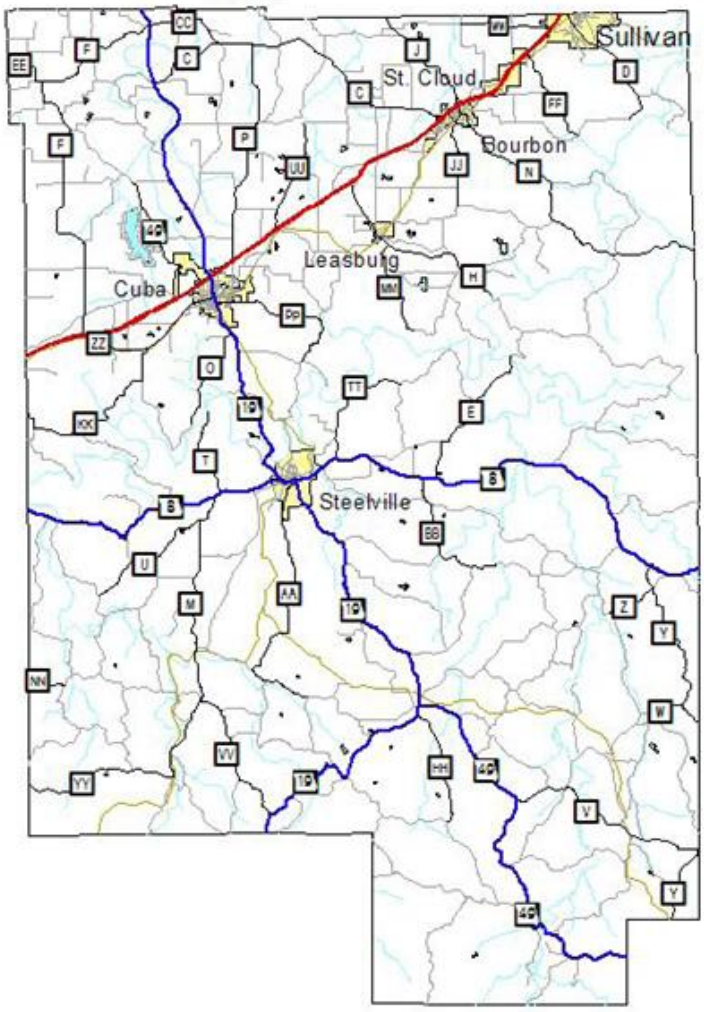
Osage County

Multi-Jurisdiction

Natural Hazard Mitigation Plan

February 2013



Prepared by
Meramec Regional Planning Commission
4 Industrial Drive
St. James, MO 65559

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EXECUTIVE SUMMARY

The purpose of natural hazards mitigation is to reduce or eliminate long-term risk to people and property from natural hazards. Osage County and participating jurisdictions developed this multi-hazard mitigation plan to reduce future losses to the County and its communities resulting from natural hazards. The plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 and to achieve eligibility for the Federal Emergency Management Agency (FEMA) Flood Mitigation Assistance, Pre-Disaster Mitigation and Hazard Mitigation Grant Programs.

The Osage County Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the following local governments and organizations that participated in the planning process:

- Osage County
- Village of Argyle
- City of Chamois
- Village of Freeburg
- City of Linn
- City of Meta
- City of Westphalia
- Osage County R-I School District (Chamois)
- Osage County R-II School District (Linn)
- Osage County R-III School District (Westphalia)

In addition to the local governments and school districts, several other entities participated in this effort providing support and contributing to the mitigation strategy:

- Missouri Department of Social Services, Family Service Division
- Chamois Fire Department
- Meta Fire Protection District
- Osage County Health Department
- Osage County 9-1-1
- American Red Cross

The County's planning process followed a methodology prescribed by FEMA, which began with the formation of a Hazard Mitigation Planning Committee (HMPC) comprised of key stakeholders from Osage County, participating jurisdictions and state and federal agencies. The Osage County HMPC was assisted in this planning effort by the Meramec Regional Planning Commission (MRPC). The MRPC was created January 23, 1969 by then Governor Warren E. Hearnes. The commission serves the eight-county area of Osage, Dent, Osage, Maries, Osage, Osage, Pulaski and Washington counties as well as 33 municipalities.

Under the initiative set forth by the Missouri State Emergency Management Agency (SEMA), the Missouri Association of Councils of Government (MACOG) agreed to meet the challenge of developing plans for cities and counties throughout the state. SEMA's initiative further states that due to time and funding limitations, the plans developed by Missouri's regional planning

commissions should cover natural hazards only. Manmade and/or technological hazards are not addressed in this plan, except in the context of cascading damages.

The MRPC assisted the Osage County HMPC by providing professional staff to coordinate the committee's activities and prepare the planning document. MRPC staff took the input provided by the HMPC and incorporated it into the plan document. Citizens and public organizations have participated in the process. This effort will be sustainable over the long term because it enjoys grassroots support that stems from a sense of local and individual ownership.

The HMPC assessed the risks, identifying and profiling hazards threatening the county. The HMPC then determined the County's vulnerability to the identified hazards and examined the County's capability to mitigate these hazards. The County is vulnerable to a number of potential hazards and those have been identified, profiled and analyzed in this plan. Tornadoes, floods, winter storms and thunderstorms are among the hazards that can have a significant impact on the County.

Based upon the risk assessment, the HMPC identified goals for reducing risk from hazards. The goals of this multi-hazard mitigation plan are to:

Goal 1: Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.

Goal 2: Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.

Goal 3: Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards and hazard mitigation alternatives that can reduce their vulnerabilities.

Goal 4: Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business and industry to create a widespread interest in mitigation.

Goal 5: Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefit of special interests.

Goal 6: Secure resources for investment in hazard mitigation.

To meet the identified goals, the plan recommends the mitigation actions summarized in the table on the follow page. The table includes the action item, hazards and jurisdictions it applies to and priority. Additional details on the goals, objectives and action items are outlined in Chapter 4.

The multi-hazard mitigation plan has been formally adopted by the Osage County Commissioners and the governing bodies of each participating jurisdiction and will be updated within a five-year timeframe.

Table 4.2 Mitigation Actions Hazards Addressed, Applicable Jurisdictions

		Hazards											Jurisdictions										
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III	Priority
1.1.1	Continue public education/awareness efforts on personal emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc) through the distribution of materials, press releases and postings on website/FaceBook.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
1.1.2	Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
1.1.3	Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.	X	X	X	X	X	X	X	X	X	X	X	X	X										H
1.1.4	Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
1.2.1	Need to continue to examine ways to expand and improve warning systems.								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
1.2.2	Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H

		Hazards												Jurisdictions										
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III	Priority
	schools to insure advanced warning about threatening weather.																							
1.2.3	Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.					X			X	X	X	X		X										H
1.2.4	Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.									X	X			X	X	X	X	X	X	X	X	X	X	H
1.2.5	Continue to promote participation in the Smart Prepare Beta test & encourage residents to upload information for use by 9-1-1 & response agencies to improve response during emergencies/ disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather	X		X	X	X			X	X	X	X	X	X	X	X	X	X	X	X				H
1.2.6	Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	X						X	X		X		X	X										H
1.3.1	Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.									X	X	X		X	X	X	X	X	X	X				H

		Hazards												Jurisdictions										
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III	Priority
1.3.2	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.					X								X	X	X	X	X	X	X				H
1.3.3	Continue to review and evaluate the need for generators for critical systems and response support in all communities.	X		X		X			X	X	X	X	X	X	X	X	X	X	X	X				H
1.3.4	Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.									X	X			X	X	X	X	X	X	X	X	X	X	M
1.3.5	Encourage the construction of tornado safe rooms in every school that does not have one.										X										X	X	X	M
2.1.1	Continue to encourage businesses/government/schools to develop and implement emergency plans.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
2.1.2	Continue to evaluate and update emergency operation plans.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
2.1.3	Continue to conduct emergency preparedness exercises periodically.	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
2.1.4	Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	X						X	X		X		X	X										H

		Hazards												Jurisdictions										
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2.1.5	Regularly review and update school emergency plans.	X	X	X	X	X	X	X	X	X	X	X	X								X	X	X	H
2.1.6	Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.	X	X	X	X	X	X	X	X	X	X	X	X								X	X	X	H
2.1.7	Conduct emergency preparedness exercises in schools on a regular basis.	X	X	X	X	X	X	X	X	X	X	X	X								X	X	X	H
2.2.1	Educate and raise awareness of residents and contractors on the dangers of floodplain development and the benefits of the National Flood Insurance Program.					X								X	X	X		X		X				H
2.2.2	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.					X								X	X	X		X		X				H
2.3.1	Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.	X				X			X	X	X			X										M
3.1.1	Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events and through OEM website and FaceBook page.	X	X	X	X	X	X	X	X	X	X	X	X	X										H

		Hazards												Jurisdictions										
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III	Priority
3.1.2	Continue to provide regular press releases from county EMD office concerning hazards, where they strike, frequency, preparedness and how to mitigate.	X	X	X	X	X	X	X	X	X	X	X	X	X										H
3.2.1	Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.				X	X			X	X	X	X		X										H
3.2.2	Ask SEMA mitigation specialists to present information to city councils, county commission, school districts, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
3.2.3	Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
3.3.1	Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
3.3.2	Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management	X	X	X	X	X	X	X	X	X	X	X	X	X										H
3.4.1	Encourage local jurisdictions, EMD office and other	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X				H

		Hazards												Jurisdictions										
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	organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)																							
3.4.2	Publicize county or citywide drills.	X		X		X			X	X	X	X	X	X	X	X	X	X	X	X				H
3.4.3	Continue to provide information on EMD website and FaceBook on preparedness and mitigation.	X	X	X	X	X	X	X	X	X	X	X	X	X										H
4.1.1	Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
4.1.2	Joint training (and drills) between agencies, public and private entities (including schools/businesses).	X		X		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
4.1.3	Pool different agency resources to achieve widespread mitigation planning results.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
4.2.1	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				H
4.2.2	Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.	X	X	X	X	X	X	X	X	X	X	X	X	X										H
5.1.1	Encourage all communities to develop stormwater					X				X		X		X	X	X	X	X	X	X				L

		Hazards												Jurisdictions										
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III	Priority
	management plans.																							
5.1.2	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
5.2.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.					X								X	X	X		X		X				L
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.					X								X	X	X		X		X				M
6.1.1	Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
6.1.2	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	X		X		X	X	X	X					X										H
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				H
6.1.4	Encourage local jurisdictions to budget for mitigation projects.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
6.2.1	Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				M

		Hazards												Jurisdictions											
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III	Priority
6.2.2	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases, brochures, EMD website and FaceBook	X	X	X	X	X	X	X	X	X	X	X	X	X										H
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H

44 CFR requirement 201.6(c)(5): The local hazard mitigation plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan. For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

Note to Reviewers: *When this plan has been reviewed and approved pending adoption by FEMA Region VII, the adoption resolutions will be signed by the participating jurisdictions and added to Appendix C. A model resolution is provided.*

The following jurisdictions participated in the development of this plan and have adopted the multi-jurisdictional plan. Resolutions of Adoptions are included in Appendix C.

- Osage County
- Village of Argyle
- City of Chamois
- Village of Freeburg
- City of Linn
- City of Meta
- City of Westphalia
- Osage County R-I School District (Chamois)
- Osage County R-II School District (Linn)
- Osage County R-III School District (Westphalia)

Participation of local governing bodies as stakeholders is critical to successful mitigation implementation. As former SEMA Deputy Director Beauford C. "Buck" Katt writes:

"One thing we have learned over the years is that mitigation programs crumble unless locals, both private and public, have a stake in the process; they simply must feel a sense of ownership for the program to be successful. We strongly believe that this effort will be successful and sustainable over the long term only if it enjoys grassroots support that stems from a sense of local and individual ownership."

Citizens and public organizations have participated in the process. This effort will be sustainable over the long term because it enjoys grassroots support that stems from a sense of local and individual ownership. Through SEMA's Scope of Work, Osage County contracted with the Meramec Regional Planning Commission and participated fully in the preparation of the plan. Once this plan is approved, Osage County, its cities, school districts and local utilities will be eligible for future mitigation assistance from FEMA and will be able to more effectively carry out mitigation activities to less the adverse impact of future disasters in the county.

Model Resolution

Resolution # _____
Adopting the Osage County Multi-Hazard Mitigation Plan

Whereas, the _____ recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, the U.S Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

Whereas, an adopted Multi-Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the _____ fully participated in the FEMA prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Missouri State Emergency Management Agency and Federal Emergency Management Agency officials have reviewed the Osage County Multi-Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

Whereas, the _____ desire to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Osage County Multi-Hazard Mitigation Plan; and

Whereas, adoption by the governing body for the _____ demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan; and

Whereas, adoption of this legitimizes the plan and authorizes responsible agencies to carry out their responsibilities under the plan;

Now, therefore, be it resolved, that the _____ adopts the Osage County Multi-Hazard Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri State Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

Passed on this date _____

Certifying Official Signature _____

1 INTRODUCTION AND PLANNING PROCESS

1.1 Purpose

The purpose of the Osage County Hazard Mitigation Plan is to substantially and permanently reduce the county's vulnerability to natural hazards. The plan is intended to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property and the natural environment. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention, and identifying activities to guide the community towards the development of a safer, more sustainable community.

In an effort to ensure the purpose of the Osage County Hazard Mitigation Plan is fulfilled, the participants in the development of this plan defined and established a list of goals which are directly relevant to meeting the purpose of the plan. The following is a list of the goals identified by the participants of this plan:

1. Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
2. Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
3. Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.
4. Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
5. Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefit of special interests.
6. Secure resources for investment in hazard mitigation.

This plan was also developed to make Osage County and participating jurisdictions eligible for certain federal disaster assistance. Those programs include the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program and Flood Mitigation Assistance Program.

1.2 Background and Scope

Each year natural disasters take the lives of hundreds of people and injure thousands more in the United States alone. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses and individuals recover from disasters. Taxpayer dollars only partially

reflect the total cost of disasters. Insurance companies and non-governmental organizations that respond to disasters and/or assist with recovery also contribute enormous sums of money in the wake of natural disasters. Many of these events are predictable and loss of life and property damage could be reduced or eliminated with proper planning and preparation.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council, 2005).

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set and appropriate strategies to lessen impacts are determined, prioritized and implemented. This plan documents Osage County's hazard mitigation planning process and identifies relevant hazards, vulnerabilities and strategies the County and participating jurisdictions will use to decrease vulnerability and increase resiliency and sustainability in Osage County.

This multi-jurisdictional plan complies with SEMA's and FEMA's planning guidance; FEMA regulations, rules, guidelines and checklists; the Code of Federal Regulations; and existing federal and state laws; and such other reasonable criterion as the President, Governor, federal and state congresses and SEMA and FEMA may establish in consultation with local governments while the plan is being developed. This plan also meets the minimum planning requirements for all FEMA mitigation programs, such as the Flood Mitigation Assistance (FMA) Program, the Pre-Disaster Mitigation (PDM) Program, the Hazard Mitigation Grant Program (HMGP), and where appropriate, other FEMA mitigation related programs such as the National Earthquake Hazards Reduction Program (NEHRP), the National Flood Insurance Program (NFIP) and the Community Rating System (CRS).

The Osage County Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the participating jurisdictions within the County's borders, including the following:

- Osage County
- Village of Argyle
- City of Chamois
- Village of Freeburg
- City of Linn
- City of Meta
- City of Westphalia
- Osage County R-I School District (Chamois)
- Osage County R-II School District (Linn)
- Osage County R-III School District (Westphalia)

New jurisdictions added in the 2009 plan revision process are:

- Osage County R-I School District (Chamois)
- Osage County R-II School District (Linn)
- Osage County R-III School District (Westphalia)

Table 1.1 Continuing, New or Discontinued Jurisdictions Participating in the Plan

Jurisdiction Name	Continuing Jurisdiction	New Jurisdiction	Discontinued Jurisdiction
Osage County	X		
Village of Argyle	X		
City of Chamois	X		
Village of Freeburg	X		
City of Linn	X		
City of Meta	X		
City of Westphalia	X		
Osage County R-I Schools (Chamois)		X	
Osage County R-II Schools (Linn)		X	
Osage County R-III Schools (Westphalia)		X	

The information and guidance in this plan document will be used to help guide and coordinate mitigation activities and decisions for local jurisdictions and organizations. Proactive mitigation planning will help reduce the cost of disaster response and recover to local communities and residents by protecting critical infrastructure, reducing liability exposure and minimizing overall community impacts and disruptions. Osage County has been affected by natural disasters in the past and participating jurisdictions and organizations are committed to reducing the impacts of future incidents and becoming eligible for hazard mitigation-related funding opportunities.

1.3 Plan Organization

The Osage County Hazard Mitigation Plan has been prepared according to the requirements of the Disaster Mitigation Act of 2000, which emphasized the need for a more coordinated approach to mitigation planning and implementation. Furthermore, the plan has been developed and organized within the rules and regulations established under the 44 CFR 201.6, published in the *Federal Register* on February 26, 2002 and finalized on October 31, 2007. The regulations established the requirements that local hazard mitigation plans must meet in order to fulfill the eligibility requirements for local jurisdictions to apply for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act.

The plan contains a mitigation action listing, a discussion of the purpose and methodology used to develop the plan, a profile on Osage County, as well as the hazard identification and vulnerability assessment of natural hazards. In addition, the plan offers a discussion of the

community's current capability to implement the goals, objectives and strategies identified here in. The plan is organized as follows:

- Executive Summary
- Prerequisites
- Chapter 1: Introduction and Planning Process
- Chapter 2: Planning Area Profile and Capabilities
- Chapter 3: Risk Assessment
- Chapter 4: Mitigation Strategy
- Chapter 5: Plan Implementation and Maintenance
- Appendices

To assist in the explanation of the above identified contents, there are several appendices included which provide more detail on specific subjects. This plan is intended to improve the ability of Osage County and the jurisdictions within to handle disasters and will document valuable local knowledge on the most efficient and effective ways to reduce loss.

1.4 Planning Process

44 CFR Requirement 201.6(c)(1): [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process and how the public was involved.

The Osage County Hazard Mitigation Planning Committee (HMPC) first organized in 2004 when the Missouri State Emergency Management Agency (SEMA) provided funding for hazard mitigation planning to counties throughout the state of Missouri. Osage County's hazard mitigation plan was originally developed by the Meramec Regional Planning Commission. MRPC assisted the county in forming a planning committee comprised of representatives from each of Osage County's cities, city and rural fire departments, police departments, ambulance districts, the county health department, local businesses, and utility companies. This cross section of local representatives was chosen for their experience and expertise in emergency planning and community planning for Osage County. The (HMPC) was re-activated in 2009 to conduct the review and update of the plan. The County joined with SEMA to contract with the Meramec Regional Planning Commission (MRPC) to assist with the review and update of the plan document that was originally approved in 2004. Two plan update meetings were held. The first meeting was held on April 28, 2009. A second meeting was held on May 21, 2009. All meetings were advertised on MRPC's website and public notices were provided through the Osage County Courthouse. Sign in sheets and meeting notes from each of those meetings are included in Appendix A: Planning Process Documentation. Much of the information gathering for the plan was done by written and electronic correspondence.

The Osage County Multi-Hazard Mitigation Plan was developed as the result of a collaborative effort among Osage County, the cities of Argyle, Chamois, Freeburg, Linn, Meta, Westphalia, Osage County R-I School District (Chamois), Osage County R-II School District (Linn), Osage

County R-III School District (Westphalia) and public agencies, non-profit organizations, the private sector as well as regional, state and federal agencies. MRPC contacted and asked for volunteers to serve on the planning committee from the county and local city governments, school districts, local fire departments, ambulance districts, police departments, the county health department, local businesses, utility companies and the American Red Cross. This cross-section of local representatives was chosen for their experience and expertise in emergency planning and community planning in Osage County.

Osage County followed the combination model of plan participation. Due to time and duty constraints, not all the jurisdictions that were invited to participate were able to be active on the planning committee. In those cases where providing a planning committee representative was not possible, MRPC, following the guidance document *Multi-Jurisdictional Mitigation Planning – State and Local Mitigation Planning How-To Guide Number Eight, FEMA 386-8 August 2006*, provided the jurisdiction with a resolution authorizing MRPC to prepare the plan on their behalf. Copies of those resolutions are included in Appendix A: Planning Process Documentation. These authorizing jurisdictions were still asked to review the draft plan, provide input and data for the document and formally adopt the plan.

Interviews were conducted with stakeholders from the community and two meetings were conducted during the plan update. Additionally, through public committee meetings, press releases and draft plan posting on MRPC's website, ample opportunity was provided for public participation. Any comments, questions and discussions resulting from these activities were given strong consideration in the development as well as the review and update of this plan. A mitigation planning committee guided and assisted the Meramec Regional Planning Commission in both the development and updating of the plan.

1.4.1 Multi-Jurisdictional Participation

44 CFR Requirement 201.6 (a) (3): Multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan.

During the original planning process in 2004, Osage County invited incorporated cities, school districts, emergency response agencies, utility companies and not-for-profits to participate in the hazard mitigation planning process. The following is the list of people and organizations that were invited to participate during the 2004 planning process:

- Kerry Bax, City of Westphalia
- Alvin Bexten, Westphalia Community Fire Department
- Ruth Bock, Gasconade-Osage County Health Department
- Carolyn Broman, Mayor, City of Linn
- Ed Brunnert, Argyle Street Commissioner
- Christopher Dickneite, Mayor, City of Westphalia
- Kim Evans, Osage County Family Services Division
- Carl Fowler, Osage County Sheriff
- Clyde Fredrich, Linn Water, Street and Utilities Superintendent
- Leo Gerloff, Jr., Chamois Fire Protection District

- Dale Helton, Mayor, City of Meta
- John Hilke, Chairperson, Village of Freeburg
- Dale Leimkiller, Linn Rural Fire Association
- Daryl Luecke, Osage County Associate Commissioner
- Michael Massman, Meta Fire & Rescue
- Kerry Montgomery, Osage Ambulance District
- Paul Owensby, Linn Police Department
- Leonard Reinkemeyer, Argyle Volunteer Fire Department
- Gary Reynolds, Mayor, City of Chamois
- Vicki Sallin, Gasconade-Osage County Health Department
- Joe Schmidt, Mayor, Village of Argyle
- Russell Scheulen, Osage County Presiding Commissioner
- Brad Strope, Osage County Emergency Management Director
- David Struemph, Freeburg Water and Sewer Superintendent
- Joe Veit, Comm-Unity Ambulance District
- Lisa Vincent, Osage County Communications
- Jerry Wolfe, Osage County Associate Commissioner

During the 2009 Update and Revision, Osage County invited incorporated cities, school districts, emergency response agencies, utility companies and not-for-profits to participate in the hazard mitigation planning process. The following is the list of people and organizations that were invited to participate:

- James Wright, Chamois Fire Protection District and Mayor of the City of Chamois
- Ed Brunnert, Argyle Street Commissioner
- Ron Hoffman, Fire Chief, Linn Fire Protection District
- Darnell Schroeder, Meta Fire & Rescue
- Alvin Bexten, Westphalia Community Fire Department
- Joe Veit, Comm-Unity Ambulance District, Meta, MO
- Kerry Montgomery, Osage Ambulance District, Linn, MO
- Leon Reinkemeyer, Argyle Volunteer Fire Department, Argyle, MO
- Carl Fowler, Osage County Sheriff
- Richard Bray, Jr., Chief of Police, Linn, MO
- Lisa Vincent, Osage County Communications
- Larry Fredich, Linn Water, Street and Utilities
- Russell Schuelen, Presiding Commissioner, Osage County
- Vincent Samson, Associate Commissioner, Osage County
- Elmer Senevey, Associate Commissioner, Osage County
- Joe Schmidt, Mayor, Argyle, MO
- Darryl Haller, Chairperson, Village of Freeburg
- Dwight Massey, Mayor, Linn, MO
- Terry Libbert, Mayor, Meta, MO
- Christopher Dickneite, Mayor, Westphalia, MO
- Elaine Baber, Mayor, Chamois, MO

- David Struemph, Freeburg Water and Sewer Superintendent
- Vicki Sallin, osage County Health Department
- Ruth Bock, Osage County Health Department
- Andrea (Andi) Rice, Osage County Emergency Management Director
- Kim Evans, Osage County Department of Family Services
- Kerry Bax, City Clerk, Westphalia, MO
- Sheila Turner, City of Linn
- Diana Bogle, City of Chamois
- Kaye Kampeter, Water Clerk, City of Meta
- Ryan Nowlin, Superintendent, Osage County R-I School District (Chamois)
- Mary Elsensohn, Superintendent, Osage County R-II School District (Linn)
- Joe Scott, Superintendent, Osage County R-III School District (Westphalia)
- Byron Baker, President, Linn Industrial Development Corporation
- Stanley Strope, Osage County Clerk
- Kim Brunnert, City Clerk, Argyle, MO
- Sarah Honey, City Clerk, Chamois, MO
- David Bogle, Superintendent, Chamois, MO
- Allen Gradel, Clerk, Village of Freeburg
- John Hilke, Fire Chief, Freeburg Fire Department
- Anton Libbert, Water Superintendent, Meta, MO
- Connie Gladden, City Clerk, Meta, MO
- Larry Kliethermes, City of Westphalia

The Disaster Mitigation Act requires that each jurisdiction either participate directly in the planning process or authorize another entity to represent them in the planning process. There were a number of criteria for participation including the following:

- Providing a representative to serve on the planning committee;
- Participating in at least one of two or more meetings of the planning committee, either by direct representation or through authorized representation;
- Providing data for plan development;
- Identifying goals and mitigation actions for the plan;
- Prioritizing mitigation actions/projects for the plan;
- Reviewing and commenting on the draft plan document;
- Informing the public, local officials and other interested parties about the planning process and providing opportunities for them to comment on the plan;
- Formally adopting the plan

The jurisdictions that participated in the process, as well as their level of participation in the process are shown in Table 1.1. Documentation of meetings, including sign-in sheets are included in Appendix A: Planning Process Documentation.

1.4.2 The Planning Process

Osage County and MRPC worked together to develop the plan and based the planning process on FEMA's Local Multi-Hazard Mitigation Planning Guidance (2008), the State and Local Mitigation Planning How-To Guides (2001) and the *Multi-Jurisdictional Mitigation Planning (2006)*. The planning process has included organizing the county's resources, assessing the risks to the county, developing the mitigation plan and implementing the plan and monitoring the progress of plan implementation.

The planning process formally began with the initial meeting being held in conjunction with the Osage County Commission meeting on April 28, 2009. MRPC mailed out letters of invitation to all of the jurisdictions listed above. MRPC's invitations were mailed out to representatives of each of Osage County's cities, city and rural fire departments, ambulance districts, police departments, the county health department, colleges and universities, local businesses, utility companies and the American Red Cross. This cross section of local representatives was chosen for their experience and expertise in emergency planning and community planning for Osage County. The mailing list is included in Appendix A: Planning Process Documentation. In some cases jurisdictions desired to participate in the planning process but were not able to attend planning meetings. In order to insure that these jurisdictions would be considered part of the plan, MRPC followed the planning guidance provided by FEMA and provided Authorizing Resolutions to those jurisdictions for review and adoption. Copies of the Authorizing Resolutions are included in Appendix A. Those jurisdiction still participated by providing information and reviewing the plan document, but did not have adequate staff to attend planning meetings.

All planning committee members were provided drafts of sections of the plan as they became available. Members of the planning committee then reviewed the plan drafts and provided valuable input to MRPC staff. The planning committee performed a needs assessment, developed goals, objectives and recommendations and prioritized mitigation projects. Additionally, MRPC staff contacted several employees of the county and city governments to gain needed information concerning city services, plans and capabilities.

Osage County assisted in the planning process by issuing public notice of the planning meetings as well as by providing facilities for the meetings. County officials, including commissioners and the county emergency management director attended and participated in the meetings.

The planning committee contributed to the planning process by:

- attending and participating in meetings
- collecting data for the plan
- making decisions on plan content
- reviewing drafts of the plan document
- developing a list of needs
- prioritizing needs and potential mitigation projects
- assisting with public participation and plan adoption

Table 1.2 shows the meeting dates as well as agenda items for each of the meetings.

Table 1.2 Osage County Hazard Mitigation Planning Meetings

Meeting	Topics Covered	Date
Osage County Hazard Mitigation Planning Committee	Initial meeting: Welcome & introductions, review of action items, review of current Osage County Hazard Mitigation Plan, discussion of goals & objectives & progress made in 5 years, discussion of possible changes to goals and objectives, setting of date and time of next meeting	April 28, 2009
Osage County Hazard Mitigation Planning Committee	Welcome & introductions, review of action items, review of current plan, discussion of goals & objectives & progress made in 5 years, discussion of possible changes to goals & objectives	May 21, 2009

Agenda items at the first meeting included a review of the plan update requirements; a review of the current Osage County Hazard Mitigation Plan; a discussion of mitigation goals and objectives and what if any progress had been made on those goals and objectives during the past five years; and discussion of possible updates and changes that might need to be made to the goals and objectives. Staff provided copies of the plan for HMPC members to take home and review and provided information on where to view the document on the MRPC website. Participants were asked to provide input and updates to MRPC staff. Planning committee members were asked to review the background, history, capabilities and hazards sections to make sure that the information was correct and current. Staff explained how the planning and review process would progress at the local, state and federal levels. The following jurisdictions and organizations were in attendance at the April 28, 2009 meeting of the Osage County HMPC:

Donna Zeilmann, American Red Cross
James Wright, City of Chamois
Richard Schollmeyer, Chamois, MO
Joe Scott, Osage County R-III School District (Westphalia)
Russell Scheulen, Osage County Commission
Vincent Samson, Osage County Commission
Sara Michie, Gasconade/Osage County Health Department
Andrea Rice, Osage County Emergency Management Agency/9-1-1

At the second meeting MRPC staff went over the list of action items; reviewed sections of the plan; and lead a discussion on the goals and objectives and possible changes that need to be made. The participants reviewed the goals, objectives and action items and provided input on any action items that had been accomplished; provided descriptions of programs that had been established since the plan was written that addressed plan objectives; and reviewed and discussed action items that might no longer be applicable or relevant. The following individuals, by jurisdictions and organizations, were in attendance at the May 21, 2009 meeting of the Osage County HMPC:

Patrick Caldwell, Department of Social Services, Family Services Division

Sheri Schuchardt, Department of Social Services, Family Services Division
Jim Wright, City of Chamois/Chamois Fire Protection District
Kenny Helton, Meta Fire & Rescue Fire Protection District
Donna Zeilmann, American Red Cross
Sara Michie, Gasconade/Osage County Health Department
Joe Scott, Osage County R-III School District (Westphalia)
Russell Scheulen, Osage County Commission
Andrea Rice, Osage County Emergency Management Agency/9-1-1

Table 1.3 shows the entities involved in the planning process and how they participated. All of these entities, as well as jurisdictions located in neighboring counties, were asked to review the draft plan and provide input into the document.

Table 1.3 Participation in Osage County Hazard Mitigation Planning Meetings

Jurisdiction	Participating Jurisdiction	Participated in Planning Process	HMPC April 28, 2009 Meeting	HMPC May 21, 2009 Meeting	Signed Authorized Representative Resolution	Completed Surveys/ Provided Information
Osage County	X	X	X	X		X
Village of Argyle	X				X	X
City of Chamois	X	X	X	X		X
Village of Freeburg	X				X	X
City of Linn	X				X	X
City of Meta	X			X	X	X
City of Westphalia	X				X	X
Osage County R-I School District	X				X	X
Osage County R-II School District	X				X	X
Osage County R-III School District	X	X	X	X		X

In some cases jurisdictions desired to participate in the planning process but were not able to attend planning meetings. In order to insure that these jurisdictions would be considered part of the plan, MRPC followed the planning guidance provided by FEMA and provided Authorizing Resolutions to those jurisdictions for review and adoption. Copies of the Authorizing Resolutions are included in Appendix A. Those jurisdiction still participated by providing

information and reviewing the plan document, but did not have adequate staff to attend planning meetings. Even if a jurisdiction submitted an Authorizing Resolution, in order to be considered a participating jurisdiction, they were still expected to provide information for the plan either by completing surveys or responding to direct requests. In addition, all participating jurisdictions were asked to review the final draft plan, including goals and action items and provide input to the HMPC. Those individuals who provided information for the plan, and the jurisdictions they represent, are listed in Table 1.4 below.

1.4 Names of Participants Providing Data for Osage County Plan

Name	Jurisdiction	Completed Survey	Provided Information
Andrea Rice, EMD Stanley Strope, County Clerk	Osage County	X	X
Kym Brunnert, City Clerk Joe Schmidt, Chairman	Village of Argyle	X	X
Jim Wright, Mayor Larry Backes, City Clerk	City of Chamois	X	X
Allen Gradel, City Clerk	Village of Freeburg	X	X
Kim Stirnaman, City Clerk	City of Linn		X
Phyllis Allen, City Clerk Carrie Roberds	City of Meta	X	X
Kerry Bax, City Clerk	City of Westphalia	X	X
Sid Doerhoff	Osage County R-I Schools	X	X
Mary Elsensohn	Osage County R-II Schools	X	X
Joe Scott, Superintendent	Osage County R-III Schools		X

1.4.3 Public Participation in the Planning Process

44 CFR Requirement 201.6 (b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

The development of this plan has involved the public throughout. All meetings were publicized in accordance with Missouri's Sunshine Law (RSMo 610.010, 610.020, 610.023 and 610.024) the public was notified each time the plan, or sections of the plan, was presented for review and discussion. Input from each public official (city and county), and each school district was solicited by mailing an explanatory letter and directions to the MRPC website located at (www.meramecregion.org) and/or the Osage County Emergency Management Agency website (www.osagecountyema.com) where a copy of the draft plan could be viewed or downloaded. Hard copies of the final draft were placed at the Osage County Courthouse and city hall buildings for Argyle, Chamois, Freeburg, Linn, Meta and Westphalia. A hard copy of the draft

could be obtained by contacting MRPC and requesting one. MRPC did press releases to make people aware of the planning process and of where to view drafts of the plan document. Drafts were made available to any interested citizens. Copies of public notices and press releases are included in Appendix A: Planning Process Documentation.

In addition Osage County is dedicated to the continued involvement of the public during the bi-annual review and the five-year update, as well as, in the interim. Osage County and its encompassing jurisdictions have established strategies herein which will provide opportunity for continued public involvement. These strategies include a copy of the adopted plan to be placed at the Osage County Courthouse and the city hall or municipal building of each jurisdiction for public review. In addition, a copy of the plan and any proposed revisions will be displayed on the county-sponsored website with a phone number for the public to direct questions or comments regarding the plan to the emergency management director.

1.4.4 Coordination with Other Departments/Agencies/Jurisdictions

44 CFR Requirement 201.6 (b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process. (3) Review and incorporation, if appropriate, of existing plans, studies, reports and technical information.

There are several organizations that have a presence in Osage County whose purpose and goals coincide with hazard mitigation. In order to insure that those agencies were included in the hazard mitigation planning process they were invited to participate in the planning committee. The organizations that chose to participate in the planning process are listed in 1.4.2. The complete mailing list is included in Appendix A: Planning Process Documentation.

Planning meetings and the planning process were announced through press releases and public notices in accordance with Missouri's Sunshine Law (RSMo 610.010, 610.020, 610.023 and 610.024). Press releases were distributed throughout the eight-county Meramec region. The public was notified each time the plan, or sections of the plan were presented for review. Input from each public official (city and county) was solicited by mailing an explanatory letter and copy of the particular draft. All planning committee members were given a draft of each section as it became available. Additionally, MRPC staff contacted many employees of the county, its cities and other organizations to gain needed information concerning services, plans and capabilities. Drafts of the plan were made available to any interested citizen either in hard copy or via download from the City of Sullivan website. Postcards were mailed out to neighboring jurisdictions inviting them to review the plan and provide input and notifying them of where to view copies of the document. A listing of those jurisdictions that were mailed postcards is included in Appendix A.

MRPC staff contacted jurisdictions as well as the planning committee to insure that all applicable plans, studies, reports and technical information were identified and made available for review and comparison with the draft plan. The list of documents can be found in Section 2.2.

2 PLANNING AREA PROFILE AND CAPABILITIES

Chapter 2 provides a general profile and description of Osage County and each of the jurisdictions participating in the hazard mitigation planning process. A list of capabilities for each jurisdiction is also included.

2.1 Osage County Planning Area Profile

Figure 2.1 provides a map of Osage County including incorporated cities, major highways, and topography.

2.1.1 History and Development

The first settlers came into Osage county in the early 1800s and were predominantly French and second-generation Americans from the East. Starting in the early 1830s, there was a large influx of German settlers, which continued for several decades. The county was formally organized in Jan. 1841. It was named for the Osage River. For the first two years after the county's formal organization, county business, including court business, was conducted in various homes throughout the county. The first courthouses were log homes of Thomas Robinson, Elijah White, Adolphus Mengese, and Eli McJilton. The first temporary building constructed for the express purpose of holding court was built by Eli McJilton. The first permanent courthouse was erected in 1843 at a cost of $3,420.79 in the county seat of Linn. Completed in 1844, this building served the county until 1874 when it was sold to make way for a new courthouse. The new courthouse was damaged by fire in 1880, and then burned to the ground in 1922. In 1923, the building, which still serves as the county courthouse, was constructed along Route 50 in Linn at a cost of $85,000.

In 1844 the first log jail was constructed in Osage county, popularly called the "dog house" and many of the inmates found the dirt floor to their advantage in tunneling out. A limestone and cotton-rock jail was erected in 1858 at a cost of $2,560 and was torn down when the new jail in the basement of the present day court house was completed in 1924.

The first newspaper published in Linn was the *Osage County Advocate*, a non-partisan local newspaper edited by C.W. Crutsinger. Two years later, Col. L. Zevely purchased the paper and called it the *Unterrified Democrat*. Peter B. Stratton, Jr. purchased the paper in 1875 and called it *Osage County News*. J.W. Zevely purchased the paper again in 1882 and renamed it the *Unterrified Democrat*, which it still holds.

The early economy of the area was based almost entirely upon agriculture. In 1898, exports from Osage County included cattle, hogs, wheat, corn, flour, sheep, clover seed, wine, poultry, eggs, butter, cross ties, hides and furs. The county is part of the steep, hilly and rocky Missouri Ozarks and the soil is not conducive to crop production, thus, agriculture has always been strongest in livestock production. Agriculture in the county has always been primarily at the subsistence level. As agriculture became more and more mechanized following WWI, the economic viability

of the small subsistence farm dwindled, resulting in great out-migration from the area. Although the existence of four navigable rivers in or on the borders of the county were historically an asset for transportation of exports and imports, the location and topography of the county prohibits it from becoming a major transportation or trade center. The only natural resources present have been timber and fire clay.

Cities in Osage county included Argyle, Chamois, Freeburg, Linn, Meta and Westphalia. Argyle is located in the southwestern part of Osage county. Argyle experienced its greatest building boom when the Rock Island railroad built tracks near the city. Petitioned for incorporation was filed February 3, 1908. In 1906, the first school building was constructed. The school was remodeled in 1937 when a high school was added to the structure.

Chamois is located about seven miles west of the northeast corner of the county on the Missouri River and the Missouri Pacific railroad. The town was given its name by Morgan Harbor, who was one of the first settlers to locate in the vicinity of the city. The city received electricity in the fall of 1914. The city water works and sewage system was installed in 1923. The Chamois high school was accredited and approved as a first class four-year high school in 1920.

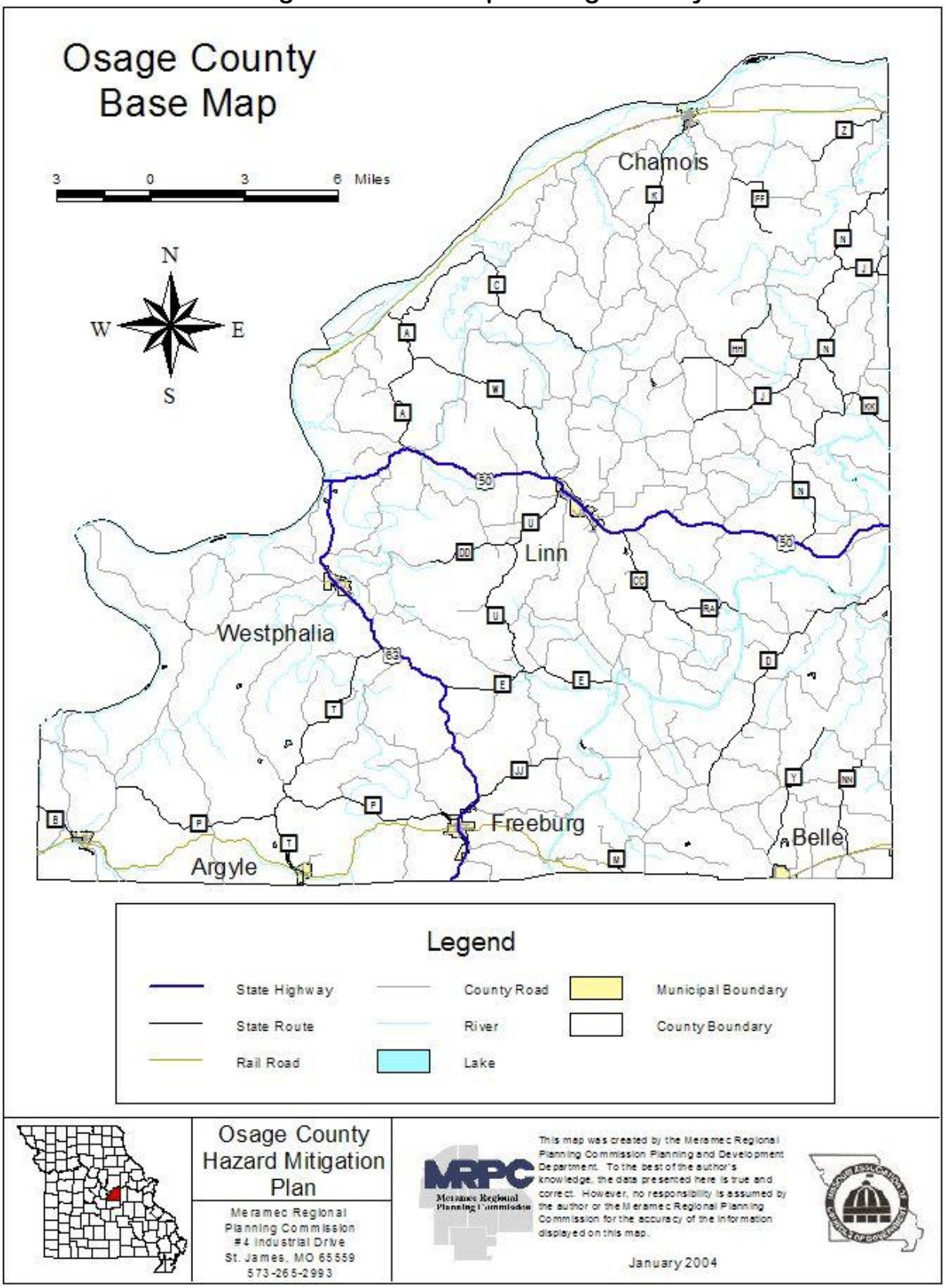
Freeburg is located about 20 miles southeast of Linn, on Highway 63. The Rock Island Railroad intersects the town. Most of the land upon which the town is located was homesteaded by Adam Wieberg. The village experienced the greatest "boom" when the St. Louis and Colorado Railroad built its tracks near the city and dug a tunnel under the outlying district. Petition for incorporation of the town of Freeburg was filed November 2, 1909.

Linn is a well-built, busy town, stretching for a mile along Highway 50 in the center of Osage County. The County Court of Osage County chose the site of the permanent seat of justice in 1842, creating the town of Linn. The town was named for Lewis Fields Linn, the only Missourian unanimously elected to the US Senate and who is claimed as the state's "Model Senator." On October 3, 1899, Linn was incorporated as a village and on October 11, 1911 it was incorporated as a city of the fourth class. The growth of Linn has been steady and substantial. Linn has many commercial clubs and business clubs; the present Chamber of Commerce was organized in 1940.

Meta is located on the Rock Island Railroad, in the southwest corner of the county. The city for the most part is located at the foot of a high hill at the edge of a valley. The good location of the city and the progressiveness of its people had induced many businesses to locate there, including Roller Mills, a Cheese Factory, a Farmer Exchange, a Lumber Yard, a depot with stock pens and charcoal kilns. Petition for incorporation was filed on Nov. 14, 1904.

