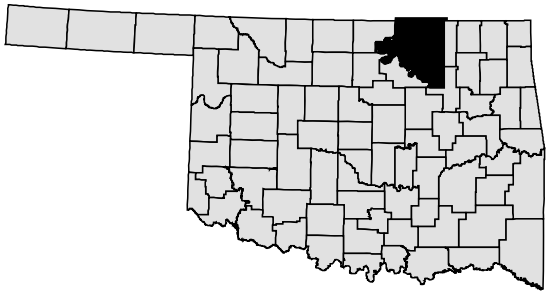
Osage County



Multi-Jurisdictional Multi-Hazard Mitigation Plan

Participation Jurisdictions:

Osage County
Town of Avant
City of Barnsdall
Town of Burbank
Town of Fairfax
City of Hominy
City of Pawhuska
Town of Prue
City of Shidler
Town of Wynona
Anderson Elementary School District
Barnsdall Independent School District
Bowring School District
Hominy Independent School District
McCord School District
Osage Hills Elementary School District
Pawhuska Independent School District
Prue Independent School District
Woodland School District
Wynona Independent School District

November 7, 2011

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Chapter 1: Introduction

1.1 About the Plan

This document is the first phase of a multi-hazard mitigation plan for Osage County. It is a strategic planning guide developed in fulfillment of the Hazard Mitigation Grant Program requirements of the Federal Emergency Management Agency (FEMA), according to the Stafford Disaster Relief and Emergency Assistance Act. This act provides federal assistance to state and local governments to alleviate suffering and damage from disasters. It broadens existing relief programs to encourage disaster preparedness plans and programs, coordination and responsiveness, insurance coverage, and hazard mitigation measures.

This plan is developed in accordance with guidance from, and fulfills requirements for the Hazard Mitigation Grant Program (HMGP). The plan addresses natural hazards and hazardous materials events.

1.1.1 Purpose

The purpose of this plan is to:

1. Assess the ongoing hazard mitigation activities in Osage County (Chapter 1)
2. Outline the Planning Process used by Osage County in completing a Multi-Hazard Mitigation Plan (Chapter 2)
3. Identify and assess the hazards that may pose a threat to citizens and property (Chapter 3)
4. Evaluate mitigation measures that should be undertaken to protect citizens and property (Chapter 4)
5. Outline a strategy for implementation of mitigation projects (Chapter 5)
6. Plan Maintenance and Adoption (Chapter 6)

The objective of this plan is to provide guidance for county-wide hazard mitigation activities for the next five years. It will ensure that Osage County and other partners implement activities that are most effective and appropriate for mitigating natural hazards and hazardous materials incidents.

1.1.2 Scope

The scope of the Osage County Multi-Hazard Mitigation Plan is county-wide. It addresses natural hazards deemed to be a threat to the citizens of Osage County, as well as hazardous-materials events. Both short-term and long-term hazard mitigation opportunities are addressed beyond existing federal, state, and local funding programs. The jurisdictions participating in this

plan are Osage County, and the Osage County communities of Avant, Barnsdall, Burbank, Fairfax, Hominy, Pawhuska, Prue, Shidler, and Wynona. Also participating in this plan are school districts in Osage County; the school districts of Anderson Elementary School District (1 site), Barnsdall Independent School District (2 sites), Bowring School District (1 site), Hominy School District (1 site), McCord School District (1 site), Osage Hills Elementary School District (1 site), Pawhuska Independent School District (5 sites), Prue Independent School District (2 sites), Woodland School District (2 sites), and the Wynona Independent School District (1 site).

1.1.3 Authority

Section 409 of the *Robert T. Stafford Disaster Relief and Emergency Assistance Act*, (Public Law 93-288, as amended), Title 44 CFR, as amended by Section 102 of the *Disaster Mitigation Act of 2000*, provides the framework for state and local governments to evaluate and mitigate all hazards as a condition of receiving federal disaster assistance. A major requirement of the law is the development of a hazard mitigation plan.

1.1.4 Funding

Funding for the Osage County Multi-Hazard Mitigation Plan was provided by a grant from the Federal Emergency Management Agency (FEMA) and the Oklahoma Department of Emergency Management (ODEM). A 75% FEMA grant through the ODEM, with a 25% local share, was administered through the Indian Nations Council of Governments (INCOG). The Hazard Mitigation Grant Program grant under FEMA-1883-DR-OK was $88,000.01. The local match was $29,333.67.

1.1.5 Goals

The goals for the Osage County Multi-Hazard Mitigation Plan were developed by the staff and the Osage County Emergency Management Advisory Committee (OCEMAC), with input from interested citizens. The local goals were developed taking into account the hazard mitigation strategies and goals of the federal and state governments.

National Mitigation Strategy and Goal

FEMA has developed ten fundamental principles for the nation's mitigation strategy:

1. Risk reduction measures ensure long-term economic success for the community as a whole, rather than short-term benefits for special interests.
2. Risk reduction measures for one natural hazard must be compatible with risk reduction measures for other natural hazards.
3. Risk reduction measures must be evaluated to achieve the best mix for a given location.
4. Risk reduction measures for natural hazards must be compatible with risk reduction measures for technological hazards, and vice versa.
5. All mitigation is local.
6. Emphasizing proactive mitigation before emergency response can reduce disaster costs and the impacts of natural hazards. Both pre-disaster (preventive) and post-disaster (corrective) mitigation is needed.
7. Hazard identification and risk assessment are the cornerstones of mitigation.

8. Building new federal-state-local partnerships and public-private partnerships is the most effective means of implementing measures to reduce the impacts of natural hazards.
9. Those who knowingly choose to assume greater risk must accept responsibility for that choice.
10 Risk reduction measures for natural hazards must be compatible with the protection of natural and cultural resources.

FEMA's goal is to:

1. Substantially increase public awareness of natural hazard risk so that the public insists on having safer communities in which to live and work
2. Significantly reduce the risk of loss of life, injuries, economic costs, and destruction of natural and cultural resources that result from natural hazards

State of Oklahoma Mitigation Strategy and Goals

The State of Oklahoma has developed a Strategic All-Hazards Mitigation Plan to guide all levels of government, business, and the public to reduce or eliminate the effects of natural, technological, and man-made disasters. The goals and objectives are:

1. Improve government recovery capability.
2. Provide pre- and post-disaster recovery guidance.
3. Protect public health and safety.
4. Reduce losses and damage to property and infrastructure.
5. Preserve natural and cultural resources in vulnerable areas.
6. Preserve the environment.
7. Focus only on those mitigation measures that are cost-effective and provide the best benefit to communities.

The key measures to implement these goals include:

1. Enhance communication between state and federal agencies and local governments to facilitate post-disaster recovery and pre- and post-disaster mitigation.
2. Coordinate federal, state, local, and private resources to enhance the preparedness and mitigation process.
3. Ensure consistency between federal and state regulations.
4. Protect critical facilities from hazards.
5. Support legislation that protects hazardous areas from being developed. Osage County's Goal

Osage County's Goal

To improve the safety and well-being of the citizens residing and working in Osage County by reducing the potential of death, injury, property damage, environmental and other losses from natural and technological hazards

Goals for mitigation of each of the hazards are presented in Chapter 4

1.1.6 Point of Contact

The primary point of contact for information regarding this plan is:

Mike Pattison
Osage County Emergency Management Director
125 E. 6th Street
Pawhuska, OK 74056
Office: (918) 287-2285
Fax: (918) 287-4896
e-mail: Howard_Pattison@yahoo.com

The secondary point of contact is:

Adrian Horn
Osage County Emergency Management
125 E. 6th Street
Pawhuska, OK 74056
Office: (918) 287-2285
Fax: (918) 287-4896
e-mail: Adrianhorn_ocems@yahoo.com

1.2 Community Description

Like most counties in the region, Osage County is faced with a variety of hazards, both natural and man-made. In recent history, winter storms, lightning, floods, and tornadoes have made the national headlines. Any part of the county may be impacted by high winds, drought, hail, fire, hazardous materials events, and other catastrophes. In some cases such as flooding and dam failure, the areas most at risk have been mapped and delineated.

Osage County is located north of the Arkansas River in the eastern part of the State of Oklahoma. According to 2010 Census figures, Osage County has a population of 44,437. It has experienced a growth rate of 6.8% since 2000, with an annual average growth of 0.66%.

1.2.1 Geography

Latitude: 35.59N
Longitude: 96.36W

Osage County is located in northeast Oklahoma and is accessed primarily by US-60, SH 20, SH 99, SH 18 and SH 11. Pawhuska, the county seat of Osage County is 57 miles northeast of Tulsa and 135 miles northeast of Oklahoma City. Osage County encompasses approximately 2300 square miles and is the largest county in the State of Oklahoma. The area is part hills and bluffs and part wide prairie, marking the dividing line between the ridges of the Ozarks in the East and the broad plains of the West. This land is part of the Osage Reservation. Map Number 1 in Appendix 1 is a location map of Osage County.

1.2.2 Climate

Pawhuska, the county seat of Osage County lies at an elevation of 818 feet above sea level. Osage County is far enough south to miss the extreme cold of winter. The climate is essentially continental characterized by rapid changes in temperature. The winter months are usually mild, with temperatures occasionally falling below zero, but only for a very short time. Temperatures of 100 degrees or higher are often experienced from late July to early September. January's average temperature is 34.9 degrees Fahrenheit and July's average is 81.8 degrees Fahrenheit. Osage County will receive a wide variety of precipitation throughout any given year. It averages 39.79 inches of rainfall and 9 inches of snow each year.

1.2.3 History

In 1872, the United States Government purchased land from the Cherokee Nation for the Osage tribe and it was then that the tribe moved to Indian Territory. At statehood, 1907, this Osage Reservation became Osage County, the largest county in Oklahoma. The name is a corruption by the French of the tribal name Wah-Sha-She. Pawhuska, the county seat, was named for Chief Pa-hue-Skah, which means "white hair."

1.2.4 Population and Demographics

The Osage County has an estimated 2010 population of 47,472. Over the last twenty years, Osage County's population is growing increasingly older, with the median age increasing from 34.5 in 1990 to 38.1 in 2000 to 41.1 in 2010, according to the U.S. Bureau of the Census. Older

populations are more vulnerable to certain hazards, such as extreme heat and cold. A map, showing the age 65 and older areas, is shown in Map Number 2 in Appendix 1. Low-income populations are also more vulnerable to extreme temperatures; low-income areas are shown in Map Number 3 in Appendix 1. Osage County demographic data is shown in Table 1-1.

Table 1-1: Osage County Demographic Data
Source: 2010 Census

SUBJECT	NUMBER
Total Population	47,472
65 years and older	7,278
Poverty Status in 1999 (individuals)	5,651

According to the Osage County Assessor's Office there are 20,546 properties with improvements within the Osage County, with a total assessed value of $1,400,159,197. Numbers of properties with improvements (buildings, garages, pools, storage, etc.) and improvement values, by type are shown in the table below.

Table 1-2: Osage County Housing Property Types by Assessed Values
Source: Osage County Assessor's Office

Category	Number of Structures	Structure Value ($$)
Residential	16,716	1,051,339,817
Commercial	933	166,846,220
Agricultural	2,897	181,973,170
Total	20,546	1,400,159,197

1.2.5 Local Utilities--Lifelines

Lifelines are defined as those infrastructure facilities that are essential to the function of the community and the well being of its residents. They generally include transportation and utility systems. Transportation systems include interstate, US, and state highways, rail, waterways, ports and harbors, and airports. Utility systems include electric power, gas and liquid fuels, telecommunications, water, and wastewater. The following table shows utilities and the companies or sources that supply each one for Osage County.

Table 1-3: Utility Suppliers for Osage County

UTILITY	SUPPLIER
Electric	AEP/PSO
Water	City/Town and RWD
Sewage Treatment	City/Town
Natural Gas	City/Town and ONG and Center Pointe Gas
Telephone	Southwestern Bell and Windstream
Cable TV	Community Cablevision

1.2.6 Economy

According to the 2000 U.S. Census, in 1999, of Osage County's population over the age of 16, there are 20,409 people in the labor force and 5.6% are unemployed. Of the people employed, 73.4% are salary and private-wage workers, 16.5% are government workers, and 9.5% are self-employed in unincorporated businesses. The median household income in 1999 was $34,477, and the median family income was $40,784. The 2010 Census data of this subject is not been published.

1.2.7 Industry

Principle employment occupations in Osage County include managerial, professional, sales, and office work, followed by production, transportation, construction, maintenance, and service occupations.

1.2.8 Future Development

The Tulsa Metropolitan Statistical Area is growing at 1.3%, the same as the national growth rate. Comparatively, the State of Oklahoma is growing at 1.0% annually. Osage County's annual growth rate is 0.67%. Growth, development and redevelopment in Osage County continue at a significant pace. Primary growth areas include the Skiatook Lake area in the southeast quadrant, the extreme east edge of the county adjacent to the City of Bartlesville and the northwest quadrant of the county east of Ponca City. The 2010 Census data of this subject is not been published.

Growth Trends

Oklahoma Department of Commerce estimates that Osage County will continue to grow at 1.37% per year over the next twenty years. Development activity is expected to continue in the southern and eastern parts of the county adjacent to Tulsa County and the City of Bartlesville.

1.3 Regulatory Framework

This section contains a summary of the current ordinances for land use, zoning, subdivision, floodplain in Osage County that was reviewed by the Osage County Multi-Hazard Planning Committee. It also lists the current building codes and fire insurance rating.

1.3.1 Comprehensive Planning and Zoning

Osage County has a comprehensive plan, zoning code, and subdivision regulations. The Osage County Planning Commission oversees planning and zoning in Osage County. The Zoning Code and Subdivision Regulations, and input by the County Planning and Zoning staff, were utilized as a reference in the development of this Hazard Mitigation Plan.

Osage County Zoning Code, adopted March 1, 1994, is administered by County staff.

Osage County Subdivision Regulations, adopted October 10 1988, is administered by the Osage County Planning Commission pursuant to the powers vested through Title 19, Oklahoma Statutes, Chapter 19.a, Sections 12 and 13, as amended to review, approve and disapprove plats for the subdivision of land within the Osage County.

Avant Zoning Code is administered by the Town.
Avant Subdivision Regulations are administered by the Town.
Barnsdall Zoning Code is administered by the City.
Barnsdall Subdivision Regulations, adopted is administered by the City.
Burbank does not have a Zoning Code
Burbank does not have subdivision regulations
Fairfax does not have a zoning code.
Fairfax does not have subdivision regulations.
Hominy Zoning Code is administered by the City.
Hominy does not have subdivision regulations.
Pawhuska Zoning Code, adopted 2006, is administered by the City.
Pawhuska Subdivision Regulations, adopted 1970, is administered by the City.
Prue does not have zoning code.
Prue does not have subdivision regulations..
Shidler does not have a Zoning Code.
Shidler dies not have Subdivision Regulations.
Wynona does not have a Zoning Code.
Wynona does not have subdivision regulations.

1.3.2 Floodplain Management

The Osage County participates in the National Flood Insurance Program (NFIP). The County enforces floodplain management regulations beyond the national minimum criteria. The County's floodplain management regulations and mapping were utilized as a resource and reference in the development of this Hazard Mitigation Plan. The other communities participating in the plan; Avant, Barnsdall, Burbank, Fairfax, Hominy, Osage, Pawhuska, Prue, Shidler, Webb City, and Wynona, also participate in the NFIP.

1.3.3 Building Codes

The Osage County has adopted and uses the 2000 version of the International Building Codes published by BOCA, as well as supplemental ordinances which cover areas where the International Codes are inadequate or vague. This information was used as a reference in preparing this Hazard Mitigation Plan.

Osage County requires building permits in the unincorporated areas of the County.
Avant requires building permits and administers a building code.
Barnsdall requires building permits and administers a building code.
Burbank does not require building permits.
Fairfax requires building permits. The Town does not administer a building code.
Hominy does not require building permits.
Pawhuska uses the International Building Code and requires building permits.
Prue does not require building permits.
Shidler does not require building permits.
Wynona does not require building permits.

1.3.4 Fire Protection and Insurance

Osage County has numerous community fire departments, with various ISO fire ratings. Ratings for the participating communities in Osage County range from 4 to 9, where lower numbers signify better ratings. Primary factors related to the rating process involves how the department responds to alarms and notifies its personnel; the supply and distribution of water in the area; staffing; training and equipment. ISO ratings for the participating communities' fire departments in the County are as follows: Avant – 9, Barnsdall – 8, Burbank – 9, Fairfax – 8, Hominy – 5, McCord – 9, Pawhuska – 4, Prue – 9, Shidler – 9, and Wynona – 9. Fire Department statistics and information were used as a reference in preparing this Hazard Mitigation Plan and are discussed in more detail in Chapter 3: Wildfires.

1.4 Existing Hazard Mitigation Programs

In an effort to address hazards that impact the county, the Osage County has identified an existing plans and procedures for informing people about protection measures and warning the public of impending threats. The review of existing plans is important in the preparation of this hazard mitigation plan.

1.4.1 Emergency Operations Plans

The Osage County has adopted an Emergency Operations Plan, revisits and readopts it annually; the last readoption in 2011. The EOP was used as a reference in preparing this Hazard Mitigation Plan As part of the EOP, critical facilities were identified. These facilities include shelters, police and fire stations, schools, childcare centers, senior citizen centers, hospitals, disability centers, vehicle and equipment storage facilities, emergency operations centers, and city halls. Osage County's critical facilities are shown in Map Number 4 in Appendix 1, and listed in Section 3.3. The vulnerability of Critical Facilities to various hazards is addressed in this study.

Avant has adopted an Emergency Operations Plan, adopted in 2011.
Barnsdall has adopted an Emergency Operations Plan, adopted in 2011.
Burbank has adopted an Emergency Operations Plan, adopted in 2011.
Fairfax has adopted an Emergency Operations Plan, adopted in 2010.
Hominy has adopted an Emergency Operations Plan.
Pawhuska has adopted an Emergency Operations Plan, adopted in 2010.
Prue has adopted an Emergency Operations Plan, adopted in 2010.
Shidler has adopted an Emergency Operations Plan, adopted in 2010.
Wynona has adopted an Emergency Operations Plan.

The Bowring School District has an EOP, adopted in 2007.
The Wynona Independent School District has an EOP.

1.4.2 Capital Improvement Plan

The Capital Improvement Plan (CIP) is the principle method of scheduling and financing future capital needs, and part of those needs could address hazard mitigation actions. Major updates to the CIP should occur periodically and the plan should receive a minor review during the annual budgeting process. All eight of the participating communities have CIPs, and projects on their CIPs could have a positive impact upon the community's ability to mitigate and respond to hazard events.

The Town of Avant adopted their CIP in 2001. Their capital projects included:

1. Water line improvements
2. Gas line improvements
3. New Town Park
4. Town Hall administrative equipment

The City of Barnsdall last updated their CIP in 2008. Their capital projects included:

1. ADA compliant restrooms in City Hall
2. A concrete floor in the warehouse
3. Improvements to the HVAC in the library building
4. New Public Works equipment

The Town of Burbank last updated their CIP in 2009. Their capital projects included:

1. Street and roadside drainage ditch rehab
2. Complete phase 2-4 of water line improvements
3. Rehab high I/I manholes
4. Replace clay sewer lines

The Town of Fairfax last updated their CIP in 2011. Their capital projects included:

1. Repair pump floatation device at water supply lake
2. Sewer line and manhole rehabilitation
3. Sewer lift station rehabilitation
4. Replace Fire Department SCBA units

The City of Hominy last updated their CIP in 2011. Their capital projects included:

1. Improvements to water and wastewater treatment plant
2. Overlay streets
3. New street sweeper
4. New lawn mowers

The City of Pawhuska last updated their CIP in 2011. Their capital projects included:

1. New streetscape
2. Overlay streets
3. Improvements to sidewalks
4. New trash truck

The Town of Prue last updated their CIP in 2008. Their capital projects included:

1. Replace undersized water lines
2. Roof repairs to Town Hall
3. Overlay streets
4. Improvements to Town Hall entrance

The City of Shidler last updated their CIP in 2007. Their capital projects included:

1. Wastewater treatment plant improvements
2. Replace water lines
3. Add fire hydrants and water line valves
4. Replace Fire Department SCBA equipment

The Town of Wynona last updated their CIP in 2011. Their capital projects included:

1. Replace communication equipment in Town Hall
2. Replace water lines and fire hydrants
3. Replace sewer lines
4. Overlay streets

Not all the school districts have capital improvement plans. These that do are:

The Bowring School District CIP was adopted in 2009. Their capital projects include:

1. Replace the old gym floor.
2. Replace gas heaters in the old gym.

The McCord School District CIP was lasted approved in July 2010. Their capital projects include:

1. Retrofit metal roof for cafeteria.
2. Purchase a 65 passenger diesel school bus.
3. Remodel two bathrooms.
4. Purchase 30 computers.
5. Replace student desks and chairs.

The Osage Hills Elementary School District CIP was adopted in 2011. Their capital projects include:

1. New Roof.
2. Replace the HVAC.
3. Install a security entrance.
4. Parking Improvements.

The Pawhuska Independent School District has a CIP. Their capital projects include:

1. Renovate the Indian Camp to house PK–2. Includes a new secure door, administrative offices, age appropriate rest rooms, renovate the kitchen and cafeteria areas. Estimated cost $1,184,050.00.
2. Renovate Elementary School grades 3-6. Includes construction of an age appropriate rest room, secured entry, open the hallways to exit outside, upgrade interior hallways, and replace HVAC. Estimated cost $1,606,602.00.
3. Renovate High School. Includes adding a secure entry, administrative offices, new rest rooms, one additional classroom, new entrance from main building into attached field house, replace ceiling tile and lights in hallways, renovate field house lobby and concession area, and repair the drainage problem at the site. Estimated cost $1,745,420.00.
4. Replace visitor bleachers at the football stadium with metal bleachers and press box. Estimated cost $225,000.00.
5. Demolish the old administration/HS building at 15th and Lynn. Estimated cost $125,000.00.

The Woodland School District does not have a capital improvement plan.

The Wynona Independent School District has a CIP.

Chapter 2:

The Planning Process

2.1 Documentation of the Planning Process

The Osage County Multi-Hazard Mitigation Plan is a county-wide effort to coordinate Osage County's multi-hazard planning, development, and mitigation activities. The Indian Nations Council of Governments (INCOG) was responsible for overall coordination and management of the study, aided by Osage County staff and representatives of the participating jurisdictions.

A mitigation plan is the product of a rational thought process that reviews the hazards, quantifies their impacts on the county, identifies alternative mitigation activities, and selects those activities that will work best for the county.

This plan addresses the following hazards

- Floods
- Tornadoes
- High Winds
- Lightning
- Hailstorms
- Severe Winter Storms
- Extreme Heat
- Drought
- Expansive Soils
- Wildfires
- Earthquakes
- Hazardous Materials Events
- Dam Breaks

The approach for the Osage County multi-hazard mitigation plan update followed a ten-step process, based on the guidance and requirements of FEMA. The ten steps are described below.

2.1.1 Step One: Organize to Prepare the Plan

An open public process was established to give all sections in Osage County and individuals and agencies in the County regional area interested in hazard mitigation issues, an opportunity to become involved in the planning process and make their views known. Citizens and community leaders; city, county, regional, state, and federal staff; and professionals active in hazard mitigation planning provided important input in the development of the plan.

The planning process was originally created by the Board of County Commissioners in Commission action for Osage County in appointing the Osage County Emergency Management Advisory Committee (OCEMAC) to oversee the planning effort.

The OCEMAC membership is partially made up of representatives of departments who have roles in hazard planning, response, protection, and mitigation. These committee members are also representative of various civic organizations and other communities in the county. The OCEMAC was supported by the county staff. INCOG staff worked with the committee for this hazard mitigation plan update. The County and INCOG staff met several times during the planning process, attended all meetings of the OCEMAC, and meetings with elected officials.

All of the OCEMAC meetings were posted at the County and in other public places, including the County Emergency Management Office, and open to the public.

For the individual communities and school districts, participating in the Osage County plan, their representatives were members of the OCEMAC.

The OCEMAC met at the Pawhuska Dave Landrum Community Center during the planning process to review progress, identify issues, receive task assignments, and advise the County and INCOG staff dedicated to updating the plan. Neighboring jurisdictions, Federal and State agencies, businesses, universities, non-profit organizations and the public were invited to the OCEMAC meetings throughout the entire planning process. Local research and input was provided by committee members and the INCOG staff provided a regional hazard mitigation perspective and direct access to state and federal hazard information resources and led the preparation of draft planning documents. INCOG staff outlined the plan and prepared a draft. Committee members selected the hazards to investigate, provided specific county information, conducted the public hazard awareness survey, ranked mitigation activities, and selected the action plan projects. INCOG staff then prepared the final plan update for review. A list of OCEMAC members and meetings are shown in Table 2-1. The agendas, minutes, and sign-in sheets for these meetings are included in Appendix 2.

Table 2–1:
Osage County Emergency Management Advisory Committee
Committee Members

Name	Jurisdiction
Howard Pattison	Osage County Emergency Mgmt, and Committee Chairman
Adrian Horn	Osage County Emergency Management
Earleen Reedy	Town of Avant
Cindy Morris	City of Barnsdall
Glenda Willard	Town of Burbank
Sharon Box	Town of Burbank
Cordelia Reed	Town of Burbank
Kira Teachout	Town of Burbank
Rae Ann Smith	Town of Fairfax
Charlie Cartwright	Town of Fairfax
Henry Cook	Town of Fairfax
Felix Nance	City of Hominy
Steve Pitts	City of Hominy
Tex Bayouth	City of Hominy
Paul McAlexander	City of Pawhuska
Gip Allen	City of Pawhuska
Mark Chamberlain	City of Pawhuska
Brenda Owens	Town of Prue
Kenneth Goodman	Town of Prue
Billy J. Lay	Town of Prue
Ed Kramer	City of Shidler

Tennie Slone	Town of Wynona
Janet Delaney	Town of Wynona
Jim Lott	Town of Wynona
Brent McKee	Anderson School
Brett Banker	Anderson School
Rick Loggins	Barnsdall Independent School District
Nicole Hinkle	Bowring School
Ginger Chinn	Bowring School
John Strom	Bowring School
Pat Drummond	Hominy School District
Boyd Braden	McCord Schools
Jeannie O'Daniel	Osage Hills School
Jim Smith	Osage Hills School
Ben West	Pawhuska ISD #2
Greg Hembree	Pawhuska ISD #2
Thad Green	Pawhuska ISD #2
Tom Scully	Prue Independent School District
Sandy Parker	Woodland School District
Dixie Hurd	Wynona School District
Bobbi McGill	Wynona School District
Jacque Canady	Osage County Inter-local Cooperative
John McElhenney	INCOG
Vernon Seaman	INCOG

Osage County Emergency Management Advisory Committee Meetings and Activities

Date	*Activity*
First meeting 07/21/2011	OCEMAC meeting at Pawhuska Dave Landrum Community Center to discuss the overall need for a plan, the jurisdictions to be included in the update, the planning process and plan outline, discuss hazard identification and assessment issues and begin review of Draft Plan.
Second meeting 09/15/2011	OCEMAC meeting at Pawhuska Dave Landrum Community Center to review the public hazard awareness survey, review the mapping, discuss mitigation goals and objectives, and discuss mitigation activities and the ranking process.
Third meeting October 26, 2011	OCEMAC meeting at Pawhuska Dave Landrum Community Center to review the mitigation activities selected by the County, the Communities, and the School Districts. Also discuss the plan maintenance and the County, Communities, and School Districts adoption process.
Fourth meeting 11/30/2011	
Fifth meeting	

2.1.2 Step Two: Involve the Public

An open to the public planning process was again utilized by the County in this plan update.. In addition to the OCEMAC, the staff team undertook additional projects to inform the public of this effort and to solicit their input. All meetings of the OCEMAC were publicly posted as required by ordinances and rules of the jurisdiction. A public hazard awareness survey was developed and circulated by plan participants and by the County to solicit community input on an assessment of the public's level of concern for each hazard in July, 2011. The results of these surveys were important to the development of the plan and selection of mitigation activities. 95 responses were received. A copy of the survey and summary of the responses are included in Appendix 4. Public comments were also invited by public notice. A public hearing was held during the committee meeting held on November 30, 2011. The public was also invited to comment on the updated plan at the Board of County Commissioners meeting to further solicit public comments before final plan update approval. A copy of the public hearing notice, attendance, and minutes are included in Appendix 2.

2.1.3 Step Three: Coordinate with Other Agencies and Organizations

As part of the plan update process and to collect data on the hazards that impact Osage County, staff reviewed information sources of public agencies, private organizations, and academia that contend with natural hazards. These sources included printed documents and internet web sites. These agencies and organizations included FEMA, the Corps of Engineers, the US Geological Survey, INCOG, Osage County, the Oklahoma Department of Environmental Quality, the Oklahoma Water Resources Board, the National Climatic Data Center, the National Oceanic and Atmospheric Administration, and the Natural Resource Conservation Service. Academia included the University of Oklahoma. FEMA mapping, when combined with aerial data and historic data from the National Climatic Data Center proved to be crucial to hazard identification and impact. The following list of agencies and organizations either participated in the planning process or were invited to comment on a draft of the updated plan prior to approval. A sample letter requesting comments is included in Appendix 3.

Federal
- US Army Corps of Engineers
- Natural Resource Conservation Service (NRCS)
- US Fish and Wildlife Service

National Non-Profit
- American Red Cross

State
- Oklahoma Department of Emergency Management
- Oklahoma Water Resources Board
- Oklahoma Conservation Commission
- Oklahoma Department of Wildlife Conservation
- Oklahoma Department of Environmental Quality

Regional
- Indian Nation Council of Governments (INCOG)

Osage County
- County Emergency Management

Tribal
- Osage Nation

Avant/Barnsdall/Burbank/Fairfax/Hominy/Pawhuska/Prue/Sand Springs/Skiatook/Shidler/Wynona
- Municipal Offices

Business
- John Heskett, Heskett & Heskett

Academia
- Anderson Elementary School District
- Avant Independent School District
- Barnsdall Independent School District
- Bowring School
- Hominy Independent School District
- McCord School
- Osage Hills School
- Pawhuska ISD #2
- Prue Independent School District
- Woodland School District
- Wynona Independent School District

Non-Profit

Osage County Inter-local Cooperative

Coordination with other county planning efforts is critical to the success of the Multi-Hazard Mitigation Plan updates. The planning process utilized for the initial plan was followed for the 2011 update. The OCEMAC used information included in the most current version of the County's Comprehensive Plan, Emergency Operations Plan, FIRM Maps, Building Codes and County Ordinances as part of the update process. The County Staff provided information in regard to the utilization of the initial Multi-Hazard Mitigation Plan as a resource for integrating Action Plan Activities and other plan information into other County planning activities. Through participation in the OCEMAC, participating communities and school districts provided valuable information to the plan update process.

2.1.4 Step Four: Assess the Hazard

The staff team collected data on the hazards from available sources. Hazard assessment is included in Chapter 3, with the discussion of each hazard.

Table 2-2 lists the various hazards that affects Osage County, describes how they were identified, and why they were identified.

Table 2–2:
How and Why Hazards Were Identified

Hazard	*How Identified*	*Why Identified*
Floods	• Review of FEMA and City and County floodplain maps • Buildings in the floodplains • Historical floods and damages	• 6849 parcels in Osage County are located in the floodplain • Over $ 178 million of property at risk
Tornados	• Input from Emergency Manager • Consensus of Emergency Management Advisory Committee • Review of data from the National Climatic Data Center	• Osage County is located in "Tornado Alley" • 73 tornado events were reported in the county over the past 61 years. • All citizens and buildings are at risk
High Winds	• National Weather Service data • Loss information provided by national insurance companies	• 441 high wind-related events in Osage County in the last 61 years, and $ 996,000 in damage
Lightning	• Committee members' experience	• Lightning occurrence with thunderstorms are common throughout the county.
Hailstorms	• National Climatic Data Center and State Disaster Declarations	• 524 hail damage events in Osage County over the last 61 years
Severe Winter Storms	• National Climatic Data Center and State Disaster Declarations	• 35 snow and ice events in Osage County in the last61 years, reporting over $51 million in property damage.
Extreme Heat	• Review of number of heat-related deaths and injuries during hot Oklahoma summers • Review of data from National Climatic Data Center and National Center for Disease Control	• Local community service organizations have made heat-related deaths a high priority

Drought	• Historical vulnerability to drought, the "Dust Bowl" era • Drought and water shortages in Osage County and adjacent counties occurred during the preparation of this update.	• Need to ensure adequate long-term water resources for Osage County
Expansive Soils	• Input from INCOG • Review of NRSC data	• Damage to buildings from expansive soils can be mitigated with public information and building code provisions
Wildfires	• Input from the Committee • Input from Rural Fire Coordinator	• Continuing loss of life and property due to fires • Numerous areas of Osage County are exposed and vulnerable to wildfires
Earthquakes	• Historic records of area earthquakes • Input from Oklahoma Geological Survey • Input from USGS	• Osage County has a history of mild earthquakes
Dam Break	• OWRB Dam Safety Program • Review of FIRM maps	• Eleven dams in the county are listed as significant or high hazard dams. • Dam breaks provide very little warning time.
Hazardous Materials Events	• Input from ODEQ	• Several hazardous materials sites are scattered throughout the county • Major traffic ways expose Osage County to potential traffic way hazardous materials incidents

2.1.5 Step Five: Assess the Problem

The hazard data was analyzed in light of what it means to public safety, health, buildings, transportation, infrastructure, critical facilities, and the economy. County and INCOG staff prepared several analyses using INCOG's geographic information system. The discussion of the problem assessment is addressed for each hazard in Chapter 3.

DAMAGE ESTIMATION METHODOLOGY

The following methodologies were used in the development of damage cost estimated for buildings and contents for flooding and tornado/high wind damage, used in Osage County's Multi-Hazard Mitigation Plan and Update.

Structure Value: The value of the buildings within Osage County was obtained from the Osage County Assessor's office.

Contents Value: Value of contents for all buildings was estimated using FEMA 386-2 *Understanding Your Risks*. Table, page 3-11, "Contents Value as Percentage of Building Replacement Value".

2.1.6 Step Six: Set Goals

Hazard mitigation goals and objectives for Osage County were developed by the OCEMAC to guide the development of the plan. The hazard mitigation goals and objectives for the County are listed in Chapter 4.

2.1.7 Step Seven: Review Possible Activities

A wide variety of measures that can affect hazards or the damage from hazards were examined. The mitigation activities were organized under the following six categories. A more detailed description of each category is located in "Chapter 4: Mitigation Strategies."

1. **Preventive activities**—Zoning, building codes, city ordinances
2. **Structural Projects**—Levees, reservoirs, channel improvements
3. **Property protection**—Acquisition, retrofitting, insurance
4. **Emergency service**—Warning, sandbagging, evacuation
6. **Public information and education—**Outreach projects and technical assistance

2.1.8 Step Eight: Draft an Action Plan

The County and the OCEMAC reviewed the list of recommended actions in the initial Osage County Multi-Hazard Mitigation Plan. The County reported to the committee the projects that were completed. Potential future hazard mitigation activities were reviewed and discussed by the committee. The County then selected mitigation projects and activities for the County to include in this update; for each project or activity identified for this update, it identified the party responsible for implementing the task, estimated the cost of the project, identified potential funding sources, and determined the target completion date for each activity. Each participating jurisdiction did the same for their own jurisdiction. Once all the jurisdiction's action plans were drafted, they were inserted into the final draft of the County multi-hazard mitigation plan update.

2.1.9 Step Nine: Adopt the Plan

The OCEMAC reviewed the final draft approved the final plan and submitted it to the Osage County Board of County Commissioners, and each jurisdiction's governing board, for adoption.

2.1.10 Step Ten: Implement, Evaluate, and Revise

Adoption of the Multi-Hazard Mitigation Plan is only the beginning of this effort. County offices, other agencies, and private partners will proceed with implementation. The OCEMAC will monitor progress, evaluate the activities, and annually recommend revisions to the action items. This process will involve quarterly meetings in which the OCEMAC will monitor progress on the Action Plan and review other mitigation actions for inclusion in the Action Plan for Years 2 through 5. This monitoring and review process will also be coordinated so as to provide input into other appropriate county and community planning efforts specifically updates to the County's Capital Improvement Plan and the County's Annual Budget.

Chapter 3:

Risk Assessment and Vulnerability Analysis

3.1 Identifying Hazards

There were 13 hazards investigated by the OCEMAC. These were considered to be all the relevant hazards, following the committee's hazard information search. Hazard identification was discussed at the initial hazard mitigation planning meetings, held on July 21, 2011.

The hazards facing the participating Osage County communities and the participating school districts are the same hazards facing the County. The participating communities' buildings, and the participating school districts' buildings, are all located within Osage County. Therefore, their risk and vulnerability from the hazards are included in the Osage County countywide risk and vulnerability analysis. A map showing the location of the schools' buildings are shown on Map 1A in Appendix 1.

The hazards are listed in Table 2.2. The table lists each hazard, the items that were considered in how the hazard was identified, and why each hazard was identified. Hazard information was obtained from the County Emergency Management, Community Officials, regional planning agency (INCOG), review of FIRMs, and public input.

3.2 Profiling Hazard Events

This section provides a profile of each hazard. In this section, the letter "X", when included in a subsection identification label, refers to a specific hazard's subsection, as follows:

X=1 Flood Hazard
X=2 Tornado Hazard
X=3 High Winds Hazard
X=4 Lightning Hazard
X=5 Hail Storm Hazard
X=6 Winter Storm Hazard
X=7 Heat Hazard
X=8 Drought Hazard
X=9 Expansive Soils Hazard
X=10 Wildfire Hazard
X=11 Earthquake Hazard
X=12 Hazardous Material Hazard
X=13 Dam Break

Subsection 3.2.X.1 describes each hazard, subsection 3.2.X.2 identifies the location of the hazard, subsection 3.2.X.3 identifies the extent (such as severity or magnitude) of the hazard, subsection 3.2.X.4 provides information on previous occurrences, subsection 3.2.X.5 discusses the probability of future occurrences, and subsection 3.2.X.6 discusses vulnerability and impact. Each hazard affects the county as a whole, except floods, expansive soil and dam breaks which are location specific.

3.2.1 Flood Hazard

3.2.1.1 Flooding is defined as the accumulation of water within a water body and the overflow of the excess water onto adjacent lands. The floodplains are the lands adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding.

