. There were 30 fatalities connected to tornadoes during this time period, 14 of which occurred in 1974. Property losses between 1950-1996 ranged from $12,935,503.00 to $129,355,150.00. (The accounting methods used for losses changed in 1996.) The losses estimated between 1996-2014 was $70,290,000.00.


Social Vulnerability - Impacts on Housing & Disaster Resiliency
Tornado Events 1950 - 2014
Creek 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
PAWNEE
OSAGE
PAYNE
TULSA
CREEK
LINCOLN
OKMULGEE
OKFUSKEE
State Highway 51
State Highway 33
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 3.5 7 14 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
Creek 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
PAWNEE
OSAGE
PAYNE
TULSA
CREEK
LINCOLN
OKMULGEE
OKFUSKEE
State Highway 51
State Highway 33
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 3.5 7 14 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
Creek County
Tornado prior to 1996
$ losses associated with event
>$50
$50-$500
$500-$5,000
$5,000-$50,000
$50,000-$500,000
$500,000-$5,000,000
$5,000,000-$50,000,000
$5000,000,000
Tornados after 1996
$ in millions in losses associated with event
(accounting categories changed in 1996)
0.00 - 0.91
0.92 - 3.20
3.21 - 8.50
8.51 - 13.11
13.12 - 125.34
125.35 - 370.00
370.01 - 1000.00
1000.01 - 2800.10
Social Vulnerability Index
1.614549 - 2.616235
2.616236 - 3.237072
3.237073 - 3.854933
3.854934 - 4.661284
4.661285 - 6.459169
PAWNEE
OSAGE
PAYNE
TULSA
CREEK
LINCOLN
OKMULGEE
OKFUSKEE
State Highway 51
State Highway 33
19XX or 20XX Year of Event
Selected County Boundary
Oklahoma Municipal Boundaries
COUNTY NAME
0 3.5 7 14 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

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

No public shelters were noted. However, the County HMP does include language to pursue addressing shelters for mobile home parks and encouraging through Safe Room Rebate program for individuals to have private shelters at home.

Storm shelter registration for Creek County:

http://www.creekcountyonline.com/cem_files/CreekCountySafeRoomRegistration.pdf

C.2.1.3 Public Policy and Governance to Build Disaster Resiliency

The Sapulpa comprehensive plan states directly that policies and planning should be in alignment with HMP for the city and county. Many provisions to avoid developing in flood-prone areas are supported.

C.2.1.4 Local Emergency Response Agency Structure

C.2.1.5 Threat & Hazard Warning Systems

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

- ☐ Sirens
- ☐ Phone notification (Nixle)
- ☐ Emergency Broadcast System

City of Drumright included in their CIP in 2010 to replace older storm sirens.
City of Bristow included in the HMP to replace 2 sirens and add a

Social Vulnerability

Based on the research work done by the Texas A&M University Hazard Reduction and Recovery Center [CITATION], 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 the

