

Disaster Resiliency

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

The major sources of data on Natural Disasters come from National Oceanic and Atmospheric Administration, National Weather Service (NWS) Storm Prediction Center (SPC), U.S. Geological Survey, Department of the Interior which is then often integrated into local Hazard Mitigation Plans (HMP). HMPs at either the county or city level seek to document past events, past damages, and address proactive measures to improve the community's response to an event and efforts to have a more resilient community.

In the State of Oklahoma the typical hazards that are addressed in the HMPs include:

- ✧ Dam Failure
- ✧ Drought
- ✧ Earthquake
- ✧ Extreme Heat
- ✧ Flood
- ✧ Hailstorm
- ✧ High winds
- ✧ Lightning
- ✧ Tornado
- ✧ Wildfire
- ✧ Winter Storm

Largely, when we discuss housing, some of these listed hazards can be addressed through building practices and site locations. However, others such as drought and extreme heat are generally state-wide impacts that require more regional approaches for mitigation and adaptation.

Part of addressing hazards and risks in an area is understanding and planning in advance as best as possible to be prepared to minimize damage and loss of life. Often one of the tools for communities to fully understand their risks and how they plan to address them when they occur is to prepare a Hazard Mitigation Plan or HMP. The following chart indicates the communities (county or city) that have an HMP and/or Emergency Operations Plan. In some cases these plans were not available to the public either by request or online, but data related to key risks was used to provide a profile for each county.

Table 1.0 : Hazard Mitigation Plans and Emergency Operations Plans by County

County	Hazard Mitigation Plan Available for Public Review/ Use	Emergency Operations Plan Available for Public Review / Use
Adair	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Alfalfa	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Atoka	N	Oklahoma All Hazards Intrastate Mutual Aid Plan; Atoka Emergency Management Operation Plan
Beaver	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Beckham	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan, Beckham County Emergency Operation Plan
Blaine	N	Oklahoma All Hazards Intrastate Mutual Aid Plan

Bryan	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Caddo	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Canadian	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Carter	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Cherokee	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Choctaw	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Cimarron	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Cleveland	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Coal	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Comanche	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Cotton	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Craig	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Creek	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Custer	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Delaware	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Dewey	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Ellis	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Garfield	N	Oklahoma All Hazards Intrastate Mutual Aid Plan; Emergency Operations Plan For Garfield County
Garvin	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Grady	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Grant	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Greer	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Harmon	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Harper	N	Oklahoma All Hazards Intrastate Mutual Aid Plan

Haskell	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Hughes	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Jackson	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan, Jackson County Emergency Operations Plan
Jefferson	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Johnston	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Kay	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Kingfisher	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan; Emergency Operations Plan (EOP) for the City of Kingfisher and Kingfisher County
Kiowa	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan; Emergency Operations Plan
Latimer	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
LeFlore	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Lincoln	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Logan	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan; Logan County & the City of Guthrie Emergency Management Operations Plan
Love	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Major	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Marshall	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Mayes	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
McClain	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
McCurtain	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
McIntosh	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Murray	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Muskogee	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Noble	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Nowata	N	Oklahoma All Hazards Intrastate Mutual Aid Plan

Okfuskee	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Oklahoma	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Okmulgee	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Osage	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Ottawa	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Pawnee	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Payne	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Pittsburg	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Pontotoc	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Pottawatomie	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Pushmataha	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Roger Mills	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Rogers	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Seminole	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Sequoyah	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Stephens	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Texas	Y	City of Guymon Emergency Operations Plan, Oklahoma All Hazards Intrastate Mutual Aid Plan
Tillman	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Tulsa	Y	Oklahoma All Hazards Intrastate Mutual Aid Plan
Wagoner	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Washington	In Progress	Oklahoma All Hazards Intrastate Mutual Aid Plan
Washita	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Woods	N	Oklahoma All Hazards Intrastate Mutual Aid Plan
Woodward	N	Oklahoma All Hazards Intrastate Mutual Aid Plan

Those communities that lack an HMP, have an outdated plan, or expired plan should consider the benefits of having both an HMP and EOP given natural events are a part of living in Oklahoma but how we respond and plan for these events can help minimize loss of life and property. Funding for working on HMPs can come from FEMA on an annual cycle basis:

Pre-Disaster Mitigation Grant Program (PDM)

<https://www.fema.gov/pre-disaster-mitigation-grant-program>

Authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

In many cases, counties and communities are eager to create or update their HMPs however lack funding for technical expertise in preparing the plan. Additionally, coordination with FEMA also can be a perceived or real barrier to final adoption of a HMP.

Despite this, there are general principles that are covered in an HMP that are relevant for communities to employ related to creating safe, appropriate, and sustainable housing in the state.

When addressing the intersection between housing needs and disaster resiliency the major areas of overlap is planning by location (proximity to risk, likelihood of threat and impact) and methods to avoid and/or recover after an event. Of the typical hazards addressed within an HMP, the threats that are most connected to housing include:

- ✧ Earthquake
- ✧ Flood
- ✧ Hailstorm, High winds, Winter Storm, Extreme Heat
- ✧ Wildfire
- ✧ Tornado

Earthquakes & Housing

Earthquakes, or smaller tremors, have been a part of the Oklahoma geological area since 2009¹. There has been definitive connection between fracking or injection wells and increased frequency and intensity of earthquakes state-wide². At present, most locales continue to study what impacts these earthquakes are having and what actions such as improved building codes should be pursued.

The largest earthquake ever recorded in the state of Oklahoma occurred in November 2011 with the epicenter in Lincoln County (magnitude 5.6; <http://newsok.com/article/3620706>).

Currently researchers continue to study the impacts of earthquakes in our region and discuss what actions communities might take to reduce impacts to structures. In many of the HMPs for the communities that discussed earthquakes, the frequency and magnitude were deemed not

¹ USGS. "Record Number of Oklahoma Tremors Raises Possibility of Damaging Earthquakes". http://earthquake.usgs.gov/contactus/golden/newsrelease_05022014.php

² Stanford Report. "Oklahoma earthquakes linked to oil and gas wastewater disposal wells, say Stanford researchers". June 18, 2015
<http://news.stanford.edu/news/2015/june/okla-quake-drilling-061815.html>

high enough on the risk assessment for county-level action. This in part is also due to the lack of specific locations to address as well as best practices for structures that also incorporate a cost/benefit analysis. The impact of earthquakes in the region may continue to be a relevant point for discussion related to building practices, though consensus on the actions to take have not been determined to date.

For more information on current risks of earthquakes and impacts on housing:

USGS has real time feed for earthquake activity:

<http://earthquake.usgs.gov/earthquakes/feed/v1.0/>

USGS also has maps and modeling for hazards due to seismic activity:

<http://earthquake.usgs.gov/hazards/>

FEMA also provides guidance on “Seismic Codes” which are provisions with the International Building Code (IBC) and related guidance on working toward model codes for resistance to seismic hazards. <http://www.fema.gov/building-codes>

National Earthquake Hazards Reduction Program (NEHRP) leads the federal government’s efforts to reduce the fatalities, injuries and property losses caused by earthquakes: <http://www.fema.gov/national-earthquake-hazards-reduction-program>

Flooding & Housing

The intimate relationship between droughts and flooding is critically experienced in Oklahoma. Soil that becomes parched from long-standing drought can act like impervious concrete when rains come. The penetration and saturation of the soil may take time resulting in flash floods before the soil can help to slow the flow of the water. Beyond issues of run-off from flash floods across parched land, we also have construction within the floodway or floodplain. Floodplain management is an important planning step in preventing risks to businesses and residences. Provisions within local codes should work to encourage open space near streams and rivers to allow for a healthy riparian area that can handle floodwaters and put fewer people at risk during storm events. Many counties and cities have learned from repeated floods that purchasing land and moving buildings (development) out of flood-prone areas is both for the health and safety as well as good economics for the community. Regulating buildings from being built in the floodplain from the beginning is essential as many communities find it difficult to purchase land or relocate individuals from land that experiences repetitive losses due to flooding.

For more information on floodplain management:

- Floodplain Management Information for Communities:
<http://www.fema.gov/floodplain-management-information-communities>
- Online mapping was included for many of the county profiles to show potential flood areas based on FEMA’s National Flood Hazard Layer
<http://fema.maps.arcgis.com/>

Hailstorm, High winds, Winter Storm, Extreme Heat & Housing

Storm events are part of the cyclical, global nature of climate. Climate change, regardless of causes, is something every community needs to come with adaptation strategies. Storms and increased number and severity of storms can be part of that picture. Building codes are certainly one piece of the puzzle. Emergency management plans, at the county, town and individual level are another strategy. Many of our county emergency managers consistently

The US Department of Energy has assembled a guide for identifying wasteful utility practices and providing tips for reducing energy usage in your home.
<http://energy.gov/energysaver/tips-your-homes-energy-use>

The Joint Commission on Accreditation of Healthcare Organizations' "Standing Together: An Emergency Planning Guide for America's Communities" provides a foundation for communities to create their own emergency management plans.

The American Red Cross's "Make a Disaster Preparedness Plan" is great resource for emergency planning measures individual households can take.

In many cases, the risk of wildfires impacting housing is due to a more urbanized fringe encroaching on meadows, prairie and open spaces. Paying attention to the cycle of high precipitation, longer growing seasons, and then drought conditions can create the environment for wildfires. Location of where housing is placed is one method to minimize loss of life and property due to this hazard. Additionally planning for firebreaks, evacuation routes, and shelter locations is essential to addressing the hazard when it arises.

http://texasforests.tamu.edu/uploadedFiles/TFSMain/Preparing_for_Wildfires/Prepare_Your_Home_for_Wildfires/Contact_Us/CWPP2.pdf

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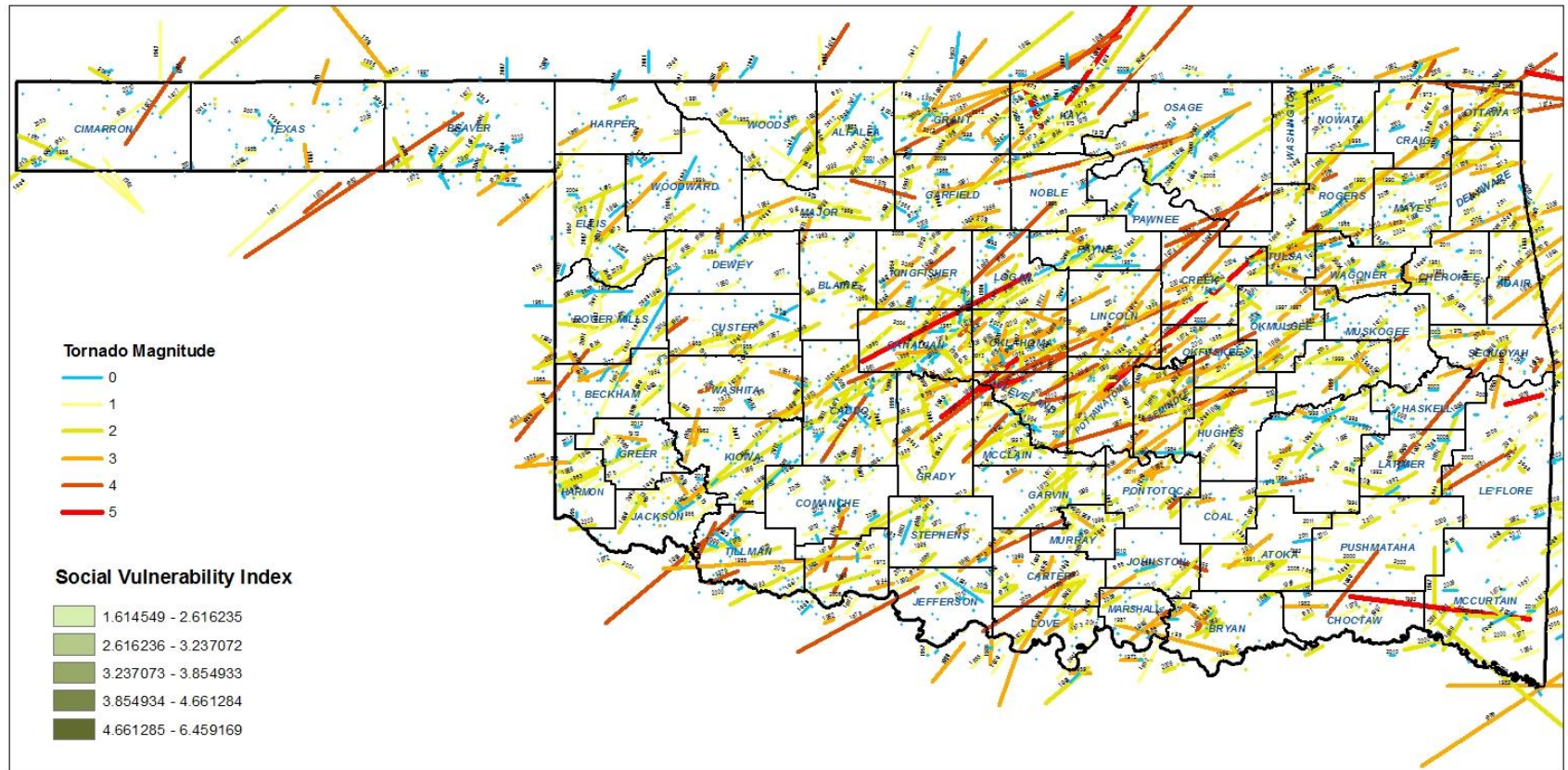
Tornadoes & Housing

Planning for a disaster event is often the only course of action. Tornadoes can occur across the state and while patterns or “tornado alley” may indicate to Oklahoma residents we are at risk, we do not have the ability to narrowly identify where tornadoes will occur. We can, however be prepared. In most counties the emergency managers counsel their residents to have an emergency pack of needed items including a weather radio. They further encourage all residents to identify where they will shelter – ideally a location in their home and at their place of work (depending on when the event should occur). Most emergency manager are wary about providing public shelters because they do not want to encourage their residents to get out on the road during an event. Getting caught in a tornado in a car is far more risky than staying in an internal room of a home or business. However, many jurisdictions are noting that those in mobile homes, multi-family and other lower income housing may not have an adequate shelter option. In some communities the course of action is to work to build strategic community public shelters. In several of the county HMPs, planning for community shelters related to mobile homes and apartments were included as recommended actions for the area. Many tribes in Oklahoma have funded large public shelters and have also included as part of their emergency management planning lists of their elders or vulnerable populations in order to provide assistance and/or transportation to a shelter when needed. This same sentiment was echoed in some county-level HMPs. The awareness and taking steps to being prepared to assist vulnerable populations within our communities is important in reducing loss of life or injuries.