Westphalia is located along Highway 63, about 11 miles southwest of Linn. In 1830 a group of educated Catholic immigrants from Westphalia in Germany, came up the "breaks of the Osage" and located in the bend of the Maries River, near the present site of Westphalia.

Figure 2.1 Base Map of Osage County



2.1.2 Geography and Topography

Osage County is located in central Missouri, approximately eight miles east of the state capital of Jefferson City, approximately 60 miles west of the St. Louis metro area. It is bordered on the west by the Osage River and on the north by the Missouri River. The county is bordered on the north by Callaway County, to the East by Gasconade County, to the south by Maries County and to the west by Cole County. Osage County has a total land cover of approximately 613 square miles. The bulk of the land cover in the county is woodland, with areas of the county that are used for row crop agriculture – particularly in the river valleys. The area includes karst terrain, which is characterized by springs, caves, losing streams and sinkholes.

Physiographic features, such as river basins and watersheds, play an important role in the development of any given area. Practical planning and engineering methods take advantage of the topography in planning and designing sewer and water facilities. The individual watersheds should form the basis for sewer and water districts, while several contiguous watersheds within the same drainage basin may be combined to form a sewer or water district.

A drainage basin is the total area drained by a river and all of its tributaries. A watershed is the area drained by a single stream. During the last 100 years, stream channels in the Ozarks have become wider and shallower, and deep-water fish habitat has been lost. Historical data indicate that channel disturbances have resulted most directly from clearing of vegetation along stream channels, which decreases bank strength. Historical and stratigraphic data show that after 1830, Ozarks streams responded to land-use changes by depositing more gravel and less muddy sediment, compared to pre-settlement conditions. Because less muddy sediment is being deposited on flood plains, many stream banks now lack cohesive sediments, and, therefore, no longer support steep banks. Land use statistics indicate that the present trend in the rural Ozarks is toward increased populations of cattle and increased grazing density; this trend has the potential to continue the historical stream-channel disturbance by increasing storm-water runoff and sediment supply.[i]

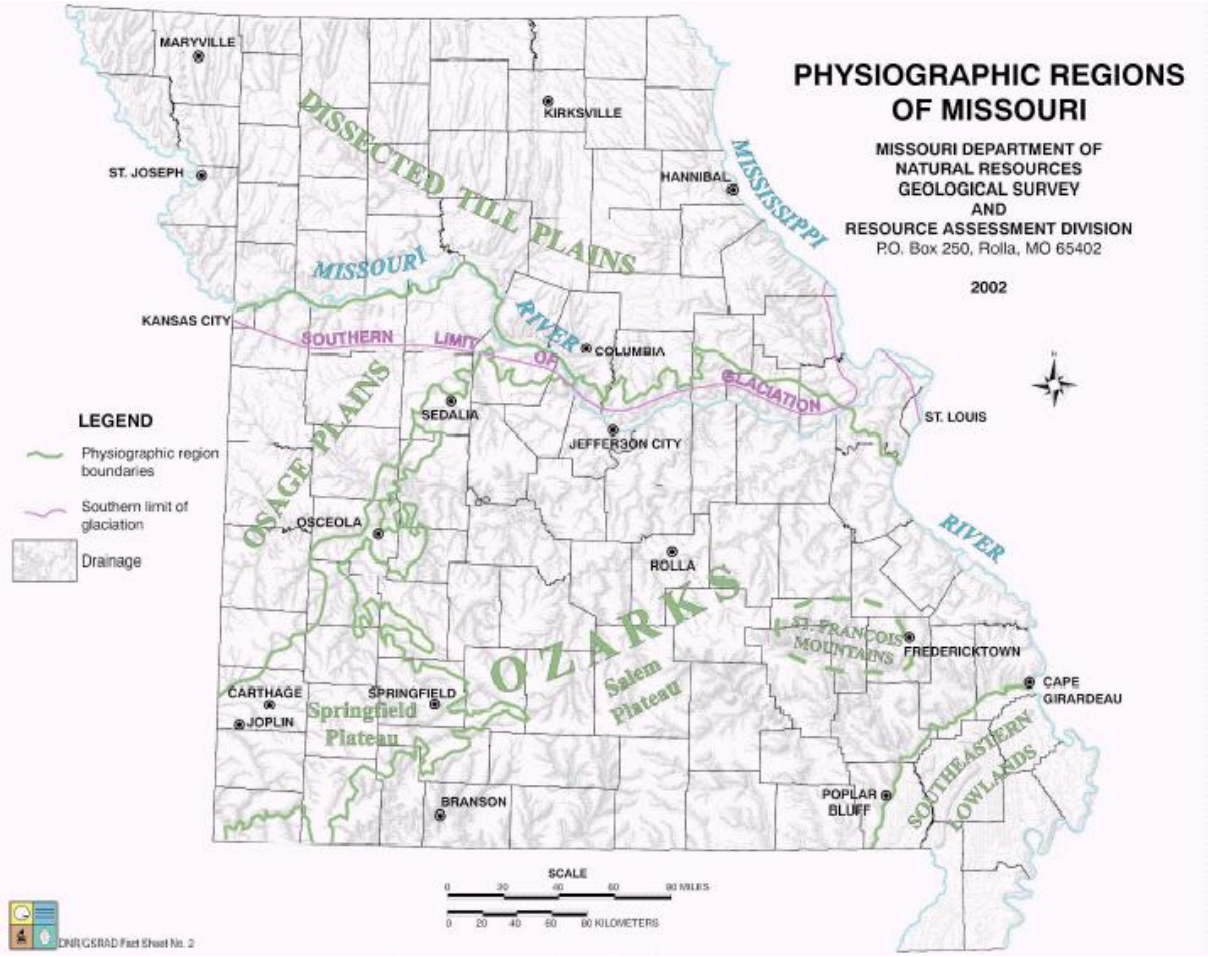
Osage County is a rolling high plateau—stretching between the Osage and Gasconade Rivers to the Missouri River, by which the major area is drained. Figure 2-2 shows the Physiographic regions of Missouri, with Osage County in the Ozarks Salem Plateau and it's northern border on the Missouri River. Osage County is located in four river basins: Bourbeuse River, Lower Osage River, Lower Gasconade River and Lower Missouri-Moreau rivers. The major streams are the Missouri River, with its large tributaries, Loose Creek and Bailey's Creek; the Osage River, with the Big and Little Maries Creeks; and the Gasconade River, with Pointer's, Brush, Swan, Owen's and Lesser Creeks. Figure 2-3 shows the entire watersheds that transect Osage County. Figure 2-4 shows the watersheds within the county as well as springs and sinkholes.

The Bourbeuse River watershed is located within the northeastern quarter of the Ozark Highlands. The main stem of the Bourbeuse River winds northeasterly through Phelps, Gasconade, and Franklin counties to join the Meramec River, and its watershed additionally encompasses portions of Maries, Osage, and Crawford counties. The Bourbeuse River is 147 miles from mouth to headwaters, and the lower 132 miles have permanent flow. The Bourbeuse

River watershed drains 843 square miles and is composed of a number of smaller watersheds including Spring Creek, Boone Creek, Brush Creek, Red Oak Creek, Dry Fork, Little Bourbeuse River, and the Lower Bourbeuse River. The gradient of the main stem is low compared to other streams of the Ozark Highlands, and gradients of the tributaries are slightly higher in the lower watershed compared to the upper watershed.

Cropland and pasture are the land uses for 45% of the Bourbeuse River watershed. According to 1992 NRCS estimates, approximately 16,600 acres were cultivated, another 59,100 acres of farmland were uncultivated, and 140,900 acres were pasture. These areas are found primarily within stream floodplains. Fifty-one percent of the total land area within the watershed is deciduous forest. Other forest types are evergreen and mixed forestland. Successional areas, such as shrub and brush rangeland, are small in total acreage, reflecting the high grazing rates and hay production in the watershed. Most of the urban-type land use is found in the lower watershed near Union.

Figure 2.2
Physiographic Regions of Missouri



Although some exceptions are present and improvements are needed, water quality in the Bourbeuse River watershed is generally good. Sewage treatment plants for St. James, St. Clair, and Cuba have not always met water quality standards for their treated discharge. In general, non-point pollution in the form of sediment from erosion and organic wastes from livestock impair water quality. In particular, organic wastes from livestock contribute to excessive algal production in watershed streams. Contaminant sampling for pesticide bioaccumulation in fish indicates that Bourbeuse fish are safe for human consumption.

Stream habitat conditions within the Bourbeuse River and its tributaries are variable. The main stem has no channelized segments, and old mill dams located near Beaufort and Union provide channel grade controls. A number of tributaries are impounded, with the largest impoundment being Indian Lake (326 acres) in the Brush Creek sub-watershed. In many streams, the lack of adequate riparian corridors, excessive nutrient loading, stream bank erosion, excessive runoff and erosion, and the effects of extensive in-stream gravel mining are among the problems observed. Grazing practices along many streams contribute to stream bank instability, nutrient loading, and poor riparian corridor conditions.[ii]

The Gasconade River watershed is located within the Ozark Plateau of the Interior Ozark Highlands. The river meanders north to northeast through Webster, Texas, Laclede, Pulaski, Dent, Maries, Osage, Phelps, and Gasconade counties to join the Missouri River. The Gasconade River is 271 miles long from mouth to headwaters with 263 miles having permanent flow. The Upper and Lower Gasconade River watersheds drain 2,806 square miles. The Upper Gasconade River watershed has an average gradient of 27.6 feet/mile, and the Lower Gasconade River watershed has an average of 3.9 feet/mile. A number of springs within the middle Gasconade River portions are due to the karst geology of the Roubidoux and Gasconade Dolomite Formation and losing stream segments. The karst topography causes losing portions in the Osage Fork, Roubidoux, North Cobb, Little Piney, Spring, and Mill creeks, and Gasconade River. The entire Gasconade River watershed is reported to have 76 springs and the largest concentration of big springs in the state**.**

As a whole, the Gasconade River watershed is rural with low population density and high farmland density. The most populated areas are Pulaski and Phelps counties, which are experiencing land development from growth surrounding Fort Leonard Wood and the City of Rolla. Lower watershed areas of Maries, Osage, and Gasconade counties have low population density. The Upper and Lower Gasconade River watersheds have 49% and 33%, respectively, grassland and cropland as land use. A general trend in the rural Gasconade River watershed toward increased cattle numbers per pastured acre has continued to the present. Forest comprises approximately 46% of the land cover within the Upper Gasconade River watershed and 66% within the Lower Gasconade River watershed. Forests are in good health and have sustainable forest production. Forest land is largely under private ownership with federally-owned forest having the second largest holdings, followed by state-owned lands having a smaller percentage. Public land is 12% or 221,040 acres within the entire watershed. To provide water-based recreational opportunities, 23 public stream accesses have been developed in the watershed. Gasconade River watershed annual precipitation ranges from 40.35 to 42.67 inches with a annual mean of 41.66 inches. This precipitation and the local geology provides good base flow conditions and lower variability in stream flow throughout major portions of the watershed.

Average runoff had greater extremes from the late 1970s to the present than during the 1960s to the late 1970s.

The Gasconade River watershed's designated stream uses, assigned by the Missouri Department of Natural Resources (MDNR) are warm water aquatic life protection and fishing, and livestock and wildlife watering. Threats to beneficial uses in the Gasconade River watershed are point and non-point sources of pollutants. The number of point pollution sources and flow from point pollution sources is low. In fact, improvements have been made to point source discharges through monitoring by the MDNR and sewage treatment upgrades. Also, the Gasconade River has recovered well from the December 1988 oil spill that released hundreds of thousands of gallons of crude oil into the main stem Gasconade River from a broken pipeline near Vienna. On the contrary, non-point source pollution remains a difficult challenge. Numerous MDNR Soil and Water Program Special Area Land Treatment projects in the Upper Gasconade River Hydrologic Unit (HU), and portions of the Upper Osage Fork HU are addressing nutrient problems that have cattle manure as their sources. Sand and gravel mining in sensitive areas can and has effected fisheries, especially sensitive cool- and cold-water fisheries. Other potential non-point pollution sources are two landfills in Wright and Phelps counties. Runoff from farms, mining operations, construction sites, forest operations, residential septics, and impervious surface in urbanized areas create a complex resource management challenge.

Figure 2.3
Osage County Watersheds

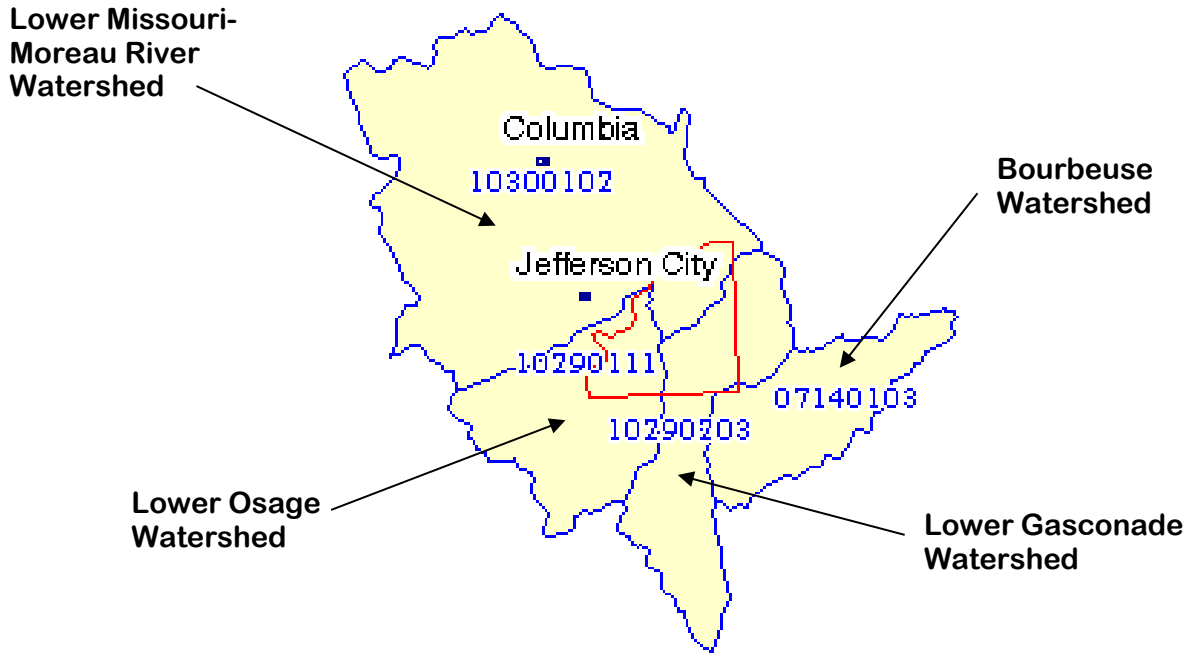
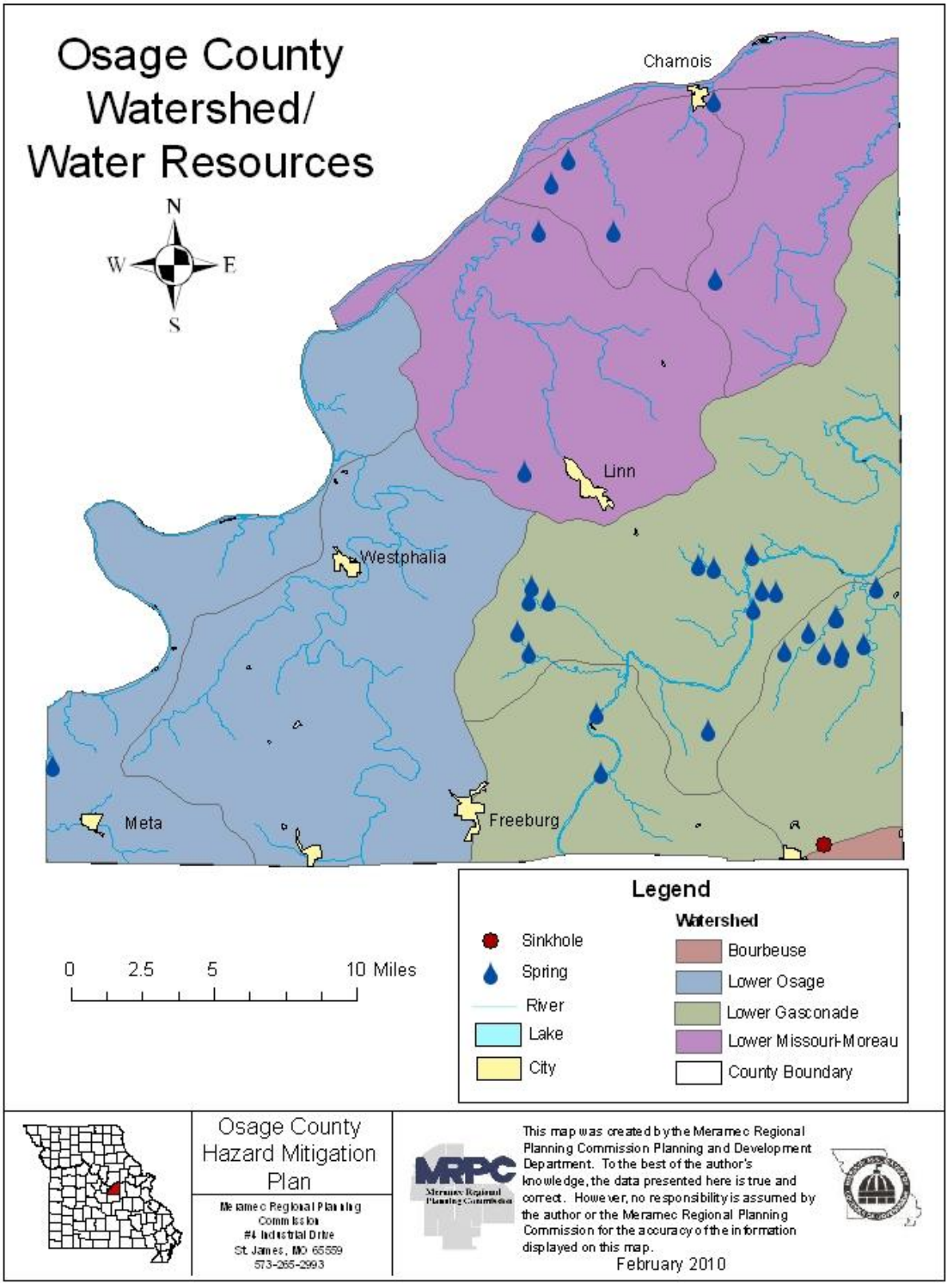


Figure 2.4


Osage County Watershed/ Water Resources
N
W
E
S
Chamois
Linn
Westphalia
Meta
Freeburg
0 2.5 5 10 Miles
Legend
Sinkhole
Spring
River
Lake
City
Watershed
Bourbeuse
Lower Osage
Lower Gasconade
Lower Missouri-Moreau
County Boundary
Osage County Hazard Mitigation Plan
Meramec Regional Planning Commission
#4 Industrial Drive
St. James, MO 65559
573-265-2993
MRPC
Meramec Regional Planning Commission
This map was created by the Meramec Regional Planning Commission Planning and Development Department. To the best of the author's knowledge, the data presented here is true and correct. However, no responsibility is assumed by the author or the Meramec Regional Planning Commission for the accuracy of the information displayed on this map.
February 2010

The Upper Gasconade River watershed was poorly forested along major segments of its tributaries and main stem compared to the Lower Gasconade River watershed. Thirty-eight percent of the major stream segments within the Upper Gasconade River watershed and 46% of the major segments of the Lower Gasconade River watershed had forested corridors. Results of the corridor quality ratio used to assess stream segments indicated that the Lower Gasconade River watershed had more stream segments rated as good (81%) than the Upper Gasconade River watershed (64%). Based on the land use/ land cover Geographic Information Systems (GIS) analysis, priority management should be given to those hydrologic units that were rated relatively low on the objective rating scale. The Lower Gasconade River HU was rated as poor due to the lack of forested stream corridor. In addition, the Lower Roubidoux Creek HU, should be given priority management attention because of its sensitive springs, growing human population, and urbanization.[iii]

The East Osage River Basin is found in central Missouri in the Missouri counties of Osage, Maries, Cole, Pulaski, Miller, Camden, Morgan, Benton, and Hickory and encompasses 2,474.52 mi^2. Lake of the Ozarks was formed in 1931 in the western half of the East Osage River Basin.

This basin lies within a dissected plateau known as the Salem Plateau and is represented by four of Missouri's natural divisions. Karst features are common and soils are generally acidic with moderate to low fertility. Erosion rates are generally low although new housing developments, road construction, intensive confinement of livestock and overgrazing have denuded land causing locally-increased erosion and sediment pollution.

The basin has undergone a major shift in land use during the last 300 years. Historically, the basin was occupied by the native Osage tribe. As European settlers moved into the basin, they degraded environmental quality and displaced the native people. European settlers cleared timber, over harvested fish and game, and plowed soil on steep hillsides. In the early days, people used the Osage River and its tributaries as a main mode of transportation and constructed wing dikes to control the flows of the river. In 1931, construction of Bagnell Dam was completed forming Lake of the Ozarks-a prime recreational and tourist destination. Harry S Truman Dam and Reservoir was completed in 1979. Bagnell Dam and Truman Dam both currently provide hydroelectric power generation. Agriculture in the basin has experienced a shift from a crop-based system in the earlier days of settlement to a livestock-based system today. Many concentrated animal feeding operations (CAFOs), gravel mining operations, waste water treatment plants, and urban construction projects currently exist within the basin. The Missouri Department of Natural Resources (MDNR), Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), Missouri Department of Conservation (MDC), Natural Resources Conservation Service (NRCS), and county Soil and Water Conservation Districts have worked with landowners to protect natural resources in the basin.

Precipitation in the basin is typical of a mid-Missouri basin with an average of 40 inches per year. The U.S. Geological Survey (USGS) has maintained 16 gauging stations within the basin. Due to the karst topography of the basin, a number of losing streams and springs exist within the area. Truman Dam and Bagnell Dam on the Osage River have significantly impacted the hydrology of the region.

Water of the basin is used for household use, commercial use, recreational use, and hydroelectric use. There are more than 85,000 residents of the basin served by public supplied surface water, public supplied groundwater, or private wells. Water quality is normally good, but pollution incidents occasionally occur, causing stream contamination and fish kills. The Clean Water Act requires each state to maintain a list of critically impaired streams. Currently, there are 1.9 miles of 303(d)-listed impaired streams and 50 impaired reservoir acres found within the basin. Sources of impairment include damming, riparian degradation, channel alteration, urbanization, flow alteration, sedimentation, low dissolved oxygen, point source pollution, and nonpoint source pollution. Hydroelectric power generation using the discharge of impounded water of the Osage River has caused considerable stream flow alteration and channel degradation to the Osage River below Bagnell Dam and has caused multiple fish kills below both Truman and Bagnell dams.

Habitat conditions of the basin have been considerably altered in some areas. Logging, land clearing, burning, and overgrazing have degraded fish and wildlife habitats within the basin. Stream channels have become destabilized due to peaking-style discharge from dams, gravel mining, and channelization. Riparian corridors are in fair condition throughout the basin with an average of 61% riparian forest and 35% riparian grassland. There is only about 1% of the basin in riparian cropland and <1% in urban land-use. The Osage River below Bagnell Dam has the highest percentage of riparian cropland (20%) in the basin.

The basin has a rich diversity of animal and plant species within its boundaries. Some species which historically occurred within the basin could not cope with the changes brought about by the European settlers. Other species such as the Niangua darter, lake sturgeon, and pink mucket mussel still exist, although their future is imperiled due to habitat changes, over harvest, introduction of exotic species, or water quality changes. The MDC has sampled the fish communities of the basin since 1940. Each sub-basin hosts a different fish community structure depending on a variety of factors including inter-specific competition, habitat availability, pollution events, or hydrologic characteristics.

Bagnell Dam has significantly changed the timing of water quantity discharged down the Osage River channel. This change in discharge rates and volume may have negatively affected the fish community found in the lower Osage River and its tributaries.

The Missouri River drains one-sixth of the United States and encompasses 529,350 square miles. It flows 2,341 miles from its headwaters at the confluence of the Gallatin, Madison, and Jefferson Rivers in the Rocky Mountains at Three Forks, Montana, to its confluence with the Mississippi River at St. Louis, Missouri.

The basin is home to about 10 million people from 28 Native American tribes, 10 states (Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming), and a small part of Canada.

Precipitation in the basin varies from an annual mean of 40 inches in the interior highlands of the Missouri Ozarks to 10 inches in the dry upland plains of North and South Dakota, Wyoming, and

Montana. The basin's elevation drops from 14,000 foot peaks at its northwestern boundary to about 400 feet where it joins the Mississippi.

Historically, the "Big Muddy" changed course. The channel relocated over 2,000 feet or more a year in some places and deposited huge amounts of silt in other places. It is estimated that 11 billion cubic feet of sediment were carried past St. Charles, Missouri in 1879 — enough to cover a square mile of ground 200 feet deep.Banks along the river would erode 200 to 300 feet during a single rise of the river. It was the movement of this sediment that created braided channels in the meandering river, hampering navigation and the permanency of bottomland farms and river towns.

The Rivers and Harbors Acts of 1912, 1917, 1925, 1927, 1930, 1935, and 1945 each affirmed the desire of the floodplain occupants, the basin's elected officials, and the federal government to tame the river for navigation, development, and flood control.

The Missouri River Bank Stabilization and Navigation Project created one stabilized channel from the numerous small channels. The plan entailed concentrating the water flow and shaping it in smooth easy bends so that the energy of the flowing water scoured out a deeper, more efficient, navigation channel. Officially completed in 1981, 735 miles of the Missouri River from Sioux City, Iowa, to St. Louis, Missouri have been channelized or stabilized by the plan, allowing urban and agricultural development of the floodplain.

From bluff to bluff, the river-floodplain below Sioux City, Iowa, covers 1.9 million acres. Historically, the river meandered across more than one-fourth of this floodplain acreage. This "meander belt" contained a variety of fish and wildlife habitats including wetlands, sandbars, wet prairies, and bottomland forests. Seasonal floods provided the water needed to replenish shallow-water habitats used for fish and wildlife breeding and growth.

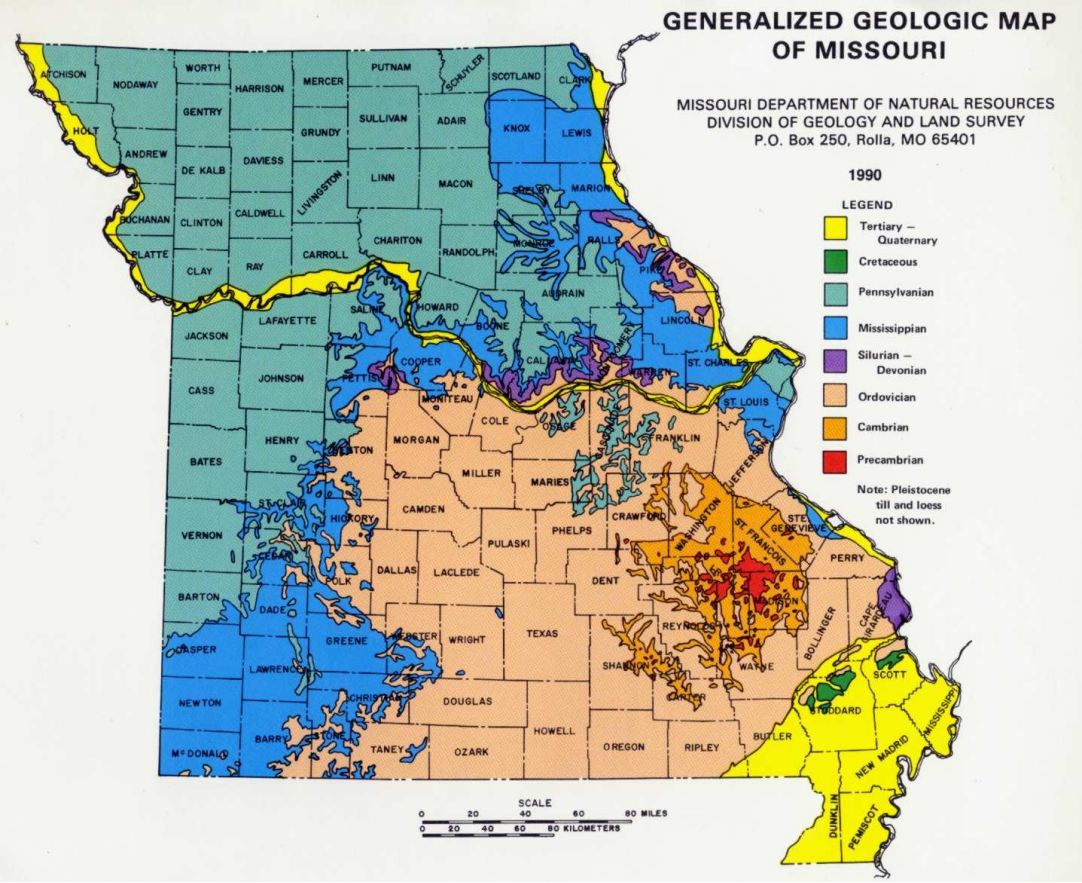
Channelization shortened the river 72 miles, resulting in a loss of 127 miles of river shoreline habitat. Aquatic habitat was lost as 168,000 acres of sediment accreted behind the wing dikes, forming new land. Nearly 354,000 acres of meander belt habitat were lost to urban and agricultural floodplain development. Levees, built to protect against flooding, allowed floodplain property investments. Levees isolated riverine off-channel habitats and wetlands from the river.

The damage to fish and wildlife habitat was acknowledged in 1986 when the Corps was authorized to implement the Missouri River Fish and Wildlife Mitigation Project. The goal of the project is to acquire and restore 28,000 acres in Iowa, Kansas, Missouri, and Nebraska. This equals approximately five-percent of the habitat lost as a result of the Missouri River Bank Stabilization and Navigation Project.[iv]

The county is located in the Ozark Plateau – the largest outcrop area of Ordovician–age rocks in the United States.[v] This rock is 505 to 441 million years old and made up primarily of carbonates and thin shales with three distinctive sandstone layers: the Gunter at the base of the column, the red and white Roubidoux which is often used as a building stone and the St. Peter glass sand. This stone is the result of a time period when Missouri was covered by a shallow sea and the stone frequently produces aquatic fossils from that time period.[vi] Portions of this formation

contain rock that dissolves and fractures over time from rainwater, thus resulting in the karst features found throughout the Ozarks. Figure 2.5 shows the geologic regions of the state.

Figure 2.5



Source: Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division.

Osage County has been a participant in the National Flood Insurance Program since February 2, 1990. The City of Argyle has been a participant in the NFIP since August 1, 1986. Chamois since November 15, 1984, Linn has been participating since 2006, Meta joined on April 19, 2012 and Westphalia since September 10, 1984. Freeburg is not participating at the current time.[vii]

As part of its floodplain management plan, the county requires that houses be built one foot above base flood elevation. A floodplain development permit is required for all proposed construction or other development, including the placement of manufactured homes, in accordance with the Floodplain Management Ordinance. County road crews or employees are expected to notify the flood plain administrator when they witness any new construction in the floodplain that has not been granted a construction permit. Osage County's Emergency Management Director serves as floodplain administrator.

2.1.3 Soil Types

The topography of Osage County is nearly uniform, consisting of narrow ridges and steep sided valleys. Elevations rise from an average of about 600 feet along the stream valleys to near 1,000 feet along the ridge crests. Generally, the land in the county slopes very gradually towards the Osage and Missouri rivers.

According to *the Soil Survey of Osage County, Missouri,* published by the Natural Resources Conservation Service (NRCS), there are eight different soil types found in Osage County. However, 55 percent of the county is dominated by two of those soil types – the Wrengart-Gatewood Association and the Gatewood-Gravois Association.

The Wrengart-Gatewood Association accounts for an estimated 25 percent of the soil type in the county. This soil type is found on narrow ridge tops and is made up of loess and residuum. The Gatewood-Gravois Association makes up an estimated 30 percent of the soil type in the county. This soil type can be found on side slopes and is also made of loess and residuum. Other soil types found in Osage County include the Menfro-Gatewood Association, Haynie-Leta-Blake Association, Jamesfin-Racoon-Kaintuck Association,Swiss-Plato-Union Association, Rueter-Plato-Gravois Association and Wrengart-Swiss-Gatewood Assocation. [viii]

2.1.4 Climate

Snow occurs between November and April, both inclusive, but most of the snow falls in December, January and February. An average of about 13 inches of snow occurs annually in the Meramec Region. It is unusual for snow to stay on the ground for more than a week or two before it melts. Winter precipitation usually is in the form of rain, snow or both. Conditions sometimes are border-line between rain and snow, and in these situations freezing drizzle or freezing rain occurs. Spring, summer and early fall precipitation comes largely in the form of showers or thunderstorms. Thunderstorms are most frequent from April to July. Measurable precipitation occurs on the average of less than 100 days per year. About half of these will be days with thunderstorms.

Most of the precipitation is absorbed by the soil and plants; however, a portion of the precipitation forms runoff and is returned to streams and other bodies of water.

Table 2.1 Average Rainfall for Osage County

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Inches	1.4	1.7	3.3	3.6	4.9	4.4	3.0	3.1	4.0	3.5	2.9	2.6	38.4

Average of rainfall from 1971-2000. Source: http://www.countrystudies.us

Because of its inland location, Missouri and Osage County are subject to frequent changes in temperature. The average annual temperature is in the mid 60s with an average in January of about 27 degrees and an average in July of about 77 degrees.[ix]

Table 2.2 Average Minimum and Maximum Temperatures for Osage County by Month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average High Temperature	38	44	55	67	76	84	90	88	80	68	56	44	65.8
Average Low Temperature	15	18	28	40	50	58	64	62	54	41	31	20	40
Mean Temperature	27	32	44	54	64	72	77	75	67	56	44	32	53.6

Minimum and maximum represent the coldest and warmest average months on record.[x]
Source: http://www.countrystudies.us

While winters are cold and summers are hot, prolonged periods of very hot weather are unusual. Occasional periods of mild, above freezing temperatures are noted almost every winter. Conversely, during the peak of the summer season occasional periods of dry, cool weather break up stretches of hot, humid weather. About half of the days in July and August will have temperatures of 90 degrees or above, but it is not unusual for the temperature to drop into the 50s by the evening. In winter, there is an average of about 100 days with temperatures below 32 degrees. Temperatures below zero are infrequent with only about three days per year reaching this low temperature. The first frost occurs in mid-October, and the last frost occurs about mid-April.

2.1.5 Population/Demographics

Osage County's current 13,768 residents are spread across the county's 606 square miles and divided by sex with 52 percent male and 48 percent female. The median age of county residents is 39.3 years. 28.2 percent of the population is 19 years of age or younger. 71.8 percent of the population is 20 years of age or older. 14.9 percent is 65 years of age or older. 98.84 percent of Osage County residents are Caucasian; 0.5 percent black or African American; .08 percent are Asian; .4 percent are of mixed race; and .03 percent are some other race.[xi]

According to Census 2010 data, the population of Argyle is 162; Chamois is 396; Freeburg is 437; Linn is 1,459; Meta is 229; and Westphalia is 389. There are 4,922 households in Osage County and 5,904 housing units.[xii] The median value for homes in rural and urban Osage County was estimated at $135,360 in 2008, up significantly from $84,100 in 2000.[xiii]

According to the State of Missouri's Office of Administration, Osage County's population is predicted to stay relatively stable over the next 15 years. Projections show an increase of 1.6 percent from 2000 to 2010; 1.5 percent from 2010 to 2020; and an increase of 1.5 percent from 2020 to 2030. This is a total increase in population of 4.6 percent over 30 years.[xiv]

Table 2.3 shows population trends for communities in Osage County from 1950 to 2010.

Table 2.3 Historic Population Trends of Osage County Communities 1960-2010

Community	1960	1970	1980	1990	2000	2010
Argyle	99	262	216	178	164	162
Chamois	658	615	546	449	456	396
Freeburg	399	577	554	446	423	437
Linn	1,050	1,289	1,211	1,148	1,354	1459
Meta	360	387	336	249	249	229
Westphalia	316	332	285	287	320	389

Source: Missouri Census Data Center

Table 2.4 shows both populations trends and racial group breakdowns for Osage County.

Table 2.4 Osage County Population Trends and Breakdown of Racial Groups

Year	1970	1980	1990	2000	2010
Total Population	10,994	12,014	12,018	13,062	13,768
White Alone	10,978	11,971	11,940	12,884	13,608
Black/African American Alone	3	3	38	21	79
Amer. Indian/ AK Native Alone	**	23	148	31	0
Asian Alone	**	17	783	10	11
Hawaiian/ Pacific Islander Alone	**	Included with Asian	783	3	0
Some Other Race Alone	13	0	105	9	5
Two or More Races	**	**	**	104	65
% White	99.85	99.64	95.9	98.64	98.84
% Non-White	.15	.36	4.1	1.36	1.16

Source: 1970, 1980, 1990, 2000 U.S. Census of Population, Bureau of the Census, US Department of Commerce

Table 2.5 shows the age and sex composition of the county for the years 1980 through 2010.

Table 2.5 – Age Sex Comparison of the Population for Osage County 1990 - 2010

	2010				2000				1990			
Age Group	Number of Males	% of Total Males	Number of Females	% of Total Females	Number of Males	% of Total Males	Number of Females	% of Total Females	Number of Males	% of Total Males	Number of Females	% of Total Females
0-4	477	3.4	416	3.0	438	6.6	433	6.7	440	7.1	409	7.0
5-9	486	3.5	502	3.6	493	7.4	461	7.2	475	7.7	501	8.6
10-14	495	3.6	471	3.4	504	7.6	490	7.6	529	8.5	443	7.6
15-19	642	4.6	429	3.1	572	8.6	458	7.1	560	9.1	416	7.2
20-24	469	3.4	341	2.5	469	7.1	366	5.7	503	8.1	365	6.3
25-29	389	2.8	340	2.4	387	5.8	357	5.5	485	7.8	417	7.2
30-34	413	3.0	368	2.7	452	6.8	439	6.8	473	7.6	446	7.7
35-39	438	3.2	404	2.9	561	8.5	473	7.4	444	7.2	369	6.3
40-44	482	3.5	480	3.5	470	7.1	478	7.4	373	6.0	331	5.7
45-49	614	4.4	499	3.6	458	6.9	408	6.3	311	5.0	306	5.3
50-54	519	3.7	484	3.5	387	5.8	353	5.5	283	4.6	275	4.7
55-59	467	3.4	424	3.1	333	5.0	328	5.1	270	4.4	256	4.4
60-64	394	2.8	358	2.6	283	4.3	290	4.5	263	4.3	257	4.4
65-69	296	2.1	296	2.1	265	4.0	268	1.2	255	4.1	305	5.2
70-74	227	1.6	254	1.8	200	3.0	232	3.6	204	3.3	244	4.2
75-79	200	1.4	230	1.7	174	2.6	248	3.9	168	2.7	214	3.6
80-84	122	0.9	160	1.2	102	1.5	155	2.4	90	1.5	142	2.4
85+	89	0.6	203	1.5	80	1.2	197	3.1	68	1.1	128	2.2
Totals	**7,219**	**52.0%**	**6,659**	**48.0%**	**6,628**	**50.7%**	**6,434**	**49.3%**	**6,194**	**51.5%**	**5,824**	**49.5%**

SOURCE: 1970, 1980, 1990, 2000 & 2010 Census, U.S. Census Bureau

Table 2.6 shows the median age of the population of Osage County for 1970 through 2010.

Table 2.6 Median Age In Years for Osage County: 1970-2010

1970			1980			1990			2000			2010		
Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
28.7	29.9	29.3	28.1	30.6	29.1	30.9	33.9	32.3	35.0	37.2	36.1	37.8	40.6	39.3

Source: 1970, 1980, 1990, 2000, 2010 Census, U.S. Department of Commerce

Table 2.7 compares the family income of Osage County residents with the rest of the Meramec Region, State of Missouri and United States. This table shows that Osage County has a lower

percentage of families living on $19,999 or less than the rest of the region –17.4 percent compared to 22.2 percent for the region; and a higher percentage of families living on $35,000 or more –63.7 percent compared to the regional average of 57.6 percent. Compared to the state and nation, Osage County fared better than the state average (20.4 percent) for families living on $19,999 or less and 1.1 percent lower than the national average for that income bracket. Osage County also fared better than the state for families living on $35,000 or more - 63.7 percent compared to 61.8 percent. On the national level, Osage County's percentage of families living on $35,000 or more was slightly lower with the national average being 65.4 percent.

Table 2.7 Osage County Family Income (2010)

	Under $10,000	$10,000 - $14,999	$15,000- $19,999	$20,000 - $24,999	$25,000 - $29,999	$30,000- $34,999	$35,000 and over	
Osage County	283 5.3%	361 6.8%	282 5.3%	296 5.6%	315 5.9%	392 7.4%	3,372 63.7%	
Meramec Region	6,247 8.6%	5,327 7.3%	4,616 6.3%	5,277 7.3%	4,994 6.9%	4,335 6%	41,958 57.6%	
State of Missouri	190,559 8.1%	145,390 6.2%	142,611 6.1%	144,260 6.1%	138,306 5.9%	136,677 5.8%	1,457,459 61.8%	
United States	8,529,677 7.4%	6,472,374 5.6%	6,326,462 5.5%	6,329,273 5.5%	6,084,213 5.3%	6,052,286 5.3%	75,137,579 65.4%	

Source: 2010 U.S. Census Bureau, U.S. Department of Commerce & 2009-2011 American Community Survey

Table 2.8 compares Osage County's median income with the rest of the Meramec Region, State of Missouri and nation. Osage County's median income of $55,813 is higher than the region's average of $48,794, and, in contrast with most rural counties in south central Missouri, just below the State average of $57,661. The county is lower in relation to the national average median family income of $62,982. The percentage of people living in poverty is also lower than the region, state or nation with Osage County being 10.9 percent, the region at 15.8 percent, the state at 14 percent and the nation at 13.8 percent.

Table 2.8 Osage County Median Income Comparison – 2010 Data

Location	Median Family Income	Percent of U.S. Median	Persons in Poverty	Percent in Poverty
Osage County	$55,813	88.6	1,490	10.9
Meramec Region	$48,794	77.5	28,735	15.8
State of Missouri	$57,661	91.6	802,569	14.0
United States	$62,982	100.0	40,917,513	13.8

Source: 2010 U.S. Census Bureau, U.S. Department of Commerce & 2006-2010 American Community Survey

Table 2.9 shows the educational attainment of Osage County residents – both the number and percentage of the population. As demonstrated by the table, 39.2 percent of the population has some education beyond high school, with 10.5 percent holding an associate degree, 9.3 percent holding a bachelor's degree and 3.9 percent with graduate or professional degrees. The percentage holding a high school diploma (46.8 percent) is significantly higher than the regional average of 38.2 percent or the state average of 32.6 percent. The number of people with associate degrees is also slightly higher than the regional or state average.

Table 2.9 Osage County General Education Attainment (2010)

Education Attainment	High School no diploma	High School Diploma	Some College No Degree	Associate Degree	Bachelors Degree	Graduate or Professional Degree
Number of Population	582	4,225	1,396	948	839	355
Percent of Population	6.5	46.8	15.5	10.5	9.3	3.9

Source: 2010 U.S. Census Bureau, U.S. Department of Commerce & 2006-2010 American Community Survey 5 year estimates

The civilian labor force in the Meramec Region increased 7.8 percent between 1980 and 2010, while the civilian labor force in Missouri grew 24 percent for the same time period. The bulk of that growth occurred as more and more women entered the workforce. From 1980 – 2010 the male civilian labor force in Missouri increased by 16.3 percent compared to falling by 1.4 percent in the Meramec Region, while the female civilian labor force increased by 32.2 percent statewide but 42.2 percent for the region.