3.2.1.2 The location of the flood hazard in Osage County is its regulatory floodplain, as defined by the County's Flood Insurance Rate Maps (FIRMs). The regulatory floodplain lies in several watersheds within the County. The flood hazard is shown on Map Number 5 in Appendix 1.

3.2.1.3 The severity of a flood is determined by several factors; including, rainfall intensity, duration, and location, and ground cover imperviousness and degree of saturation. The magnitude of the flood hazard is the regulatory floodplain. The regulatory floodplain is defined as the area inundated by the runoff from the rainfall having a one-percent chance of occurring in any given year. Although flooding is an identified hazard, the effects have been minimal except for a few locations in the County. The regulatory floodplain is identified in the County's Flood Insurance Rate Maps (FIRMs) as Zone A and Zone AE. The following chart describes the FIRM's flood zones.

FLOOD ZONES		
Zone A	The 100-year or Base Floodplain. There are seven types of A zones:	
	A	The base floodplain mapped by approximate methods, i.e., BFEs are not determined. This is often called an unnumbered A zone or an approximate A zone.
	A1-30	These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the firm shows a BFE (old format).
	AE	The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-30 zones.
	AO	The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided.
	AH	Shallow flooding base floodplain. BFE's are provided.
	A99	Area to be protected from base flood by levees or Federal flood protection systems under construction. BFEs are not determined.
	AR	The base floodplain that results from the de-certification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection
Zone V and VE	**V**	The coastal area subject to velocity hazard (wave action) where BFEs are not determined on the FIRM.
	VE	The coastal area subject to velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B and Zone X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and the 500-year floods. B zones are also used to designate base floodplains or lesser hazards, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.	
Zone C and Zone X (unshaded)	Area of minimal flood hazard, usually depiction FIRMs as exceeding the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood.	
Zone D	Area of undetermined but possible flood hazards.	

A typical flood hazard would be an event where rainfall occurs causing runoff to exceed the creek channel capacity spilling runoff into the floodplain fringe, the area between the creek channel and the edge of the regulatory floodplain. This area of inundation would still be regulated by the County's (and each community's) Flood Damage Prevention Ordinance where new buildings are protected under the ordinance and older structures are addressed below in section 3.2.1.4. The worst case flood event would be where rainfall occurs causing runoff to exceed the regulatory floodplain, thereby inundating areas and possibly structures outside the areas regulated by the Flood Damage Prevention Ordinance, the ordinance adopted by Osage County and the communities as part of their participation in the National Flood Insurance Program. A proposed action plan will be included to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.1.4 Historically, the County has recognized flooding as a hazard. The County joined the National Flood Insurance Program (NFIP) in 1987, adopting a Flood Damage Prevention Resolution, and requiring that all future development be built one foot above the 100-year base flood elevation. From 1950 through 2010, Osage County has had 71 flood events, causing an estimated $992,000 in total damages. The County reports there are six repetitive loss structures in the unincorporated portion of Osage County.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.1.5 The probability of future flooding from the regulatory floodplain is statistically a one-percent chance of occurring in any given year, the 100-year floodplain. The County and participating communities require all new development to develop in compliance with their flood damage prevention ordinance. Therefore, new development will not cause an increase in the flood hazard by not increasing the hazard on to adjacent property and building new structures above the regulatory flood elevation; both provisions of the ordinance. So the probability of future flood damage should not increase with future development. According to the likelihood rating from Appendix 6, the likelihood of a flood hazard in the County is "highly likely" because there have been 71 reported flood events from 1950 through 2010; no change in likelihood from the original hazard mitigation plan to this update.

3.2.1.6 Flooding can take many forms including river floods (riverine) and creeks and flash floods. The most likely event for serious flooding would be flash flooding due to storm water drainage backup caused by a large amount of rain from a thunderstorm. Flash floods occur with little or no warning and can reach peak flow within a few minutes. Waters from flash floods move with great force and velocity and can roll boulders, tear out trees, destroy buildings, and sweep away bridges. These walls of water can reach heights of 10 to 30 feet and generally carry large amounts of debris. Most flood deaths are due to flash floods.

The low-lying areas in the flood plains would be more susceptible to flooding. Roadways in the area are vulnerable and have a history of having to be closed during flooding events. This can cause what is usually temporary interruptions to the highway and road system and has the potential to isolate a community for a period of time. The county has no structures that are classified as repetitive loss structures. Water Wells, houses, utility lines and sewer systems are damaged by flood waters. This causes the citizens to be without power, homes and in many cases people must be relocated to other areas.

CONTRIBUTING FACTORS TO THE FLOOD HAZARD	
Factor	**Effect**
Precipitation Rate	The most obvious contributing factor. As the rate of precipitation increases, so to does its ability to outpace the ability of the watershed to absorb it. This is the dominant factor in flash flooding events, and can overwhelm any or all of the following factors.
Training Echoes	Storm cells that follow each other (much like box cars on a train) can repeatedly deposit large amounts of water on the same watershed, overwhelming its ability to handle runoff.
Slope of Watershed	Steeper topography (hills, canyons, etc.) will move runoff into waterways more quickly, resulting in a quicker, flashier response to precipitation.
Shape of Watershed	Longer, narrower watersheds will tend to "meter out" runoff so that water arrives from down shed (nearer to the mouth of the stream) areas faster than from up shed areas. In watersheds that are more square or circular than elongated, runoff tends to arrive in the main stem at the same time, intensifying the response. This factor becomes more significant with larger watersheds.
Saturation of Soils	Saturated or near-saturated soils can greatly reduce the rate at which water can soak into the ground. This can increase runoff dramatically.
Hardened Soils	Extremely dry soils can develop a pavement or "crust" that can be resistant to infiltration. This is especially true in areas of recent wildfire, where plant oils or resins may cause the soil to be even more water-resistant.
Urbanization	The urban environment usually intensifies the response to heavy precipitation. The two dominant urban factors are: 1) increased pavement coverage, which prevents infiltration and dramatically increases runoff; and 2) Urban systems are designed to remove water from streets and byways as quickly as possible. This accelerates the natural response to precipitation by placing runoff in waterways much more quickly.
Low-water crossings	The vast majority of flash flood related deaths occur in vehicles. Many of these deaths occur at low-water crossings where the driver is unaware of the depth of the water or the consequences of driving into it.

It is estimated that 7 % of the residential structures (1167 residences) in the County are located in the 100 year floodplain. It is unknown the number of people that reside in these residences; these structures are valued at $67 million dollars. No structures are designated as repetitive loss structures.

3.2.2 Tornado Hazard

3.2.2.1 A tornado is a rapidly rotating vortex or funnel of air extending to the ground from a cumulonimbus cloud. When the lower tip of a vortex touches earth, the tornado becomes a force of destruction. The path width of a tornado is generally less than a half-mile, but the path length can vary from a few hundred yards to dozens of miles. A tornado moves at speeds from 30 to 125 mph, but can generate winds exceeding 300 mph.

3.2.2.2 Osage County is located northwest of Tulsa, Oklahoma. The following figure obtained from the FEMA web site shows central Oklahoma, along with the area around Fort Worth Texas, to be the area of highest number of recorded tornados per area in the country. Within Osage County, no area of the County is any more or less at risk from the tornado hazard.

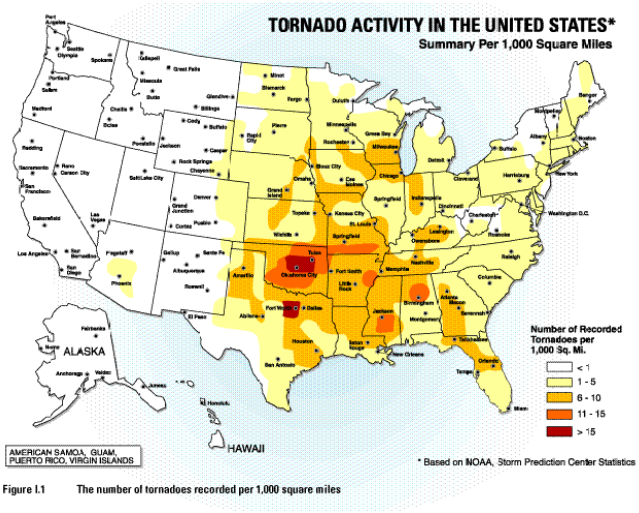


Figure I.1 The number of tornadoes recorded per 1,000 square miles

3.2.2.3 The severity of tornados is measured on the Fujita Tornado Scale (see below). Almost 70% of all tornadoes are measured F0 and F1 on the Fujita Tornado Scale, causing light to moderate damage, with wind speeds between 40 and 112 miles per hour. F4 and F5 tornadoes are considerably less frequent, but are the big killers. 67 percent of all tornado deaths were caused by F4 and F5 storms, which represent only 1% of all tornadoes. From 1950 through 2010, Osage County experienced four tornados with a Fujita Scale magnitude greater than F3.

Table 3.1
FUJITA TORNADO SCALE

Category	Wind Speed (mph)	Damage
F0	Gale tornado (40-72)	**Light:** Damage to chimneys, tree branches, shallow-root trees, sign boards
F1	Moderate tornado (73-112)	**Moderate:** Lower limit is beginning of hurricane wind speed—surfaces peeled off roofs, mobile homes pushed off foundations or overturned, cars pushed off roads
F2	Significant tornado (113-157)	**Considerable:** Roofs torn off frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted, light-object missiles generated
F3	Severe tornado (158-206)	**Severe:** Roofs and some walls torn off well-constructed houses, trains overturned, most trees in forest uprooted, cars lifted off the ground and thrown
F4	Devastating tornado (207-260)	**Devastating:** Well-constructed houses leveled, structures with weak foundations blown off some distance, cars thrown and large missiles generated
F5	Incredible tornado (261-318)	**Incredible:** Strong frame houses lifted off foundations and carried considerable distance to disintegrate, automobile-sized missiles fly through the air in excess of 100 yards, trees debarked

On February 1, 2007, the Fujita scale was decommissioned in favor of the more accurate Enhanced Fujita Scale, which replaces it. None of the tornadoes recorded on or before January 31, 2007 will be re-categorized. Therefore maintaining the Fujita scale will be necessary when referring to previous events.

Table 3.2

ENHANCED FUJITA TORNADO SCALE

Enhanced Fujita Category	Wind Speed (mph)	Potential Damage
EF0	65-85	**Light damage:** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	**Moderate damage:** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	**Considerable damage:** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	**Severe damage:** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	**Devastating damage:** Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	**Incredible damage:** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yd); high-rise buildings have significant structural deformation; incredible phenomena will occur.
Source: http://en.wikipedia.org/wiki/Enhanced_Fujita_Scale		

A typical tornado hazard would be an EF0 event, as defined in Table 3-3 above, the Enhanced Fujita Tornado Scale. The worst case tornado hazard would be an EF5 event, as defined in Table 3-3 above. An action plan item will be included to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.2.4 According to the National Climatic Data Center, from 1950 through 2010, Osage County has experienced 73 tornados, causing an estimated $32.8 million in property damage.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.2.5 Meteorological conditions have not changed, so future tornado events should occur at the same probability as previous events. No area of the County is any more or less at risk from the tornado hazard. According to the likelihood rating from Appendix 6, the likelihood of a tornado hazard in the County is "highly likely" because there have been 73 reported flood events from 1950 through 2010; no change in likelihood from the original hazard mitigation plan to this update.

3.2.2.6 Osage County is located in what is considered an active part of tornado alley. Every structure in the County is vulnerable to tornadoes. Structures, automobiles, persons, agriculture, and utilities can sustain damage from tornados. Utility service outages can affect large segments of the population for long periods of time. Economic losses from homeowners and businesses alike can be devastating. Food spoilage with lack of refrigeration, gas pumps not operating, and daily life activities can all come to a halt. People displaced from homes that are damaged and destroyed also create a new set of challenges with the basics of food, shelter and clothing.

On the lower end, damage from an F0 tornado with winds from 40-72 mph can result in destruction of road signs, tall structures, trees, and possible damage to shingled roofs. Mid –range F2 and F3 tornadoes with winds from 113-206 mph will result in considerable damage. Roofs will be torn off structures, mobile homes completely demolished, most trees and plant life destroyed, objects as big as cars thrown small distances (as well as other light missiles being generated), and trains being blown over can result from these storms. The worst case is the F5 tornado with winds from 261-318 mph. Total destruction will occur in the path of the tornadoes, which have been up to ½ mile wide in the past. Homes, automobiles, appliances, outbuildings, and anything outdoors can be picked up and thrown long distances as large missiles. Most plant life including lawns, shrubs and trees are completely destroyed.

Utility infrastructure such as power lines, substations, water towers, and water wells, are vulnerable and can be severely damage or destroyed from a tornado. Emergency vehicles responding to the devastated areas can have trouble responding due to down power lines and debris in roadways. Livestock is vulnerable during tornado events and are often killed since there is little protection for the animals on the open range. People caught in the path of a tornado who don't take shelter have the potential of being injured or killed. Residents most vulnerable to tornadoes are those living in mobile homes.

Historically the tornado will move in a southwest to northeast direction, but can move in any direction. Consequently, vulnerability of humans and property is difficult to evaluate since the tornadoes form at different strengths, in random locations, and create narrow paths of destruction.

Advances in meteorology and the use of Doppler radar allow efficient prediction of tornado formation before they occur. A network of storm watchers attempt to identify funnel clouds and report to various networks to alert the population. Even though these advances have significantly improved the available response time, tornadoes can still occur unexpectedly and without warning.

Utilizing storm spotters and early warning systems, county residents can take appropriate precautions during these events. As a result, casualty rates are low. The popularity of mobile/manufactured housing has increased susceptibility of existing structures to tornadoes. The use of better building techniques, tie-down systems and the availability of storm shelters all help mitigate losses in the county.

3.2.3 High Wind Hazard

3.2.3.1 Wind is defined as the motion of air relative to the earth's surface. Extreme windstorm events are associated with cyclones, severe thunderstorms, and accompanying phenomena such as tornadoes and downbursts. Winds vary from zero at ground level to 200 mph in the upper atmospheric jet steam at 6 to 8 miles above the earth's surface. The mean annual wind speed in the mainland United States is reported by FEMA to be 8 to 12 mph, with frequent speeds of 50 mph and occasional wind speeds of greater than 70 mph. Oklahoma wind speeds average 10 miles per hour.

The location of this hazard is uniform over the entire County area. No area of the County is more of less at risk from a high wind hazard than another.

The magnitude of the high wind hazard is categorized on various wind scales, such as the Beaufort, Saffir-Simpson, and the Fujita measurement scales. The tables below containing the

Beaufort and Saffir-Simpson scales show that there is little consensus of opinion as to what wind speeds produce various damages. (The Fujita Scale is shown in the section 3.2.2, "Tornado Hazard"). The National Weather Service (NWS) issues Severe Thunderstorm Warnings whenever a thunderstorm is forecast to produce wind gusts to 58 miles per hour (50 knots) or greater and/or hail one inch in diameter or larger. Hail size increased from ¾ inch to one inch on January 5, 2010, for warning issues. The hail hazard will be addressed in Section 3.2.5.

Table 3.3
BEAUFORT SCALE

Force	Wind Speed (mph)	Damages
9	47-54	**Strong gale:** Chimneys blown down, slate and tiles torn from roofs
10	55-63	**Whole gale:** Trees broken or uprooted
11	64-75	**Storm:** Trees Uprooted, cars overturned
12	75+	**Severe Storm:** Devastation is widespread, Buildings destroyed

Table 3.4
SAFFIR-SIMPSON SCALE

Category	Wind Speed (mph)	Storm Surge (feet)	Damages
1	74-95	4- 5	**Minimal:** Trees, shrubbery, unanchored mobile homes, and some signs damaged, no real damage to structures
2	96-110	6-8	**Moderate:** Some trees toppled, some roof coverings damaged, major damage to mobile homes
3	111-130	9-12	**Extensive:** Large trees are toppled, some structural damage to roofs, mobile homes destroyed, structural damage to small homes and utility buildings
4	131-155	13-18	**Extreme:** Extensive damage to roofs, windows, and doors, roof systems on small buildings completely fail, some curtain walls fall
5	155+	18+	**Catastrophic:** Roof damage is considerable and widespread, window and door damage is severe, extensive glass failure, entire buildings could fall

A typical high wind hazard would be a Saffir-Simpson Scale category 1 event, as defined in Table 3.3 above, the Saffir-Simpson Scale. The worst case high wind hazard would be a Saffir-Simpson Scale category 5 event, as defined in Table 3.3 above. A proposed action plan will be included to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.3.4 According to the National Climatic Data Center, there have been ~~22~~ 441 recorded thunderstorm and high winds events during the period of 1950 through 2010, causing an estimated $996,000 in property damage.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.3.5 The majority of the United States is at some risk of high wind hazards, including Osage County. Meteorological conditions have not changed so future events should occur at the same probability as the previous events. According to the likelihood rating from Appendix 6, the

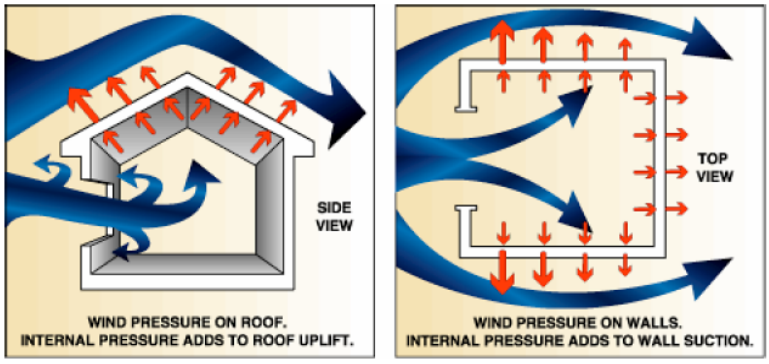
likelihood of a high wind hazard in the County is “highly likely”; no change in likelihood from the original hazard mitigation plan to this update.

3.2.3.6 Property damage and loss of life from windstorms are increasing due to a variety of factors. Use of manufacturing housing and mobile homes is on an upward trend, and this type of structure provides less resistance to wind than conventional construction. With the deteriorating condition of older homes, and the increased use of aluminum-clad mobile homes, and poorly designed homes, the impacts of wind hazards will likely continue to increase.

Winds are always part of severe storms such as tornadoes and blizzards, but do not have to accompany a storm to be dangerous. Down-slope windstorms, straight-line winds, and microbursts can all cause death, injury, and property damage. Very little available data exists separate from thunderstorms or tornado data. Any efforts made to mitigate for tornadoes or thunderstorm winds should address the hazard of high winds.

Extreme winds can cause several kinds of damage to a building. The diagram below shows how extreme winds affect a building and helps explain why these winds cause buildings to fail. Wind speeds, even in these extreme wind events, rapidly increase and decrease. An obstruction, such as a house, in the path of the wind causes the wind to change direction. This change in wind direction increases pressure on parts of the house. The combination of increased pressures and fluctuating wind speeds creates stress on the house that frequently causes connections between building components to fail. For example, the roof or siding can be pulled off or the windows can be pushed in.

Diagram of Windstorm Effects



Buildings that fail under the effects of extreme winds often appear to have exploded, giving rise to the misconception that the damage is caused by unequal wind pressures inside and outside the building. This misconception has led to the myth that during an extreme wind event, the windows and doors in a building should be opened to equalize the pressure. In fact, opening a window or door allows wind to enter a building and increases the risk of building failure.

Damage can also be caused by flying debris (referred to as windborne missiles). If wind speeds are high enough, missiles can be thrown at a building with enough force to penetrate windows, walls, or the roof. For example, an object such as a 2” x 4” wood stud weighing 15 pounds, when carried by a 250-mph wind, can have a horizontal speed of 100 mph and enough force to penetrate most common building materials used in houses today. Even a reinforced masonry wall will be penetrated unless it has been designed and constructed to resist debris impact during extreme winds. Because missiles can severely damage and even penetrate walls and roofs, they threaten not only buildings but the occupants as well.

In addition to structural issues, high winds can affect electrical and other utilities with service outages. Power lines can ground out or knocked down causing loss of electrical service. Travel can be disrupted with the loss of stop lights, street lights and dangerous cross winds making travel difficult. There could also be loss of water, sewer, and communications abilities.

3.2.4 Lightning Hazard

3.2.4.1 Lightning is a discharge of atmospheric electricity, accompanied by a vivid flash of light, from a thunderstorm, frequently from one cloud to another, sometimes from a cloud to the earth. The sound produced by the electricity passing rapidly through the atmosphere causes thunder.

Within the thunderstorm clouds, rising and falling air causes turbulence which results in a build up of a static charge. The negative charges concentrate in the base of the cloud. Since like charges repel, some of the negative charges on the ground are pushed down away from the surface, leaving a net positive charge on the surface. Opposite charges attract, so the positive and negative charges are pulled toward each other. This first, invisible stroke is called a stepped leader. As soon as the negative and positive parts of the stepped leader connect there is a conductive path from the cloud to the ground and the negative charges rush down it causing the visible stroke. Thunder is caused by extreme heat associated with the lightning flash. In less than a second, the air is heated from 15,000 to 60,000 degrees. When the air is heated to this temperature, it rapidly expands. When lightning strikes very close by, the sound will be a loud bang, crack or snap. Thunder can typically be heard up to 10 miles away. During heavy rain and wind this distance will be less, but on quiet nights, when the storm is many miles away, thunder can be heard at longer distances.

3.2.4.2 The location of this hazard is uniform over the entire County area. No area of the County is more of less at risk from a lightning hazard than another.

3.2.4.3 The type of lightning is a measure of the severity of the lightning hazard. Cloud-to-ground is the more severe type is terms of potential cause of damage. The table below from the National Climatic Data Center shows the types and frequency categories of lightning. The more severe type of lightning; coupled with an increased frequency, pose a greater lightning hazard. Although lighting is an identified hazard in the County, the effects have been minimal with no reported events occurring within the period from 1950 through 2010.

Table 3.5
TYPE OF LIGHTNING

Type	Contraction	Definition
Cloud to Ground	CG	Lightning occurring between cloud and ground.
In Cloud	IC	Lightning which takes place within the cloud.
Cloud to Cloud	CC	Streaks of lightning reaching from one cloud to another.
Cloud to Air	CA	Streaks of lightning which pass from a cloud to the air, but do not strike the ground.

Table 3.6
FREQUENCY OF LIGHTNING

Frequency	Contraction	Definition
Occasional	OCNL	Less than 1 flash per minute.
Frequent	FRQ	About 1 to 6 flashes per minute
Continuous	CONS	More than 6 flashes per minute.

3.2.4.4 For Osage County, the National Climatic Data Center (NCDC) received no reports of lightning strikes during the 61 year period from 1950 through 2010. With the frequent wind and thunderstorm activity the county experiences, it is certain that lightning strikes occurred but were just not reported. According to the Oklahoma State Fire Marshall's Office, lightning caused no structure fires in the Osage County between 1995 and 2000.

Appendix 6 summarizes previous occurrences of this hazard.

Lightning strikes can also cause high-voltage power surges that have the ability to seriously damage equipment and valuable data if surge protection devices are not installed properly. Property damage from power surges and resulting fires can destroy not only the electronics in private homes, but also unprotected PBXs, telecommunications equipment, wireless systems, and radio base stations.

3.2.4.5 Meteorological conditions have not changed so future events should occur at the same probability as the previous events. According to the likelihood rating from Appendix 6, the likelihood of a lightning hazard in Osage County is "unlikely" because there haven't been any reported lightning hazard events in the County during the period from 1950 through 2010.

3.2.4.6 The largest vulnerability to lightning is the potential loss of human life. Property damage can also occur to structures, electrical equipment, water wells, etc. Anyone outdoors during a thunderstorm is exposed and at risk of injury from lightning. Most people are injured or killed by lightning will participating in some form of recreation. Some of the area swimming pools and water parks are installing early warning devices for the danger of lightning strikes. Damage to trees and homes would generally be under $1,000 if a strike did occur.

3.2.5 Hail Storm Hazard

3.2.5.1 Hail is frozen water droplets formed inside a thunderstorm cloud. They are formed during the strong updrafts of warm air and downdrafts of cold air, when the water droplets are carried well above the freezing level to temperatures below 32 deg F, and then the frozen droplet begins to fall, carried by cold downdrafts, and may begin to thaw as it moves into warmer air toward the bottom of the thunderstorm. This movement up and down inside the cloud, through cold then warmer temperatures, causes the droplet to add layers of ice and can become quite large, sometimes round or oval shaped and sometimes irregularly shaped, before it finally falls to the ground as hail.

3.2.5.2 The location of this hazard is uniform over the entire County area. No area of the County is more of less at risk from the hail storm hazard than another.

3.2.5.3 The severity of damage caused by hail storms depends on the hailstone sizes (average and maximum), number of hailstones per unit area, and associated winds. The magnitude of a hail storm is in the following table.

Table 3.7
HAILSTONE SIZES

Diameter	Example	Diameter	Example
1/4 inch	Pea	1 ¾ inches	Golf Ball
1/2 inch	Marble	2 ½ inches	Tennis Ball
3/4 inch	Penny	2 ¾ inches	Baseball
7/8 inch	Nickel	3 inches	Tea Cup
1 inch	Quarter	4 inches	Grapefruit
1 ½ inches	Ping Pong Ball	4 ½ inches	Softball

The extent of the hazard can range from damage through destruction of structures and personal property to bodily injury, depending on the diameter. The National Climatic Data Center has reported hail in the County up to 2 ¾ -inches in diameter.

The National Weather Service (NWS) issues Severe Thunderstorm Warnings whenever a thunderstorm is forecast to produce wind gusts of 58 miles per hour (50 knots) or greater and/or hail size one inch in diameter or larger. Prior to January 5, 2010 the criteria for hail was ¾ inch or larger.

A typical hail storm hazard would be hailstones that are noticeable but cause no damage. The worst case hail storm event would be a hail storm event where the hailstones exceed the maximum diameter reported by a recording agency such as the National Climatic Data Center, causing wide-spread structure damage and at a time of a large public outdoor gathering causing injuries to persons not under cover of a substantial structure. A proposed action plan item will be included to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.5.4 According to the National Climatic Data Center, Osage County experienced 217 hail hazard events of hail diameter 1-inch and greater during the period from 1950 through 2010, causing an estimated $423,000 in property damage. During the same time period, the County experienced 524 hail hazard events of hail diameter of ¾-inch or greater, causing the same estimated $423,000 in property damage. According to the likelihood rating from Appendix 6, the likelihood of a hail hazard in Osage County is “highly likely”; no change in likelihood from the original hazard mitigation plan to this update.
Appendix 6 summarizes previous occurrences of this hazard.

3.2.5.5 Meteorological conditions have not changed so future events should occur at the same probability as the previous events. An estimate of future occurrences is shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6.

3.2.5.6 Vulnerability is difficult to evaluate since hail occurs in random locations and creates relatively narrow paths of destruction. Hail is capable of causing considerable damage to crops, buildings, and vehicles, and occasionally death to farm animals. Hail can also strip leaves and small limbs from non-evergreen trees. While large hail poses a threat to people caught outside in a storm, it seldom causes loss of human life.

- Costs and losses to agricultural and livestock producers
- Reduced yields and crop loss
- Injuries or loss of livestock
- Damage to barns and other farm buildings

- Damage to trees resulting in increased susceptibility to disease
- Urban, residential, and commercial
- Damage to buildings, possibly Osage County critical facilities
- Roofs
- Windows
- Damage to automobiles, trucks, trains, airplanes, etc.
- Disruptions to local utilities and services
- Power
- Communications
- Transportation

Past storms in the Osage County have showed crops losses from slight damage of less than 10% production loss to total devastation of the crop with 100% loss. Damage to vehicles can range from several hundred dollars to total loss of the vehicle. At times when large parking lots or dealerships get hit, losses can be in the millions of dollars. Loss from a major hailstorm damaging automobiles and structures in a larger city could total in the tens of millions of dollars.

3.2.6 Winter Storm Hazard

3.2.6.1 All winter storms are accompanied by cold temperatures and blowing snow, which can severely reduce visibility. A severe winter storm is one that drops 4 or more inches of snow during a 12 –hour period, or 6 or more inches during a 24- hour span. An ice storm occurs when freezing rain falls from clouds and freezes immediately on impact. All winter storms make driving and walking extremely hazardous. The aftermath of a winter storm can impact a community or region for days, weeks, and even months. Storm effects such as extreme cold, flooding, and snow accumulation can cause hazardous conditions and hidden problems for people in the affected area. People can become stranded on the road or trapped at home, without utilities or other services. Residents, travelers and livestock may become isolated or stranded without adequate food, water and fuel supplies. The conditions may overwhelm the capabilities of a local jurisdiction. Winter storms are considered deceptive killers as they indirectly cause transportation accidents, and injury and death resulting from exhaustion/overexertion, hypothermia and frostbite from wind chill, and asphyxiation; house fires occur more frequently in the winter due to the lack of proper safety precautions while using home heating equipment.

3.2.6.2 The location of this hazard is uniform over the entire County area. No area of the County is more of less at risk from the winter storm hazard than another.

3.2.6.3 A winter storm can range from moderate snow (2 to 4 inches over 12 to 24 hours) to blizzard conditions (4 to 6 inches over 12 to 24 hours) with high winds, freezing rain or sleet, heavy snowfall with blinding wind-driven snow and extremely cold temperatures that lasts several days. Some winter storms may be large enough to affect several states while others may affect only a single community. All winter storms are accompanied by cold temperatures and blowing snow, which increases the severity of the winter storm.

The Balthrop Ice Scale attempts to quantify the severity of the winter storm hazard. The scale is shown in Table 3-12.

Table 3.8
THE BALTHROP ICE SCALE

Level	Cause	Effect
Level 1; Nuisance Event, No Major Impact	Freezing rain and sleet, but little ice accumulation. Roads not hazardous. Ice forming on grass.	Little to no effect on the State of Oklahoma.
Level 2; Minor Event, Caution Advised	No measurable ice. Black ice on roads and bridges. Winter Weather Advisory.	Untreated roadways and bridges may become hazardous and slick. Livestock may need additional supplemental feed.
Level 3; Major Event, Isolated Emergency Conditions in the State of Oklahoma	Ice accumulations of ¼ to ½ inches. Reduced visibility. Winter Storm Warning.	Widespread hazardous road conditions. Travel discouraged. Isolated power outages because of down power lines from ice accumulations. Tree damage. Livestock loss potential increases. Supplemental feed necessary.
Level 4; Extreme Event, The State of Oklahoma Under Full State of Emergency	Crippling event. Winds over 35 mph. Little to no visibility. Ice accumulations of more than ½ inch. Blizzard Warning.	Road conditions hazardous to impassable. People and livestock isolated. Widespread power and utility outages. Infrastructure damage. High potential for loss of livestock. Structures threatened from accumulating ice. Communications infrastructure lost from ice accumulation. May be a long lasting event.

A typical winter storm hazard would be a Level 1 event, as defined by the Balthrop Ice Scale, a nuisance event. The worst case winter storm hazard would be a Level 4 event, where transportation is stopped, widespread power outages, livestock loss is likely, and the duration may be long. An action plan item will be included to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.6.4 According to the National Climatic Data Center, 35 snow and ice events were reported in Osage County from 1950 through 2010, causing an estimated $51.5 million of property damage. The total areas affected within the county were not reported, but estimated to have affected large areas of the County.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.6.5 Meteorological conditions have not changed so future events should occur at the same probability as the previous events. According to the likelihood rating from Appendix 6, the likelihood of a winter storm hazard in Osage County is "likely", down from the "highly likely" rating in the original mitigation plan because a longer time period was used in this update.

3.2.6.6 Osage County is affected periodically by heavy snow and ice that cause damage. Trees and power lines fall due to the weight of ice and snow causing damage to their surroundings as well as blocking streets and roads. Icy roads cause accident rates to increase and impair the ability for emergency vehicles to respond which can result in more injuries and a higher loss of life.

Winter storms can range from accumulating snow and/or ice over just a few hours to blizzard conditions with blinding wind-driven snow that can last several days. The aftermath from a damaging winter storm can continue to impact a region for weeks and even months. Economic losses can occur to livestock producers and any business in the affected areas. Water systems being shut down or frozen can disrupt social services, schools, homes, and businesses. Carbon monoxide poisoning is always a possibility as homeowners and businesses use alternative heat

sources to keep warm. Personal health can be affected in a variety of ways including mental and physical stress, frostbite or related injuries and inability to travel for care.

Cold waves pose a variety of threats to individuals and communities. The list below summarizes some of the most common impacts of cold waves.

- Costs and losses to livestock producers
    - Loss of livestock due to exposure
    - Greater mortality due to Increased vulnerability to disease
    - Increased feed costs
    - Reduced milk production
    - Cost of supplemental water for livestock if onsite ponds and streams are frozen
    - Machinery and farm vehicles that will not operate in cold weather
- Urban, residential, and commercial impacts
    - Availability of water for municipal use due to frozen and burst water lines
    - Homes with alternative energy sources
    - House fires from overburdened chimneys
    - Carbon monoxide poisoning from exhaust produced by heaters and generators
    - Vehicles that will not operate in cold weather
    - Cost of keeping transportation lines clear of ice and snow
- Health
    - Mental and physical stress in the form of "cabin fever"
    - Frostbite and hypothermia
    - Disruption of services
    - Government offices and schools closed
    - Garbage collection halted
- General economic effects
    - Revenue loss from lost production in business and industry
    - Negative impact of economic multipliers
    - Higher energy costs
    - Damage to animal species
    - Loss of wildlife, particularly if cold wave is coupled with prolonged snow cover that makes sources of food unavailable
    - Greater mortality due to Increased vulnerability to disease
    - Loss of trees and woody shrubs that are not hardy enough to survive prolonged exposure to cold temperatures, especially when soil moisture is low
    - Pollution from increased energy production

A major winter storm can be lethal. Preparing for cold weather conditions and responding to them effectively can reduce the dangers caused by winter storms.

Mitigating ice storm damage must be a joint effort by Local Community and County workers, private land owners, and corporate entities. County workers simply do not have the available resources to maintain all the wire systems in the County. Ordinances that require the maintenance of trees and shrubs surrounding the area of electric and telephone wires are a first step toward mitigating ice storm damage. Aggressive public education programs must be in place to alert people to the possible damages to their and other's property. Large corporations such as Oklahoma Gas and Electric do not have the man-power or financial resources to maintain all their lines. Regular trimming by all levels of participants can substantially reduce the damage caused by future episodes.

3.2.7 Heat Hazard

3.2.7.1 Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. Drought occurs when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation.

3.2.7.2 The location of this hazard is uniform over the entire County area. No area of the County is more of less at risk from the heat hazard than another.

3.2.7.3 The severity of the extreme heat is dependent on a combination of temperature and humidity. High temperatures, when combined with high humidity can put an area in the "Extreme Danger" category on the National Weather Service Heat Index scale. When extreme heat is combined with drought, excessively dry hot conditions that contribute to a high risk of life-threatening heat-related illnesses may result. The heat index is a measure of the severity of a heat hazard. The heat index can be related to a range of specific heat disorders. Osage County can experience heat index reading into the heat stroke range.

Table 3.9
HEAT INDEX

Temperature (F) versus Relative Humidity (%)						
°F	90%	80%	70%	60%	50%	40%
80	85	84	82	81	80	79
85	101	96	92	90	86	84
90	121	113	105	99	94	90
95		133	122	113	105	98
100			142	129	118	109
105				148	133	121
110						135

High Temperature	Possible Heat Disorder:
80°F – 90°F	Fatigue possible with prolonged exposure and physical activity.
90°F – 105°F	Sunstroke, heat cramps and heat exhaustion possible.
105°F – 130°F	Sunstroke, heat cramps, and heat exhaustion likely, and heat stroke possible.
130°F or greater	Heat stroke highly likely with continued exposure.

A typical heat hazard would be to persons experiencing temperatures reaching 90 degrees, as described in Table 3-14 above. The elderly population is most at risk from this high heat hazard. The worst case heat hazard event would be to persons exposed to temperatures exceeding 130 degrees where heat stroke is likely. An action plan item will be included to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.7.4 According to the National Climatic Data Center, from 1950 through 2010, Osage County experienced nine extreme heat events. No structural damage was recorded for the heat hazard for the county, but is attributed to five deaths.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.7.5 Meteorological conditions have not changed so future events should occur at the same probability as the previous events. According to the likelihood rating from Appendix 6, the likelihood of a heat hazard in Osage County is "occasional", an increase in the likelihood scale from the "unlikely" rating in the original mitigation plan.

3.2.7.6 In a normal year, approximately 175 Americans die from extreme heat. Between 1936 and 1975, nearly 20,000 people succumbed to the effects of heat and solar radiation. From 1979-1999, excessive heat exposure caused 8,015 deaths in the United States. On average approximately 400 people die each year from exposure to heat. In Oklahoma, July is generally the hottest month of the year, followed by August.

Heat kills by pushing the human body beyond its limits. Under normal conditions, the body's internal thermostat produces perspiration that evaporates and cools the body. However, in extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature.

Most heat disorders occur because the victim has been overexposed to heat or has over exercised for his or her age and physical condition. Other conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality.

Extreme heat can have a serious economic impact on a community. Increased demand for water and electricity may result in shortages of resources. Moreover, damage to food supplies may occur as the heat damages agricultural crops and livestock are susceptible to heat related injuries or death.

Young children, elderly people, and those who are sick or overweight are more likely to become victims to extreme heat. Other conditions that can limit the ability to regulate temperature include fever, dehydration, heart disease, mental illness, poor circulation, sunburn, prescription drug use, and alcohol use. Another segment of the population at risk is those whose jobs consist of strenuous labor outside. When temperatures reach 90 degrees and above, people and animals are more likely to suffer sunstroke, heat cramps, and heat exhaustion.