Social Vulnerability Analysis - Creek County

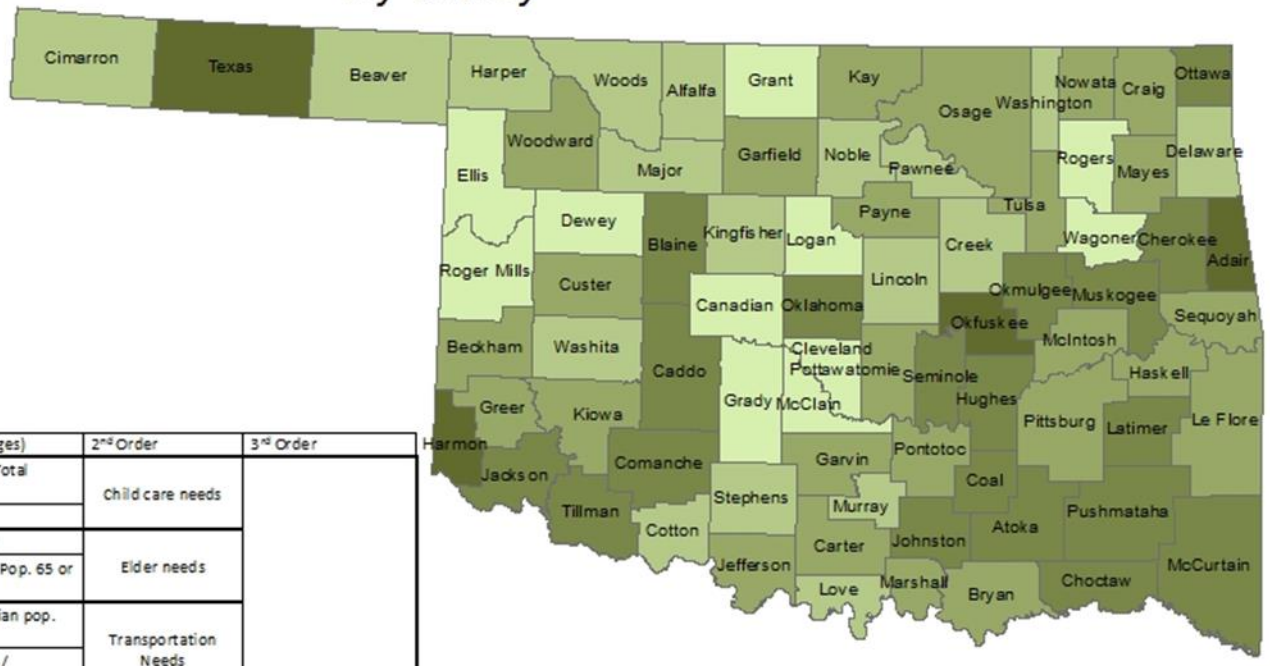
Base Social Vulnerability Indicators (%)		2nd Order	3rd Order
1.) Single Parent Households	12.40%	0.187 (Child Care Needs)	**3.138 Social Vulnerability 'Hotspot' or Area of Concern**
2.) Population Under 5	6.26%		
3.) Population 65 or Above	15.55%	0.249 (Elder Needs)	
4.) Population 65 or Above & Below Poverty Rate	9.38%		
5.) Workers Using Public Transportation	0.12%	0.044 (Transportation Needs)	
6.) Occupied Housing Units w/o Vehicle	4.32%		
7.) Housing Unit Occupancy Rate	88.40%	2.393 (Temporary Shelter and Housing Recovery Needs)	
8.) Rental Occupancy Rate	25.20%		
9.) Non-White Population	22.11%		
10.) Population in Group Quarters	1.13%		
11.) Housing Units Built Prior to 1990	68.82%		
12.) Mobile Homes, RVs, Vans, etc.	18.91%		
13.) Poverty Rate	14.72%		
14.) Housing Units Lacking Telephones	1.62%	0.265 (Civic Capacity Needs)	
15.) Age 25+ With Less Than High School Diploma	15.20%		
16.) Unemployment Rate	8.69%		
17.) Age 5+ Which Cannot Speak English Well or Not At All	0.94%		

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

reof – can highlight places where additional work is needed to reduce impacts on households.