As shown in Table 2.10, Osage County's civilian labor force increased by 24 percent and the unemployed person percentage went from 5.4 percent in 1980 to 2.8 percent unemployment in 2010. The female civilian labor force percentage of unemployed dropped from 4.8 percent in 1980 to 2.3 percent in 2010. The male civilian labor force unemployment rate went from 5.3 percent in 1980 remained to 3.2 percent in 2010, doing much better than the state and national rates. According to the Missouri Department of Economic Development, unemployment for the United States has increased from 7.1 percent in 1980 to 9.6 percent in 2010. The Missouri rates closely mirror those percentages and usually are a few tenths of a point less than the national figure. The average unemployment rate for the state in 2010 was 9.4 percent.

Table 2.10 Osage County Labor Force

	2010			2000			1990			1980		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Persons 16 years & Older	10,753	5,600	5,153	9,999	5,076	4,923	6,046	3,423	2,623	5,277	3,213	2,064
Total Labor Force	6,977	3,916	3,061	6,807	3,677	3,130	6,040	3,420	2,620	5,273	3,209	2,064
In Armed Forces	23	20	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Civilian Labor Force (CLF)	6,954	3,896	3,058	6,807	3,677	3,130	6,040	3,420	2,620	5,273	3,209	2,064
Persons Employed	6,760	3,773	2,987	5,620	3,565	3,055	5,882	3,310	2,572	4,987	3,040	1,947
Persons Unemployed	194	123	71	187	112	75	158	110	48	286	169	117
% Unemployed CLF	2.8%	3.2%	2.3%	2.7%	3.0%	2.4%	2.6%	3.2%	4.8%	5.4%	5.3%	5.7%
Persons not in Labor Force	3,776	1,684	2,092	3,188	1,397	1,791	3,009	1,255	1,754	3,442	1,241	2,201

Source: 2010 U.S. Census Bureau, U.S. Department of Commerce; Bureau of Labor and Statistics Local Area Unemployment website – www.bls.gov/lau

2.1.6 Schools/Vocational/Technological Schools/Colleges/ Universities

Osage County has three public school districts. Of those three, all have elementary through high school. Those school districts and the size of the student population are identified in Table 2.11.

Table 2.11 Osage County School Districts and Student Enrollment 2009

School District	Osage County R-I	Osage County R-II	Osage County R-III
Student Enrollment	235	648	847

Source: Missouri Department of Elementary and Secondary Education website www.dese.mo.gov

Osage County R-I has two facilities—an elementary school and a high school. Both Osage County Elementary and Chamois High School are located at 614 South Poplar Street in Chamois.

Osage County R-II has two facilities—an elementary school and a high school. The Osage County Elementary School is located at 1212 East Main Street in Linn. Both the Linn Middle School and High School are located at 146 Highway CC in Linn.

Osage County R-III has two facilities—an elementary school and a high school. Both Fatima Elementary and Fatima High School are located at 142 East Main Street in Westphalia.

In addition, Osage County is serviced by several parochial and private schools. They include:

- Holy Family – located at 110 West Oliver, Freeburg
- Sacred Heart – located at 4309 Highway U, Rich Fountain
- St. Joseph Elementary School – located at 123 East Main Street, Westphalia

- Immaculate Conception - located at 147 County Road 402, Loose Creek
- St. George Elementary School – located at 601 East Main Street, Linn
- St. Mary's School – located at 1641 Highway C, Bonnots Mill

2.1.7 Business/Industry

The major private employers located in Osage County are Quaker Window Products Company in Freeburg with over 500 employees; Osage County schools with over 200 employees; Linn State Technical College with 160 employees; Diamond Pet Foods Company in Meta with 120 employees and El Sevier Distribution Center in Linn with 120 employees.

Table 2.12 Employees By Industry for the Employed Civilian Population 16 Years Old & Over

Category	Number
Total Employed:	6,760
Agriculture, forestry, fishing and hunting, mining:	402
Construction	951
Manufacturing	1,097
Wholesale trade	304
Retail trade	707
Transportation and warehousing	283
Information	99
Finance, insurance, real estate and rental and leasing:	288
Professional, scientific, management, administrative and waste management services:	308
Educational, health and social services:	1,064
Arts, entertainment, recreation, accommodation and food services:	142
Other Services, except Public Administration	296
Public administration	819

Source: 2006-2010 American Community Survey 5 Year Estimates

There are 38 employers in the county that are considered private manufacturing firms, with the largest being Quaker Window Products Co., with 500 employees. According to the 2002 Census of Retail Trade, conducted by the U.S. Department of Commerce, there are 53 retail trade establishments in Osage County, with annual combined sales of $122,103,000.[xv] (All data on employees by industry is based on 2000 U.S. Census which is the most current data available.)

2.1.8 Agriculture

Due to the rural nature of the area, agriculture and timber are significant factors in the local economy. According to the 1997 Census of Agriculture, Osage County had 1,242 farms encompassing 309,258 acres, with an average farm size of 249 acres. Five years later in the 2002 Census of Agriculture, the number of farms had fallen to 1,129 encompassing 291,282 total acres

and the average farm size had increased to 258 acres. By the 2007 Census of Agriculture, the number of farms had increased to 1,181, encompassing 297,477 acres. The average size of farms in Osage County had fallen slightly to 252 acres. In 2007 the county had 48 farms with 1,000 or more acres, four percent of the total number of farms in the county.[xvi] According to the 2007 Census of Agriculture, Osage County's market value of agricultural products sold was $66,167,000.

The Ozarks region of Missouri is the focal point of several converging ranges of plant associations. Eastern hardwoods, southern pines and western prairies and the wildlife each supports, all reach the outward limits of their range in this area. As a result, various types of forest lands and animal habitats co-exist within a limited area. Several sawmills operate in the area and the large amount of National Forest Lands in the region also contribute to the importance of timber production and logging to the local economy.

Table 2.13 shows the amount of timber resources available in Osage County.

Table 2.13 Timber Resources of Osage County

Category	Total	Softwoods	Hardwoods
All Live Trees on Timberland (in cubic feet)	209,328,846	17,172,915	192,155,931
Net Volume of Growing-Stock on Timberland (in cubic feet)	186,063,774	16,439,711	169,624,062
Average Annual Mortality of Growing-Stock on Timberland(in cubic feet)	3,711,212	0	3,711,212
Average Net Annual Growth of Growing Stock on Timberland (in cubic feet)	2,110,674	729,640	1,381,033

Source: Miles, Patrick D., Dec-29-2007. Forest Inventory mapmaker web-application version 3.0. St. Paul, MN: US Department of Agriculture, Forest Service, North Central Research Station. www.ncrs2.fs.fed.us/4801/fiadb/index.htm

2.1.9 Environmentally Sensitive Areas

The location and characteristics of natural areas need to be included when considering hazard mitigation projects. Environmentally sensitive areas exist in Osage County because of the area's geological characteristics, primarily karst terrain and seismic zones. Karst can best be described as a land area lying on soluble rock through which a tangible amount of water moves through naturally occurring cracks and crevices. The most significant natural process occurring in karst areas is the solutional weathering of the soluble rock. This process takes place when rainwater combines with carbon dioxide in the soil or atmosphere and forms a carbonic acid (a weak acidic solution that breaks down limestone). The dissolved limestone washes away leaving cracks and crevices in the rock. These fissures in the stone formation act as conduits from surface water to groundwater.

Because of the porous nature of the underlying rock, a large amount of the rainfall in karst areas moves quickly and directly into the groundwater system. Water moves rapidly through karst and

does not undergo the purification it would receive if seeping through soil and less permeable rock formations. Karst area groundwater is very susceptible to contamination, thus making it extremely difficult, if not impossible, to site landfills in karst areas under Subtitle D regulations. The state, when compared to the nation as a whole, is at a distinct disadvantage.

The Ozark Plateaus National Water Quality Assessment Program (NAWQA) study, initiated by USGS in 1991, determined that the factors that affect water quality are climate, physiography, soils, water use, land use, population, and geology. Poultry, cattle and swine production, in addition to septic tanks and sewage-treatment plants, have affected water quality by increasing concentrations of nutrients and bacteria in water. Surface- and ground-water quality has been significantly degraded by drainage from abandoned lead and zinc mines in the Tri-State District of Kansas, Missouri, and Oklahoma and the Old Lead Belt in southeastern Missouri.[xvii]

The Missouri Department of Conservation maintains several public use and conservation areas in the county. There are 1,479 acres in Painted Rock Conservation Area, 976 acres in Smoky Waters Conservation Area, 499 acres in Ben Branch Lake Conservation Area, 214 acres in Cooper Hill Conservation Area, 77 acres at Dr. Bernard Bruns Access, 20 acres at Meta Tower Site, 16 acres at Rollins Ferry Access, 9 acres at Pointers Creek Access, 6 acres at Bonnots Mill Access, and one acre at Chamois Access. Figure 2.5 is a map of conservation areas located in Osage County. The Gasconade and Osage rivers are popular recreational destinations, especially during summer weekends.

Table 2.14 provides a summary of public use areas and conservation areas located in Osage County. Figure 2.5 is a map of conservation areas and their locations in the county.

Table 2.14 Summary of Public Use Areas and Conservation Areas

County	Area
Osage	Ben Branch Lake Conservation Area
	Bonnots Mill Access
	Dr. Bernard Bruns Access
	Chamois Access
	Cooper Hill Conservation Area
	Meta Tower Site
	Painted Rock Conservation Area
	Pointers Creek Access
	Rollins Ferry Access
	Smoky Waters Conservation Area

Source: Missouri Department of Conservation Atlas, 2003.

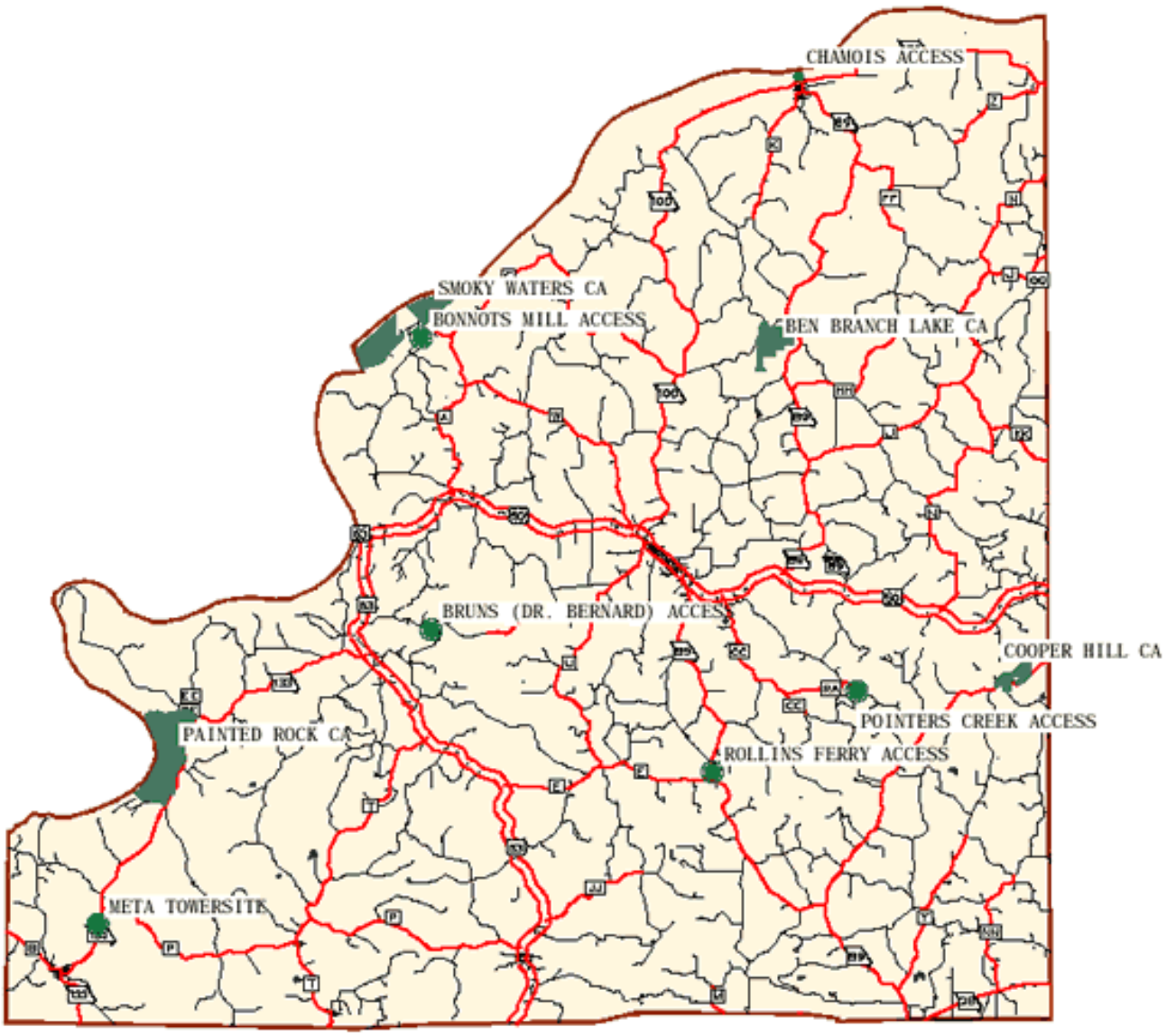
Other areas that are considered environmentally sensitive would include the water resources located in the county, including the Gasconade River basin, Maries River Basin, Osage River basin and the Missouri River basin.

Osage County is home to three natural springs that were large enough to have had flow studies done by the Missouri Department of Natural Resources: Bacon Spring, Hollenbeck Spring and Rich Fountain are all located in the Gasconade River Basin.

- Bacon Spring, 32,000 gpd
- Hollenbeck Spring, 90,000 gpd
- Rich Fountain, 26,000 gpd

Most of these springs are used for watering stock and all are located on private property.

Figure 2.5 Missouri Department of Conservation Lands in Osage County



Source: Missouri Department of Conservation, 2003.

2.1.10 Endangered Species and Species of Concern

According to the Missouri Department of Conservation, several of Missouri's endangered animal and plant species, as well as species of concern, are found in Osage County. The Scaleshell and Pink Mucket mollusks are found in the county's streams and rivers; the Niangua Darter is found in the Osage River and the Pallid Sturgeon is found in the Missouri River.[xviii] The hellbender is a large salamander that lives in clear streams and springs in the Ozarks region. The numbers of this amphibian have declined significantly in recent years leading to the placement of this animal on the state's list of species of concern. Birds included on the list are bald eagles and cerulean warblers. Although the bald eagles numbers have increased dramatically in recent years, the cerulean warbler's population has been in decline. Two bat species are on the federal endangered species list – the gray bat and the Indiana bat. Both populations have declined precipitously and the decline has been attributed to human disturbance, decline of food sources due to pesticides and warming temperatures in hibernation caves. The plains spotted skunk is also listed as a species of concern. This animal's population has also declined due to habitat loss.

2.2 Jurisdictional Descriptions and Capabilities

The mitigation capabilities for each of the jurisdictions participating in the hazard mitigation plan are profiled in this section. These profiles include an overview of the jurisdiction and its organizational structure; a description of staff, fiscal and technical resources; and information regarding existing hazard mitigation capabilities such as adopted plans, policies and regulations, if any. The descriptions and capabilities assessments are based on available and applicable data, including information provided by the jurisdictions during the planning process.

2.2.1 Unincorporated Osage County

Osage County

Overview

The jurisdiction of Osage County includes all unincorporated areas within the county boundaries. Osage County is governed by a three-member County Commission. The Commission is composed of a presiding commissioner, representing all of the county's population. The presiding commissioner is elected to a four-year term. Two associate commissioners are also elected to four year terms. The associate commissioners each represent half of the county's population.

Osage County Courthouse

Osage County operates as a third-class county. The county government has the authority to administer county structures, infrastructures, and finances as well as floodplain regulations. Third class counties do not have building regulations. The three-member county commission generally is the final authority on county issues. Other county officials include the county clerk, assessor, circuit clerk and recorder, collector, treasurer, prosecuting attorney, sheriff, associate circuit judge, coroner, public administrator, surveyor and emergency management director.

Osage County has staff resources in floodplain management, emergency management and GIS. The county has a full-time 911/emergency management director. The 911/ Emergency Operations Center has GIS capabilities. The 911/Emergency Operations Center is located at 205 East Main, Linn, MO. The backup location is 119 South Highway 89, Linn, MO. Table 2.15 outlines Osage County's personnel resources in 2009.

Osage County Administration Building

Table 2.15 Osage County Administrative and Technical Resources

Personnel Resources	Department/Position	Comments
Personnel Skilled in GIS	911/Emergency Management Office	GIS Coordinator
Floodplain Manager	County EMD Office	
911/Emergency Management Director	Office of Emergency Management	Full-time

There are six fire departments located in the county. All are volunteer departments. Those departments include Argyle Volunteer Fire Department, Belle FD, Chamois Fire Protection District, Freeburg Fire Department, Linn Fire Protection District, Meta Fire & Rescue and Westphalia Fire Protection District.

The county is served by four ambulance districts – Ozark Central Ambulance District, Maries-Osage Ambulance District, Osage Ambulance District and COMM-Unity Ambulance District. The closest hospitals are located in Jefferson City, in adjoining Cole County; and Hermann, in Gasconade County.

Existing Plans and Policies

Osage County participates in the National Flood Insurance Program. The county does have a flood plain ordinance, #60.3(d), last updated in November 2008. The County 911/Emergency Management Director serves as the floodplain manager. A floodplain development permit shall be required for all proposed construction or other development, including the placement of manufactured homes, in the areas described in Article 2, Section A. No person, firm, corporation, or unit of government shall initiate any development or substantial-improvement or cause the same to be done without first obtaining a separate floodplain development permit for each structure or other development. The unincorporated areas of the county do not have building codes. The county has a local emergency operations plan (LEOP) that is administered and maintained by the 911/Emergency Management Director.

Other Mitigation Activities

The Office of Emergency Management, local fire departments, Sheriff's Department and the Osage County Health Department have conducted public education campaigns to raise awareness and increase preparedness among the county's population. Those programs have included Ready-In-3 emergency preparedness, fire safety, storm preparedness, heat wave preparedness and DARE (Drug Abuse Resistance Education).

2.2.2 Cities

Six incorporated cities participated in the planning development process. The mitigation capability of these communities varies, but each supports the mitigation goals of the county overall. Descriptions of each participating city are provided below and Table 2.16 at the end of the section summarizes mitigation capabilities for each of the cities.

Village of Argyle

Overview

The Village of Argyle is located in the southeast section of Osage County along the Maries County line. In 1904, the town was incorporated. According to the 2010 US Census, the village has a population of 162. There is a three member board of trustees and a mayor. Village personnel include a city clerk, treasurer, street commissioner, and collector.

Technical and Fiscal Resources

Argyle is a participating community in the National Flood Insurance Program. The Chairperson is the Flood Plain manager. Law enforcement in the community is provided by Osage County Sheriff Department. The city has one warning siren. The warning siren is controlled by the Osage County 911/Emergency Operations Center.

The Osage County 911/Emergency Operations Center in Linn services the 911 capabilities for Argyle. The Maries/Osage Ambulance Service provides ambulance service for the city and surrounding area. There is an Argyle Volunteer Fire Department located in Argyle, which serves the city and the surrounding area as well. The Argyle Rural Fire Department is made up of volunteer firefighters.

Fiscal tools or resources that the city could potentially use to help fund mitigation activities include Community Development Block Grants, capital improvements project funding, taxes for specific purposes, debt through general obligation bonds, debt through special tax bonds, debt through private activities and withholding spending in hazard prone areas.

Existing Plans and Policies

Argyle is a member of the National Flood Insurance Program. Argyle's Volunteer Fire Department has an ISO rating of 9 inside the city limits and 9 outside city limits. The city is included in the county LEOP.

Other Mitigation Activities

The 911/Emergency Operations Center as well as the Argyle Volunteer Fire Department currently provides education/awareness and emergency preparedness programs.

City of Chamois

Overview

Chamois, Missouri is located on the Missouri River and Missouri Pacific Railroad approximately halfway between Hermann and Jefferson City on Highway 100. The town was incorporated on April 3, 1855. The railroad depot was the nucleus around which the town was built. The town was laid out and surveyed in 1856 on land belonging to John M. Shobe. According to the 2010 US Census, the city has a population of 396. There is a four member board of aldermen and a mayor. The city personnel include a city clerk, superintendent, fire chief and city attorney.

Chamois experienced a spurt of growth in the 1870s when the Missouri Pacific located a freight division point there. In addition, the railroad located a Division Headquarters Point in the community with a round table, a round house, coal chutes, and water storage tanks. Stock yards were constructed where cattle were unloaded from eastbound trains, watered, fed, rested, and reloaded en route to St. Louis.

The division headquarters was moved to Jefferson City in 1896, after that, railroad activity in the community began to decline, particularly since the Great Depression of the 1930's, even though a second track was laid during mid-1920 and the number of trains stopping at Chamois slowly declined until regular stops were discontinued altogether in 1969 or 1970.

Chamois was a busy river port early in its history. Steamboats stopped frequently, loading or unloading goods and then moving on. There were numerous ferries throughout the years that frequently crossed the river at Chamois, carrying people and goods to and from the north bank.

The first mayor was elected in 1878. A waterworks and sewer system was constructed in 1923, with a sewage lagoon added in 1961. The City Hall was destroyed by fire and replaced in 1882. The city organized a volunteer fire department in 1949. Mail came to the Chamois area by steamboat until the railroad became active in the late 1850's. The first post office was constructed on Main Street in 1856. Electricity was first brought to Chamois in 1913-14.

Technical and Fiscal Resources

Chamois is a participating community in the National Flood Insurance Program and has a Flood Insurance Study. The Mayor is the Flood Plain manager. Law enforcement in the community is provided by Osage County Sheriff Department. The city has one warning siren. The warning siren is controlled by the Osage County 911/Emergency Operations Center.

The Osage County 911/Emergency Operations Center in Linn services the 911 capabilities for Chamois. The Osage Ambulance District provides ambulance service for the city and surrounding area. There is a Rural Fire Protection District located in Chamois, which serves the city and the surrounding area as well. The Chamois Rural Fire Department is made up of volunteer firefighters.

Fiscal tools or resources that the city could potentially use to help fund mitigation activities include Community Development Block Grants, capital improvements project funding, taxes for specific purposes, fees for water, sewer, debt through general obligation bonds, debt through special tax bonds, debt through private activities and withholding spending in hazard prone areas.

Existing Plans and Policies

Chamois is a member of the National Flood Insurance Program and has had a flood insurance study. Chamois does not have building codes or zoning ordinances. Chamois' Rural Fire Department has an ISO rating of 7 inside the city limits and 9 outside city limits. The city is included in the county LEOP.

Other Mitigation Activities

The 911/Emergency Operations Center currently provides education/awareness and emergency preparedness programs.

Village of Freeburg

Overview

Freeburg is located twenty miles southeast of Linn on U.S. Highway 63 where it crosses the Rock Island Railroad. The town began when settlers moving into the area discovered the land around Westphalia and Rich fountain was already taken, so they moved south of the Maries River and established a new community. According to the 2010 US Census, the village has a population of 437. There is a four member board of trustees and a mayor. The village personnel include a clerk, water and sewer superintendent, fire chief and attorney.

In 1879, the village was known as Englebert after Engelbert Franke who had consented to have his house serve as the post office. He was appointed the first postmaster in 1886. Dissatisfaction with the post office name prompted residents to change it to Frankeburg around 1887 or 1888. Later the name was changed again to Frankenstein; but there was already a Frankenstein in Osage County so the German –speaking residents of the community adopted the name Frieburg, later changed to the present spelling.

The Rock Island Railroad came through in 1902. Freeburg has the distinction of being the only town in Osage County built over a railroad tunnel. When the Rock Island was built coming west from St. Louis, it came up the valley from the Gasconade River until it confronted a large hill. Unable to surmount the engineering problems of building over the hill, the railroad tunneled through it. The railroad supplied work for the village's people; it was a shipping point for the area around Freeburg and Westphalia, and it became a source of transportation at a time when roads were very poor.

Technical and Fiscal Resources

Freeburg does not participate in the National Flood Insurance Program, have a Flood plain Management Ordinance, Flood Insurance Study, or maintain Elevation Certificates.

Law enforcement in the community is provided by Osage County Sheriff Department. The city has one warning siren. The warning siren is controlled by the Osage County 911/Emergency Operations Center.

The Osage County 911/Emergency Operations Center in Linn services the 911 capabilities for Freeburg. The Maries County Ambulance District provide ambulance service for Freeburg. The Freeburg Volunteer Fire Department provides fire protection.

Fiscal tools or resources that the City could potentially use to help fund mitigation activities include Community Development Block Grants, capital improvements project funding and taxes for specific purposes.

Existing Plans and Policies
The fire department's ISO rating is six inside the city limits and ten outside the city limits. The city is also part of the county LEOP.

Other Mitigation Activities
The 911/Emergency Operations Center currently provides education/awareness and emergency preparedness programs.

City of Linn

Overview
The City of Linn was officially designated as the Osage County seat in 1842 by the Missouri General Assembly. The town is named for Lewis Fields Linn, the only unanimously elected Senator from Missouri. Linn was incorporated as a village in 1899 and as a 4th class city in 1911. The City of Linn is located along Highway 50 in the center of Osage County. According to the 2010 US Census, the city has a population of 1,459. There is a five member board of aldermen and a mayor. The city employs a full time city clerk. Other city personnel include a treasurer, police chief, utilities superintendent, fire chief and city attorney.

Three courthouses preceded the present building in Linn. Osage County acquired its jail in 1843 when a structure containing triple-log walls and a dirt floor was completed. The county ordered a Poor House built in 1857 on farm land south of Linn. Linn's first school was completed in 1843. Linn Technical College was established in 1961.

Technical and Fiscal Resources
Linn is a participating community in the National Flood Insurance Program and has a Flood Insurance Study. The Flood Plain Management Ordinance was adopted in 2006. The Mayor of Linn serves as the Flood Plain manager. Law enforcement in the community is provided by the Linn City Police Department, located at 1200 East Main Street, Linn, Mo 65051. The city has two warning sirens. The warning sirens are controlled by the Osage County 911/Emergency Operations Center.

The Osage County 911/Emergency Operations Center in Linn services the 911 capabilities for Linn. The Osage County Ambulance Service provides ambulance service for the city and surrounding area. There is a City/Rural Fire Protection District located in Linn, which serves the city and the surrounding area as well.

Linn adopted Building Codes in 2005. The Police Chief is responsible for enforcing these codes. Linn has one certified inspector on staff. All residential and non-residential construction – both new and renovations – require a building permit and inspections by the city. The city has site plan review requirements. Linn's Zoning Ordinance was passed in 1998.

Fiscal tools or resources that the city could potentially use to help fund mitigation activities include Community Development Block Grants, capital improvements project funding, taxes for specific purposes, fees for water, sewer, gas or electric services, impact fees for new

development, debt through general obligation bonds, debt through special tax bonds, debt through private activities and withholding spending in hazard prone areas.

Existing Plans and Policies

Linn is a member of the National Flood Insurance Program and has had a flood insurance study. Linn's Fire Department has an ISO rating of five inside the city limits and eight outside city limits. Linn maintains Capital Improvement and Infrastructure plans. The city is included in the county LEOP.

Other Mitigation Activities

The 911/Emergency Operations Center as well as Linn Fire Department currently provide education/awareness and emergency preparedness programs.

City of Meta

Overview

Meta is a community that owes its existence to railroad promotion. Settlements like this are found all over the United States – places where the railroad bought or was given land by the government, planned a town on this land, and divided the property into lots which it sold. In the case of Meta, the Rock Island Railroad did the promotion, in 1901, when the company was building a new line westward from St. Louis.

In the early part of October, 1901, the railroad assigned John Terrill of Vienna the job of finding a suitable point between the Koeltztown tunnel and the Osage River for a railroad on the new line being constructed. Terrill selected the spot where Meta stands today because the land in the valley floor was relatively flat and free of timber and because Sugar Creek provided a source of clean, fresh water. The railroad, known at the time as the St. Louis, Kansas City, Colorado Railroad Company, then bought 120 acres of land from Joseph Finke and the heirs of the late Dedrick Schriefer. The town was incorporated on November 14, 1904.

Meta is located in the southwest corner of Osage County at the junction of highways 133 and B. According to the 2010 census, Meta has a population of 229. Meta is a fourth class city, governed by a four person board of aldermen and mayor. The city employs a part-time city clerk. Other personnel include a collector, water superintendent and water clerk.

Technical and Fiscal Resources

Meta participates in the National Flood Insurance Program. The city clerk is the Floodplain Manager. The Flood Plain Management Ordinance was adopted in 2012.

Meta does not have building codes, therefore does not require an inspector, building permits or have site plan requirements.

Law enforcement in the community is provided by Osage County Sheriff Department. The city has one warning siren. The warning siren is controlled by the Osage County 911/Emergency Operations Center.

The Osage County 911/Emergency Operations Center in Linn services the 911 capabilities for Meta. Ambulance service for Meta is provided by the Comm-Unity Ambulance District, Osage County Ambulance District, Maries County Ambulance District, and Miller County Ambulance District.

Fiscal tools or resources that the City could potentially use to help fund mitigation activities include Community Development Block Grants, capital improvements project funding, taxes for specific purposes, debt through general obligation bonds, debt through special tax bonds, debt through private activities and withholding spending in hazard prone areas.

Existing Plans and Policies

Meta is a member of the National Flood Insurance Program. The city has a Capital Improvements Plan and an Emergency Operations Plan. The fire department's ISO rating inside city limits is seven and nine outside city limits. The city is also part of the county LEOP.

Other Mitigation Activities

The 911/Emergency Operations Center as well as the Meta Fire Department currently provide education/awareness and emergency preparedness programs.

City of Westphalia

Overview

Early in 1835, a party of German immigrants traveled up the Osage River and settled on the Maries River, one of the tributaries of the Osage. Dr. Bernard Bruns is credited with the founding of the settlement at the bend of the Maries River, now located at the junction of Highways 50 and 63. These immigrants named their new home "New Westphalia Settlement," later changed to "New Westphalia." These people were well educated and wished to provide the same privilege to their children.

In 1838 Fathers Vergaegen, DeTheus, and Smedts purchased, for $5, forty acres of land on the left bank of the Maries River from Mr. Francis (Franz) Geisberg. Soon after his arrival, Father Helias reserved fourteen acres for himself. The remaining twenty-six lots were offered to the artisans and laborers of New Westphalia Settlement. The community soon centered around the new land, and the name New Westphalia was given to it. The Missouri General Assembly incorporated Westphalia in 1857.

Westphalia is located in west central Osage County on Highway 63, approximately four miles south of the Highway 63 and 50 Junction. According to the 2010 census, Westphalia has a population of 389. Westphalia is a fourth class city, governed by a four person board of aldermen and mayor. The city employs a city clerk. Other personnel include a water district clerk and fire chief.

Technical and Fiscal Resources

Westphalia participates in the National Flood Insurance Program. The city's Flood Plain Ordinance was adopted in September 1984. The city clerk serves as the Flood Plain Manager. The Flood Plain Management Ordinance was adopted in 1984.

Westphalia does not have building codes nor site plan review requirements.

Law enforcement in the community is provided by Osage County Sheriff Department. The city has one warning siren. The warning siren is controlled by the Osage County 911/Emergency Operations Center.

The Osage County 911/Emergency Operations Center in Linn services the 911 capabilities for Westphalia. The Osage Ambulance District and Maries Osage Ambulance District serve the community. Westphalia has a volunteer fire department.

Existing Plans and Policies

Westphalia currently participates in the National Flood Insurance Program and has a Flood Plain Management Ordinance. The rural fire district's ISO rating is six, while the city ISO rating is six. The city is also part of the county LEOP.

Other Mitigation Activities

The 911/Emergency Operations Center as well as the Westphalia Fire Department currently provide education/awareness and emergency preparedness programs.

Table 2-17 Osage County & Participating Cities: Summary of Mitigation Capabilities

Capability	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia
Emergency Operations Plan	Y	Y	Y	Y	Y	Y	Y
Building Code/Year	N	N	N	N	Y/2005	N	N
Fire Department ISO Rating	N/A	7/9	7/9	6/10	5/8	7/9	6/6
National Flood Insurance Program	Y	Y	Y	N	Y	N	Y
Zoning Ordinance	N	Y	N	N	Y	N	Y
Site Plan Review Requirements	N	N	N	N	Y	N	N
Economic Development Plan/Policy	N	N	N	N	N	N	N
Stormwater Management Ordinance	N	N	N	N	N	N	N

2.2.3 School Districts

The following school districts are participating jurisdictions in this plan: Osage County R-I (Chamois), Osage County R-II (Linn), and Osage County R-III (Westphalia). As public institutions responsible for the care and education of the county's children, these school districts share an interest with Osage County in public safety and hazard mitigation planning. Figure 2-6 provides the boundaries of the school districts participating in this planning process.

Technical and Fiscal Resources

The school districts in Osage County all have the authority to levy taxes for special purposes related to education and student safety and/or incur debt through general obligation or special tax bonds.

All schools in the district participating in this plan have NOAA all hazard radios on site to provide early warning of hazard events. All schools also have Alert FM provided by Osage County Emergency Management. In addition, each school has fire alarms and a public address system capable of providing specific instructions in the event of an emergency. Two of the Osage County school districts, Osage County R-I in Chamois and Osage County R-II in Westphalia, have automated phone message systems used to contact parents for normal school announcements. These automated phone message systems could also be utilized to provide emergency information regarding the schools.

None of the school districts have dedicated grant writers on staff. Existing staff work on grants when necessary. At most schools the Superintendent of schools, principals, curriculum directors, or director of student services perform grant writing duties as well as emergency management planning.

Existing Plans and Policies

All schools in the district have crisis management plans in place. All schools in the district participate in the Emergency Response Information Portal (ERIP) program sponsored by the Missouri Department of Homeland Security. This internet based project assists schools with the development of all-hazards emergency plans and through a restricted website provides access to those plans to local emergency response agencies.

Other Mitigation Activities

All schools participating in the plan conduct regular fire, earthquake and tornado drills on a quarterly basis or semi-annual basis. Although all the schools have designated safe areas for tornados – none of these areas would be considered certified safe rooms.

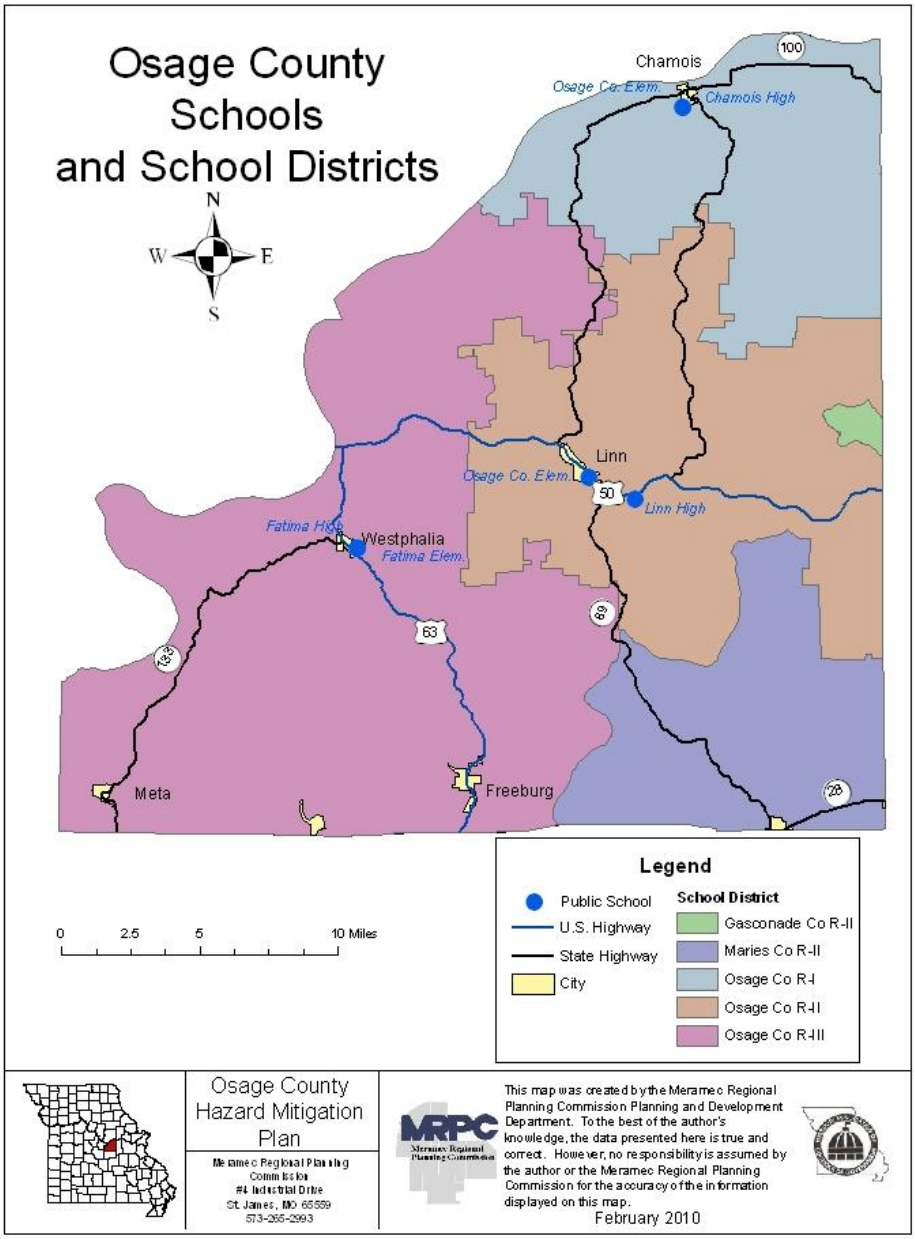
Table 2.18 Schools in Participating Districts with Reported 2011-12 Enrollment

Osage Co. R-I School District (Chamois)	**2011-12 Enrollment – Total: 196**
Osage County Elementary (K-6)	105
Chamois High (7-12)	91
Osage Co. R-II School District (Linn)	**2009-10 Enrollment – Total: 641**
Osage County Elementary (PK-6)	344
Linn High (7-12)	297

Osage County R-III School District	2009-10 Enrollment – Total: 837
Fatima Elementary (K-6)	369
Fatima High (7-12)	468

Source: Missouri Department of Elementary and Secondary Education website: http://www.dese.mo.gov

Figure 2-6



2.2.4 Colleges/Universities

Linn State Technical College is located in Linn, Osage County, Missouri. There are several institutions of higher learning located in adjacent counties such as Lincoln University in Cole County, Metro Business College in Cole County, Westminster College in Callaway County and William Woods University in Callaway County.

Table 2.19 College/University Satellite Campuses Located in Osage County

College/University	Location	Description
Linn State Technical College	One Technology Drive Linn, MO 65051	Public Two-Year College specializing in technical education. Associate of Science degrees, Certificates

[i] U.S. Geological Survey Fact Sheet FS-027-96
[ii] Ibid.
[iii] Missouri Watersheds. http://www.conservation.state.mo.us/fish/watershed/mdc40.htm
[iv] The Missouri River Story. http://infolink.cr.usgs.gov/The_River/
[v] http://geology.about.com/library/bl/maps/blmissourimap.htm.
[vi] http://members.socket.net/~joschaper/ordo.html. *Ordovician Period*
[vii] NFIP Community Status Report
[viii] *Soil Survey of Osage County, Missouri.* By Keith O. Davis, natural Resources Conservation Service, and Wyn A. Kelley, Missouri Department of Natural Resources.
http://soildatamart.nrcs.usda.gov/manuscripts/MO151/0/Osage_Mo.pdf
[ix] http://www.countrystudies.us
[x] http://www.average-temperature.com/temps/MO/
[xi] U.S. Census Bureau, Census 2010.
[xii] U.S. Census Bureau, Census 2010.
[xiii] http://www.city-data.com/county/Osage_County-MO.html
[xiv] Missouri State Government, Division of Budget & Planning website
http://www.oa.state.mo.us/bp/projections/scenario.html
[xv] 2002 Census of Retail Trade – U.S. Department of Commerce- www.census.gov/prod/ec02/ec0244amott
[xvi] 1997 & 2002 Census of Agriculture, USDA, National Agriculture Statistics Service
[xvii] U.S. Geological Survey Fact Sheet FS-027-96
[xviii] Missouri Department of Conservation, "Missouri Animals of Conservation Concern"
http://www.bourbonmo.com/
http://www.cubamo.com
http://www.sullivanmo.com/index.php
http://sullivan.mo.us/
http://www.Osagecountymo.net/
http://www.eastcentral.edu/ecc/extcamp/SAC/

3 RISK ASSESSMENT

44 CFR Requirement 201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to those identified hazards. The goal of the risk assessment process is in the event of a hazard event, to approximate the potential losses in Osage County, including loss of life, personal injury, property damage and economic losses. The risk assessment process provides an opportunity for the county and the communities within the county to better understand their potential risks from natural hazards and to better prepare for those potential events through preparedness and mitigation planning.

The risk assessment for Osage County and its jurisdictions followed the methodology described in the FEMA publication 386-2, *Understanding your Risks: Identifying Hazards and Estimating Losses* (2002). This methodology includes the following steps:

- Identifying the hazards
- Profiling hazard events
- Inventorying assets
- Estimating losses

Multi-Jurisdictional Risk Assessment

For this multi-jurisdictional hazard mitigation plan, the risk assessment looks at each jurisdiction's risks whenever they deviate from the risks facing the entire planning area. Osage County is uniform in terms of climate and topography as well as construction characteristics and development trends. Therefore, overall hazards and vulnerability do not vary greatly across the planning area for most hazards. Weather-related hazards will impact the entire the county in much the same fashion, as do topographical/geological related hazards such as earthquake. Sinkholes are widespread in the county, but more localized in their effects.

The hazards that do vary across the planning area include dam failure, levee failure and flood. Table 3.2 shows the hazards identified for each participating jurisdiction and in Section 3.2, under each hazard description, the section Likely Location discusses how some hazards vary among jurisdictions in the planning area. The section titled Hazard History provides a narrative, based on the best available data, on where past hazard events have occurred and the approximated losses to specific jurisdictions during those events. In Section 3.3 Vulnerability Assessment, includes information on structures and estimates of potential losses by jurisdiction (where data is available) for hazards of moderate and high priority.