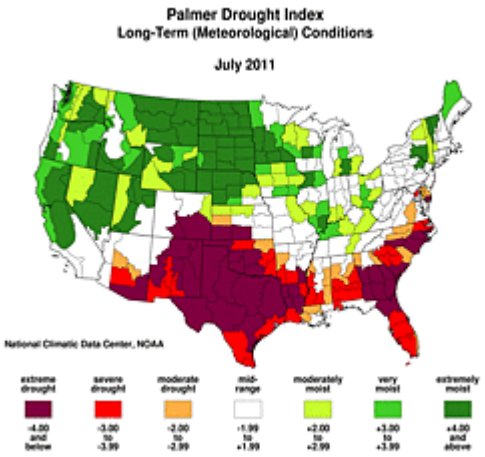
Another extreme heat hazard is air pollution. During summer months, consistent high temperatures and stagnant airflow patterns cause a build-up of hydrocarbons to form a dome-like ceiling over large cities. The abundance of factories, automobiles, lawn equipment, and other internal combustion machines emit high particulate matter that builds and worsens with the increase in temperature. The resulting stagnant, dirty, and toxic air does not move away until a weather front arrives to disperse it. When the particulate matter reaches a pre-determined level, an ozone alert is issued for the Tulsa area and implementation measures are undertaken to reduce the use of cars and the output of the offending chemicals. Ozone alerts usually include advisories for the elderly and those with breathing difficulties to stay indoors in air-conditioned environments.

3.2.8 Drought Hazard

3.2.8.1 A drought is a period of drier-than-normal conditions that results in water-related problems. Precipitation (rain or snow) falls in uneven patterns across the country. When no rain or only a small amount of rain falls, soils can dry out and plants can die. When rainfall is less than normal for several weeks, months, or years, the flow of streams and rivers declines, water levels in lakes and reservoirs fall, and the depth to water in wells decreases. If dry weather persists and water supply problems develop, the dry period can become a drought. The first evidence of drought usually is seen in records of decreased rainfall. Within a short period of time, the amount of moisture in soils can begin to decrease. The effects of a drought on flow in streams and rivers or on water levels in lakes and reservoirs may not be noticed for several weeks or months. Water levels in wells may not reflect a shortage of rainfall for a year or more after the drought begins. A period of below-normal rainfall does not necessarily result in drought conditions. Some areas of the United States are more likely to have droughts than other areas. In humid, or wet, regions, a drought of a few weeks is quickly reflected in a decrease in soil moisture and in declining flow in streams. In arid, or dry, regions, such as Oklahoma, people rely on ground water and water in reservoirs to supply their needs. They are protected from short-term droughts, but may have severe problems during long dry periods because they may have no other water source if wells or reservoirs go dry.

3.2.8.2 The location of this hazard is uniform over the entire County area. No area of the County is more of less at risk from the drought hazard than another.

3.2.8.3 The Palmer Drought Index was developed in the 1960s and uses temperature and rainfall information in a formula to determine dryness. It has become the semi-official drought severity index. The Palmer Index is most effective in determining long term drought; a matter of several months. It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. NOAA has used this index to classify the drought hazard through the continental United States. As of August 5, 2011, Osage County was in the severe to extreme severity range of the Palmer Drought Index. The national map showing the July 2011 Palmer Drought Index is shown below.



A typical drought hazard would be a mid-range to moderate Palmer Drought Index, where some form of voluntary water rationing would be encouraged but not required, and the only damage

would be to under watered lawns. The worst case drought hazard event would be a Palmer Drought index of negative 4.00 and below, an extreme drought, where it lasts for months to years. An action plan item will be included to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.8.4 One of the greatest natural disasters in U.S. history and the most severe and devastating to Oklahoma was the decade-long drought in the 1930s that has become known as the Dust Bowl. Reaching its peak from 1935 through 1938, high temperatures and low rainfall combined to destroy crops and livestock. High winds literally blew the land away, causing massive soil erosion. Hundreds of small rural communities were ruined and about 800,000 people were displaced. The total expenditure by the American Red Cross for drought relief in Oklahoma in 1930-1931 was the third largest ever in the nation.

According to the National Climatic Data Center, there have been nine drought events in Osage County from 1950 through 2010. The likelihood of a drought hazard in Osage County is "occasional", an increase in the likelihood scale from the "unlikely" rating in the original mitigation plan.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.8.5 Meteorological conditions have not changed so future events should occur at the same probability as the previous events. An estimate of future occurrences is shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6.

3.2.8.6 Lack of fresh water is damaging to livestock and crops. During the summer months, temperatures in the Osage County area can easily reach over 100 degrees Fahrenheit. Often these high temperatures will persist for many days and possibly for weeks. When these high temperatures coincide with times of no rain, drought has been reported for areas of Osage County. Drought conditions increase fire hazards and reduces water supply. Heat and drought also effect local workforce capabilities. Workers exposed to these elements must be monitored for heat exhaustion and heat stroke. Another problem associated with drought is stale water. Areas of stale water are known to produce deadly bacteria.

Drought impacts in a number of ways, spanning all regions, and is capable of affecting the economy as well as the environment. Specific impacts can include

- reduced crop, rangeland;
- increased livestock and wildlife mortality rates;
- reduced income for farmers and agribusiness;
- increased fire hazard;
- reduced water supplies for municipal/industrial, agricultural and power uses;
- damage to fish and wildlife habitat;
- increased consumer prices for food;
- reduced tourism and recreational activities;
- unemployment;
- reduced tax revenues because of reduced expenditures; and
- foreclosures on bank loans to farmers and businesses.

The most direct impact of drought is economic rather than loss of life or immediate destruction of property. While drought impacts in Oklahoma are numerous and often dependent upon the timing

and length of individual drought episodes, the greatest impacts of drought are usually experienced in the agricultural community. In addition to the obvious direct losses of both crop and livestock production due to a lack of surface and subsurface water, drought is frequently associated with increases in insect infestations, plant disease, and wind erosion.

Of course, one of the most significant potential impacts of drought relates to public water supply. In metropolitan areas, including Osage County, there may be a need to stop washing cars, cease watering the grass and take other water conservation steps. In smaller communities, reduced flow in rivers and streams can have a significant affect on the water amount allowed for municipal use. Hot weather during the summer increases demand and subsequent use of supplies, as well as evaporation. In turn, increased water demand can stress many smaller and/or antiquated delivery and treatment facilities to the point of collapse. Prolonged drought has a much greater impact on rural communities, which usually rely on relatively small watersheds and are especially vulnerable during such periods.

Water shortages can also affect fire fighting capabilities in both urban and rural settings through reduced water flows and pressures. Most droughts dramatically increase the danger of fires on wild land. Although drought can have serious impact during winter months, it is most often associated with extreme heat. Wildlife, pets, livestock, crops, and humans are vulnerable to the high heat that can accompany drought.

3.2.9 Expansive Soils Hazard

3.2.9.1 Soils and soft rock that tend to swell or shrink due to changes in moisture content are commonly known as expansive soils. Changes in soil volume present a hazard primarily to structures built on top of expansive soils. The most extensive damage occurs to highways and streets. The effect of expansive soils are most prevalent in regions of moderate to high precipitation, where prolonged periods of drought are followed by long periods of rainfall. Expansive soils can be recognized either by visual inspection in the field or by conducting laboratory analysis. Shales, clay shales, and residual soils containing smectite often have a characteristic “popcorn” texture, especially in semiarid areas.

3.2.9.2 The Natural Resources Conservation Service (NRCS) has identified the soils in Osage County. The expansive tendency of a soil is a function of its shrink-swell potential. The locations of these types of soils are shown on Map Number 7 in Appendix 1.

The soil data for Osage County is from the State Soil Geographic (STATSGO) data base. The STATSGO data base is designed for multi-county resource planning, and is not detailed enough for interpretations at the county level. The soil maps for STATSGO are compiled by generalizing the more detailed SSURGO soil maps, Soil Survey Geographic (SSURGO) data base. The STATSGO data base is raster GIS data; each map unit is assigned an attribute value by sampling areas on more detailed maps and expanding the data statistically to characterize all map units. Raster type data cannot be used for spatial analysis; however, it is shown in Map Number 7 for a general location of expansive soils throughout the county.

3.2.9.3 The NRCS sorts this shrink-swell potential soil property in Osage County into five categories; very low, low, moderate, high, and very high. This is the range of magnitude of an expansive soils hazard. Shrink-swell potential categories are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The categories are very low, a change of less than 1%; low, 1 to 3%; moderate, 3 to 6%; high, 6 to 9%; and very high, greater than 9%. Map Number 8 in Appendix 1 illustrates the scattered areas within the

County that have a high shrink-swell potential. Approximately 40% of the County falls into this category.

A typical expansive soils hazard would be to structures built in areas of high shrink-swell potential that were not built with any foundation displacement protection, such as post-tension reinforcing in foundations. The worst case expansive soils hazard event would be to structures as described above, but during extreme and extended drought conditions where the soils dry out to such a depth causing voids to occur which would increase the circumstances for foundations to deflect causing foundation and structure damage. An action plan item will be included to try to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.9.4 No information is available for the Osage County area on how expansive soils have damaged structures. This hazard develops gradually and thus not usually reported, largely because a catastrophic expansive soils hazard event has not occurred

3.2.9.5 The soils' properties have not changed, so future occurrences of soils expansion and contraction will continue. An estimate of future occurrences is rated as "unlikely", the same as the original mitigation plan, shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6, because no data is reported for this hazard.

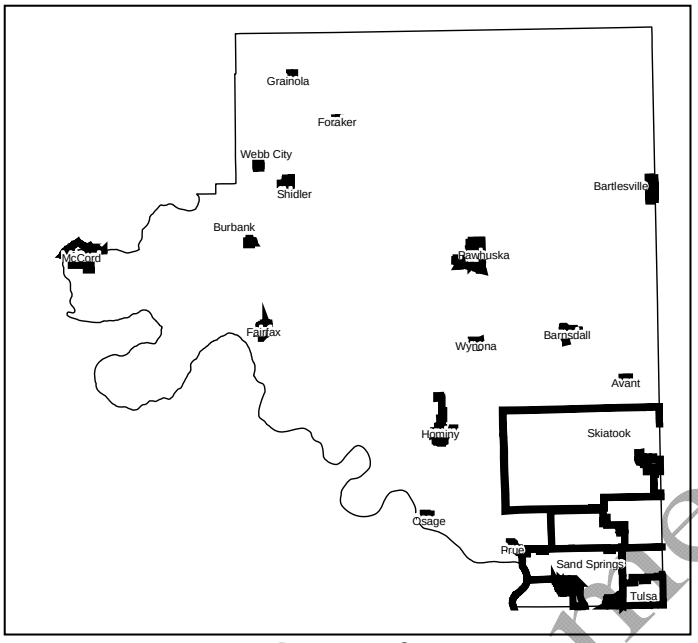
3.2.9.6 There is no need to address expansive soils in this plan due to the lack of data related to damage and there is no justification for mitigating vulnerabilities. Vulnerabilities include structures with foundations such as homes and businesses, concrete slabs in driveways and sidewalks, and parking lots. Asphalt surfaces such as highways and runways could be affected. These structures are affected because expansive soils cause uneven settlement of the soil under the structures' foundations. This causes cracking and damage to the foundation and structure above the foundation, such as a building's wall and a road's pavement.

3.2.10 Wildfire Hazard

3.2.10.1 Wildfires are defined as the uncontrolled burning of highly vegetated areas, usually in forests and wooded areas. Grass fires in Osage County pose a problem every year.

3.2.10.2 According to County Emergency Management, fire locations are more frequent around the more populated areas; however, all locations throughout the county are prone to grass fires. The locations of the fire departments in Osage County are shown on Map Number 8 in Appendix 1.

The urban interface is where the main risk and vulnerability is, and exits around the incorporated communities in Osage County. The following chart is a display of the urban interface location, in black, around the incorporated Osage County communities.



Urban Interface

3.2.10.3 The County's susceptibility to a wildfire is dependent upon seasonal environmental factors such as current and antecedent weather (including wind velocity and humidity), fuel types, moisture, temperature, and live and dead vegetation. Changes in these factors raise or lower the fire danger rating throughout the county. The magnitude of the fire hazard in Osage County is "Highly Likely", based upon the likelihood rating in Appendix 6. State Fire Marshall Reports show the City of Pawhuska alone responded to 53 grass fire events from 2008 through 2010. However, due to data limitations, the number of acres burned was not recorded. As mentioned above, seasonal environmental factors raise and lower fire danger ratings. A typical wildfire hazard would be a grass fire, in which a Fire Department is dispatched to put out the fire before it causes any damage to crops, structures, or persons. The worst case wildfire scenario would be an event that could not be controlled before it overwhelms a community, causing damage to crops, structures, and persons. Although the number of incidences indicate that wildfires are likely to occur, most wildfires are small in size and contained by local resources. Therefore, the fire departments do not consider wildfires to be a major threat to the County overall. An action plan item will be included to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.10.4 In Osage County, the State Fire Marshall reports show the City of Pawhuska alone responded to 53 grass fire events from 2008 through 2010.

3.2.10.5 Osage County Fire Departments are continuing campaigns to educate the public on the causes and effects of fires. However, all fires cannot be prevented so this hazard will continue. The likelihood rating for wild fires in the County is "highly likely", the same likelihood rating from the original mitigation plan. This estimate of future occurrences is shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6.

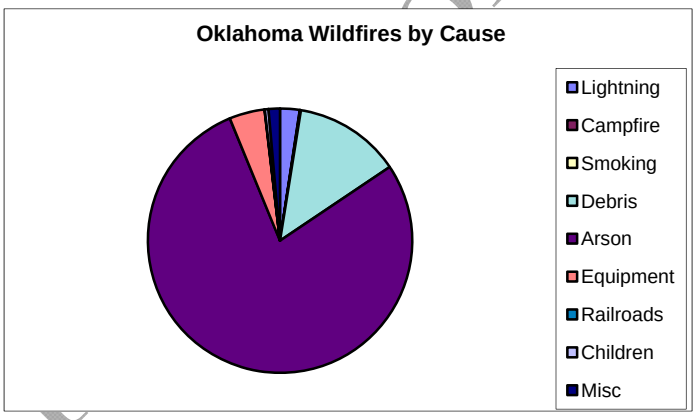
3.2.10.6 Periods of drought, dry conditions, high temperatures, and low humidity set the stage for wildfires. Areas along railroads and people whose homes are in woodland settings (especially cedar woodlands) in rural areas have an increased risk of wildfire. The sparsely populated tall grassed range lands, are capable of experiencing large sweeping fires. Ironically,

fire suppression is capable of creating larger fire hazards, because live and dead vegetation is allowed to accumulate in areas where fire has been excluded. The especially large accumulations of deadfall throughout the county resulting from the severe ice storms of 2000 and 2007, is becoming a concern to firefighters.

People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are another leading cause of wildfires. Other sources of ignition include railroads, catalytic converters on automobiles, and spontaneous ignition of hay bales. Wildfires that do not encounter a human population are difficult to calculate damages. Homes and businesses that are burned in naturally occurring fires are usually privately owned. When wild lands are destroyed by fire, the resulting erosion can cause heavy silting of streams, rivers, and reservoirs. Serious damage to aquatic life, irrigation, and power production then occurs.

This vulnerability to wildfire results in over 18,000 wildfires in the State each year. These fires burn about 300,000 acres. Over 97% of these wildfires are human caused. In fact, Oklahoma's fire risk is more closely associated with the presence of people than with fire danger or fuel types. Since human activity accounts for such a high percentage of the wildfires, there is limited opportunity for mitigation through public awareness and education.

An action plan item will be included to collect detailed data on this wildfire hazard within the County to better document the impact of wildfires on the County.



Arson is also a large proportion of the percentage of wildfires. Based on the above data, Oklahoma has a high probability of future hazard events. On average, fires kill nearly 5,500 Americans each year. Over 30,000 people are injured in fires annually. In the United States, someone dies in a fire every 40 minutes. Most often, victims are children or the elderly. Nearly 25 percent of the fires that kill young children are started by children playing with fire. Approximately 1,300 senior citizens die in fires annually. Approximately three-quarters of all fire fatalities occur in residential dwellings. Each year in the US, fire causes over $2 billion worth of damage to homes.

3.2.11 Earthquake Hazard

3.2.11.1 An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of plates. Earthquakes strike suddenly, without warning. Earthquakes can occur at any time of the year and at any time of the day or night. On a yearly basis, 70 to 75 damaging earthquakes occur throughout the world. Estimates of losses from a future earthquake in the United States approach $200 billion. There are 45 states and territories in the United States at moderate to very high risk from earthquakes, and they are located in every region of the country. California experiences the most frequent damaging earthquakes; however, Alaska experiences the greatest number of large earthquakes—most located in uninhabited areas. The largest earthquakes felt in the United States were along the New Madrid Fault in Missouri, where a three-month long series of quakes from 1811 to 1812 included three quakes larger than a magnitude of 8 on the Richter scale. These earthquakes were felt over the entire Eastern United States, with Missouri, Tennessee, Kentucky, Indiana, Illinois, Ohio, Alabama, Arkansas, and Mississippi experiencing the strongest ground shaking.

3.2.11.2 The faults most likely to affect Oklahoma are the New Madrid Fault, centered in the Missouri Bootheel region, and the Meers Fault, located in southwestern Oklahoma near Lawton. The distance from the Missouri Bootheel region to Pawhuska, OK, (in the center of Osage County) is approximately 370 miles, and the distance from the Meers fault region to Pawhuska is approximately 180 miles.

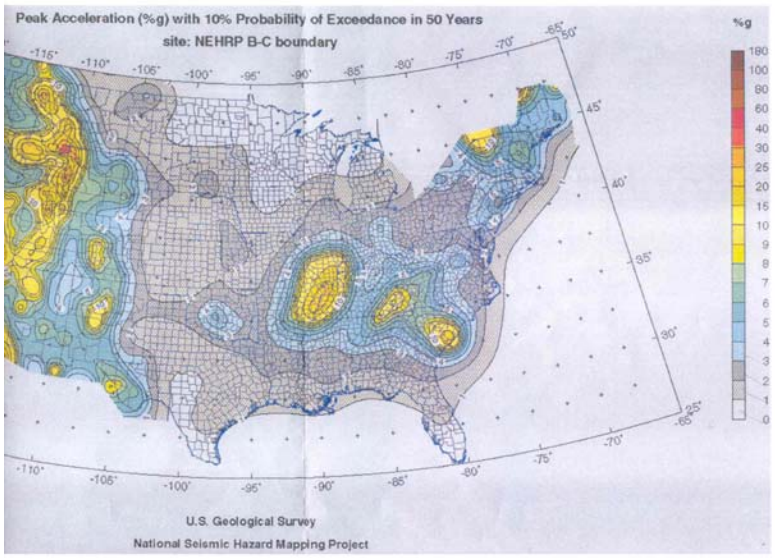
3.2.11.3 The severity of an earthquake can be expressed in several ways. The magnitude of an earthquake, usually expressed by the Richter Scale, is a measure of the amplitude of the seismic waves. The Richter Scale, named after Dr. Charles F. Richter of the California Institute of Technology, is the best known scale for measuring the magnitude of earthquakes. The scale is logarithmic. An earthquake of magnitude 2 is the smallest earthquake normally felt by people. Earthquakes with a Richter value of 6 or more are commonly considered major; great earthquakes have magnitude of 8 or more on the Richter scale.

Table 3.10
THE RICHTER SCALE

Magnitude	Description
1 to 3	Recorded on local seismographs, but generally not felt.
3 to 4	Often felt, with little to no damage reported.
5	Felt widely, slight damage near epicenter.
6	Damage to poorly constructed buildings and other structures within 10 kms.
7	"Major" earthquake. Causes serious damage up to 100 km (recent Taiwan, Turkey, Kobe, Japan, Iran and California earthquakes).
8	"Great" earthquake, great destruction, loss of life over several 100 km (1906 San Francisco, 1949 Queen Charlotte Islands).
9	Rare great earthquake, major damage over a large region over 1000 km (Chile 1960, Alaska 1964, and west coast of British Columbia, Washington, Oregon, 1700)

The USGS National Seismic Hazard Mapping, shown below, shows Osage County in the 2%g (peak acceleration), 10% probability of exceedance in 50 years area. According to the FEMA

386-2, “Understanding Your Risks”, Step 1; areas with 2%g peak acceleration or less have a relatively low seismic risk, and an earthquake risk assessment is not warranted.



A typical earthquake event would be a magnitude 1 to 3 on the Richter Scale, which would be largely unfelt and no damage. The worst case earthquake hazard would be a magnitude 9 on the Richter Scale, causing a large amount of structure damage and personal injury over a large area. An action plan item will be included to collect detailed data on this hazard, as well as all hazards, to better document typical and much worse events.

3.2.11.4 Counties adjacent to Osage County experienced 47 earthquakes between 1977 and 2000, or about two per year. On November 5, 2011, the state experienced its largest and third largest earthquakes in state history. A 4.8 magnitude earthquake occurred near Prague at about 2:12 am, and then a 5.6 magnitude earthquake occurred near Sparks at about 10:53 pm. Both earthquakes were centered in Lincoln County, a county southwest of Osage County in central Oklahoma. The later earthquake surpassed the then largest earthquake in state history, a 5.5 magnitude earthquake near El Reno on April 9, 1952.

3.2.11.5 However, most earthquakes in the state are not felt. The most likely major earthquake event that could impact the area would probably originate in the New Madrid Fault Zone, which has been relatively quiet for 150 years. Seismologists estimate the probability of a 6 to 7 magnitude earthquake in the New Madrid area in the next 50 years to be higher than 90%.

According to the National Climatic Data Center, there have been no earthquake events in Osage County from 1950 through 2010; a likelihood rating of “unlikely”. This estimate of future occurrences is shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6.

3.2.11.6 Because the extreme infrequency of major events in or near Osage County, the impact of the earthquake hazard does not justify mitigating vulnerabilities. Vulnerabilities would include all structures, homes, businesses and transportation infrastructure. Earthquake insurance is the only viable mitigation activity. Insurance would not lessen the event; just keep the hazard from becoming a financial disaster.

3.2.12 Hazardous Material Hazard

3.2.12.1 Hazardous materials are chemical substances that, if released or misused, can pose a threat to the environment or human health. These chemicals are used in industry, agriculture, medicine, research, and consumer goods. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or chemical accidents at plant sites. In the State of Oklahoma, communities are required to list facilities that either use or store Extremely Hazardous Substances (EHS) in their Emergency Operations Plans (EOP). EHS facilities are a subset of the Tier 2 facilities; and like the Tier 2 facilities, EHS facilities are reported annually to the Oklahoma Department of Environmental Quality by the users. The EHS facilities are incorporated into the Osage County plan update.

3.2.12.2 The locations of the Osage County EHS-facilities are listed in the following table, and shown in Map Number 9 in Appendix 1.

Table 3.11
OSAGE COUNTY EHS FACILITIES

Facility Name	Street Address	City
AT&T – Pawhuska	221 E. Main	Pawhuska
AT&T – Skiatook	115 E Rogers Blvd	Skiatook
Baker Petrolite	801 County Rd 1807	Hominy
Chevron Phillips Chemical Co,. LP. – Bartlesville Technology	Hwy 60 & 123	Bartlesville
Cochran Chemical Company Shidler Warehouse	316 Private Road	Shidler
ConocoPhillips–Bartlesville Technology Center	Highway 60 West & State Highway 123	Bartlesville
Level 3 Communications	545A-CR 2401	Barnsdall
PSO–Barnsdall Tap Substation	1 mile north, 3 miles East of Hwy 123 & 11	Barnsdall
PSO–Shidler Substation	20806 State Hwy. 18	Shidler
PSO–West Edison Substation	2015 W. Edison St.	Tulsa
Reef Services, LLC.	876 Old Hwy 99	Pawhuska
Road Safe Traffic Systems	1302 West 36th St	Tulsa
Superior Specialty Gas Services	1102 West 36th Street N	Tulsa

3.2.12.3 The location and extent of the hazardous material hazard in Osage County are the EHS fixed location sites. The sites include buildings or property where EHS materials are manufactured or stored, and are regulated nationally under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) by the U.S. Environmental Protection Agency (EPA), and in Oklahoma by the Department of Environmental Quality.

A typical hazardous material hazard scenario would be an automobile accident where gasoline (which is not an EHS) is spilled and the local fire department responds. The worst case scenario would be responding to facility that contains a hazardous material that has not been properly

documented so the responders may not be properly prepared for the hazardous material they would be encountering.

3.2.12.4 For the evaluation of previous occurrences of hazardous material events, traffic accidents with gasoline spills were included in the number of hazardous material events experienced by the County, in addition to responding to incidents at EHS facilities. The City of Pawhuska Fire Departments alone responded to 17 hazardous material incidents from 2008 through 2010. Several Osage County Fire Departments have developed Hazardous Materials Standard Operating Guides. These guides provide Fire Department personnel with guidance and assistance in determining incident levels for response to hazardous materials incidents.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.12.5 Chemicals and hazardous materials are used throughout our society today, and will continue to be used in the future. And Osage County will continue to be exposed to this hazard. According to the City of Pawhuska's State Fire Marshall reports, there have been 17 hazardous material spill events in their jurisdiction from 2008 through 2010; a likelihood rating of "highly likely". This estimate of future occurrences is shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6.

3.2.12.6 Many parts of the County are susceptible to hazardous materials events due to the high number of highly traveled roads and highways. Potential impacts include disruptions in transportation if highways are shut-down. Local businesses and residences can be affected by the roads being closed. Soils and waterways could become contaminated by spills, but are generally contained and cleaned up by professional response teams.

3.2.13 Dam Break Hazard

3.2.13.1 A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings.

A dam failure is the collapse, breach, or other failure resulting in downstream flooding. Dam failures are primarily caused by hydrologic or structural deficiencies. A hydrologic deficiency is inadequate spillway capacity, caused by excessive runoff from a large amount of precipitation. Structural deficiencies include seepage, erosion, cracking, sliding, and overturning, mainly caused by the age of a dam and lack of maintenance.

The Oklahoma Water Resources Board coordinates the Oklahoma Dam Safety Program to ensure the safety of dams in the state. The program requires inspections every five years for low hazard structures and every three years for significant hazard structures. The program requires annual inspections for high hazard dams. Dams are designated as high hazard dams due to the presence of occupied dwellings immediately downstream. There are 168 dams in Osage County in the program. And of these, 156 are categorized as a low hazard structures. The following table lists the 12 Osage County dams in the program categorized as significant hazard or high hazard.

Table 3.12
OSAGE COUNTY DAMS IN THE OKLAHOMA DAM SAFETY PROGRAM

NAME	CREEK	CITY	HAZARD CATEGORY
BIRCH LAKE	BIRCH CREEK	AVANT	High
BLUESTEM	MIDDLE BIRD CREEK	PAWHUSKA	High
DEER LAKE	TR-ROCK CR	BARTLESVILLE	High
FAIRFAX	WILD CREEK	FAIRFAX	High
HOMINY LAKE	CLAREMORE CREEK	HOMINY	High
HUDSON LAKE	BUTLER CREEK	BARTLESVILLE	High
HULAH LAKE	CANEY RIVER	BARTLESVILLE	High
PAWHUSKA	TR CLEAR CREEK	PAWHUSKA	High
SHELL (Sand Springs Municipal)	SHELL CREEK	SAND SPRINGS	High
WAXHOMA (Barnsdall Lake)	TR-DOG THRESHER CR	BARNSDALL	High
CHARLOTTE (Shidler Lake)	ROCK CR	BURBANK	Significant

3.2.13.2 The dams listed in Table 3-10 above pose a high or significant risk, per the OWRB, to occupied dwelling in Osage County. Their locations are shown in Map Number 10 in Appendix 1. The location of the dam break hazard, the specific area of inundation from a failure of any of these dams is not available from the Corps of Engineers or the OWRB. The 500-year floodplain, downstream of the dam, was used to estimate the inundation area. The location of the dam break hazard is shown in Map Number 11 in Appendix 1. A mitigation action to create a dam inundation area map will be recommended.

3.2.13.3 For the extent of the dam break hazard, the specific area of inundation from a failure of any of these dams is not available. The 500-year floodplain, downstream of the dam, was used to estimate the inundation area. For the purposes of this hazard's risk assessment, the 500-year floodplain downstream of these lakes is the extent of this hazard. The worst case scenario of this hazard would be an unexpected failure of a high hazard dam, so the emergency personnel could not effectively notify people in the area of inundation of the impending event.

3.2.13.4 Osage County has never been flooded by a dam failure. Its impact on the County would be similar to the flood hazard. Nationally, the most famous dam break event occurred at Johnstown, PA. The South Fork Dam was built across Little Conemaugh River 14 miles upstream of Johnstown. In 1889, South Fork Dam failed, and the resulting flood on the Little Conemaugh River caused over 2200 fatalities.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.13.5 Never say never, but continued dam inspection and proper maintenance should continue to keep these dams from failing. Communities in Osage County contract with private engineering firms to annually inspect the dams as required and report to the Oklahoma Water Resources Board. Communities that use impoundments from dams for a water source in the County are responsible for any required maintenance. According to the County Emergency Management Department,, there have been no dam breaks in Osage County from 1950 through 2010; a likelihood rating of "unlikely". This estimate of future occurrences is shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6.

3.2.13.6 As long as dams exist so does the chance for failure. The Oklahoma Water Resources Board (OWRB) coordinates the Oklahoma Dam Safety Program to ensure the safety of more than 4,500 dams in the state that falls within its jurisdiction. Dams falling within the OWRB's jurisdiction are non-Federally constructed and maintained dams which are: 1) greater than 6 feet in height with storage capacities of 50 acre-feet or more; and/or 25 feet or greater in height with storage capacities of 15 acre-feet or more. The program requires inspections every five and three years for low and significant hazard structures, respectively. It requires annual inspection of the State's high-hazard dams, so designated due to the presence of one or more habitable structures downstream with loss of life and flooding likely to occur if a dam were to fail.

Oklahoma has 184 high hazard dams and 87 significant hazard dams in the State that could possibly put people and structures at risk, but there is no recorded history of dam failure in the State of Oklahoma since 1950. Flooding potential exists if dam failure should occur at these high hazard dams. The dams in Osage County are high hazard due to the fact that they provide source water for public water systems. If a failure occurred, the potential exists to have thousands of people, pets, and livestock without water for a long period of time. Obviously the impact of this would be devastating and many people would have to relocate to carry on normal lives. Disruption to businesses and schools would be enormous. The economic impact of such an event would be impossible to predict.

The initial hazard classifications are based upon current conditions, including population and land-use patterns below the dams. Such conditions can shift over time, such that a structure that is not considered high-hazard may receive such designation in the future, should, for example, dwellings be built within the floodplain below the dam. Other high-hazard dams may have such designation lowered should land-use patterns change, reducing the threat of loss to life or property. Mitigation aspects, such as relocations of vulnerable properties, can reduce the number and magnitude of high-hazard dams. To protect vulnerable populations the State of Oklahoma and Osage County, the following law is in place:

State Law 785:25-7. Warning and evacuation plans.

- Owners of existing or proposed dams classified as high hazard, regardless of the size of such dams, and any other dam as determined by the Board, shall provide an adequate warning system and written evacuation plan to protect downstream lives and property, with a written description of said system and written evacuation plan to be approved by and filed with the local Civil Defense authorities.
- Additionally, the written description of the warning system and approved evacuation plan shall be filed with the Board.

3.3 Assessing Vulnerability: Identifying Assets

This section describes vulnerability in terms of the type and number of existing buildings and critical facilities in the hazard location. The vulnerability analysis utilized FEMA publication 386-2, "Understanding Your Risks," Step 3, in order to determine the building value and contents value to determine a total value per building at risk from the hazard.

The Osage County Assessor classifies properties into three (3) types; residential, commercial, and agricultural. A value for each property with a structure was determined by the assessor. The contents value was determined as a percentage of the building value, based on the Contents Value table in FEMA 386-2, Step 3.

The following table shows this information for all buildings in Osage County, and the critical facilities. This table will be referred to for all hazards that do not vary by location throughout the county.

Table 3.13
TOTAL BUILDINGS IN COUNTY

Category	Number of Structures	Structure Value ($$)
Residential	16,716	1,051,339,807
Commercial	933	166,846,220
Agricultural	2,897	191,973,170
Total	20,546	1,400,159,197

Flood hazards, dam break hazards, and hazards from expansive soils are the only three hazards that vary in magnitude based on their geographic location. A hypothetical tornado was analyzed in the tornado hazard section. For these hazards, GIS models were used to determine the buildings in a hazard location.

For each hazard, the assets (buildings) at risk from that hazard are tabularized in each hazard's section, or referred to the above table. The total number of buildings at risk, the building type, the building value, its contents value, and the total value is shown. These tables follow the format in FEMA 386-2, worksheets 3a "Inventory Assets".

This assessment also analyses the critical facilities at risk from each hazard. Where a hazard varies by location, these facilities' locations are shown in relation to the hazard on a separate map. Information on mobile homes is not tracked by the Osage County Assessor; therefore, it is not included in the Osage County vulnerability assessment.

Facilities that are classified to be critical by Osage County are listed in the following table, and shown on Map Number 4 in Appendix 1. These facilities are critical to the County in they provide public safety and emergency response services to the public in the event of a hazard occurrence or they are necessary to preserve welfare and quality of life to the community.

Table 3.14
COUNTY CRITICAL FACILITIES

TYPE	NAME	ADDRESS	CITY
Ambulance	Hominy Ambulance	Main & Regan	Hominy
Ambulance	Fairfax Ambulance	SH 18 &Hospital Rd	Fairfax
Ambulance	Sedan Ambulance Service	120 S Chawtawqua	Sedan
Ambulance	Shidler Ambulance	3rd & Cosden Rd	Shidler
Ambulance	Skiatook Ambulance 2	S Linapah	Skiatook
Ambulance	Bartlesville Ambulance	501 S Quapaw	Bartlesville
Ambulance	Barnsdall Ambulance	5th & Walnut	Barnsdall
Ambulance	Pawhuska Ambulance	Fire Department	Pawhuska
Ambulance	Green Country Ambulance	Imperial Blvd & Prue Rd	Osage County
Child Care	Barnsdall Building Blocks	308 W Cedar	Barnsdall
Child Care	Osage Nation Head Start	408 W Cedar	Barnsdall
Child Care	Wah-Zha-Zhi Early Learning Center	408 W Cedar	Barnsdall
Child Care	Calvary Temple CC	4501 W Edison	Tulsa
Child Care	Chisum's CCC	1331 N Rosendale	Tulsa
Child Care	Circle of Friends Discovery	903 W McKinley	Fairfax
Child Care	Country Club Gardens	959 N Country Club Dr	Tulsa
Child Care	Dimples & Smiles D.C.	823 S Tinker	Hominy
Child Care	Hominy Head Start	1120 S She-She	Hominy
Child Care	Hugs and Kisses	209 S Petitt	Hominy
Child Care	Osage Nation Head Start	102 Buffalo Ave	Hominy
Child Care	Kids Kampus	130 W 15th	Pawhuska
Child Care	Osage Nation Head Start	600 W Main	Barnsdall
Child Care	Osage Nation Head Start Fairfax	1001 W Roosevelt	Fairfax
Child Care	Wah-Zha-Zhi Early Learning Center	913 W McKinley	Fairfax
Child Care	Osage Nation Head Start Hominy	702 Russell	Hominy
Child Care	Osage Nation Head Start Pawhuska	15th and Grandview	Pawhuska
Child Care	Osage Tribal Head Start Shidler	Hwy 11	Shidler
Child Care	Pawhuska Head Start	1425 Lynn Ave	Pawhuska
Child Care	Pawhuska Head Start #2	1923 McKenzie	Pawhuska
Child Care	Popeye's	414 W 12th	Pawhuska
Child Care	Osage Nation Head Start	15th and Grandview	Pawhuska
Child Care	Sweet Things	1801 W Oak	Skiatook
Child Care	Cindy Care, LLC	210 S John Zink	Skiatook
Child Care	Essentially Kids Inc	205 S Hominy	Skiatook
Child Care	Osage Nation Head Start	1801 W Oak	Skiatook
Child Care	Wah-Zha-Zhi Early Learning Center	1801 W Oak	Skiatook
Child Care	Susie's Home Day Care	316 E 6th	Wynona
Child Care	Holt's Day Care	218 E 10th	Wynona
Child Care	Osage Nation Head Start	64500 US Hwy 60	Ponca City
Fire	Airport Rd Fire Dept	RT 5 Box 112	Bartlesville
Fire	Avant Volunteer Fire Dept	PO Box 219	Avant
Fire	Barnsdall Volunteer Fire Dept	NE of Barnsdall	Barnsdall
Fire	Big Bend Volunteer Fire Dept	RT 1 Box 98B	Ralston
Fire	Blackdog Fire Dept	5724 W 58 St N	Tulsa
Fire	Burbank Volunteer Fire Dept	W of Burbank	Burbank
Fire	Country Corner Fire Dept	RT 2 Box 150	Sperry
Fire	Elm Creek (Foraker) Fire Fighters	RT 1 Box 291	Foraker
Fire	Fairfax Volunteer Fire Dept	161 S Main	Fairfax

Fire	Foraker Volunteer Fire Dept	RT 1 Box 238	Foraker
Fire	Frontier Shores Fire Dept	HC 60 Box 121	Osage
Fire	Grainola Volunteer Fire Dept	RT 1 Box 201	Grainola
Fire	Grayhorse Indian Village Fire Dept		Osage County
Fire	Green Country Estates Fire Dept	Imperial Blvd & Prue Rd	Osage County
Fire	Hominy Fire Dept	111 S Regan	Hominy
Fire	Hominy Ranchers Rural Fire Dept	PO Box 646	Hominy
Fire	Hulah Volunteer Fire Dept	RT 1	Copan
Fire	McCord Volunteer Fire Dept	3609 S McCord Rd	McCord
Fire	Morgan's Corner Volunteer Fire Dept	HC 67 Box 403	Skiatook
Fire	Nature Conservancy Fire Fighters		Osage County
Fire	Nelogany Rural Volunteer Fire Dept	HC 63 Box 52	Pawhuska
Fire	Osage Cove Fire District Assoc		Osage County
Fire	Osage Hills Rural Firefighters (Bartle	RT 3 Box 5300	Bartlesville
Fire	Osage Hills Volunteer Fire Dept	Box 95	Osage
Fire	Pawhuska Fire Dept	900 S Lynn	Pawhuska
Fire	Prue Volunteer Fire Dept	Box 187	Prue
Fire	Rock Fire Dept	HC 67 Box 695	Skiatook
Fire	Shidler Volunteer Fire Dept	3rd and Cosden	Shidler
Fire	Skiatook Fire Dept	PO Box 399	Skiatook
Fire	Webb City Volunteer Fire Dept	C/O RT 1 Box 134	Webb City
Fire	Wynona Volunteer Fire Dept	PO Box 44	Wynona
Fire	Zink Fire Dept	HC 67 Box 725	Skiatook
Hospital	Fairfax Community Hospital	Main and Taft	Fairfax
Hospital	Pawhuska Hospital	1101 E 15th	Pawhuska
Government	Avant Town Hall		Avant
Government	Barnsdall City Hall		Barnsdall
Government	Burbank Town Hall		Burbank
Government	Fairfax City Hall		Fairfax
Government	Foraker Town Hall		Foraker
Government	Grainola Town Hall		Grainola
Government	Hominy City Hall		Hominy
Government	Osage Town Hall		Osage
Government	Pawhuska City Hall		Pawhuska
Government	Prue Town Hall		Prue
Government	Shidler City Hall		Shidler
Government	Webb City Town Hall		Webb City
Government	Wynona Town Hall		Wynona
Government	Osage County Courthouse	5th and Grandview	Pawhuska
Government	Avant Wastewater Treatment Facility		Avant
Government	Barnsdall Water Treatment Facility		Barnsdall
Government	Barnsdall Wastewater Treatment Facility		Barnsdall
Government	Burbank Wastewater Treatment Facility		Burbank
Government	Fairfax Water Treatment Facility		Fairfax
Government	Fairfax Wastewater Treatment Facility		Fairfax
Government	Hominy Water Treatment Facility		Hominy
Government	Hominy Wastewater Treatment Facility		Hominy
Government	Pawhuska Water Treatment Facility		Pawhuska
Government	Pawhuska Wastewater Treatment Facility		Pawhuska
Government	Shidler Water Treatment Facility		Shidler
Government	Shidler Wastewater Treatment Facility		Shidler
Government	Wynona Wastewater Treatment Facility		Wynona

Medical Clinic	Robert Clark Family Health Center	212 N Main	Fairfax
Medical Clinic	Hominy Family Medical Clinic	119 W Main	Hominy
Nursing Home	Barnsdall Nursing Home	411 S 4th ST	Barnsdall
Nursing Home	Fairfax Manor	701 W. Harrison Ave	Fairfax
Nursing Home	Pawhuska Nursing Home	1228 S. Pecan	Pawhuska
Nursing Home	Skiatook Nursing Home	318 S. Cherry	Skiatook
Police	Avant Police		Avant
Police	Barnsdall Police		Barnsdall
Police	Fairfax Police		Fairfax
Police	Hominy Police		Hominy
Police	Pawhuska Police		Pawhuska
Police	Shidler Police		Shidler
Police	Skiatook Police		Skiatook
Police	Wynona Police		Wynona
School	Avant Elementary	104 Cherokee ST	Avant
School	Barnsdall Elementary	401 S 10th ST	Barnsdall
School	Barnsdall High School	200 S 8th ST	Barnsdall
School	Barnsdall Junior High School	200 S 8th St	Barnsdall
School	Bowring Schools	87 Country Rd	Pawhuska
School	Hominy High School	401 S Eastern Ave	Hominy
School	Hominy Middle School	600 Cotton Gin Road	Hominy
School	Horace Mann Elementary	200 S Pettit St	Hominy
School	Indian Camp Elementary	2005 N Boundary	Pawhuska
School	Osage Hills Elementary	702 Dewey Ave	Bartlesville
School	Pawhuska Elementary	1700 Lynn Ave	Pawhuska
School	Pawhuska High School	621 E 15th ST	Pawhuska
School	Pawhuska Junior High School	615 E 15th ST	Pawhuska
School	Prue Elementary	PO Box 130	Prue
School	Prue High School	PO Box 130	Prue
School	Anderson Elementary	17501 W Anderson Rd	Sand Springs
School	Shidler Elementary	PO Box 85	Shidler
School	Shidler High School	PO Box 85	Shidler
School	Woodland Elementary	715 W Mulberry Ave	Fairfax
School	Woodland High School	100 N. 6th ST	Fairfax
School	Wynona Elementary	PO Box 700	Wynona
School	Wynona High School	PO Box 700	Wynona
Sheriff	Osage County Sheriff	County Offices	Pawhuska
Prisons	Connors Correctional Facility	N Hwy 99	Hominy

3.3.1 Flood Hazard

For the structures at risk from a flood hazard, those buildings on property intersecting the regulatory floodplain is summarized below. There are 67 critical facilities located on property intersecting the regulatory floodplain.