In addition to preparedness after any type of disaster event, recovery efforts are equally important. Having a Hazard Mitigation Plan and connecting with the Oklahoma Emergency Management office both can help counties prepare themselves for an event as well as be positioned to received federal dollars for recovery. This can be a critical level of assistance, particularly for the most social vulnerable within our community.

Each county profile contains maps of historic tornadoes shown with the social vulnerability index (see last section). This shows how this physical hazard impacts each county and compound those impacts with populations that are socially vulnerable means additional and targeted assistance may be warranted. The following pages contains are two map for historic tornadoes for the state.

Tornado Events 1950 - 2014

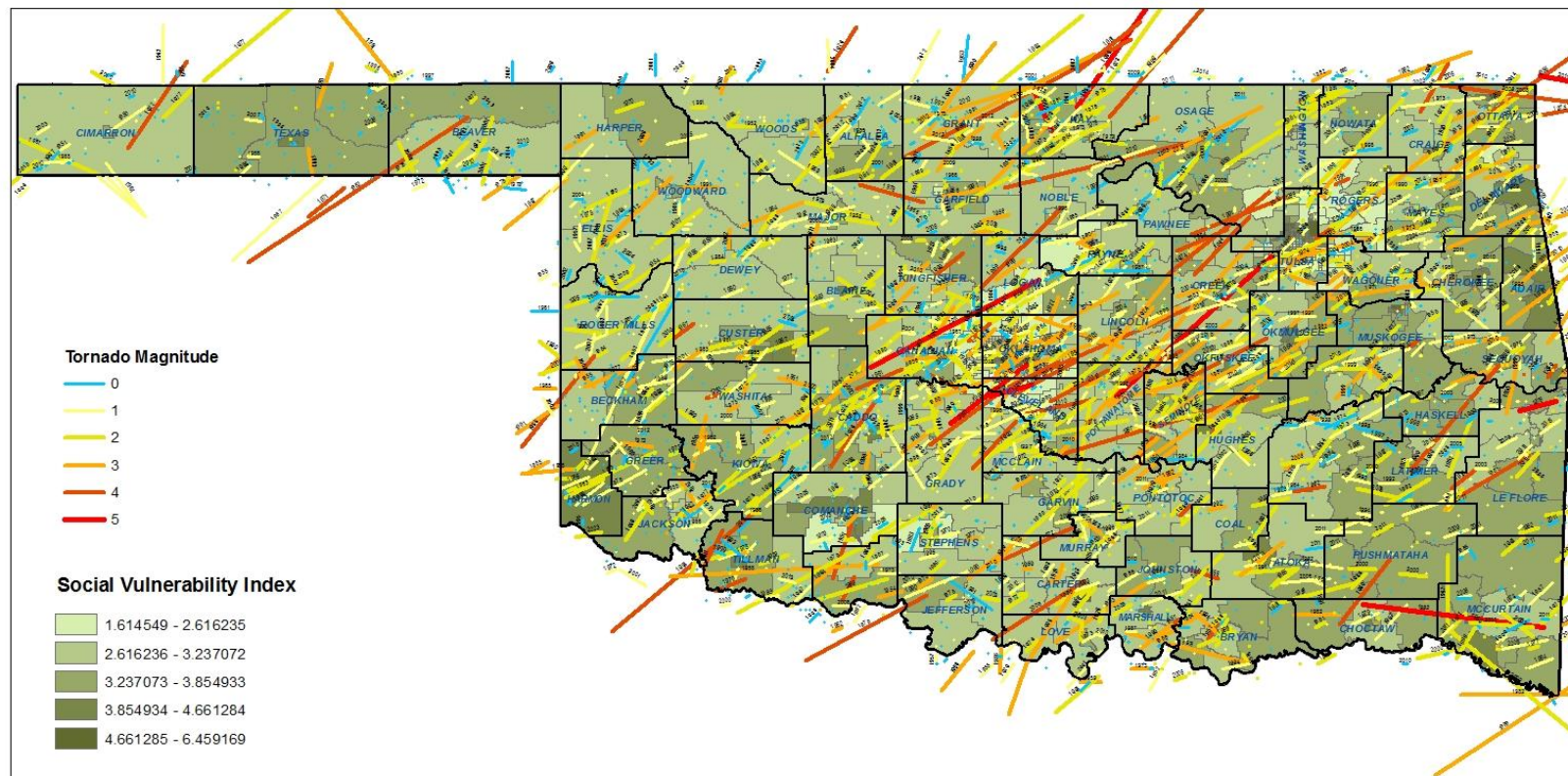


Tornado data from NOAA <http://www.spc.noaa.gov/gis/svrgis/>

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



Tornado data from NOAA <http://www.spc.noaa.gov/gis/svrgis/>

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

19XX or 20XX Year of Event

Selected County Boundary

COUNTY NAME



0 20 40 80 Miles

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

Most jurisdictions provide warnings and advice that residents should shelter-in-place. The current philosophy in emergency preparedness is that people are more likely to die or be injured trying to travel to a shelter while the event is happening and would be safer staying in a nearby location.

Many counties encourage registration of home/personal shelters in order for emergency personnel to remove debris and provide assistance to these locations after the risk has passed and as needed. The registration and orderly maintenance of a database by an emergency management office allows for more thorough and effective response after the event has passed to insure all residents are able to exit their shelters. In order to preserve privacy and security most if not all county or city officials keep these registries keep these databases secured and do not provide these locations for shelters to others. Where information was available we have included it in the county profiles and in the table in this section.

General discussions with private installers for shelters in the State of Oklahoma reveal that there are 54 companies in Oklahoma that provide tornado shelters and safe rooms. Most of these companies estimated that they installed around 300 shelters per year, though the numbers ranged from 50 installed an average year by smaller, family-owned businesses to about 4,500 shelters installed in an average year by the larger companies. Some companies indicated that their numbers started to climb noticeably after the May 2013 tornado that struck Moore. The larger companies were more likely to say they install all over the state while smaller businesses were more likely to remain within a few surrounding counties. All of the companies stated that they install for anyone who is able to pay. Smaller businesses tend to get more requests from private residences while the larger companies install for a variety of customers. This includes low-income families by means of grants, as well as some apartment complexes and commercial businesses. All companies stated that they highly recommend their customers register their newly installed shelter with their local fire department. One company pointed out that people need to receive building permits even for shelters, so the town is likely aware of their location.

Table 2.0 Overview of Shelter information by County

County	Registry for Emergency Managers	General Scope and/or Information on Shelters per County
Adair	No registry for county or county seat (Stilwell).	Not available
Alfalfa	Alfalfa County Online registration http://gcem.org/storm-shelter-registration/alfalfa-county/	Public shelter in Cherokee, in the Armory, but it is not marked Aline has a storm shelter in the school and a marked shelter on Main Street in Carmen.
Atoka	No registry for county or county seat (Atoka)	EF-3 tornado in 2 community storm shelters in Tuhuska, OK. <ul style="list-style-type: none"> • Pleasant View Freewill Baptist Church located at 503 Star Rd., Atoka • New Zion Methodist Church located on Boggy Depot Rd. East, near Forrest Hill Rd. • Posey Park located on the East side of Atoka on the corner of Kentucky and B St. • The old Choctaw Community Center located at 1410 S. Gin Rd., Atoka • Southside Baptist Church located at 1200 South McNally Dr., Atoka • Hillcrest Baptist Church located at 335 E Highway 3, Atoka
Beaver	No registry for county or county seat (Beaver)	Not available
Beckham	No registry for county or county seat (Sayre)	Sayre <ul style="list-style-type: none"> •City Of Sayre Building Basement 214 Nth 4th •First Baptist Church Sayre, Ok. 512 N. 4th Elk City <ul style="list-style-type: none"> •Elk City Fire Department 303 W. 5th Elk City, Ok Erick <ul style="list-style-type: none"> •First Baptist Church 400 S. Main Erick, Ok •First Christian Church 223 S. Walnut Erick, Ok •Erick School Shelter 200 S. Cedar Erick, Ok
Blaine	Blaine County Online registration: http://gcem.org/storm-shelter-registration/blaine-county/	Blaine County has three public shelters at the First Baptist Church in Watonga, 301 N. Noble; the Nazarene Church in Watonga, on East Oklahoma 33; and at the Armory Building in Watonga, on Main Street.

		In a power outage event: Geary- Geary Community Center Geary; Geary-Cheyenne & Arapaho Community Hall; Canton- Canton Community Center
Bryan	Bryan County online storm shelter registry: http://www.durantemergencymgt.org/shelter-registration.html	Choctaw Nation has implemented a storm shelter/safe room program and funded 1,136 shelters for elder and special needs tribal members
Caddo	Caddo County has an online storm shelter registry: http://www.caddocounty911.org/storm-shelter-registration	In power outage event: Anadarko- First Baptist Church, 700 W. Petree Rd.; Carnegie Elementary School, 202 West 4th St.
Canadian	City of Yukon Online Registration: http://www.cityofyukonok.gov/online-forms/storm-shelter-registry/	Mustang Town Center is NOT a "Tornado" shelter – however this shelter serves as the "Evacuation Shelter" http://www.cityofmustang.org/police/page/evacuation-shelter Mustang: Lakehoma Elementary School, 224 S Clear Springs Road; Mustang Middle School South, 1145 S Heights Drive. El Reno: Park View Hospital, 2115 Park View Drive. For information, call 262-2640 In a power outage event: Concho Community Hall, 200 Wolf Robe Circle; Concho- Native American Center
Carter	Carter County online registration: http://www.cartercountyma.org/	
Cherokee	No information found on shelter registration.	Five shelters are expected to be complete by the end of 2015 - 40 feet by 8 feet storm shelters are being placed at the Cherokee Immersion Charter School, Keys Fire Department, Woodall Fire Department, Dry Creek Community Building and Tailholt Fire Department. The shelters will hold up to 100 people each. (Cherokee Nation) http://www.cherokee.org/News/Stories/20150604_CherokeeNationdonates\$77KforstormsheltersinsouthernCherokeeCounty.aspx
Choctaw	Not Available	
Cimarron	No online registry noted.	5 public shelters mapped and shown for public use: https://ok-cimarroncounty.civicready.com/Shelters

Cleveland	<p>Online registration http://www.clevelandcountyoak.com/FormCenter/Storm-Shelter-Registration-3/Storm-Shelter-Registry-43</p> <p>Norman Online registration http://www.normanok.gov/content/storm-shelter-registration</p> <p>Moore Online registration http://www.cityofmoore.com/pinpointshelter</p>	<p>Bond election for funding for storm shelters at schools, Emphasis on Sheltering-in-place.</p> <p>On April 13, 2015, the Osage Nation received a grant award of \$27,500 from the American Red Cross to provide tornado shelters for Osages living in Moore, Oklahoma, during the 2013 tornado. The purpose of the grant is to provide funding for the construction of safe rooms/shelters in homes that provide protection from injury/death caused by the forces of extreme winds. https://www.osagenation-nsn.gov/news-events/news/osage-nation-receives-27500-red-cross-tornado-grant-0</p> <p>Lexington: Lexington High School Gymnasium, 420 NE 4.; Luther Middle School, 905 S Dogwood. For information, call 277-3500.</p> <p>Norman: Cleveland Elementary School, 500 N Sherry; Whittier Recreation Center, 2200 W Brooks; Irving Recreation Center, 1920 E Alameda Norman - In event of a power outage: 315 E. Hayes St. & - Northhaven Church, 4600 NW 36th Ave</p>
Coal	<p>Online storm shelter registry: http://coalem1.wix.com/coalcoem#!saferoom-registration/cxxj</p>	
Comanche	<p>City of Lawton Call to register shelter: Register your personal Storm Shelter or Safe Room with Emergency Management by calling (580) 355-0535 from 7 am to 12 pm or 1 pm to 5 pm. Comanche County Online registration: http://www.comanchecounty.us/index.php/component/chronoforms/?chronoform=SafeRoomRegistration</p>	<p>Action item from HMP: Action Item #T-HW 5. Install 20 new residential and commercial storm shelters to reduce the loss of life.</p> <p>There are six community shelters in schools.</p>
Cotton	No information available.	
Craig	No information available.	
Creek	<p>Storm shelter registration for Creek County: http://www.creekcountyonline.com/cem_files/CreekCountySafeRoomRegistration.pdf</p>	<p>County HMP supports finding storm shelter options for mobile home parks and has mapped their vulnerable populations in order to understand where assistance may be needed.</p>
Custer	<p>City of Clinton Online registration: http://www.clintonok.gov/residents/public-</p>	<p>The following projects were not started due to lack of funding in the Town of</p>

	safety/emergency-management-system/storm-shelter-registration	<p>Arapaho.</p> <ul style="list-style-type: none"> Construct community shelter that will hold at least 350 adults. (p. 76) <p>In a power outage event: Hammon-Cheyenne & Arapaho Community Hall; Clinton- Cheyenne-Arapaho Elderly Nutrition Center</p>
Delaware	<p>Delaware County online registration (form must be mailed in):</p> <p>http://delawarecountyemergencymanagement.com/</p>	<p>Only one public storm shelter in Delaware County located in the community of Bernice. The lack of community shelters is in part due to age and hazard risk of the older facilities that were previously used as shelters</p>
Dewey	No information available.	<p>County constructed storm shelter that can hold up to 150 people and withstand an EF-5.</p> <p>In a power outage event: Seiling-Seiling Community Building; Seiling-Cheyenne & Arapaho Community Hall;</p>
Ellis	No information available.	
Garfield	<p>City of Enid Online registration</p> <p>http://www.enid.org/departments/ae/emergency-management/storm-shelter-registration</p> <p>Garfield County online registry</p> <p>http://gcem.org/storm-shelter-registration/garfield-county/</p>	
Garvin	<p>Register – print out and mail form:</p> <p>http://garvincountye911.org/</p>	<p>In a power outage event: Elmore City First Baptist Church, 107 S Texas Ave; Lindsay- Calvary Baptist Church, 401 W. Chickasaw; Paoli- Paoli Senior Citizens Center; Pauls Valley- Garvin County Fair Barn, 1401 N Willow</p>
Grady	<p>Bridge Creek Online Registration:</p> <p>http://www.bridgecreekfd.org/storm-shelter-registration.html</p> <p>Tuttle Online Registration:</p> <p>http://www.emtuttle.com/</p>	<p>City of Tuttle provides Public Tornado Shelter at City Hall (221 W Main St) as a shelter (though prefer shelter in place) - 1000-person community safe room</p> <p>http://www.emtuttle.com/</p> <p>Bridge Creek Elementary school provided shelter for more than 100 people</p> <p>Chickasha lists their Water Department and the Grady County Emergency Management facility as public storm shelters</p> <p>Minco considered using its Armory as a public storm shelter.</p> <p>Blanchard: Blanchard Middle School, 400 N Harrison.</p>