3.1 Identification of Hazards Affecting Osage County

44 CFR Requirement 201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

3.1.1 Methodology

FEMA provided the following list of potential hazards for consideration in the hazard mitigation planning process:

- Avalanche
- Coastal Erosion
- Coastal Storm
- Dam/Levee Failure
- Debris Flow
- Drought
- Earthquake
- Expansive Soils
- Extreme Heat
- Flood
- Hailstorm
- Hurricane
- Land Subsidence
- Landslide
- Severe Winter Storm
- Tornado
- Volcano
- Wildfire
- Windstorm

Based on past history and future probability, the Hazard Mitigation Planning Committee (HMPC) determined that the following potential hazards would be included in the Osage County Hazard Mitigation Plan:

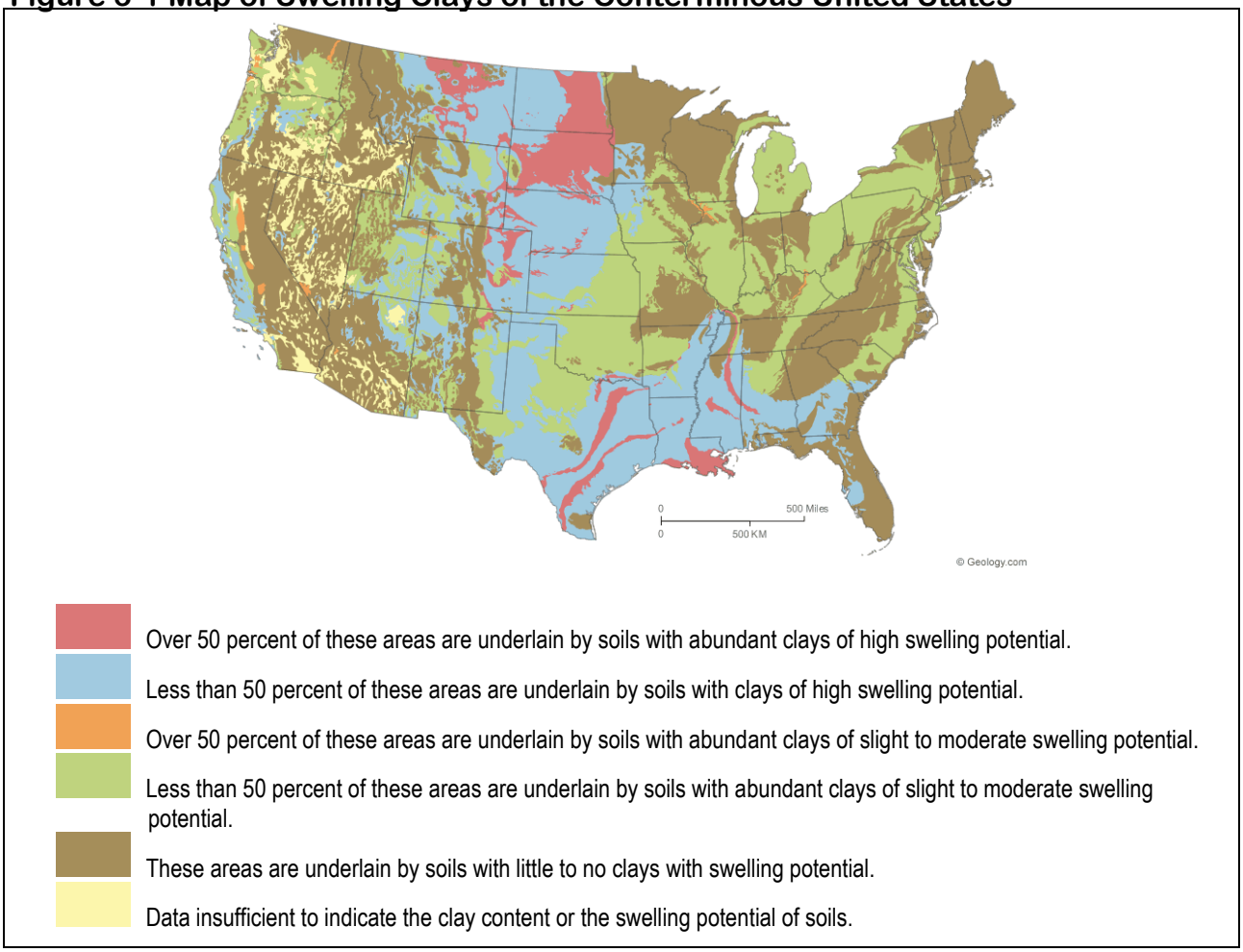
- Dam Failure
- Drought
- Earthquake
- Extreme Heat
- Flood
- Landslide
- Land Subsidence/Sinkholes
- Levee Failure
- Severe Storm (Hailstorm/Windstorm)/Tornado
- Severe Winter Weather
- Wildfire

Several hazards were not included. Some were eliminated because they do not exist in the planning area and the risk of some hazards was considered insignificant. Table 3.1 outlines the hazards eliminated from the plan and the reasons for doing so.

Table 3.1 Hazards Not Profiled in the Plan

Hazard	Reason for Omission
Avalanche	No mountains in the planning area.
Coastal Erosion	Planning area is located in the Midwest, not on any coast.
Coastal Storm	Planning area is located in the Midwest, not on any coast.
Debris Flow	There are no mountainous areas in the planning area where this type of event occurs.
Expansive Soils	There are no areas of expansive soils in the planning area.
Hurricane	Planning area is located in the Midwest, not on any coast.
Volcano	There are no volcanic areas in the county.

Figure 3-1 Map of Swelling Clays of the Conterminous United States



Source: http://geology.com/articles/soil/, "Swelling Clays Map of the Conterminous United States" by W. Olive, A. Chleborad, C. Frahme, J. Shlocker, R. Schneider & R. Schuster

Some hazards have been combined in the Osage County Plan to match how the hazards are listed in the Missouri State Hazard Mitigation Plan. That state-wide plan combines Severe Thunderstorms with Tornados.

Data on hazards was gathered from a variety of sources but primarily from the following:

- Missouri State Hazard Mitigation Plan
- Spatial Hazard Event and Loss Database (SHELDUS), provided through the University of South Carolina hazards Research Lab
- National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center
- Federal Disaster Declarations from the Federal Emergency Management Agency (FEMA)
- Various articles, data sets and publications available via the internet (sources are indicated at the end of each section of the plan document)

The Osage County HMPC identified eleven hazards that had the potential to affect the planning area. Those hazards are listed in Table 3.2 and further described in the following section of the plan. It was determined by SEMA that only natural hazards would be addressed in the plan.

Table 3.2 Hazards Identified for Osage County Plan and Affected Jurisdictions

Hazard	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-1	Osage County R-II	Osage County R-III
Dam Failure	X	X								
Drought	X	X	X	X	X	X	X	X	X	X
Earthquake	X	X	X	X	X	X	X	X	X	X
Extreme Heat	X	X	X	X	X	X	X	X	X	X
Flood	X	X	X	X	X	X	X	X	X	X
Landslide	X	X	X	X	X	X	X			
Levee Failure	X									
Severe Storms-Hail/Wind Storm	X	X	X	X	X	X	X	X	X	X
Tornado	X	X	X	X	X	X	X	X	X	X
Severe Winter Weather	X	X	X	X	X	X	X	X	X	X
Land Subsidence/Sinkholes	X									
Wildfire	X	X	X	X	X	X	X	X	X	X

3.1.2 Disaster Declaration History

In order to assess risk, it was logical to review the disaster declaration history for the State of Missouri and specifically for Osage County. Federal and state disaster declarations are granted when the severity and magnitude of a hazard event surpasses the ability of local government to respond and recover. Disaster assistance is initiated when the local government's response and recovery capabilities have been exhausted. In this type of situation, the state may declare a

disaster and provide resources from the state level. If the disaster is so great that state resources are also overwhelmed, a federal disaster may be declared in order to allow for federal assistance.

There are three agencies through which a federal disaster declaration can be issued – FEMA, the U.S. Department of Agriculture (USDA) and/or the Small Business Administration. A federally declared disaster generally includes long-term federal recovery programs. The type of declaration is determined by the type of damage sustained during a disaster and what types of institutions or industries are affected.

A declaration issued by USDA indicates that the affected area has suffered at least a 30 percent loss in one or more crops or livestock industries. This type of declaration provides those farmers affected with access to low-interest loans and other programs to assist with disaster recovery and mitigation.

Missouri has been especially hard hit by natural disasters in the recent past. The state has had 49 federally declared disasters since 1957. Of those, 21 have occurred between 2000 and 2009. All of these disasters have been weather related – severe wind and rain storms, tornados, flooding, hail, ice storms and winter storms. Table 3.3 lists the federal disaster declarations for Missouri that included Osage County from 2000 through 2011. County data pertaining to federal disaster declarations could not be found prior to 2000.

Table 3.3 Disaster Declaration History of Osage County 2000-2009

Declaration Number	Declaration Date	Disaster Description	Type of Assistance Received	Counties Included in Disaster Declaration
1961	3/23/2011	Winter Storm	Public Assistance	Adair, Andrew, Audrain, Barton, Bates, Benton, Boone, Caldwell, Callaway, Carroll, Cass, Cedar, Chariton, Clark, Clinton, Cole, Cooper, Dade, Dallas, DeKalb, Grundy, Henry, Hickory, Howard, Johnson, Knox, Laclede, Lafayette, Lewis, Linn, Livingston, Macon, Madison, Maries, Marion, McDonald, Miller, Moniteau, Monroe, Montgomery, Morgan, Newton, **Osage**, Pettis, Platte, Polk, Pulaski, Putnam, Ralls, Randolph, Ray, St. Clair, Saline, Schuyler, Scotland, Shelby, Sullivan, Vernon and Worth
1847	6/26/2009	Severe Storms, Tornados and Flooding	Public Assistance	Adair, Barton, Bollinger, Camden, Cape Girardeau, Cedar, Crawford, Dade, Dallas, Dent, Douglas, Greene, Hickory, Howell, Iron, Jasper, Knox, Laclede, Lewis, Madison, Maries, Marion, Miller, Newton, Oregon, Ozark, Perry, **Osage**, Polk, Pulaski, Ray, Reynolds, Ripley, St. Francois, Ste. Genevieve, Saline, Shannon, Shelby, Stone, Sullivan,

Declaration Number	Declaration Date	Disaster Description	Type of Assistance Received	Counties Included in Disaster Declaration
				Texas, Vernon, Washington, Wayne, Webster, and Wright
3303	1/30/2009	Severe Winter Storm	Public Assistance	All 114 Missouri counties
1809	11/13/2008	Severe Storms, Flooding and a Tornado	Individual and Public Assistance	Adair, Audrain, Barry, Bollinger, Boone, Butler, Callaway, Cape Girardeau, Carter, Chariton, Christian, Clark, Crawford, Dent, Douglas, Dunklin, Howard, Howell, Jefferson, Knox, Lewis, Lincoln, Linn, Madison, Maries, Marion, Miller, Mississippi, Montgomery, New Madrid, Oregon, **Osage,** Ozark, Perry, Ralls, Randolph, Ray, Reynolds, Ripley, Schuyler, Scotland, Scott, Shannon, Shelby, St. Genevieve, St. Charles, St. Louis, Stoddard, Stone, Sullivan, Taney, Texas, Wayne, Webster and Wright Counties, and the Independent City of St. Louis.
1749	3/19/2008	Severe Storms and Flooding	Individual and Public Assistance	Audrain, Barry, Barton, Boone, Bollinger, Butler, Callaway, Camden, Cape Girardeau, Carter, Cedar, Christian, Cole, Cooper, Crawford, Dade, Dallas, Dent, Douglas, Dunklin, Franklin, Gasconade, Greene, Hickory, Howard, Howell, Iron, Jasper, Jefferson, Laclede, Lawrence, Lincoln, Madison, Maries, McDonald, Miller, Mississippi, Montgomery, Moniteau, Morgan, New Madrid, Newton, Oregon, **Osage**, Ozark, Pemiscot, Perry, Pike, Polk, Pulaski, Reynolds, Ripley, St. Charles, St. Clair, St. Francois, St. Louis, Ste. Genevieve, Shannon, Scott, Stoddard, Stone, Taney, Texas, Vernon, Warren, Washington, Wayne, Webster, and Wright Counties and the Independent City of St. Louis
1736	12/27/2007	Severe Winter Storms	Public Assistance	Adair, Andrew, Atchison, Audrain, Barton, Benton, Boone, Buchanan, Caldwell, Callaway, Camden, Cedar, Clinton, Cole, Dade, Daviess, DeKalb, Gentry, Grundy, Harrison, Hickory, Holt, Jasper, Lincoln, Linn, McDonald, Mercer, Miller, Moniteau, Montgomery, Morgan, Newton, Nodaway, **Osage**, Pike, Putnam, St. Clair, Schuyler,

Declaration Number	Declaration Date	Disaster Description	Type of Assistance Received	Counties Included in Disaster Declaration
				Scotland, Sullivan, Warren & Worth
3281	12/12/2007	Severe Winter Storms	Public Assistance	All Missouri counties
1708	6/11/2007	Severe Storms and Flooding	Individual and Public Assistance	Andrew, Atchison, Bates, Buchanan Caldwell, Carroll, Cass, Chariton, Clay, Clinton, Daviess, DeKalb, Gentry, Grundy, Harrison, Holt, Howard, Jackson, Lafayette, Linn, Livingston, Mercer, Morgan, Nodaway, **Osage**, Platte, Ray, Saline, Sullivan and Worth
1676	1/15/2007	Winter Storms and Flooding	Public Assistance	Barry, Barton, Callaway, Camden , Christian, Cole, Crawford, Dade, Dallas, Dent, Franklin , Gasconade, Greene, Hickory , Jasper, Laclede, Lawrence , Lincoln , Maries, McDonald, Miller, Montgomery , Newton , **Osage**, Polk, Pulaski, St. Charles , St. Clair, St. Louis , Stone, Warren , Webster, Wright, and the independent City of St. Louis
3232	9/10/2005	Hurricane Katrina	Evacuation Support	All Missouri counties
1463	5/6/2003	Severe Storms, Tornadoes and Flooding	Individual and Public Assistance	Barry, Barton, Bates, Benton, Bollinger, Buchanan, Camden, Cass, Cedar, Christian, Clay, Clinton, Cooper, Crawford, Dade, Dallas, Dent, Douglas, Franklin, Knox, Gasconade, Cape Girardeau, Greene, Henry, Hickory, Iron, Jackson, Jasper, Jefferson, Johnson, Laclede, Lafayette, Lawrence, Marion, McDonald, Miller, Monroe, Morgan, Newton, **Osage**, Perry, Pettis, Phelps, Platte, Polk, Pulaski, Ray, Saint Francois, Saint Louis, Sainte Genevieve, Saline, Scott, St. Clair, Stoddard, Stone, Taney, Vernon, Washington and Webster

Source: Missouri State Emergency Management Agency, www.sema.dps.mo.gov

3.2 Profile of Hazards Affecting Osage County

44 CFR Requirement 201.6(c)(2)(i): [The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

3.2.1 Methodology

Each hazard that has been determined to be a potential risk to Osage County is profiled individually in this section of the plan document. The information provided varies dependent upon the amount of data available to use in the profile and risk assessment process. As the plan is updated, and additional data becomes available, this information will be added to provide a more detailed picture of the hazards affecting Osage County. This process will increase the county's ability to assess and prioritize hazards and mitigation strategies.

Each hazard profile includes:

- Description of the hazard
- Characteristics of the hazard
- History of how the hazard has affected the county—the frequency of damage in the past
- Information on the geographic location of hazards (if applicable)
- Seasonal pattern (if applicable)
- Speed of onset and existing warning systems (if applicable)
- Severity of past incidents, i.e. damages relative to that of other hazards
- Discussion of Probable Risk/Likeliness of Future Occurrence
- Discussion of likely adverse impact on the planning area—the estimated magnitude/severity of the hazard
- Recommendations

In order to maintain consistency and incorporate multiple factors into the ranking process, the hazards were prioritized based on a calculated priority risk index (CPRI) that takes into account four elements of risk: probability, magnitude/severity, warning time and duration. This process and the formula for weighting each element of risk were described in MitigationPlan.com™.

The probability of each profiled hazard is classified and quantified in the following manner:

- Highly likely: An event is probable within one year—a near 100 percent probability of occurring. (4)
- Likely: An event is probable within the next three years—a 33 percent probability of occurring. (3)
- Occasional: An event is probable within the next five years—a 20 percent probability of occurring. (2)
- Unlikely: An event is possible within the next 10 years—a 10 percent probability of occurring. (1)

The magnitude of each profiled hazard is classified and quantified in the following manner:

- Catastrophic – More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. (4)
- Critical – 25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses resulting in permanent disability. (3)
- Limited – 10-24 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses do not result in permanent disability. (2)
- Negligible – Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid. (1)

The potential speed of onset was classified and quantified in the following manner:

- Less than six hours (4)
- Six to 12 hours (3)
- 13-24 hours (2)
- More than 24 hours (1)

The duration of the hazard was classified and quantified in the following manner:

- More than one week (4)
- Less than one week (3)
- Less than one day (2)
- Less than six hours (1)

After assigning a score to each of the risk elements listed above, a formula is used to determine the score for each hazard. The formula was developed by MitigationPlan.com™:

(Probability x .45) + (Magnitude/Severity x .30) + (Warning Time x .15) + (Duration x .10) = CPRI

Based on the CPRI scores, the hazards were then separated into three categories, as used in the Missouri Hazard Mitigation Plan. Based on the data available and the ranking process provided in the State of Missouri Hazard Mitigation Plan, the hazards adverse impact on the community are ranked based on High, Medium or Low: High (2.5-4.0) Moderate (2.0-2.5) and Low (1.1-1.9).

Data used to determine ranking included the hazard profile, HAZUS data and information gleaned from the State Hazard Mitigation Plan (2007) and Missouri Hazard Analysis (2008). Table 3.4 summarizes the results of the hazard profiles using this methodology.

Table 3.4 Osage County Hazard Profile Summary

Hazard Type	Probability	Magnitude	Warning Time	Duration	CPRI	Planning Priority
Dam Failure- Argyle						
& County:	1	2	4	3	1.95	Low
Cities & Schools:	1	1	4	3	1.65	Low
Drought	1	1	1	4	1.3	Low
Earthquake	2	1	4	4	2.05	Moderate
Extreme Heat	4	4	1	3	3.45	High

Hazard Type	Probability	Magnitude	Warning Time	Duration	CPRI	Planning Priority
Flood – Freeburg, Linn, R-II & R-III:	4	2	4	2	2.9	High
County, Argyle, Chamois, Meta, Westphalia, R-I:	4	2	4	3	3.0	High
Landslide	1	1	4	1	1.45	Low
Land Subsidence/ Sinkholes	1	1	4	3	1.45	Low
Levee Failure – County:	1	2	2	4	1.75	Low
Cities & Schools:	1	1	2	4	1.45	Low
Severe Storm (Hail storm/Wind storm)	4	1	4	1	3.0	High
Tornado	2	2	4	1	2.2	Moderate
Severe Winter Storm	4	1	1	3	2.55	High
Wildfire – County:	4	1	4	2	2.9	High
Cities:	3	1	4	2	2.45	Moderate
Schools:	1	1	4	2	1.55	Low

Sources: Osage County hazard mitigation planning committee, Missouri Hazard Mitigation Plan (2007), Missouri Hazard Analysis (2008)

Developing rankings for each hazard helps the county plan for and prioritize risks. Those hazards ranked as high risk should receive the most attention from preparedness and hazard mitigation planners. Hazard mitigation projects developed by the county should focus first on hazards ranked as High risk. These include extreme heat, flood, severe storm (hail/wind storm), severe winter storm and for the unincorporated areas of the county, wildfire.

3.2.2 Dam Failure

Description

Over the years dam failures have injured or killed thousands of people, and caused billions of dollars of property damage in the United States. Among the most catastrophic were the failures of the Teton Dam in Idaho in 1976, which killed 14 people and caused more than $1 billion in damage, and the Kelly-Barnes Dam in Georgia which left 39 dead and $30 million in property damage. In the past few years, there were over 200 documented dam failures nationwide, that caused four deaths and millions in property damage and repair costs.

The problem of unsafe dams in Missouri was underscored by dam failures at Lawrenceton in 1968, Washington County in 1975, Fredricktown in 1977, and a near failure in Franklin County in 1979. A severe rainstorm and flash flooding in October 1998 compromised about a dozen small, unregulated dams in the Kansas City area. But perhaps the most spectacular and widely publicized dam failure in recent years was the failure of the Taum Sauk Hydroelectric Power Plant Reservoir atop Profitt Mountain in Reynolds County, Mo.

In the early morning hours of December 14, 2005, a combination of human and mechanical error in the pump station resulted in the reservoir being overfilled. The manmade dam around the reservoir failed and dumped over a billion gallons of water down the side of Profitt Mountain, into and through Johnson's Shut-Ins State Park and into the East Fork of the Black River. The massive wall of water scoured a channel down the side of the mountain that was over 600 feet wide and 7,000 feet long that carried a mix of trees, rebar, concrete, boulders and sand downhill and into the park.[i] The deluge destroyed Johnson's Shut-Ins State Park facilities—including the campground—and deposited sediment, boulders and debris into the park. The flood of debris diverted the East Fork of the Black River into an older channel and turned the river chocolate brown. Fortunately the breach occurred in mid-winter. Five people were injured when the park superintendent's home was swept away by the flood, but all were rescued and eventually recovered. Had it been summer, and the campground filled with park visitors, the death toll could have been very high.[ii] This catastrophe has focused the public's attention on the dangers of dam failures and the need to adequately monitor dams to protect the vulnerable.

Despite the significance of the immediate damage done by the Taum Sauk Reservoir dam failure, the incident also highlights the long-term environmental and economic impacts of an event of this magnitude. Four years later, the toll of the flooding and sediment on aquatic life in the park and Black River is still being investigated. Even after the removal of thousands of dump truck loads of debris and mud, the river is still being affected by several feet of sediment left in the park. The local economy, heavily reliant upon the tourism from the park and Black River, has also been hit hard.[iii]

Overall, many of Missouri's smaller dams are becoming a greater hazard as they continue to age and deteriorate. While hundreds of them need to be rehabilitated, lack of available funding and often questions of ownership loom as obstacles difficult to overcome.[iv]

Hazard Characteristics

A dam is defined by the National Dam Safety Act as an artificial barrier which impounds or diverts water and: (1) is more than six feet high and stores 50 acre feet or more, or (2) is 25 feet or more high and stores more than 15 acre feet. Based on this definition, there are over 80,000 dams in the United States. Over 95 percent are non-federal, with most being owned by state governments, municipalities, watershed districts, industries, lake associations, land developers, and private citizens. Dam owners have primary responsibility for the safe design, operation and maintenance of their dams. They also have responsibility for providing early warning of problems at the dam, for developing an effective emergency action plan, and for coordinating that plan with local officials. The State has ultimate responsibility for public safety, and many states regulate construction, modification, maintenance, and operation of dams, and also ensure a dam safety program. Dams can fail for many reasons. The most common are:

1. **Piping:** internal erosion caused by embankment leakage, foundation leakage and deterioration of pertinent structures appended to the dam.
2. **Erosion:** inadequate spillway capacity causing overtopping of the dam, flow erosion, and inadequate slope protection.
3. **Structural Failure:** caused by an earthquake, slope instability or faulty construction.[v]

Dam construction varies widely throughout the state. A majority of dams are of earthen construction. Missouri's mining industry has produced numerous tailing dams for the surface disposal of mine waste. These dams are made from mining material deposited in slurry form in an impoundment. Other types of earthen dams are reinforced with a core of concrete and/or asphalt. The largest dams in the state are built of reinforced concrete and are used for hydroelectric power.[vi]

According to the Missouri State Hazard Mitigation Plan, as of July 2003, Missouri had 4,100 recorded dams. This is the largest number of manmade dams of any state, due mainly to the topography of the state that allows lakes to be built easily and inexpensively. Of these 4,100, only about 620 fall under state regulations, while another 85 dams are under federal control.

According to Stanford University's National Performance of Dams Program, there were 72 dam incidents in Missouri between 1975 and 2001. Of these 72 incidents, 16 were classified as dam failures.[vii]

Missouri's Department of Natural Resources (MDNR) Water Resources Center maintains a Dam and Reservoir Safety Program. The objective is to ensure that dams are safely constructed, operated and maintained pursuant to Chapter 236 Revised Statutes of Missouri. Under that law, a dam must be 35 feet or higher to be state regulated. These dams are surveyed by state inspectors at least every five years. However, most Missouri dams are less than 35 feet high and so are not regulated. The state encourages dam owners to inspect unregulated dams, but the condition of these dams may be substandard.[viii]

The hazard potential for dam failure is classified by the Interagency Committee on Dam Safety by the following three definitions:

- Low Hazard Potential: Failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.
- Significant Hazard Potential: Failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities or other impacts. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
- High Hazard Potential: Failure or mis-operation will probably cause loss of human life.

Likely Locations

According to the Missouri Spatial Data Information Services (MSDIS), based on information provided to MSDIS by the Missouri Department of Natural Resources, Water Resources Center (MDNR-WRC), there are a total of 21 dams located in Osage County. The majority are privately owned. One of the dams, Ben Branch Dam, is greater than 34 feet in height and so is regulated by the state. Twelve dams in the county are rated as high risk dams. This means that a failure of the dam could result in not only property losses but injuries and deaths. Of the remaining dams, one is rated a significant hazard. This means that a failure of the dam could result in significant property damage. The remaining eight are rated as low risk hazards, which means a failure would likely not result in significant property damages and no injuries or deaths. All of the dams

registered with the Missouri Department of Natural Resources (MDNR) and their dam height, lake area and hazard risk are listed in Table 3.5. The non-regulated dams vary in height from 23 to 33 feet. Figure 3-2 is map of the dams in Osage County that also categorizes the dams by hazard risk.

Table 3.5 Osage County Dams

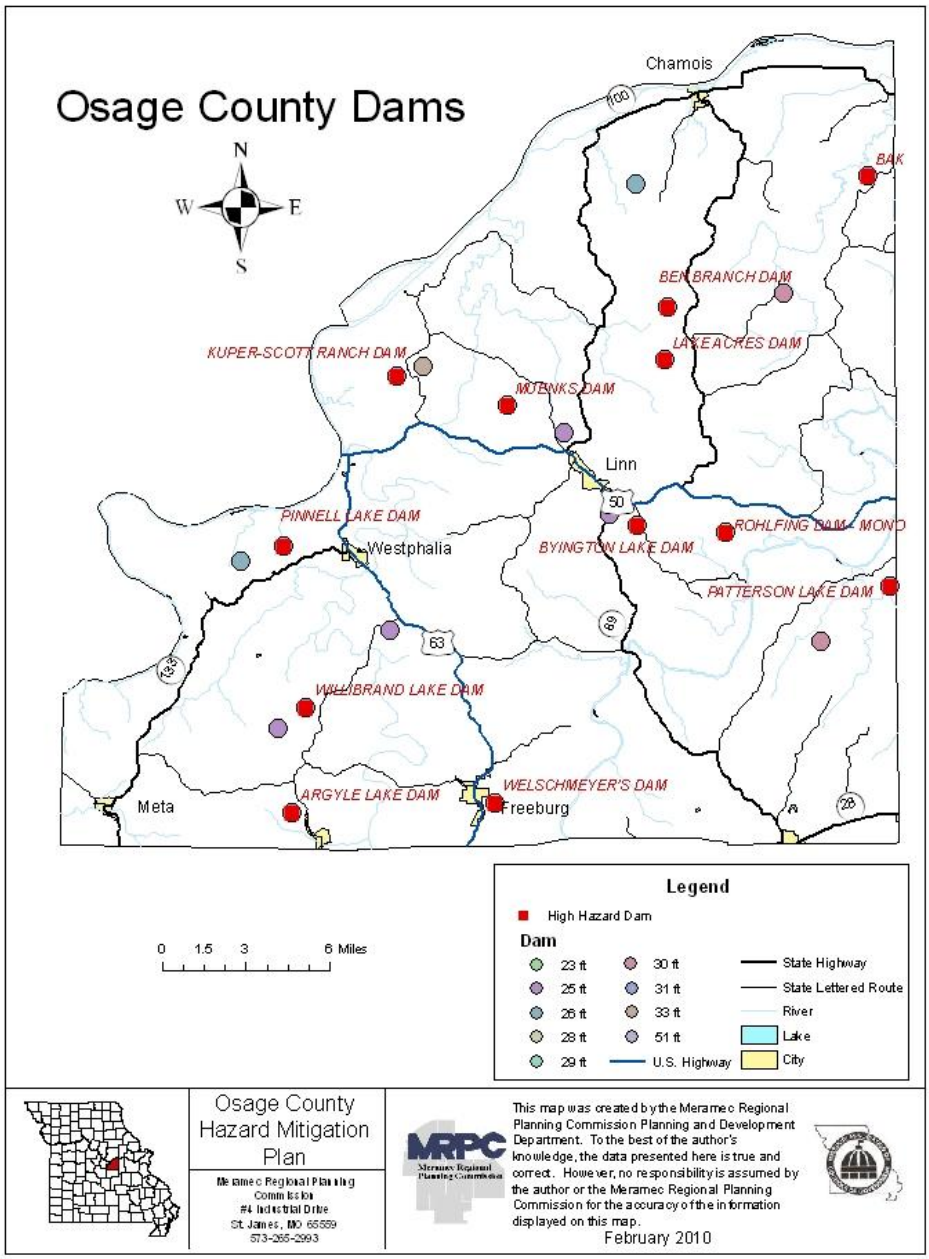
Name of Dam	Dam Height (feet)	Lake Area (acres)	Hazard Risk
Argyle Lake Dam	25	12	High
Baker Dam	25	4	High
Baumhoer Lake Dam	26	3	Low
Ben Branch Dam	51	44	High
Byington Lake Dam	33	9	High
College Hill Dam	30	12	Low
Dill. Lee Dam	25	4	Low
Franken Lake Dam	25	9	Low
Hug Dam	26	8	Low
JGF Farms Dam	25	4	Low
Kuper-Scott Ranch Dam	25	5	High
Lake Acres Dam	30	9	High
Lake Isabell Dam	30	3	Low
Luecke Lake Dam	25	6	Low
Muenks Dam	29	5	High
Patterson Lake Dam	31	10	High
Pinnell Lake Dam	25	8	High
Rohlfing Dam – Mononame 408	23	6	High
Scott Lake Dam	33	12	Significant
Welschmeyer's Dam	28	5	High
Willibrand Lake Dam	25	25	High

Source: Osage County Emergency Operations Plan and Missouri Department of Natural Resources – website: http://www.dnr.mo.gov/env/wrc/damsft/Crystal_Reports[ix]

An insufficiency exists in the data for dams in Osage County. Although there are topographical and aerial photography maps available, no information on failed dam inundation areas exists. Topographic and aerial photographic maps were studied and compared to try to illustrate the likely areas that would be affected. However, until better data can be developed and confirmed, the information illustrated in Figures 3-3 through 3-5 should be considered a representation of potential impact areas. The county will continue to strive to improve the data on dam inundation.

The 12 dams rated as high hazard are Argyle Lake Dam, Baker Dam, Ben Branch Dam, Byington Lake Dam, Kuper-Scott Ranch Dam, Lake Acres Dam, Muenks Dam, Patterson Lake Dam, Pinnell Lake Dam, Rohlfing Dam– Mononame 408, Welschmeyer's Dam and Willibrand Lake Dam. Many of these high hazard dams have structures or infrastructure located below the dam. The aerial maps included in Figures 3-3 through 3-5 better illustrate the impact areas should any of these dams fail and show the high hazard dams and the probable impact area should the dam fail. This impact area has been drawn in, based on analysis of topographic maps and aerial photos.

Figure 3-2



Five high hazard dams are located in the northern portion of the county. All are located in rural, unincorporated areas. Baker Dam is located southwest of the community of Morrison. There are several homes located in the vicinity of the dam that could be damaged should the dam fail. In addition, a dam failure might damage County road 251 and possibly affect State Road N to the west. Ben Branch Dam is located in the north central part of the county and is part of Ben Branch Lake Conservation Area, owned and operated by the Missouri Department of Conservation.

Should this dam fail it would inundate mostly farmland. There are a small number of homes and farm structures located below the dam that would be affected. The closest home is approximately .5 mile away, with the next structure located .77 miles away. Two county roads might also be damaged. County Road 312 lies approximately 1.5 miles below the dam in the estimated inundation zone. County Road 313 lies approximately 1.8 miles below the dam. It is also possible, depending on the severity of the failure, that Highway 100 might be impacted. It crosses the inundation zone approximately 2.5 miles below the dam.

Lake Acres Dam is located approximately 1.8 miles south of Ben Branch Lake Dam. A failure of Lake Acres Dam would certainly impact County Roads 311 and 311A. There is a residence near the dam that might be impacted, as well as several agricultural structures located immediately below the dam. Otherwise, a failure would affect cropland and some forested land. Muenks Dam is located 1.5 miles north of Highway 50 and 2.6 miles west of Highway 100. A residence is located approximately .27 miles from the dam near the inundation zone and may be affected. Outbuildings near the home would likely be impacted by a failure as well. Another farm, including a home and outbuildings is located approximately .7 miles below the dam and might also be affected by a dam failure.

Kuper-Scott Ranch Dam is located west of Muenks Dam. Approximately two miles north of the community of Loose Creek, which is located on Highway 50. The area is unincorporated, but has several housing developments located within a mile of the dam. It appears that the homes most likely to be affected by a dam failure would be located immediately south and west of the Kuper-Scott Ranch Lake. State Road A might also be impacted, as well as several private driveways. Figure 3-3 illustrates these five high hazard dams located in the northern part of Osage County as well as the likely inundation zones.

There are three high hazard dams on the southeast portion of the county. Byington Lake Dam is located approximately .75 miles south of Highway 50 and Linn State Technical College, and .17 miles west of State Road CC. There are at least four homes that are within 300 yards of the dam and located within the potential inundation zone and additional homes further south of the dam that could be impacted. . State Road CC might also be impacted by a failure of the Byington Lake Dam, along with several private roads leading to homes in the area. Rohlfing Dam – Mononame 408 lies approximately 3 miles east of Byington Lake Dam, 1.25 miles south of Highway 50 and adjacent to County Road 810. Several homes lie in the potential inundation zone for this dam. One home is located less than 50 yards below the dam. The next closest is approximately 250 yards south of the lake. County Road 810 would certainly sustain damage if the dam failed, as would several private roads providing access to homes. Patterson Lake Dam is located .8 of a mile southeast of Cooper Hill and within .1 mile of the Gasconade County border. The lake lies adjacent to County Road 731. This dam is located in a rural area. If it were to fail, the flood water would flow approximately .25 mile to a tributary of the Gasconade River. There appear to be at least two homes located within 150 yards below the dam, as well as several other farm structures which would all be in danger if a catastrophic failure occurred. County Road 731 would also likely sustain damage. Figure 3-4 illustrates these three high hazard dams.

Figure 3-3

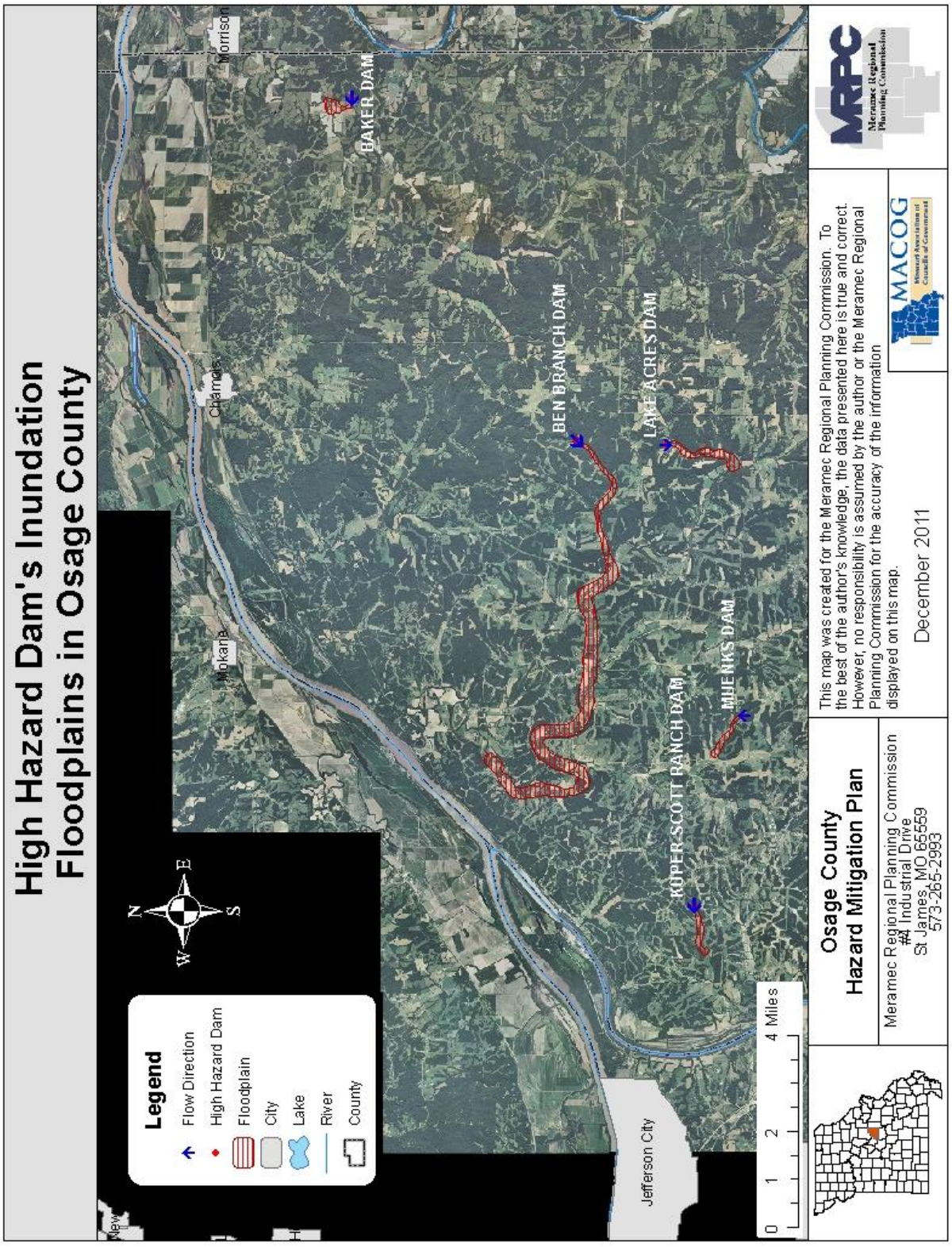

High Hazard Dam's Inundation
Floodplains in Osage County
Legend
Flow Direction
High Hazard Dam
Floodplain
City
Lake
River
County
N
E
S
W
0 1 2 4 Miles
Morrison
Chamois
Mokane
Jefferson City
BAKER DAM
BEN BRANCH DAM
LAKE ACRES DAM
MUENKS DAM
KUPERSCOTT RANCH DAM
Osage County
Hazard Mitigation Plan
Meramec Regional Planning Commission
#4 Industrial Drive
St James, MO 65559
573-265-2993
This map was created for the Meramec Regional Planning Commission. To the best of the author's knowledge, the data presented here is true and correct. However, no responsibility is assumed by the author or the Meramec Regional Planning Commission for the accuracy of the information displayed on this map.
December 2011
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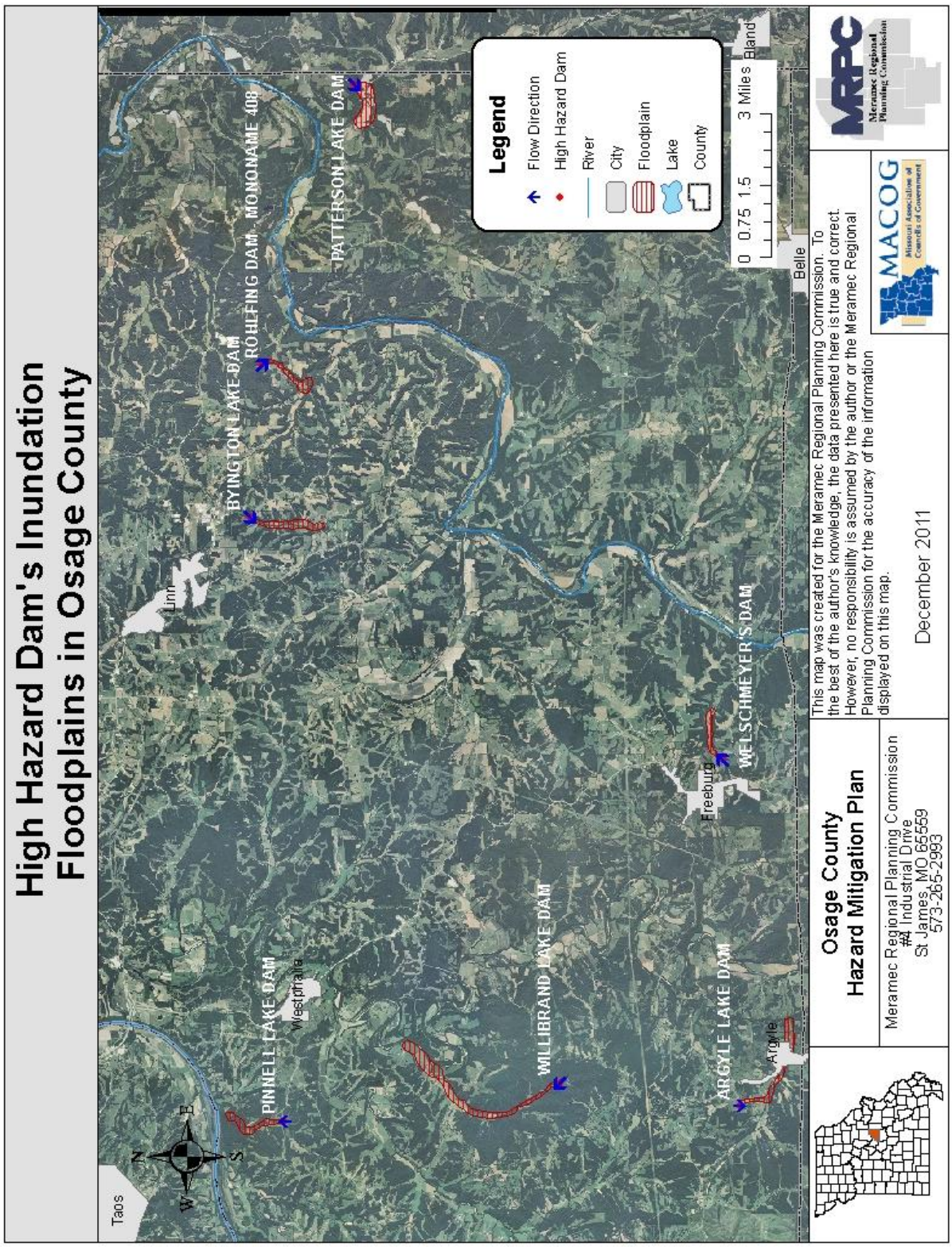
Figure 3-4


High Hazard Dam's Inundation
Floodplains in Osage County
Legend
Flow Direction
High Hazard Dam
River
City
Floodplain
Lake
County
0 0.75 1.5 3 Miles
PINNELL LAKE DAM
WILLIBRAND LAKE DAM
ARGYLE LAKE DAM
BYINGTON LAKE DAM
ROHLFING DAM
MONONAME 408
PATTERSON LAKE DAM
WELSCHMEYER'S DAM
Taos
Westphalia
Linn
Freeburg
Argyle
Belle
Bland
N
S
E
W
Osage County
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Pinnell Lake Dam is located approximately two miles west of Westphalia, just south of County Road 503. If this dam were to fail, County Road 503 would certainly be impacted. The road is less than 50 yards below the dam. Although there are some homes north of the dam, it appears that they lie outside the inundation zone. There are, however, some outbuildings, forest land and cropland that would likely be impacted. Willibrand Lake Dam is located .42 miles west of State Road T, approximately 2.5 miles north of the community of Koeltztown. The inundation zone is empty of structures or public roads for 1.8 miles before reaching a farm located off of County Road 512. The only other impacts would be on mostly forested and some pasture land. Argyle Lake Dam is located approximately one mile northwest of the community of Argyle and .42 miles east of State Road T. The first farm located within the inundation zone is approximately .5 miles from the dam. A home and several outbuildings could be affected, as well as cropland and pasture. Argyle Dam is the one high hazard dam in the county that may have the potential to affect a community. The inundation zone for the dam intersects with the city boundary of Argyle approximately one mile from the lake. It appears that the water would likely flow down a stream bed and affect few homes or businesses. State Road T, which runs through Argyle, may also be impacted if the dam should fail. Welschmeyer's Dam is located less than one half mile east of the city of Freeburg and .17 miles north of County Road 636. The likely inundation zone runs almost due east of the site, however and will not have any impact on the village of Freeburg. There are two farms located near the inundation zone, but it is not likely that they would be affected if the dam should fail. The closest one is approximately .5 miles from the dam. The next closest structures are approximately one mile down the inundation zone. One private road might be affected if the dam should fail. Figure 3-5 illustrates these four dams.