Table 3.15
TOTAL BUILDINGS IN REGULATORY FLOODPLAIN

Type	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Residential	1167	67,314,645	33,657,323	100,971,968
Commercial	48	53,675,458	53,675,458	107,350,916
Agricultural	1029	57,661,810	57,661,810	115,323,620
Total	2244	178,651,913	144,944,591	323,646,504

Any future building in a flood hazard will be built in conformance with the County's Flood Damage Prevention Ordinance as part of the County's membership in the NFIP; therefore, future buildings will not be considered by FEMA as at risk from the regulatory floodplain. The same will be for each Osage County community participating in the plan update, as they are also members of the NFIP.

3.3.2 Tornado Hazard

Osage County was hit by an F-5 tornado on 1991, in the southeastern corner of the county. The length of this tornado was approximately 21 miles, its width of impact was reported at 2550 feet, and the location is approximately shown in Map Number 13 in Appendix 1. It was reported to have done substantial damage to all structures in its impact width along its length. To illustrate the structures at risk if this tornado occurred today, the current buildings within this tornado's path were determined and their building, contents, and total value estimated. This information is shown on the following table.

The critical facilities are also shown on Map Number 13; there are two facilities at risk from this tornado.

Table 3.16
BUILDINGS IN TORNADO SCENARIO

Type	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Residential	244	28,035,572	14,017,786	42,053,358
Commercial	60	20,662,853	20,662,853	41,325,706
Agricultural	29	3,088,664	3,088,664	6,177,328
Total	333	51,787,089	37,769,303	89,556,392

3.3.3 Dam Break Hazard

For the structures at risk from a dam break hazard, those buildings on property intersecting the 500-year floodplain downstream of each lake is summarized below. Because of the large drainage areas upstream of most of the dams identified in section 3.2.13, the Osage County Floodplain Administrator determined the impact of the dam break inundation area downstream of most of the dams would be greater than the regulatory floodplain. Therefore, Birch Lake Dam, Bluestem Lake Dam, Deer Lake Dam, Fairfax Lake Dam, Hominy Lake Dam, Hudson Lake Dam, Hulah Reservoir Dam, Pawhuska Lake Dam, Shell Lake Dam Waxhoma Dam, and the additional dam on Skiatook Reservoir were determined to pose a larger hazard in a dam break scenario than the regulatory flood.

Table 3.17
BUILDINGS IN DAM BREAK (500-YEAR FLOODPLAIN) INUNDATION AREA

Type	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$
Residential	1323	46,838,953	23,419,477	70,258,430
Commercial	173	43,706,522	43,706,522	87,413,044
Agricultural	349	19,499,170	19,499,170	38,998,340
Total	1845	110,044,645	86,625,169	196,669,814

Map Number 14 in Appendix 1 shows the location of the critical facilities in relation to the dam break hazard. There are 58 critical facilities at risk from this dam break hazard.

3.3.4 High Wind Hazard

All areas, and all buildings, in the County are at equal risk from this hazard. The total number of buildings, and value, in the County is shown in the table at the beginning of this section.

3.3.5 Lightning Hazard

All areas, and all buildings, in the County are at equal risk from this hazard. The total number of buildings, and value, in the County is shown in the table at the beginning of this section.

3.3.6 Hail Storm Hazard

All areas, and all buildings, in the County are at equal risk from this hazard. The total number of buildings, and value, in the County is shown in the table at the beginning of this section.

3.3.7 Winter Storm Hazard

All areas, and all buildings, in the County are at equal risk from this hazard. The total number of buildings, and value, in the County is shown in the table at the beginning of this section.

3.3.8 Heat Hazard

All areas, and all buildings, in the County are at equal risk from this hazard. The total number of buildings, and value, in the County is shown in the table at the beginning of this section.

3.3.9 Drought Hazard

All areas, and all buildings, in the County are at equal risk from this hazard. The total number of buildings, and value, in the County is shown in the table at the beginning of this section.

3.3.10 Expansive Soils Hazard

The properties at risk from this hazard are properties located on high and very high shrink-swell potential soil types. The locations of expansive soils are shown in Map Number 7 in Appendix 1. As discussed in the profile of the expansive soil hazard in Osage County, the soil information is stored in raster type data. A spatial analysis to determine the number of properties and buildings at risk from high and very high shrink-swell potential soil cannot be preformed. However, the general location of properties at risk from expansive soils hazard is shown on Map 7 in Appendix 1. Generally, these are in the western part of the county.

There is no need to address expansive soils in this plan due to the lack of data related to damage and there is no justification for mitigating vulnerabilities. Vulnerabilities include structures with foundations such as homes and businesses, concrete slabs in driveways and sidewalks, and parking lots. Asphalt surfaces such as highways and runways could be affected.

3.3.11 Wildfire Hazard

All areas, and all buildings, in the County are at equal risk from being impacted by this hazard. The total number of buildings, and value, in the County is shown in the table at the beginning of this section. Fires can also destroy non structural assets such as agriculture, vegetation, and vehicles. Vulnerability of these non-structural assets, both in identifying these assets and estimating their damage potential was not quantified.

3.3.12 Earthquake Hazard

All areas, and all buildings, in the County are at equal risk from this hazard. The total number of buildings, and value, in the County is shown in the table at the beginning of this section. Vulnerabilities include all structures, homes, businesses and transportation infrastructure.

3.3.13 Hazardous Material Hazard

The public is most at risk from hazardous materials when they are being transported. The County has defined the major transportation routes and are shown in Map Number 15 in Appendix 1.

3.4 Assessing Vulnerability: Estimating Potential Losses

For each hazard, an analysis was done to determine the potential dollar losses to vulnerable buildings identified in Section 3.3. The analysis followed the methodology discussed in FEMA 386-2, step 4, and the format of FEMA 386-2 worksheet #4 "Estimate Losses".

Only the flood hazard, dam break hazard, and the hypothetical tornado analyses identified structures with varying amounts of damage.

3.4.1 Flood Hazard

For the flood hazard, for this planning exercise, all structures on property intersecting the regulatory floodplain are evaluated at one foot below the base flood elevation. (Actual first floor elevations were not surveyed and the best available topography has 10 foot contour intervals making windshield surveys plus and minus five feet.) Using FEMA 386-2, part 4, building damage with one foot of flood depth is estimated to be 14 percent of the building value, and content damage is estimated to be 21 percent of the building value.

Table 3.18
DAMAGE ESTIMATE WITH ONE-FOOT FLOOD DEPTH

Type	Number of Buildings	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Residential	1167	9,424,050	7,068,038	16,492,088
Commercial	48	7,514,564	11,271,846	18,786,410
Agricultural	1029	8,072,653	12,108,980	20,181,634
Total	2244	25,011,268	30,448,864	55,460,132

3.4.2 Tornado Hazard

For the tornado hazard analysis, the path and impact area of the F-5 tornado to hit Osage County in 1991 was depicted in Map Number 13 in Appendix 1. As discussed in Section 3.3.2, the current buildings at risk from this tornado were determined. The FEMA 386-2 literature states there are no standard loss estimation models and tables for tornados. Therefore, all buildings within this tornado's impact area were estimated to be completely destroyed. The potential loss from this tornado today is shown in the following table.

Table 3.19
TOTAL BUILDINGS IN TORNADO SCENARIO

Type	Number of Buildings	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Residential	244	28,035,572	14,017,786	42,053,358
Commercial	60	20,662,853	20,662,853	41,325,706
Agricultural	29	3,088,664	3,088,664	6,177,328
Total	333	51,787,089	37,769,303	89,556,392

3.4.3 Dam Break Hazard

For the dam break hazard, for this planning exercise, all structures on property intersecting the hazard location were evaluated at two feet below the water elevation. (Actual first floor elevations were not surveyed and the best available topography has 10 foot contour intervals making windshield surveys plus and minus five feet.) This is one foot more than the vulnerability analysis for the flood hazard because the hazard from a dam break could occur as a surge of water rather than just rising water; therefore, it could cause more damage and that is accounted for in the greater damage estimate percentages for two feet deep. Using FEMA 386-2, part 4, building damage with two feet of flood depth is estimated to be 22 percent of the building value, and content damage is estimated to be 33 percent of the building value.

Table 3.20
DAMAGE ESTIMATE WITH TWO-FEET FLOODING DEPTH

Type	Number of Buildings	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Residential	1323	10,304,570	7,728,427	18,032,997
Commercial	173	9,615,435	14,423,152	24,038,587
Agricultural	349	4,289,817	6,434,726	10,714,544
Total	1845	24,209,822	28,586,306	52,796,128

3.4.4 Hazardous Material Hazard

The locations of the critical facilities in relation to the hazardous material locations and the major transportation routes are shown in Map Number 16 in Appendix 1.

3.4.5 Expansive Soils

The potential damage to structures and infrastructure located on high and very high shrink-swell potential soils is dependant on the design of its foundation and quality of the construction of the foundation. Both factors were beyond the scope of this multi-hazard mitigation plan. Set damage estimates based on a percentage of the structure value were not used because of the wide variation of the factors involved in a foundation's stability. There is no need to address expansive soils in this plan due to the lack of data related to damage and there is no justification for mitigating vulnerabilities. Vulnerabilities include structures with foundations such as homes and businesses, concrete slabs in driveways and sidewalks, and parking lots. Asphalt surfaces such as highways and runways could be affected.

3.4.6 All Other Hazards

The magnitude of the damage to structures from all the other hazards does not vary by location. The total building and content value for all structures in County is totaled and shown in the table in the beginning of Section 3.3.

3.5 Assessing Vulnerability: Analyzing Development Trends

This section discusses the community's vulnerability in terms of a general description of land use and development trends so that mitigation options can be considered in future land use decisions. Three areas were analyzed. These are the types of existing and proposed land uses, development densities in the hazard areas, and anticipated changes in land use

3.5.1 The Osage County Assessor assigns three land use categories for the county. These are residential, commercial, and agricultural. Land use changes can occur, and are initiated by the property owner, usually to accommodate a new development. The County's Board of Adjustment reviews each change request, and takes into account hazards and hazard prone areas in ruling on any land use change request.

3.5.2 There are 41,376 parcels of property in County. Of these, 20,830 parcels are undeveloped. Map Number 17 in Appendix 1 shows this information. It must be noted that no new building development will be added to the flood hazard because any new building will conform to the County's Flood Damage Prevention Ordinance, which the County will continue to vigorously enforce. It will be recommended to all new construction to investigate the shrink-swell potential of its soils, and design and construct the foundation with the soils' properties as a consideration.

3.5.3 Anticipated changes in land use, i.e., new subdivision development, are expected to occur outside the larger communities in the county; Bartlesville, Pawhuska, Sand Springs, Skiatook, and Tulsa, as new development pushes outside their corporate limits to their fence lines.. It is not anticipated the smaller communities will have significant development in the short term, however infill development will continue; utilizing existing infrastructure within the community.

Chapter 4:
Mitigation Strategies

This chapter identifies the hazard mitigation goals set by Osage County and the participating jurisdictions, and discusses the mitigation projects or measures to be taken to achieve those goals.

4.1 Hazard Mitigation Goals

4.1.1 Mission Statement

To create a disaster-resistant community and improve the safety and well-being of the citizens of Osage County by reducing deaths, injuries, property damage, environmental losses, and other losses from natural and technological hazards in a manner that advances community goals, quality of life, and results in a more livable, viable, and sustainable community.

The mission statement and goals were determined by the committee at their initial meetings. Specific objectives were developed during the risk assessment phase and evaluated again as potential action steps were considered.

4.1.2 Specific Goals and Objectives

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

Objectives:

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

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

Objectives:

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

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

Objectives:

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

Goal 4 Hailstorm Hazard: To reduce the risk from hailstorms in Osage County.

Objectives:

1. Promote construction of hail resistant roofs.

Goal 5 Lightning Hazard: To reduce the risk from lightning in Osage County.

Objectives:

1. Reduce loss of life and property, and injury due to lightning by increased public awareness of measures to prevent and reduce damage, including warnings.

Goal 6 Winter Storm Hazard: To reduce the hazards from winter storms in Osage County.

Objectives:

1. Reduce property loss and community disruption due to severe winter cold and ice storms.

Goal 7 High Winds Hazard: To reduce the risk from high winds in Osage County.

Objectives:

1 Educate and encourage the building trades industry about construction standards that are adequate to withstand frequent high winds.

Goal 8 Drought Hazard: Reduce the economic impact of drought hazards to Osage County.

Objectives:

1. Reduce damage to property and building foundations due to drought by improving building codes.

Goal 9 Wildfire Hazard: To reduce the threat of wildfire hazards and their financial impact in Osage County.

Objectives:

1. Develop a County-wide fire response and support group to facilitate the provisioning of water to fires during large fires.

Goal 10 Expansive Soil Hazard: Reduce structure's susceptibility to soil movement.

Objectives:

1. Reduce damage to property and building foundations due to expansive soils by improving building codes.

Goal 11 Earthquake Hazard: To reduce the risk from earthquakes in Osage County.

Objectives:

1. Educate and encourage the building trades industry about earthquake resistant construction.

Goal 12 Hazardous Materials Hazard: To reduce the risk from hazardous material storage facilities around Osage County.

Objectives:

1. Protect the public from exposure from hazardous materials events from sites within the community.

Goal 13 Dam Break Hazard: To reduce the risk of a dam break hazard in Osage County.

Objectives:

1. Identify dams that could impact the county.
2. Identify areas at risk.

Goal 14 Extreme Heat: To reduce the risk from extreme heat in Osage County.

Objectives:

1. Lessen injury and potential loss of life to citizens during periods of extreme heat through education.

4.2 Mitigation Categories

There are several types of measures that communities and individuals can use to protect themselves from, or mitigate the impacts of, natural and man-made hazards. Mitigation measures, for purposes of this study, fall into the following categories:

Preventive Measures
Structural Projects
Property Protection
Emergency Services
Public Information and Education

4.2.1 Preventive Measures

Preventive measures are designed to keep certain conditions from occurring or getting worse. The objective is to ensure that **new** development does not increase damages or loss of life, and that new construction is protected from those hazards. Preventive measures are usually administered by building, zoning, planning, and code enforcement offices. They typically include planning, zoning, building codes, and floodplain development regulations and storm water management.

The first two measures, planning and zoning, work to keep damage-prone development out of the hazardous or sensitive areas. Comprehensive Plan's prepared by communities in Osage County identify areas that are sensitive to urban development. Zoning Ordinance's in Osage County regulates development by dividing the county and communities into zones or districts and setting development criteria for each zone or district. A zoning ordinance is considered the primary tool to implement the comprehensive plan's guidelines for how land should be developed.

The next two measures are floodplain development regulations building codes. Osage County participates in the National Flood Insurance Program (NFIP). The NFIP sets minimum requirements for subdivision regulations and building codes. Building codes require a level of new construction standards for new building construction.

The final measure concerns hazardous materials stored and transported through the County.

4.2.1.1 Preventative Activities

- Planning and zoning help Osage County and communities in the county develop proactively so that the resulting infrastructure is laid out in a coherent and safe manner.
- Participation in the NFIP and using floodplain ordinances and subdivision regulations to regulate floodplain development is beneficial for Osage County and communities in the county.
- Building codes for foundations, sprinkler systems, masonry, and structural elements such as roofs and the exterior building envelope are prime mitigation measures for occurrences of floods, tornadoes, high winds, extreme heat and cold, and earthquakes.
- Better information about hazardous materials in and being transported through the County is desired for safety and contingency planning.

4.2.2 Structural Projects

Structural projects are usually designed by engineers or architects, constructed by both the public and private sector, and maintained and managed by governmental entities. Structural projects traditionally include storm water detention reservoirs, levees and floodwalls, channel modifications, and drainage and storm sewer improvements.

4.2.2.1 Structural Activities

- Crossing and roadway drainage improvements must take into account additional detention or run-off reduction.
- Drainage and storm sewer improvements carry runoff from smaller, more frequent storms.
- Drainage system maintenance is an ongoing project of removing debris that decreases the effectiveness of detention ponds, channels, ditches, and culverts.

4.2.3 Property Protection Measures

Property protection measures are used to modify **existing** buildings or property subject to damage from various hazardous events. Property protection measures are normally implemented by the property owner. However, in some cases, technical and financial assistance can be provided by a governmental agency. Property protection measures from flooding typically include acquisition and relocation, flood-proofing, building elevation, and barriers. Property protection measures from other natural hazards include retrofitting, reinforced foundations, enhanced building codes with emphasis on the exterior building envelope, anchoring of roof and foundation, installation of safe rooms, hail resistant roofing, and insurance.

4.2.3.1 Property Protection Activities

Floods

- Dry flood proofing (making walls watertight so floodwaters cannot get inside)
- Wet flood proofing (letting the water in and removing everything that could be damaged by a flood)
- Installing drain plugs, standpipes or backflow valves to stop sewer backup

Tornado

- Constructing an underground shelter or in-building "safe room"
- Securing roofs, walls and foundations with adequate fasteners or tie downs
- Strengthening garage doors and other large openings

High Winds

- Installing storm shutters and storm windows
- Burying utility lines
- Installing/incorporating backup power
- supplies

Hailstorms

- Installing hail resistant roofing materials

Lightning

- Installing lightning rods and lightning surge interrupters
- Burying utility lines
- Installing/incorporating backup power supplies

Winter Storms

- Adding insulation
- Relocating water lines from outside walls to interior spaces
- Sealing windows
- Burying utility lines
- Installing/incorporating backup power supplies
- Tree trimming adjacent to overhead power lines.

Extreme Heat and Drought

- Adding insulation
- Installing water saver appliances, such as shower heads and toilets

Wild Fires

- Replacing wood shingles with fire resistant roofing
- Adding spark arrestors on chimneys
- Landscaping to keep bushes and trees away from structures
- Installing sprinkler systems
- Installing smoke alarms

General Measures

From the above lists, it can be seen that certain approaches can help protect from more than one hazard. These include:

- Strengthening roofs and walls to protect from wind and earthquake forces
- Bolting or tying walls to the foundation protect from wind and earthquake forces
- and the effects of buoyancy during a flood
- Adding insulation to protect for extreme heat and cold
- Anchoring water heaters and tanks to protect from ground shaking and flotation
- Burying utility lines to protect from wind, ice and snow
- Installing backup power systems for power losses during storms
- Installing roofing that is hail resistant and fireproof

Insurance has the advantage that, as long as the policy is in force, the property is protected and no human intervention is needed for the measure to work. Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the National Flood Insurance Program (NFIP). Flood insurance

coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area.

4.2.4 Emergency Service Measures

Emergency services measures protect people during and after a hazard event. Locally, these measures are coordinated by the emergency management agencies of the individual communities. Measures include preparedness, threat recognition, warning, response, critical facilities protection, and post-disaster recovery and mitigation.

Threat recognition is the key. The first step in responding to a flood, tornado, storm or other natural hazard is knowing that one is coming. Without a proper and timely threat recognition system, adequate warnings cannot be disseminated.

After the threat recognition system tells municipal police departments and/or Osage County Emergency Management Agency that a hazard is coming, the next step is to notify, **or warn**, the public and staff of other agencies and critical facilities. The following are the more common warning media:

- Outdoor warning sirens
- Sirens on public safety vehicles
- NOAA Weather Radio
- Commercial or public radio or TV stations
- Cable TV emergency news inserts
- Telephone trees
- Door-to-door contact
- Mobile public address systems

Just as important as issuing a warning is telling people what to do. A warning program should have a public information aspect. People need to know the difference between a tornado warning (when they should seek shelter in a basement) and a flood warning (when they should stay out of basements).

4.2.4.1 Emergency Services Activities

The protection of life and property is the foremost important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

Response Activities

- Activating the emergency operations room (Emergency Management)
- Closing streets or bridges (Sheriff/Police/County or Public Works)
- Shutting off power to threatened areas (OG&E/AEP/City and Rural Co-ops)
- Holding children at school/releasing children from school (School District)
- Passing out sand and sandbags (County or Public Works)
- Ordering an evacuation (Commission Chairman or Mayor)
- Opening evacuation shelters (Red Cross)
- Monitoring water levels (County or Public Works)

- Security and other protection measures (Sheriff or Police)

After a disaster, communities should undertake activities to protect public health and safety, facilitate recovery, and prepare people and property for the next disaster. This is commonly referred to as Post-Disaster Recovery and Mitigation.

Recovery Activities
- Patrolling evacuated areas to prevent looting
- Providing safe drinking water
- Monitoring for diseases
- Vaccinating residents for tetanus
- Clearing streets
- Cleaning up debris and garbage
- Regulating reconstruction to ensure that it meets all code requirements, including the NFIP's substantial damage regulations

Mitigation Activities
- Conducting a public information effort to advise residents about mitigation measures they can incorporate into their reconstruction work
- Evaluating damaged public facilities to identify mitigation measures that can be included during repairs
- Acquiring substantially or repeatedly damaged properties from willing sellers
- Planning for long term mitigation activities
- Applying for post-disaster mitigation funds

Overall Emergency Service Activities
- Using solid, dependable threat recognition systems is first and foremost in emergency services.
- Following a threat recognition, multiple or redundant warning systems and instructions for action are most effective in protecting citizens.
- Good emergency response plans that are updated yearly ensure that well-trained and experienced people can quickly take the appropriate measures to protect citizens and property.
- To ensure effective emergency response, critical facilities protection must be part of the plan.
- Post-disaster recovery activities include providing neighborhood security, safe drinking water, appropriate vaccinations, and cleanup and regulated reconstruction.

4.2.5 Public Information and Education Measures

Successful public information and education measures involve both public and private sectors. Public information and education activities advise and educate citizens, property owners, renters, businesses, and local officials about hazards and ways to protect people and property from them. Public information activities are among the least expensive mitigation measures, and at the same time are often the most effective thing a community can do to save lives and property. All mitigation activities begin with public information and education.

Many benefits stem from providing map information to inquirers. Residents and businesses that are aware of the potential hazards can take steps to avoid problems and reduce their exposure to flooding, dam failure or releases, hazardous materials events, and other hazards that have a

geographical distribution. These mapped hazards are included in this Hazard Mitigation study, and are discussed below. Flood Insurance Rate Maps (FIRMS) and Flood Hazard Boundary maps are available to show the flood zones for each property. Flood insurance is always recommended for those properties subject to flooding, especially for those in Flood Zone A.

Hazardous materials sites, listed in the Oklahoma Department of Environmental Quality's EHS list, are shown on Map Number 10 in Appendix 1, and are listed in Section 3.2.12. Transportation routes frequently used in the transport of hazardous materials include US Highway 60, State Highway (SH) 10, SH 11, SH 18, SH 20, SH 97, SH 99 and SH 123. There are no railroads currently within the county. High-pressure pipeline locations have been suppressed by the Federal government since 9/11.

Public Libraries located in the county are a place for residents to seek information on hazards, hazard protection, and protecting natural resources. Historically, libraries have been the first place people turn to when they want to research a topic. Interested property owners can read or check out handbooks or other publications that cover their situation. The libraries also have their own public information campaigns with displays, lectures, and other projects, which can augment the activities of the local government.

4.2.5.1 Public Information and Education Activities

There are many ways that public information programs can be used so that people and businesses will be more aware of the hazards they face and how they can protect themselves. Most public information activities can be used to advise people about all hazards, not just floods. Other public information activities require coordination with other organizations, such as schools and real estate agents. There are several area organizations that can provide support for public information and educational programs.

An example of one such public information activity is to encourage all citizens, businesses and organizations to have insurance on all their property that could be damaged / destroyed by any hazard; such as, homeowner's insurance, flood insurance, earthquake insurance, income interruption insurance, and crop and agriculture insurance.

4.3 Research, Review, and Prioritization

A wide range of literature searches and other sources were researched to identify mitigation measures for each hazard. Measures were identified to ascertain those that were most appropriate for Osage County. The public involvement process included a citizen hazard mitigation questionnaire. 95 responses were received. The survey and summary of the responses are included in Appendix 4. The public involvement process also included holding open meetings for all committee meetings; and a public hearing on November 30, 2011. A list of potential mitigation measures was prepared by staff and presented to the committee to stimulate debate and discussion.

The committee reviewed the mitigation activities. The committee incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities. While not referred to by name at the time of the mitigation activity review, the intent of the method was used. An explanation of each STAPLE+E criteria item is as follows:

S: Social	Mitigations actions are acceptable to the county if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the county's social and cultural values.
T: Technical	Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.
A: Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P: Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
L: Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E: Economic	Budget constraints can significantly deter the implementation of mitigation actions. It is important to evaluate whether an action is cost-effective before an action is implemented.
E: Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with environmental regulations, and that are consistent with the county's environmental goals, have mitigation benefits while being environmentally sound.

Among the factors discussed for each activity was its economic impact on the county. A cost-benefit analysis was not done for each activity under consideration, but the committee decided to have a formal cost-benefit evaluation done for any selected activity that would follow the requirements of the funding source when funds are being sought and the OCEMAC would look for actions with a benefit greater than its cost.

While the committee did not select projects for each jurisdiction, it did offer recommendations. Osage County, and each participating jurisdiction, selected their own mitigation actions, with the criteria as outlined in this section.

The potential social impact, implementation capabilities (county work force), and potential funding availability for each activity, and the other STAPLE+E criteria principles were considered in selecting activities. All participating jurisdictions took into account the above factors in selecting hazard mitigation activities. The County's action plan included at least two projects or activities for each hazard, as shown in Table 5.2.

Chapter 5:
Action Plan

Osage County has again reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. The County also reviewed the list of recommended actions, activities and projects the County included in the previous plan to identify actions that had been completed, and what other activities should be continued, deferred, or cancelled. The results of this review are included in table 5.1 below.

Table 5.1
Status of Mitigation Actions from Previous Plan

Activity	Action Description	Progress on Activities	Recommendation for the Activities
1	Investigate community tornado shelter programs implemented in other jurisdictions**.**	Completed	Remove from updated plan
2	Provide surge protection and uninterruptible power sources for electronic-reliant county facilities, such as the Sheriff Department, County Offices, and Emergency Operations Center.	Still investigating funding	Continue into updated plan
3	Develop a plan for Sheriff Department and Fire Department personnel to expand their knowledge and capabilities relative to hazardous materials and events, including meth labs. Also include public education on Meth Labs.	Still investigating funding	Continue into updated plan
4	Obtain funding for the distribution of educational materials on the hazards of extreme heat to vulnerable populations.	Still investigating funding	Continue into updated plan
5	Upgrade the emergency communications network for fire, police, sheriff, 911, ambulance and other emergency operations.	Still investigating funding	Continue into updated plan
6	Develop a public information campaign to promote the advantages of individual fire suppression equipment in residences, including fire extinguishers.	Still investigating funding	Continue into updated plan
7	Update County equipment and vehicles for combating ice storm damage/adverse conditions to public infrastructure.	Still investigating funding	Continue into updated plan
8	Educate the public about adequate building systems for resistance to tornados and high winds.	Still investigating funding	Continue
9	Install window air conditioners for elderly shut-ins for whom extreme heat can be a life threatening hazard.	Still investigating funding	Continue into updated plan
10	Identify and plan for hazardous materials and incidents on major transportation routes throughout the county.	Still investigating funding	Continue into updated plan
11	Investigate other communities' tornado shelter programs.	Completed	Remove from updated plan

12	Hazard Occurrence Data Collection.	Still investigating funding	Continue into updated plan
13	Public Education for Mitigation	Still investigating funding	Continue into updated plan
14	Window Laminates	Still investigating funding	Continue into updated plan
15	Establish fire breaks in the Wildfire urban interface.	Still investigating funding	Continue into updated plan
16	Safe Rooms in Schools	Was still investigation funding	Remove from update, include with the schools

As part of the plan update process, this chapter identifies at least two (2) specific activities per hazard to achieve the mitigation goals. For each activity, the hazard it would be mitigating is identified, the type of activity is shown, the lead agency is identified, an anticipated time schedule and estimated cost is shown, identification of the possible funding sources is made, and the type of work product and expected outcome is discussed. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The following table, Table 5.2, identifies which mitigation type project is associated with each hazard for Osage County.

Each participating jurisdiction prepared its own action plan by identifying at least four to five activities or projects that jurisdiction could undertake in the next five years to mitigate specific hazards. Each mitigation action included information on the same eight points as discussed in the previous paragraph.

Mitigation Actions and Activities for each of the participation jurisdictions.

Osage County has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. Osage County, as the sponsoring jurisdiction, identified and selected 14 activities, at least two activities for each hazard, as shown in the following table, and these are listed after the table.

Table 5.2
Osage County Mitigation Actions or Activities per Hazard

Hazard Type	Osage County Mitigation Action Number
Flood	4, 10, 11, 14
Tornado	4, 10, 11, 14
High Winds	10, 11, 12, 14
Lightning	1, 10, 11, 14
Hail	10, 11, 12, 14
Winter Storm	6, 10, 11, 14
Extreme Heat	8, 10, 11, 12, 14
Expansive Soils	10, 11, 14
Drought	10, 11, 14
Wildfire	10, 11, 13,14
Earthquake	10, 11, 14
Hazardous Material Events	9, 10, 11, 14
Dam Break	10, 11, 14

1. **Provide surge protection and uninterruptible power sources for electronic-reliant county facilities, such as the Sheriff Department, County Offices, and Emergency Operations Center.**
   Hazard Type: Lightning
   Project Type: Mitigation
   Lead: County Emergency Management
   Time Schedule: FY2012-2016
   Estimated Cost: $ 500 per unit and $20,000 for installation of generator per facility
   Source of Funding: Local / Grants
   Work Product: The work product will be electronic protection units to protect the electronic equipment in County facilities.
   Expected Outcome: The expected outcome will be uninterrupted data retrieval from County facilities. With so much data and municipal records stored electronically, access to that data is vital to the continuous operation of government.

2. **Develop a plan for Sheriff Department and Fire Department personnel to expand their knowledge and capabilities relative to hazardous materials and events, including meth labs. Also include public education on Meth Labs.**
   Hazard Type: Hazardous Materials
   Project Type: Training
   Lead: County Emergency Management
   Time Schedule: FY2012, and annually
   Estimated Cost: $10,000.00
   Source of Funding: Local
   Work Product: Training for emergency response personnel.
   Expected Outcome: This will allow County personnel and personnel who respond to county emergencies to properly identify potentially hazardous situations, assess the magnitude and monitor the event until hazardous material response contractors arrive. Also include a public information campaign to educate the general public on how to identify Meth Labs.

3. **Obtain funding for the distribution of educational materials on the hazards of extreme heat to vulnerable populations.**

Hazard Type: Extreme Heat
Project Type: Education
Lead: County Emergency Management
Time Schedule: FY2012
Estimated Cost: $10,000.00
Source of Funding: Local / Grants
Work Product: Development information on the hazards of extreme heat.
Expected Outcome: The expected outcome will be increased public awareness of the dangers of extreme heat. This information is targeted primarily vulnerable populations through agencies that work with these populations.

4. **Upgrade the emergency communications network for fire, police, sheriff, 911, ambulance and other emergency operations.**

Hazard Type: Flood, Tornado
Project Type: Mitigation
Lead: County Emergency Management
Time Schedule: FY2012-2016
Estimated Cost: $5,000,000.00
Source of Funding: Local / FEMA / Homeland Security
Work Product: Upgrade in communication equipment and to evaluate and possibly expand personnel dispatching coverage.
Expected Outcome: The outcome will be the ability to better disseminate information to response personnel and the public.

5. **Develop a public information campaign to promote the advantages of individual fire suppression equipment in residences, including fire extinguishers.**

Hazard Type: Wildfire
Project Type: Education
Lead: County Emergency Management
Time Schedule: FY2012-2014
Estimated Cost: $10,000.00
Source of Funding: Local / Grants
Work Product: Develop a public information campaign promoting individual fire suppression equipment in residences. This campaign would also include fire extinguishers.
Expected Outcome: The expected outcome will be increased fire protection for individual residences.

6. **Update County equipment and vehicles for combating ice storm damage/adverse conditions to public infrastructure.**
   Hazard Type: Severe Winter Storm
   Project Type: Mitigation
   Lead: County Maintenance Department
   Time Schedule: FY2012-2015
   Estimated Cost: $ 10,000.00 (will utilize existing county vehicles)
   Source of Funding: Local
   Work Product: Acquisition of additional winter snow and ice equipment (plows and spreaders) for its existing vehicles to combat ice and winter storms.
   Expected Outcome: Returning the infrastructure back to normal operations as quickly as possible after winter storms, ice and snow hazards, and all adverse conditions, is essential to hazard recovery, and is the expected outcome.

7. **Educate the public about adequate building systems for resistance to tornados and high winds.**
   Hazard Type: Tornado, High Winds
   Project Type: Education
   Lead: County Emergency Management
   Time Schedule: FY2012-2014
   Estimated Cost: $10,000.00
   Source of Funding: Local / Grants
   Work Product: The development of educational materials on building systems to resist high wind hazards and tornados.
   Expected Outcome: The expected outcome will be increased public awareness of building systems that are available to resist tornados and high wind hazards.

8. **Install window air conditioners for elderly shut-ins for whom extreme heat can be a life threatening hazard.**
   Hazard Type: Extreme Heat
   Project Type: Mitigation
   Lead: County Emergency Management
   Time Schedule: FY2012-2016
   Estimated Cost: $50,000
   Source of Funding: Local / Grants
   Work Product: The work product is to develop non-profit oriented funding or county funding resources (or through donations) and the installation capability to meet the needs of elderly shut-ins and other vulnerable populations as needing assistance during extreme heat events.
   Expected Outcome: The expected outcome is to reduce the number of persons who are exposed to heat as a life threatening hazard.

9. Identify and plan for hazardous materials and incidents on major transportation routes throughout the county.

Hazard Type: Hazardous Materials
Project Type: Mitigation
Lead: County Emergency Management
Time Schedule: FY2012-2004
Estimated Cost: $5,000.00
Source of Funding: Local
Work Product: The work product is a plan to address hazardous material spills, and training for all personnel who work as first responders to hazardous material events.
Expected Outcome: The expected outcome will be efficient response to hazardous material incidents, minimizing their effect on the public.

10. Hazard Occurrence Data Collection.

Hazard Type: All Hazards
Project Type: Mitigation
Lead: Osage County Emergency Management
Time Schedule: On-going when started
Estimated Cost: $10,000.00/year
Source of Funding: Local
Work Product: The work product will be a database of information about each future hazard occurrence.
Expected Outcome: The expected outcome will be good community specific information on the hazard that impact the County for future plan updates.