		In a power outage event: Blanchard-Pioneer Telephone Building, 101 East Ceteran Memorial Highway
Grant	Grant County online registry http://gcem.org/storm-shelter-registration/grant-county/	Two public storm shelters located east of the Grant County Courthouse. The shelters each hold about 34 people. Public storm shelters — both holding about 34 people each — at the Grant County District 1 shop at 2005 Elm St. in Wakita and the Grant County District 3 shop on Dogwood, east of the fairgrounds, in Pond Creek. Co-op in Manchester also has a storm shelter available to the public. In a power outage event: Chickasha-Grady County Fairgrounds, 500 East Choctaw
Greer	No information available.	In the event of power outage: Magnum-The Church of New Beginnings, 408 S. Louis Tittle; Hobart- First Methodist Church, 201 S. Washington
Harmon	No information available.	HMP recommends constructing a community shelter in the county. In a power outage event: Hollis- Hollis Civic Center, 208 W. Jones
Harper	No shelter registry.	
Haskell	No information available	
Hughes		100 individual shelters, 3 public shelters Holdenville New Age Nutrition Center, 124 N. Creek
Jackson	No information available.	In a power outage event: Altus- Altus Community Center, 401 Falcon Rd. El Dorado – Emergency Operations Center
Jefferson	No information available.	
Johnston	No information available.	Tishomingo Public Storm Shelters * Tishomingo Elementary School at 508 N. Neshoba Avenue. Entrance location is on the south side of the school main building at the corner of Sixth Street and Neshoba Avenue. * Tishomingo High School Gymnasium at 1300 E. Main. Entrance location is on the south side of the Gym.
Kay	Ponca City Online Registration: http://www.myponcacity.com/shelter/index.php	The City of Ponca City does not maintain public storm shelters. At this time there are no buildings that meet the construction specifications established by Texas Tech University's Wind Science and Engineering

		Department, and adopted by FEMA. (Ponca City website)
Kingfisher	Kingfisher County Online registration http://gcem.org/storm-shelter-registration/kingfisher-county/	Public shelter in Kingfisher County Annex Building, 124 E Sheridan. Kingfisher County Sheriff's Office, 119 S Main Hennessey has one public shelter located next to the old gymnasium at 601 S. Main Okarche has no public shelters
Kiowa	No information available.	HMP recommends creating a database of storm shelters and for individuals to build storm shelters.
Latimer	No information available	City of Wilburton: •Storm Shelter, Gary Rosebure City Park •Mitchell Hall, Basement; Eastern Oklahoma State College •Fire Department, Basement; 300 W. Ada Street (NOTE: No pets allowed) •First Baptist Church, Basement; 101 W. Blair Street •First Methodist Church, Basement; 209 E. Ada Street •Life Church, Basement; 1102 Hwy 2 South •Storm Shelter, Wilburton Housing Authority; 600 East Ash
LeFlore	Online registry: http://www.lcem.us/shelterregistration.html	According to the Le Flore County Emergency Management website, there are 10 public storm shelters. •Arkoma- First Baptist Church •Heavener- Saferoom between the High School and Elementary School •Howe- New Highschool Gym •Panama- Panama Middle School •Pocola- Elementary School •Poteau- High School •Poteau- Pansy Kidd Middle School •Poteau- Upper Elementary School •Spiro- High School Safe Room •Wister- Behind new High School Gym
Lincoln		Chandler: Chandler High School, 1700 block of Park Road. Church of Christ, at First and Cleveland.
Logan	Logan County Online registration: http://gcem.org/storm-shelter-registration/logan-county/ Guthrie – Woodcrest Fire http://woodcrestfd.com/stormshelter.html	
Love		

Major	Major County Online registration: http://gcm.org/storm-shelter-registration/major-county/	
Marshall	No information available.	
Mayes	Shelter registry is maintained by the emergency management office	<p>Locust Grove built a public school facility that also serves as a community shelter. The 24,000-square-foot dome-shaped structure is built to withstand winds up to 250 mph and can hold more than 1,500 people.</p> <p>Mayes County also received FEMA funding for 55 private storm shelters</p>
McClain	Online registration: http://mcclain-co-ok.us/storm-shelter-registration/	<p>Purcell: Multipurpose Center at Purcell Municipal Lake; Trinity United Methodist Church, 211 N Second; Senior Citizens Center, 228 N Second; Purcell Middle School, 919 N Ninth; First Baptist Church, 422 W Main St.</p> <p>In the event of power outage: Newcastle- Newcastle Storm Shelter, 851 N Carr; Purcell- Multi-Purpose Center, 1400 Chandler Rd</p>
McCurtain	Not available	
McIntosh	City of Checotah has a registration (via email): http://www.checotah.net/emergencyServices.aspx	City of Checotah will open up the Multiple-Purpose Building located on SW 2nd St at Checotah Intermediate School.
Murray	Murray County does have an online registry for private storm shelter (url not available)	2 public shelters in the City of Sulphur
Muskogee	<p>Muskogee call to register Muskogee Fire Department 918-687-5483</p> <p>Muskogee Storm Shelter registration: http://readymuskogee.com/storms_and_hazards/register_your_storm_shelter</p>	<p>City of Muskogee Emergency Management Director Jimmy Moore listed three public tornado shelters or safe rooms in Muskogee:</p> <ul style="list-style-type: none"> • Tony Goetz Elementary School, 2412 Haskell Blvd. • Hilldale Elementary School, 315 E. Peak Blvd. • Basement of Masonic Temple, 121 S. Sixth St. <p>Two churches also have opened as safe rooms, but are not official shelters.</p> <ul style="list-style-type: none"> • First Baptist Church, 111 S. Seventh St., opened its Boston Avenue entrance. No animals are allowed. • First United Methodist Church, 600 E. Broadway. <p>(http://www.muskogeephoenix.com/archives/breaking-news-area-shelters-</p>

		open/article_d44e1368-3797-5d93-a3b8-b856cd868876.html)
Noble	No information available.	
Nowata	Paper listing of locations of shelters is maintained. Further work on indexing by quadrant is desired.	There are three public shelters in Nowata County located in the Towns of New Alluwe, Lenapah, and Wann. Oklahoma Union High School has two rooms that are designated as Safe Rooms. To date, there are around 25-30 registered storm shelters.
Okfuskee	No shelter registration identified	No public shelters listed.
Oklahoma	<p>OKC Online registration: https://www.okc.gov/action/StormShelter/Welcome.aspx</p> <p>Oklahoma County Online registration https://www.oklahomacounty.org/sheriff/stormshelter/</p> <p>City of Nichols Hills Online registration: http://www.nicholshills.net/sectionindex.asp?sectionid=65</p> <p>Edmond Online registration: http://edmondok.com/index.aspx?NID=500</p> <p>City of Warr Acres http://www.warracres-ok.gov/news.php?extend.120.1</p> <p>City of Midwest City Online Registration: http://midwestcityok.org/storm-shelter-registration</p>	<p>Edmond: Will Rogers Elementary School, 1215 E Ninth St.; Northern Hills Elementary School, 901 E Wayne St.</p> <p>Luther: Luther High School, 320 NE 2; Luther Middle School, 915 S Dogwood St.</p> <p>Warr Acres: Lillie Sloan Park, 5900 block of NW 40; Cherokee Hills Park, NW 67 and Cherokee; Warr Acres City Hall, 5930 NW 49.</p> <p>Nicoma Park: Nicoma Park Elementary School, 11601 Jeffords Ave.</p> <p>Choctaw: First Baptist Church, 2700 Main St.</p> <p>Midwest City: Reed Center, 5800 Will Rogers Drive.</p> <p>In event of a power outage: Oklahoma City- 330 SW 4th St.</p>
Okmulgee	The county has an online registry but url has some difficulties.	
Osage	<p>Osage County has a storm shelter registration program. Residents can e-mail the following address to register their shelters: osagecountystormshelters@gmail.com</p> <p>Sand Springs online registration: https://ok-sandsprings.civicplus.com/MyAccount?from=Url&url=/FormCenter/Police-Department-3/Storm-Shelter-Registration-Form-58&anchor=&validationMessage=</p>	Most jurisdictions have elected to not have public shelters in order to discourage people from leaving safe places and ultimately be caught on the road trying to reach a public shelter. Mitigation measures included in the HMP include installing safe rooms/storm shelters in schools and other public facilities.

Ottawa	<p>City of Miami Online registration: http://www.miamiokla.net/DocumentCenter/View/334</p>	<p>The City of Miami does not maintain public storm shelters. The Miami Civic Center does not meet the construction specifications established by Texas Tech University's Wind Science and Engineering Department, and adopted by FEMA. In addition, there are a number of reasons why relying on a public shelter is a dangerous idea. http://www.miamiokla.net/DocumentCenter/View/439 In 2013, Ottawa County emergency management director submitted 120 applications to FEMA for storm shelter funding.</p>
Pawnee		<p>One new public shelter that can hold 1,000 to 1,500 people constructed in 2012 (next to elementary school). Two older shelters at middle and high school.</p>
Payne	<p>Payne County online registration: http://www.paynecounty.org/storm-shelter-registry/ City of Stillwater online registration: http://stillwater.org/shelter.php</p> <p>City of Perkins online registration: Shelters may be registered at the cityofperkins.net or by calling Perkins City Hall at 547-2445.</p>	
Pittsburg	<p>Online form for registering shelter: http://pittsburg.okcounties.org/stormshelter.pdf</p> <p>Online/by mail or fax shelter registration: http://www.cityofmcalester.com/index.aspx?nid=401</p>	<p>Kiowa, OK – Kiowa Schools constructed a 400 person shelter — roughly 100 more than the current enrollment at Kiowa Public Schools in 2015. http://www.mcalesternews.com/news/kiowa-safe-room-complete/article_4d377c1a-ae0a-11e4-987f-c3df815fd697.html</p> <p>Two public shelters in McAlester: •One is the old McAlester High School building. The old high school, also known as the McAlester Building Foundation, is between Second and Third Streets on Adams Avenue. •The other is the bottom hallway of the McAlester Police Department http://www.mcalesternews.com/news/local_news/few-safe-havens-from-mcalester-storms/article_068a976c-011b-55f7-ba0a-ad9d93debd14.html</p>
Pontotoc	<p>If you live in Pontotoc County and have a shelter you need you register, you can do that by calling 211.</p>	<p>According to the HMP, the City of Ada does not have an official public shelter with its city limits designed to serve as a shelter during a disaster event.</p>

		<p>Residents are encouraged to shelter in place.</p> <p>The only structure in Ada open to the public as a storm shelter is the Horrace Mann Building on the campus of East Central University, which is opened as a public service by ECU.</p> <p>However numerous public facilities are available <i>after</i> a disaster including: Red Cross, public school gymnasiums, and numerous churches.</p> <p>The HMP does state that the city of Ada has inspected and gained reimbursement funding for more than 30 safe-room shelters in Pontotoc County. However it is unclear whether these were public or private shelters.</p>
Pottawatomie	City of Shawnee Storm shelters can be registered by calling 405-878-1650 with your information	<p>Citizen Potawatomi Nation has secured funding to construct a 2,500 safe room to address tornado hazard to the area (planned to be rated to handle F5 event). Additionally CPN has 3 community shelters (all welcome) https://www.potawatomi.org/news/top-stories/1338-cpn-secures-funding-for-community-safe-room-and-elder-s-program</p> <p>In a power outage event: Asher- First Baptist Church, 109 E. Main St</p>
Pushmataha		
Roger Mills		<p>The Roger Mills County HMP notes that they need to do the following:</p> <ul style="list-style-type: none"> * Create database on citizens with existing storm shelters. * Build safe rooms/storm shelters to protect from tornadoes and high winds
Rogers	Rogers County: Register Your Storm Shelter by Calling: 918-923-4795	<p>Verdigris and Catoosa are in the process of building storm shelters at public schools.</p> <p>Three school districts are building storm shelters: a cafeteria and a storm shelter for the Catoosa School District, Verdigris School District with one shelter at the high school and two will be at the Lower and Upper Elementary School campuses, and Oologah-Talala School District will build 2 shelters.</p>

Seminole	City of Seminole online registration http://www.seminole-oklahoma.net/stormshelter.html	Estimate of a total of 350 individual shelters that have been registered and 1 public shelter (a public school, operated by the state) that are documented at the city and/or county level. In a power outage event: Seminole-Seminole City Hall, 401 N. Main
Sequoyah	Registry not identified.	Public Shelters are often provided at: —Sequoyah County Courthouse —Central Public Schools —Liberty School (North of Roland) —Gans Schools —Brushy Schools Library —Moffett School and the Moffett Police Department. —Vian has NO Public Shelter. -----Roland - old Roland High School is designated as a storm shelter; ----Gore and Webbers Falls the designated storm shelter is the Webbers Falls School No pets are allowed in any of the cellars. Every shelter is handicapped accessible except Moffett School and the Moffett Police Department.
Stephens	Stephens County: http://www.stephenscountyoak.com/emergency-management/other-resources	Duncan has hopes of setting up to seven shelters in the school system. Mark Twain Elementary and Irving Elementary had theirs delivered in June 2015 and Plato Elementary was planning to get theirs soon after the article was written. The shelters are FEMA rated to withstand an EF5 tornado. http://www.kswo.com/story/29420548/duncan-public-schools-gets-tornado-shelters In the event of power outage event: Stephens County Fairgrounds, 1616 South 13th Street, Oklahoma
Texas	No information available	HMP indicates there are 24 storm shelters in the incorporated areas, most being in churches.
Tillman	No information available	HMP advises education on individual installation of shelters and recommended funding for a community shelter. 12-2015 a bid opening was posted for potential shelter construction.
Tulsa	Bixby Online registration: http://www.bixby.com/pdf/storm_shelter_form.pdf Broken Arrow Online registration:	One shelter at Johanna Woods Mobile Home Park, in Broken Arrow; three shelters are designed to hold up to 170 community residents in each (Broken

	http://www.brokenarrowok.gov/index.aspx?nid=398 Glenpool – call to register: Community Development Department -- 918-322-5409 Tulsa & Unincorporated Tulsa County - - Tulsa Area Emergency Management Agency -- 918-596-9899 Sand Springs online registration: https://ok-sandssprings.civicplus.com/MyAccount?from=URL&url=/FormCenter/Police-Department-3/Storm-Shelter-Registration-Form-58&anchor=&validationMessage= City of Tulsa Online registration: https://www.cityoftulsa.org/public-safety/storm-shelter-registration.aspx City of Jenks Online registration: http://www.jenks.com/city/storm-shelter-registry City of Owasso Online registration: http://www.cityofowasso.com/FormCenter/Emergency-Management-8/Storm-Shelter-Registration-53	Arrow).
Wagoner	Online and phone registration: http://www.cityofcoweta-ok.gov/Government/EmergencyManagement/StormShelterRegistration.aspx https://www.ok.gov/triton/modules/formbuilder/form.php?form_id=302686772233eb98aee7276d58f79de802f78da164b5a1a44a4575492f9f8726	
Washington	Washington County keeps an online form for registering locations of private shelters: http://form.jotform.us/form/50278836611155 http://wcema-ok.us/	Town of Copan recently constructed a public storm shelter on Weldon Avenue in 2015. There are around 400 registered storm shelters in Washington County
Washita	No information available.	
Woods	No information available.	Two small public shelters in Hopeton and Capron
Woodward	Online registration: https://docs.google.com/forms/d/1j7gs0kr9fMxYaFjOpX7NpKYgl5JcUCrwOk9MFwjLoCQ/viwwform	There reportedly are no public storm shelters in Woodward County.