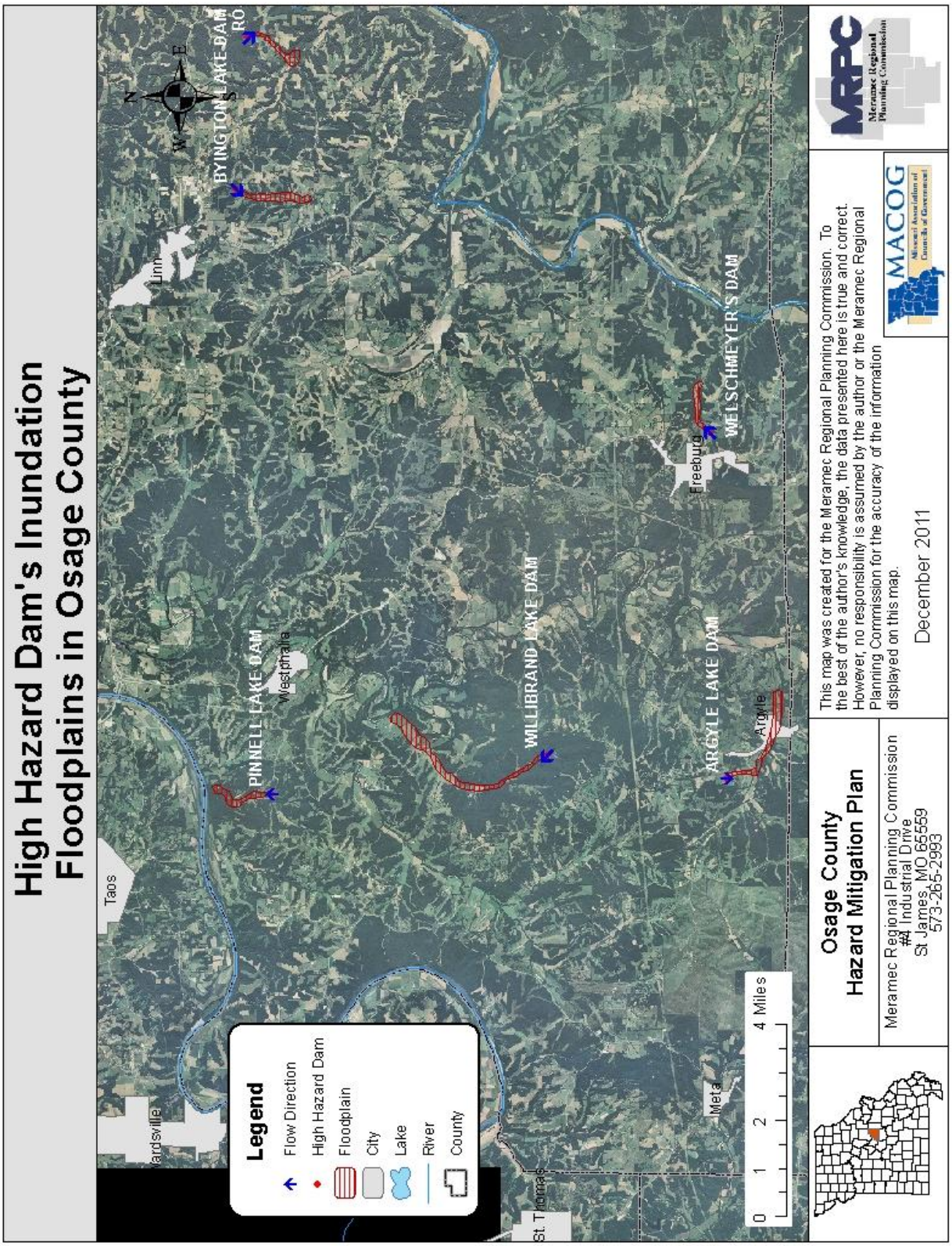
The majority of the dams located in Osage County are on small farm lakes and not a serious threat. However, two of the high hazard dams are on larger lakes. The high hazard dams that serve lakes of 25 acres of surface area or more include Willibrand Lake with 25 acres and Ben Branch Lake with 44 acres of surface area.

Based on the locations of the dams in Osage County, and in particular the high hazard dams, the jurisdictions most vulnerable to dam failure are the Village of Argyle and unincorporated areas of Osage County. The only affect any dam failures might cause any other jurisdictions, including school districts, would be possible damage to some roads and/or bridges that might result in adjustments made to travel or bus routes. In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions, there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts.

Type of Damage

Dam failure leads to the cascading emergency of flash flooding. When a dam fails, the pent-up water can be suddenly unleashed and have catastrophic effects on life and property downstream. Homes, bridges and roads can be demolished in minutes. There have been at least 27 recorded dam failures in 20 Missouri counties in the last 100 years. Fortunately, only one drowning has been associated with a dam failure in the state[x], and until the Taum Sauk Reservoir dam failure,

Figure 3-5


High Hazard Dam's Inundation
Floodplains in Osage County
Legend
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High Hazard Dam
Floodplain
City
Lake
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County
0 1 2 4 Miles
PINNELL LAKE DAM
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ARGYLE LAKE DAM
WELSCHMEYER'S DAM
BYINGTON LAKE DAM
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there had previously been little consequence to property. The Taum Sauk Reservoir breach destroyed a state park and cost millions to remediate, with cleanup actions still on-going.

Hazard Event History

Out of 21 dams in the county, 12 are rated as high risk and one is rated as significant risk. While dam failure is a disaster that has never occurred in Osage County or any of its jurisdictions, there is one dam near the Village of Argyle that could cause property damage if it failed and eleven additional dams located in the county with the potential to cause property losses if they are not properly maintained. All of the high hazard dams are classified as high hazard because of homes and or businesses that are located below these dams and most of them have the potential to damage roadways.

Statement of Severity/Magnitude

For the Village of Argyle and portions of Osage County – Limited (2) – 10-24 percent of property severely damaged; shutdown of facilities for more than a week; and /or injuries/illnesses do not result in permanent disability. Because there is a high hazard dam located near Argyle with an estimated inundation zone that transects the southern part of the community, we have given the Village of Argyle, as well as the county, a higher rating than the rest of the jurisdictions. Roads, bridges and homes could be damaged if a catastrophic dam failure occurred.

For the cities of Chamois, Freeburg, Linn, Meta and Westphalia and the Osage County R-I, R-II and R-III - Negligible (1) - Injuries and/or illnesses are treatable with first aid; minor quality of life lost; shutdown of critical facilities and services for 24 hours or less; less than 10 percent of property is severely damaged. None of these jurisdictions have critical facilities that would be affected by a failure of any of the high hazard dams in the county.

Statement of Probable Likeliness of Future Occurrence

Unlikely (1) – Event is possible within the next 10 years; event has up to one in 10 years chance of occurring; history of events is less than or equal to 10 percent likely per year. As there have been no dam failures in Osage County, the probability of a future occurrence is unlikely in the foreseeable future.

Warning Time and Duration

The speed with which a dam may fail depends mainly upon the cause of the failure. A dam may fail in a matter of a few minutes or the process may takes days, weeks or months. Because of this warning time can vary radically from incident to incident. If there is a catastrophic failure of a large dam, there could be very little or no warning for people living in the impact area. Based on history, warning time is typically less than six hours. The duration of the event will depend on quickly and completely the dam fails and the volume of water being held back by the dam. Generally the duration will be less than one week.

Probable warning time of less than 6 hours (4). Duration of less than a week (3).

Statement of Next Disaster's Likely Adverse Impact on the Community

A dam failure in Osage County would have little impact on the daily operations of the county or the majority of the communities. Families living near the dam may experience washed out roadways or possibly even a demolished home. The possible exception to this would be the Village of Argyle where a dam failure could directly or indirectly affect some homes and businesses. Although the Taum Sauk Reservoir incident had a great impact on the local economy of that area, there are no dams in Osage County that are economically significant enough to have a similarly adverse economic impact. Ben Branch Lake, the largest lake in Osage County, is the centerpiece of a public use area owned and operated by the Missouri Department of Conservation. Failure of this dam would not result in economic problems for residents of the area.

Recommendation

Encourage land use management practices to decrease the potential for damage from a dam collapse, including the discouragement of development in areas with the potential for sustaining damage from a dam failure. Install public education programs to inform the public of dam safety measures and preparedness activities. Offer training programs for dam owners to encourage them to inspect their dams and so that they may learn how to develop and exercise emergency action plans.

Hazard Summary – Dam Failure – Village of Argyle, Osage County

Calculated Priority Risk Index	Planning Priority
1.95	Low

Hazard Summary – Dam Failure – Cities of Chamois, Freeburg, Linn, Meta, Westphalia, Osage County R-I, R-II and R-III School Districts

Calculated Priority Risk Index	Planning Priority
1.65	Low

3.2.3 Drought

Description

Drought is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. Drought is a temporary aberration; it differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate.

Drought is an insidious hazard of nature. Although it has scores of definitions, it originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as "normal". It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal

crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity.

Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event (less precipitation than expected resulting from natural climatic variability) and the demand people place on water supply. Human beings often exacerbate the impact of drought. Recent droughts in both developing and developed countries and the resulting economic and environmental impacts and personal hardships have underscored the vulnerability of all societies to this "natural" hazard.[xi]

Hazard Characteristics

Drought is not limited to a hazard that affects just farmers, but can extend to encompass the nation's whole economy. Its impact can adversely affect a small town's water supply, the corner grocery store, commodity markets and a big city's tourism. On average, drought costs the U.S. economy about $7 billion to $9 billion a year, according to the National Drought Mitigation Center. The dictionary definition of drought is a period of prolonged dryness. Current drought literature commonly distinguishes between three "categories" of drought, all of which define drought in simplified terms:

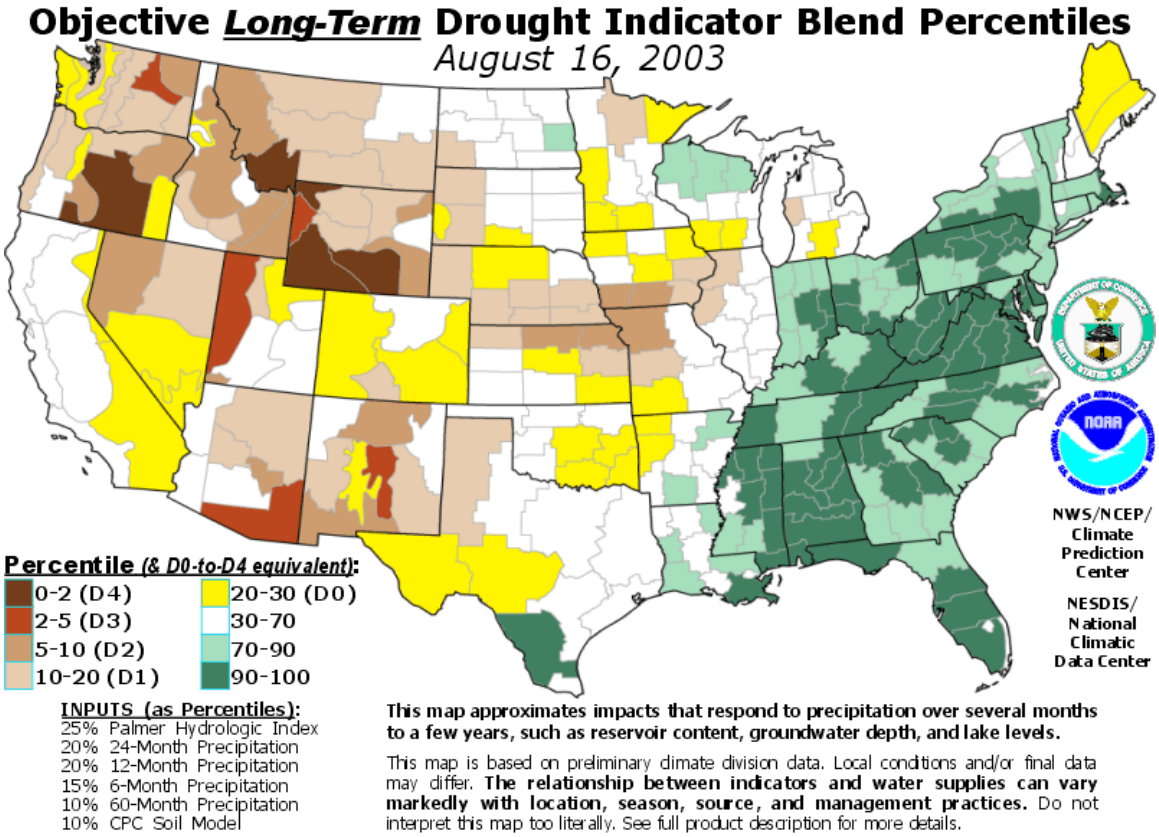
1. **Agricultural Drought**, defined by soil moisture deficiencies.
2. **Hydrological Drought**, defined by declining surface and groundwater supplies, and
3. **Meteorological Drought**, defined by precipitation deficiencies.

Each of these definitions relates the occurrence of drought to water shortfall in some component of the hydrological cycle. Each affects patterns of water and land use, and each refers to a repetitive climatic condition. In urban areas, drought can affect those communities dependent on reservoirs for their water, as decreased water levels due to insufficient rain can lead to the restriction of water use. In agricultural areas, drought during the planting and growing season can have a significant impact on yield. To take the definition of drought even further, the U.S. Government definition of an agricultural drought incorporates specific parameters based upon historical records. Agricultural drought is "a combination of temperature and precipitation over a period of several months leading to a substantial reduction in yield (bushels per acre) of one or more of the three major food grains (wheat, soybean, corn). A substantial reduction is defined as a yield (bushels per acre) less than 90 percent of the yield expected with temperature/ precipitation equal to long term average values."

Regardless of the specific definition, droughts are difficult to predict or forecast both as to when they will occur, and how long they will last. According to Dr. Grant Darkow, Department of Atmospheric Science, University of Missouri-Columbia, there is a recognizable "upper air flow pattern and simultaneous surface pattern associated with abnormal dryness over Missouri." When the upper airflow pattern is typified by air flowing in a broad arc over the central plains with higher speeds in southern Canada than over the U.S., then the air over the southern plains will be "characterized by a weak clockwise circulation." "Storm systems coming off the Pacific Ocean" will cross the extreme northwestern states and southern Canada, thus bypassing the

Midwestern states. When this flow pattern persists, the result can be a prolonged period of drought.[xii]

Figure 3-6



Likely Locations

All areas and jurisdictions in Osage County are susceptible to drought, but particularly cities where thousands of residents are served by the same source of water. These cities use deep hard rock wells that are 1,100 to 1,800 feet deep and can experience drought when recharge of these wells is low. However, rural residences with individual wells will likely also be affected.

Type of Damage

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to our ability to produce goods and provide services.

Impacts are commonly referred to as direct or indirect. Reduced crop, rangeland and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of direct impacts. The consequences of these impacts illustrate indirect impacts. For example, a reduction in crop, rangeland, and forest productivity may result in reduced income for farmers and agribusiness,

increased prices for food and timber, unemployment, reduced tax revenues because of reduced expenditures, increased crime, foreclosures on bank loans to farmers and businesses, migration, and disaster relief programs. Direct or primary impacts are usually biophysical. Conceptually speaking, the more removed the impact from the cause, the more complex the link to the cause. In fact, the web of impacts becomes so diffuse that it is very difficult to come up with financial estimates of damages. The impacts of drought can be categorized as economic, environmental, or social.

Not all impacts of drought are negative. Some agricultural producers outside the drought area or with surpluses benefit from higher prices, as do businesses that provide water-related services or alternatives to water-dependent services; these types of businesses were among the "winners" in the 1987–89 U.S. drought.

Many economic impacts occur in agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to obvious losses in yields in both crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and diseases to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk.

Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Reduced income for farmers has a ripple effect. Retailers and others who provide goods and services to farmers face reduced business. This leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue for local, state, and federal government. Less discretionary income affects the recreation and tourism industries. Prices for food, energy, and other products increase as supplies are reduced. In some cases, local shortages of certain goods result in the need to import these goods from outside the stricken region. Reduced water supply impairs the navigability of rivers and results in increased transportation costs because products must be transported by rail or truck.

Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

Social impacts mainly involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many of the impacts specified as economic and environmental have social components as well. Population

out-migration is a significant problem in many countries, often stimulated by greater availability of food and water elsewhere. Migration is usually to urban areas within the stressed area or to regions outside the drought area; migration may even be to adjacent countries, creating refugee problems. However, when the drought has abated, these persons seldom return home, depriving rural areas of valuable human resources necessary for economic development. For the urban area to which they have immigrated, they place ever-increasing pressure on the social infrastructure, possibly leading to greater poverty and social unrest.[xiii]

Hazard History

Missouri's average annual rainfall ranges from about 34 inches in the northwest to about 48 inches in the southeast. Even the driest areas of Missouri have enviable rainfall, compared to most western states. But lack of rainfall impacts certain parts of the state more than others because of alternate sources and usage patterns. Most of the southern portions of Missouri are less susceptible to problems caused by prolonged periods of non-rain, since there are abundant groundwater resources. Even with decreased stream flow or lowered reservoir levels, groundwater is still a viable resource in southern Missouri. Row-crop farming is not extensive and therefore agricultural needs aren't as great as in other parts of the state. The only exception is in the southwestern and southeastern areas where irrigation is used.[xiv]

According to the National Climatic Data Center and the Missouri Department of Natural Resources, there have been five drought events reported for Osage County. The first three separately reported events were actually all related and occurred between 1999 and 2000. The second two – February 2006 and October 2007 were much milder and were also related.

Drought of 1999-2000. Most of Missouri was in a drought condition during the last half of 1999, along with other states in the Midwest and the nation. The dryness did not begin to evolve until July 1999, but rapidly developed into a widespread drought by September. At that time, Missouri was placed under a Phase I Drought Advisory level by the Department of Natural Resources (DNR), and Governor Carnahan declared an Agricultural Emergency for the entire State. Agricultural reporting showed a 50 percent crop loss from the drought in 50 counties, with severe damage to pastures for livestock, corn crops, and Missouri's top cash crop—soybeans. On Oct. 13, 1999, U.S. Agriculture Secretary Dan Glickman declared all Missouri counties agricultural disaster areas, making low-interest loans available to farmers in Missouri and contiguous states. The drought intensity increased through autumn and peaked at the end of November 1999. In fact, the five-month span between July and November became the second driest July-November period in Missouri since 1895, averaging only 9.38 inches of rain.

A wetter than normal winter diminished dry conditions in central and southern Missouri, but long-term moisture deficits continued to exist. At the same time, the remainder of the state (roughly north of the Missouri River) continued under drought conditions. Overall dry conditions returned through much of the state in March 2000, and costly wildfires and brush fires (70) erupted in many counties. By May, the entire state was under a Phase II Drought Alert level, and on May 23, 2000, then Gov. Mel Carnahan announced activation of the Missouri Drought Assessment Committee (DAC), made up of state and federal agencies and chaired by the director of the Missouri Department of Natural Resources. At a May 25th meeting, the DAC selected a subcommittee (guided by the Missouri Drought Response Plan) to determine the drought status

of each county. Based on observations across the state and projections of future rainfall, the committee in June upgraded the drought status for 27 northern Missouri counties to Phase III, Conservation. This was based on concerns for water supplies and agricultural impacts. The City of Milan in Sullivan County was among the most severely affected for water supplies. In June, a total of 80 Missouri counties remained under the Phase II alert level, while seven counties in Southeast Missouri (Butler, Dunklin, Mississippi, New Madrid, Pemiscot, Scott and Stoddard) remained under Phase I advisory conditions.

By mid-July 2000, some areas of northern Missouri benefited from additional rainfall, while drier conditions prevailed in other areas. At its July 12, 2000 meeting, the DAC revised its assessment, placing 30 counties under Phase III Conservation, including Osage County and nine other counties in the south central area. The remaining 84 counties in the state were all under Phase II, Drought Alert. This included seven counties in northern Missouri downgraded from Phase III Conservation, and seven counties in Southeast Missouri previously assessed as Phase I, Advisory. To ease the agricultural impact of the drought during the summer months, Gov. Carnahan gained release of over 1 million acres from the Conservation Reserve Program (CRP) to allow farmers and ranchers in 21 counties an additional source to cut hay for livestock feed. Also, livestock producers in 16 counties were released from CRP contracts to allow cattle grazing on certain idle lands.[xv] Total crop damages from the 1999-2000 drought were estimated at $660,000 for the entire state.[xvi]

The event of 2006-2007 was far milder, with a drought alert being issued during February 2006 and again in October 2007, but no significant damage occurred. Other than the more severe circumstances of 1999-2000, drought has historically not been a hazard in Osage County. Large amounts of groundwater resources make this region of the state less susceptible to drought conditions, however prolonged lack of rainfall could result in a more serious drought event.

Seasonal Pattern

Drought can be caused by both lack of rain during the spring, summer and fall and lack of snow during the winter months because both are necessary for the recharging of groundwater sources. The driest months are typically January and February.

Speed of Onset and Existing Warning Systems

Drought is a hazard that evolves slowly and may not cause danger for months or years. Warning systems are important to drought conditions as city and county officials must inform residents of water conservation efforts or provide other information about the drought emergency.

Warning Time and Duration

A drought evolves slowly and can last for months or even years. Probable warning time of more than 24 hours (1). Duration of more than one week (4).

Statement of Severity/Magnitude

Negligible (1) - Injuries and/or illnesses are treatable with first aid; minor quality of life lost; shutdown of critical facilities and services for 24 hours or less; less than 10 percent of property is severely damaged. Because of its geographical location and characteristic weather patterns, Missouri is vulnerable to drought conditions. According to the Missouri State Hazard Mitigation Plan, in regards to drought susceptibility, Osage County is located in Region B which is

considered moderately susceptible to drought. Groundwater resources are adequate to meet domestic and municipal water needs and the topography is generally unsuitable for row-crop irrigation. Based on historical information, future drought events in Osage County will most likely have a negligible effect on residents.

Statement of Probable Risk/Likeliness of Future Occurrence

Unlikely (1) – Event is possible within the next 10 years; event has up to one in 10 years chance of occurring; history of events is less than or equal to 10 percent likely per year. In the past decade, Missouri has experienced drought conditions that have affected a large portion of the state. Future occurrence of mild drought in Osage County is likely but severe drought is very unlikely.

Statement of Next Disaster's Likely Adverse Impact on the Community

The next drought to affect Osage County will likely have no or little impact on the daily activities of Osage County residents and businesses. If a major drought should occur, farmers may suffer low crop yields and/or have difficulty finding adequate pasture for livestock.

Recommendation

All cities and the county commission should adopt water conservation ordinances that limit the amount of water that residents may use during a period of drought. The county and its sectors should develop water monitoring plans as an early warning system. Each sector should inventory and review their reservoir operation plans. A water conservation awareness program should be presented to the public either through pamphlets, workshops or a drought information center. Voluntary water conservation should be encouraged to the public. The county and its jurisdictions should continually look for and fund water system improvements, new systems and new wells.

Hazard Summary – Drought – All Jurisdictions in Osage County

Calculated Priority Risk Index	Planning Priority
1.3	Low

3.2.4 Earthquake

Description

Earthquakes can be defined as shifts in the earth's crust causing the surface to become unstable. This instability can manifest itself in intensity from slight tremors to large shocks. The duration can be from a few seconds up to five minutes. The period of tremors (and shocks) can last up to several months. The larger shocks can cause ground failure, landslides, liquefaction, uplifts and sand blows.

The earth's crust is made up of gigantic plates, commonly referred to as tectonic plates. These plates form what is known as lithosphere and vary in thickness from 6 1/2 miles (beneath oceans) to 40 miles (beneath mountain ranges) with an average thickness of 20 miles. These plates "float" over a partly melted layer of crust called the athenosphere. The plates are in motion and where a plate joins another, they form boundaries. Where the plates are moving toward each

other is called convergent plate boundary and when they are moving away from each other is called a divergent plate boundary. The San Andreas Fault in California is a horizontal motion boundary, where the Pacific plate is moving north while the North American plate is moving west. These movements release built up energy in the form of earthquakes, tremors and vulcanism (volcanoes). Fault lines such as the San Andreas come all the way to the surface and can be readily seen and identified. There are fault lines that do not come all the way to the surface, yet they can store and release energy when they adjust. Many of the faults in the Central United States can be characterized this way.

The subterranean faults were formed many millions of years ago on or near the surface of the earth. Subsequent to that time, these ancient faults subsided, while the areas adjacent were pushed up. As this fault zone (also known as a rift) lowered, sediments then filled in the lower areas. Under pressure, they hardened into limestones, sandstones, and shales - thus burying the rifts. With the pressures on the North Atlantic ridge affecting the eastern side of the North American plate and the movements along the San Andreas Fault by the Pacific plate, this pressure has reactivated the buried rift(s) in the Mississippi embayment. This particular rift system is now called the Reelfoot Rift.

There are eight earthquake source zones in the Central United States, two of which are located within the state of Missouri—the New Madrid Fault and the Nemaha Uplift. Other zones, because of their close proximity, also affect Missourians. These are the Wabash Valley Fault, Illinois Basin, and the Nemaha Uplift. The most active zone is the New Madrid Fault, which runs from Northern Arkansas through Southeast Missouri and Western Tennessee and Kentucky to the Illinois side of the Ohio River Valley.

The Nemaha Uplift is of concern to Missourians because it runs parallel to the Missouri/Kansas border from Lincoln, NE to Oklahoma City, OK. Its earthquakes are not as severe as the historic New Madrid fault zone, but there have been several earthquakes that have affected the Missouri side of the line.[xvii]

Type of Damage

Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated landfill and other unstable soil, and trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage.[xviii]

The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction. Although numerous intensity scales have been developed over the last several hundred years to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli (MM) Intensity Scale. It was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to

catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects.

The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects actually experienced at that place. After the occurrence of widely-felt earthquakes, the Geological Survey mails questionnaires to postmasters in the disturbed area requesting the information so that intensity values can be assigned. The results of this postal canvass and information furnished by other sources are used to assign an intensity within the felt area. The maximum observed intensity generally occurs near the epicenter.

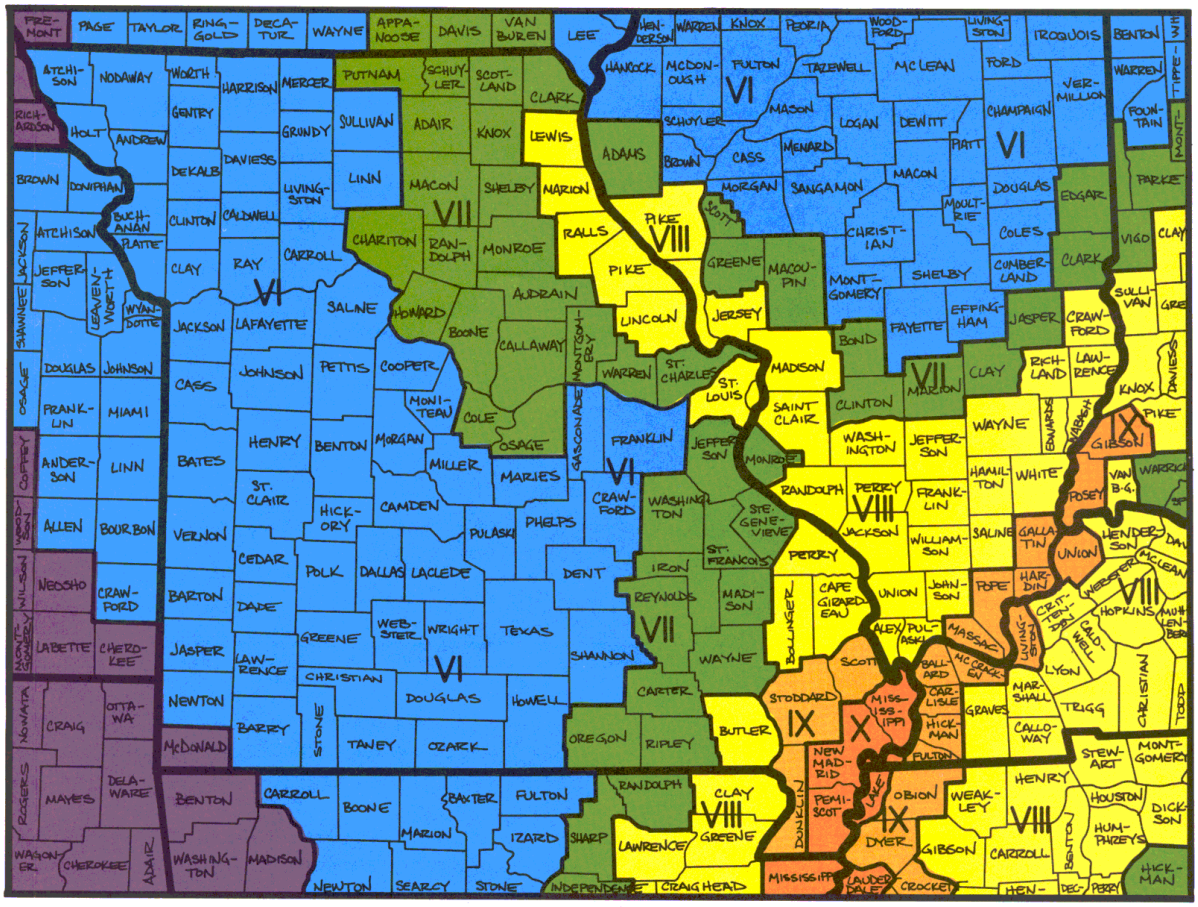
The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of VIII or above. The following Table 3.6 is an abbreviated description of the Modified Mercalli Scale. Figure 3-7 shows the Modified Mercalli Intensity Scale overlaid on the State of Missouri.

Table 3.6 Modified Mercalli Intensity (MMI) Scale

MMI	Felt Intensity
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.[xix]

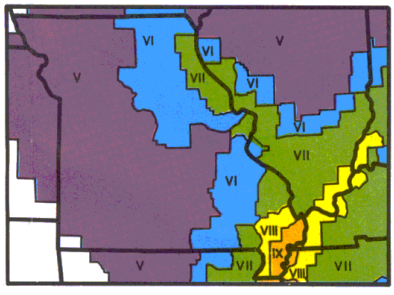
Figure 3-7

PROJECTED EARTHQUAKE INTENSITIES



This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

6.7

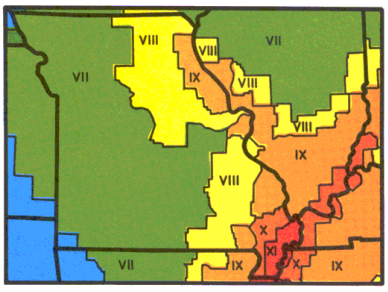


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 6.7 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

7.6

This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 8.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

8.6



Source: Missouri State Emergency Management Agency website: http://sema.dps.mo.gov

Large earthquakes in Missouri could trigger additional hazards such as soil liquefaction, lateral spreading, landslides and sinkhole collapse – specifically in the karst topography present in much of southeast Missouri. Liquefaction is a site soil response to strong earthquake ground motion. Strong earthquake waves cause water pressure to increase within sandy soils, forcing sand grains apart, and the material will behave as a dense liquid. Sandblows form in the areas where liquefied sand is overlain by heavier clay rich silts, causing a geyser-like eruption of sand onto the land surface. Liquefaction causes land to lose its load-bearing capacity, which can lead to differential settlement and associated building foundation failures. Lateral spreading can occur on even gentle slopes and seriously damage buried utilities and road networks. Landslides could be triggered in steep slopes and road cuts through unstable geologic materials, potentially damaging and closing roads and railroads. Earthquakes could exacerbate existing problems and cause landslides where none have occurred before.[xx]

Hazard History

Most of Missouri's earthquake activity has been concentrated in the southeast corner of the state, which lies within the New Madrid seismic zone. The written record of earthquakes in Missouri prior to the nineteenth century is virtually nonexistent; however, there is geologic evidence that the New Madrid seismic zone has had a long history of activity. The first written account of an earthquake in the region was by a French missionary on a voyage down the Mississippi River. He reported feeling a distinct tremor on Christmas Day 1699 while camped in the area of what is now Memphis, TN.

Whatever the seismic history of the region may have been before the first Europeans arrived, after Dec. 16, 1811, there could be no doubt about the area's potential to generate severe earthquakes. On that date, shortly after 2 AM, the first tremor of the most violent series of earthquakes in the United States history struck southeast Missouri. In the small town of New Madrid, about 290 kilometers south of St. Louis, residents were aroused from their sleep by the rocking of their cabins, the cracking of timbers, the clatter of breaking dishes and tumbling furniture, the rattling of falling chimneys, and the crashing of falling trees. A terrifying roaring noise was created as the earthquake waves swept across the ground. Large fissures suddenly opened and swallowed large quantities of river and marsh water. As the fissures closed again, great volumes of mud and sand were ejected along with the water.

The earthquake generated great waves on the Mississippi River that overwhelmed many boats and washed others high upon the shore. The waves broke off thousands of trees and carried them into the river. High river banks caved in, sand bars gave way, and entire islands disappeared. The violence of the earthquake was manifested by great topographic changes that affected an area of 78,000 to 130,000 square kilometers.

On Jan. 23, 1812, a second major shock, seemingly more violent than the first, occurred. A third great earthquake, perhaps the most severe of the series, struck on Feb. 7, 1812.

The three main shocks probably reached intensity XII, the maximum on the Modified Mercalli scale, although it is difficult to assign intensities, due to the scarcity of settlements at the time. Aftershocks continued to be felt for several years after the initial tremor. Later evidence indicates that the epicenter of the first earthquake (Dec. 16, 1811) was probably in northeast Arkansas.

Based on historical accounts, the epicenter of the Feb. 7, 1812, shocks was probably close to the town of New Madrid.

Although the death toll from the 1811-12 series of earthquakes has never been tabulated, the loss of life was very slight. It is likely that if at the time of the earthquakes the New Madrid area had been as heavily populated as at present, thousands of persons would have perished. The main shocks were felt over an area covering at least 5,180,000 square kilometers. Chimneys were knocked down in Cincinnati, Ohio, and bricks were reported to have fallen from chimneys in Georgia and South Carolina. The first shock was felt distinctly in Washington, D.C., 700 miles away, and people there were frightened badly. Other points that reported feeling this earthquake included New Orleans, 804 kilometers away; Detroit, 965 kilometers away; and Boston, 1,769 kilometers away.

The New Madrid seismic zone has experienced numerous earthquakes since the 1811-12 series, and at least 35 shocks of intensity V or greater have been recorded in Missouri since 1811. Numerous earthquakes originating outside of the state's boundaries have also affected Missouri. Five of the strongest earthquakes that have affected Missouri since the 1811-12 series are described below.

On Jan. 4, 1843, a severe earthquake in the New Madrid area cracked chimneys and walls at Memphis, Tennessee. One building reportedly collapsed. The earth sank at some places near New Madrid; there was an unverified report that two hunters were drowned during the formation of a lake. The total felt area included at least 1,036,000 square kilometers.

The Oct. 31, 1895, earthquake near Charleston, MO probably ranks second in intensity to the 1811-12 series. Every building in the commercial area of Charleston was damaged. Cairo, Illinois, and Memphis, Tennessee, also suffered significant damage. Four acres of ground sank near Charleston and a lake was formed. The shock was felt over all or portions of 23 states and at some places in Canada.

A moderate earthquake on April 9, 1917, in the Ste. Genevieve/St. Mary's area was reportedly felt over a 518,000 square kilometer area from Kansas to Ohio and Wisconsin to Mississippi. In the epicentral area people ran into the street, windows were broken, and plaster cracked. A second shock of lesser intensity was felt in the southern part of the area.

The small railroad town of Rodney, MO experienced a strong earthquake on Aug. 19, 1934. At nearby Charleston, windows were broken, chimneys were overthrown or damaged, and articles were knocked from shelves. Similar effects were observed at Cairo Mounds and Mound City, IL, and at Wickliff, KY. The area of destructive intensity included more than 596 square kilometers.

The Nov. 9, 1968, earthquake centered in southern Illinois was the strongest in the central United States since 1895. The magnitude 5.5 shock caused moderate damage to chimneys and walls at Hermann, St. Charles, St. Louis, and Sikeston, Missouri. The felt areas include all or portions of 23 states.[xxi]

Several area residents observed a small seismic occurrence during the early morning hours of July 8, 2003, near Rolla, located in Phelps County, which is south of Osage County. According to information from the USGS, a microearthquake happened about 20 miles northeast of Rolla and measured 2.9 on the Richter scale. The earthquake originated at a depth of about 3.1 miles beneath the earth's surface. In southern parts of Missouri, earthquakes of this magnitude happen frequently, but are an unusual event in Osage County. The nearest faults are the Leasburg Fault and the Cuba Fault.

Small earthquakes continue to occur frequently in Missouri. An average of 200 earthquakes are detected every year in the New Madrid Seismic Zone alone. Most are detectable only with sensitive instruments, but on an average of every 18 months, southeast Missouri experiences an earthquake strong enough to crack plaster in buildings.[xxii]

Large amounts of damage caused by an earthquake can lead to cascading natural disasters. Dam structures could be weakened and even potentially destroyed by massive shaking of the earth. The potential failure of the dam could cause the structure to release its contents and cause a flash flooding emergency as well. The earthquake may also cause electrical lines to break, which could potentially start fires that spread into wildfires.

Osage County is located in south central Missouri, a good distance from the southeast corner of the state that has the potential for catastrophic damage should a significant earthquake occur. According to the Earthquake Intensity Map provided through state agencies, Osage County is located in Zone VII and would experience only slight damage in the event of a severe quake in southeast Missouri. The greater impact would be the result of damage to transportation and communications systems. In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions, there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts.

Warning Time and Duration

Earthquakes may occur at any time and are very difficult to predict, making timely warnings nearly impossible.

Probable warning time of less than six hours (4). Duration of more than one week (4).

Statement of Severity/Magnitude

Negligible (1) - Injuries and/or illnesses are treatable with first aid; minor quality of life lost; shutdown of critical facilities and services for 24 hours or less; less than 10 percent of property is severely damaged. Osage County is located in the south central part of the state and Figure 3-3 – Earthquake Intensity Map shows that the county, at a Mercalli rating of VII, would have relatively mild damage compared to counties located closer to the New Madrid region. Another consideration is that if a catastrophic earthquake were to occur, Osage County would suffer consequences from damage to communications and transportation infrastructure in the higher

impact seismic zones. In addition, the county would likely be affected by the staging of state and federal response resources to the event and the impact of refugees from the affected area.

Statement of Probable Risk/Likeliness of Future Occurrence

Occasional (2): An event is probable within the next five years—a 20 percent probability of occurring. In much the same way as meteorologists forecast rain, earth scientists present forecasts of earthquakes as the chance or "probability" of an earthquake occurring in a specific time interval. It is generally accepted that earthquakes can be expected in the future as frequently as in the recent past. The USGS and the Center for Earthquake Research and Information of the University of Memphis now estimate that for a 50-year time period: the probability of a repeat of the 1811-1812 earthquakes is between seven and 10 percent. The probability of an earthquake with magnitude 6.0 or larger is between 25 and 40 percent.[xxiii]

Statement of Next Disaster's Likely Adverse Impact on the Community

Since Osage County is not near the New Madrid shock zone, it will most likely endure mild effects from the earthquake, minor damage to buildings, utility disruption, environmental impacts and economic disruptions/losses. If a major earthquake should occur, Osage County could be impacted by the number of refugees traveling through the area seeking safety and assistance.

Recommendation

Encourage purchase of earthquake hazard insurance. Establish structurally sound emergency shelters in several parts of the county.

Hazard Summary – Earthquake – All Jurisdictions in Osage County

Calculated Priority Risk Index	Planning Priority
2.05	Moderate

3.2.5 Extreme Heat

Description

The National Weather Service defines a heat wave as three consecutive days of 90° F plus temperatures. These high temperatures generally occur from June through September, but are most prevalent in the months of July and August. Missouri experiences about 40 days per year above 90 degrees, based on a 30-year average compiled by the NWS from 1961-1990. July leads this statewide mean with 15 days above 90 degrees, followed by August with an average of 12 days over 90. June and September average six days and four days respectively for temperatures above 90 during the same 30-year period. This is based on local climatological data from NWS stations at Kansas City, Columbia, Springfield, and St. Louis. As these regional reports indicate, all of Missouri is subject to heat wave during the summer months. Ambient temperature however, is not the only factor to consider when assessing the likely effect of heat. Relative humidity must also be considered, along with exposure, wind, and activity.[xxiv]

High humidity, a common factor in Missouri, can magnify the effects of exteme heat. While heat-related illness and death can occur from exposure to intense heat in just one afternoon, heat stress on the body has a cumulative effect. The persistence of a heat wave increases the threat to public health.

Type of Damage

Heat can kill 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. Elderly people, young children, and those who are sick or overweight are more likely to become victims of extreme heat. Because men sweat more than women, they are more susceptible to heat illness because they become more quickly dehydrated. The duration of excessive heat plays an important role in how people are affected by a heat wave. Studies have shown that a significant rise in heat-related illnesses happens when excessive heat lasts more than two days. Spending at least two hours per day in air conditioning significantly cuts down on the number of heat-related illnesses.[xxv]

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating, or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop. Ranging in severity, heat disorders share one common feature: the individual has overexposed or over-exercised for his/her age and physical condition in the existing thermal environment. Sunburn, with its ultraviolet radiation burns, can significantly retard the skin's ability to shed excess heat.[xxvi]

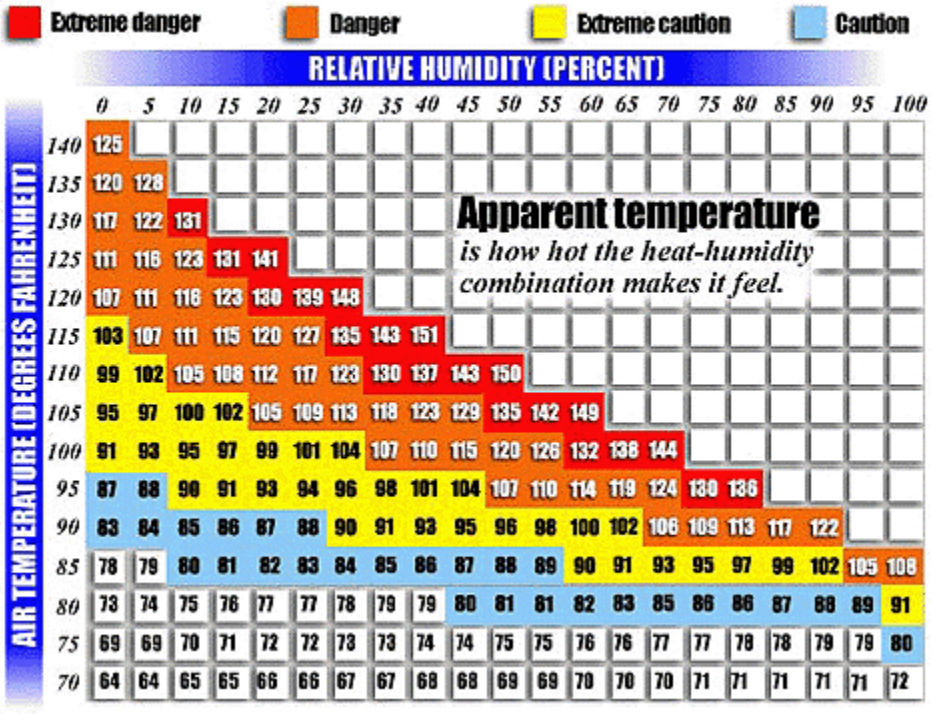
Air temperature is not the only factor to consider when assessing the likely effects of a heat wave. High humidity, which often accompanies heat in Missouri, can increase the harmful effects. Relative humidity must also be considered, along with exposure, wind and activity. The Heat Index devised by the NWS and shown in Figure 3-8, combines air, temperature and relative humidity. Also known as the apparent temperature, the Heat Index is a measure of how hot it really feels. For example, if air temperature is 102 degrees and the relative humidity is 55 percent then it feels like 130 degrees; 28 degrees hotter than the actual ambient temperature.

To find the Heat Index from the table shown below, find the air temperature along the left side of the table and the relative humidity along the top. Where the two intersect is the Heat Index for any given time of day.

In addition to the effects of a heat wave on humans, heat can also affect animals. Livestock often respond to heat by reducing their food intake. This in turn affects milk production, reproduction and muscle (meat) building. All of these things can have a negative impact on agriculture.[xxvii]

Heat waves can also be a major contributing factor to power outages (brownouts, etc.), as the high temperatures result in exceptionally high demand for electricity for cooling purposes. Power outages for prolonged periods increase the risk of heat stroke and subsequent fatalities due to the loss of air conditioning or fans and proper ventilation.[xxviii]

Figure 3-8
Heat Index



Hazard History

Twenty-five instances of excessive heat were recorded in Osage County between 1995 and 2009. One of these events, in July 1995, caused a death in the county. A 66-year old man died in his home when his air conditioning failed. Several people were treated for heat-related illnesses and heat related deaths were reported throughout Missouri for many of these events. According to the Missouri State Hazard Mitigation Plan, the summer of 1980 was the deadliest year for heat-related deaths in the state. 295 people died of heat related illnesses during the heat wave that gripped the state that summer. More recently, in 1999, 42 Missouri residents died of hyperthermia. Statewide, heat wave deaths most often occur in urban areas and people age 65 and older are most susceptible.