11. Public Information on Mitigation

Hazard Type: All Hazards
Project Type: Mitigation
Lead: Osage County Emergency Management
Time Schedule: FY2012-2013
Estimated Cost: $50,000.00
Source of Funding: Local/Grant
Work Product: The work product will be information on specific mitigation activities that the public can implement.
Expected Outcome: The expected outcome will be more mitigation activities implemented by the residents of the County.

12. Window Laminates

Hazard Type: Hail, Heat, High Winds
Project Type: Mitigation
Lead: County Administration
Time Schedule: As funds become available
Estimated Cost: $50,000.00
Source of Funding: Local/Grant
Work Product: The work product would be installing laminates to all public buildings' windows.
Expected Outcome: The expected outcome will be a layer of protection from the hazards to prevent or lessen injuries to occupants of the buildings.

13. Establish fire breaks in the Wildfire urban interface.

Hazard Type: Wildfires
Project Type: Mitigation
Lead: County Emergency Management
Time Schedule: As funds become available
Estimated Cost: $1,000,000.00
Source of Funding: Grant
Work Product: The work product would be a fire resistant buffer around the incorporated parts of the County.
Expected Outcome: The expected outcome will be to minimize the area where wildfires can easily enter the urban areas of the County.

14. Osage County Web Site

Hazard Type: All Hazards
Project Type: Mitigation
Lead: Emergency Management
Time Schedule: FY2012, then on-going
Estimated Cost: $20,000.00
Source of Funding: Local or Grant
Work Product: Build an information dissemination web site for Osage County.
Expected Outcome: To provide information on the County to County residents, people having business in the County, and visitors to the County. It will provide information related to Osage County activities and, in particular, on hazards that are affecting the County with links to other hazard monitoring agencies. The ultimate outcome is an efficient tool to disseminate Osage County information.

The Town of Avant has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The Town of Avant selected five mitigation activities to make up their Action Plan, as follows.

1. **Provide surge protection and backup power for the Water Treatment Facility, Wastewater Treatment Facility, and Town Hall.**
   Hazard Type – Lightning, Winter Storm, High Winds, Tornado
   Project Type – Mitigation
   Lead Agency – Town
   Time Schedule – FY 2012-2013
   Estimated Cost – $50,000.00
   Source of Funding – Grants
   Work Product – Surge protectors to protect critical electrical equipment at the water treatment facility, wastewater treatment facility, and computers and servers at the Town Hall.
   Expected Outcome – It is vitally important that Town residents have a continuous water service, wastewater service, and Town government, especially during hazard events. Preventing lightning from knocking out the power the electrical equipment at these critical facilities, and restoring electric power when it is interrupted is vitally important to maintain the continuity of government services to the Town's residents.

2. **Emergency Warning Sirens.**
   Hazard Type – Flood, Tornado
   Project Type – Mitigation
   Lead –Town
   Time Schedule – FY2013 - 2015
   Estimated Cost – $ 100,000.00
   Source of Funding – Grants
   Work Product: – Installation of emergency warning sirens in the Town.
   Expected Outcome: – The Town does not have emergency warning sirens. So the acquisition and installation of a warning system will provide a warning system to notify residents of impending hazards.

3. **Replace undersized water lines.**
   Hazard Type – Wildfires
   Project Type – Mitigation
   Lead Agency – Town
   Time Schedule – FY2012-2014
   Estimated Cost – $200,000.00
   Source of Funding – Grants
   Work Product – Replace undersize water lines with 6-inch lines, and add fire hydrants.
   Expected Outcome – Improve the effectiveness of the Town's water distribution system to adequately supply a fire flow throughout the community, and adding fire hydrants increases the fire fighting protection area. These improvements will also improve the Town's ISO rating.

4. **Develop a contingency plan for responding to a massive power outage due to severe winter storms, ice and snow.**
   Hazard Type – Severe Winter Storm
   Project Type – Mitigation
   Lead – Town
   Time Schedule – FY 2013
   Estimated Cost – $ 5,000.00
   Source of Funding – Grants
   Work Product – Prepare a plan to route electric power around power outage areas.
   Expected Outcome: – To make the electric power distribution system more resistant to localized outages in order to limit the areas with electric power.

5. **Snow Removal Equipment**
   Hazard Type – Winter Storm
   Project Type – Mitigation
   Lead Agency – Town
   Time Schedule – FY 2013
   Estimated Cost – $75,000.00
   Source of Funding – Grants
   Work Product – Acquisition of a snow plow blade and sand spreader, and a vehicle that can be fitted to use the snow plow and sand spreader.
   Expected Outcome – The streets could be cleared better and faster for emergency personnel. It will also allow citizens to navigate the community in a safer manner, and have access to essential services sooner.

The City of Barnsdall has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The City of Barnsdall selected six activities, five mitigation activities, to make up their Action Plan, as follows.

1. **Hazard Occurrence Data Collection.**
   Hazard Type: – All Hazards
   Action Plan Project Type: – Mitigation
   Lead: – City Administration
   Time Schedule: – On-going when started
   Estimated Cost: – $10,000.00/year
   Source of Funding: – Local
   Work Product/Expected Outcome: The work product will be a database of information about each future hazard occurrence. The expected outcome will be good community specific information for future plan updates.

2. **Replace inadequately sized water lines with lines of sufficient size to provide proper fire protection, and develop a fire department response plan to all developed property within the City.**
   Hazard Type: –Wildfire
   Action Plan Project Type: – Mitigation
   Lead: – Public Works Department
   Time Schedule: – FY2013 – 2017
   Estimated Cost: – $400,000.00
   Source of Funding: – Local and Grants
   Work Product/Expected Outcome: ODEQ requires all water lines with fire hydrants be a minimum of six-inch in diameter. The City of Barnsdall has approximately 13,000 feet of two-inch and four-inch water lines with fire hydrants attached to them. The City's work product is to prioritize these lines and replace them with adequately sized lines. The work product will also extend the water distribution system to all developed property in the City that does not have fire flow capabilities. The outcome will be to improve the water circulation throughout the system and the fire protection function of the water distribution system to all developed property within the City.

3. **Supply NOAA Weather Radios to all local government buildings, schools and critical facilities.**
   Hazard Type: – Flood, Tornado
   Action Plan Project Type: – Mitigation
   Lead: – Fire Department
   Time Schedule: – FY2013
   Estimated Cost: – $100.00 per radio
   Source of Funding: – Local / FEMA
   Work Product/Expected Outcome: – The work product will be to have NOAA weather radios in these facilities. The outcome will be increased awareness of severe weather and hazards at facilities that respond to hazards and to facilities critical to the welfare of the city and its citizens.

4. **Develop a plan for Barnsdall Police and Fire Department personnel to expand their knowledge and capabilities relative to hazardous materials and events, including meth labs.**
   Hazard Type: – Hazardous Materials
   Action Plan Project Type: – Training
   Lead: – Police Department and Fire Department
   Time Schedule: – FY2013, and annually
   Estimated Cost: – $2,000.00
   Source of Funding: – Local
   Work Product/Expected Outcome: – Training for emergency response personnel. This will allow Town personnel to properly identify potentially hazardous situations, assess the magnitude and monitor the event until hazardous material response contractors arrive.

5. **Develop a contingency plan for responding to a massive power outage due to severe winter storms, ice and snow.**
   Hazard Type: – Severe Winter Storm
   Action Plan Project Type: – Mitigation
   Lead: – Electric Department
   Time Schedule: – FY2013
   Estimated Cost: – $5,000.00
   Source of Funding: – Local
   Work Product/Expected Outcome: – A plan to identify activities and procedures to minimize the frequency of power outages in the Barnsdall area, and a response plan to reduce the time period of power outages, and a prioritization process to establish service back to critical facilities and customers. The goal is to make the power system in the Barnsdall area more resistant to hazards such as winter storms, snow, and ice.

6. **Identify and plan for hazardous materials and incidents on major transportation routes, including railroads, and insure Barnsdall Police and Fire personnel are up to date on their hazardous materials training.**
   Hazard Type: – Hazardous Materials
   Action Plan Project Type: – Mitigation
   Lead: – Fire Department
   Time Schedule: – FY2013
   Estimated Cost: – $5,000.00
   Source of Funding: – Local
   Work Product/Expected Outcome: – The work product is a plan to address hazardous material spills, and training for all personnel who work as first responders to hazardous material events. The expected outcome will be efficient response to hazardous material incidents, minimizing their effect on the public.

The Town of Burbank has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The Town of Burbank selected four mitigation activities to make up their Action Plan, as follows.

1. **Construct a storm shelter in t central location for the Community's residents.**
   Hazard Type – Tornado, High Winds, Severe Winter Storms
   Project Type – Mitigation
   Lead Agency – Town Administration, Town Emergency Management
   Time Schedule – FY2012 - 2014
   Estimated Cost – $75,000.00
   Source of Funding – Grants
   Work Product – Community wide storm shelter.
   Expected Outcome – there are no public storm shelters in the community, so this will provide a safe shelter for the residents in the event of a hazard.

2. **Replace the antique storm siren with an up to date siren or sirens.**
   Hazard Type – Tornados, Flood, Wildfires, Hazardous Material Event
   Project Type – Mitigation
   Lead Agency – Town Emergency Management, Town Fire Department
   Time Schedule – FY2012 - 2014
   Estimated Cost – $35,000.00
   Source of Funding – Local and Grants
   Work Product – A modern storm siren or sirens, with telemetry and remote activation.
   Expected Outcome – To be able to adequately warn the Town residents of an impending hazard.

3. **Supply NOAA Weather Radios to all local government buildings and critical facilities.**
   Hazard Type – All Hazards
   Project Type – Mitigation
   Lead Agency – Town Administration, Public Works Department
   Time Schedule – FY2013
   Estimated Cost – $1,000.00
   Source of Funding – Local and Grants
   Work Product – Purchase weather radios for these buildings and facilities
   Expected Outcome – To provide an increased awareness and a better warning time for approaching severe weather at facilities and building that respond to hazard events and are critical to the care of the community residents.

4. Communication Equipment

Hazard Type – Wildfires, Hazardous Material Events
Project Type – Mitigation
Lead Agency – Town Fire Department, Town Emergency Management
Time Schedule – FY2013
Estimated Cost – $20,000.00
Source of Funding – Local and Grants
Work Product – A radio communication upgrade and hand held radios
Expected Outcome – Better communication will make the first responders and emergency response personnel safer and more efficient in dealing with hazardous situations.

The Town of Fairfax has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The Town of Fairfax selected four mitigation activities to make up their Action Plan, as follows.

1. **Snow Removal Equipment**
   Hazard Type – Winter Storm
   Project Type – Mitigation
   Lead Agency – Street Department
   Time Schedule – FY 2012-2013
   Estimated Cost – $8,000.00 utilizing existing equipment
   Source of Funding – Local and Grants
   Work Product – Purchase a sand spreader and a snow blade (plow) for street department vehicles.
   Expected Outcome – The streets could be cleared better and faster for emergency personnel. It will also allow citizens to navigate the community in a safer manner, and have access to essential services sooner.

2. **Initiate a water conservation plan.**
   Hazard Type – Drought
   Project Type – Mitigation
   Lead Agency – City Administration
   Time Schedule – FY 2013
   Estimated Cost – $2,000.00
   Source of Funding – Local and Grants
   Work Product – A plan for residents to identify ways to conserve water usage and methods to implement these conservation efforts into their everyday activities.
   Expected Outcome – The goal is to make sure people are aware of excess water use, and of sources of wasting water, in the event the water supply becomes limited.

3. **Provide safe rooms in the Police Department and the Fire Department Stations to protect the community's first responders.**
   Hazard Type – Tornado
   Project Type – Mitigation
   Lead Agency – Police and Fire Departments
   Time Schedule – FY 2012-2013
   Estimated Cost – $20,000.00
   Source of Funding – Grants and Local
   Work Product – Safe rooms for the community's first responders to protect the personnel who protect the Town.
   Expected Outcome – Emergency personnel must be able to survive the hazard in order to provide post hazard assistance.

4. **Provide surge protection and backup power for the Police Department and the Water Treatment Facility.**
   Hazard Type – Lightning, Winter Storm, High Winds, Tornado
   Project Type – Mitigation
   Lead Agency – Police Department and Public Works Authority
   Time Schedule – FY 2012-2013
   Estimated Cost – $25,000.00
   Source of Funding – Grants
   Work Product – Surge protectors to protect critical electrical equipment at the water treatment facility and the Police Department, and emergency generators for backup power sources.
   Expected Outcome – It is vitally important that Town residents have a continuous water service and a continual functioning Police Department, especially during hazard events. The water treatment facility must be able to function continuously, and the Police must be able to communicate to provide their public safety service.

The City of Hominy has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The City of Hominy selected four mitigation activities to make up their Action Plan, as follows.

1. **Warning Sirens**
   Hazard Type – Tornado/Severe weather
   Project Type – Mitigation
   Lead Agency – City emergency management
   Time Schedule – FY 2011-12
   Estimated Cost – $5,000.00
   Source of Funding – Grant/possible local funding
   Work Product – Expanding outdoor warning siren network by adding a siren at the City Lake.
   Expected Outcome – With the potential for campers, ball teams playing ball at the ball grounds and other guests and visitors present, a siren is needed for the safety of the public. The current plan is to send a police officer or fire vehicle to the area to disseminate warning(s), however this process is slow, and in the event the officer is on a call, could potentially be delayed.

2. **Communication Equipment**
   Hazard Type – Wild fire/Hazardous Materials incident
   Project Type – Mitigation
   Lead Agency – Hominy Fire Department
   Time Schedule – On or before January 1, 2013
   Estimated Cost – $30,000
   Source of Funding – Grant/Local
   Work Product – New pagers, hand-held radios and radio system upgrade
   Expected Outcome – January 1, 2013 new FCC regulations will require modification or replacement of radio systems. Without these updated communications tools or fire department will be crippled, in terms of alerting fire fighters for emergency situations.

3. **Installation of reverse 911 telephone system.**
   Hazard Type – All hazards
   Project Type – Mitigation
   Lead Agency – Hominy Emergency Management
   Time Schedule – FY 2012-13
   Estimated Cost – $25,000.00
   Source of Funding – Grant
   Work Product – Reverse 911 system
   Expected Outcome – Improved all hazards warning

4. Acquisition of mobile command center

Hazard Type – All hazards
Project Type – Mitigation
Lead Agency – Hominy Emergency Management
Time Schedule – FY 2011-2012
Estimated Cost – $10,000.00
Source of Funding – Grants/donations/local contributions
Work Product –Mobile Command Post & Communications unit
Expected Outcome – Communications and coordination of activities at a scene are vital. Completion and equipping the donated unit with radios, computers, and video equipment for command and control, as well as interface with the emergency operations center will save lives and property. Once completed it is anticipated that M.O.A. will be executed with surrounding jurisdictions which will allow us to share this valuable resource.

The City of Pawhuska has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The City of Pawhuska selected 12 mitigation activities to make up their Action Plan, as follows.

1. **Lake Pawhuska Dam Repair.**
   Hazard Type: Dam Break
   Project Type: Mitigation
   Lead Agency: Public Works Department
   Time Schedule: FY2012-2013
   Estimated Cost: $100,000.00
   Funding Source: Local
   Work Product: Repair the dam on the lake.
   Expected Outcome: Reduction in the risk of dam failure by making necessary repairs to keep the dam in a satisfactory condition.

2. **Acquire floodplain properties where acquisition is the most cost effective mitigation measure.**
   Hazard Type: Flood
   Project Type: Mitigation
   Lead: Public Works Department
   Time Schedule: As project becomes necessary
   Estimated Cost: $ 75,000.00 / structure
   Source of Funding: HMGP, (75% Federal and 25% Local)
   Work Product/Expected Outcome: The City currently does not have any repetitive loss structures. However, the City has chosen to include this item as a priority in the event floods occur and structures meet the criteria to be classified as repetitive loss structures.

3. **Develop a contingency plan for responding to a massive power outage due to severe winter storms, ice and snow.**
   Hazard Type: Severe Winter Storm
   Project Type: Mitigation
   Lead: Electric Department
   Time Schedule: on-going project
   Estimated Cost: $ 2,000.00
   Source of Funding: Local
   Work Product/Expected Outcome: The City has previously prepared a “switching plan” to route electricity around power outage areas. The work product is to annually outdated this plan. The goal is to make the power system in the Pawhuska area more resistant to hazards such as winter storms, snow, and ice.

4. **Tree trimming needs around power lines to lessen the probability of tree branches causing power outages due to severe winter storms, ice and snow.**
   Hazard Type: Severe Winter Storm
   Project Type: Mitigation
   Lead: Electric Department
   Time Schedule: on-going project
   Estimated Cost: $ 20,000.00 annually
   Source of Funding: Local
   Work Product/Expected Outcome: Remove tree branches overhanging power lines. This will lessen the probability of tree branches, weighted down by snow and ice, interfering with power lines and causing power outages.

5. **Teach City employees the symptoms of common, life-threatening emergencies, for instance, the symptoms of heat disorders, and how to give CPR and first aid.**
   Hazard Type: Extreme Hear
   Project Type: Education
   Lead: Fire Department
   Time Schedule: on-going project
   Estimated Cost: $ 2,000.00
   Source of Funding: Local
   Work Product/Expected Outcome: The work product is employee training. Fire Department personnel are qualified as CPR and first aid instructors, and provide training city personnel. The outcome is that people who interact with the public have knowledge and skills necessary to prevent, recognize, and provide basic care for injuries and sudden illnesses until advanced medical personnel arrive and take over.

6. **Evaluate and update warning systems.**
   Hazard Type: Flood, Tornado
   Project Type: Mitigation
   Lead: Electric Department
   Time Schedule: FY2013 - 2015
   Estimated Cost: $ 100,000.00
   Source of Funding: Local / FEMA/REAP
   Work Product/Expected Outcome: A study has already been conducted for emergency warning sirens and identified five sirens are needed. The work product will be to upgrade and install five new emergency warning sirens in Pawhuska. The outcome will be that the City will upgrade their warning systems when construction funds become available, so the City can efficiently disseminate information to the public in the event of a hazard or an emergency.

7. **Supply NOAA Weather Radios to all local government buildings, schools and critical facilities.**
   Hazard Type: All Hazards
   Project Type: Mitigation
   Lead: Fire Department
   Time Schedule: FY2013
   Estimated Cost: $ 1,000.00
   Source of Funding: Local / FEMA
   Work Product/Expected Outcome: The work product will be to determine which specific facilities to supply, and purchase radios for these facilities. The outcome will be increased awareness of severe weather and hazards at facilities that respond to hazards and to facilities critical to the welfare of the City and its citizens.

8. **Update City equipment and vehicles for combating ice storm damage/adverse conditions to public infrastructure.**
   Hazard Type: Severe Winter Storms
   Project Type: Mitigation
   Lead: Public Works Department
   Time Schedule: FY2016 - FY2018
   Estimated Cost: $ 10,000.00 (will utilize existing city vehicles)
   Source of Funding: Local
   Work Product/Expected Outcome: The City has identified additional equipment (plows and spreaders) for its existing vehicles. Returning the city infrastructure back to normal operations as quickly as possible after winter storms, ice and snow hazards, and all adverse conditions, is essential to hazard recovery.

9. **Make sure that fire extinguishers are strategically placed and serviced in all City facilities and vehicles.**
   Hazard Type: Wildfires
   Project Type: Mitigation
   Lead: Fire Department
   Time Schedule: on-going annual activity.
   Estimated Cost: $ 500 – $ 1,000.00 annually
   Source of Funding: Local
   Work Product/Expected Outcome: The work product is properly functioning fire extinguishers. The outcome is a consistent level of good "first-line" fire fighting equipment that can be used until the City Fire Department personnel arrive.

10. **Replace inadequately sized water lines with lines of sufficient size to provide proper fire protection.**
    Hazard Type: Wildfires
    Project Type: Mitigation
    Lead: Public Works Department
    Time Schedule: FY2013 – FY2018
    Estimated Cost: $1,500,000.00
    Source of Funding: Local / Grants
    Work Product/Expected Outcome: ODEQ requires all water lines with fire hydrants be a minimum of six-inch in diameter. The City inventoried their water system, including fire hydrants, for their CIP. The City of Pawhuska has approximately 75,000 feet of two-inch and four-inch water lines with fire hydrants attached to them. The City's work product is to prioritize these lines and replace them with adequately sized lines. This will improve the fire protection function of the water distribution system and also improve the water circulation throughout the system.

11. **Provide backup facilities, including a safe room, at the fire station for the emergency response personnel located at the Pawhuska police station.**
    Hazard Type: Tornados
    Project Type: Mitigation
    Lead: Police Department and Fire Department
    Time Schedule: FY2014
    Estimated Cost: $ 25,000.00 for large safe room and stand by generator
    Source of Funding: Local / FEMA
    Work Product/Expected Outcome: The work product is a second (or alternate) Police command and communication facility, located at the City Fire Department, housed in a facility that will function as a large occupancy safe room. The outcome is a back-up Police command and communication facility to the primary facility at the Police Department becomes non-operational, and also serves to protect on-site personnel from tornado hazards.

12. **Develop a plan for Pawhuska Police and Fire Department personnel to expand their knowledge and capabilities relative to hazardous materials and events, including meth labs.**
    Hazard Type: Hazardous Materials
    Project Type: Mitigation
    Lead: Police Department and Fire Department
    Time Schedule: FY2013
    Estimated Cost: $ 2,000.00
    Source of Funding: Local
    Work Product/Expected Outcome: Training for emergency response personnel. This will allow city personnel to properly identify potentially hazardous situations, assess the magnitude and monitor the event until hazardous material response contractors arrive.

The Town of Prue has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The Town of Prue selected four mitigation activities to make up their Action Plan, as follows.

1. **Safe Rooms at the School**
   Hazard Type – Tornado
   Project Type – Mitigation
   Lead Agency – Town and School District
   Time Schedule – As funds become available
   Estimated Cost – Unknown
   Source of Funding – School Bond Issue and/or Grant
   Work Product – Safe Room
   Expected Outcome – To improve the safety of the students and residents in Prue, by providing a safe location during a tornado hazard.

2. **Bury overhead power lines and purchase back-up power generators**
   Hazard Type – Severe Winter Storms
   Project Type – Mitigation
   Lead Agency – Public Service Company of Oklahoma and Verdigris Valley Electric
   Time Schedule – FY2013-2015
   Estimated Cost – Unknown
   Source of Funding – Grant
   Work Product – Bury the overhead power lines and provide back-up power generators.
   Expected Outcome – Buried utility lines are protected from winter storms to minimize service interruption. And the back-up generators provide power to critical facilities during outages to continue electric service.

3. **Replace undersized water lines.**
   Hazard Type – Wildfires
   Project Type – Mitigation
   Lead Agency – Town Public Works Authority and Town Fire Department
   Time Schedule – FY2012-2014
   Estimated Cost – $200,000.00
   Source of Funding – Grants
   Work Product – Replace undersize water lines with 6-inch lines, and add fire hydrants.
   Expected Outcome – Improve the effectiveness of the Town's water distribution system to adequately supply a fire flow throughout the community, and adding fire hydrants increases the fire fighting protection area. These improvements will also improve the Town's ISO rating.

4. Information Campaign on the hazards of Extreme Heat and Drought

Hazard Type – Extreme Heat, Drought
Project Type – Education
Lead Agency – Town
Time Schedule – FY2012-2014
Estimated Cost – Unknown
Source of Funding – Local
Work Product – Distribution of informational brochures on water conservation and personal behavior during periods of extreme heat
Expected Outcome – To decrease the daily consumption of water during droughts instead of building new water storage facilities, and educate the public on the health hazards of extreme heat.

The City of Shidler has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The City of Shidler selected four mitigation activities to make up their Action Plan, as follows.

1. **Install window air conditioners for elderly shut-ins for whom extreme heat can be a life threatening hazard.**
   Hazard Type: Extreme Heat
   Project Type: Mitigation
   Lead: City
   Time Schedule: FY2013 – FY2018
   Estimated Cost: $500 per unit
   Source of Funding: Local / Grants
   Work Product/Expected Outcome: The work product is to develop non-profit oriented funding resources (or through donations) and the installation capacity to meet the needs of elderly shut-ins identified by local groups or through the County Health Department as needing assistance during extreme heat events. The expected outcome is to reduce the number of elderly persons who are exposed to heat as a life threatening hazard.

2. **Upgrade the emergency communications network for fire, police, 911, ambulance and other emergency operations.**
   Hazard Type: Flood, Tornado
   Project Type: Mitigation
   Lead: Police Department
   Time Schedule: FY2013-2018
   Estimated Cost: $1,500,000.00
   Source of Funding: Local/FEMA/Homeland Security
   Work Product/Expected Outcome: The work product will be the upgrade in communication equipment and to evaluate and possibly expand personnel dispatching coverage. The outcome will be the ability to better disseminate information to response personnel and the public.

3. **Develop a plan for Shidler Police and Fire Department personnel to expand their knowledge and capabilities relative to hazardous materials and events, including meth labs.**
   Hazard Type: Hazardous Materials
   Project Type: Training
   Lead: Police Department and Fire Department
   Time Schedule: FY2012, and annually
   Estimated Cost: $2,000.00
   Source of Funding: Local
   Work Product/Expected Outcome: Training for emergency response personnel. This will allow City personnel to properly identify potentially hazardous situations, assess the magnitude and monitor the event until hazardous material response contractors arrive.

4. **Supply NOAA Weather Radios to all local government buildings, schools and critical facilities.**

   Hazard Type: Flood, Tornado
   Project Type: Mitigation
   Lead: Fire Department
   Time Schedule: FY2013
   Estimated Cost: $100.00 per radio
   Source of Funding: Local / FEMA
   Work Product/Expected Outcome: The work product will be to have NOAA weather radios in these facilities. The outcome will be increased awareness of severe weather and hazards at facilities that respond to hazards and to facilities critical to the welfare of the city and its citizens.

The Town of Wynona has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The Town of Wynona selected five mitigation activities to make up their Action Plan, as follows.

1. **Update Town equipment and vehicles for combating ice storm damage/adverse conditions to public infrastructure.**

   Hazard Type: Tornado, High Winds, Severe Winter Storms, Wildfires,
   Project Type: Mitigation
   Lead: Public Works Department, Fire Department
   Time Schedule: FY2011-FY2013
   Estimated Cost: $45,000
   Source of Funding: Local and Grants
   Work Product/Expected Outcome: The Town has an old, worn out trencher and a tractor with a brush hog on it. To return the infrastructure back to normal operations as quickly as possible, the Town needs a good 4WD Backhoe to clear streets, replace lines (water and sewer), remove debris and is essential to hazard recovery.

2. **Emergency generators to restore power to Town's infrastructure and water wells**

   Hazard Type: Tornadoes, High Winds, Severe Winter Storms, Wildfires.
   Project Type: Mitigation
   Lead: Public Works, Town Administration, Fire and Police Departments
   Time Schedule: FY2011-FY2013
   Estimated Cost: $10,000
   Source of Funding: Local and Grants
   Work Product/Expected Outcome: The work product will be to have 2 large generators to run the Town Hall and Fire Station and 3 small generators to run the 3 water wells. Keeping our water source available is vital in any hazard.

3. **Replace antique storm siren with up to date sirens that can be heard throughout the Town**

   Hazard Type: Tornado, floods, wildfires and hazardous material events
   Project Type: Mitigation
   Lead: Emergency Management Department
   Time Schedule: FY2011-FY2014
   Estimated Cost: $30,000
   Source of Funding: Local and Grants
   Work Product/Expected Outcome: The work product will be to place new sirens at strategic points in Town with telemetry from a central access to activate the sirens in the event of a storm requiring the towns' citizens to take shelter.

4. **Place a storm shelter for First Responders, Utility Workers, Police and Fire Personnel at Town Hall**

   Hazard Type: Tornado, Heavy Winds, Severe Winter Storms
   Project Type: Mitigation
   Lead: Emergency Management Department
   Time Schedule: FY2011-2015
   Estimated Cost: $30,000-$50,000
   Source of Funding: Local and Grants
   Work Product/Expected Outcome: The storm shelter would house emergency personnel in the event of hazardous weather, to protect them during the hazard so they can effectively respond after the hazard.

5. **Place a Storm Shelter in a centrally located place for the Town's citizens**

   Hazard Type: Tornado, Heavy Winds, Severe Winter Storms.
   Project Type: Mitigation
   Lead: Town Administration, Emergency Management
   Time Schedule: FY2011-2014
   Estimated Cost: $75,000
   Source of Funding: Grants
   Work Product/Expected Outcome: There are no public storm shelters in Wynona, so people need a safe place to go to get out of the hazard.

The Anderson School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District selected three mitigation activities to make up their Action Plan, as follows.

1. **Install a backup electrical power system, consisting of a natural gas generator and connection to current electrical system, at school to allow it to be used when total loss of power occurs in the district**.
   Hazard Type: Severe Winter Storm or Tornado
   Project Type: Mitigation
   Lead: Anderson School
   Time Schedule: As funds become available
   Estimated Cost: $25,000.00
   Source of Funding: Grant or Bond Issue
   Work Product: The work product would be a natural gas generator, connect natural gas generator to an existing gas line on property and connect the generator to existing electrical box.
   Expected Outcome: The expected outcome would be to power the building including the gym with electric, heat and AC to house displaced community members until power is restored to their homes.

2. **Equipment to clean-up, treat or prevent winter storms from damaging facilities, roadways , parking lots and sidewalks.**
   Hazard Type: Severe Winter Storm or Tornado
   Project Type: Mitigation
   Lead: Anderson School
   Time Schedule: As funds become available
   Estimated Cost: $75,000.00
   Source of Funding: Grant or Bond Issue
   Work Product: The work product would be equipment such as a skid steer/snowplow equipment, spreader for ice melt, chainsaws to trim trees, portable generators, etc.
   Expected Outcome: The expected outcome would be preventive and reactive measures to lessen negative impact of severe winter weather on school and stakeholders, and facilities/grounds to lessen the disruption of service. Currently the school has no equipment to remove debris or clean sidewalks, parking lots and streets.

3. **Install 2-way Radios on School Buses**
   Hazard Type: Tornado/Hazardous Events/Winter Storms/Tornado
   Project Type: Mitigation
   Lead: Anderson School
   Time Schedule: As funds become available
   Estimated Cost: $30,000.00
   Source of Funding: Grant or Bond Issue
   Work Product: The work product would be to install two-way radios in all busses, two mobile units for administrators and a base unit for the office.
   Expected Outcome: The expected outcome would be to have a means of communication with all busses and administrators in case of hazardous events.

The Barnsdall Independent School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District selected three mitigation activities to make up their Action Plan, as follows.

1. Outside/Outdoor Warning System

Hazard Type: Lightening
Project Type: Mitigation
Lead: Barnsdall Public School
Time Schedule: FY 2012-2013
Estimated Cost: $15,000
Source of Funding: Local / Grants
Work Product: The work product is to have an emergency warning system for playgrounds, bus loading areas, athletic fields and other areas of campus.
Expected Outcome: The expected outcome is to provide an early warning system for the school and the surrounding community of approaching lightening.

2. School Safe Room

Hazard Type: Tornado, High Winds
Project Type: Mitigation
Lead: Barnsdall Public School
Time Schedule: FY 2013-14
Estimated Cost: $25,000
Source of Funding: Local / Grants
Work Product: The work product will be the installation of a in school safe room in both buildings.
Expected Outcome: The expected outcome will be to provide a safe, secure location for students and staff during storms.

3. Install Retro-Fit Metal Roof on Jr./Sr. High School Buildings

Hazard Type: High Winds, Hail
Project Type: Mitigation
Lead: Barnsdall Public School
Time Schedule: FY 2016-2017
Estimated Cost: $250,000
Source of Funding: Grants/Bond
Work Product: The work product will be to install a retro-fit metal roof on the Jr./Sr. High School building.
Expected Outcome: The outcome will be to protect students, staff, and assets of the school from loss due to roof damage caused by high winds and/or hail damage.

The Bowring School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District has yet to identify mitigation activities to make up their Action Plan. The following four slots are place holders, awaiting their mitigation activities.

1. NAME OF ACTIVITY
   Hazard Type –
   Project Type – Mitigation
   Lead Agency –
   Time Schedule –
   Estimated Cost –
   Source of Funding –
   Work Product –
   Expected Outcome –

2. NAME OF ACTIVITY
   Hazard Type –
   Project Type – Mitigation
   Lead Agency –
   Time Schedule –
   Estimated Cost –
   Source of Funding –
   Work Product –
   Expected Outcome –

3. NAME OF ACTIVITY
   Hazard Type –
   Project Type – Mitigation
   Lead Agency –
   Time Schedule –
   Estimated Cost –
   Source of Funding –
   Work Product –
   Expected Outcome –

4. NAME OF ACTIVITY
   Hazard Type –
   Project Type – Mitigation
   Lead Agency –
   Time Schedule –
   Estimated Cost –
   Source of Funding –
   Work Product –
   Expected Outcome –

The Hominy Independent School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District selected four mitigation activities to make up their Action Plan, as follows.

1. **Install 2-way radios on schools busses.**
   Hazard Type – Tornado, Hail, Winter Storm, Hazardous Materials Events
   Project Type – Mitigation
   Lead Agency – Hominy Schools
   Time Schedule – As funds become available
   Estimated Cost – $15,000.00
   Source of Funding – Grants
   Work Product – All busses would be outfitted with 2-way radios and the supervisor would have a base unit in the school office.
   Expected Outcome – Improved communication with all buses at all times.

2. **Safe rooms in schools**
   Hazard Type – Tornados, High Winds
   Project Type – Mitigation
   Lead Agency – Hominy Schools
   Time Schedule – As funds become available
   Estimated Cost – to be determined
   Source of Funding – Grants
   Work Product – A new safe room for the elementary campus and community which can be used as the cafeteria.
   Expected Outcome – Staff and students at the elementary school campus and community members at large would have a safe place to escape severe weather.

3. **Communication equipment**
   Hazard Type – Hazardous Materials Events, and general emergency situations
   Project Type – Mitigation
   Lead Agency – Hominy Schools
   Time Schedule – prior to January 1, 2013
   Estimated Cost – $5,000.00
   Source of Funding – Local funds / Grants
   Work Product – New pagers, hand-held radios and radio system upgrade.
   Expected Outcome – January 1, 2013 is when new FCC regulations will require modifications or replacement of radio systems. With these new radios, Hominy Schools will be able to communicate with First Responders in the event of an emergency.

4. Train school personnel in the proper procedures for dealing with emergency situations.
Hazard Type – All hazards
Project Type – Training
Lead Agency – Hominy Schools
Time Schedule – on-going activity
Estimated Cost – $1,000.00
Source of Funding – Local
Work Product – Training for school staff.
Expected Outcome – As a result of this training, school personnel will be prepared to properly identify emergencies, assess the situation, and execute the propoer response.

The McCord School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District selected eight mitigation activities to make up their Action Plan, as follows.

1. **Secure School Project**
   Hazard Type: Security, Weather, Tornado
   Project Type: Mitigation
   Lead: McCord Public Schools
   Time Schedule: As funds become available
   Estimated Cost: unknown
   Source of Funding: Bond/Grants
   Work Product: The work product will be to install safety doors, metal walls, cameras, and door scanners.
   Expected Outcome: The expected outcome is to provide students, staff, and faculty with a safe and secure work/learning environment and protect them from dangerous elements, whether man-made or natural.

2. **Snow/Ice Removal Equipment**
   Hazard Type: Winter Storms
   Project Type: Mitigation
   Lead: McCord Public Schools
   Time Schedule: As funds become available
   Estimated Cost: $80,000
   Source of Funding: Local / Grants/Bond
   Work Product: The work product will installing electric snow/ice melt carpets; snow/ice box blades; and obtaining a snow blower
   Expected Outcome: The expected outcome will be to have safe and accessible streets, sidewalks, and buildings during winter weather storms.

3. **Bio Hazard Prevention**
   Hazard Type: Hazardous Materials/Chemical and Germ Warfare/Health Risks
   Project Type: Mitigation
   Lead: McCord Public Schools/McCord Senior Citizens/McCord Volunteer Fire Department
   Time Schedule: FY 2014
   Estimated Cost: $20,000.00
   Source of Funding: Local
   Work Product: At least two chemical suits and cleaners/decontamination, neutral, disinfectant, stabilizing agents.
   Expected Outcome: The expected outcome is to create a healthy community for immediate contamination needs.

4. **Surge Protection and Uninterruptable Power Sources for Electronic Reliant School Facilities**
   Hazard Type: Lightening, High Winds, Severe Winter Storms
   Project Type: Mitigation
   Lead: McCord Public Schools
   Time Schedule: FY 2012-2014
   Estimated Cost: $500 per unit and $20,000 for generator installation per facility
   Source of Funding: Local / Grants
   Work Product: The work product will be the installation of equipment to protect electronic equipment.
   Expected Outcome: Due to the quantity of data and school records stored electronically, access to the data is vital to the continuous operation of the school district. The expected outcome will be to provide uninterrupted data retrieval services from the school facilities which will better serve the students and the community.

5. **Safe room/Storm Shelter at the McCord Volunteer Fire Department and the McCord School**
   Hazard Type: Flood, Tornado
   Project Type: Mitigation
   Lead: McCord Public Schools/McCord Volunteer Fire Department
   Time Schedule: As funding becomes available
   Estimated Cost: $50,000
   Source of Funding: Grants/Local
   Work Product: The work product will be to install 2 large capacity safe rooms for the residential neighborhood and the school campus.
   Expected Outcome: The outcome will be to provide a safe, secure shelter for the school and the surrounding community.

6. **Sidewalks above the water/flood area**
   Hazard Type: Floods
   Project Type: Mitigation
   Lead: McCord Public Schools
   Time Schedule: As funding becomes available
   Estimated Cost: $20,000.00
   Source of Funding: Local / Grants
   Work Product: The work product will be to install sidewalks around the school that are above the flood area.
   Expected Outcome: The expected outcome will be for students, teachers, and visitors to be able to walk from the parking areas into the buildings.

7. **Retro Fit Metal Roof**
   Hazard Type: High Wind
   Project Type: Mitigation
   Lead: McCord Public Schools
   Time Schedule: FY 2014-2016
   Estimated Cost: $ 450,000
   Source of Funding: Bond Issue
   Work Product: The work product will be to install a retro fit metal roof on the office and cafeteria buildings.
   Expected Outcome: The expected outcome is to provide protection to students, staff, visitors, and building assets from damages due to rain, wind, and hail/snow.