C.2.1.3 Public Policy and Governance to Build Disaster Resiliency

Building Codes, Site Plan, Subdivision, Zoning Review & Regulations

Key areas where local jurisdictions can plan for typical hazards and work to increasing the resiliency of residences and businesses includes reviewing building code requirements for the areas. Insuring that structures are not built in the flood plain, or when in partial threat of being near or in the flood plain that preventive measures are required to mitigate being repeatedly flooded is important. Most cities and towns with basic codes requirements for development have very similar language to this effect. The key for most jurisdictions is to 1) not grant variances and allow development in the floodplain or near areas that repeatedly flood (streams, creeks, lakes, etc) 2) to work to move/remove structures which were built in the past in these risk-prone areas.

Building Codes for all cities draw from the 2009 International Building Codes and 2011 National Electric Codes.

Insuring all communities follow good building practices related to hazard mitigation include components of structural practices and not building in the floodplain.

Relevant codes that are typically included in most, if not all, communities in Oklahoma:

Floodplain, floodway

- “no structure, improvement, or development, temporary or permanent, shall be constructed in the floodway, nor shall any obstruction, fill or storage of goods, materials or equipment be permitted within the floodway” (OKC Municode)
- “existing nonconforming uses in the floodway shall not be expanded but may be modified, altered or repaired to incorporate floodproofing measures provided such measures do not raise the level of the 100-year flood.” (OKC Municode)

As with most regulatory documents, exceptions and alternate solutions are often incorporated into the codes. However, exceptions to building in the floodplain should be taken very seriously as the impacts on that development as well as all surrounding development has long term and repetitive consequences.

Storm shelters, safe rooms

FEMA provides guidance on construction of storm shelters/safe rooms:

<http://www.fema.gov/fema-p-320-taking-shelter-storm-building-safe-room-your-home-or-small-business>

Cities often incorporate similar guidance and require permits to be filed prior to construction of a shelter:

- “No fallout or tornado shelter shall be constructed within the City unless a building permit has been issued by the Development Services Director or designated representative.
- No building permit for the construction of a fallout or tornado shelter shall be issued until plans and specifications for each type shelter have been approved by a registered professional engineer or architect, and/or the Development Services Director, or

designated representative, as conforming to the standards and specifications as set forth in this article.” (OKC Municode)

Related to policy decisions, Fire Department ISO ratings are often set in the Hazard Mitigation Plan which can have impacts on home insurance rates.⁴ Therefore, counties with limited funding for fire departments, emergency communications, water supply, and an assessment of all the risks in the area can impact the ability to protect their residents from hazards in the area.

C.2.1.4 Local Emergency Response Agency Structure

Having a clear structure for roles and responsibilities during a hazard event is essential. Some counties and cities have spelled this out clearly in their Emergency Operations Plan, but many do not. This is a useful tool to managing people and efforts, including the arrival of federal assistance. Each city and county should consider having a clear structure in place to improve communication and organization during a crisis. This structure, ideally a clear flow chart, outlines who is in charge or the hierarchy during a crisis or event. Further, good delineation of the order of responsibilities assists during recovery efforts as well. Coordination of the right assistance (money, shelter, food, water, etc), community groups, volunteers and federal assistance requires the local level groups to clearly understand direction and control elements that are often contained in the Emergency Operations Plan. It is recommended that every community have an easily accessed EOP to facilitate response and recovery. Where available for this study, the structure or availability of this structure was discussed in the county profiles.

C.2.1.5 Threat & Hazard Warning Systems

There are different ways counties and cities provide information to residents in times of a weather or man-made hazard event. First, most emergency managers simply want individuals to be ‘weather-aware’. Part of being weather-aware means having a weather radio and/or subscribing to the local county phone notification/email notification system about events in the area. Sirens are for outdoor warning of people who are literally outside and need to be aware that an event is imminent and therefore they need to seek immediate shelter. Outdoor sirens in fact are not intended for those already inside. If you hear a siren, emergency managers would advise that you need to find the best location to shelter-in-place rather than go out on the roads to find shelter. Having warning sirens is a community decision. Some communities may find that the cost and misunderstanding of residents on what to do when they hear the sirens is not an effective tool for their community. However, most counties and communities in Oklahoma tend to be interested in having sirens as one method of notification of a hazard. However, most counties also try to encourage resident to not rely on only one method of notification of a hazard.

Below is a table that is an overview of the warning systems we identified in the counties or cities in Oklahoma.

Table 3.0 : Warning Systems by County

⁴ “ISO’s Fire Suppression Rating Schedule (FSRS), evaluates four primary categories of fire suppression — fire department, emergency communications, water supply, and community risk reduction. The FSRS includes standards set by the National Fire Protection Association (NFPA).” <http://www.isomitigation.com/>

County	Types of Warning Systems
Adair	No warning systems (outdoor sirens, notification systems) were noted specifically. Facebook notifications are maintained.
Alfalfa	No information available
Atoka	Phone notification (text message alerts); Other (emails alerts)
Beaver	5 outdoor warning sirens in five of the rural communities; a local pager system through the fire departments and emergency management system; a telephone tree to critical facilities; and an area-wide radio network to communicate warnings to people, and a facebook page Facebook notifications https://www.facebook.com/BeaverCountyEM/
Beckham	34 sirens (Sayre—3, Carter-3, Elk City-15, Erick-3, Texola-1)
Blaine	Two sirens were noted on the Oklahoma Sirens Google Map.
Bryan	31 sirens identified in Bryan County (including 1 in Colbert, 3 in Calera, and 2 in Caddo), Emergency Broadcast System, Facebook, Black Board Connect emergency notification system.
Caddo	Sirens, Emergency Broadcast System
Canadian	Canadian County's Mass Notification System: Blackboard Connect; City of Yukon - maintains and operates a nine-siren, outdoor emergency warning system designed to warn the public who are OUTDOORS and away from other types of warning devices. El Reno has nine sirens. City of Yukon - http://www.cityofyukonok.gov/city-departments/emergency-management/emergency-operations-center/ Oklahoma City has 182 tornado warning sirens located across Oklahoma , Canadian and Cleveland counties.
Carter	Sirens, Phone notification (Text message alerts.) Emergency Broadcast System and Facebook notifications.
Cherokee	City of Tahlequah - Blackboard Connect service notification system can send personalized voice messages to residents and businesses within minutes with specific information about time-sensitive or common-interest issues such as emergencies and local community matters. There are 59 sirens in the county, but official indicate more sirens are needed for full coverage.
Choctaw	Not Available
Cimarron	Not Available
Cleveland	Outdoor warning systems (most with the ability to make a siren tone, other tones, and pre-recorded voice. Moore Public Schools also uses mass calling/texting/and email system. Oklahoma City has 182 tornado warning sirens located across Oklahoma , Canadian and Cleveland counties.

Coal	Nixle email/phone notification
Comanche	Comanche County utilizes a mass notification systems to alert citizens during emergencies and times of disaster. That systems is Nixle. http://www.comanchecounty.us/index.php/emergency-notification-systems Comanche County also has sirens, phone notification, and utilizes Emergency Broadcast System.
Cotton	Storm spotting and training
Craig	City of Vinita, OK has nine sirens and applied for a matching grant in March 2015 to upgrade these nine with three sirens which cover a larger area
Creek	Sirens (upgrades and new sirens installed in Drumright and Bristow) Phone notification (Nixle) Emergency Broadcast System
Custer	Purchased 2 sirens from City of Stillwater surplus (one single-phase and three three-phase sirens)
Delaware	Emergency Alert Program – sign up for notifications. Facebook notifications are used as one means of notification. Within the mitigation measures of the HMP, the Mayors of each of the incorporated communities are tasked with ensuring that additional outdoor warning devices are purchased and installed.
Dewey	Limited information available. Sirens are in various places in the county.
Ellis	Sirens, Phone notification, Emergency Broadcast System, Facebook
Garfield	Garfield County has a total of 16 jurisdictions within the county. All but 2 have storm sirens.
Garvin	16 outdoor sirens in Paul's Valley; Emergency Alert System
Grady	Tuttle – mapped locations for sirens (approximately 6 sirens) https://www.google.com/maps/d/u/0/viewer?ll=35.31%2C-97.752914&spn=0.070896%2C0.168174&t=m&msa=0&z=13&source=embed&ie=UTF8&mid=zsMbeKZ1DJto.kMw0Rx_pEnNQ
Grant	No information available.
Greer	No information available.
Harmon	Sirens were proposed in HMP; At least 1 siren is in Hollis
Harper	No information available.
Haskell	Sirens, Emergency Broadcast, Facebook
Hughes	There are outdoor sirens, phone notification, and Emergency Broadcast System
Jackson	19 sirens

Jefferson	Sirens, Emergency Broadcast, Facebook
Johnston	Tishomingo – Blackboard Connect notification, Storm Siren (Installed in 2009 near the Middle School); Facebook, New Notification system and sign-up (Nov. 2015): https://secure.hyper-reach.com/comsignupw.jsp?id=54802
Kay	Sirens in county, Ponca City has 4 sirens, Emergency Broadcast System
Kingfisher	Kingfisher has four tornado sirens
Kiowa	Sirens
Latimer	Sirens, Emergency Broadcast System, Facebook
LeFlore	City of Pocola has sirens; facebook
Lincoln	Sirens, Emergency Broadcast System, Facebook, smartphone ap
Logan	Logan County Outdoor Warning System – approximately 10 outdoor sirens http://logancountyok.com/index.php?bShow=775&cat=3
Love	Sirens, Facebook
Major	No information available.
Marshall	Sirens, Phone notification
Mayes	NOAA Weather Radios Mayes County outdoor warning system includes 26 sirens
McClain	Sirens, Emergency Broadcast System
McCurtain	Facebook
McIntosh	Checotah has (3) three sirens located in the following locations: <ul style="list-style-type: none"> • Charlie's Chicken • Marshall Elementary • Alternative School
Murray	Two sirens were noted on the Oklahoma Sirens Google Map.
Muskogee	19 sirens across the city of Muskogee; Facebook notifications
Noble	Noble County purchased two three-phase sirens from City of Stillwater surplus.
Nowata	There are warning sirens in Nowata and in the towns. No sirens exist in the rural areas of the county.
Okfuskee	Sirens, Emergency Broadcast System / email notification, Facebook
Oklahoma	Oklahoma City has 182 tornado warning sirens located across Oklahoma, Canadian and Cleveland counties.; Bethany has six emergency sirens and

	a cable television override; Warr Acres has three sirens
Okmulgee	Sirens, Emergency Broadcast System, Facebook, radio
Osage	Sirens are throughout the county. The HMP outlines new and updated sirens needed in the various towns.
Ottawa	Sirens, Emergency Broadcast System
Pawnee	Two sirens were noted on the Oklahoma Sirens Google Map.
Payne	City of Stillwater now has forty-two outdoor warning sirens. With Oklahoma State University's three sirens, there are forty-five warning sirens covering the University and the City.
Pittsburg	Sirens (Sirens that are maintained and activated by OEM from the Emergency Operations Center are in the towns and communities of Alderson, Arpelar, Arrowhead Estates, Bugtussle, Haywood, Indianola, Savanna, Shady Grove, and McAlester. OEM officials say sirens are only meant to be heard from outside of a home.) Emergency Broadcast System, Facebook, Phone aps
Pontotoc	Sirens – The City of Ada has 16 warning sirens throughout the community. Based on the map below, the coverage area covers the majority (if not all of the urban portions of the City of Ada) Phone notification (HMP mentions paging systems but does not explain whether text or call.) Emergency Broadcast System (via FM/AM radio and TV broadcasts)
Pottawatomie	Approximately 19 sirens; Desire to purchase and distribute NOAA radios to the public, schools and critical facilities (Action Project 21)
Pushmataha	No information available
Roger Mills	The Rogers Mills County notes in the HMP for mitigation are needed: <ul style="list-style-type: none"> • Improve Warning Systems (storm sirens, cell phone notification, fire alert, etc.) (p.62) Cheyenne has purchased 3 storm sirens. Hammon intends to purchase storm sirens in 2014.
Rogers	NOAA Weather Radios; City of Claremore outdoor warning system includes 8 sirens.
Seminole	Sirens (Numbers of sirens and siren coverage were not found nor included in the Proposed City of Seminole HMP); Phone notification (Emergency text messages); Emergency Broadcast System
Sequoyah	Information on notification systems was not identified.
Stephens	Blackboard Emergency Notification System; sirens
Texas	City of Guymon – nine outdoor warning sirens; Limited sirens county-wide – HMP indicates gaps and need for additional coverage.
Tillman	Sirens (12 sirens in Tillman County)

	http://www.kswo.com/story/29119029/frederick-explains-why-sirens-didnt-go-off?clienttype=mobile Phone notification (nixe) , Emergency Broadcast System / radio transmissions, Facebook
Tulsa	Sand Springs: http://www.sandspringsok.org/index.aspx?NID=467 -19 sirens; Tulsa 84 emergency warning sirens; Phone notification (TulsaAlert: call, email, or text alerts.) (estimate that 3% of population is not covered by siren warning); Emergency managers said it would take about 15 more sirens to fill all of the gaps outdoors. http://www.newson6.com/story/29079556/city-working-to-expand-storm-siren-network Emergency Broadcast System (EAS- utilizes FM, AM, and TV broadcast stations.) Flood Alert System that monitors rainfall and stream levels
Wagoner	Blackboard Connect Registration ; sirens mapped for the county (approximately 26, including those in Tulsa area).
Washington	200 NOAA weather radios, Oklahoma Weather Alert Remote Notification (OK-WARN) program, 36 outdoor sirens (26 of the sirens have the capability to not only sound a siren tone and several other tones, but also provide live or pre-recorded voice)
Washita	Sirens
Woods	Alva has 6 sirens
Woodward	Emergency Notification System http://www.readywoodward.com/ ; 18 outdoor sirens (installed after 2012 tornado to replace older sirens)

Social Vulnerability

This is an added component to the study. The connection between physical hazards and our populations that may have factors that reduce their ability to plan in advance, cope during an event and recover after an event is directly related with housing. We need to plan for housing in locations away from repeated risk factors such as flooding and provide assistance during natural events like tornadoes. Assistance that may be needed includes transportation during an event to a shelter or safe place. Public shelters are often needed for those in apartments, mobile homes, or housing without private shelters. Our elders may have general mobility or cognitive issues that can mean additional assistance is needed for transportation or even design of facilities. Those that may be unemployed or underemployed, renters, minorities, persons in poverty and many other factors may lead to great need for temporary housing if their housing or

employment has been destroyed in an event. Many of these socially vulnerable people may not have insurance or family or other resources to assist them if they experience losses from an event. We provided this analysis for each county to raise awareness that while hazards exist for all the population within a county, some may need additional attention and focus to insure their safety, health and recovery.