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		

Legend

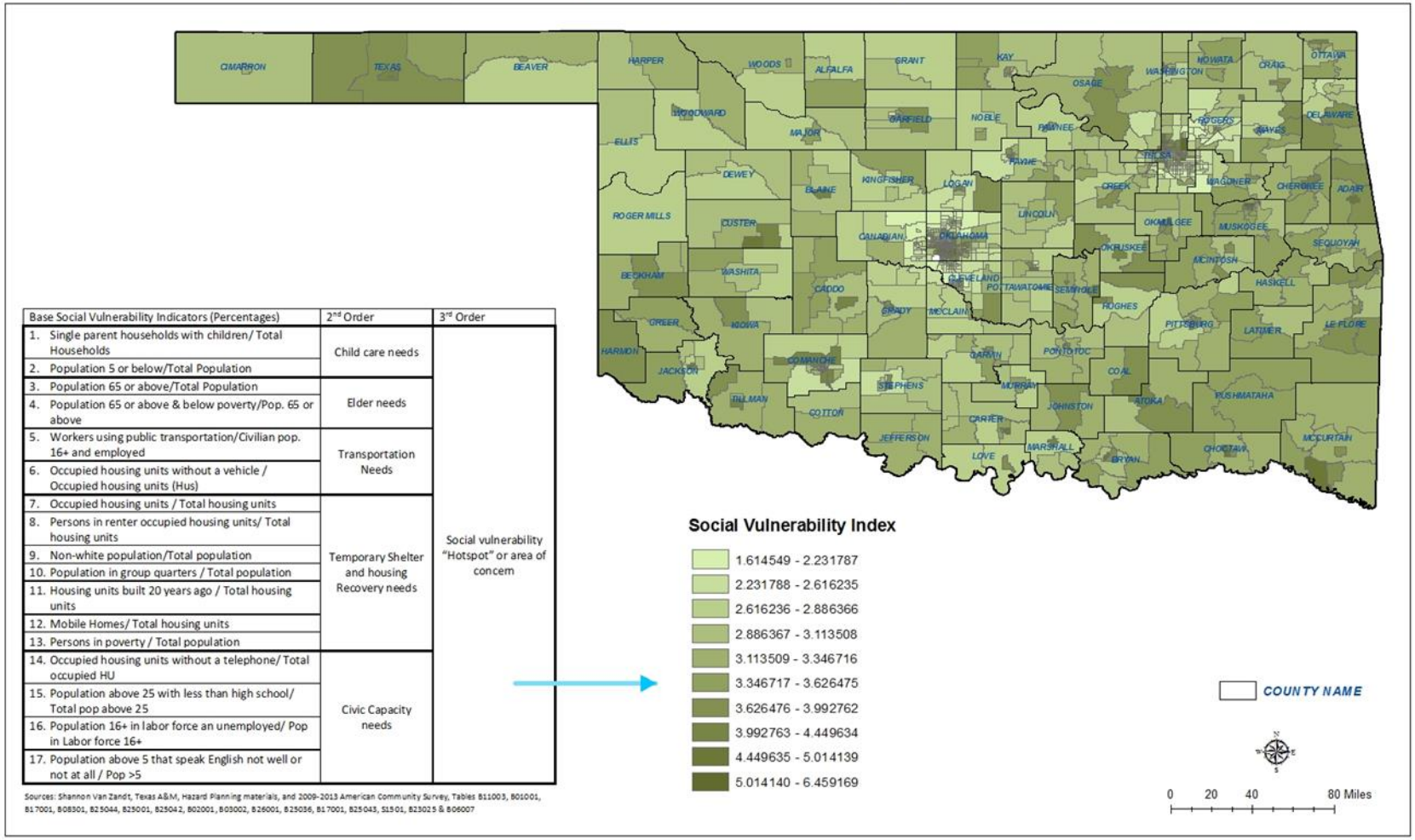
Social Vulnerabiity "Hot Spots"

- 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

Source: Shannon Van Zandt, Texas A&M, Hazard Planning materials; 2008-2013 American Community Survey, Tables B11003, B01001, B17001, B08201, B25044, B25091, B25043, B01001, B08007, B16001, B25026, B17001, B25043, B15001, B19053 & B05007