8. Campaign of Hazardous Material Events, Including Meth Labs

Hazard Type: Hazardous Materials-including Meth
Project Type: Education
Lead: McCord Public Schools
Time Schedule: As funds become available
Estimated Cost: $10,000
Source of Funding: Local / Grants
Work Product: The work product will be to educate the students, parents, and staff and provide them with written information, materials, handouts, and pamphlets on hazardous materials.
Expected Outcome: The expected outcome will be increased public awareness of hazardous materials, including meth.

The Osage Hills Elementary School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District selected five mitigation activities to make up their Action Plan, as follows.

1. Install retro-fit metal roof.

Hazard Type: High Winds, Hail
Project Type: Mitigation
Lead: Osage Hills School
Time Schedule: 2018 or as funds become available
Estimated Cost: $250,000.00
Source of Funding: Grant, Bond Issue
Work Product/Expected Outcome: The work product would be a retro-fit, metal roof on the main building. The expected outcome would be protecting students, staff, and assets of the school from loss due to roof damage caused by high winds and/or hail damage.

2. Safe Room/Storm Shelter at school.

Hazard Type: Tornado
Project Type: Mitigation
Lead: Osage Hills School
Time Schedule: As funds become available
Estimated Cost: $40,000.00
Source of Funding: Grant and local match
Work Product/Expected Outcome: The work product would be a large capacity safe room/storm shelter on school grounds. The students, staff, and visitors would be able to access safe room/storm shelter within 3 minutes of warning/alarm. The expected outcome would be safe locations within or adjacent to current structures for students, staff, and visitors while at school, from tornado hazards.

3. Equipment to clean-up, treat, or prevent severe winter storms from damaging facilities, roadways, parking lots, and sidewalks.

Hazard Type: Severe Winter Storms
Project Type: Mitigation
Lead: Osage Hills School
Time Schedule: As funds become available
Estimated Cost: $35,000.00
Source of Funding: Grant and local match
Work Product/Expected Outcome: The work product would be equipment such as bobcat/snowplow equipment, spreader for ice melt, chainsaws to trim trees, generators, etc. The expected outcome would be preventive and reactive measures to lessen negative impact of severe winter weather on school, its stakeholders, and facilities/grounds to lessen the disruption of service.

4. Outdoor Sirens and Intercom System

Hazard Type: Tornadoes, Lightning, Hailstorms, Hazardous Materials, High Winds
Project Type: Mitigation
Lead: Osage Hills School
Time Schedule: As funds become available
Estimated Cost: $15,000.00
Source of Funding: Grant and local match
Work Product/Expected Outcome: The work product would be emergency sirens and/or intercom systems for playground, bus loading, and other exterior areas of campus. The expected outcome would be early warning system to school and surrounding community of approaching tornadoes, lightning, hailstorms, high winds, or hazardous material exposure.

5. Fire Hydrant/Water Supply Facility

Hazard Type: Wildfires
Project Type: Mitigation
Lead: Osage Hills School/Osage County/Local Fire Department
Time Schedule: As funds become available
Estimated Cost: $50,000.00
Source of Funding: Grant and local match
Work Product/Expected Outcome: The work product would be a secure, reliable water supply (hydrant, storage tank) for volunteer fire depts. The expected outcome would be to provide additional assets to fire departments in protecting school and surrounding community from wildfires.

The Pawhuska Independent School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District selected four mitigation activities to make up their Action Plan, as follows.

1. **Safe Rooms in Schools**
   Hazard Type: Tornado
   Project Type: Mitigation
   Lead Agency: Pawhuska Schools Administration
   Time Schedule: As funds become available
   Estimated Cost: Unknown. Depends on the specific facility requirements
   Source of Funding: Grants
   Work Product: A large capacity safe room within each school building.
   Expected Outcome: The students and facility would not have to go outside to get to a safe facility, utilizing the "shelter in place" concept.

2. **Upgrade surge protection and uninterruptable power sources for electronic reliant school facilities**
   Hazard Type: Lightning, High Winds, Severe Winter Storms
   Project Type: Mitigation
   Lead Agency: Pawhuska Schools Administration
   Time Schedule: FY2012-2014
   Estimated Cost: $500 per unit and $20,000 for generator installation per facility.
   Source of Funding: Local/Grants
   Work Product: Installation of equipment to protect electronic equipment.
   Expected Outcome: Due to the quantity of data and school records stored electronically, access to the data is vital to the continuous operation of the school district. This will provide uninterrupted data retrieval services from the school facilities which will better serve the students and the community.

3. **Outside/Outdoor Warning System**
   Hazard Type: Lightening
   Project Type: Mitigation
   Lead: Pawhuska Schools
   Time Schedule: FY 2013
   Estimated Cost: $15,000
   Source of Funding: Local / Grants
   Work Product/Expected Outcome: The work product is to have an emergency warning system for playgrounds, bus loading areas, athletic fields and other areas of campus. The expected outcome is to provide an early warning system for the school and the surrounding community of approaching lightening.

4. Equipment to clean-up, treat, or prevent severe winter storms from damaging facilities, roadways, parking lots, and sidewalks.

Hazard Type: Severe Winter Storms
Project Type: Mitigation
Lead: Pawhuska Schools
Time Schedule: FY 2014
Estimated Cost: $35,000
Source of Funding: Local / Grants

Work Product/Expected Outcome: The work product will be to have equipment such as bobcats, snow plows, spreader for ice melt, chainsaws to trim trees, and generators. The expected outcome will be preventative and reactive measures to lessen negative impact of severe winter weather on our school, it's stakeholders; our facilities, it's stake holders; and facilities/grounds to lessen the disruption of service.

The Prue Independent School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District selected two mitigation activities to make up their Action Plan, as follows.

1. **Upgrade the surge protection and uninterruptable power sources for the electronic reliant school facilities.**
   Hazard Type – Lightning, High Winds, Severe Winter Storms
   Project Type – Mitigation
   Lead Agency – Prue Schools Administration
   Time Schedule – FY 2012-2014
   Estimated Cost – $500 per unit and $20,000 per generator installation, per facility.
   Source of Funding – Local / Grants
   Work Product – Installation of equipment to protect the School's electronic equipment.
   Expected Outcome – Due to the quantity of data and school records stored electronically, access to the data is vital to the continuous operation of the school district. This will provide uninterrupted data retrieval services from the school facilities which will better serve the students and community.

2. **Safe Rooms in Schools.**
   Hazard Type – Tornado
   Project Type – Mitigation
   Lead Agency – Prue School Administration
   Time Schedule – As funds become available
   Estimated Cost – Depends upon the specific facility requirements
   Source of Funding – Grants
   Work Product – A large capacity safe room within each school building
   Expected Outcome – Protection of the students and facility within each facility utilizing the "shelter in place" concept.

The Woodland School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District selected six mitigation activities to make up their Action Plan, as follows.

1. **Upgrade Intercom System at the District's School Buildings.**
   Hazard Type : Tornado / Hazardous Material Events
   Action Plan: Mitigation
   Lead: Woodland Schools
   Time Schedule: As funds become available
   Estimated Cost: $20,000.00
   Source of Funding: Grants
   Work Product/Expected Outcome: The work product would be to upgrade the intercom system inside and outside the schools. The expected outcome would be to better inform the students and staff in the event of hazardous events.

2. **Install Breakage Resistant Windows.**
   Hazard Type: High wind / Hail
   Action Plan: Mitigation
   Lead: Woodland Schools
   Time Schedule: As funds become available
   Estimated Cost: $30,000.00
   Source of funding: Grants
   Work Product/Expected Outcome: The work product would be to upgrade the windows in the school classrooms. The expected outcome would be to make the windows resistant to breakage from high winds and hail.

3. **Install Lightning Rods and Surge Protectors at School Buildings.**
   Hazard Type: Lighting
   Action Plan: Mitigation
   Lead: Woodland Schools
   Time Schedule: As funds become available
   Estimated Cost: $20,000.00
   Source of funding: Grants
   Work Product/Expected Outcome: The work product would be to install lighting rods and surge protection devices. The expected outcome would be to protect students, buildings and electric equipment from lighting strikes.

4. Install 2-way Radios on School Buses.

Hazard Type: Tornado / Hail / Winter Storm / Hazardous Events
Action Plan: Mitigation
Lead: Woodland Schools
Time Schedule: As funds become available
Estimated Cost: $15,000.00
Source of funding: Grants
Work Product/Expected Outcome: The work product would be to install two-way radios in all busses and supervisors with a base unit in the school office. The expected outcome would be to have means of communication with all busses and supervisors in case of hazardous events.

5. Storm Shelters in each School Building.

Hazard Type: Tornado
Action Plan: Mitigation
Lead: Woodland Schools
Time Schedule: As funds become available
Estimated Cost: $75,000.00
Source of funding: Grants and local
Work Product/Expected Outcome: The work product would be to build in-ground storm shelters at all school sights. The expected outcome would be providing a safe location for students and staff while at school from storm hazards.

6. Purchase Snow Removal Equipment.

Hazard Type: Winter Storm
Action Plan: Mitigation
Lead: Woodland Schools
Time Schedule: As funds become available
Estimated Cost: $7,000.00
Source of funding: Grants
Work Products/Expected Outcome: The work product would be to purchase snow removal equipment. The expected outcome would be to have equipment to remove snow from parking lots and roadways at all school sights.

The Wynona Independent School District has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigations activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as the County did as was detailed in Section 4.3. Once funding is sought, a detailed benefit/cost analysis will be done and will follow the requirements of the funding source. The District selected three mitigation activities to make up their Action Plan, as follows.

1. **Provide equipment and vehicles for combating ice storm damage/adverse conditions to public infrastructure.**

   Hazard Type: Tornado, High Winds, Severe Winter Storms, Wildfires,
   Project Type: Mitigation
   Lead: School Administration
   Time Schedule: FY2011-FY2013
   Estimated Cost: $80,000
   Source of Funding: Local and Grants
   Work Product/Expected Outcome: The work product is a tractor or bobcat with a blade and fork. The expected outcome would be to return the infrastructure back to normal operations as quickly as possible. Presently, the school has no equipment to clear the parking lots or sidewalks during storms; therefore, the school needs a good tractor or bobcat with a blade and fork to remove debris and is essential to hazard recovery.

2. **Place a Storm Shelter at the school for faculty and student use.**

   Hazard Type: Tornado, Heavy Winds
   Project Type: Mitigation
   Lead: School Administration
   Time Schedule: FY2011-2014
   Estimated Cost: $75,000
   Source of Funding: Grants
   Work Product/Expected Outcome: The work product is number of storm shelters. The expected outcome is a safe place for students and facility to go during a hazard while school is in session. Presently, there are no storm shelters at Wynona Public Schools, so people need a safe place to go to get out of the hazard while at school.

3. **Emergency generators to restore power to school and water wells**

   Hazard Type: Tornadoes, High Winds, Severe Winter Storms, Wildfires.
   Project Type: Mitigation
   Lead: School Administration, school maintenance
   Time Schedule: FY2011-FY2013
   Estimated Cost: $20,000
   Source of Funding: Local and Grants
   Work Product/Expected Outcome: The work product will be to have 4 large generators to run the school buildings and 3 small generators to run the 3 water wells. The expected outcome is to keep water available to the school for normal operations. With an appropriate agreement, the emergency generators could also be used by the Town.

Chapter 6:

Plan Maintenance and Adoption

This chapter includes a discussion of the plan maintenance process and documentation of the adoption of the plan by the Osage County Emergency Management Advisory Committee and the Osage County Board of County Commissioners.

6.1 Monitoring, Evaluating, Updating the Plan

The Chairman of the Board of County Commissioners and the Emergency Management Director will oversee the day-to-day implementation of the plan. Monitoring will include getting quarterly reports from the agencies and departments involved in the mitigation activities as to their progress in implementing the projects included the Action Plan that fall within that agency's or department's scope of responsibility.

The Osage County Emergency Management Advisory Committee will also evaluate the mitigation plan on an annual basis. The evaluation shall include reviewing the goals and objectives of the mitigation plan for any changes. The evaluation will also include a review of the hazards in the plan to determine if the risks or hazard locations have changed. The Osage County Emergency Management Advisory Committee will complete and provide an annual evaluation to the Board of County Commissioners summarizing the accomplishments of the mitigation activities. In the action plan, the Osage County Emergency Management Advisory Committee will review the items identified to implement each action plan activity for their appropriateness, and report problems to the Board of County Commissioners. These implementation items include the responsible agency to oversee the mitigation activity, the time schedule, and the funding source.

The Osage County Emergency Management Advisory Committee will make a comprehensive update to the Multi-Hazard Mitigation Plan within five years, from the approval date, as per FEMA requirements, and will be re-submitted to ODEM and FEMA for approval as required.

6.2 Incorporating the Multi-Hazard Mitigation Plan

The Osage County Multi-Hazard Mitigation Plan has been adopted by the Osage County Commission as a guide to county-wide mitigation activities. Appropriate Action Plan activities will be incorporated into the planning process, and in the annual county budget. As stated in section 6.1, the Chairman and the Emergency Management Director will oversee the day-to-day implementation of the plan.

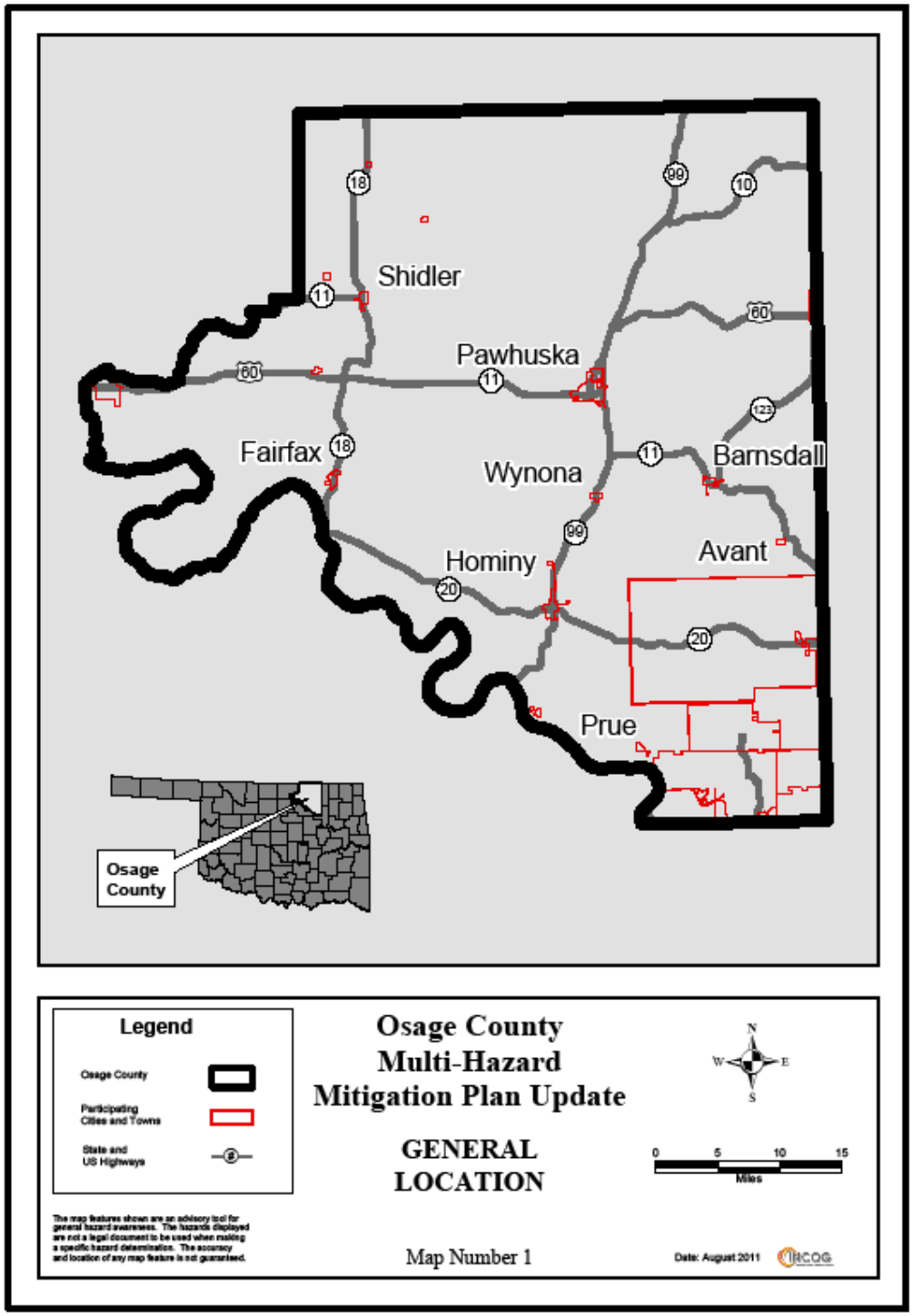
They will work with the OCEMAC to monitor how mitigation activities are incorporated into other county plans. Members of the OCEMAC are also Department Heads charged with the responsibility of updating and enforcing key plans and policies of the County. Osage County

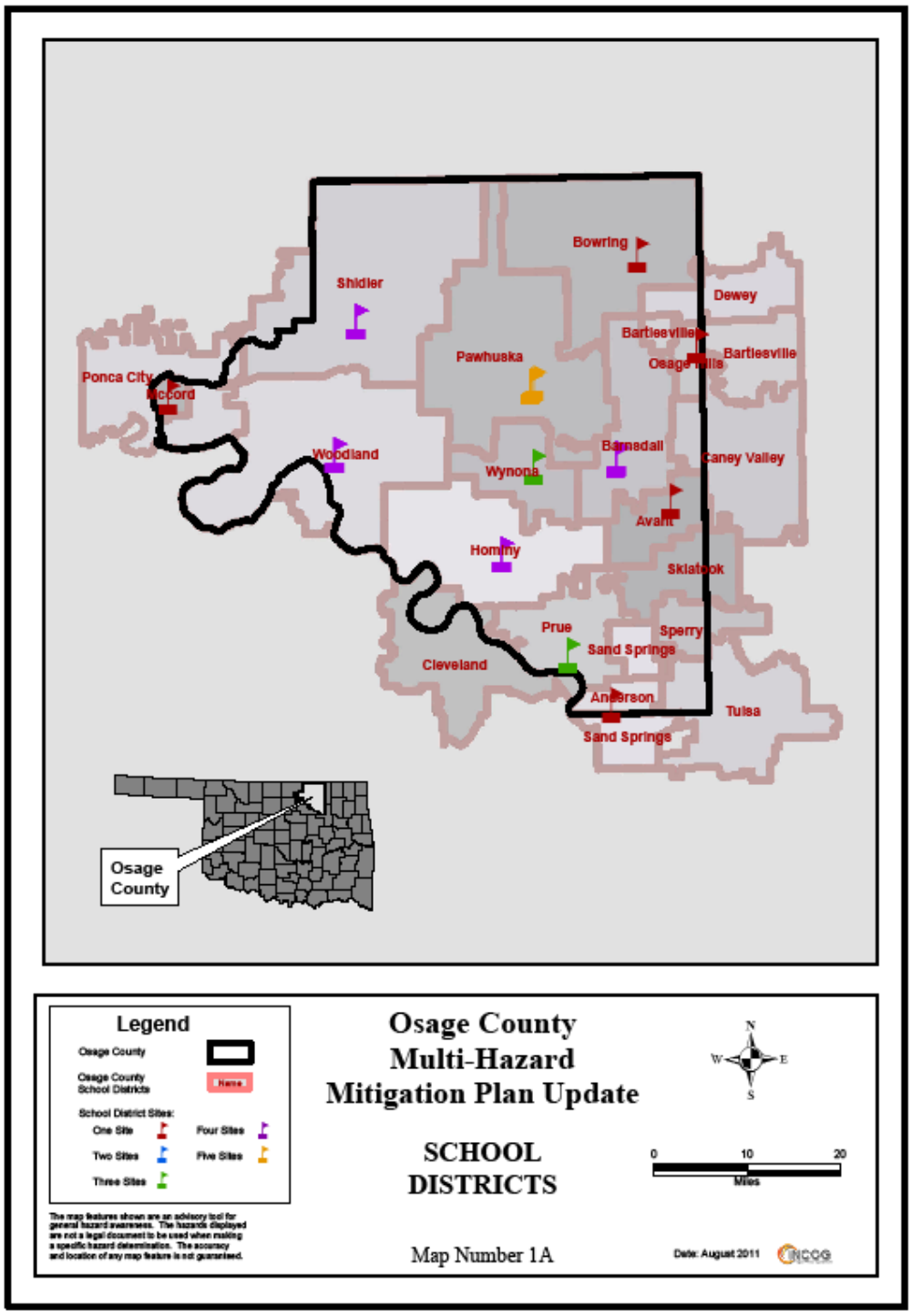
currently has a capital improvement plan to guide development and future improvements. These plans have mitigation strategy components in them, and the County will incorporate any approved the mitigation plan strategies into those plans `when the particular plan is updated. All plans are updated as needed by the County. The inspections department enforces the building codes in Osage County. After adoption of the mitigation plan, the inspections department will continue to enforce the building codes on new construction. Selection of future CIP projects will include consideration of the goals and objectives of the mitigation plan.

6.3 Public Involvement

Osage County is committed to involving the public directly in updating and maintaining the Multi-Hazard Mitigation Plan. Copies of the Plan will be available at the Osage County Emergency Management Office and at the County Courthouse. Input from citizens will be solicited as to how the mitigation process can be more effective. Comments can be made directly to the Chairman of the Board of County Commissioners and the Emergency Management Director.

Appendix 1: Maps


Shidler
Pawhuska
Fairfax
Wynona
Barnsdall
Hominy
Avant
Prue
Osage County
Legend
Osage County
Participating Cities and Towns
State and US Highways
Osage County Multi-Hazard Mitigation Plan Update
GENERAL LOCATION
N
W
E
S
0 5 10 15
Miles
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Map Number 1
Date: August 2011
INCOG


Bowring
Shidler
Dewey
Bartlesville
Pawhuska
Bartlesville
Ponca City
Osage Hills
Accord
Woodland
Barnsdall
Caney Valley
Wynona
Avant
Hominy
Skiatook
Prue
Sperry
Sand Springs
Cleveland
Anderson
Tulsa
Sand Springs
Osage County
Legend
Osage County
Osage County School Districts
School District Sites:
One Site
Two Sites
Three Sites
Four Sites
Five Sites
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County Multi-Hazard Mitigation Plan Update
SCHOOL DISTRICTS
Map Number 1A
N
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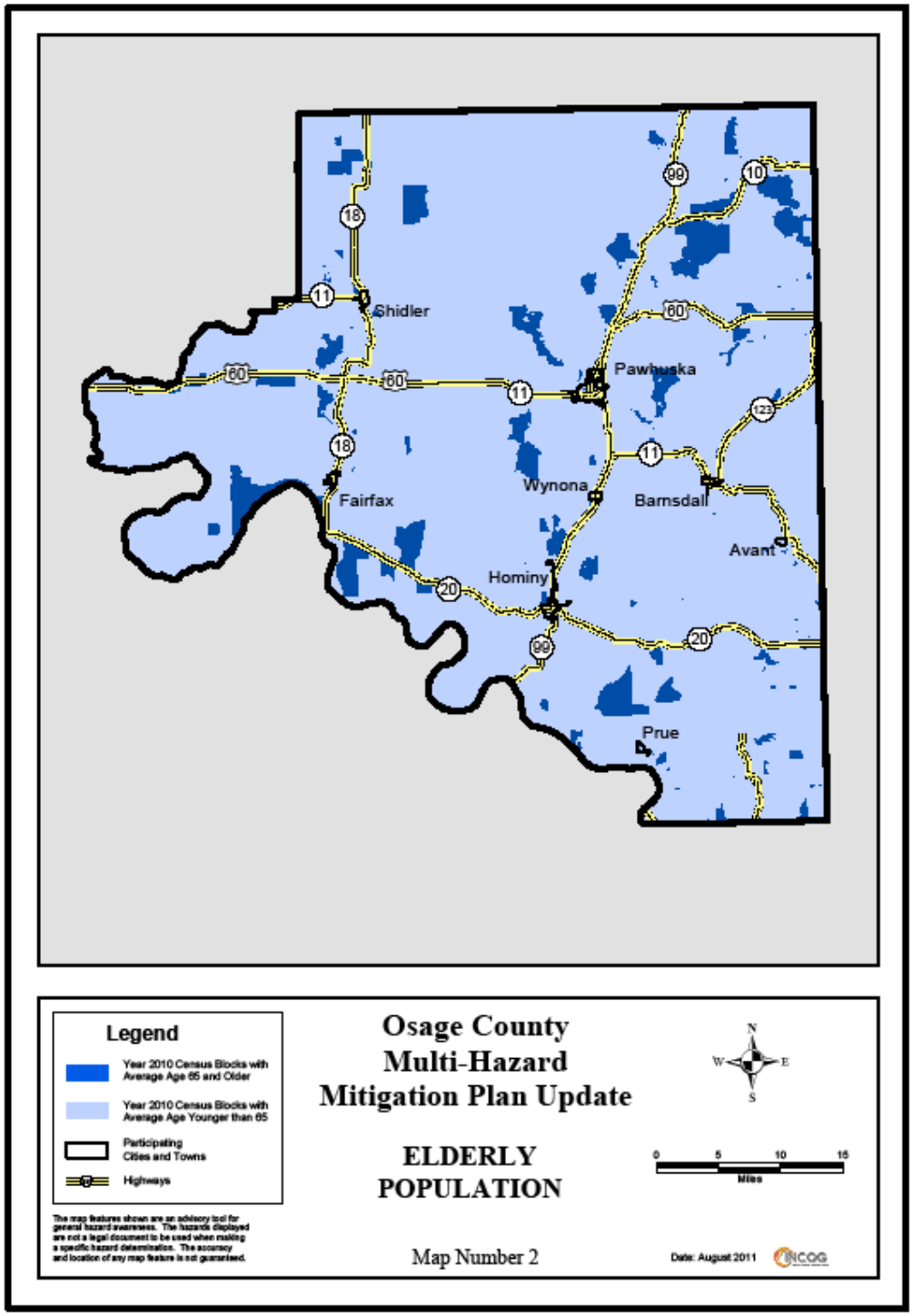
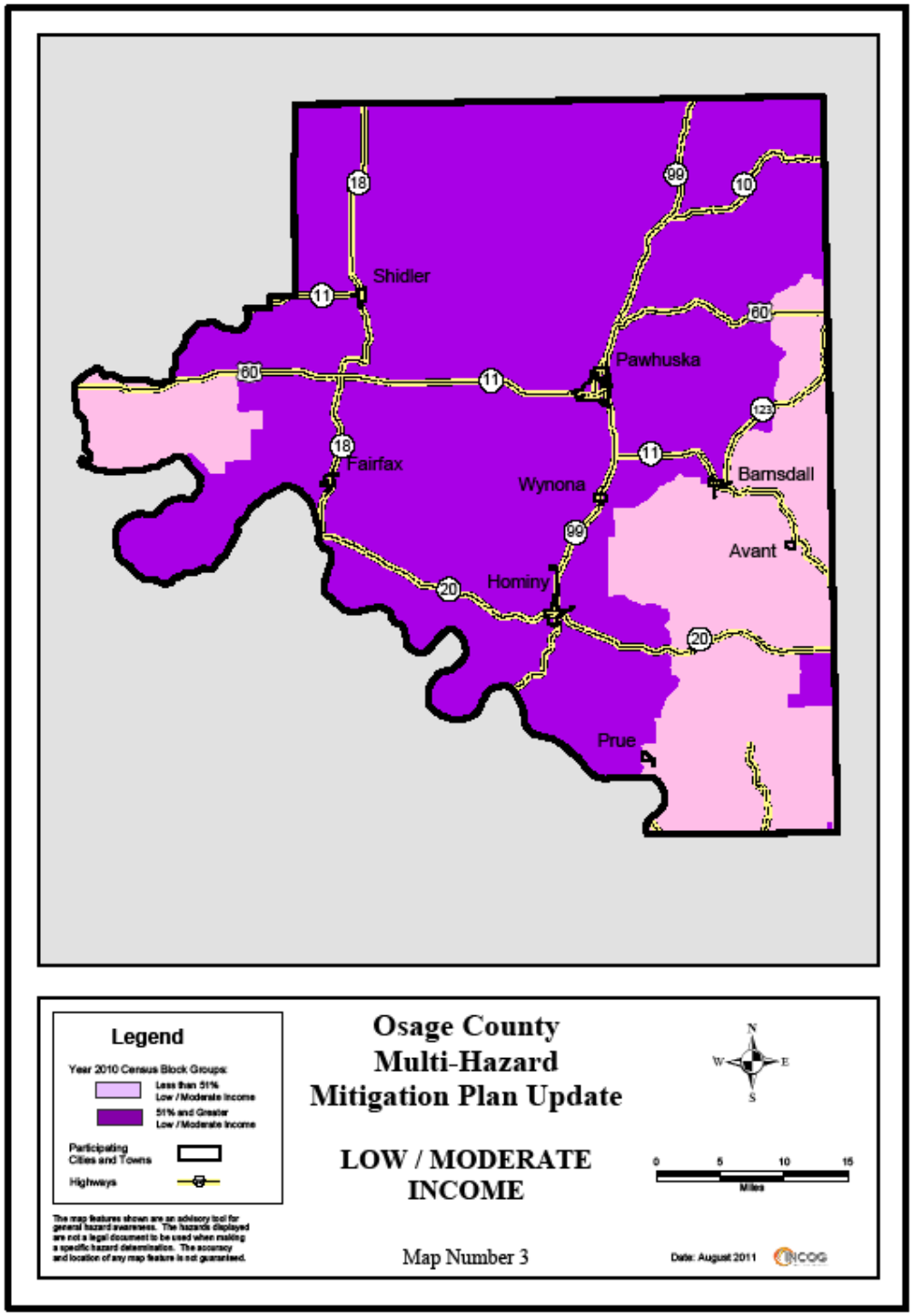
10
20
Miles
Date: August 2011
INCOG


Shidler
Pawhuska
Fairfax
Wynona
Barnsdall
Avant
Hominy
Prue
99
10
18
11
60
123
20
Legend
Year 2010 Census Blocks with Average Age 65 and Older
Year 2010 Census Blocks with Average Age Younger than 65
Participating Cities and Towns
Highways
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
ELDERLY
POPULATION
N
W
E
S
0
5
10
15
Miles
Map Number 2
Date: August 2011
INCOG


Shidler
Pawhuska
Fairfax
Wynona
Barnsdall
Avant
Hominy
Prue
18
99
10
11
60
123
20
Legend
Year 2010 Census Block Groups:
Less than 51% Low / Moderate Income
51% and Greater Low / Moderate Income
Participating Cities and Towns
Highways
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County Multi-Hazard Mitigation Plan Update
LOW / MODERATE INCOME
N
W
E
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5
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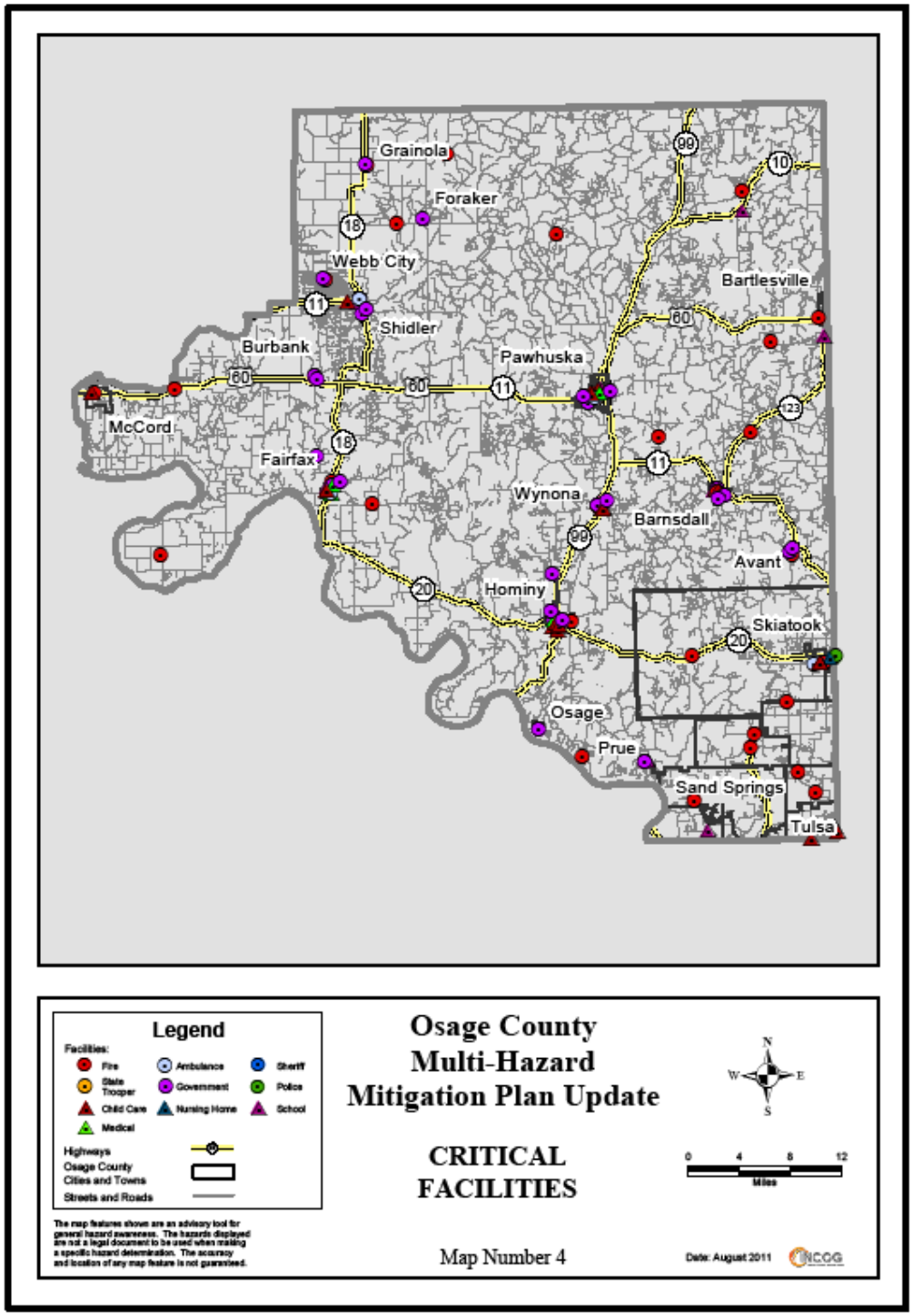
15
Miles
Map Number 3
Date: August 2011
INCOG