Table 4.0 Index - Levels of Social Vulnerability Analysis

Base Social Vulnerability Indicators (Percentages)	2 nd Order	3 rd 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 Van Zandt, Texas A&M, Hazard Planning materials; 2009-2013 American Community Survey, Tables B11003, B01001, B17001, B08301, B25044, B25001, B25042, B02001, B03002, B26001, B25036, B17001, B25043, S1501, B23025 & B06007

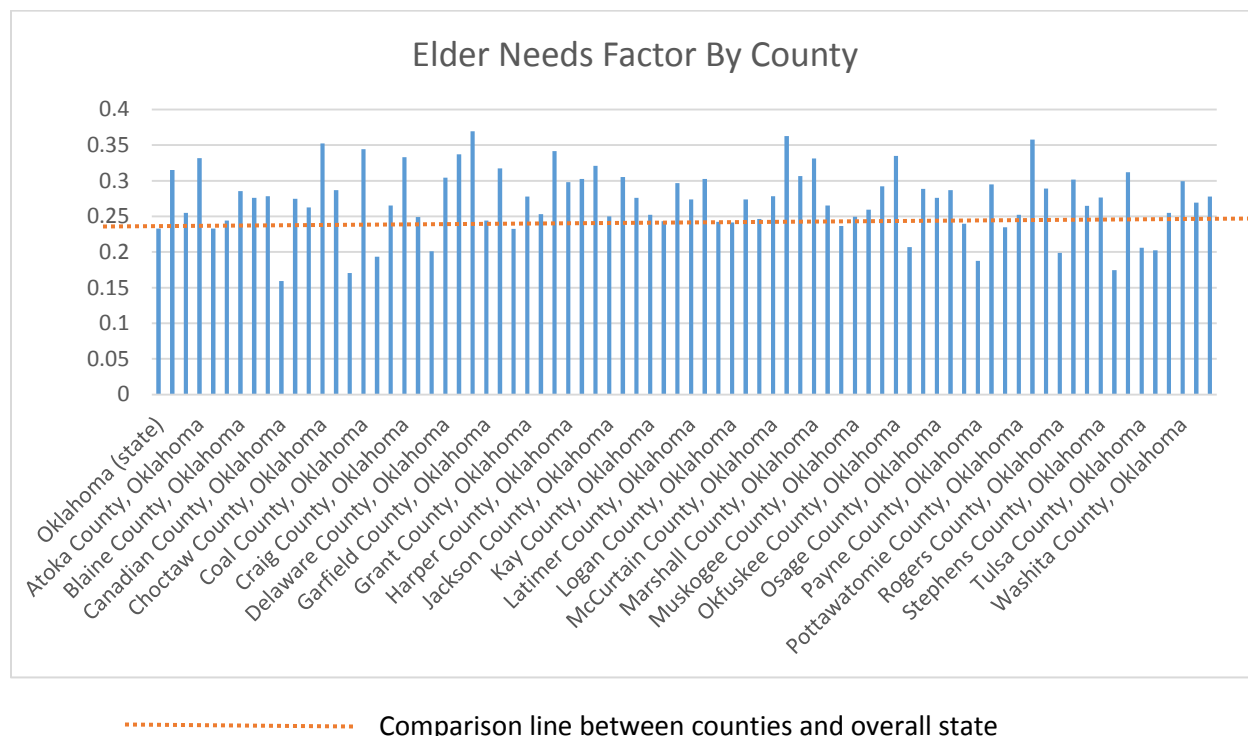
Child Care Factor: In places where there are a high number of households with single parents, these households may have one element of vulnerability where caring for children is an added task and these households may or may not have enough support. During an event this is added responsibility with fewer resources. This factor alone may not mean a household will experience more negative impacts, but rather combined with other factors and a physical hazard could make navigating the event and recovery more challenging. This factor also incorporates number of children as part of the added need or responsibility.

[illegible]

33

Elder Care Factor: Similarly to the child care factor, where there are poor as well as higher elder populations, these households may experience cognitive issues or mobility issues that require additional assistance from the community.

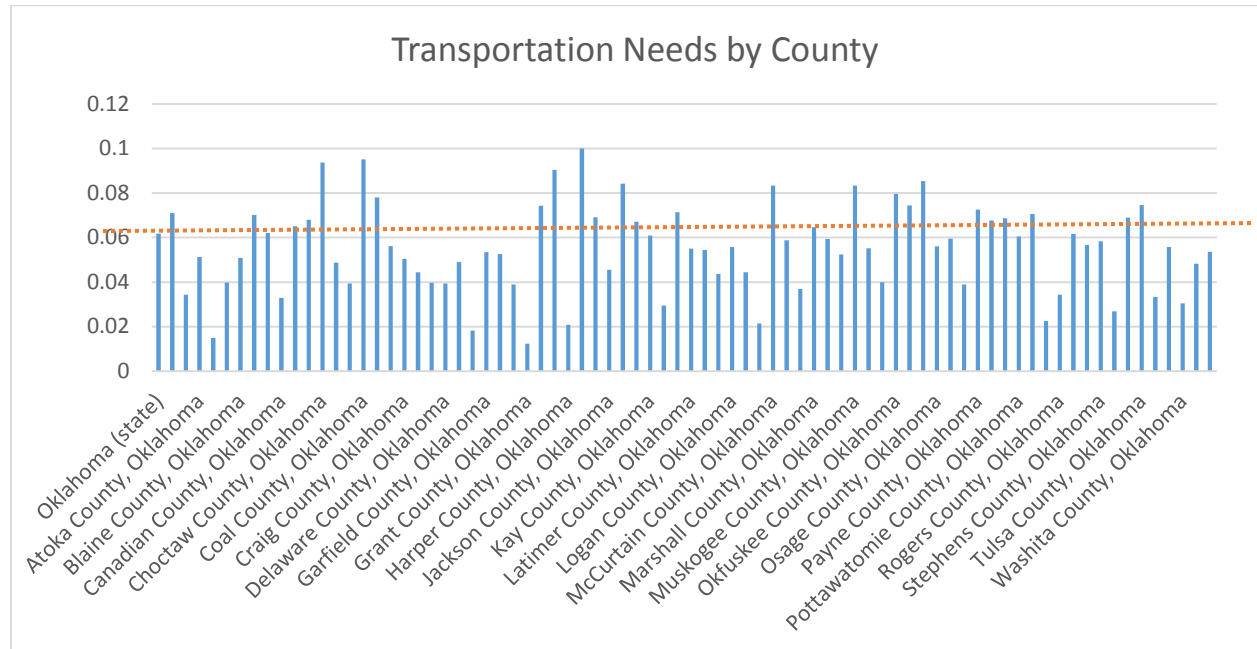
Table 5.0 Elder Care Factor By County



This table shows the relative county need for elder care. The overall state is at .232, therefore this gives us a comparison point for the other counties. For example, counties above the level for the state may note that there is reason to consider strategies to assist the elderly before and during an event.

Transportation Needs: Household reliant on transit or without a vehicle have limited options for evacuation or reaching a shelter.

Table 6.0 Transportation Needs Factor by County

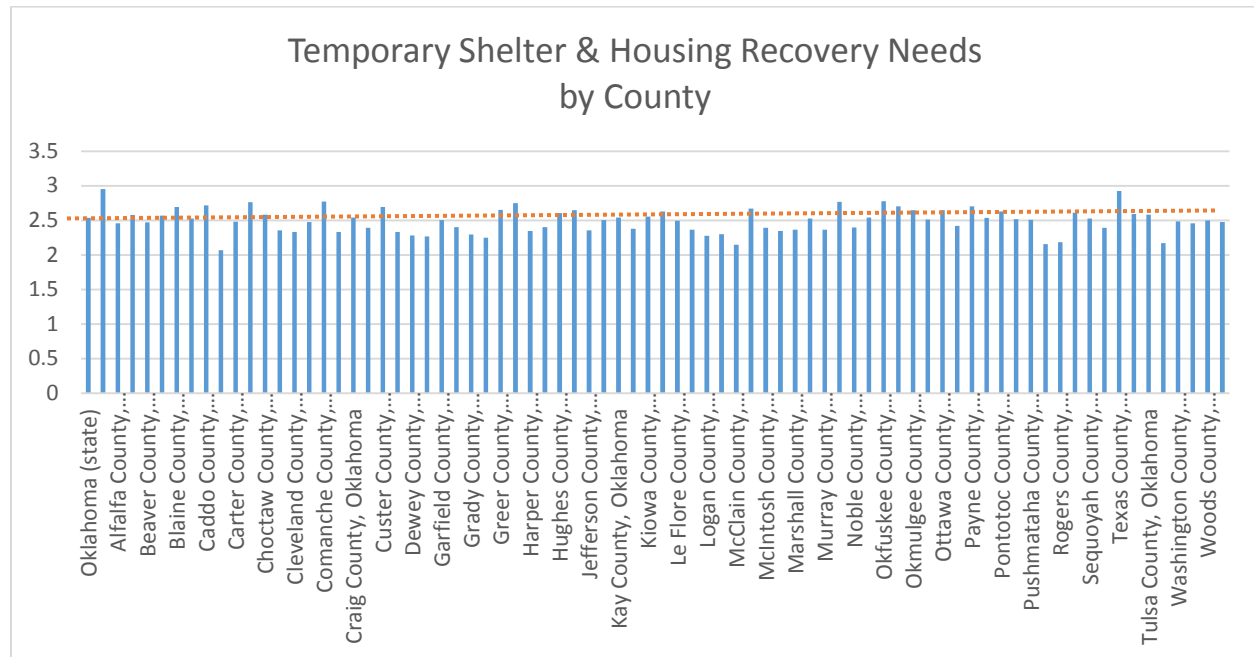


..... Comparison line between counties and overall state

This table shows the relative county need for transportation. The overall state is at .0617, therefore this gives us a comparison point for the other counties. For example, counties above the level for the state may note that there is reason to consider strategies to assist those relying on transit/walking and bicycling before and during an event.

Temporary Shelter and Housing Recovery Needs: Historically renters may experience more difficulties in finding temporary shelter or new housing after an event. Landlords may not rebuild or may not rebuild quickly. Renter insurance, if even maintained, may only cover contents not temporary housing. Older housing may be more susceptible to severe damage and not be rebuilt at the same level of rent. Mobile home owner and those persons in poverty may also be at further need for temporary and new housing options after an event.

Table 7.0 Temporary Shelter and Housing Recovery Needs by County

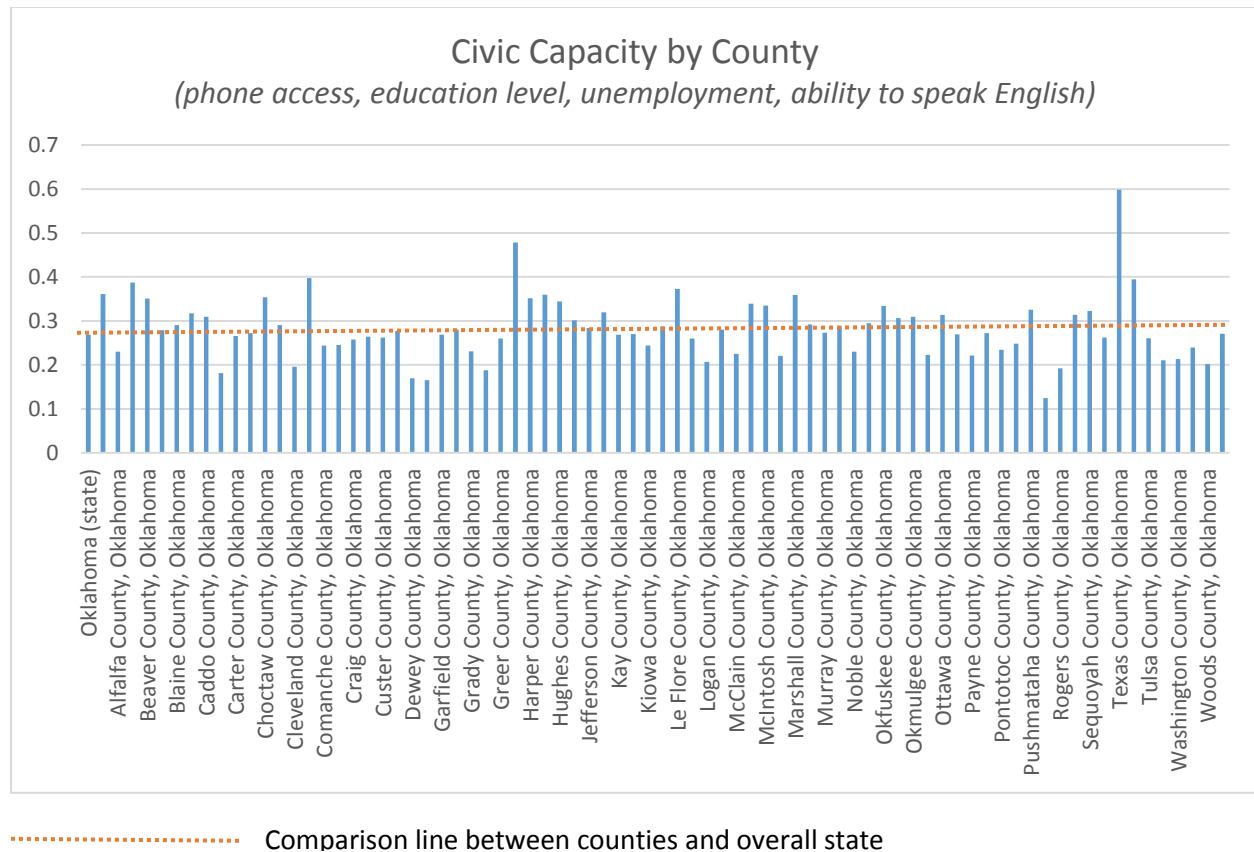


..... Comparison line between counties and overall state

This table shows the relative county need for temporary shelter. The overall state is at 2.53, therefore this gives us a comparison point for the other counties. For example, counties above the level for the state may note that there is reason to consider strategies have temporary shelter options before, during and after an event.