Social Vulnerability - Impacts on Housing & Disaster Resiliency



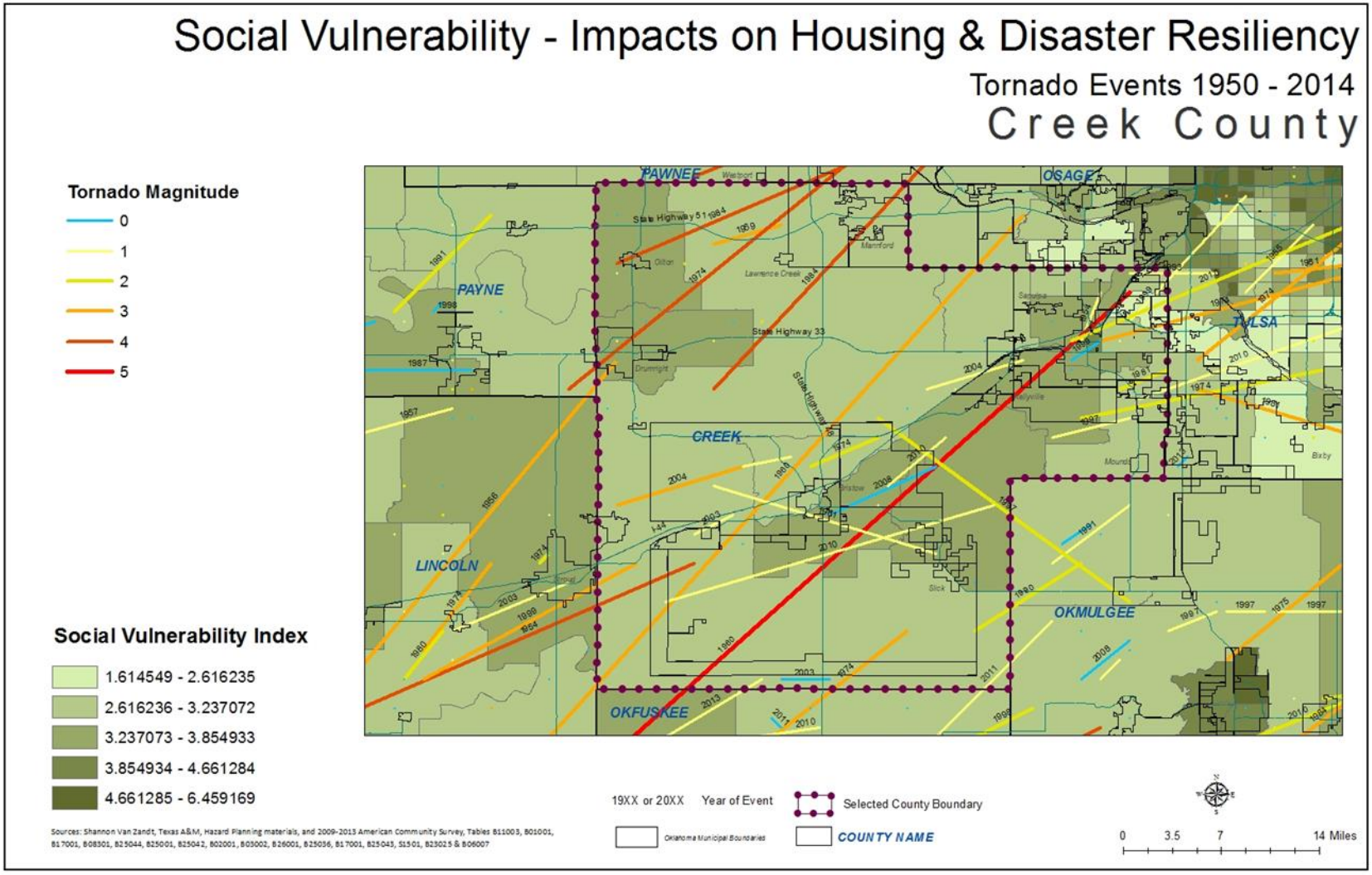
Base Social Vulnerability Indicators (Percentages)	2nd Order	3rd Order
1. Single parent households with children/ Total Households	Child care needs	Social vulnerability "Hotspot" or area of concern
2. Population 5 or below/Total Population		
3. Population 65 or above/Total Population	Elder needs	
4. 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

Creek 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 about average per this index for social vulnerability when comparing as a county to other counties in the state. There are several census tracts that have elevated social vulnerable scores and therefore attention during an event and as part of recovery should be directed in these areas.

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.