Grainola
Foraker
Webb City
Shidler
Burbank
Pawhuska
Bartlesville
McCord
Fairfax
Wynona
Barnsdall
Avant
Hominy
Skiatook
Osage
Prue
Sand Springs
Tulsa
99
10
18
11
60
23
20
Legend
Facilities:
Fire
Ambulance
Sheriff
State Trooper
Government
Police
Child Care
Nursing Home
School
Medical
Highways
Osage County Cities and Towns
Streets and Roads
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County Multi-Hazard Mitigation Plan Update
CRITICAL FACILITIES
Map Number 4
N
W
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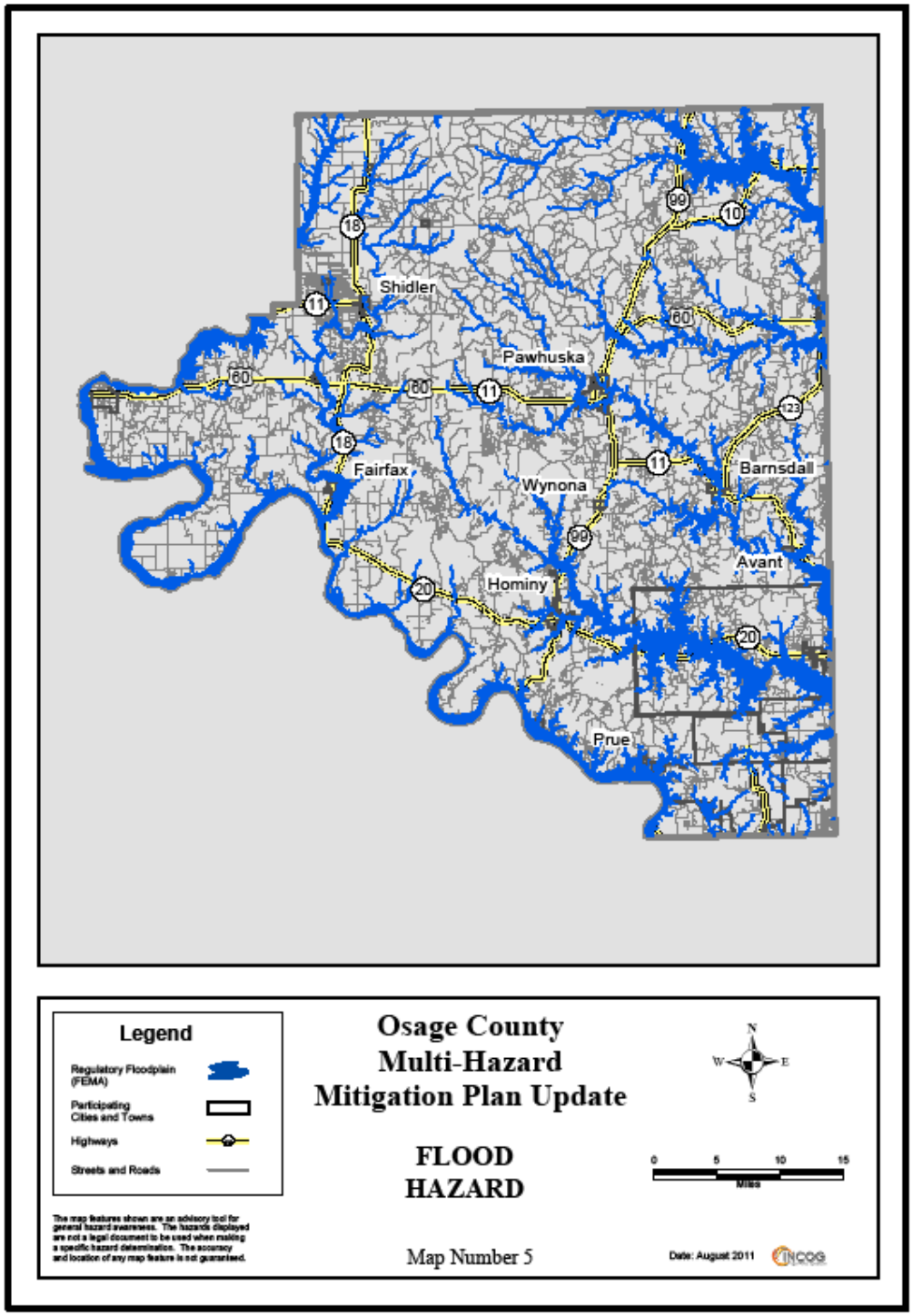
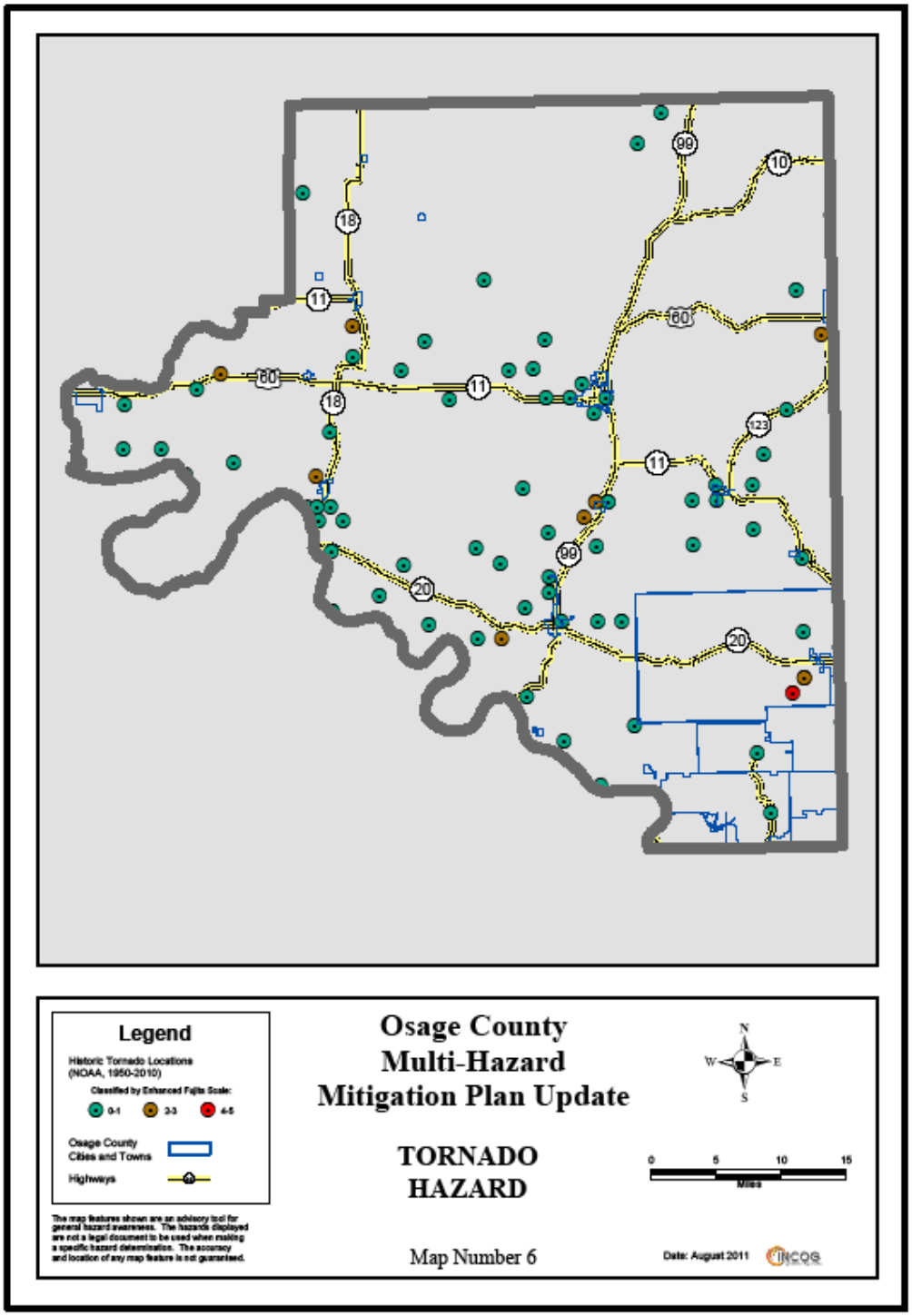
4
8
12
Miles
Date: August 2011
NCOG


Shidler
Pawhuska
Fairfax
Wynona
Barnsdall
Avant
Hominy
Prue
Legend
Regulatory Floodplain (FEMA)
Participating Cities and Towns
Highways
Streets and Roads
Osage County
Multi-Hazard
Mitigation Plan Update
FLOOD
HAZARD
Map Number 5
Date: August 2011
INCOG


99
10
18
11
60
60
18
11
123
11
99
20
20
Legend
Historic Tornado Locations
(NOAA, 1950-2010)
Classified by Enhanced Fujita Scale:
0-1
2-3
4-5
Osage County
Cities and Towns
Highways
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
TORNADO
HAZARD
Map Number 6
N
W
E
S
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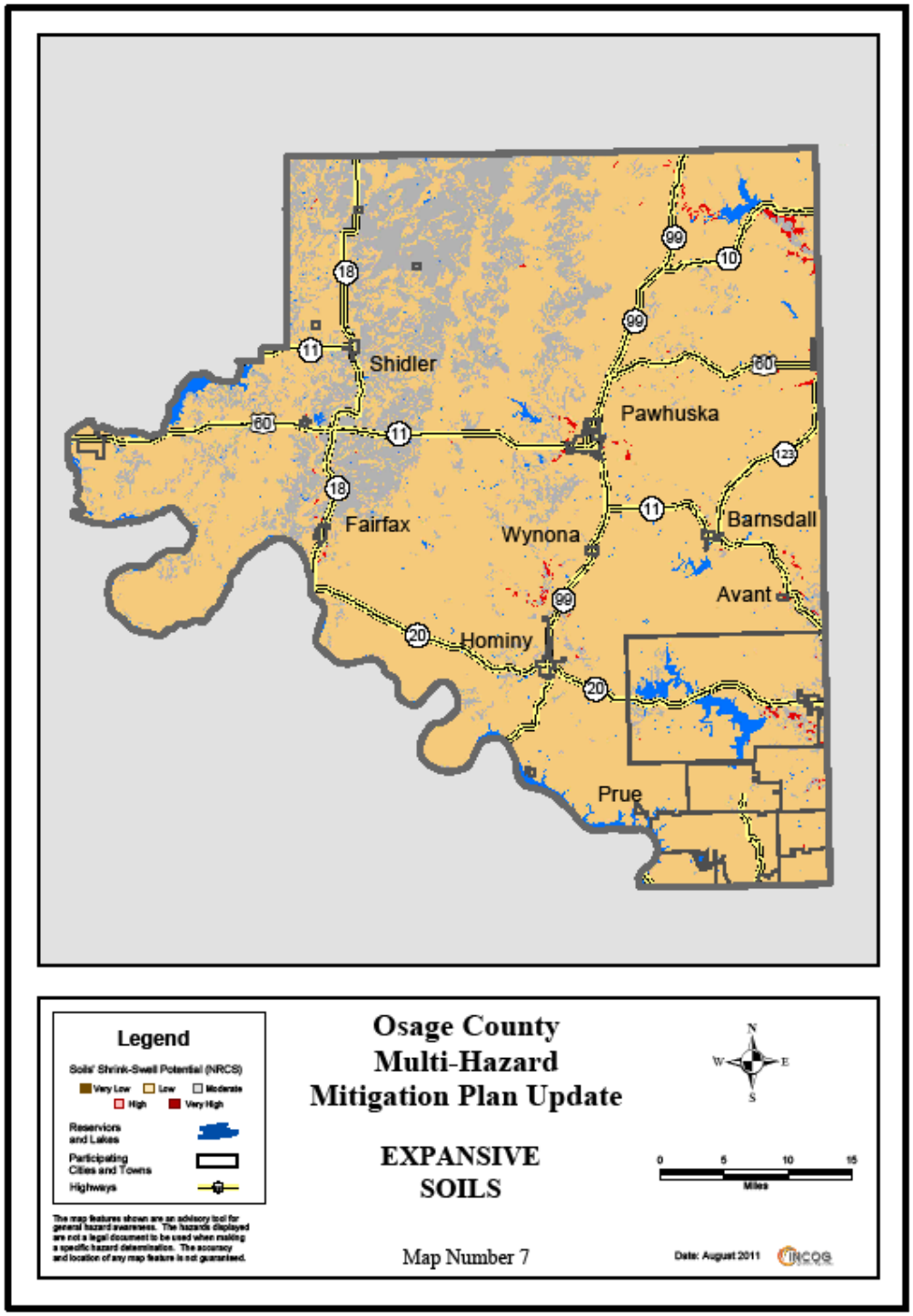
10
15
Miles
Date: August 2011
INCOG


Shidler
Pawhuska
Fairfax
Wynona
Barnsdall
Avant
Hominy
Prue
Legend
Soils' Shrink-Swell Potential (NRCS)
Very Low
Low
Moderate
High
Very High
Reservioirs and Lakes
Participating Cities and Towns
Highways
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
EXPANSIVE
SOILS
Map Number 7
N
W
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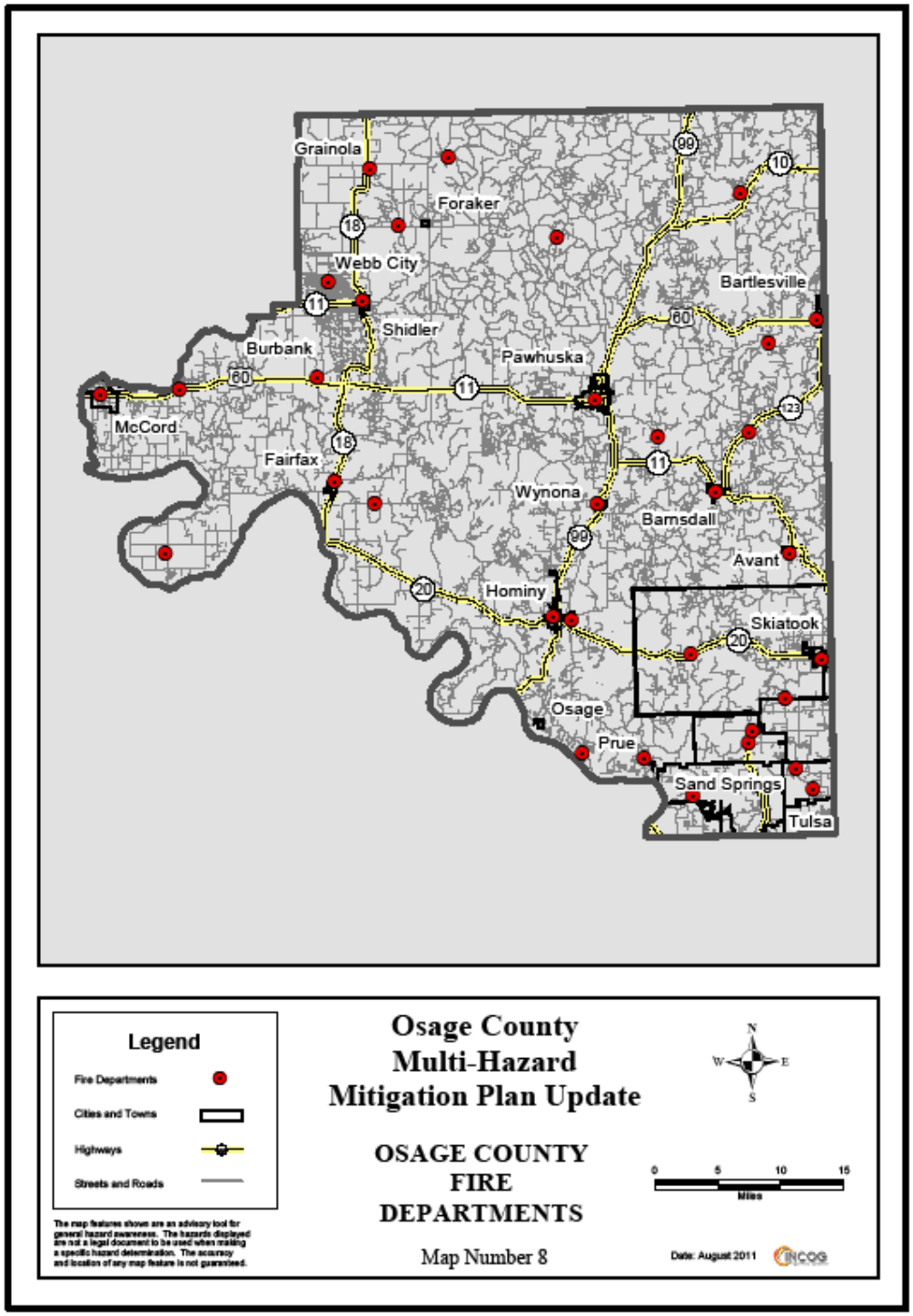
5
10
15
Miles
Date: August 2011
INCOG


Grainola
Foraker
Webb City
Shidler
Burbank
Pawhuska
Bartlesville
McCord
Fairfax
Wynona
Barnsdall
Avant
Hominy
Skiatook
Osage
Prue
Sand Springs
Tulsa
99
10
18
11
60
23
20
Legend
Fire Departments
Cities and Towns
Highways
Streets and Roads
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
OSAGE COUNTY
FIRE
DEPARTMENTS
Map Number 8
N
W
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5
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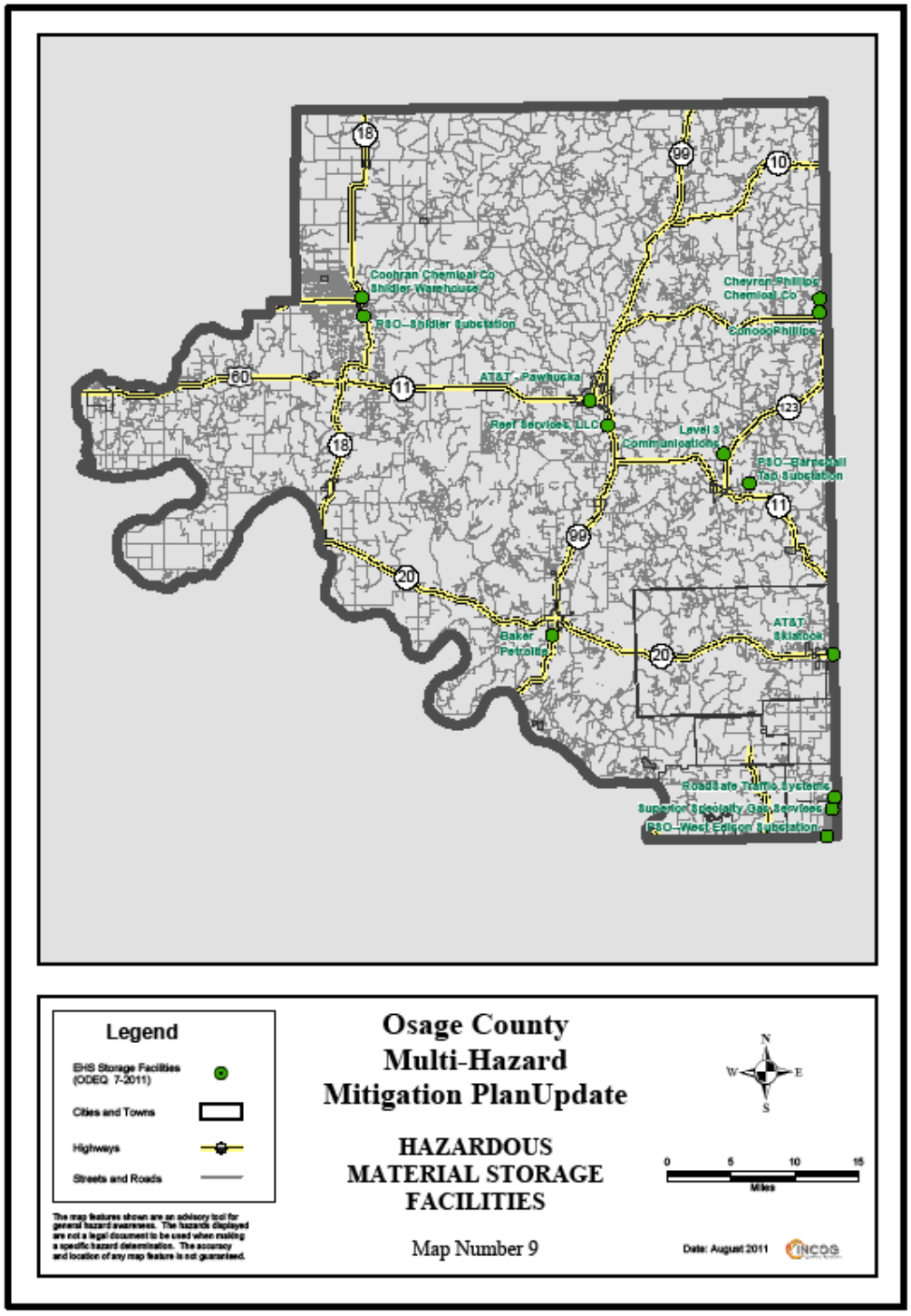
15
Miles
Date: August 2011
INCOG


Cochran Chemical Co
Shidler Warehouse
PSO--Shidler Substation
Chevron Phillips
Chemical Co
ConocoPhillips
AT&T - Pawhuska
Reef Services, LLC
Level 3
Communications
PSO--Barnsdall
Tap Substation
AT&T
Oklahoma
Baker
Petrolite
Roadsafe Traffic Systems
Superior Specialty Gas Services
PSO--West Edison Substation
Legend
EHS Storage Facilities
(ODEQ 7-2011)
Cities and Towns
Highways
Streets and Roads
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation PlanUpdate
HAZARDOUS
MATERIAL STORAGE
FACILITIES
Map Number 9
N
W
E
S
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5
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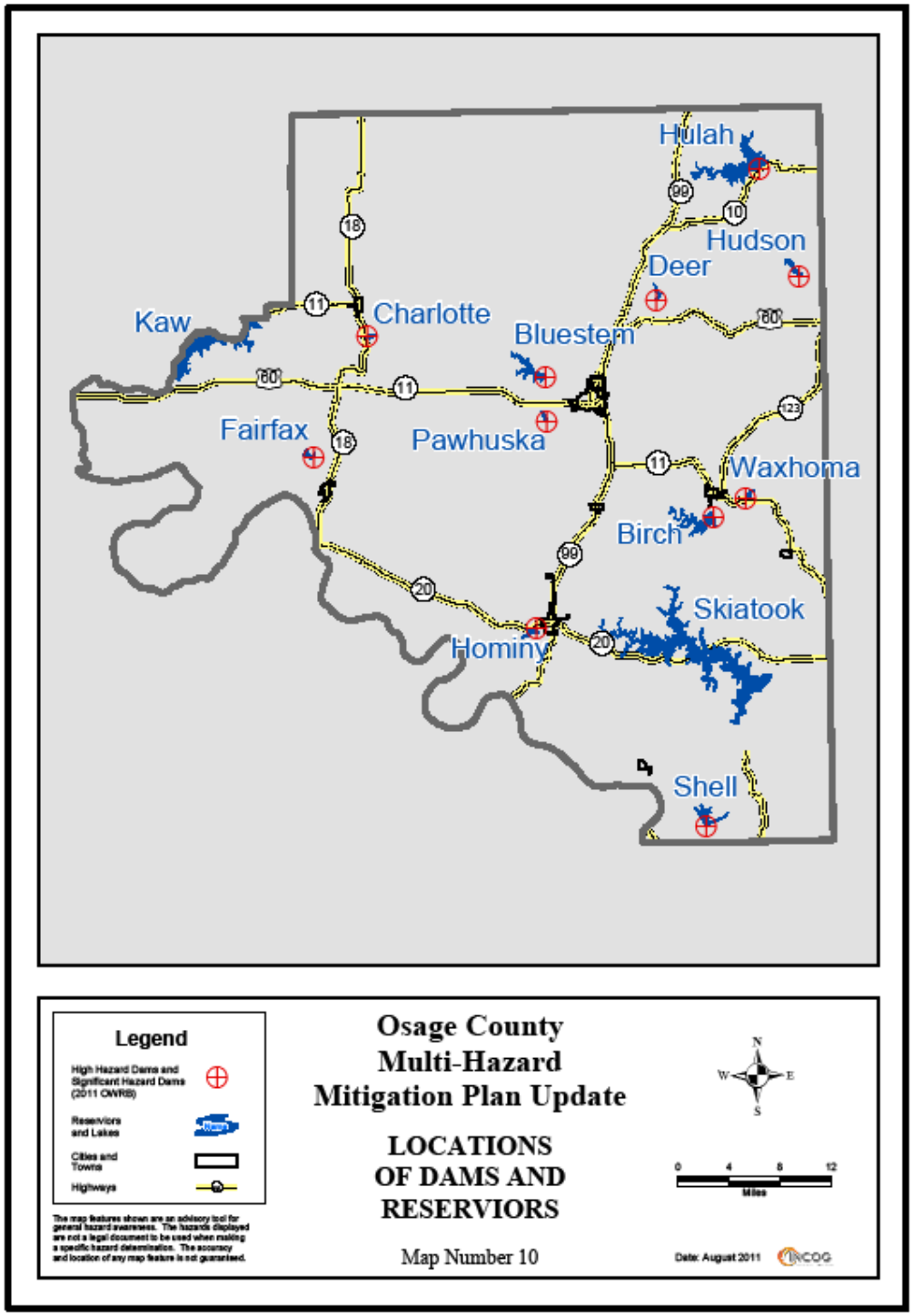
15
Miles
Date: August 2011
INCOG


Hulah
Hudson
Deer
Kaw
Charlotte
Bluestem
Fairfax
Pawhuska
Waxhoma
Birch
Skiatook
Hominy
Shell
99
10
18
11
60
23
20
Legend
High Hazard Dams and Significant Hazard Dams (2011 OWRB)
Reservoirs and Lakes
Cities and Towns
Highways
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
LOCATIONS
OF DAMS AND
RESERVIORS
Map Number 10
N
W
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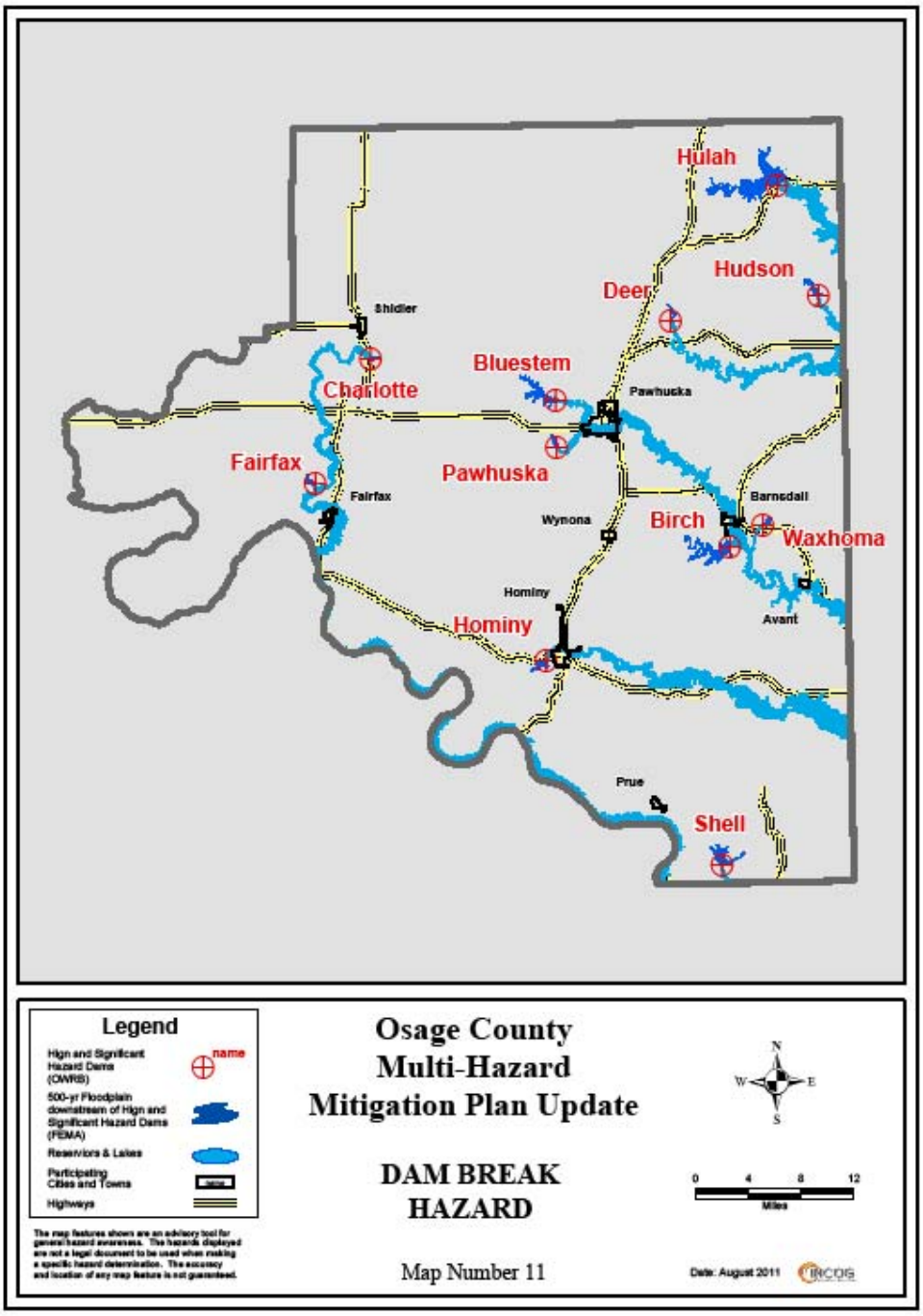
S
0 4 8 12
Miles
Date: August 2011
INCOG


Hulah
Hudson
Deer
Shidler
Bluestem
Charlotte
Pawhucka
Fairfax
Pawhuska
Fairfax
Barnsdall
Wynona
Birch
Waxhoma
Hominy
Hominy
Avant
Prue
Shell
Legend
High and Significant Hazard Dams (OWRB)
name
500-yr Floodplain downstream of High and Significant Hazard Dams (FEMA)
Reservoirs & Lakes
Participating Cities and Towns
Highways
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
DAM BREAK
HAZARD
Map Number 11
N
W
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S
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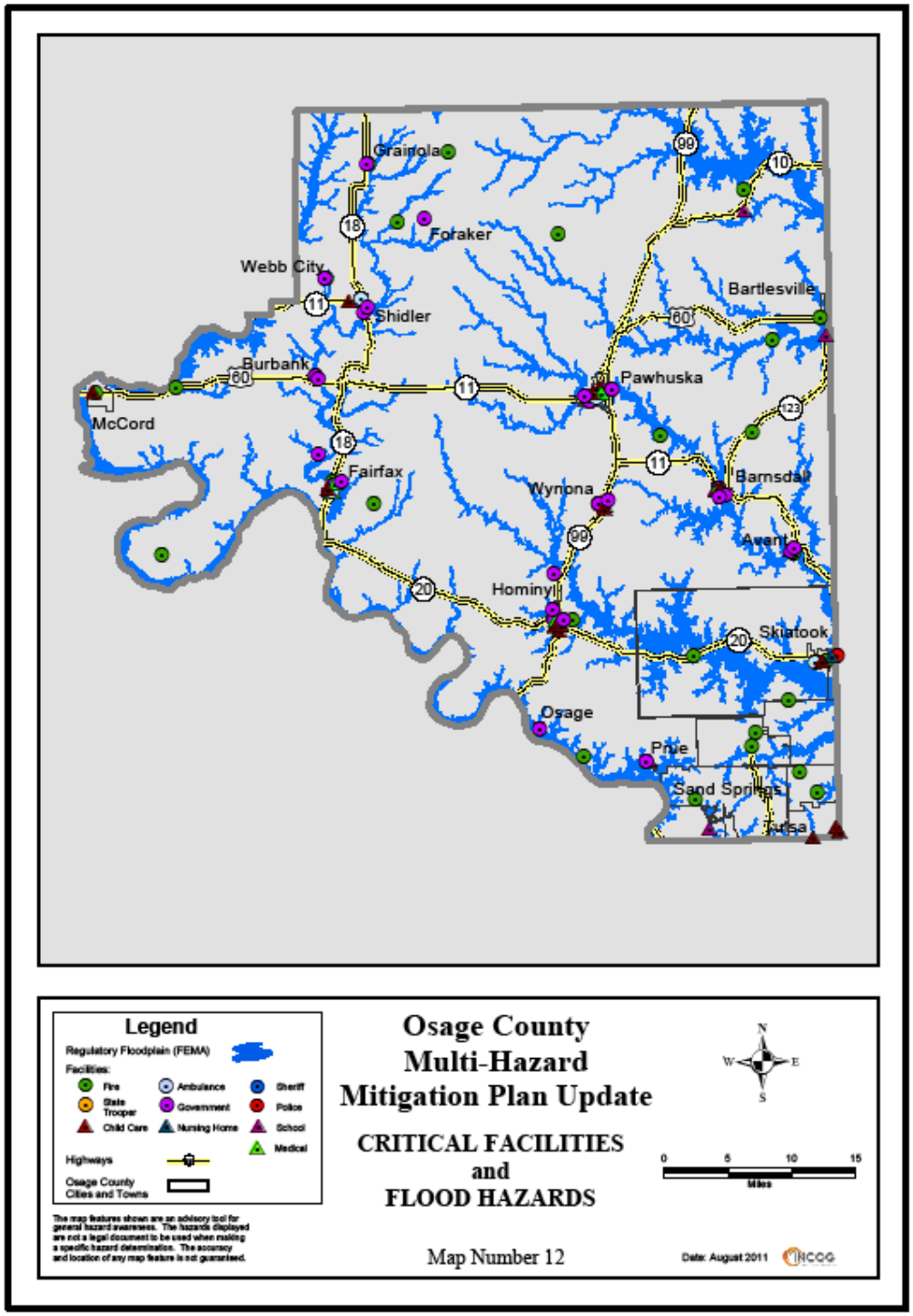
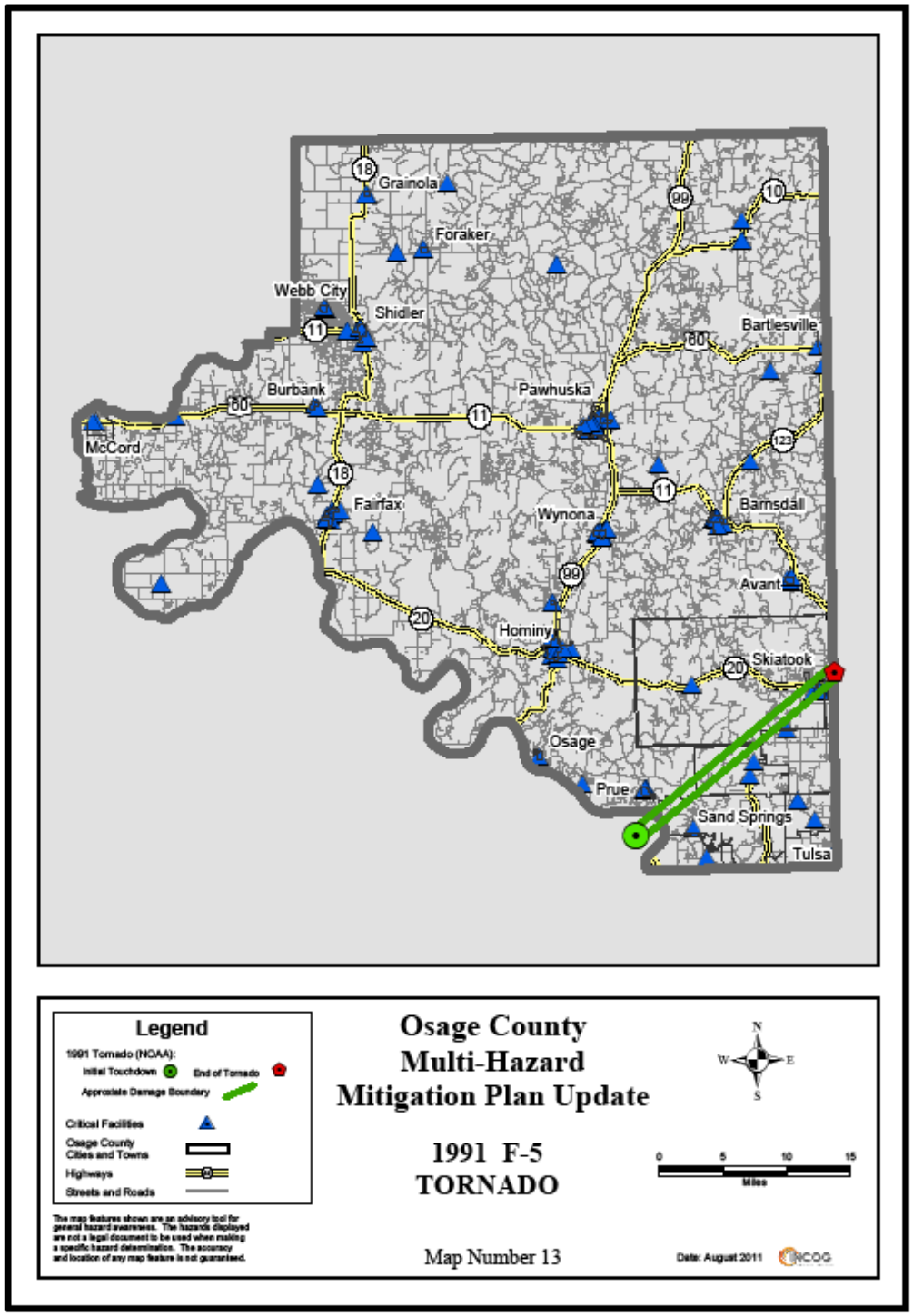
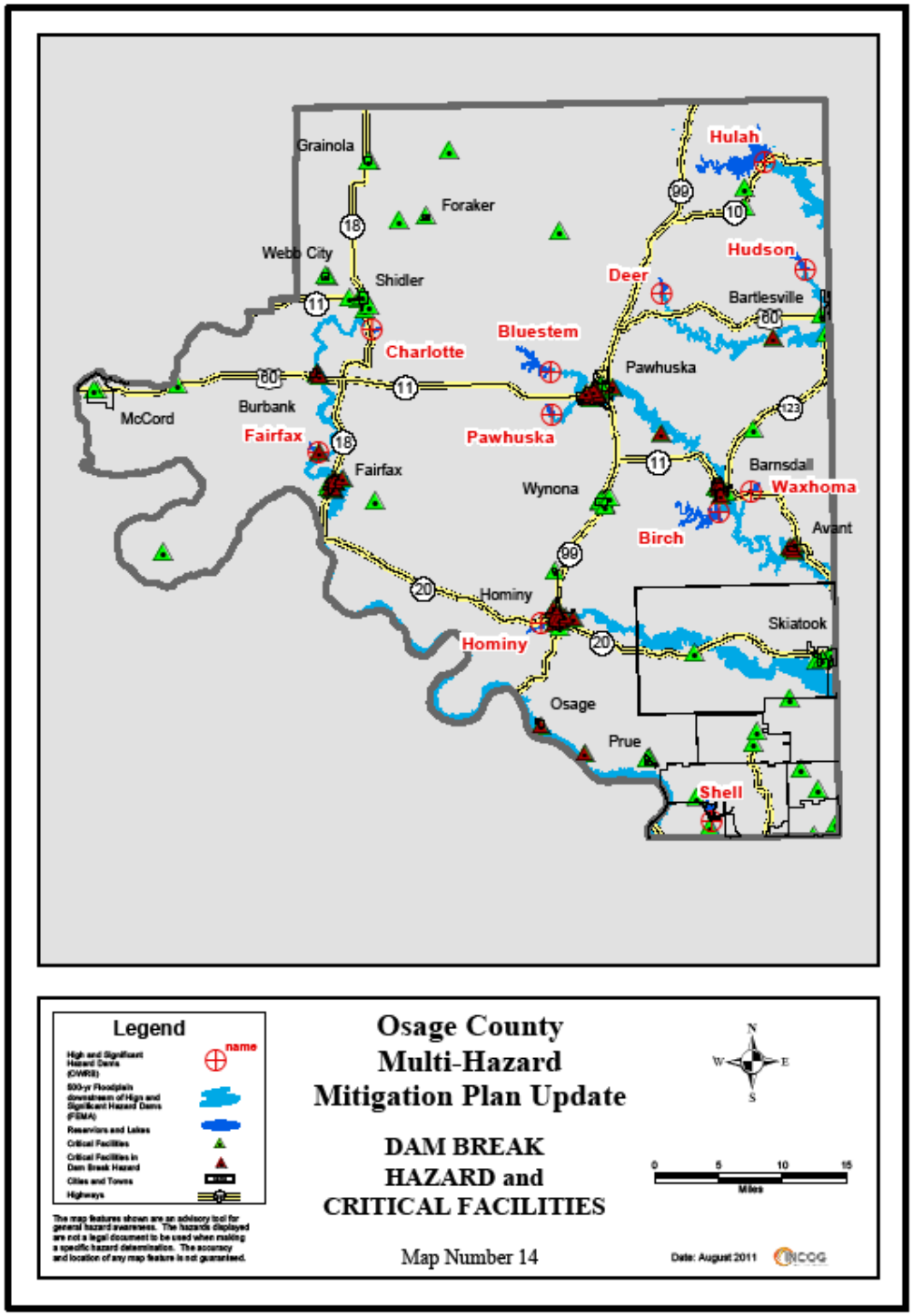
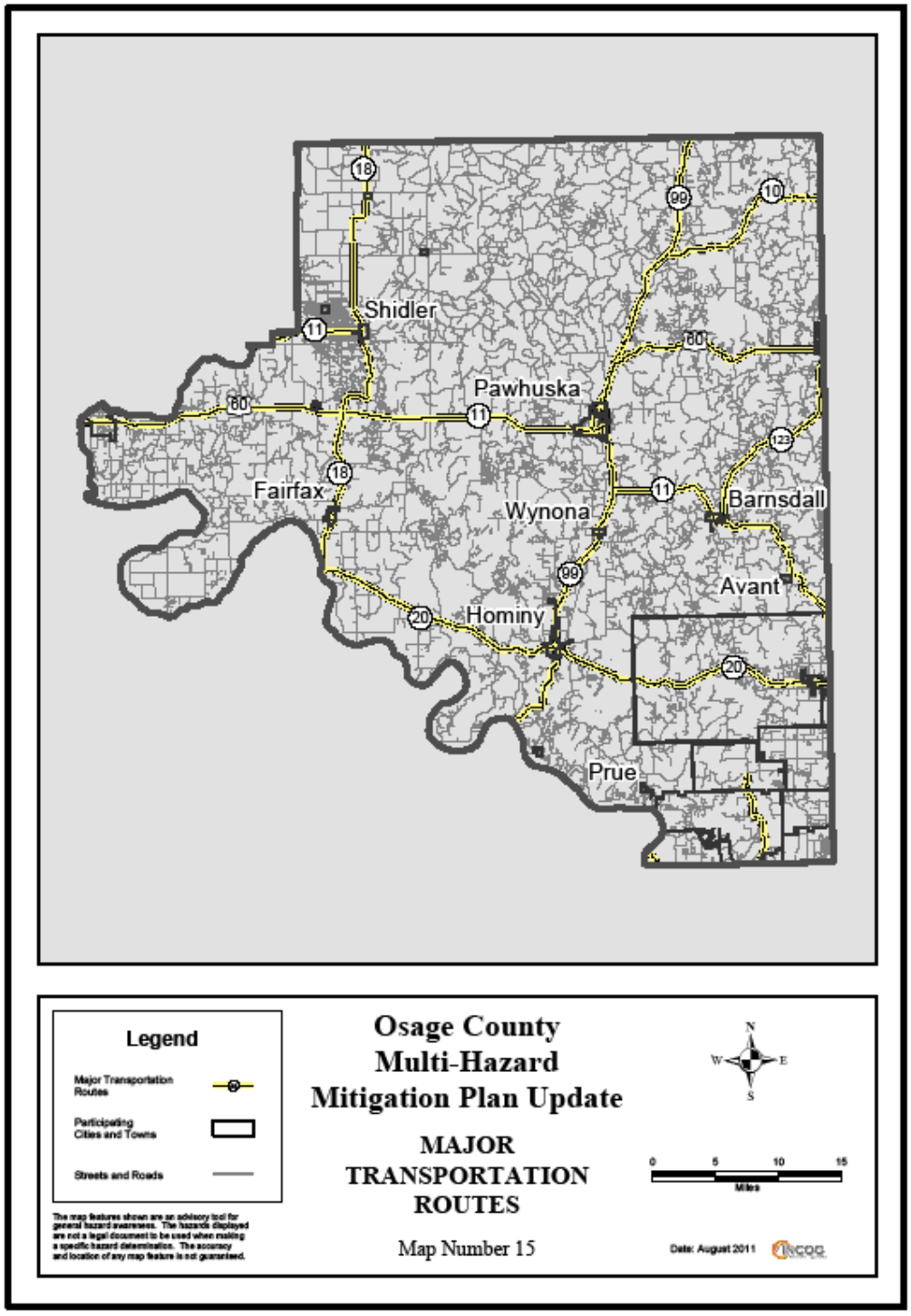
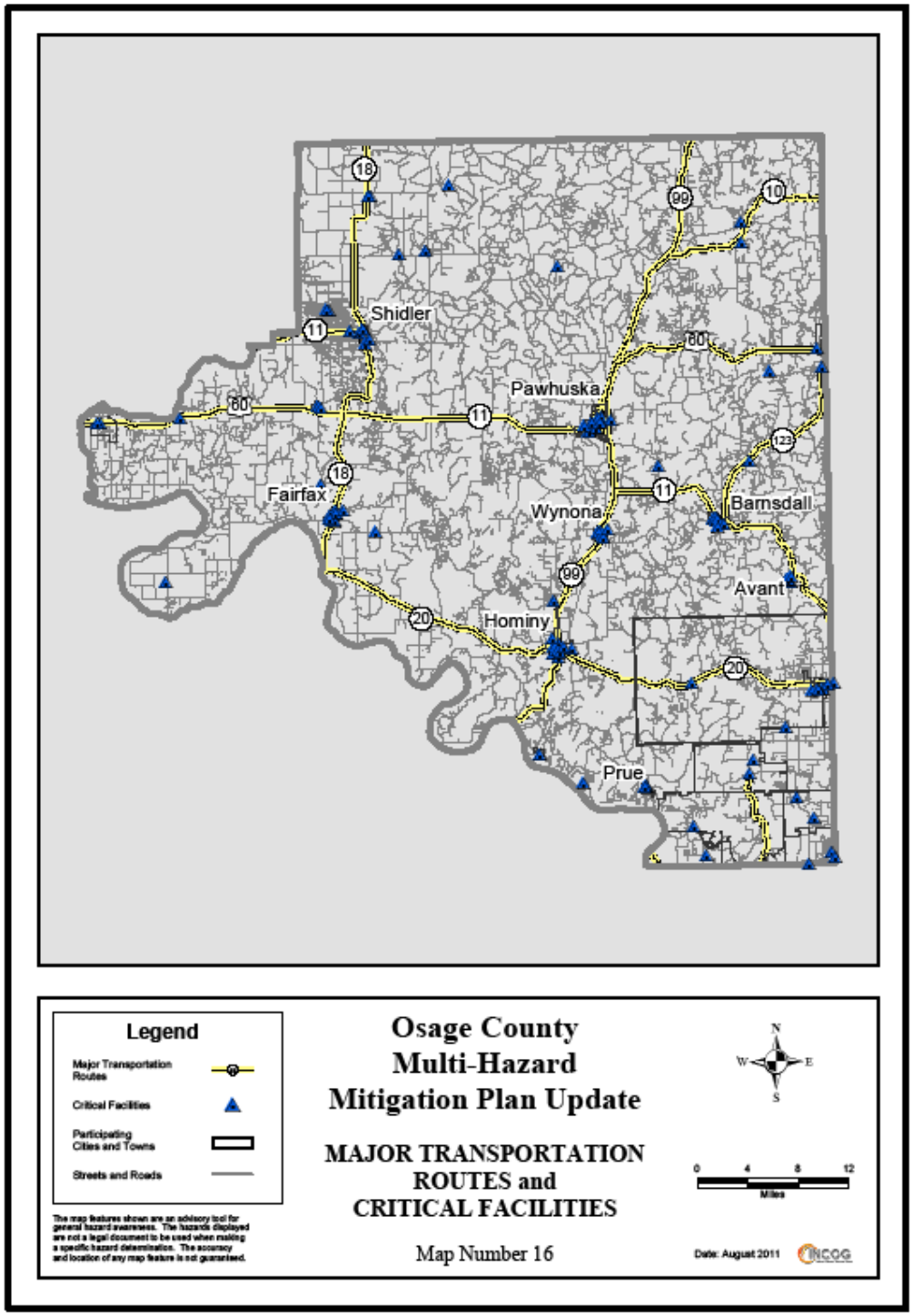
4
8
12
Miles
Date: August 2011
INCOG