Civic Capacity Needs: The ability to get information (telephone, internet), education level, employment (under or unemployed) and English proficiency can also impact a household's ability to have information to prepare for an event as well as how to get help afterwards.

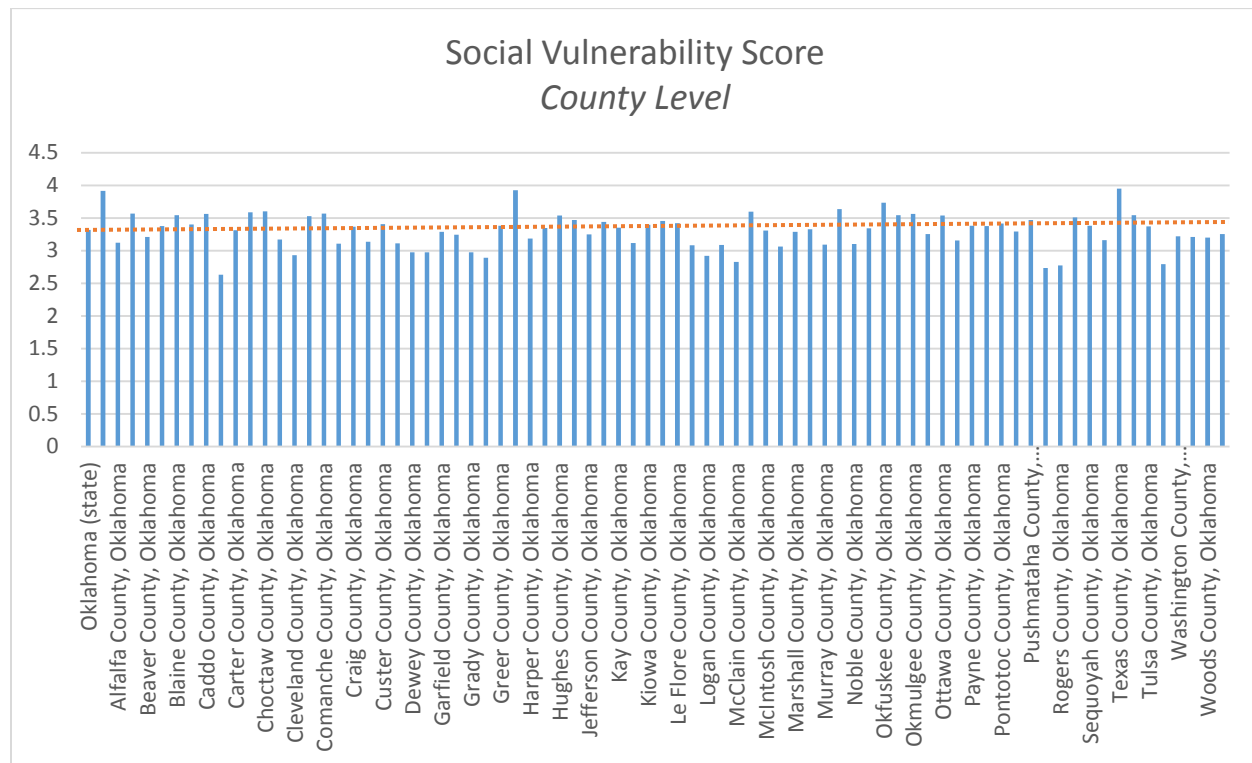
Table 8.0 Civic Capacity Needs by County



This table shows the relative county civic capacity. The overall state is at .268, therefore this gives us a comparison point for the other counties. For example, counties above the level for the state may note that there is reason to consider strategies to include multi-language education programs and information, flyers and early notifications via other modes that telephone (tv, radio), and well developed materials on how to prepare and where to do for all education levels.

Combine all of these factors together and add a physical hazard like a major flood event or tornado and it is clear why populations in our communities that have these factors struggle even more during and after an event. Targeting efforts to provide logistical assistance (e.g. transportation, emergency kits, and education) and physical assistance (e.g. temporary and new housing) should be part of an overall housing strategy within each community.

Table 9.0 Social Vulnerability Index By County

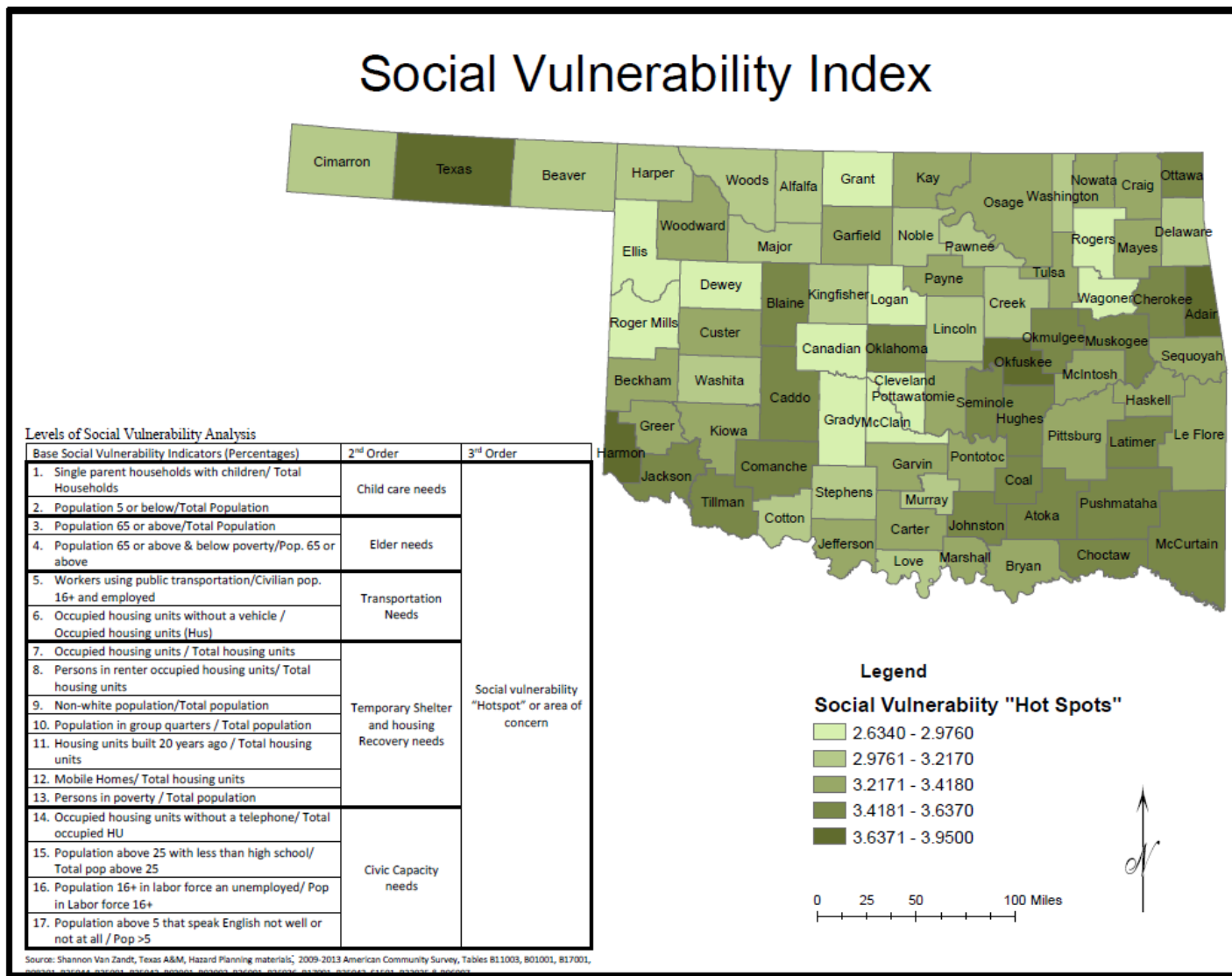


..... Comparison line between counties and overall state

Arguably it is important to note that a county having a lower score than the state or another county does not mean that there are no socially vulnerable populations in that area. It may mean the amount of population that have these factors is lower, which is certainly good, but it does not mean that attention to those that are at risk should be ignored. This index is a tool for our communities to pay more attention to those that may need basic assistance in order to prevent loss of life and ability to recover after a hazard event.

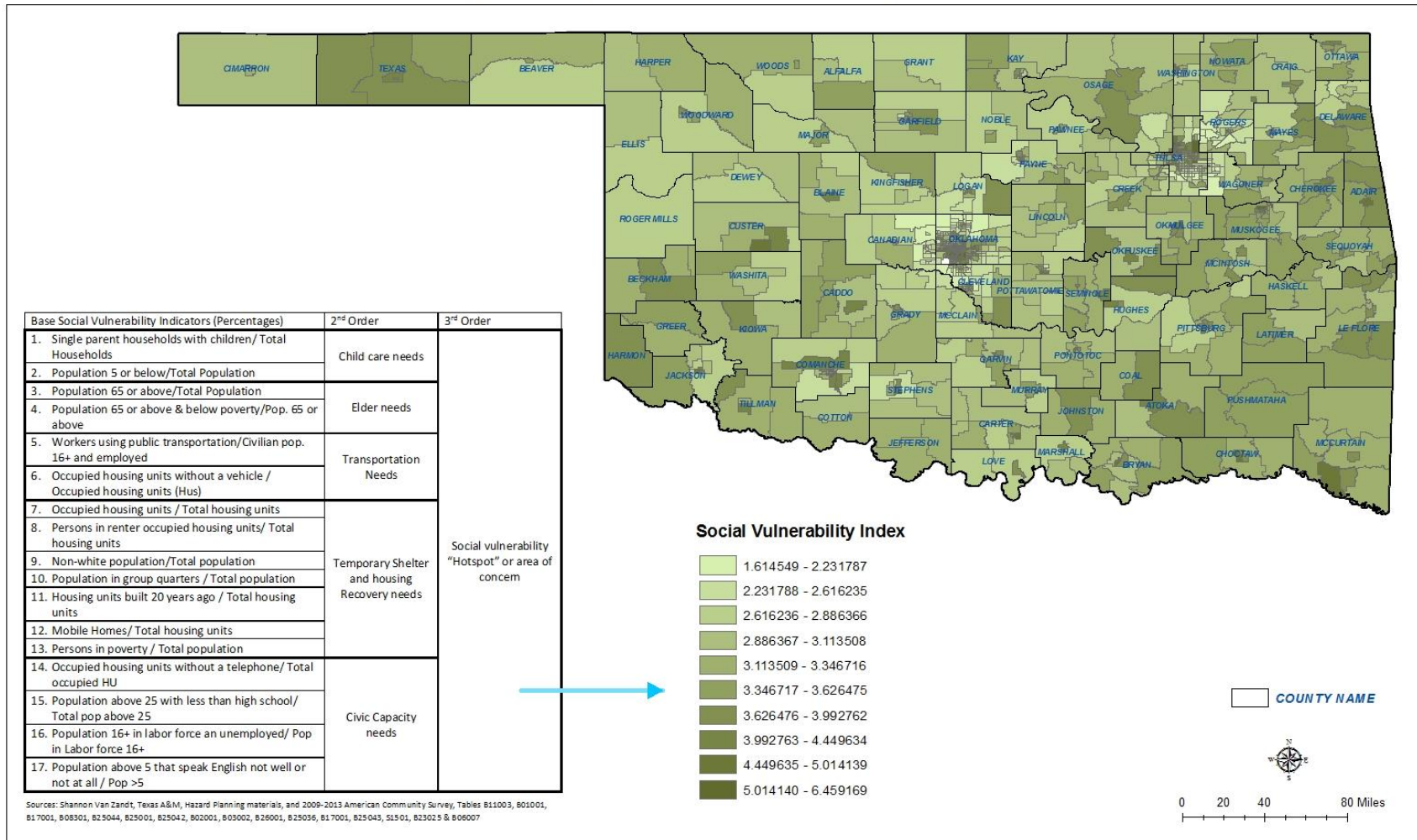
Looking at the census tract level for these same factors refines our understanding of where in the county the particular needs and vulnerability may lie. It is better illustrated via the map by census tracts using this same index. Within each county profile we looked at the relative score at the county level (Map 1) and then at the census tract level (Map 2). This second step noted where in the county measures to provide assistance may be the most helpful. Within each county profile, we overlaid the historical tornado events to show how the physical hazard combined with social vulnerability could have further negative impacts.

Map 1: Overview of State by County– Social Vulnerability



Map 2: Overview of State by Census Tract – Social Vulnerability

Social Vulnerability - Impacts on Housing & Disaster Resiliency



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

Disaster Resiliency Specific Findings & Recommendations

For all counties, standard recommendations include:

- Continue to update and maintain or simply create the county HMP and include attention to areas within the county that in addition to physical vulnerability may have compounding social vulnerability factors.
 - Encourage making progress on goals or recommendations contained in HMP that support installing shelters for public use, shelters that address multifamily apartments and mobile home needs, and shelters that target lower income and socially vulnerable populations.
- Efforts to strengthen building codes related to tornadoes and natural disasters should be considered.
 - Continue to support regulations that prevent development in the floodplain and removing structures in the floodplain that experience repeated damages from floods.
- 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.