In addition to human losses, a heat wave has the possibility of cascading into other natural disasters. Severe heat can lead to drought conditions if no rain is present for a lengthy period of time. This lack of rain and presence of hot temperatures can also encourage the spreading of wildfires. As mentioned earlier, another serious cascading emergency is power disruptions as demand exceeds the power grids ability to supply electricity. Specific property or crop damage estimates are unknown, though it may be presumed that periods of high heat were detrimental to crop yields. Temperatures in Osage County have been recorded at reaching just over 100 degrees Fahrenheit and heat indices have ranged between 115 and 120 during instances of extreme heat.

Season Pattern and Existing Warning Systems

Excessive heat is most common in the summer months of June through August. Education is the most preventive warning system available in Osage County. The Osage County Health

Department provides information to residents about preparing for heat waves. The National Weather Service (NWS) is able to predict periods of high heat with good accuracy and this information is disseminated to the population through various forms of media.

Warning Time and Duration

Due to improvements in meteorology, the heat waves can be predicted several days in advance of onset. Table 3.7 shows the three response levels developed by the NWS, based on the Heat Index, to alert the public to the potential heat hazards:

Table 3.7 National Weather Service Heat Index Response Levels

Heat Index	Response Level
130 degrees F or higher	Warning
105 degrees F to 129 degrees F	Watch
90 degrees F to 104 degrees F	Advisory

Source: Missouri State Hazard Mitigation Plan May 2007

The Missouri Department of Health and Senior Services will announce a statewide hot weather health alert (Table 3.8) when conditions are as follows:

Table 3.8 MO Dept. of Health & Senior Services Hot Weather Alerts

Type of Alert	Conditions of Alert
Hot Weather Health Alert	Heat indices of 105 degrees F in a large portion of the state are first reached (or predicted).
Hot Weather Health Warning	Heat indices have been 105 degrees F or more for two days in a large portion of the state, or weather forecasts call for continued heat stress conditions for at least 24 to 48 hours over a large portion of the state.
Hot Weather Health Emergency	When extensive areas of the state meet the following criteria: (1) high sustained level of heat stress (HI 105 degrees F for three days) (2) increased numbers of heat-related illnesses and deaths statewide and (3) the NWS predicts hot, humid temperatures for the next several days for a large portion of the state.

Source: Missouri Department of Health and Senior Services.

Probable warning time of more than 24 hours (1). Duration of less than one week (3).

Statement of Severity/Magnitude

Catastrophic (4) – More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. Unfortunately, extreme heat has resulted in one death in Osage County. Because there has been a death attributed to extreme heat conditions, this hazard is being rated a four. Based on information from the Department of Health and Senior Services and the NWS, the state rates the probability of a heat wave as moderate and severity as moderate, but the probability could be upgraded to severe.[xxix]

Statement of Probable Risk/Likeliness of Future Occurrence

Highly Likely (4) – event is probable within one year—a near 100 percent probability of occurring. Based on historical evidence, the occurrence of extreme heat is a yearly phenomenon in Osage County. It can be assumed with reasonable security that high temperatures will be seen in the county on an annual or biannual basis.

Statement of Next Disaster's Likely Adverse Impact on the Community

When extreme heat next strikes Osage County the impact will probably have a low impact on the community. Some agricultural producers may see a crop loss and water suppliers may see an increase amount of water consumption. Mental and physical stress may be caused by the extreme heat. Heat waves place stress on the power grid as well. As evidenced by heat waves in the past that resulted in one death, at least some portion of the population of Osage County is critically vulnerable to this hazard.

Recommendation

Many people do not realize how deadly a heat wave can be. Extreme heat is a natural disaster that is not as dramatic as floods or tornados. However, based on the hazard summary table below, it is evident that extreme heat is a high planning priority.

Working with the Osage County Health Department and EMD, local governments should encourage residents to reduce the level of physical activity, wear lightweight clothing, eat fewer protein-rich foods, drink plenty of water, minimize their exposure to the sun and spend more time in air-conditioned places. People who work outdoors should be educated about the dangers and warning signs of heat disorders. Buildings, ranging from homes (particularly those of the elderly) to factories, should be equipped with properly installed, working air conditioning units or have fans that can be used to generate adequate ventilation. Charitable organizations and the health department should work together to provide fans to at-risk residents during times of critical heat.

Hazard Summary – Extreme Heat – All Jurisdictions in Osage County

Calculated Priority Risk Index	Planning Priority
3.45	High

3.2.6 Flood (Riverine and Flash)

Description

Floods are the number one weather-related killer in the United States. Between 1993 and 1999, Missouri recorded more than 75 deaths attributed to flooding. A flood is partial or complete inundation of normally dry land areas. Riverine flooding is defined as the overflow of rivers, streams, drains and lakes due to excessive rainfall, rapid snowmelt or ice. There are several types of riverine floods–including headwater, backwater, interior drainage and flash flooding, which is characterized by rapid accumulation or runoff of surface waters from any source. This type of flooding impacts smaller rivers, creeks and streams, and can also occur as a result of dams being breached or overtopped. Because flash floods can develop in just a matter of hours, most flood related deaths result from this type of flooding event.

The areas adjacent to rivers and stream banks that serve to carry excess flood water during rapid runoff are called floodplains. A floodplain is defined as the lowland and relatively flat areas adjoining rivers and streams. The term base flood, or 100-year flood is the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year, based upon historical records. Floodplains are a vital part of a larger entity called a basin—defined as all the land drained by a river and its branches.

The land that forms the state of Missouri is contained within either the Mississippi, Missouri, Arkansas or White River basins. The Mississippi River Basin drains the eastern part of the state; the Missouri River Basin drains most of the northern and central part of the state; the White River Basin drains the south central part of the state; while, the Arkansas River Basin drains the southwest part of the state. The Missouri River Basin drains over half the state, as the river moves west to east across the state. When the Missouri River joins the Mississippi at St. Louis, it becomes part of the Mississippi River Basin—the largest basin in terms of volume of water drained on the North American continent.

The fact that most of the land that comprises the state of Missouri is part of the Mississippi-Missouri River drainage basin means that a significant portion of the land area of the state lies in flood-plains. For example, some 43 percent of the land in St. Charles County is in floodplains. In terms of agricultural land in Missouri, 34 percent of Missouri's cropland lies in a floodplain. This leaves much of the Missouri population and economic resources extremely vulnerable to flooding.[xxx]

In some cases, flooding may not be directly attributable to a river, stream or lake overflowing its banks. It may simply be the combination of excessive rainfall or snowmelt, saturated ground and inadequate drainage. With no place to go, the water will find the lowest elevations—areas that are often not in a floodplain. This type of flooding is called sheet flooding and is becoming increasingly more common as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow.

Flooding can also occur outside the floodplain when combined storm and sanitary sewers cannot handle the extremely heavy flow of water that often accompanies storm events. The result of this problem is flooded basements.

Flash floods occur within six hours of a rain event, or after a dam or levee failure, or following a sudden release of water held by an ice or debris jam, and flash floods can catch people unprepared. Residents usually have little or no notice of these sudden and dangerous flood events.

As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin. Heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. The water moves from the clouds, to the ground, and into streams at a much faster rate in urban areas. Adding these elements to the hydrological systems can result in floodwaters that rise very rapidly and peak with violent force.

Because flooding along rivers is generally characterized as a slow moving disaster, communities downstream often have sufficient time to take protective measures, such as sandbagging and evacuations. Nevertheless, these flood disasters extract a heavy toll in terms of human suffering and extensive losses to public and private property. By contrast, flash flood events, which are characterized by a rapid water rise with little warning time, have caused a higher number of deaths and major property damage in many areas of Missouri in recent years.[xxxi]

Type of Damage

The major streams in Osage County are the Missouri River, with its large tributaries, Loose Creek and Bailey's Creek; the Osage River, with the Big and Little Maries Creeks; and the Gasconade River, with Pointer's, Brush, Swan, Owen's and Lesser Creeks. Riverine flooding in Osage County typically affects areas of the county along the Missouri, Osage, and Gasconade Rivers. However, flash flooding has occurred in all of the communities at some time. The flooding mainly affects low water bridges on county-maintained roads and letter roads. Drivers who travel on the county maintained roads have dealt with closed roads numerous times due to flash flooding. Roads in the county that have flooded in recent years include County Roads 508 and 542 near Meta; Highway W northwest of Linn; Highway P west of Koeltztown; Highway 89 four miles north of Belle; County Road 412 near Loose Creek; County Road 416 near Bonnot's Mill; Highway N in Freedom; Highway W north of Linn; Highway CC at the junction of Highway 50; County Road 806 south of Highway CC; Highway 50 east of Linn and near Mt. Sterling; Highways Y and NN in southeastern Osage County; Highway E; and Highway RA southeast of Linn. Flash flooding generally only results in short periods of time when roads are covered with water. However, the Gasconade and Missouri Rivers can and have stayed in flood stage for prolonged periods of time – days or even weeks.

In 1995, a 53 year-old man died when his pickup truck was swept away in a flood-swollen creek near Linn. He was trying to cross the creek when his car stalled in several feet of water. Upon leaving his vehicle, he drowned and was found four and one-half miles down river. More typical damages caused by Osage County floods range from destroyed crops to floating cars and damaged homes and businesses. Propane gas tanks and chain-link fences have also been lifted from their anchored positions and carried downstream. Some county roads have experienced severe erosion caused by flash floods. The county has had low water crossings completely destroyed by flood waters.

Geographic Location

Of the seven participating jurisdictions in the Osage County Hazard Mitigation Plan, five are members of the National Flood Insurance Program (NFIP). Those are Osage County and the cities of Argyle, Chamois, Linn and Westphalia. Freeburg and Meta are not members of the NFIP. According to FEMA, there are Digitized Flood Insurance Rate Maps (DFIRMs) for all areas of Osage County including each city.

The Osage County Hazard Mitigation Plan contains maps created with FEMA's Hazards U.S. Multi-Hazard (HAZUS-MH) database. This software program is a nationally applicable standardized methodology for estimating potential losses from earthquakes, hurricane winds and floods. HAZUS-MH uses Geographic Information Systems (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and

infrastructure, as well as allowing users to estimate the impacts of specific types of hazards. This software is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this plan and the actual social and economic losses following a specific flood.

HAZUS-MH was used in the following maps to estimate potential losses from a 100 year flood in the planning area. All of the maps included here have been generated with HAZUS-MH and/or GIS information provided by the Missouri Spatial Data Information System (MSDIS). . All maps are for planning purposes only.

There are four watersheds located in Osage County: the Lower Missouri-Moreau, the Lower Gasconade, the Lower Osage, and the Bourbeuse. The rivers with the most potential to cause major flood damage in the county are the Missouri, Osage, and Gasconade Rivers. The Missouri River drainage basin includes ten states and is one of the most significant rivers in the upper Midwest. The second most significant river would be the Gasconade River. This river is 271 miles long and drains 2,806 square miles of southwest and south central Missouri. The Osage River is a 276 mile long tributary of the Missouri River and drains an estimated 15,300 square miles. The Osage River has been impounded by the US Corps of Engineers at two locations. Bagnell Dam, built in the 1920s for hydroelectric power, created the Lake of the Ozarks. Further up the river Harry S. Truman Dam was built in the 1970s for flood control and it forms Harry S. Truman Reservoir. The Bourbeuse River watershed affects only a small portion of the southeast part of the county. All of the rivers pose threats of flooding, with the greatest magnitude flooding provided by the Missouri River, which in turn affects the Gasconade and Osage rivers. Figure 3-9 is a flood plain map for the county generated from DFIRM. Figure 3-10 is a floodplain map generated through HAZUS.

In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions, there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts. Various floodplain maps are included at the end of this section for each jurisdiction.

Figure 3-9

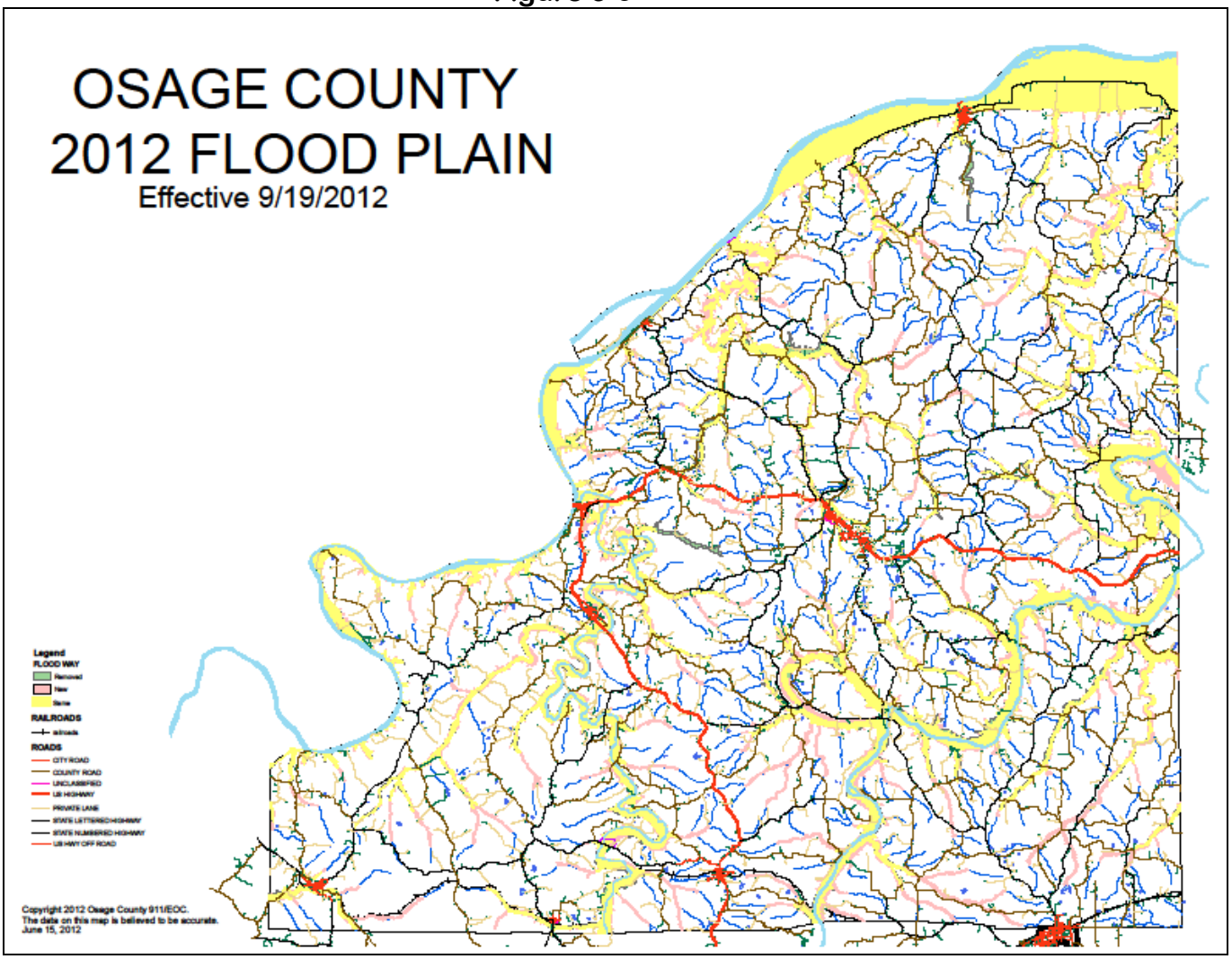
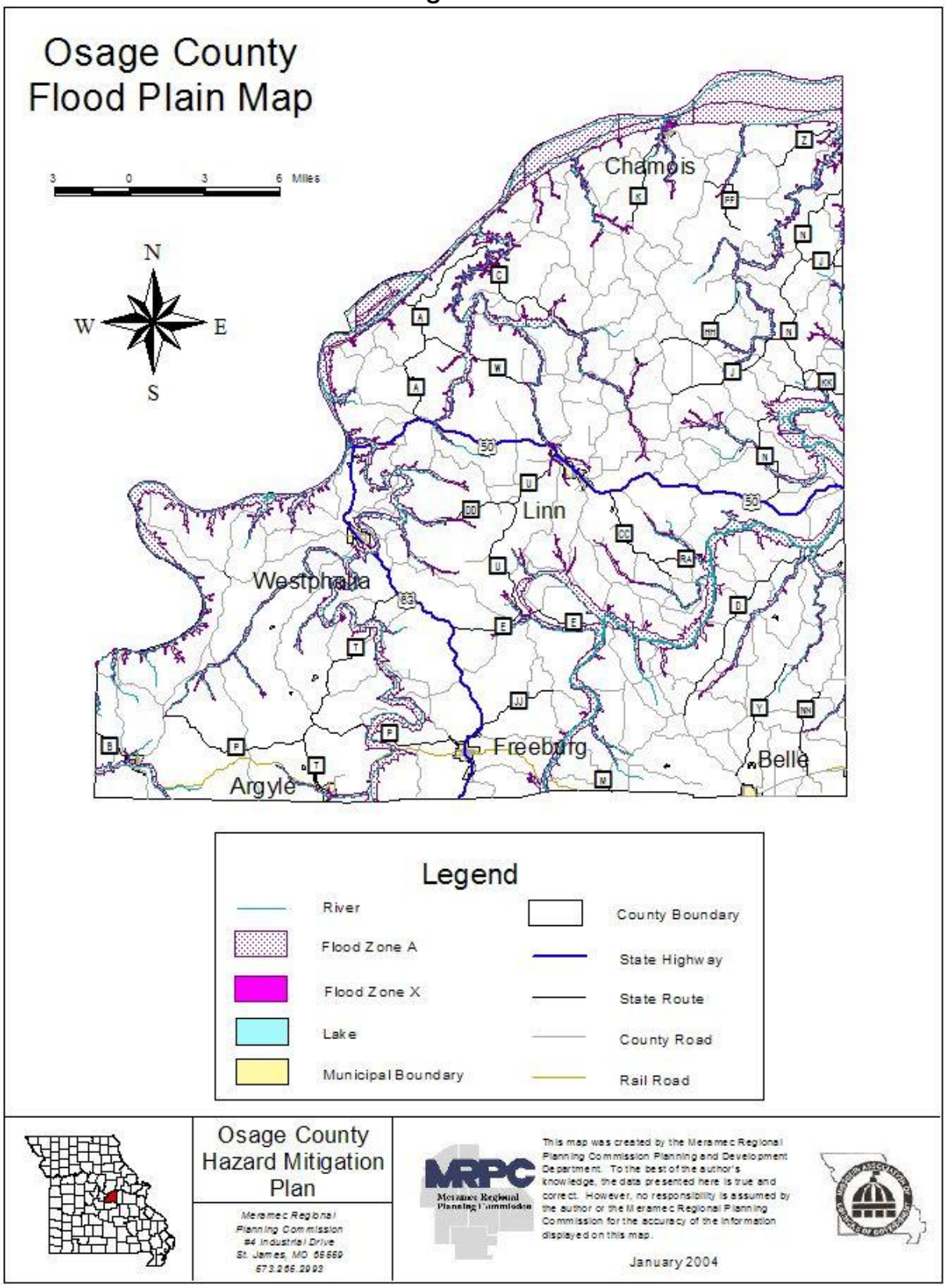

OSAGE COUNTY
2012 FLOOD PLAIN
Effective 9/19/2012
Legend
FLOOD WAY
Removed
New
Same
RAILROADS
railroads
ROADS
CITY ROAD
COUNTY ROAD
UNCLASSIFIED
US HIGHWAY
PRIVATE LANE
STATE LETTERED HIGHWAY
STATE NUMBERED HIGHWAY
US HWY OFF ROAD
Copyright 2012 Osage County 911/EOC.
The data on this map is believed to be accurate.
June 15, 2012

Figure 3-10


Osage County
Flood Plain Map
3 0 3 6 Miles
N
W E
S
Chamois
Linn
Westphalia
Freeburg
Belle
Argyle
Legend
River
Flood Zone A
Flood Zone X
Lake
Municipal Boundary
County Boundary
State Highway
State Route
County Road
Rail Road
Osage County
Hazard Mitigation
Plan
Meramec Regional
Planning Commission
#4 Industrial Drive
St. James, MO 65559
573.265.2993
MRPC
Meramec Regional
Planning Commission
This map was created by the Meramec Regional Planning Commission Planning and Development Department. To the best of the author's knowledge, the data presented here is true and correct. However, no responsibility is assumed by the author or the Meramec Regional Planning Commission for the accuracy of the information displayed on this map.
January 2004

Hazard History

Osage County has several rivers and small tributaries in both unincorporated and incorporated areas that are susceptible to flooding. The Missouri River defines the county's northern boundary. The Osage River mostly defines the county's western boundary. In addition, both the Maries River and the Gasconade River run within the county. There are areas of the county that are susceptible to riverine flooding. Major flooding in 1993 and again in 1994 resulted in a great deal of damage along the Missouri River and in communities located along the river. Flash flooding also causes damage in areas and communities far removed from the big river in the north. The National Oceanographic and Atmospheric Administration only maintains records back to May of 1993 for Osage County and damage descriptions only as far back as 2007.

A total of 32 floods and flash floods have affected the county between May 1993 and April 2012. The county, on average, experiences at least one to two flooding events every year. Of the 32 reported events, four events caused property damage ranging from $1,000 per event to $5 million in April 1994. Most of the 32 flood events caused no property damage or injuries. There has been one death attributed to flash flooding in Osage County. A 53 year-old man died when his pickup truck was swept away in a flood-swollen creek near Linn. He was trying to cross the creek when his car stalled in several feet of water. Upon leaving his vehicle, he drowned and was found four and one-half miles downriver. Table 3.9 illustrates flood events in the county from September 1993 to April 2012.

Table 3.9 Osage County Flood Events and Locations (1993-2012)

Location or County	Date	Type	Property Damage	Crop Damage	Damage Description
Linn	05/05/1993	Flash Flood	0	0	Description not available.
Linn	05/05/1993	Flash Flood	0	0	Description not available.
Linn	05/05/1993	Flash Flood	0	0	Description not available.
Osage County	04/11/1994	Flash Flood	$500,000	$500,000	Description not available.
Multiple County	04/11/1994	River Flood	$5,000,000	$5,000,000	Description not available.
Osage County	05/17/1995	Flash Flood	$5,000	0	Description not available.
Multiple County	05/01/1996	River Flood	0	0	Description not available.
Osage County	05/06/1996	Flash Flood	0	0	Description not available.
Osage County	07/04/1998	Flash Flood	0	0	Description not available.
Osage County	07/26/1998	Flash Flood	0	0	Description not available.
Osage County	07/29/1998	Flash Flood	0	0	Description not available.
Multiple County	10/06/1998	Flood	0	0	Description not available.
Osage County	05/27/2000	Flash Flood	0	0	Description not available.
Multiple County	06/04/2001	Flood	0	0	Description not available.
Multiple County	05/08/2002	Flood	0	0	Description not available.

Location or County	Date	Type	Property Damage	Crop Damage	Damage Description
Osage County	05/09/2002	Flash Flood	0	0	Description not available.
Osage County	05/12/2002	Flash Flood	0	0	Description not available.
Osage County	08/18/2002	Flash Flood	0	0	Description not available.
Osage County	08/20/2002	Flash Flood	0	0	Description not available.
Osage County	08/26/2006	Flash Flood	0	0	Description not available.
Bonnots Mill	05/08/2007	Flood	$5,000	$25,000	Missouri River flooded portions of farmland and roads along the river.
Rich Fountain	03/19/2008	Flood	0	0	Heavy rain caused major flooding of the Gasconade River which crested at Rich Fountain at 33 feet – 2nd highest on record. Highway E, Highway 50 were closed.
Westphalia	03/31/2008	Flash Flood	0	0	Heavy rain resulted in numerous road closures including CR 508, CR 542 near Meta; Highway W northwest of Linn and Highway P west of Koeltztown.
Freeburg	05/08/2009	Flash Flood	0	0	Heavy rain resulted in flash flooding. Highway 89 had two feet of water over it at 4 miles north of Belle.
Bonnots Mill	9/14/2008	Flood	0	0	Heavy rain from Hurricane Ike resulted in flooding, including numerous roads countywide.
Shubert	11/15/2009	Flash Flood	0	0	Heavy rains resulted in flash flooding over several roads – CR 412 near Loose Creek and CR 416 near Bonnots Mill.
Shubert	06/05/2010	Flood	0	0	Missouri River reached flood stage – moderate flooding of some roadways and farmland along the river.
Frankenstein	06/08/2010	Flash Flood	0	0	Heavy rain caused flash flooding and road closures – secondary road near junction of Highway 50 and Highway 89 east of Linn; Highway N in Freedom; Highway W north of Linn.
Argyle	07/09/2010	Flash Flood	0	0	Heavy rain caused flash flooding and road closures – Highway CC at junction of Highway 50 and CR 806 southest of Highway CC.
Shubert	03/15/2012	Flash Flood	0	0	Heavy rain caused flash flooding and road closures – Highway 50 east of Linn; Highways Y and NN.

Location or County	Date	Type	Property Damage	Crop Damage	Damage Description
Chamois	03/172012	Flash Flood	0	0	Heavy rain caused flash flooding, several secondary roads were flooded.
Osage County	04/14/2012	Flash Flood	0	0	Heavy rain caused flash flooding – several road closures including Highway RA southeast of Linn.

Source: National Climactic Data Center

Of the seven jurisdictions in Osage County, five are members of the National Flood Insurance Program (NFIP). Those are Osage County and the cities of Argyle, Chamois, Linn and Westphalia. Freeburg and Meta are not members of the NFIP. According to repetitive loss data provided by SEMA, there are 15 properties in Osage County that have had repetitive losses. Four of the properties are located in Chamois, two of the properties are in Westphalia, and the rest of the properties are located in unincorporated areas of the county. Thirteen of the properties are single-family dwellings and the other two are multi-family dwellings. One property has flooded five times, two properties have flooded four times, two properties have flooded three times, nine properties have flooded twice, and one property has flooded just once. None of the properties have been mitigated.

One levee district is organized in Osage County – the Chamois to Morrison A-1 Levee District. This not for profit organization has a ten-year certification of protection assessed by the U.S. Army Corps of Engineers. Corps engineers inspect the levee every two years and levees must meet a five-year level of protection. Federal monies are available for 80 percent of any repair costs, with the other 20 percent coming from local match (cash or in-kind labor). Other levees may exist in the county but are not part of the Corps of Engineers' program.

Seasonal Patterns

Riverine flooding has historically occurred most frequently in the spring when a combination of wet weather and spring thaw have resulted in flood conditions in the large river basins of the Missouri and Mississippi. However, flash floods can occur at any time of the year and are generally caused by severe thunderstorms with heavy rainfall. From August 1993 through April 2012, flood events occurred in Osage County in the months of March through November.

Warning Time and Duration

While floods are known to grow slowly and allow adequate time for warning, the flash flooding that is often associated with Osage County can rapidly develop into an emergency for which residents are unprepared. While it may seem prudent to estimate that most residents can predict probable flooding by witnessing large amounts of rain, many residents are still swept downstream in their cars while trying to cross bridges inundated by water. Radio and television stations in the area can provide warnings to residents based on missives from the National Weather Service. If adequate warning is available, county or city enforcement officials can help residents evacuate from potentially dangerous flooding areas. The Missouri, Osage and Gasconade River flood stages are generally predictable, but sudden, heavy rainfall can cause

smaller rivers systems and tributaries to quickly flood and catch people unprepared. According to the Missouri State Hazard Because Osage County has several rivers and tributaries in its boundaries, it is susceptible to both riverine flooding and flash flooding . According to the Missouri State Hazard Mitigation Plan, in recent years, flash flooding rather than riverine flooding has actually caused more deaths and property damage in many parts of the state. Due to its proximity to the Missouri River, the community of Chamois and the Osage County R-I School district are more vulnerable to riverine flooding. Westphalia's proximity to the Maries River also makes it more vulnerable to riverine flooding. The communities of Argyle and Meta both have tributaries running through portions of the community that make both more vulnerable to flooding. The cities of Freeburg and Linn are vulnerable to flash flooding. Riverine floods generally have several days of warning, but for the purposes of this assessment, all jurisdictions will be scored based on flash flooding for warning time and both types of flooding for duration.

For the cities of Freeburg and Linn and Osage County R-II and R-III: Probable warning time of less than six hours for most common flash flooding (4). Duration of less than one day (2).

For Osage County and the cities of Argyle, Chamois, Meta and Westphalia and the Osage County R-I School District: Probable warning time of less than six hours for most common flash flooding (4) – longer for riverine flooding. Duration of less than one week (3).

Statement of Severity/Magnitude

Limited (2) - Injuries and/or illnesses do not result in permanent disability; shutdown of facilities for more than a week; 10-24 percent of property severely damaged. The Missouri State Hazard Mitigation Plan states that in terms of overall damage, Missouri's most severe single hazard is flooding. Flooding has resulted in more federal disaster declarations in Missouri than any other hazard in the past three decades. Much of this flood damage has occurred in the two major river basins – the Missouri River and the Mississippi River. Of the 32 flood events reported in Osage County since 1993, only one resulted in significant damage. In April 1994, a multiple county flood event resulted in $5,000,000 in property damage. There are fifteen properties listed by the NFIP that have had repetitive losses with the most recent loss in 2005. Based on the majority of the data, the CPRI and historical information of flood events and flood damages in Osage County, the severity of a future flood would likely be negligible, but because of the incident where an individual died, it has been rated as limited. While some county residents may be delayed in their traveling, damages are usually low or nonexistent. Loss of life and injuries are also typically limited. Historically, the most impacted areas have been in unincorporated areas of the county, with events occurring at least once in Argyle, Chamois, Freeburg, Linn and Westphalia.

Statement of Probable Risk/Likeliness of Future Occurrence

Highly Likely (4) – Event is probable within one year—a near 100 percent probability of occurring. All past information regarding flooding in Osage County leads to the assessment that riverine and flash flooding will occur in the county. It can be safely assumed that flooding will happen at least once every year and will likely average twice per year, depending on weather conditions and precipitation. There are specific areas of the county and the communities that can be expected to be impacted as evidence in Table 3.9. Several roads in the county are vulnerable to flooding including County Roads 508 and 542 near Meta; Highway W northwest of Linn;

Highway P west of Koeltztown; Highway 89 four miles north of Belle; County Road 412 near Loose Creek; County Road 416 near Bonnot's Mill; Highway N in Freedom; Highway W north of Linn; Highway CC at the junction of Highway 50; County Road 806 south of Highway CC; Highway 50 east of Linn and near Mt. Sterling; Highways Y and NN in southeastern Osage County; Highway E; and Highway RA southeast of Linn. Low lying areas in Argyle, Chamois, Meta and Westphalia are also prone to flooding. Due to its proximity to the flood plain, Osage County R-I School District may be more vulnerable to flooding as well. Some school bus routes may be affected by flooding for short periods of time and adjustments made to the routes driven by busses, but these would be short-lived and not considered a significant problem.

Statement of Next Disaster's Likely Adverse Impact on the Community

The next flash flood in Osage County will most likely have little impact on the day-to-day activities of the county overall. Most roads in the county including highways, interstates and county roads are not threatened by this hazard except in extreme circumstances. With the exception of Chamois, few buildings lie in the floodplain, leaving limited areas of potential destruction. With the exception of Chamois, no critical facilities, including school buildings are located in the floodplain. The new DFIRM maps show a considerably larger area of Chamois in the floodplain and a significant number of additional buildings are now considered in flood prone areas. Some jurisdictions will be impacted by temporary road closures.

Recommendation

The county has already adopted a Floodplain Management Ordinance concerning construction in the floodplain. The county should consider doing buyouts of properties that are flood prone and have had repetitive losses to mitigate future disasters. Local governments should make a strong effort to further improve warning systems to insure that future deaths and injuries do not occur. Local governments should consider making improvements to roads and low water crossings that consistently flood by placing them on a hazard mitigation projects list and actively seek funding to successful complete the projects.

Hazard Summary – Flood – Osage County, Cities of Argyle, Chamois, Meta, Westphalia, Osage County R-I School District

Calculated Priority Risk Index	Planning Priority
3.0	High

Hazard Summary – Flood – Cities of Freeburg & Linn, Osage County R-II & R-III School Districts

Calculated Priority Risk Index	Planning Priority
2.9	High

3.2.7 Landslide

Description

The term landslide encompasses a broad range of land disturbances including rock falls—where rocks fall or bounce down-slope; slides—where deep failure of slopes causes rock and/or

sediment to slide along the Earth's surface; and shallow debris flows—where sediment and the material it collects as it moves, flows across the Earth's surface.[xxxii]

Falls: Due to weathering, steep mountain slopes and rock outcrops are constantly going through the process of erosion, often in the form of rocks falling or bouncing down slopes. Such falls can be triggered by the freezing of water within crevasses in the stone, the growth of plants and expansion of their root systems, earthquakes or by people moving around on the slope or outcrop. This type of landslide is generally easy to identify by looking for talus—a buildup of loose rocks at the base of a steep slope. Talus is typically cone shaped and is found at the base of many mountain ranges and rocky outcroppings.[xxxiii] This is perhaps the most common type of landslide activity in the Ozark region. As the slopes in the Ozarks are not as dramatic or large as those in regions like the Appalachians or Rockies, the rock falls are also smaller.

Slides: A mass of slope material, generally soil, moving as a cohesive block. There are several different types of slides but the most common is a slump. A slump occurs when a portion of hillside moves down-slope under the influence of gravity. A slope has a definitive shape, with a scarp or cliff at the top of the slump and a bulge of material—also called the toe—at the base.[xxxiv]

Flows: In this type of landslide, the material moving down-slope is typically being transported as a very thick fluid—a river of debris, rock and/or soil. Water is generally the transport agent for flows. When heavy rains contribute to a landslide, material on the slope that becomes saturated with water may develop a debris flow or mud flow. This slurry of rock and mud may pick up trees, houses and cars and cause catastrophic damage to the area covered by the debris flow. These flows can cause additional flooding damage by blocking bridges and tributaries.[xxxv]

The type of flow that most people are likely to be familiar with are lahars, which are formed when volcanoes erupt. The heat from the eruption rapidly melts the snowcap on the volcano and the water rushing down the sides of the already unstable slope gathers ash, mud and other debris. A primary example of this type of landslide is the destruction following the eruption of Mount St. Helens, when the resulting lahars caused extensive damage to rivers, lakes, forests, roads and bridges and other human development in the area.[xxxvi]

According to the U.S. Geological Survey, the primary reason for landslides is gravity acting on an over-steepened slope. But there are many naturally occurring factors that can lead to landslides, including:

- Erosion by rivers, glaciers or ocean waves;
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains;
- Earthquakes create stresses that make weak slopes fail;
- Earthquakes of a magnitude of 4.0 and greater have been known to trigger landslides;
- Volcanic eruptions produce loose ash deposits, heavy rain and debris flows;
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore from waste piles or from man-made structures may stress week slopes to failure.

Human development on or at the base of areas that are prone to landslides contributes to the cost of landslides in property damage and human life. Losses can be reduced by avoiding development on unstable slopes or at the base of these areas.

Likely Locations. Landslides occur in all 50 states and every U.S. territory. Mountainous regions, such as the Appalachian Mountains, Rocky Mountains and Pacific Coastal Ranges are all highly susceptible to landslides. But any area composed of weak or fractured materials resting on a steep slope can experience landslides.[xxxvii] Areas that are most prone to landslides include:

- On existing old landslides.
- On or at the base of slopes.
- In or at the base of minor drainage hollows.
- At the base or tope of an old fill slope.
- At the base or top of a steep cut slope.
- Developed hillsides where leach field septic systems are used.[xxxviii]

The most likely type of landslide to occur in Osage County would be a rock slide caused by weathering of stone outcrops. The region has many areas where fractured, eroding bedrock is exposed, including bluffs cut for highways. Rock slides are common in these areas but rarely cause damage to property or infrastructure. In most cases, residents avoid building in areas where rock falls occur. In rock fall prone areas, where highways have cut through bedrock, the roads are usually built far enough from the bluff to avoid damage to the actual road bed. The rock falls are generally small and the talus forms in the ditches where it is easily removed.

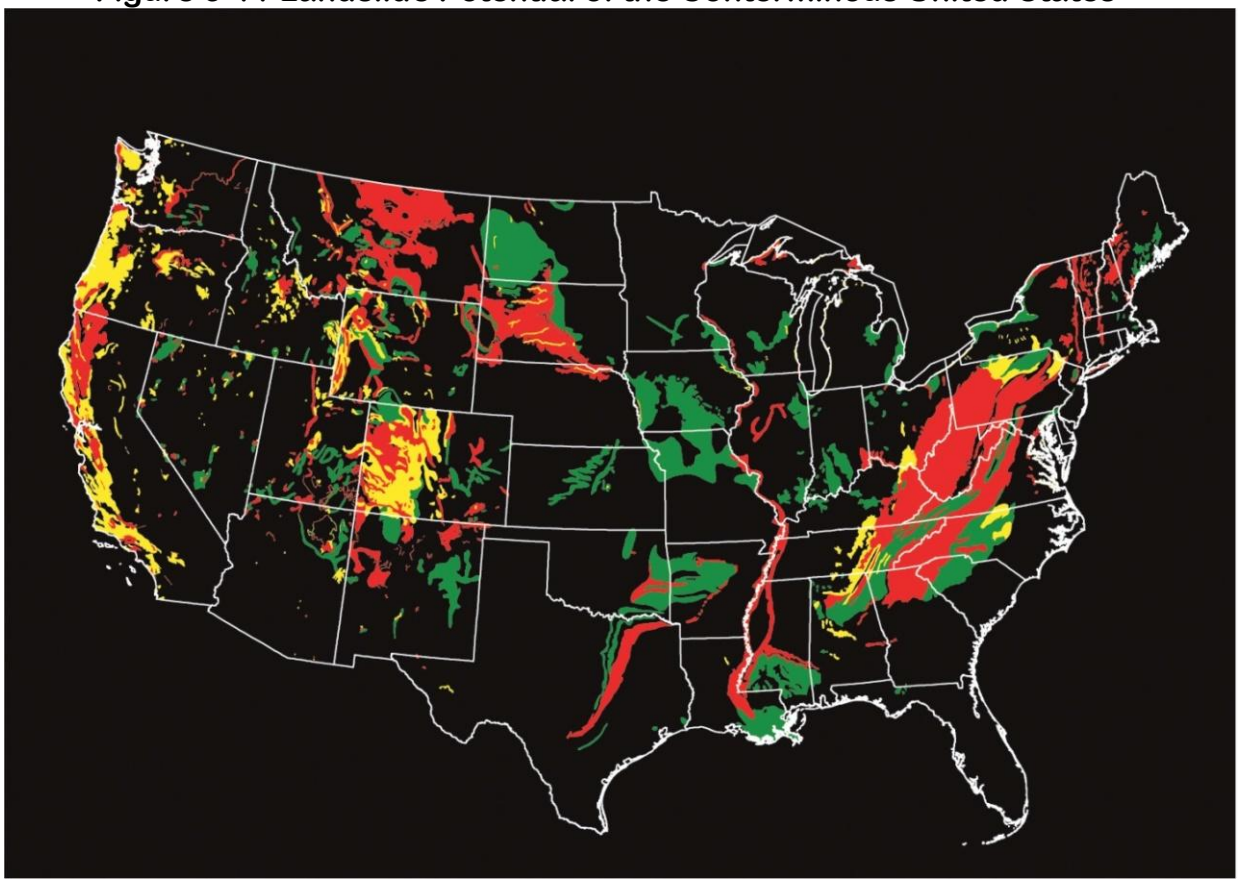
The map in Figure 3-11 shows the landslide potential for the United States. Missouri has areas of moderate landslide potential in the northern half of the state and some areas of very high potential along the eastern border in the Mississippi floodplain. The USGS states that although landslides can occur in the black portions of the map, which includes Osage County, they are unlikely.[xxxix]

Type of Damage

It is estimated that, in the United States, landslides cause 25 to 50 deaths and $3.5 billion dollars in property damage every year. Worldwide the figures are staggering – hundreds of billions of dollars in damages and hundreds of thousands of deaths and injuries every year.[xl]

Landslides lead to lost human, industrial, agricultural and forest productivity and can cause significant environmental damage.[xli] Landslides destroy homes, businesses and infrastructure such as utilities, bridges and roads. This hazard can gather enough momentum and debris to completely destroy anything in its path. Landslides can not only cause substantial damage, this hazard also makes permanent changes to the terrain that can affect future development and use of the land.[xlii] Although landslides are frequently caused by another natural disaster, such as earthquakes, floods or volcanic eruptions, the resulting landslide often causes more damage than the triggering event. For example, the Alaska earthquake of 1964 and the eruption of Mount St. Helens in 1980 had far more damage from the landslides that occurred than from the initial hazard event.[xliii]

Figure 3-11 Landslide Potential of the Conterminous United States[xliv]



Landslide potential of the conterminous United States: Red areas have very high potential, yellow areas have high potential and green areas have moderate potential. Landslides can and do occur in the black areas but the potential is low. Map not to scale. Sources: the National Atlas and the USGS.

Destruction caused by large landslides is frequently catastrophic – buildings crushed and buried by debris, bridges and utilities swept away. The loss of human life can be significant. It is critical that citizens be informed of the dangers and the warning signs of an impending landslide.

Warning signs include:

- Springs and seeps forming in areas where they did not exist before.
- New cracks or unusual bulges in the ground, street pavements or sidewalks.
- Soil moving away from foundations.
- Ancillary structures such as decks and patios tilting and/or moving relative to the main house.
- Tilting or cracking of concrete floors and foundations.
- Broken water lines and other underground utilities.
- Leaning telephone poles, trees, retaining walls or fences.
- Offset fence lines.
- Sunken or down-dropped road beds.
- Rapid increase in creek water levels, possibly accompanied by increased turbidity.

- Sudden decrease in creek water levels though rain is still falling or has just ceased.
- Sticking doors and windows and visible open spaces indicating jambs and frames are out of plumb.
- A faint rumbling sound that increases in volume is noticeable as the landslide nears.
- Unusual sounds such as trees cracking or boulders slamming together could indicate moving debris.[xlv]

In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions, there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts.

Hazard History

Landslides occur throughout the United States and cause an estimated $3.5 billion in damages and as many as 50 deaths each year. There have been a number of dramatic, well publicized landslide events in recent years, mostly located on the West Coast in California and the Pacific Northwest. A large landslide damaged a number of homes in LaConchita, Calif., on March 4, 1995. Ten years later, a portion of the same landslide became a debris flow during a period of heavy rain. The debris flow damaged a number of additional homes and killed 10 people.[xlvi]

The largest landslide in recorded history occurred when Mount St. Helens erupted on May 18, 1980. In a dramatic explosion that blew off the top 1,300 feet of the mountain, the volcano devastated 240 square miles. The rock slide and debris avalanche that resulted from the eruption traveled 14 miles, destroying nine highway bridges, numerous private and public buildings and many miles of highways, roads and railroads. The volume of material in the landslide was large enough to fill 250 million dump trucks.[xlvii]

However, as illustrated by the map in Figure 3-11, Osage County lies within an area of low probability for landslides. Rock falls do occur in the area, but are typically small and do not have a significant impact. Some roads, including Highway 63, have areas where the road has cut through bedrock and created bluffs. Rock falls occur frequently along these bluffs as a result of natural weathering. There have been no reports of property damage or injuries due to these small rock falls and the talus created is easily removed during the course of regular highway maintenance.

Warning Time and Duration

Probable warning time of less than six hours (4). Duration of less than six hours (1).

Statement of Severity/Magnitude

Negligible (1) - Injuries and/or illnesses are treatable with first aid; minor quality of life lost; shutdown of critical facilities and services for 24 hours or less; less than 10 percent of property is severely damaged. Due to past history and reports developed by the USGS, the severity of any future landslides in Osage County would be low. To date there have been no reports of damage or injury from landslides. Development typically avoids areas that have the potential of incurring damage from rock falls and other types of landslides.

Statement of Probable Risk/Likeliness of Future Occurrence

Unlikely (1) – Event is possible within the next 10 years; event has up to one in 10 years chance of occurring; history of events is less than or equal to 10 percent likely per year. It is unlikely that there will be property damage, injuries or loss of life due to landslides in Osage County. There will continue to be small rock falls in areas where normal weathering of rock results in this type of landslide. However, because of the small size of these rock falls they are a low priority for hazard mitigation planning.