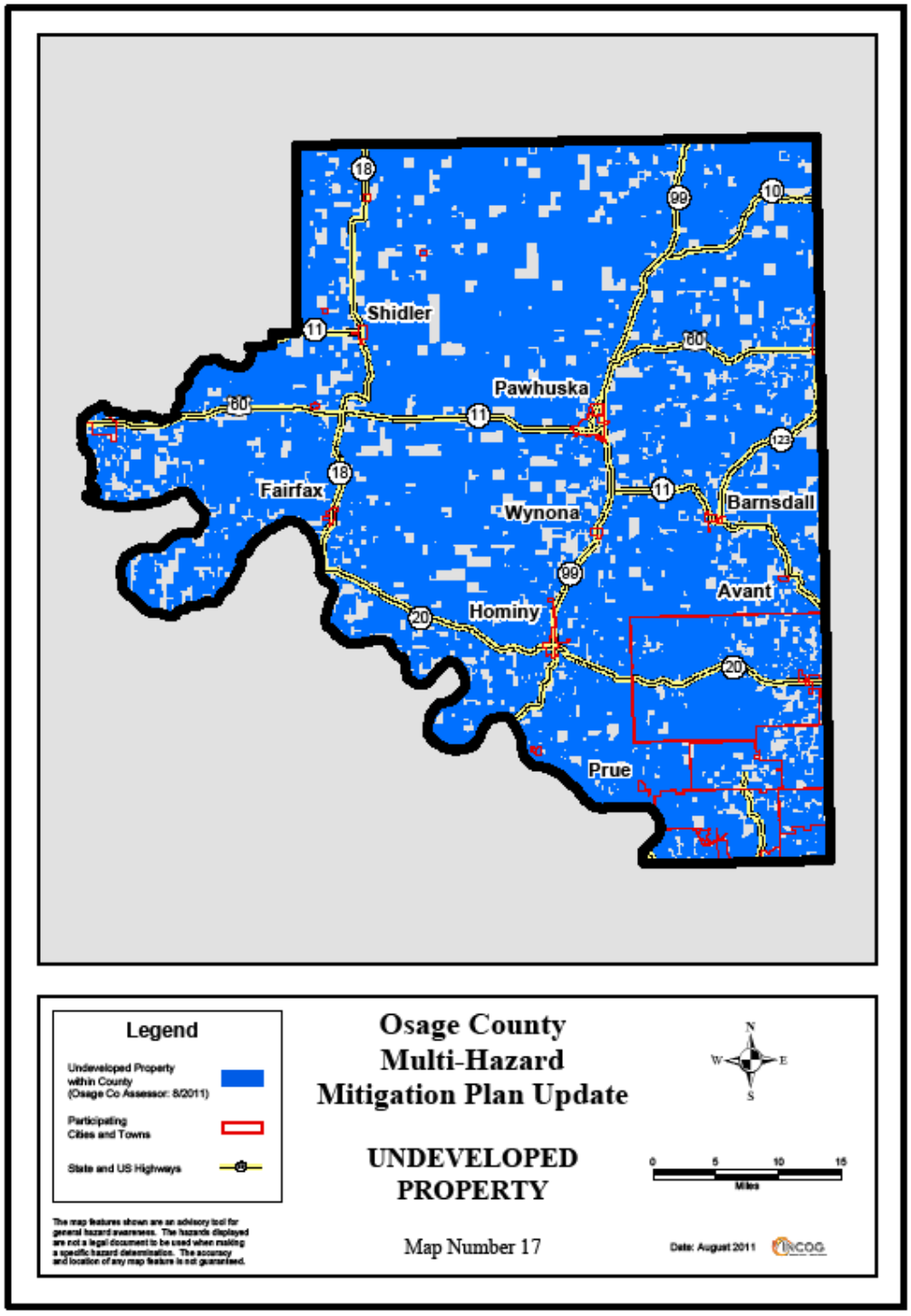

Grainola
Foraker
Webb City
Shidler
Burbank
McCord
Fairfax
Pawhuska
Bartlesville
Barnsdall
Wynona
Avant
Hominy
Skiatook
Osage
Prue
Sand Springs
Tulsa
99
10
18
11
60
23
20
Legend
Regulatory Floodplain (FEMA)
Facilities:
Fire
Ambulance
Sheriff
State Trooper
Government
Police
Child Care
Nursing Home
School
Medical
Highways
Osage County Cities and Towns
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
CRITICAL FACILITIES
and
FLOOD HAZARDS
Map Number 12
N
W
E
S
0
5
10
15
Miles
Date: August 2011
INCOG


Grainola
Foraker
Webb City
Shidler
Bartlesville
Burbank
Pawhuska
McCord
Fairfax
Wynona
Barnsdall
Avant
Hominy
Skiatook
Osage
Prue
Sand Springs
Tulsa
Legend
1991 Tornado (NOAA):
Initial Touchdown
End of Tornado
Approxiate Damage Boundary
Critical Facilities
Osage County Cities and Towns
Highways
Streets and Roads
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
1991 F-5
TORNADO
N
W
E
S
0
5
10
15
Miles
Map Number 13
Date: August 2011
INCOG


Grainola
Foraker
Webb City
Shidler
Hulah
Hudson
Deer
Bartlesville
Bluestem
Charlotte
Pawhuska
McCord
Burbank
Fairfax
Fairfax
Pawhuska
Barnsdall
Waxhoma
Wynona
Birch
Avant
Hominy
Hominy
Skiatook
Osage
Prue
Shell
Legend
name
High and Significant Hazard Dams (OWRB)
500-yr Floodplain downstream of High and Significant Hazard Dams (FEMA)
Reservoirs and Lakes
Critical Facilities
Critical Facilities in Dam Break Hazard
Cities and Towns
Highways
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
DAM BREAK
HAZARD and
CRITICAL FACILITIES
Map Number 14
N
W
E
S
0
5
10
15
Miles
Date: August 2011
NCOG


Shidler
Pawhuska
Fairfax
Wynona
Barnsdall
Avant
Hominy
Prue
18
99
10
11
60
123
20
Legend
Major Transportation Routes
Participating Cities and Towns
Streets and Roads
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
MAJOR
TRANSPORTATION
ROUTES
Map Number 15
N
W
E
S
0 5 10 15
Miles
Date: August 2011
INCOG


Shidler
Pawhuska
Fairfax
Wynona
Barnsdall
Avant
Hominy
Prue
Legend
Major Transportation Routes
Critical Facilities
Participating Cities and Towns
Streets and Roads
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Osage County
Multi-Hazard
Mitigation Plan Update
MAJOR TRANSPORTATION ROUTES and CRITICAL FACILITIES
Map Number 16
N
W
E
S
0 4 8 12
Miles
Date: August 2011
INCOG


Shidler
Pawhuska
Fairfax
Wynona
Barnsdall
Avant
Hominy
Prue
Legend
Undeveloped Property within County (Osage Co Assessor: 5/2011)
Participating Cities and Towns
State and US Highways
Osage County Multi-Hazard Mitigation Plan Update
UNDEVELOPED PROPERTY
Map Number 17
N
W
E
S
0 5 10 15
Miles
Date: August 2011
INCOG

Appendix 2: Meetings

Meeting 1 Agenda

Osage County Hazard Mitigation Plan Update Meeting

Pawhuska's Dave Landrum Community Center
Main Street and Lynn Avenue
Pawhuska, OK

July 21, 2011
10:00 am

Meeting Agenda

1. Call to order.
2. Introductions.
3. Discussion on the need to this multi-hazard mitigation plan.
4. Discussion on the involvement of the jurisdictions; Osage County, the communities, and the school districts.
5. Establishment of an Osage County hazard mitigation planning committee, and the committee chairman.
6. Review draft of Chapter 1, Introduction to the Plan. Gather general information on each jurisdiction for Chapter 1.
7. Review Chapter 2, The Planning Process. Discuss the hazards and prepare a general population hazard awareness survey.
8. Summarize the information needed from each jurisdiction for Chapters 1 and 2.
9. Set date and time for next meeting.
10. Adjourn.

Meeting 1 Posting

Meeting Notice

Osage County has received a grant from the Oklahoma Department of Emergency Management to update the Osage County multi-jurisdictional multi-hazard mitigation plan. The initial meeting in the planning process to update the Osage County multi-jurisdictional multi-hazard mitigation plan will be held July 21, 2011, at 10:00 am at the Dave Landrum Community Center, Main Street and Lynn Avenue, Pawhuska, OK. Topics planned to be discussed include the need for this multi-jurisdictional multi hazard mitigation plan, the jurisdictions to be involved, establishment of an Osage County hazard mitigation planning committee, review of a draft of the first two chapters of the updated plan, "Plan Introduction" and "The Planning Process", and a discussion on the hazards that ODEM requires to be in the plan. All Osage County citizens are invited. Contacts for this update to the Osage County multi-jurisdictional multi-hazard mitigation plan can be made to Mike Parrison, Osage County Emergency Management at 918-287-2285 or to John McElhenney, INCOG at 918-584-7526.

Posted at: Osage County EM Office

Posted Date: 07-14-11

Posted by: Adrian Horn

Meeting 1 Attendance

Osage County Hazard Mitigation Plan Update Meeting
Pawhuska's Dave Landrum Community Center
Main Street and Lynn Avenue, Pawhuska, OK
July 21, 2011

Attendance

John McElhenney	INCOG 2 W 2 St, #800, Tulsa, OK 74103 918-579-9440	jmcelhenney@incog.org
Howard Pattison	Osage County Emergency Management 125 E 6 St, Pawhuska, OK 74056 918-287-2285	Howard_Pattison@yahoo.com
Adrian Horn	Osage County Emergency Management 125 E 6 St, Pawhuska, OK 74056 918-287-2285	Adrianhorn_ocemg@yahoo.com
Jeannie O'Daniel	Osage Hills School 225 CR 2706, Bartlesville, OK 74003 918-336-6804	principal@osagehills.k12.ok.us
Nicole Hinkle	Bowring School 87 CR 3304, Pawhuska, OK 74056 918-336-6892	nhinkle@bowringps.k12.ok.us
Ben West	Pawhuska ISD #2 1801 McKenzie, Pawhuska, OK 918-287-1265	bwest@ppshuskies.org
Paul McAlexander	City of Pawhuska 118 W Main St, Pawhuska, OK 918-287-3040	paulmca@yahoo.com
Jacque Canady	Osage County Interlocal Cooperative 207 E Main St, Hominy, OK 74035 918-885-2667	jcanady@ocic.k12.ok.us
Earleen Reedy	Town of Avant PO Box 147, Avant, OK 74001 918-263-3205	AvantUtilities@aol.com
Tennie Slone	Town of Wynona PO Box 580, Wynona, OK 74084 918-846-2526	twynona@aol.com

Meeting 1 Attendance (continued)

Janet Delaney	Town of Wynona PO Box 580, Wynona, OK 74084 918-846-2526 JanWynona@yahoo.com
Ed Kramer	City of Shidler PO Box 124, Shidler, OK 74652 918-793-7171 RNNELG72@yahoo.com
Felix Nance	City of Hominy PO Box 219, Hominy, OK 74035 918-885-2164 felixanance@yahoo.com
Brent McKee	Anderson School 2195 Anderson Rd. Sand Springs, OK 74063
Brenda Owens	Town of Prue PO Box 187, Prue, OK 74060 918-242-3613 bowens@cimtel.net
Kenneth Goodman	Town of Prue PO Box 187, Prue, OK 74060 918-242-3613
Billy J. Lay	Town of Prue PO Box 187, Prue, OK 74060 918-242-3613
Rae Ann Smith	Town of Fairfax PO Box 399, Fairfax, OK 74627 918-642-5211 raesmith@windstream.net
Boyd Braden	McCord Schools 977 S McCord Rd, Ponca City, OK 74604 580-765-8806 bbraden@mccord.k12.ok.us

Meeting 1 Minutes

Osage County Hazard Mitigation Plan Update Meeting
Pawhuska's Dave Landrum Community Center
Main Street and Lynn Avenue, Pawhuska, OK
July 21, 2011

Minutes

1. The meeting was called to order at 10:00 am.

2. General introductions were made around the room.

3. John McElhenney (JDM) discussed the need for the Osage County multi-hazard mitigation plan, to understand the hazards that could affect the County and the County jurisdictions, so the participating jurisdictions will be eligible for mitigation grant funds.

4. JDM explained why the many jurisdictions were participating in the County hazard plan update, to reap the benefit of having a plan (in this case, being a part of the County plan) and not have to have individual plans for the many small jurisdictions.

5. The Osage County hazard mitigation planning committee was re-established as the jurisdictions represented, and named Mike Pattison as Chairman of the committee.

6. JDM reviewed the draft of the update of Chapter 1, and requested the jurisdictions to send information on their jurisdiction's building regulations and existing mitigation type plan (CIP and EOP for example) to the County Emergency Management staff.

7. JDM reviewed the draft of the update to Chapter 2 on the planning process. Questions arose on why specific were and were not included in the plan. JDM answered that the hazards listed were the hazards that FEMA wanted addressed. JDM then discussed the need for a citizen hazard awareness survey. The committee accepted the draft survey form, and will distribute the survey forms at their jurisdiction's main office starting next week. The completed surveys will be collected on August 5, 2011, and sent to the County emergency management office to give to INCOG to compile and present the results at the next committee meeting.

8. JDM distributed a form summarizing the information needed from each jurisdiction to complete chapters 1 and 2. The additional information should try to be completed and returned to the County emergency management office next week.

9. The next meeting of the Osage County hazard mitigation planning committee was set for Thursday, September 15, 2011, at 10 o-clock in the morning back were at the Landrum Community Center.

10. The committee meeting was adjourned at 11:30 am.

Meeting 2 Agenda

Osage County Hazard Mitigation Plan Update Meeting

Pawhuska's Dave Landrum Community Center
Main Street and Lynn Avenue
Pawhuska, OK

September 15, 2011
10:00 am

Meeting Agenda

1. Call to order.
2. Introductions.
3. Review and Approve minutes of July 21, 2011 committee meeting.
4. Discuss outstanding data to complete Chapter 1.
5. Present general population hazard awareness survey.
6. Review draft of Chapter 3, Risk and Vulnerability Analysis, including updating the list of critical facilities.
7. Review draft of Chapter 4, Mitigation Strategies.
   a. Discuss goals and objectives of the hazards' mitigation actions.
   b. Discuss mitigation activities. Identify activities for each jurisdiction.
8. Set date and time for next meeting.
9. Adjourn.

Meeting 2 Posting

Meeting Notice
Osage County Hazard Mitigation Plan Update Meeting

Osage County has received a grant from the Oklahoma Department of Emergency Management to update the Osage County Multi-Jurisdictional Multi-Hazard Mitigation Plan. The next meeting in the planning process to update the Osage County multi-jurisdictional multi-hazard mitigation plan will be held September 15, 2011, at 10:00 am at the Dave Landrum Community Center, Main Street and Lynn Avenue, Pawhuska, OK. Topics planned for discussion include reviewing the hazard awareness survey, the plan's chapter on the County's risk and vulnerability to the hazards and the plan's chapter on mitigation strategies. All Osage County citizens are invited. Contacts for this update to the Osage County multi jurisdictional Multi-Hazard Mitigation Plan can be made to Mike Patrison, Osage County Emergency Management at 918-287-2285 or to John McElhenney, INCOG at 918-584 7526.

Posted at: Osage County EM Office

Posted Date: 09-08-11

Posted by: Brian Horn

Meeting 2 Posting

Meeting Notice
Osage County Hazard Mitigation Plan Update Meeting

Osage County has received a grant from the Oklahoma Department of Emergency Management to update the Osage County Multi-Jurisdictional Multi-Hazard Mitigation Plan. The next meeting in the planning process to update the Osage County multi-jurisdictional multi-hazard mitigation plan will be held September 15, 2011, at 10:00 am at the Dave Landrum Community Center, Main Street and Lynn Avenue, Pawhuska, OK. Topics planned for discussion include reviewing the hazard awareness survey, the plan's chapter on the County's risk and vulnerability to the hazards and the plan's chapter on mitigation strategies. All Osage County citizens are invited. Contacts for this update to the Osage County multi-jurisdictional Multi Hazard Mitigation Plan can be made to Mike Pattison, Osage County Emergency Management at 918-287-2285 or to John McElhenney, INCOG at 918-584-7526.

Posted at: Osage Co. Courthouse

Posted Date: 09-08-11

Posted by: Adriana Horn

Meeting 2 Attendance

Name	Jurisdiction
Adrian Horn	Osage County Emergency Mgmt
Brent McKee	Anderson School
Felix Nance	City of Hominy
Jacque Canady	Osage County Interlocal Cooperative
Jeannie O'Daniel	Osage Hills School
Nicole Hinkle	Osage Hills School
Ben West	Pawhuska ISD #2
Earleen Reedy	Town of Avant
Rae Ann Smith	Town of Fairfax
Billy J. Lay	Town of Prue
Brenda Owens	Town of Prue
Kenneth Goodman	Town of Prue
Janet Delaney	Town of Wynona
Tennie Slone	Town of Wynona
Sandy Parker	Woodlands Schools
Dixie Hurd	Wynona Schools
Richard Forbes	Osage County Health Department
John McElhenney	INCOG

Meeting 2 Minutes

Osage County Hazard Mitigation Plan Update Meeting

Pawhuska's Dave Landrum Community Center
Main Street and Lynn Avenue, Pawhuska, OK

September 15, 2011

Minutes

The Meeting was called to order by John M^{c}Elhenney (JDM) at 10:05 am.

General introductions were made.

The minutes of the July 21, 2011 committee were reviewed and approved.

JDM identified the outstanding data to complete Chapter 1, and the respective committee member supplied the data, generally concerning select jurisdiction having an EOP and having a CIP.

The committee discussed the results of the general population hazard awareness survey.

JDM discussed the draft of Chapter 3, Risk and Vulnerability Analysis. The committee reviewed the list of critical facilities and made corrections and additions.

The committee reviewed the draft of Chapter 4, Mitigation Strategies. The goals and objectives of the hazards' mitigation actions were acceptable to the committee. JDM then discussed example specific mitigation activities. Each jurisdiction was then asked to develop a list of five mitigation activities for their jurisdiction for inclusion into the plan. The list is due to Adrian Horn by September 30.

The next meeting to review Chapter 5, Mitigation Activities, and Chapter 6, Plan Maintenance and Adoption, is set for Wednesday, October 26, 2011, at 10:00 am at the City of Pawhuska Dave Landrum Community Center.

The meeting was adjourned at 11:45 am.

Osage County Hazard Mitigation Plan Update Meeting

Pawhuska's Dave Landrum Community Center
Main Street and Lynn Avenue
Pawhuska, OK

Wednesday, October 26, 2011
10:00 am

Meeting Agenda

1. Call to order.
2. Introductions.
3. Review and Approve minutes of September 15, 2011 committee meeting.
4. Review of draft of Chapter 5; Action Plan of Mitigation Projects. Discuss any outstanding data needed to complete Chapter 5.
5. Review of draft of Chapter 6; Plan Maintenance and Adoption.
6. Develop a request for comments on the final draft of the plan update letter.
7. Set date and time for next meeting.
8. Adjourn.

Meeting 3 Posting

Meeting Notice
Osage County Hazard Mitigation Plan Update Meeting

Osage County has received a grant from the Oklahoma Department of Emergency Management to update the Osage County Multi-Jurisdictional Multi-Hazard Mitigation Plan. The next meeting in the planning process to update the Osage County multi-jurisdictional multi-hazard mitigation plan will be held October 26, 2011, at 10:00 am at the Dave Landrum Community Center, Main Street and Lynn Avenue, Pawhuska, OK. Topics planned for discussion will include the mitigation activities proposed by the jurisdictions for inclusion in the updated plan, and the requirements for adopting the updated plan by each participation jurisdiction. All Osage County citizens are invited. Contacts for this update to the Osage County multi-jurisdictional Multi-Hazard Mitigation Plan can be made to Mike Patrison, Osage County Emergency Management at 918-287-2205 or to John McElhenney, INCOG at 918-584-7526.

Posted at: Osage County EM

Posted Date: 10-20-2011

Posted by: Brian Horn

Meeting 3 Posting

Meeting Notice
Osage County Hazard Mitigation Plan Update Meeting

Osage County has received a grant from the Oklahoma Department of Emergency Management to update the Osage County Multi-Jurisdictional Multi-Hazard Mitigation Plan. The next meeting in the planning process to update the Osage County multi-jurisdictional multi-hazard mitigation plan will be held October 26, 2011, at 10:00 am at the Dave Landrum Community Center, Main Street and Lynn Avenue, Pawhuska, OK. Topics planned for discussion will include the mitigation activities proposed by the jurisdictions for inclusion in the updated plan, and the requirements for adopting the updated plan by each participation jurisdiction. All Osage County citizens are invited. Contacts for this update to the Osage County multi-jurisdictional Multi-Hazard Mitigation Plan can be made to Mike Pattison, Osage County Emergency Management at 918-287-2285 or to John McElhenney, INCOG at 918-584-7526.

Posted at: Osage County Courthouse

Posted Date: 10-20-2011

Posted by: Adriana Horn

Meeting 3 Attendance

Name	Jurisdiction
Mike Pattison	Osage County Emergency Mgmt
Adrian Horn	Osage County Emergency Mgmt
Felix Nance	City of Hominy
Paul McAlexander	City of Pawhuska
Ed Kramer	City of Shidler
Earleen Reedy	Town of Avant
Michelle Atkins	Town of Avant
Glenda Willard	Town of Burbank
Sharon Box	Town of Burbank EM
Cordelia Reed	Town of Burbank FD
Kira Teachout	Town of Burbank FD
Billy J. Lay	Town of Prue
Brenda Owens	Town of Prue
Kenneth Goodman	Town of Prue
Janet Delaney	Town of Wynona
Tennie Slone	Town of Wynona
Brent McKee	Anderson School
Rick Loggins	Barnsdall Schools
Boyd Braden	McCord Schools
Ben West	Pawhuska ISD #2
Sandy Parker	Woodlands Schools
Bobbi McGill	Wynona Schools
John McElhenney	INCOG

Meeting 3 Minutes

Osage County Hazard Mitigation Plan Update Meeting

Pawhuska's Dave Landrum Community Center
Main Street and Lynn Avenue
Pawhuska, OK

Wednesday, October 26, 2011
10:00 am

Minutes

1. The meeting was called to order by John M^{C}Elhenney (JDM) at 10:05 am.
2. General introductions were made.
3. The committee reviewed the minutes of the September 15, 2011 committee meeting, and approved the minutes as written.
4. Review of draft of Chapter 5; Action Plan of Mitigation Projects. Discuss any outstanding data needed to complete Chapter 5. The committee had received a copy of the draft of chapter 5, and JDM identified the jurisdictions that had not submitted their list of mitigation activities. Those jurisdictions were asked to stay after the meeting to finalize their lists, which they did. Several questions were asked about the various types of activities; mitigation versus training versus education. The committee discussed how this hazard mitigation grant program (HMGP) funds mitigation activities, but other types of activities that are important to the jurisdiction could be included because they could be possibly be used for other programs. Questions were asked on how binding these lists were, and the committee discussed how these lists identified important hazard mitigation activities but were not commitments.
5. JDM reviewed chapter six, Plan Maintenance and Adoption, and how the plan should be reviewed annually and updated every five years. And each jurisdiction is required to approve this update by resolution, as a requirement of their inclusion in the County plan.
6. The draft of the request for comments on the final draft of the plan update letter as accepted by the committee.
7. JDM discussed a timeline of milestones to complete to get to the next committee meeting that would complete the committee's work. All the mitigation lists must be submitted, a final draft of the updated plan must be assembled, a public hearing is to be held at the next committee meeting so the public hearing notice must be posted in advance, and the request for comments letter must be mailed with sufficient review time for comments to be prepared. The next committee meeting was scheduled for November 30, 2011, at 10 o'clock am, at the City of Pawhuska Dave Landrum Community Center.
8. The meeting was adjourned at 11:10 am.

   Following the meeting, the committee staff met with the jurisdictions still needing to finish their list of mitigation activities, and most finished theirs during this time. The others were asked to submit theirs by October 26, 2011.

Meeting 4 Agenda

Meeting 4 Posting

Public Hearing Notice

Meeting 4 Attendance

Meeting 4 Minutes

Appendix 3:
Sample Comment Letter

November 9, 2011

Richard Brierre
Executive Director
INCOG
2 West Second Street, #800
Tulsa, OK 74103

RE: Osage County Multi-Hazard Mitigation Plan Update

Dear Mr. Brierre:

The Oklahoma Department of Emergency Management and the Federal Emergency Management Agency have awarded Osage County a Hazard Mitigation Grant Program grant to update their Multi-Hazard Mitigation Plan for the County. The Multi-Hazard Mitigation Plan identifies and assesses natural hazards and hazardous materials events in the County and outlines a strategy that identifies actions to mitigate those hazards.

The planning process began in July 2011, and the final draft of the updated plan is now under review by the planning committee for the update of the Osage County Multi-Jurisdictional Multi-Hazard Mitigation Plan. A public hearing is scheduled for November 30, 2011 at the next planning committee meeting. That meeting is planned to be held at the City of Pawhuska's Dave Landrum Community Center at 10:00 am.

You are invited to participate in the review process and make recommendations. The final draft of the updated plan is available for public review at the INCOG web site, www.incog.org, or at the Osage County Emergency Management office, 125 East 6th St, Pawhuska, OK, during normal business hours.

If you have any questions or comments, please contact me at (918) 287-3980 or John McElhenney, INCOG, at (918) 584-7526.

Sincerely,

Mike Pattison
Osage County Programs Director

Appendix 4: Questionnaire

HAZARD MITIGATION SURVEY

Osage County is in the process updating the County Multi-Hazard Mitigation Plan. This will be strategic planning guide to reduce the county's impact from natural hazards and hazardous materials, in fulfillment of the Hazard Mitigation Grant Program requirements of the Federal Emergency Management Agency. This survey is intended to understand the citizen's awareness and concern of hazards that could impact Osage County.

For the following hazards, please circle the corresponding number indicating how concerned you are about these hazards affecting Osage County.

HAZARD	Very Concerned	Concerned	Somewhat Concerned	Not Concerned
Dam Breaks	4	3	2	1
Drought	4	3	2	1
Earthquakes	4	3	2	1
Expansive Soils	4	3	2	1
Extreme Heat	4	3	2	1
Floods	4	3	2	1
Hailstorms	4	3	2	1
Hazardous Materials Events	4	3	2	1
High Winds	4	3	2	1
Lightning	4	3	2	1
Severe Winter Storms	4	3	2	1
Tornadoes	4	3	2	1
Wildfires	4	3	2	1
Other Hazard: _____	4	3	2	1
Other Hazard: _____	4	3	2	1

Please return this survey to _____ by **August 5, 2011**. If you have any comments, suggestions, or additional concerns, please note them on the back of this survey.

Results of Hazard Mitigation Survey

Hazard	Average Survey Score
Dam Break	1.6
Drought	3.4
Earthquakes	1.6
Expansive Soils	1.9
Extreme Heat	3.6
Floods	2.1
Hailstorms	2.7
Haz Mat Events	2.3
High Winds	2.9
Lightning	2.8
Severe Winter Storms	3.1
Tornados	3.4
Wildfires	3.4
Illegall Dumps	2 responses at very concerned
Meth Labs	3 responses at very concerned
Water Contamination	1 response at very concerned
Copper and Iron Theft	1 response at very concerned
Prison Breaks	1 response at very concerned

Results: 95 Responses
Hazard of Most Concern is Extreme Heat
Hazards of Least Concern are Dam Breaks and Earthquakes

Scoring:

Not concerned	= 1 point (minimum score per hazard)
Somewhat concerned	= 2 points
Concerned	= 3 points
Very concerned	= 4 points (maximum score per hazard)

Appendix 5: Adoption Resolutions

Osage County

Town of Avant

City of Barnsdall

Town of Burbank

Town of Fairfax

City of Hominy

City of Pawhuska

Town of Prue

City of Shidler

Town of Wynona

Anderson Elementary School District

Barnsdall Independent School District

Bowring School District

Hominy Independent School District

McCord School District

Osage Hills Elementary School District

Pawhuska Independent School District

Prue Independent School District

Woodland School District

Wynona Independent School District

Appendix 6:
Hazard Summary

Natural Hazard Assessments

Each hazard is assigned a likelihood rating based on the criteria and methods described below.

Likelihood of Event "Rating" is based on the following definitions	
Highly likely (HL)	Event is probable within the calendar year.
Likely (L)	Event is probable within the next three years.
Occasional (O)	Event is probable within the next five years.
Unlikely (UL)	Event is possible within the next ten years.

Based on History, and using the information described above, Likelihood of Event is "Quantified" as follows:		
Highly Likely (HL)	Event has 1 in 1 year chance of occurring	1/1 = 100%
Likely (L)	Event has 1 in 3 years chance of occurring	1/3 = 33%
Occasional (O)	Event has 1 in 5 years chance of occurring	1/5 = 20%
Unlikely (UL)	Event has 1 in 10 years chance of occurring	1/10 = 10%

Which results in the following "Ranges" of Likelihood:
Event is "Highly Likely" to occur – History of events is greater than 33%.
Event is "Likely" to occur – History of events is greater than 20%, but less than or equal to 33%.
Event could "Occasionally" occur – History of events is greater than 10%, but less than or equal to 20%.
Event is "Unlikely," but is possible of occurring – History of events is less than 10%.

Example: NWS-NCDC records show that 38 tornadoes were reported in this example county between 01/01/1950 and 12/31/2003. 38 events divided by 53 years = 0.72(72%) which would make future occurrences "Highly Likely" to happen.

This table's format, categories, and the criteria for completing the table, was supplied by the Oklahoma Department of Emergency Management, 06/29/2004.

Table: Hazard Summary

OSAGE COUNTY

Summary of Hazards in the Osage County Multi-Hazard Mitigation Plan

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Floods	71 events, 1950 thru 2010	992,000	13,972	>100%	HL
Winter Storms	35 events, 1950 thru 2010	51,500,000	1,471,429	57%	L
Hailstorms	524 events, 1950 thru 2010	423,000	817	>100%	HL
Expansive Soils	zero events, 1950 thru 2010	0	0	0	UL
Extreme Heat	9 events, 1950 thru 2010	0	0	15%	O
Tornado	73 events, 1950 thru 2010	32,800,000	449,315	>100%	HL
Dam Failure	zero events, 1950 thru 2010	0	0	0	UL
High Wind	441 events, 1950 thru 2010	996,000	2,259	>100%	HL
Earthquake	zero events, 1950 thru 2010	0	0	0	UL
Lightning/Thunderstorm	zero events, 1950 thru 2010	0	0	0	UL
Wildfire (2)	25 events, 2008 thru 2010	0	0	>100%	HL
Drought	9 events, 1950 thru 2010	0	0	15%	O
Hazmat Events (2)	17 events, 2008 thru 2010	0	0	>100%	HL

First Note: Where zero events or zero dollar amounts are shown, this means there was no data reported for the hazard event.

Second Note: Event history from the City of Pawhuska.

This page is the last page of the Osage County multi-jurisdictional multi-hazard mitigation plan update.