Unique or specific recommendations or findings by county are listed below:

County	Findings & Recommendations
Adair	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Create a shelter registry for location of individual and business-based shelters (online or paper). • Tornadoes (1950 – 2014): Number: 55 Injuries:5 Fatalities:5 Damages (1996-2014): \$2,720,000.00 • Social Vulnerability: Particularly elevated social vulnerability score at county level; at census tract level particular attention to eastern tracts where Stilwell and Westville are located. • Floodplain: Narrow part of Stilwell may have floodplain issues, Watts has floodplain area on eastern edge
Alfalfa	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper). • Update and maintain the county HMP • Tornadoes (1959-2014): Number: 45 Injuries:3 Fatalities:0 Damages (1996-2014): \$260,000.00 • Social Vulnerability: Similar to overall state level • Floodplain: updated flood maps not available.
Atoka	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number:40 Injuries:59 Fatalities: 3 Damages (1996-2014): \$5,500,000.00 • Social Vulnerability: Elevated, particularly near Atoka (city)

	<ul style="list-style-type: none"> Floodplain: updated flood maps not available.
Beaver	<ul style="list-style-type: none"> Create and maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Create an online shelter registry for location of individual and business-based shelters. Tornadoes (1959-2014): Number: 65 Injuries: 20 Fatalities: 2 Damages (1996-2014): \$1,320,000.00 Social Vulnerability: Similar to overall state level Floodplain: updated flood maps not available.
Beckham	<ul style="list-style-type: none"> Create an shelter registry for location of individual and business-based shelters (online or paper) Tornadoes (1959-2014): Number: 60 Injuries: 22 Fatalities: 2 Damages (1996-2014): \$6,300,000.00 Social Vulnerability: Similar to overall state level at county level; at census tract level Sayre and Elk City have elevated scores Floodplain: Carter has some small area of floodprone land in the south end of the corporate limits, Sayre shows some floodprone areas near development.
Blaine	<ul style="list-style-type: none"> Tornadoes (1959-2014): Number: 43 Injuries:10 Fatalities:3 Damages (1996-2014): \$3,160,000.00 Social Vulnerability: Above the state score; Census tract near Watonga is elevated. Floodplain: updated flood maps not available.
Bryan	<ul style="list-style-type: none"> Create and maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Tornadoes (1959-2014): Number: 28 Injuries:14 Fatalities: 3 Damages (1996-2014): \$902,501.00 Social Vulnerability: Above the state score; Census tract near Durant is elevated. Floodplain: Durant has floodplain that is a ring around developed area; Bokchito has areas where riverine floodplain encroaches on development; Bennington has floodprone areas on east edge
Caddo	<ul style="list-style-type: none"> Tornadoes (1959-2014): Number: Injuries: Fatalities: Damages (1996-2014): Social Vulnerability: Particularly elevated social vulnerability score at county level; Census tract level Anadarko area and a corridor from southwest to northeast of the county have particularly higher scores Floodplain: Thirteen flood events were recorded in Caddo County since 1992; Recommendations for acquisition and demolition of structures in floodplain in HMP. Anadarko, Fort Cobb, and Lookeba have notable development within the floodplain.
Canadian	<ul style="list-style-type: none"> Tornadoes (1959-2014): Number: 92 Injuries: 235 Fatalities: 20 Damages (1996-2014): \$6,670,000.00 Social Vulnerability: Below state score at the county level; census tracts in the central area have elevated scores. Floodplain: Over \$3M in damages related to floods (1995-2009); All of the major cities in the county have floodplain areas where

	development has occurred.
Carter	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Tornadoes (1959-2014): Number: 55 Injuries: 54 Fatalities: 21 Damages (1996-2014): \$3,150,000.00 • Social Vulnerability: Similar to overall state level at county level; census tract level shows Ardmore area having elevated score. • Floodplain: Ardmore, Headlton, Wilson, Lone Grove, and Dickson have development that appears to be at or near the floodplain.
Cherokee	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 34 Injuries: 13 Fatalities: 2 Damages (1996-2014): \$4,810,000.00 • Social Vulnerability: Above the state score; several census tracts within the county show elevated scores. • Floodplain: Tahlequah and Hulbert has some development noted within the floodplain.
Choctaw	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 23 Injuries: 45 Fatalities: 0 Damages (1996-2014): \$0 • Social Vulnerability: Above the state score; at the census tract level Hugo area and tracts on the east and western edges of the county have particularly higher scores • Floodplain: updated flood maps not available.
Cimarron	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 42 Injuries: 3 Fatalities: 0 Damages (1996-2014): \$450,000.00 • Social Vulnerability: Similar to overall state level at county level; The area of higher level of social vulnerability by census tract is the Boise City area. • Floodplain: updated flood maps not available.
Cleveland	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 69 Injuries: 1127 Fatalities: 73 Damages (1996-2014): \$3,372,840,000.00 • Social Vulnerability: Below state score at the county level; census tracts in the central area have elevated scores. • Floodplain: Norman has developed a 50 year Greenbelt and Stormwater Management plan to address past flooding and improve planning practices near flood zones and flood prone areas. Additional drainage and stream restoration projects are also included in the HMP

Coal	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Tornadoes (1959-2014): Number: 24 Injuries: 2 Fatalities: 1 Damages (1996-2014): \$630,000.00 • Social Vulnerability: Above the state score; at the census tract level Coalgate area and eastern portion of the county have particularly higher scores • Floodplain: updated flood maps not available
Comanche	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 56 Injuries:122 Fatalities: 8 Damages (1996-2014): \$210,000.00 • Social Vulnerability: Above the state score; at the census tract level the central portion of the county, Lawton area has elevated scores. • Floodplain: 20 floods from 01/01/1993 to 03/07/2007 that resulted in \$20,000 in property damage from flash floods. No injuries or deaths were reported.
Cotton	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number:32 Injuries: 18 Fatalities: 8 Damages (1996-2014): \$110,000.00 • Social Vulnerability: Below state score at the county level; census tracts in the southern area have somewhat elevated scores. • Floodplain: Cotton County has a Countywide flood plain ordinance, which regulates the issuing of building permits within flood zones; 6 people was found to live in flood zones outside municipalities within the County
Craig	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 43 Injuries: 487 Fatalities: 25 Damages (1996-2014): \$63,910,000.00 • Social Vulnerability: Similar to overall state level at county level; census tract near Vinita has an increased social vulnerability score and has historically had tornado events • Floodplain: updated flood maps not available
Creek	<ul style="list-style-type: none"> • Exemplary connections between comprehensive plan and HMP. HMP clearly maps vulnerable populations in order to be more aware of where attention may be needed. • Tornadoes (1959-2014): Number: 64 Injuries: 526 Fatalities: 30 Damages (1996-2014): \$70,290,000.00 • Social Vulnerability: Below state score at the county level; some census tracts have elevated scores. • Floodplain: City of Sapulpa has floodplain management goals within comprehensive plan; Drumright, Sapulpa, Mannford, Slick and Bristow have notable development within the floodplain.
Custer	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 57 Injuries: 19 Fatalities: 4 Damages (1996-2014): \$1,110,000.00 • Social Vulnerability: Above the state score; at the census tract level,

	<p>the Weatherford and Clinton areas have particularly higher scores</p> <ul style="list-style-type: none"> Floodplain: Clinton, Weatherford, and Butler have notable development within or near the floodplain.
Delaware	<ul style="list-style-type: none"> Tornadoes (1959-2014): Number: 49 Injuries:53 Fatalities:0 Damages (1996-2014): \$14,310,000.00 Social Vulnerability: Below state score at the county level; Delaware (town) at the census tract level has an elevated score. Floodplain: Delaware County, Oklahoma experienced 20 floods from 05/09/1993 to 07/03/2004 that resulted in \$85,000 in property damage from flash floods. No injuries or deaths were reported.
Dewey	<ul style="list-style-type: none"> Create and maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Create a shelter registry for location of individual and business-based shelters (online or paper) Tornadoes (1959-2014): Number: 46 Injuries: 7 Fatalities: 0 Damages (1996-2014): \$3,080,000.00 Social Vulnerability: Below state score at the county level Floodplain: updated flood maps not available
Ellis	<ul style="list-style-type: none"> Create and maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Create a shelter registry for location of individual and business-based shelters (online or paper) Tornadoes (1959-2014): Number: 68 Injuries: 35 Fatalities: 6 Damages (1996-2014): \$1,270,000.00 Social Vulnerability: Below state score at the county level Floodplain: updated flood maps not available
Garfield	<ul style="list-style-type: none"> Create and maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Tornadoes (1959-2014): Number: 70 Injuries: 46 Fatalities: 1 Damages (1996-2014): \$1,640,000.00 Social Vulnerability: Below state score at the county level; census tract in the center of the county, Enid area, has elevated concern for social vulnerability Floodplain: Enid, Lahoma, Drummond, Garber have notable development within or near the floodplain.
Garvin	<ul style="list-style-type: none"> Tornadoes (1959-2014): Number: 47 Injuries: 38 Fatalities: 5 Damages (1996-2014): \$50,000.00 Social Vulnerability: Below state score at the county level; at the census tract level, the Maysville area and Pauls Valley areas have elevated scores. Floodplain:Pauls Valley, Wynnewood, Katie, Elmore, and Foster have notable development within or near the floodplain.
Grady	<ul style="list-style-type: none"> Update and maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Tornadoes (1959-2014): Number: 63 Injuries: 738 Fatalities: 41 Damages (1996-2014): \$1,000,890,000.00 Social Vulnerability: Below state score at the county level; at census tract level the central area near Chickasa has elevated social

	<p>vulnerability and historically has been hit by tornadoes</p> <ul style="list-style-type: none"> • Floodplain: Minco, Tuttle, Tabler, Chickasha, Norge, Ninnekah, Alex, Bradley, Rush Springs, and Verden have notable development within or near the floodplain.
Grant	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 73 Injuries: 21 Fatalities: 0 Damages (1996-2014): \$2,190,000.00 • Social Vulnerability: Below state score at the county level • Floodplain: updated flood maps not available
Greer	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 42 Injuries: 23 Fatalities: 2 Damages (1996-2014): \$100,000.00 • Social Vulnerability: Similar to overall state level at county level; • Floodplain: Mangnum, Granite, and Willow have notable development within or near the floodplain.
Harmon	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 24 Injuries: 6 Fatalities:0 Damages (1996-2014): \$100,000.00 • Social Vulnerability: Particularly elevated social vulnerability score at county level; at the census tract level, the entire rural county (low population overall) has particularly higher scores for all tracts • Floodplain: Hollis has floodplain concerns within the developed area.
Harper	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Update and maintain the county HMP • Tornadoes (1959-2014): Number: 27 Injuries:7 Fatalities: 0 Damages (1996-2014): \$140,000.00 • Social Vulnerability: Below state score at the county level • Floodplain: updated flood maps not available
Haskell	<ul style="list-style-type: none"> • Maintain the county HMP • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 34 Injuries:126 Fatalities: 17 Damages (1996-2014): \$480,000.00 • Social Vulnerability: Similar to overall state level at county level; at the census tract level the western portion of the county has elevated scores • Floodplain: updated flood maps not available
Hughes	<ul style="list-style-type: none"> • Maintain the county HMP • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 36 Injuries:62 Fatalities: 7 Damages (1996-2014): \$230,000.00 • Social Vulnerability: Above the state score; at the census tract area around Holdenville has increased scores • Floodplain: updated flood maps not available
Jackson	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based

	<ul style="list-style-type: none"> shelters (online or paper) Tornadoes (1959-2014): Number: 63 Injuries: 77 Fatalities: 4 Damages (1996-2014): \$20,000.00 Social Vulnerability: Above the state score; The area most vulnerable by census tract is in the area of Altus and western portion of the county. Floodplain: National Climatic Data Center storm event statistics record 12 flood events in Jackson County and participating jurisdictions during the 10-year period 1993-2003. There were no reported damages. According to National Flood Insurance Program statistics, Jackson County residents had four reported losses and received payments totaling \$5,164.00 as of May 2011.
Jefferson	<ul style="list-style-type: none"> Create and maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Create a shelter registry for location of individual and business-based shelters (online or paper) Tornadoes (1959-2014): Number: Injuries: Fatalities: Damages (1996-2014): Social Vulnerability: Below state score at the county level; at the census tract level, northwestern tracts (Waurika) of the county have elevated scores Floodplain: updated flood maps not available
Johnston	<ul style="list-style-type: none"> Create and maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Create a shelter registry for location of individual and business-based shelters (online or paper) Tornadoes (1959-2014): Number: 27 Injuries: 19 Fatalities: 2 Damages (1996-2014): \$5,250,000.00 Social Vulnerability: Above the state score; at the census tract level, western portion of the county have particularly higher scores Floodplain: updated flood maps not available
Kay	<ul style="list-style-type: none"> Maintain the county HMP Tornadoes (1959-2014): Number: 92 Injuries: 604 Fatalities: 102 Damages (1996-2014): \$5,120,000.00 Social Vulnerability: Similar to overall state level at county level; western census tract of the county (Braman, Blackwell, and Tonkawa) has increased scores. Floodplain: The Ponca City Stormwater Master Plan has mapped all the impacted structures subject to flooding and have identified structural improvements to reduce impacts (Ponca City HMP, p. 82).
Kingfisher	<ul style="list-style-type: none"> Tornadoes (1959-2014): Number: 69 Injuries: 242 Fatalities: 12 Damages (1996-2014): \$18,750,000.00 Social Vulnerability: Below state score at the county level; at the census tract level, the north and northeastern tracts of the county have elevated scores Floodplain: Hennessey and Kingfisher (town) have notable development within or near the floodplain.

Kiowa	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number:73 Injuries:9 Fatalities:2 Damages (1996-2014): \$740,000.00 • Social Vulnerability: Similar to overall state level at county level; at the census tract level, the western tracts of the county have elevated scores • Floodplain: National Climatic Data Center storm event statistics record 27 flood events in Kiowa County and participating jurisdictions during the 10-year period 2000-2013. According to National Flood Insurance Program statistics, Kiowa County residents had four reported losses and received payments totaling \$360,000.00 as of January 2013.
Latimer	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 29 Injuries: 121 Fatalities: 17 Damages (1996-2014): \$1,420,000.00 • Social Vulnerability: Above the state score; at the census tract level, most of the southern to central portion of the county have particularly higher scores • Floodplain: updated flood maps not available
LeFlore	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 59 Injuries: 147 Fatalities: 20 Damages (1996-2014): \$3,670,000.00 • Social Vulnerability: Above the state score; at the census tract level, the southern portion of the county has a particularly higher scores • Floodplain: Spiro, Shady Point, Panama, and Poteau have notable development within or near the floodplain.
Lincoln	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 77 Injuries: 355 Fatalities: 16 Damages (1996-2014): \$63,970,000.00 • Social Vulnerability: Below state score at the county level; Populations near Chandler and Stroud, per census tract level map, show higher indicators for social vulnerability • Floodplain: Chandler, Stroud, Warwick, Wellston, Prague, Meeker, Sparks have notable development within or near the floodplain.
Logan	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 52 Injuries: 241 Fatalities: 11 Damages (1996-2014): \$23,760,000.00 • Social Vulnerability: Below state score at the county level; central census tracts of the county, near Guthrie, have particularly elevated scores • Floodplain:Guthrie, Cedar Valley, Crescent, Cimarron City, have notable development within or near the floodplain
Love	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan.