Statement of Next Disaster's Likely Adverse Impact on the Community

Osage County will likely continue to see small rock slides in areas that are prone to these types of landslides, however, the probability that these rock slides will have an adverse impact on the county and communities is very low. In areas where roadways may be affected, the clearing of debris is part of the normal operations and maintenance of these roads. There are certain sections of highways where rock falls are expected due to normal weathering. But in most cases the rock falls and debris do not actually fall onto the roadway itself and so do not adversely impact transportation routes in the county.

Recommendation

The county would certainly benefit from an education program to inform citizens, community leaders and developers of the causes, likely locations and dangers of landslides. In addition, those communities that have building codes should review those codes and update them, if necessary, to include the avoidance of building in landslide prone areas.

Hazard Summary – Landslide For All Jurisdictions in Osage County

Calculated Priority Risk Index	Planning Priority
1.45	Low

3.2.8 Land Subsidence/Sinkholes

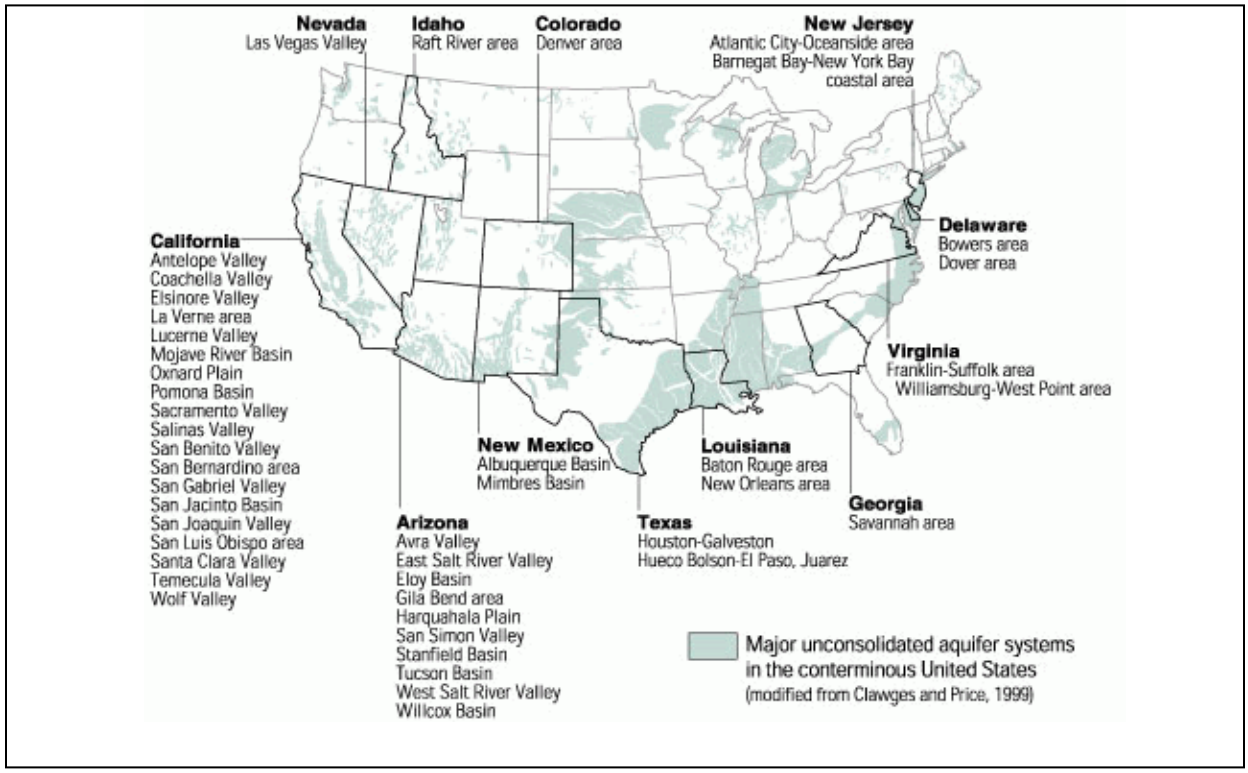
Description

According to the US Geological Survey, land subsidence is the lowering of the land-surface elevation from changes that take place underground. Common causes of land subsidence from human activity are pumping water, oil, and gas from underground reservoirs; dissolution of limestone aquifers (sinkholes); collapse of underground mines; drainage of organic soils; and initial wetting of dry soils (hydrocompaction). Land subsidence occurs in nearly every state of the United States.[xlviii]

Land subsidence occurs when large amounts of ground water have been withdrawn from certain types of rocks, such as fine-grained sediments. The rock compacts because the water is partly responsible for holding the ground up. When the water is withdrawn, the rock collapses in on itself. Land subsidence typically occurs over large areas rather than in a localized area as a sinkhole does. One of the largest problems associated with land subsidence is the resulting permanent reduction in the total storage capacity of the affected aquifer system. Figure 3-12

shows areas of the country where excessive pumping of groundwater has resulted in land subsidence and possible permanent damage to the local aquifer.[xlix]

Figure 3-12 Areas of United States Affected by Subsidence Caused by Groundwater Pumpage

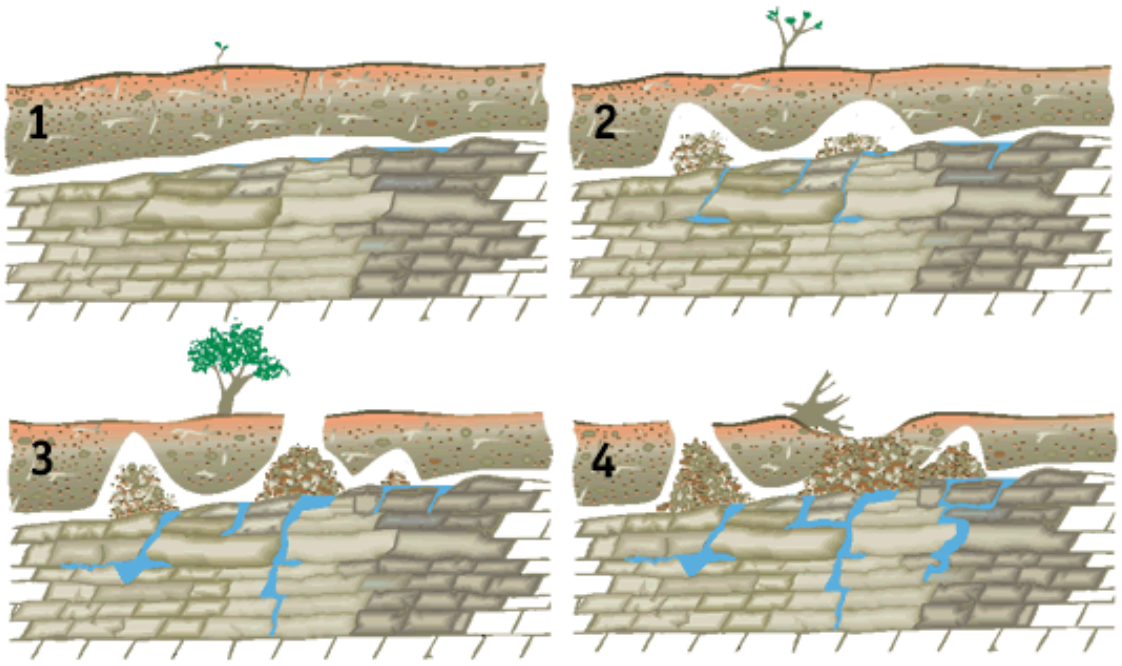


Source: US Geological Survey- http://ga.water.usgs.gov/edu/earthgwlandsubside.html

Historically, land subsidence, which is generally attributed to human activities, does not impact the central Ozarks region. The related hazard of sinkholes is the more evident hazard for this part of the state.

A sinkhole is a surface area usually formed when bedrock slowly dissolves, creating voids below ground that can cause depressions on the surface or even result in openings in the ground when the ceiling of an underlying cave collapses. Typically sinkholes appear as conical depressions in the ground. These geologic features can be very shallow and nondescript or may cover acres of ground and be hundreds of feet deep. Sinkholes are places where water drains into underground fissures and can be direct conduits to an area's groundwater. Springs are typically recharged from sinkholes and losing streams. The illustration in Figure 3-13 shows how sinkholes typically form in the Ozarks region.[l]

Figure 3-13



Sinkholes can form in a variety of ways, but all require collapse into voids that have developed in the subsurface. The movement of slightly acidic shallow groundwater dissolves the bedrock along fractures and other openings. The dissolved materials, along with some of the insoluble clays and rock fragments found above the bedrock, are removed through subsurface openings (fig. 1). Over time, the voids enlarge as groundwater movement carries away material (fig.2). A sinkhole commonly forms when the material above the void can no longer support its own weight and collapses (fig.3). Eventually, the sides of the sinkhole erode, leaving a bowl-shaped depression (fig.4).

Source: "Missouri Resources" magazine, Spring/Summer 2003 – Volume 20 – Number 1, "That Sinking Feeling – a Void, a Collapse" by Jim Van Dyke.

Although there have not been any reported incidents of sinkholes collapsing and causing personal injury or damage to property in Osage County, it is not an uncommon occurrence in Missouri. "Sinkhole collapses are a common geologic hazard in areas such as the Ozarks," said Mimi Garstang, former Geological Survey and Resource Assessment (GSRA) division director and state geologist. "Fortunately, most occur in areas away from development and typically don't cause serious damage."[li]

Most sinkholes are formed by natural processes: the movement of water through soluble rock causing erosion and the formation of voids, but human activity can speed up the process and cause sinkholes to form. Examples include drilling, leaking water and sewer lines, drainage modifications, and leaking lagoons and lakes. In 1948 an incident occurred in St. Francis County where a drilling rig caused numerous sinkholes to form.

The event was documented by J. Harlen Bretz in the book "Caves of Missouri." Sinkholes began developing around the drilling rig when it encountered voids in the bedrock. By the time the drilling was completed there were an estimated 20 sinkholes in the area around the drill hole. Some were up to 90 feet long and 20 feet wide. It was conjectured that the drilling caused water that was in voids closer to the surface to drain into voids encountered at deeper levels. This resulted in the collapse of the voids closer to the surface as loss of buoyancy and removal of sediments caused the surface collapses.[lii]

There have been a number of incidents in Missouri where sinkholes have formed and drained lakes. In the 1960s, a lake was built in northern Howell County near the Eleven Point River. A sinkhole formed in the lake bed and drained it. Although attempts were made to repair the hole, the lake has never held water for more than short periods of time. A well publicized sinkhole collapse in the St. Louis region occurred in 2004 when Lake Chesterfield, the centerpiece of an upscale subdivision in St. Charles County, drained in a matter of days due to a sinkhole collapse. Some $650,000 was spent to repair the lake, but it continues to leak.[liii]

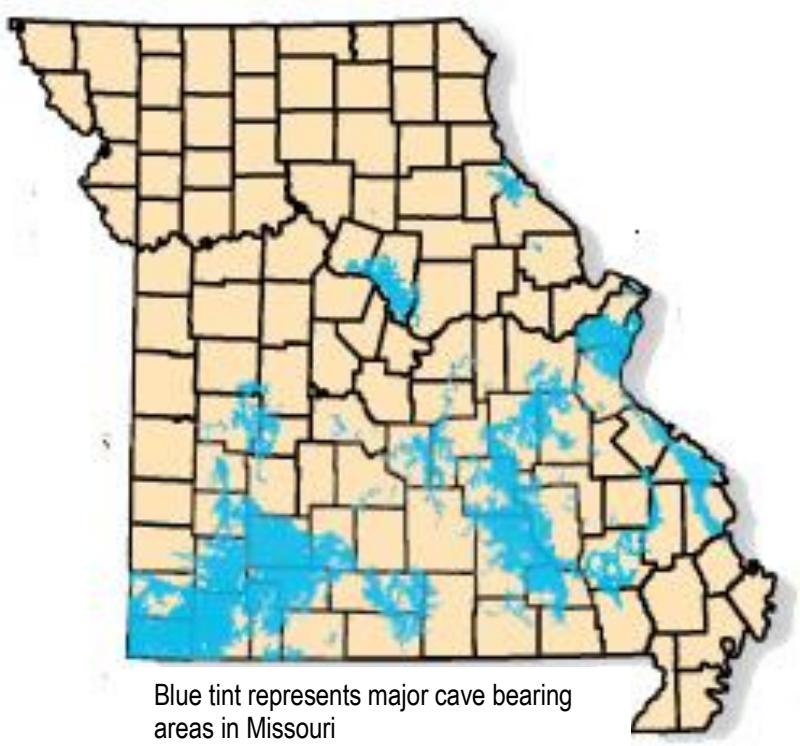
Several sewage lagoons in southern Missouri have also been adversely affected by sinkholes, including an incident in West Plains that completely drained the lagoon. In most cases, the communities are forced to abandon the original lagoon site and rebuild elsewhere or use alternate methods of sewage treatment.[liv]

There have been incidents of damage to homes and property in other parts of the state, such as Springfield and Farmington, when sinkholes formed near or under existing buildings. In some cases the sinkhole was stabilized and the damage to property repaired. However, due to the instability of sinkhole areas, the damage and process are often not reversible and losses can be substantial, as illustrated by the incident involving Lake Chesterfield.

Likely Locations**.** Sinkholes are a characteristic of karst which is defined as "a landscape characterized by the presence of caves, springs, sinkholes and losing streams, created as groundwater dissolves soluble rock such as limestone or dolomite."[lv] As illustrated by Figure 3-14 much of the southern half of Missouri has karst topography and has areas conducive to the development of caves and potential sinkholes. Insufficient data exists to accurately define likely locations other than using existing data on known sinkholes.

Figure 3-15 is a map of Osage County water resources, including springs, lakes, rivers, streams, watersheds, and marked in red—sinkholes. As is evidenced by this map, there is only one sinkhole in Osage County.

Figure 3-14 Cave Bearing Areas of Missouri



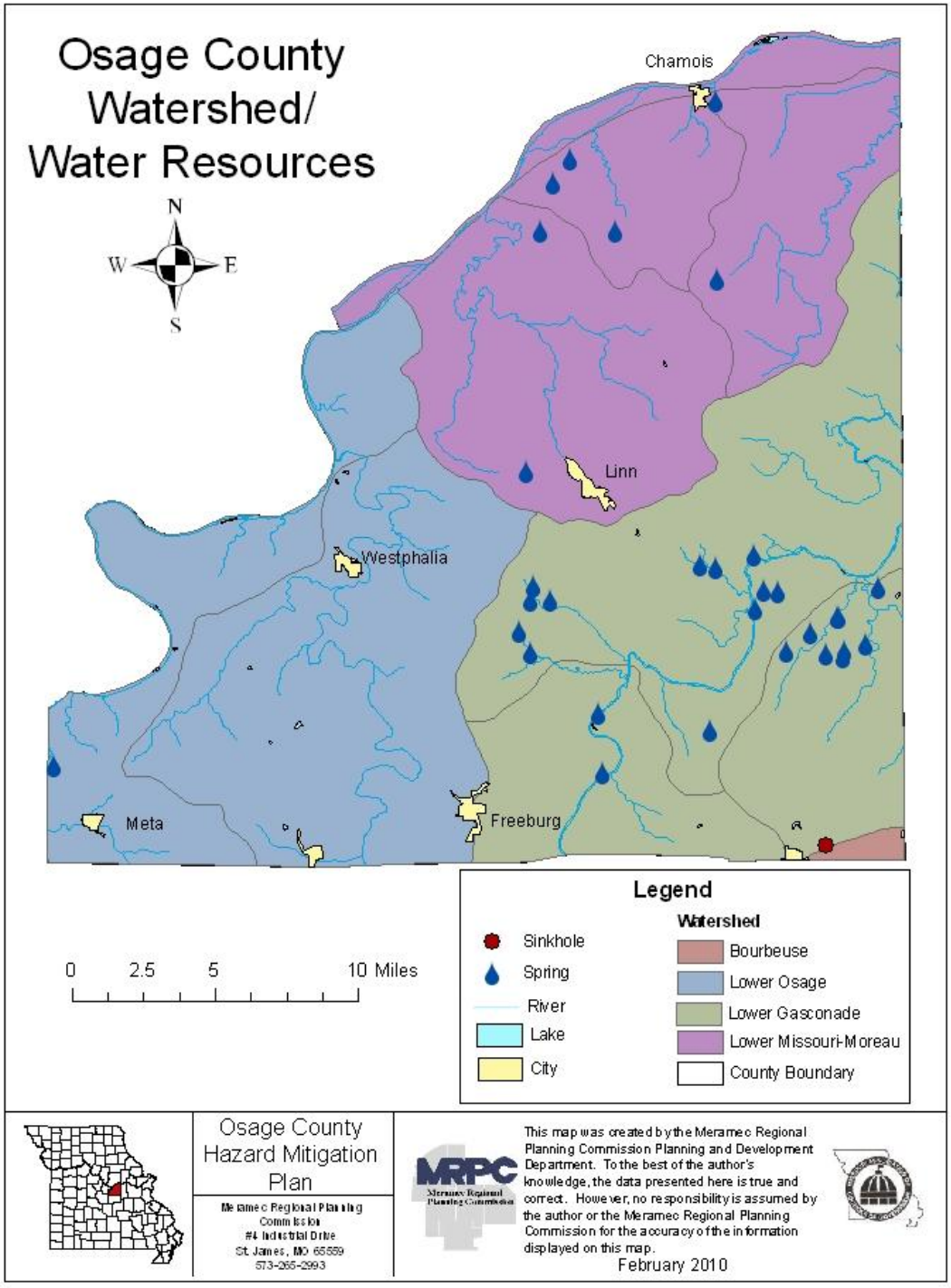
Source: "Geologic Column of Missouri" Volume 2 Issue 2 – publication of the Missouri Department of Natural Resources.

Type of Damage

The most likely type of damage to occur in conjunction with a sinkhole collapse is property damage related to foundation disturbance. Signs include cracks in interior and exterior walls; doors and windows that no longer sit square or open and close properly; depressions forming in the yard; cracks in the street, sidewalk, foundation or driveway; and turbidity in local well water. All of these can be early indicators that a sinkhole is forming in the vicinity.[lvi] In the event of a sudden collapse, an open sinkhole can form in a matter of minutes and swallow lawn, automobiles and homes. This has occurred in some parts of Missouri, particularly in the southwest part of the state, but there have been no dramatic incidents like this in Osage County.

In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts.

Figure 3-15


Osage County Watershed/ Water Resources
N
W
E
S
Chamois
Linn
Westphalia
Meta
Freeburg
0
2.5
5
10 Miles
Legend
Sinkhole
Spring
River
Lake
City
Watershed
Bourbeuse
Lower Osage
Lower Gasconade
Lower Missouri-Moreau
County Boundary
Osage County Hazard Mitigation Plan
Meramec Regional Planning Commission
#4 Industrial Drive
St. James, MO 65559
573-265-2993
MRPC
This map was created by the Meramec Regional Planning Commission Planning and Development Department. To the best of the author's knowledge, the data presented here is true and correct. However, no responsibility is assumed by the author or the Meramec Regional Planning Commission for the accuracy of the information displayed on this map.
February 2010

Hazard History
There is only one sinkhole identified in Osage County, and although incidents have occurred in other counties in southern Missouri, there have been no recorded incidents of property damage or injuries due to sinkholes in Osage County. Based on the map of sinkholes in Osage County, all incorporated cities lie outside the zone of the one identified sinkhole in the county.

Warning Time and Duration
Sinkhole collapses have historically been sudden and dramatic. In some cases, as in a sinkhole forming under a structure, there are warning signs such as cracks in foundations and obvious shifts in the structure itself. But most sinkhole collapses in Missouri have been characterized as abrupt and with little or no warning. The initial collapse may be immediate, but the area will often remain unstable for more than a few days.

Probable warning time of less than six hours for sink hole collapse (4). Duration of less than one week (3).

Statement of Severity/Magnitude
The risk for Osage County and the incorporated communities would be considered negligible due to lower population density and the lack of public facilities that might be vulnerable – such as waste water treatment facilities. In addition, only one sinkhole is identified for the county-wide area. Negligible (1) - Injuries and/or illnesses are treatable with first aid; minor quality of life lost; shutdown of critical facilities and services for 24 hours or less; less than 10 percent of property is severely damaged.

Statement of Probable Risk/Likeliness of Future Occurrence
Unlikely (1) – Event is possible within the next 10 years; event has up to one in 10 years chance of occurring; history of events is less than or equal to 10 percent likely per year. From a historical point of view, Osage County has not had problems with sinkholes and the likeliness of a future occurrence would be considered unlikely based on the CPRI. However, there is potential for this type of hazard to occur in the area of the one identified sinkhole in Osage County. This risk can be reduced by educating the public about sinkholes and discouraging development in the area surrounding the sinkhole.

Statement of Next Disaster's Likely Adverse Impact on the Community
If a sinkhole collapse should occur in a developed area of Osage County, the incident itself would be localized and would affect a relatively small area. If it occurs in a residential neighborhood, one or two homeowners could be affected. If the collapse should occur under public infrastructure, such as a road or sewer treatment facility, the impact could be far greater. The sewer treatment facilities in West Plains and Republic, Missouri were eventually abandoned and new facilities had to be built with public funds, which affected all of the residents of those communities.[lvii] Even in a situation where the collapse would affect a residential area, costs could be considerable. The draining of Lake Chesterfield had a significant negative impact on the value of the homes in that area. Residents spent $650,000 in an effort to repair the lake, but in the end were not successful in stopping the lake from leaking.[lviii]

Recommendation

Sinkholes and sinkhole areas are well documented by both the US Geological Survey and the Missouri Department of Natural Resources Geologic Resources Section. The risk of sinkhole collapse can be lessened by avoiding the construction of structures in these areas and avoiding those activities that significantly alter the local hydrology, such as drilling and mining. In addition, communities should avoid leaking water and sewer lines through appropriate maintenance and monitoring. Local residents should be educated on the risks associated with sinkholes and advised to avoid placing themselves and their property in danger by building in sinkhole areas. Communities with building codes should include prohibitions on building in known sinkhole areas.

Hazard Summary – Sinkhole /Land Subsidence For All Osage County Jurisdictions

Calculated Priority Risk Index	Planning Priority
1.45	Low

3.2.9 Levee Failure

Description

A levee, as defined by FEMA, is a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding. Levees are built parallel to a body of water in order to protect lives and properties behind it from some level of flooding. [lix] Levees are typically built of some type of less permeable soil – such as clay. They are simply a mound—wider at the base and narrower at the top and run in long strips parallel to the body of water. Levees vary widely in height and length. Levees along the Mississippi River are usually 10 to 20 feet in height and can be many miles in length.[lx] There are currently an estimated 1,602 miles of levees in place on the main stem of the Mississippi River. Privately owned and maintained levees can be much smaller.

There are five main types of levees:

- Mainline and tributary levees are generally parallel to the main channel and/or its tributaries.
- Ring levees completely encircle or "ring" an area from all directions.
- Setback levees are generally built as a backup to an existing levee that has become endangered due to such actions as river migration.
- Sublevees are constructed for the purpose of underseepage control. Sublevees encircle areas landward of the main levee that are flooded, generally by capturing seepage water during high-water stages, thus counterbalancing the hydrostatic pressures beneath the top stratum.
- Spur levees project from the main levee and provide protection to the main levee by directing erosive river currents back toward the river.[lxi]

Although levees are built to provide flood protection, they should not be considered failsafe. Levees are built to provide specific levels of protection against flooding. No levee system can provide full protection from all flooding events to the people and structures located behind it.[lxii] If the level of flooding exceeds the level for which the levee was constructed, it will overtop or breach, as occurred so dramatically in New Orleans following Hurricane Katrina. The levee failure in New Orleans resulted in 80 percent of the city being flooded and an estimated 1,600 deaths. An estimated 200,000 residents were displaced by the disaster.[lxiii]

The United States has a variety of levee systems currently in place that provide different levels of protection from flooding. Some levee systems have been in place for as long as 150 years and new levees are currently under construction. There are basically two types of levee systems – agricultural and urban. Agricultural levees are built to provide some level of flood protection for agricultural lands. Urban levee systems are built to provide some level of flood protection and flood-loss reduction for populated areas and the industrial, commercial and residential developments within those areas.[lxiv]

Unfortunately, the construction of a levee often leads people to believe that the flood-prone areas behind the levee are then completely safe from any flood hazard. This is not true and frequently results in flood losses in developments that are built behind levees that were constructed to a standard that would not provide full protection in extreme flood events. Due to the encroachment of development on land that was formerly used for agriculture, levees that were originally built to provide some protection for agricultural lands are now expected to provide total protection for developed land. Even the best constructed flood-control system cannot guarantee total protection.[lxv] The United States has experienced a number of weather events in recent years that have resulted in catastrophic losses due to flooding and in many cases the flood losses were exacerbated by levee failures. There is a widespread misunderstanding among the general public, of the true risks associated with levees. This has helped lead to the current over-dependence on structural solutions to reduce the impact of flooding and to the false sense of security among those living, working or developing in areas behind levees.[lxvi]

Levees also deteriorate over time and require constant monitoring and maintenance. Contrary to popular belief, not all levee systems are the responsibility of the USACE. Even levee systems that were built by the USACE may not be federally owned. Once the levee system is built, ownership is often transferred to a State, regional or local authority, and that entity, not the USACE, is responsible for maintenance of the levee. In addition, there are many privately owned levees. The costs of maintaining aging levee systems can be substantial, but when levee systems fail, they fail catastrophically and the damage may be greater than would have been experienced if the levee had not be present.[lxvii]

Unlike normal flood events, a levee failure is typically rapid, forceful and extremely damaging, and may occur with little or no warning. It is critical that people living behind levees be informed of the dangers and have evacuation plans in place. Because of the dangers inherent in dependence on levees, the Association of State Floodplain Managers (ASFPM) advocates that levees should only be used as a method of last resort for providing a limited means of flood risk reduction for existing development and should never be used as a means of protecting undeveloped land for the purpose of developing that property.[lxviii]

Levees can also have a negative impact on the environment as well as other properties that lie upstream, downstream, adjacent to or across the waterway. Levees transfer flood waters onto other property or communities, interfere with the natural attenuation of water flows, cause backwaters, increase the depth and velocity of flood water and encourage the degradation of channels and bank erosion.[lxix] These effects are rarely considered when levees are proposed or constructed.

There are currently thousands of miles of levee systems in the United States. These levees affect the lives of millions of people and billions of dollars of property. It is critical to the success of hazard mitigation planning that citizens and policy makers be educated on the effectiveness of levees and the hazards that remain despite levee construction.

Seasonal Pattern and Likely Locations

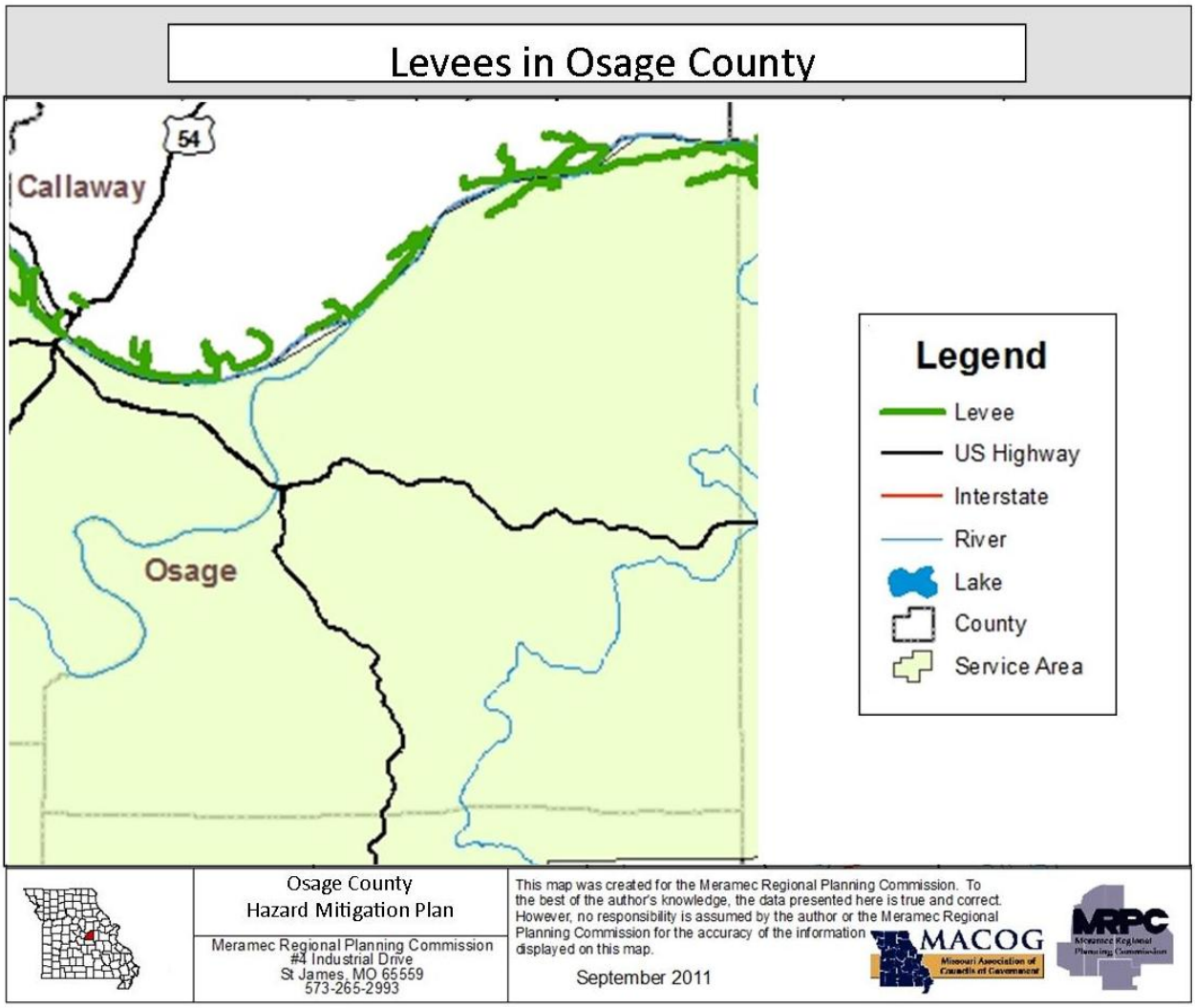
Levees in the Midwest are found along river ways. They are a common structure on the Missouri and Mississippi rivers. Osage County's northern border is the Missouri River. The U.S. Army Corps of Engineers website lists only one levee district for Osage County – The Chamois to Morrison A-1 Levee District. This not-for-profit organization has a 10-year certification of protection assessed by the U.S. Army Corps of Engineers. Corps engineers inspect the levee every two years and the levee must meet a five-year level of protection. Federal monies are available for 80 percent of any repair costs, with the other 20 percent coming from local match (cash or in-kind labor). Other levees (privately owned) may exist in the county but are not part of the Corps of Engineers' program and are not part of any organized levee district.

According to a representative of the district, the Chamois to Morrison A-1 Levee protects farmland and approximately 10 rural, occupied homes within the levee district - which is located between Chamois and Morrison. Figure 3-16 shows the levees in Osage County (as provided by the Corps of Engineers). An insufficiency in the data exists in regards to information on inundation areas should the levees in Osage County fail.

In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions, there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts.

Levees are placed under stress during periods of flooding. This typically occurs in the spring and early summer along the Missouri River when snow melt and spring thaws combined with higher precipitation cause the river to rise. However, flooding can and does occur throughout the year as is evident in the hazard section on flooding.

Figure 3-16



Type of Damage

Because levees restrain flood waters, they have the potential of causing significant damage in several ways—even when they perform as designed. Levees may protect the land behind them from flood waters, but they also force flood waters onto other property and cause damage that otherwise might not have occurred. The presence of levees also increases the depth and velocity of flood waters, which creates greater damage to affected areas, damages river channels and causes bank erosion.[lxx]

When levees fail, the resulting flood damage can be far more severe than would have occurred if the levee did not exist. Floodwaters flowing through a breach in a levee are far more concentrated, moving at higher velocities and can be far more destructive than the gradual rising of unimpeded floodwaters.[lxxi] Levee failures during the Midwestern Flood of 1993 and Hurricane Katrina resulted in structures being swept away and completely destroyed.

In addition, levee breaches often occur with little or no warning, making orderly evacuation difficult if not impossible. The rapid, high velocity flooding can be extremely dangerous for people caught in its path and as in the example of Hurricane Katrina, result in shockingly high numbers of dead and injured.

Hazard History

Even without including Hurricane Katrina's impact on New Orleans, there have been a number of well publicized, catastrophic levee failures in the last century. In 1927, following unusually heavy rains, the Mississippi River broke through levee systems built to contain the river and flooded 27,000 square miles along the southern half of the drainage basin, an area the size of Massachusetts, Connecticut, New Hampshire and Vermont combined. An estimated 700,000 people were displaced. In 1933, the Mississippi River repeated its performance in the northern portion of the river basin, flooding 16,000 square miles, including the lower Missouri River basin. In 1993 the Missouri and Mississippi rivers overflowed their banks and broke through levees again. 15,600 square miles were flooded and flood waters again lingered for weeks. 47,650 buildings were destroyed or damaged at an estimated cost of over $7.5 billion.[lxxii]

The Chamois to Morrison A-1 Levee protects mostly farmland and approximately 10 homes located on those farms. Insufficiencies in the data available make it difficult to determine inundation areas and levels of property damage should one of these levees fail. According to a representative of the district, the levee currently provides protection for approximately 10 rural households. Approximately 25-30 people could be directly affected if the Chamois to Morrison A-1 Levee failed. In 1993, the levee was overtopped, resulting in flooding of lower lying areas of the district. Sandbagging and pumping were used after the river level dropped back below the height of the levee. The levee itself was not damaged during the 1993 event, and has not been overtopped since.

Warning Time and Duration

Flood predictions along the Missouri River have become fairly accurate. Residents can expect to have several hours warning of how high flood stages will be and what to expect. Action can generally be taken in advance of high water to fortify levees. Local officials are usually able to warn residents if levees are showing signs of stress and are in danger of failing. Several radio stations and television stations in the region provide updates on river stages and issues with local levees when flooding impacts Osage County.

The initial damage from a levee failure, washing away buildings and infrastructure, would be over within a short period of time. The long-term damage of having property flooded for days or weeks would depend on the duration of the flood event causing the levee breech. Riverine flooding on large rivers like the Missouri generally last for a few days, but river levels may rise and fall and rise again based on weather events. During the 500-year flood events, the flooding lasted for weeks.

Probable warning time of 13 to 24 hours (2). Duration of more than one week. (4).

Statement of Severity/Magnitude

Although the last flood event that seriously affected the areas protected by levees in Osage County was the flood of 1993, which is considered a 500 year flood event, it is likely that the river will overtop the levees located in Osage County in the future. It is difficult to predict future floods, but history shows that flooding occurs on a regular basis and will again likely be severe enough to overtop or breach existing levees. Levees that protect farmland will result in crop losses, but little or no damage to structures. The number of residents whose homes or businesses would actually be impacted by levee failure is fairly small, being limited mainly to the levee district area between Chamois and Morrison. A failure of the Chamois to Morrison A-1 Levee would result in property and economic losses for the farms located within the district as both residences and cropland would be flooded and damaged. As this portion of Osage County has a much higher risk from levee failure, the county will be rated separately from the rest of the jurisdictions in Osage County.

For Osage County: Limited (2) - Injuries and/or illnesses do not result in permanent disability; complete shutdown of critical facilities for more than one week; 10-24 percent of property is severely damaged. Based on historical data and the potential magnitude of damage that failure of the Chamois to Morrison A-1 Levee can inflict, the probably magnitude of future events is rated as limited.

For the rest of the jurisdictions located in Osage County: Negligible (1) - Injuries and/or illnesses are treatable with first aid; minor quality of life lost; shutdown of critical facilities and services for 24 hours or less; less than 10 percent of property is severely damaged.

Statement of Probable Risk/Likeliness of Future Occurrence

Based on past history, two facts become evident. The Chamois to Morrison A-1 Levee did not fail during the 500-year flood event of 1993, it was overtopped. The levee is regularly inspected and has served the community effectively for the past 20 years without incident. For that reason, the probable risk of a levee failure in Osage County has been rated as Unlikely (1) – Event is possible within the next 10 years; event has up to one in 10 years chance of occurring; history of events is less than or equal to 10 percent likely per year.

Statement of Next Disaster's Likely Adverse Impact on the Community

It is likely that the next disaster's impact on Osage County will be limited based on historic data. The only jurisdiction that would be affected by a levee failure would be rural portions of the county. If the Chamois to Morrison A-1 Levee should be overtopped or breach during a future flood event, it would have an adverse impact on an estimated 10 homes and the farmland that is within the flood prone area of the levee district. These structures would be damaged by flood waters at a minimum. If flooding resulted in a sudden, catastrophic breach, these homes and farm buildings could be swept off their foundations. With current monitoring capabilities, it is unlikely that there would be no warning of an imminent levee failure, but if it did occur without warning there would likely be injuries or even deaths if residents were caught unaware. No lives have been lost in Osage County in recent decades from levee failures.

Recommendation

Local jurisdictions should work toward raising awareness of levees—appropriate uses, the hazards associated with levees and their limitations in flood-proofing properties. Existing levees should be regularly inspected and certified by the United States Army Corp of Engineers. Emergency response agencies and local government should insure that any people who live in areas susceptible to the hazard of levee failure have evacuation plans in place, be able to recognize the signs of an imminent levee failure understand the need for vigilance and constant monitoring of the levee during flood events.

Hazard Summary – Levee Failure – Osage County

Calculated Priority Risk Index	Planning Priority
1.75	Low

Hazard Summary – Levee Failure – Cities of Argyle, Chamois, Freeburg, Linn, Meta, Westphalia, Osage County R-I & R-II & R-III

Calculated Priority Risk Index	Planning Priority
1.45	Low

3.2.10 Severe Storms (Hail Storm/Wind Storm)/Tornado

Description

Despite their small size, all thunderstorms are dangerous. Every thunderstorm produces lightning, which kills more people each year than tornados. Heavy rain from thunderstorms can lead to flash flooding. Strong winds, hail, and tornados are also dangers associated with some thunderstorms. Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. The typical thunderstorm is 15 miles in diameter and lasts an average of 20 to 30 minutes. Of the estimated 100,000 thunderstorms that occur each year in the United States, only about 10 percent are classified as severe.

Tornados are cyclical windstorms often associated with the Midwestern areas of the United States. According to the National Weather Service, Missouri ranks 8th in the nation for frequency of tornados.[lxxiii] Weather conditions which are conducive to tornados often produce a wide range of other dangerous storm activities, including severe thunderstorms, downbursts, straight line winds, lightning, hail, and heavy rains.

Essentially, tornados are a vortex storm with two components of winds. The first is the rotational winds that can measure up to 500 miles an hour, and the second is an uplifting current of great strength. The dynamic strength of both these currents can cause vacuums that can overpressure structures from the inside. Although tornados have been documented in every state, most of them occur in the central United States. The unique geography of the central United States allows for the development of the thunderstorms that spawn tornados. The jet stream, which is a high velocity stream of air, determines which area of the central United States will be prone to tornado development. The jet stream normally separates the cold of the north from the warm of the south. During the winter, the jet stream flows west to east over Texas to the Carolina

coast. As the sun "moves" north, so does the jet stream, which at summer solstice flows from Canada across Lake Superior to Maine. During its move north in the spring and its recession south during the fall, it crosses Missouri causing the large thunderstorms that breed tornados.

Tornados spawn from the largest thunderstorms. These cumulonimbus clouds can reach heights of up to 55,000 feet above ground level and are commonly formed when moist gulf air is warmed by solar heating. The moist warm air is overridden by the dry cool air provided by the jet stream. This cold air presses down on the warm air preventing it from rising, but only temporarily. Soon, the warm air forces its way through the cool air and the cool air moves downward past the rising warm air. Adding to all this is the deflection of the earth's surface, and the air masses will start rotating. This rotational movement around the location of the breakthrough forms a vortex, or funnel. If the newly created funnel stays in the sky, it is referred to as a funnel cloud. However, if it touches the ground, the funnel officially becomes a tornado.

A typical tornado can be described as a funnel shaped cloud that is "anchored" to a cloud, usually a cumulonimbus that is also in contact with the earth's surface. This contact is, on the average, for 30 minutes and covers an average distance of 15 miles. The width of the tornado (and its path of destruction) is usually about 300 yards wide. However, tornados can stay on the ground for upward of 300 miles and can be up to a mile wide. The National Weather Service, in reviewing tornados occurring in Missouri between 1950 and 1996, calculated the mean path length was 2.27 miles and the mean path area was 0.14 square miles.

The average forward speed of a tornado is 30 miles per hour but may vary from nearly stationary to 70 miles per hour. The average tornado moves from southwest to northeast, but tornados have been known to move in any direction. Tornados are most likely to occur between 3 p.m. and 9 p.m. in the afternoon and evening, but have been known to occur at all hours of the day or night.[lxxiv]

The National Weather Service (NWS) considers a thunderstorm severe if it produces hail at least three-quarters of an inch in diameter, has winds of 58 miles per hour or higher, or produces a tornado. Thunderstorms may occur singly, in clusters or in lines. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time. Lightning is a major threat during a thunderstorm. It is the lightning that produces thunder in a thunderstorm. Lightning is very unpredictable, which increases the risk to individuals and property. In the United States, 75 to 100 people are killed each year by lightning, although most lightning victims do survive.[lxxv]

Tornados are the most concentrated and violent storms produced by the earth’s atmosphere. They are created by a vortex of rotating winds and strong vertical motion, which possess remarkable strength and cause widespread damage. Wind speeds in excess of 300 mph have been observed within tornados, and it is suspected that some tornado winds exceed 400 mph. The low pressure at the center of a tornado can destroy buildings and other structures it passes over. Most are caused by intense local thunderstorms. Most tornados are just a few dozen yards wide and only briefly touch down, but highly destructive violent tornados may carve out paths over a mile wide and more than 50 miles long.[lxxvi]

Seasonal Pattern

In Missouri, tornados occur most frequently between April and June, with April and May usually producing the most tornados. However, tornados can occur at any time of the year. While tornados can occur at any time of the day or night, they are most likely to occur between 3 p.m. and 9 p.m. Missouri averages 24 tornados per year and has recorded 1,383 tornados from 1950 through 2008. There is a high probability that tornadoes will continue to affect Missourians lives.

Type of Damage

Every tornado is a potential killer and many are capable of great destruction. Tornados can topple buildings, roll mobile homes, uproot trees, hurl people and animals through the air for hundreds of yards, and fill the air with lethal, windblown debris. Sticks, glass, roofing material, and lawn furniture all become deadly missiles when driven by a tornado's winds. Tornados do their destructive work through the combined action of their strong rotary winds and the impact of windblown debris. In the simplest cases, the force of the tornado's winds pushes the windward wall of a building inward. The roof is lifted up and the other walls fall outward. Until recently, this damage pattern led to the incorrect belief that the structure had exploded as a result of the atmospheric pressure drop associated with the tornado.[lxxvii]

A system of measurement has been developed to define the severity of a tornado based on wind speed and damage. This is known as the Fujita Scale, first proposed by Dr. Theodore Fujita in 1971. This scale is used by meteorologists to estimate the speed of winds after a tornado by studying the damage caused by the tornado to structures, not the appearance of the tornado. Different points on the scale are measured using the definitions in Table 3.10.

Table 3.10
The Fujita Scale of Tornado Definitions

Status	Definition
F0	(Light Damage) 40-72 mph. Chimneys are damaged, tree branches are broken, shallow-rooted trees are toppled.
F1	(Moderate Damage) 73-112 mph. Roof surfaces are peeled off, windows are broken, some tree trunks are snapped, unanchored manufactured homes are over-turned, attached garages may be destroyed.
F2	(Considerable Damage) 113-157 mph. Roof structures are damaged, manufactured homes are destroyed, debris becomes airborne (missiles are generated), large trees are snapped or uprooted.
F3	(Severe Damage) 158-260 mph. Roofs and some walls are torn from structures, some small buildings are destroyed, non-reinforced masonry buildings are destroyed, most trees in forest are uprooted.
F4	(Devastating Damage) 207-260 mph. Well-constructed houses are destroyed, some structures are lifted from foundations and blown some distance, cars and large objects are blown some distance.
F5	(Incredible Damage) 261-318 mph. Strong frame houses are lifted from foundations, reinforced concrete structures are damaged, automobile-sized debris becomes airborne, trees are completely debarked.