	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 20 Injuries:18 Fatalities:13 Damages (1996-2014): \$3,170,000.00 • Social Vulnerability: Below state score at the county level; The area most vulnerable by census tract is in the populated area of Marietta. • Floodplain: updated flood maps not available
Major	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 66 Injuries:49 Fatalities: 15 Damages (1996-2014): \$3,350,000.00 • Social Vulnerability: Below state score at the county level; at the census tract level, the Fairview area has elevated indicators for social vulnerability • Floodplain: updated flood maps not available
Marshall	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Tornadoes (1959-2014): Number:32 Injuries:46 Fatalities: 4 Damages (1996-2014): \$100,000.00 • Social Vulnerability: Below state score at the county level; the area most vulnerable by census tract is in the populated area of Madill. • Floodplain: updated flood maps not available
Mayes	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 60 Injuries: 145 Fatalities: 3 Damages (1996-2014): \$1,390,000.00 • Social Vulnerability: Similar to overall state level at county level; at the census tract level, the Pryor area and a corridor running from southwest to northeast portion of the county have elevated scores • Floodplain: Mayes County experienced 29 flood events between 1995 and 2010 that resulted in 1 death, 2 injuries, and \$1,018,000 in property damage.
McClain	<ul style="list-style-type: none"> • Maintain the county HMP • Tornadoes (1959-2014): Number:134 Injuries: 1294 Fatalities: 74 Damages (1996-2014): \$3,374,780,000.00 • Social Vulnerability: Below state score at the county level • Floodplain: Blanchard, Newcastle, Goldsby, Washington, Purcell, Wayne, Byers have notable development within or near the floodplain
McCurtain	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number:54 Injuries: 97 Fatalities: 1 Damages (1996-2014): \$6,610,000.00 • Social Vulnerability: Above the state score; at the census tract level, the Broken Bow and Idabel areas have elevated scores • Floodplain: Broken Bow, Idabel, Wright City have notable development within or near the floodplain
McIntosh	<ul style="list-style-type: none"> • Maintain the county HMP • Tornadoes (1959-2014): Number:46 Injuries: 19 Fatalities: 2 Damages (1996-2014): \$4,290,000.00 • Social Vulnerability: Similar to the state score; at the census tract level, the western portion of the county have particularly higher scores • Floodplain: updated flood maps not available

Murray	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Tornadoes (1959-2014): Number:32 Injuries: 15 Fatalities: 7 Damages (1996-2014): \$290,000.00 • Social Vulnerability: Below state score at the county level; The census tract near Sulphur has increased social vulnerability scores. • Floodplain: updated flood maps not available
Muskogee	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Tornadoes (1959-2014): Number:45 Injuries: 37 Fatalities:5 Damages (1996-2014): \$670,000.00 • Social Vulnerability: Particularly elevated social vulnerability score at county level; at the census tract level, the Muskogee area has particularly higher scores • Floodplain: Muskogee (city), Ft. Gibson, Taft, Haskell, Webber Falls, and Porum have notable development within or near the floodplain
Noble	<ul style="list-style-type: none"> • Maintain the county HMP • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 39 Injuries: 35 Fatalities: 2 Damages (1996-2014): \$13,270,000.00 • Social Vulnerability: Below state score at the county level; The census tract near Perry exhibits an increased social vulnerability score. • Floodplain: updated flood maps not available
Nowata	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Create an electronic database for shelter registry. • Tornadoes (1959-2014): Number: 38 Injuries:38 Fatalities:0 Damages (1996-2014): \$2,310,000.00 • Social Vulnerability: Similar to overall state level at county level; census tracts near Lenapah, Delaware, and Nowata are elevated. • Floodplain: Nowata (town) and Delaware have notable development within or near the floodplain
Okfuskee	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number:46 Injuries:220 Fatalities: 10 Damages (1996-2014): \$770,000.00 • Social Vulnerability: Particularly elevated social vulnerability score at county level; at the census tract level, the Okemah area and western portion of the county have particularly higher scores • Floodplain: updated flood maps not available
Oklahoma	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 111 Injuries:1040 Fatalities: 45 Damages (1996-2014): \$1,400,430,000.00 • Social Vulnerability: Above the state score; at the census tract level, the OKC area including south OKC and the northeast OKC portions of the city and county have particularly higher scores • Floodplain: The HMP estimates over 10,000 population within the

	100-year floodplain and an additional 11,000 in the 500-year floodplain.
Okmulgee	<ul style="list-style-type: none"> • Maintain the county HMP • Tornadoes (1959-2014): Number: 46 Injuries: 127 Fatalities:10 Damages (1996-2014): \$1,560,000.00 • Social Vulnerability: Above the state score; census tracts nearest to Okmulgee have elevated social vulnerability scores • Floodplain: (city), Henryetta, Grayson and Hoffman have notable development within or near the floodplain
Osage	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 96 Injuries:334 Fatalities:16 Damages (1996-2014): \$2,680,000.00 • Social Vulnerability: Below state score at the county level; at the census tract level, the western portion of the county, including Pawhuska, has elevated social vulnerability scores • Floodplain: Osage County has experienced 71 Flood events from 1950 through 2010 resulting in \$992,000 in damage.
Ottawa	<ul style="list-style-type: none"> • Maintain county HMP • Tornadoes (1959-2014): Number: 33 Injuries: 473 Fatalities: 22 Damages (1996-2014): \$75,300,000.00 • Social Vulnerability: Above the state score; at the census tract level, the Miami area and eastern portion of the county have particularly higher scores • Floodplain: Miami, Picher, Wyandotte, and Fairland have notable development within or near the floodplain
Pawnee	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number:30 Injuries:282 Fatalities:19 Damages (1996-2014): \$1,010,000.00 • Social Vulnerability: Below state score at the county level; most vulnerable by census tract is in the populated area of Pawnee • Floodplain: updated flood maps not available
Payne	<ul style="list-style-type: none"> • Maintain the county HMP • Tornadoes (1959-2014): Number: 52 Injuries:275 Fatalities: 20 Damages (1996-2014): \$60,000.00 • Social Vulnerability: Similar to overall state level at county level; at the census tract level, the areas near Stillwater and Cushing have increased social vulnerability scores • Floodplain: Stillwater, Cushing, Drumright, Yale, and Perkins have notable development within or near the floodplain
Pittsburg	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number:70 Injuries: 46 Fatalities: 1 Damages (1996-2014): \$3,050,000.00 • Social Vulnerability: Similar to overall state level at county level; at the census tract level, the McAlester area and eastern portion of the county have particularly higher scores • Floodplain: McAlester, Krebs, Hartshorne, Haileyville, Kiowa, Pittsburg (town), Crowder, Canadian (town), Indianola, and Quinton

	have notable development within or near the floodplain
Pontotoc	<ul style="list-style-type: none"> • Continue to update and maintain the county HMP • Continue to apply for grants and pursue funding for more public emergency shelters. • Tornadoes (1959-2014): Number: 45 Injuries:96 Fatalities:8 Damages (1996-2014): \$560,000.00 • Social Vulnerability: Above the state score; at the census tract level, the Ada area is the most socially vulnerable in the county • Floodplain: The National Climatic Data Center lists only four specific flood events in or near Ada since 1990, with these being primarily street flooding, or flooding outside the city.
Pottawatomie	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number:61 Injuries:321 Fatalities:15 Damages (1996-2014): \$2,590,000.00 • Social Vulnerability: Below state score at the county level; The census tracts near Shawnee and Tecumseh have elevated scores for social vulnerability • Floodplain:Tecumseh, Bethel Acres, Shawnee, McCloud, and many of the rural areas have close proximity to floodplain areas.
Pushmataha	<ul style="list-style-type: none"> • Maintain the county HMP • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 43 Injuries: 6 Fatalities: 0 Damages (1996-2014): \$610,000.00 • Social Vulnerability: Above the state score; uniform score across census tracts, therefore county-wide concern. • Floodplain: updated flood maps not available
Roger Mills	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number:41 Injuries: 23 Fatalities: 2 Damages (1996-2014): \$7,120,000.00 • Social Vulnerability: Below state score at the county level; no particularly elevated census tracts • Floodplain: National Climatic Data Center storm event statistics record 5 flooding events in Roger Mills County and participating jurisdictions during 2000 – 2013 with \$40,000 estimated property and \$45,000 crop damage
Rogers	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number:56 Injuries:309 Fatalities: 10 Damages (1996-2014): \$1,850,000.00 • Social Vulnerability: Below state score at the county level; the immediate census tract near Claremore has an elevated score • Floodplain: According to the NCDL, City of Claremore experienced 3 flood events between 2006 and 2011. There are seven repetitive loss structures in Claremore that are insured through NFIP.
Seminole	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Continue to apply for grants and pursue funding for more public emergency shelters.

	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number:54 Injuries:87 Fatalities:5 Damages (1996-2014): \$1,650,000.00 • Social Vulnerability: Above the state score; various census tracts, Seminole area, Konawa and eastern portion of the county, have increased social vulnerability scores. • Floodplain: Seminole (city) and Wewoka have notable development within or near the floodplain
Sequoyah	<ul style="list-style-type: none"> • Maintain the county HMP • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number:44 Injuries:242 Fatalities:35 Damages (1996-2014): \$150,550,000.00 • Social Vulnerability: Similar to overall state level at county level; at the census tracts, the central portion of the county near Sallisaw and the eastern portion of the county near Moffat and Roland have increased factor scores for social vulnerability • Floodplain: Sallisaw, Muldrow, Roland, Marble City, Vian, Gore, and Paradise Hill have notable development within or near the floodplain
Stephens	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Tornadoes (1959-2014): Number:61 Injuries:27 Fatalities:2 Damages (1996-2014): \$110,000.00 • Social Vulnerability: Below state score at the county level; The Duncan area census tracts within the county have some increased social vulnerability scores • Floodplain: Central High, Marlow, Bray, Lake Humphreys, Duncan, Velma, Sunray, Comanche and other rural areas have notable development within or near the floodplain.
Texas	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Housing should continue to avoid potential flood prone areas, and existing housing impacted by repeated floods should ideally be moved/removed. • Increase outdoor sirens consistent with developed Texas County HMP to insure coverage for the county. • Tornadoes (1959-2014): Number:72 Injuries:13 Fatalities:0 Damages (1996-2014): \$830,000.00 • Social Vulnerability: Particularly elevated social vulnerability score at county level; The area more vulnerable by census tract is primarily in the Guymon area. • Floodplain: Goodwell and Guymon have notable development within or near the floodplain.
Tillman	<ul style="list-style-type: none"> • Create a shelter registry for location of individual and business-based shelters (online or paper) • Tornadoes (1959-2014): Number: 74 Injuries: 138 Fatalities: 12 Damages (1996-2014): \$760,000.00 • Social Vulnerability: Above the state score; at the census tract level, the Frederick area and western portion of the county have particularly

	<p>higher scores</p> <ul style="list-style-type: none"> Floodplain: updated flood maps not available; National Climatic Data Center storm event statistics record 12 flooding events in Tillman County during 1995-2007. The reported damage totaled \$1.262 million
Tulsa	<ul style="list-style-type: none"> Increase sirens coverage as recommended by HMP and emergency manager Tornadoes (1959-2014): Number:67 Injuries: 383 Fatalities: 15 Damages (1996-2014): \$13,270,000.00 Social Vulnerability: Similar to overall state level at county level; at the census tract level, Tulsa – particularly North Tulsa – has increased social vulnerability Floodplain: Estimated 1425 residential buildings in the floodplain; 29 repetitive loss structures in unincorporated Tulsa County that are insured through the National Flood Insurance Program
Wagoner	<ul style="list-style-type: none"> Tornadoes (1959-2014): Number: 47 Injuries: 85 Fatalities: 0 Damages (1996-2014): \$4,560,000.00 Social Vulnerability: Below state score at the county level; at the census tract level there are tracts in the south and central where the social vulnerability index elevated Floodplain: Coweta, Porter, Wagoner (city), and Okay have notable development within or near the floodplain.
Washington	<ul style="list-style-type: none"> Maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Tornadoes (1959-2014): Number: 31 Injuries: 102 Fatalities: 1 Damages (1996-2014): \$1,920,000.00 Social Vulnerability: Below state score at the county level;The area most vulnerable by census tract is in the populated area of Bartlesville. Floodplain: Bartlesville, Dewey, Copan, Ramona and Ocheleta have notable development within or near the floodplain.
Washita	<ul style="list-style-type: none"> Create a shelter registry for location of individual and business-based shelters (online or paper) Tornadoes (1959-2014): Number:47 Injuries: 22 Fatalities: 1 Damages (1996-2014): \$100,720,000.00 Social Vulnerability: Below state score at the county level; at the census tract level, the north tracts near Foss and Canute of the county have elevated scores Floodplain: updated flood maps not available; National Climatic Data Center storm event statistics record 4 flood events in Washita County and participating jurisdictions during the period of 2000-2013. There were no reported damages. According to National Flood Insurance Program statistics, Washita County residents had one reported loss and received payments totaling \$20,000.00 as of June 2002.
Woods	<ul style="list-style-type: none"> Create and maintain the county HMP Apply for grants/funding to develop a county hazard mitigation plan. Create a shelter registry for location of individual and business-based shelters (online or paper)

	<ul style="list-style-type: none"> • Tornadoes (1959-2014): Number: 48 Injuries:5 Fatalities: 0 Damages (1996-2014): \$260,000.00 • Social Vulnerability: Below state score at the county level; The census tract near Alva has increased social vulnerability • Floodplain: updated flood maps not available
Woodward	<ul style="list-style-type: none"> • Create and maintain the county HMP • Apply for grants/funding to develop a county hazard mitigation plan. • Tornadoes (1959-2014): Number:60 Injuries: 32 Fatalities:6 Damages (1996-2014): \$410,000.00 • Social Vulnerability: Below state score at the county level; the area most vulnerable by census tract is in the populated area of Woodward. • Floodplain: Woodward (city), Mooreland, Sharon and Mutual have notable development within or near the floodplain.