Source: http://www.disastercenter.com/tornado/fujita.htm

In February 2007, an enhanced version of the Fujita Scale was adopted by meteorologists in the U.S. Table 3.11 shows both the Fujita Scale and the Enhanced Fujita Scale.

Storm winds can damage buildings, power lines and other property and infrastructure due to falling trees and branches. Severe thunderstorms can result in collapsed or damaged buildings, damaged or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Roads blocked by fallen trees during a windstorm may have severe consequences to people who need access to emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric service and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from severe thunderstorms related to both physical damages and interrupted services.

Table 3.11
Enhanced F Scale for Tornado Damage
An update to the original F-scale by a team of meteorologists and wind engineers, implemented in the U.S. on 1 February 2007.

FUJITA SCALE			DERIVED EF SCALE		OPERATIONAL EF SCALE	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	**EF Number**	**3 Second Gust (mph)**
0	40-72	45-78	0	65-85	**0**	**65-85**
1	73-112	79-117	1	86-109	**1**	**86-110**
2	113-157	118-161	2	110-137	**2**	**111-135**
3	158-207	162-209	3	138-167	**3**	**136-165**
4	208-260	210-261	4	168-199	**4**	**166-200**
5	261-318	262-317	5	200-234	**5**	**Over 200**

IMPORTANT NOTE ABOUT ENHANCED F-SCALE WINDS: The Enhanced F-scale still is a set of wind estimates (not measurements) based on damage. Its uses three-second gusts estimated at the point of damage based on a judgment of 8 levels of damage to the 28 indicators listed below. These estimates vary with height and exposure. **Important**: The three second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured, "one minute mile" speed.

Source: National Oceanic and Atmospheric Administration - http://www.spc.noaa.gov/efscale/ef-scale.html

Falling trees are a major cause of power outages. Strong winds can cause flying debris and downed utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events. Utility lines brought down by summer thunderstorms have also been known to cause fires, which start in dry roadside vegetation. Falling trees can bring electric power lines down to the pavement, creating the possibility of lethal electric shock. Rising population growth and new infrastructure in the county creates a higher probability for damage to occur from severe thunderstorms as more life and property are exposed to risk.

Hail is another hazard associated with thunderstorms. A hailstorm forms when updrafts carry raindrops into extremely cold portions of the atmosphere where the drops condense and freeze. Hail falls when it becomes heavy enough to overcome the strength of the updraft and gravity takes over. The onset of hailstorms is generally very rapid and difficult to predict. The following table illustrates the different sizes and intensities of hail as well as the type of damage associated with each category.

Table 3.12 Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5-9	0.2 - 0.4	Pea	No damage.
Potentially Damaging	10-15	0.4 – 0.6	Mothball	Slight general damage to plants, crops.
Significant	16-20	0.6 – 0.8	Marble, grape	Significant damage to fruit, crops, vegetation.
Severe	21-30	0.8 – 1.2	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored.
Severe	31-40	1.2 – 1.6	Pigeon's egg > Squash ball	Widespread glass damage, vehicle bodywork damage.
Destructive	41-50	1.6 – 2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiles roofs, significant risk of injuries.
Destructive	51-60	2.0 – 2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted.
Destructive	61-70	2.4 – 3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries.
Destructive	71-80	3.0 – 3.5	Large orange > softball	Severe damage to aircraft bodywork.
Super Hailstorm	81-90	3.6 – 3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.
Super Hailstorm	> 100	4.0 +	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.

Source: Tornado and Storm Research Organization.

Hazard History

Osage County lies along the eastern edge of tornado alley and received on average a tornado every seven to eight years. From 1950 to April 2010, Osage County recorded nine tornados from F0 to F3 in strength. One tornado event caused damage in excess of $2.5 million. Recorded tornados in Osage County since 1950 are shown in Table 3.13. No deaths have occurred in Osage County due to tornados. However, four people have been injured.

Table 3.13 Tornado History – Osage County[lxxviii]

Date	Location	Magnitude	Number injured/killed	Property Damage
9/28/59	Osage Co	F1	1 injured, 0 killed	$25,000
4/17/69	Osage Co	F1	0 injured, 0 killed	$25,000
6/21/81	Osage Co	F0	0 injured, 0 killed	$0
5/1/83	Osage Co	F3	3 injured, 0 killed	$2,500,000
7/2/92	Osage Co	F1	0 injured, 0 killed	$250,000
4/8/99	Linn	F1	0 injured, 0 killed	$1,000,000
3/12/06	Chamois	F1	0 injured, 0 killed	$0
3/12/06	Chamois	F0	0 injured, 0 killed	$0
3/10/10	Westphalia	F1	0 injured, 0 killed	$0
TOTALS			**4 injured, 0 killed**	**$3,800,000**

Source: National Oceanic and Atmospheric Administration - http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

Historical data furnished by the National Climatic Data Center show tornados have touched down in unincorporated parts of the county as well as Linn, Chamois, and Westphalia since 1950. Over the past 59 years, Osage County has had four people injured and approximately $3,800,000 in property damage attributed to tornados.

In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions, there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts.

Thunderstorm winds, while not as powerful as tornados, are still a cause for concern in Osage County. The damaging winds of thunderstorms include downbursts, microbursts and straight-line winds. Downbursts are localized currents of air blasting down from a thunderstorm, which induce an outward burst of damaging wind on or near the ground. Microbursts are minimized downbursts covering an area of less than 2.5 miles across. They include a strong wind shear (a rapid change in the direction of wind over a short distance) near the surface. Microbursts may or may not include precipitation and can produce winds at speeds of more than 150 miles per hour. Damaging straight-line winds are high winds across a wide area that can reach speeds of 140 miles per hour.[lxxix]

The National Oceanic and Atmospheric Administration reports 45 incidences of thunderstorms with high winds in Osage County since 1950. These thunderstorm winds may result in the uprooting of trees, which may cause damage to nearby power lines, buildings or homes. Osage County has been fortunate that despite the number of damaging windstorms, only a few incidents resulted in reported property damage. Since 1950, the county has suffered $25,000 in property damage due to strong winds and thunderstorms, along with a storm in 1995 that resulted in $700,000 across a multiple county area.

Another hazard associated with thunderstorms is lightening. Fortunately, there have not been any deaths or property damage attributed to lightening reported for Osage County since 1950, however, lightening kills 75 to 100 people in the United States each year.

Hail is a fairly common weather activity in Osage County, having occurred 58 times in the last 59 years. As hail is a hazard typically covered by individual insurance, damage data is not well documented for hail storms. Large hail can reach the size of grapefruit. Hail causes several hundred millions of dollars in damage annually to property and crops across the nation. The size of hailstones in Osage County has been recorded as large as 3.00 inches in diameter in 2004, but typically hail stones are much smaller. While hail can be damaging, it has typically been mild in Osage County as there is no reported property damage since 1950.[lxxx] Damage typically occurs to roofs, windows and cars. Table 3.14 lists those thunderstorm and high wind events that caused damage in Osage County, as well as all hail events recorded for Osage County.

Table 3.14 List of All Hail Storms and Thunderstorms/High Winds Resulting in Property Damage or Injuries in Osage County 1950-2009

Location	Date	Type	Magnitude	Property Damage
County	03/18/1963	Hail	1.00 in.	0
County	04/16/1967	Hail	0.75 in.	0
County	04/12/1970	Hail	1.75 in.	0
County	05/11/1975	Hail	1.00 in.	0
County	07/26/1978	Hail	1.00 in.	0
County	04/03/1984	Hail	0.75 in.	0
County	04/03/1989	Hail	0.75 in.	0
County	05/25/1989	Hail	2.50 in.	0
County	02/14/1992	Hail	0.75 in.	0
Freeburg	04/15/1994	Thndstrm Wind	0 kts.	$5,000
Folk	04/26/1994	Thndstrm Wind	0 kts.	$5,000
Linn	06/25/1994	Thndstrm Wind	0 kts.	$5,000
Byron	06/26/1994	Hail	1.00 in.	0
Linn	06/28/1994	Thndstrm Wind	0 kts.	$5,000
Freeburg	06/28/1994	Thndstrm Wind	0 kts.	$5,000
Multiple County	04/08/1995	High Winds	0 kts.	$700,000
Ellington	07/08/1995	Hail	0.75 in.	0
Loose Creek	08/07/1995	Hail	0.75 in.	0
Linn	08/07/1995	Hail	0.75 in.	0
Linn	12/23/1996	Hail	0.75 in.	0
Meta	04/15/1998	Hail	1.00 in.	0
Argyle	04/15/1998	Hail	1.00 in.	0
Freeburg	04/15/1998	Hail	0.75 in.	0
Freeburg	04/15/1998	Hail	0.75 in.	0
Chamois	05/21/1998	Hail	0.75 in.	0
Linn	06/01/1999	Hail	0.88 in.	0
Linn	06/10/1999	Hail	1.00 in.	0
Linn	03/26/2000	Hail	1.00 in.	0
Westphalia	07/19/2001	Hail	0.88 in.	0
Meta	10/23/2001	Hail	1.50 in.	0
Rich Fountain	10/23/2001	Hail	0.75 in.	0
Linn	12/18/2002	Hail	0.75 in.	0
Loose Creek	05/06/2003	Hail	1.50 in.	0
Loose Creek	05/06/2003	Hail	2.75 in.	0

Location	Date	Type	Magnitude	Property Damage
Westphalia	05/06/2003	Hail	1.75 in.	0
Linn	05/06/2003	Hail	1.75 in.	0
Meta	06/10/2003	Hail	1.50 in.	0
Chamois	05/23/2004	Hail	1.00 in.	0
Chamois	05/23/2004	Hail	3.00 in.	0
Linn	05/25/2004	Hail	0.88 in.	0
Linn	05/25/2004	Hail	0.75 in.	0
Meta	05/26/2004	Hail	1.75 in.	0
Bonnots Mill	04/21/2005	Hail	0.75 in.	0
Loose Creek	04/21/2005	Hail	0.88 in.	0
Chamois	04/21/2005	Hail	0.75 in.	0
Linn	04/21/2005	Hail	1.75 in.	0
Linn	04/21/2005	Hail	1.00 in.	0
Westphalia	04/21/2005	Hail	1.00 in.	0
Westphalia	04/21/2005	Hail	0.88 in.	0
Meta	05/11/2005	Hail	0.75 in.	0
Rich Fountain	11/05/2005	Hail	1.00 in.	0
Linn	04/02/2006	Hail	0.75 in.	0
Linn	04/02/2006	Hail	0.88 in.	0
Chamois	04/05/2006	Hail	1.75 in.	0
Westphalia	04/19/2006	Hail	0.75 in.	0
Freeburg	04/19/2006	Hail	1.00 in.	0
Linn	04/19/2006	Hail	0.75 in.	0
Rich Fountain	04/19/2006	Hail	1.50 in.	0
Rich Fountain	04/19/2006	Hail	0.75 in.	0
Bonnots Mill	05/03/2006	Hail	0.75 in.	0
Frankenstein	06/10/2006	Hail	1.00 in.	0
Linn	06/10/2006	Hail	1.00 in.	0
Linn	07/19/2006	Hail	1.00 in.	0
Linn	05/07/2009	Hail	1.00 in.	0

Source: National Oceanic and Atmospheric Agency, National Climatic Data Center, http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

Seasonal Patterns

Thunderstorms, high winds, hail and tornados are typically associated with spring and summer weather patterns. However, these types of storms can occur at any time during the year provided the conditions are right, as evidenced in the table above.

Warning Time and Duration

Significant advances have occurred over the past decade in predicting and tracking severe storms and tornados. Severe thunderstorms can develop and change direction quickly, making it difficult to adequately inform both heavily populated and sparsely populated areas. While a thunderstorm may be predicted, its severity and the chance of tornado development are less predictable. Tornado warning sirens exist in Argyle, Chamois, Freeburg, Linn, Meta, Rich Fountain and Westphalia. Several radio stations in the area and television stations in the region provide updates when severe weather threatens Osage County. Weather radios also provide an early

warning. Osage County also provides warning information through the emergency notification system, Alert FM Receivers, and county emergency management Facebook page.

Probable warning time of less than six hours (4). Duration of less than six hours (1).

Statement of Severity/Magnitude

Because the severity or magnitude is different for severe storms and tornados, each of these hazards has been rated on the CPRI separately to provide a more complete hazard analysis.

Tornados

Limited (2) - Injuries and/or illnesses do not result in permanent disability; complete shutdown of critical facilities for more than one week; 10-24 percent of property is severely damaged. Each class of tornado will cause different degrees of damages and will only strike certain parts of the county. For example, a lower strength tornado may cause limited damage in a larger portion of the county while a high strength tornado may cause significant damage in a smaller area of the county. Based on past history of almost 60 years for Osage County, there have been four injuries in nine incidents and no deaths. Out of nine tornados, one was rated as an F3 tornado – all the rest were F1 or smaller. However, as can be evidenced by tornados like the one that struck Greenville, KS, tornados have the potential to exact catastrophic damage and this knowledge should be factored into the assessment. Based on historical data and the potential magnitude of damage that tornados can inflict, the probably magnitude of future events is rated as limited.

Severe Storms

Negligible (1) - Injuries and/or illnesses are treatable with first aid; minor quality of life lost; shutdown of critical facilities and services for 24 hours or less; less than 10 percent of property is severely damaged. Despite the frequency of severe thunderstorms in Osage County, storms causing damage in regards to high winds and hail have been relatively few. In almost 60 years the county has sustained a total of $25,000 in property damage from thunder and hail storms, in addition to one storm that caused $700,000 across a multiple county area.

Statement of Probable Risk/Likeliness of Future Occurrence

Because the probability of future occurrence is different for severe storms and tornados, each of these two hazards has been rated on the CPRI separately to provide a more complete hazard analysis.

Tornados

Occasional (2) – Event is probable within the next five years; event has up to one in five years chance of occurring; history of events is greater than 10 percent but less than or equal to 20 percent likely per year. The probability of tornados is low, with tornados occurring in the county on an average of every seven to eight years. Historically, the county has been fortunate that these storms have not caused extensive damage.

Severe Storms

Highly Likely (4) – event is probable within one year—a near 100 percent probability of occurring. Severe thunderstorms are virtually guaranteed to occur in the future in Osage County. On average several severe storms occur each year. Based on historic information, it is highly likely that a severe storm, possibly including high winds and hail will occur at least once

each year and affect a majority of the county. However, the strength of these thunderstorms is generally low with little or no damage.

Statement of Next Disaster's Likely Adverse Impact on the Community

It is likely that the next disaster's impact on Osage County will be limited based on data for previous severe thunderstorms and tornados. While there is a slight possibility of strong winds, there has been little damage done to commercial or residential structures in the past. The county has had a total of $3,800,000 in damages from nine tornados. One tornado, in 1983, accounted for $2.5 million of that total. No lives were lost in the past 59 years from tornados. Mitigation activities may provide a more secure prediction that loss of life will be negligible in the future.

Recommendation

Early warnings are possibly the best hope for residents when severe weather strikes. While more than two hours warning is not possible for tornados, citizens must immediately be aware when a city will be facing a severe weather incident. Cities that do not already possess warning systems should plan to purchase a system. Storm shelters are another important means of mitigating the effects of tornados and severe thunderstorms. A community-wide shelter program should be adopted for residents who may not have adequate shelter in their homes. Residents should also be encouraged to build their own storm shelters to prepare for emergencies. Local governments should encourage residents to purchase weather radios to ensure that everyone has sufficient access to information in times of severe weather.

Hazard Summary – Tornado For All Osage County Jurisdictions

Calculated Priority Risk Index	Planning Priority
2.2	Moderate

Hazard Summary – Thunderstorm/High Wind/Hail For all Osage County Jurisdictions

Calculated Priority Risk Index	Planning Priority
3.0	High

3.2.11 Severe Winter Weather

Description

Severe winter weather, including snowstorms, ice storms and extreme cold, can affect any area of Missouri. The greatest threat is likely to occur in the area north of the Missouri River, as was the case with the devastating Kansas City area ice storm on January 31, 2002, which stretched into central Missouri and led to a Presidential Disaster Declaration. However, there have been several ice storms in the past ten years that have affected the Ozarks. Severe weather, such as snow, ice storms and extreme cold can cause injuries, deaths and property damage in a variety of ways.[lxxxi]

A winter storm can range from a moderate snow over a few hours to blizzard conditions with blinding wind-driven snow that lasts several days. Some winter storms may be large enough to affect several states, while others may affect only a single community. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely reduce visibility.

Winter storms can be defined differently in various parts of the country. Heavy snow in the south can be a dusting in the mountains. Sleet is raindrops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects; however, it can accumulate like snow and cause a hazard to motorists. Freezing rain is rain that falls onto a surface with a temperature below freezing; this causes it to freeze to surfaces, such as trees, cars, and roads, forming a glaze of ice. Even small accumulations of ice can cause a significant hazard. An ice storm occurs when freezing rain falls and freezes immediately on impact; communications and power can be disrupted for days or weeks, and even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Likely Locations. While severe winter weather is more prevalent north of the Missouri River, it frequently strikes all of Osage County during its seasonal pattern and often takes the form of ice storms, which are often more destructive than snow storms. No part of the county or the communities located within the county is exempt from this natural hazard.

Type of Damage

Winter storms are considered deceptive killers. This is because most deaths are indirectly related to the storm. Causes of death range from traffic accidents due to adverse driving conditions such as icy roads, to heart attacks caused by overexertion while shoveling snow and other related activities. Hypothermia or frostbite may be considered the most direct cause of death and injuries, which can be attributed to winter storms and/or severe cold. Economic costs are also difficult to measure. Heavy accumulations of ice can bring down trees, electric power lines and poles, telephone lines and communications towers. Such power outages create an increased risk of fire, as home occupants seek use of alternative fuel sources (wood, kerosene, etc. for heat, and fuel burning lanterns or candles for emergency lighting). Crops, trees and livestock can be killed or injured due to deep snow, ice or severe cold. Buildings and automobiles may be damaged from falling tree limbs, power lines and poles. Local governments, home and business owners and power companies can be faced with spending millions of dollars for restoration of services, debris removal and landfill hauling.[lxxxii] In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions, there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts.

Winter weather warnings are set up in stages of severity by the National Weather Service. These stages are as follows:

Winter Weather Advisory: Winter weather conditions are expected to cause significant inconveniences and may be hazardous. If caution is exercised, these situations should not become life threatening. The greatest hazard is often to motorists.
Winter Storm Watch: Severe winter conditions have begun or are about to begin.
Blizzard Warning: Snow and strong winds will combine to produce a blinding snow (near zero visibility), deep drifts, and life-threatening wind chill.
Frost/Freeze Warning: Below freezing temperatures are expected and may cause significant damage to plants, crops, or fruit trees. In areas unaccustomed to freezing temperatures, people who have homes without heat need to take added precautions.

In addition to snow, the effects of temperature and wind chill increase the severity of a winter storm. Wind blowing across exposed skin drives down the skin temperature and eventually the internal body temperature. The faster the wind blows, the faster the heat is carried away, the greater the heat loss and the colder it feels. Exposure to low wind chills can be life threatening to humans and animals.

A new Wind Chill Temperature Index took effect on November 1, 2001, replacing the original wind chill index that was devised in 1945. To find the Wind Chill Temperature Index from the table that follows, find the air temperature along the top of the table and the wind speed along the left side. The point where the two intersect is the wind chill temperature.

Figure 3-17

Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) Effective 11/01/01

Source: National Oceanic and Atmospheric Administration

Hazard History

Severe winter weather typically strikes Missouri more than once every year. Osage County receives the gamut of winter weather events from heavy snows to freezing rain. Major snowstorms happen at least once each year causing multiple school closings and suspended business and government activity. Anywhere from one to fifteen inches of snow is possible and one to three inches of ice. Storms can last from less than an hour to several days. Damages are usually minimal and no deaths are attributed to severe weather in Osage County. However, icy conditions often make roads hazardous and automobile accidents are frequent occurrences. Since 1994, more than $5.8 million in property damage has been reported from winter storms and extreme cold weather that affected the southern half of the state, including Osage County. However, only a small portion of that overall damage can be attributed to Osage County.

A major winter storm on November 30, 2006, caused a combination of freezing rain, sleet, and heavy snow to fall over sections of southwest and central Missouri. The frozen precipitation began on the 30th and fell as freezing rain and sleet, with ice accumulations up to four inches in some areas. The second wave of precipitation occurred overnight causing large amounts of snow to accumulate over the ice. Osage County was one of several counties affected. Downed power lines resulted in widespread power outages. Many residents went without power for several days.

According to the National Climatic Data Center, there have been a total of 38 extreme cold, snow or ice events reported in Osage County since 1950. Table 3.15 shows the dates, type of storm, magnitude and property damage estimates for each event.

Table 3.15 Snow and Ice Storms in Osage County 1994-2009

Location	Date	Type	Magnitude	Property Damage
Multi-County	1/14/1994	Extreme Cold	0 Deaths, 15 Injuries	$5,000,0000
Multi-County	4/5/1994	Winter Storm	0 Deaths, 0 Injuries	$500,000
Multi-County	1/3/1995	Extreme Cold	2 Deaths, 6 Injuries	0
Multi-County	1/06/1995	Ice Storm	0 Deaths, 0 Injuries	0
Multi-County	1/18/1995	Heavy Snow	0 Deaths, 0 Injuries	$2,400,000
Multi-County	1/2/1996	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	11/25/1996	Ice Storm	0 Deaths, 0 Injuries	0
Multi-County	1/8/1997	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	1/15/1997	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	1/27/1997	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	4/10/1997	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	12/8/1997	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	1/12/1998	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	3/8/1998	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	12/21/1998	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	1/1/1999	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	1/27/2000	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	3/11/2000	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	12/13/2000	Heavy Snow	0 Deaths, 0 Injuries	0
Multi-County	12/16/2000	Extreme Wind Chill	0 Deaths, 0 Injuries	0

Location	Date	Type	Magnitude	Property Damage
Multi-County	2/25/2002	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	3/2/2002	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	3/25/2002	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	12/24/2002	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	1/1/2003	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	2/23/2003	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	12/13/2003	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	1/25/2004	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	11/24/2004	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	12/8/2005	Winter Storm	2 Deaths, 0 Injuries	0
Multi-County	12/1/2006	Winter Storm	0 Deaths, 0 Injuries	0
Multi-County	1/12/2007	Ice Storm	0 Deaths, 0 Injuries	0
Multi-County	4/4/2007	Frost/Freeze	0 Deaths, 0 Injuries	0
Multi-County	12/8/2007	Ice Storm	0 Deaths, 0 Injuries	0
Multi-County	2/11/2008	Winter Weather	0 Deaths, 0 Injuries	0
Multi-County	2/21/2008	Sleet	0 Deaths, 0 Injuries	0
Multi-County	2/23/2008	Winter Weather	0 Deaths, 0 Injuries	0
Multi-County	1/6/2010	Winter Weather	0 Deaths, 0 Injuries	0
TOTALS			**4 Deaths, 21 Injuries**	**$7,900,000**

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

Seasonal Patterns

Winter storms typically occur from November through February. However, winter weather can occur as late as May or as early as October in Osage County.

Warning Time and Duration

Meteorologists predict most winter weather more than 24 hours before it happens. While the extent of the severity may not always be completely accurate, the prediction at least provides some warning to residents. Residents mainly learn about severe winter weather from local radio and television stations that provide advanced notice of this hazard.

Probable warning time of more than 24 hours (1). Duration of less than one week (3).

Statement of Severity/Magnitude

Negligible (1) - Injuries and/or illnesses are treatable with first aid; minor quality of life lost; shutdown of critical facilities and services for 24 hours or less; less than 10 percent of property is severely damaged. Although severe winter weather can affect the entire county during a single storm, this hazard will most likely be negligible because major roads and facilities are usually rarely shut down for more than 24 hours. While some public schools may experience closing for up to two weeks, these facilities are not critical and cause little disturbance in day-to-day business or government activities. Injuries are usually limited to residents falling on icy sidewalks or cars sliding into each other on frozen thoroughfares. The most significant disruption in the past few years has been power outages associated with ice storms that can last for several days for some locations. Following the severe ice storms of the past five years and the associated

power outages that affected portions of southern Missouri, communities and utility companies have become much more aggressive in their tree trimming programs. This activity has mitigated a substantial portion of the power outage problem associated with winter storms.

Statement of Probable Risk/Likeliness of Future Occurrence

Highly Likely (4) – Event is probable within one year—a near 100 percent probability of occurring. Severe winter weather can be predicted with a great degree of certainty to occur in the future. Based on past history, this hazard will likely occur at least once or twice every year and has occurred as frequently as four times during one winter season.

Statement of Next Disaster's Likely Adverse Impact on the Community

The next severe winter storm will most likely close schools for one or more days and decrease the speed of travel throughout the county for residents traveling to work and visitors traversing through the county. Some residents may miss a day of work due to road conditions. Heavy ice may cause power outages in some areas.

Recommendation

The county and cities should enhance their weather monitoring to be better prepared for severe weather hazards. If the jurisdictions monitor winter weather, they can dispatch road crews to prepare for the hazard. County and city crews can also trim trees along power lines to minimize the potential for outages due to snow and ice.

Hazard Summary – Severe Winter Weather For All Jurisdictions in Osage County

Calculated Priority Risk Index	Planning Priority
2.55	High

3.2.12 Wildfire

Description

A wildland fire is any fire occurring on grassland, forest, or prairie, regardless of ignition source, damages or benefits. According to the National Fire Plan issued by the U.S. Departments of Agriculture and Interior, the urban/wildland interface is defined as "…. the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels." Spawned by increases in population, urban expansion, creative land management decisions that place neighborhoods next to wildland preserves, parks and greenbelts, and the ever-present desire to intermingle with nature, the interface problem has grown dramatically over the last twenty years. This marriage between humans and their property of value with wildland areas has significantly increased the human exposure to wildfires.

Forest fires have had a major impact on Missouri's forests. Burning the woods was a deep-rooted tradition in the Ozarks. It took many years of education to reduce the annual spring burning. Even now, some areas of the state still experience problems with fires deliberately set by arsonists. Humans cause most of the fire in Missouri: 50 percent start from escaped debris and trash fires and 31 percent are started by arsonists. These fires cause millions of dollars worth of

damage to forests, wildlife habitat, watersheds, and property. The Department of Conservation and Forest Service rely on lookout towers, airplane petrol, and telephone reports to locate wildfires. Rural fire departments help these agencies suppress forest and grass fires in many parts of the state. [lxxxiii]

More and more people are making their homes in woodland settings in or near forests and rural areas. There, homeowners enjoy the beauty of the environment but they also face the very real danger of wildfire. Osage County is primarily comprised of pastures and wooded areas. All of these tree-filled areas are significant possibilities for wildfire disasters. Figure 3-18 is a land cover map for Osage County and which demonstrates the potential areas for wildfires.

In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions, there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts.

Type of Damage

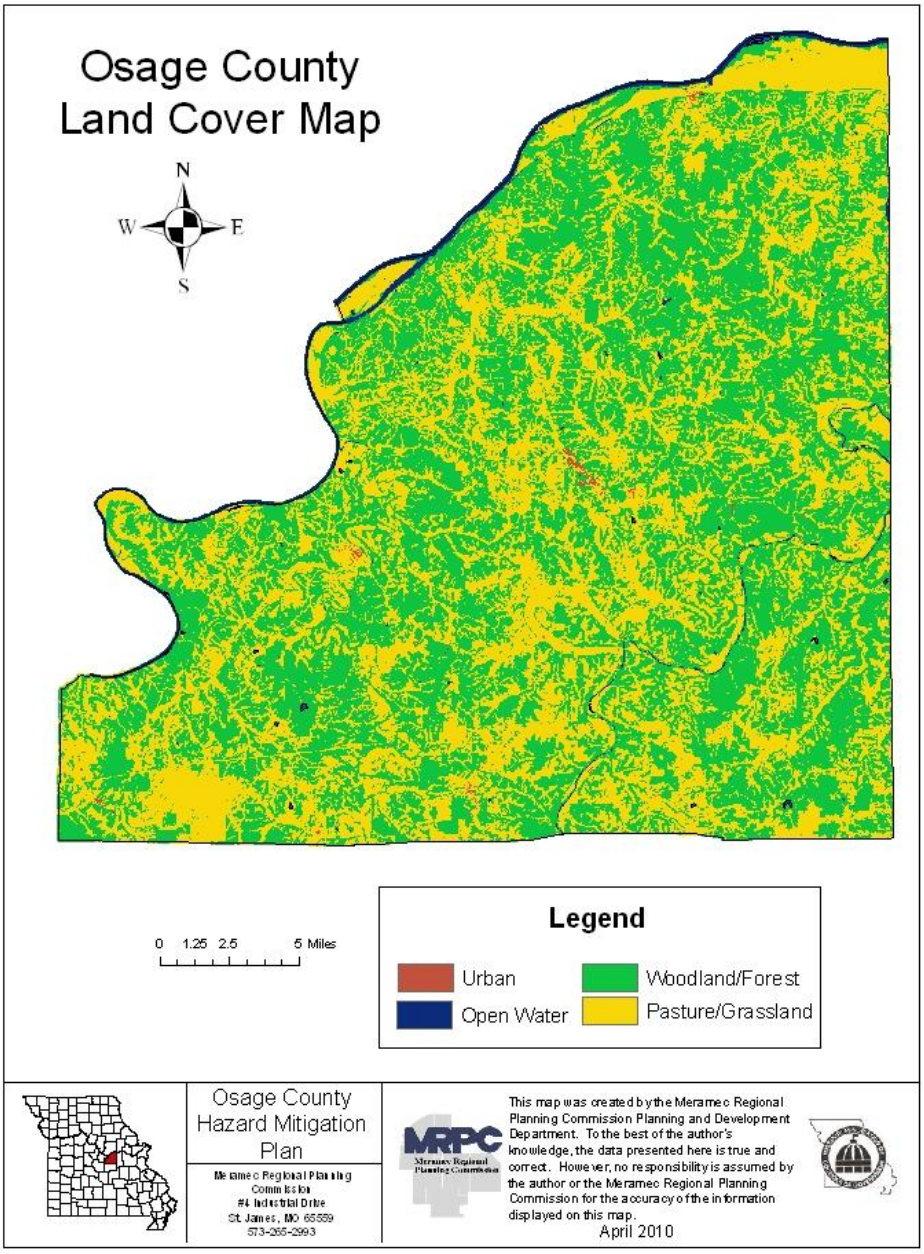
Wildfires destroy existing vegetation – forests, pastures, croplands, as well as structures such as homes, barns and businesses. The initial burn can be catastrophic – completely destroying whatever is involved. The aftermath can cause long term problems and can include crop and habitat losses. Deforested hillsides are more prone to erosion and landslides. Erosion can damage watersheds and cropland.

Hazard History

Because building structures exist anywhere people live and work, fires can occur at any time and anywhere throughout the state. The frequency of events depends on a wide range of factors. These factors could include and are not limited to: population/building density, building use, lack of fire codes, lack of enforcement when fire codes exists, fire safety practices or lack of by building occupants, lack of adequately equipped fire departments and criminal intent related to arson. Frequency of structural fire data may include the National Fire Incident Reporting System Statistics data provided by the Division of Fire Safety. According to Fire Safety, about 250 out of approximately 900 fire departments report the data utilized to compile the Missouri Incident Report statistics. For this reason, definitive conclusions are not possible. However, it is readily apparent that fire departments, law enforcement and other agencies spent considerable manpower and funding to respond to and investigate structural fires.

The Forest Division of the Missouri Department of Conservation is responsible for protecting the privately owned and state-owned woods and grasslands from wildfires. To accomplish this task, intensive forest fire protection districts have been established in the more heavily-timbered southern part of the state. At the present time, 18 forest districts afford intensive fire protection to approximately one-half of the state or about 16 million acres. Within these districts fairly accurate forest and grassland fire statistics are available from the Missouri Department of Conservation. In a typical year, there are approximately 3,500 wildfires. From July 1999 to June 30, 2000, there were some 4,000 wildfires in Missouri, burning over 132,000 acres.[lxxxiv]

Figure 3.18



Spring 2000 Brush and Wildfires. Due to extreme dry conditions, brush and wildfires whipped by 50 mph winds burned more than 17,000 acres in south-central Missouri in March 2000. In Camden County alone, there were 6,000 acres engulfed by flames and 40 structures destroyed by these fires. Some 200 homes were threatened by the approaching wildfires, prompting evacuations and shelters to be opened in Camdenton and Laurie. The brush and wildfires also erupted in the counties of: Morgan, Miller, Dallas, Laclede, Benton, Hickory, St. Clair, and

Henry, causing considerable damage to thousands of acres. The State Fire Marshall's Mutual Aid was activated with 480 volunteer fire personnel from 31 fire departments responding from neighboring areas. The Missouri Department of Conservation also provided key assistance. To help these fire departments recover their expenses, Missouri applied for a federal Fire Suppression Grant through the Federal Emergency Management Agency, with $135,000 approved as a result. This was the first such grant ever awarded to the state, and also the first within FEMA's four-state Region VII, which includes Missouri, Iowa, Kansas and Nebraska.[lxxxv] Osage County saw a small amount of wild-land fire during this major disaster, but did not suffer any significant damage. Smaller brush fires have plagued the county on multiple occasions.

According to the Missouri Department of Conservation Forest Fire Reporting, there have been 564 fires reported between January 1, 2000 and January 1, 2010. The total acreage burned from those incidents was 6,017.03 acres. Five residences and six outbuildings were damaged. Seven residences, 15 outbuildings and one commercial business were destroyed during the course of these fires.

Seasonal Patterns

Forest and grassland fires can and have occurred on any day throughout the year. The majority of the fires, however, and the greatest acreage loss will occur during the spring fire season, which is normally between February 15 and May 10. The length and severity of this burning period depends on the weather conditions. Spring in Missouri is noted for its low humidity and high winds. These conditions, together with below normal precipitation and high temperatures, result in extreme high fire danger. Not only is this the time of the year when fires are most difficult to control and suppress, it is also the time when most fire starts occur. Spring is the time of the year when rural residents normally burn their garden spots, brush piles, etc. Many landowners also still believe it is necessary to burn the woods in the spring of the year in order to get more grass, kill ticks, and "get rid of" the brush. Therefore, with the possibility of extremely high fire danger and the chances of a large number of fires starting, the spring months are the most dangerous for a wildfire standpoint. The second most critical period of the year is in the late fall. Depending on the weather conditions, there is a possibility of a sizeable number of fires occurring between mid-October and late November.[lxxxvi]

Climatic conditions such as severe freezes and drought can significantly increase the intensity of wildland fires since these conditions kill vegetation, creating a prime fuel source for these types of fires. Disease and insect infestation of forests can also lead to more dry fuel in wooded areas. The intensity of fires and the rate at which they spread are directly related to wind speed, temperature, and relative humidity.

Warning Time and Duration

Warning times for wildfires are often minimal or none. Existing warning systems include local television and radio stations and weather radios. The warning time and duration for all jurisdictions in Osage County is:

Probable warning time of less than six hours (4). Duration of less than one day (2).

Statement of Probable Future Severity/Magnitude

Negligible (1) - Injuries and/or illnesses are treatable with first aid; minor quality of life lost; shutdown of critical facilities and services for 24 hours or less; less than 10 percent of property is severely damaged. The severity of wildfire in Osage County and all of its jurisdictions should be considered negligible.

Statement of Probable Risk/Likeliness of Future Occurrence

Wildfire is another hazard where there is a difference in the probability of occurrences in incorporated and unincorporated areas of the county. Although fires that erupt in rural areas may burn longer and damage more acreage, the risk to property is lower because of the lower density of homes and businesses. The greater risk for property damage and injuries lies in those areas where developed areas meet densely vegetated areas. Figure 3-19 is a map showing the urban/wildland interface for Osage County. The communities of Argyle, Chamois and Meta show yellow areas of medium density interface intermixed with some green areas of medium density vegetation. The community of Linn shows both high density with no vegetation areas (black) and medium density with intermixed vegetation. The communities of Freeburg and Westphalia show high density with no vegetation illustrated in black. According to the map, no areas of Osage County or its jurisdictions would be considered to have a high density interface (both density of structures and density of vegetation). The probability of wild fires is considered likely, but may increase to high during certain periods, such as spring, late fall or under conditions of excessive heat, dryness and/or drought.

The likelihood of wildfire occurring in unincorporated areas of Osage County is as follows:

Highly Likely (4) – Event is probable within one year—a near 100 percent probability of occurring.

The probability of wildfire affecting the communities of Argyle, Chamois, Freeburg, Linn, Meta and Westphalia is as follows:

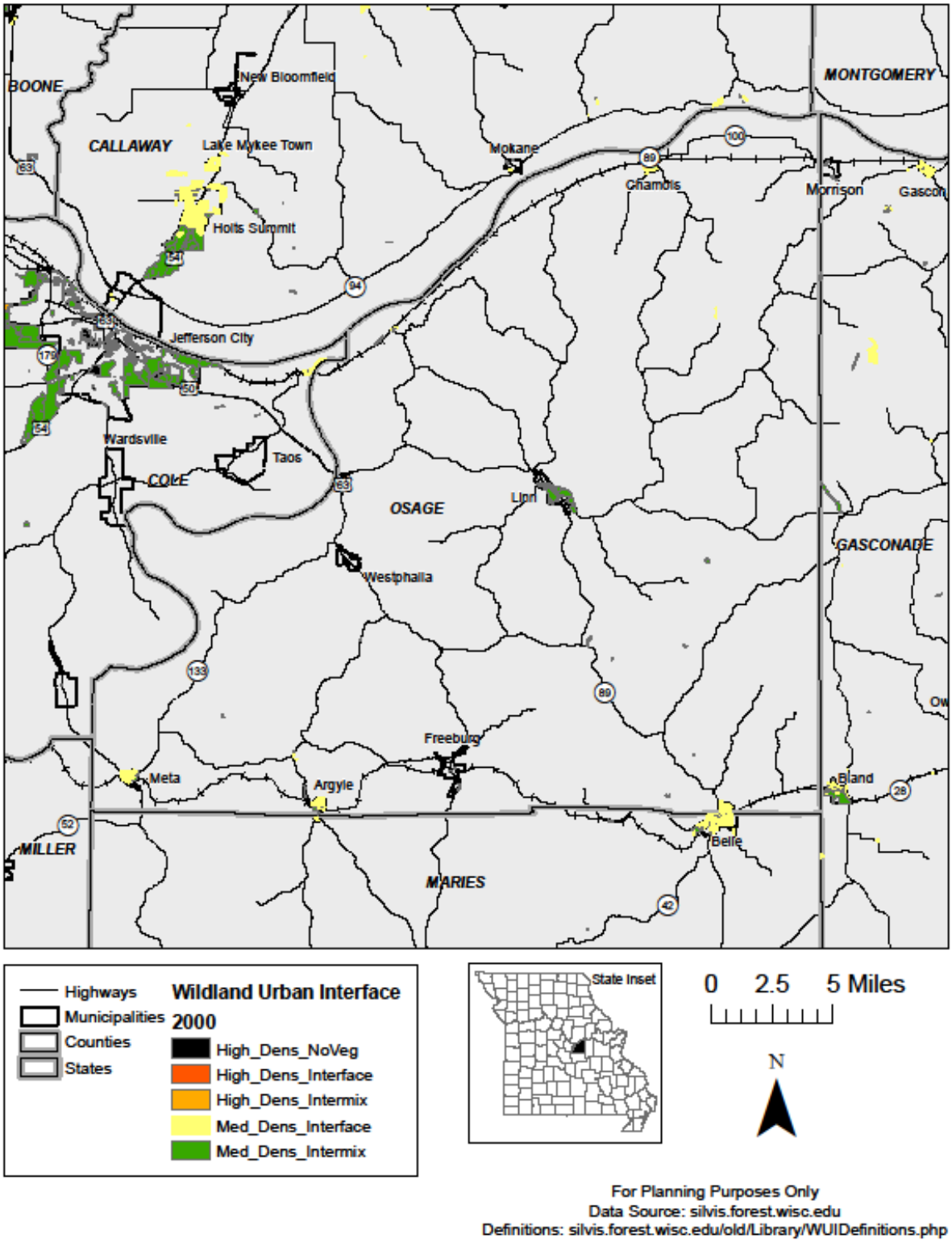
Likely (3) - An event is probable within the next three years—a 33 percent probability of occurring.

As most school facilities are located either in the city limits of communities or immediately adjacent to city limits, the risk of wildfire to school districts would be similar to that of communities. However, as school districts have far fewer buildings and assets that are at risk, their probable risk/likeliness for future occurrence would be less than that for communities in general. The probability of wildfire affecting the Osage County school districts R-I, R-II, and R-III is as follows:

Unlikely (1) - An event is probable within the next ten years—a 10 percent probability of occurring.

Figure 3-19

Osage County Wildland Urban Interface



Statement of Next Disaster's Likely Adverse Impact on the Community

As long as drought conditions are not seriously inflamed, future wildfires in Osage County should have a negligible adverse impact on the community, as it would affect a small percentage of the population.

Recommendation

Design and implement a comprehensive community awareness and educational campaign on the wildland fire danger, targeted at areas of highest risk. Develop capabilities, systems and procedures to pre-deploy fire-fighting resources during times of high wildland fire hazard. Through training and education, prepare local fire departments for wildfire scenarios. Encourage development and dissemination of maps relating to the fire hazard to help educate and assist builders and homeowners in being engaged in wildfire mitigation activities, and to help guide emergency services during response.

Hazard Summary – Wildfire – Osage County

Calculated Priority Risk Index	Planning Priority
2.9	High

Hazard Summary – Wildfire – Argyle, Chamois, Freeburg, Linn, Meta and Westphalia

Calculated Priority Risk Index	Planning Priority
2.45	Moderate

Hazard Summary – Wildfire – Osage County School Districts R-I, R-II and R-III

Calculated Priority Risk Index	Planning Priority
1.55	Low

3.2.12 Hazard Profiles Summary

The following table (Table 3.16) provides a summary of the results of the hazard profiles and if there is any variation of hazards among the various jurisdictions.

Table 3.16 Hazard Profile Planning Priority Summary by Jurisdiction

Hazard	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III
Dam Failure	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Drought	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Earthquake	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Moderate
Extreme Heat	High	High	High	High	High	High	High	High	High	High
Flood	High	High	High	High	High	High	High	High	High	High
Landslide	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Land Subsidence/ Sinkhole	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Levee Failure	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Severe Storms Hail/Wind	High	High	High	High	High	High	High	High	High	High
Severe Winter Weather	High	High	High	High	High	High	High	High	High	High
Tornado	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Moderate
Wildfire	High	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Mod-erate	Low	Low	Low

3.3 Vulnerability Assessment for Osage County

Requirement 201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement 201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement 201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement 201.6(c)(2)(ii)©: [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Requirement 201.6(c)©(2)(ii): (As of October 1, 2008) [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

3.3.1 Methodology

The vulnerability assessment further defines and quantifies populations, buildings, critical facilities and other community assets at risk from natural hazards. The vulnerability assessment for this plan followed the methodology described in the FEMA publication *Understanding Your Risks – Identifying Hazards and Estimating Losses (2002).*

The vulnerability assessment was conducted based on the best available data and the significance of the hazard. Data to support the vulnerability assessment was gathered from the following sources:

- Missouri Spatial Data Information Service (MSDIS)
- Statewide GIS datasets compiled by state and federal agencies
- FEMA's HAZUS software
- Existing plans and reports
- Personal interviews with HMPC members and representatives of other jurisdictions and stakeholders

The vulnerability assessment includes a description of:

- The community assets that are at risk from hazards in the county;
- The vulnerability to each hazard identified in the plan, including an overview of all the hazards and for those hazards with high or moderate planning priority a more in-depth analysis based on existing data;
- An overview of projected development trends;
- A summary of key issues and conclusions drawn from the assessment.

Those hazards ranked as High or Moderate risks include an estimated damage count of buildings for each jurisdiction. This damage count is estimated based on the calculated priority risk index (CPRI) that takes into account four elements of risk: probability, magnitude/severity, warning time and duration. As explained in Section 3.2.1 Methodology, each element is weighted and a numerical value developed using a pre-determined formula. Based on the score, each jurisdiction can rank a hazard as high, moderate or low risk. At the same time, this formula provides an estimated percentage for the magnitude of the damage should a hazard event occur. The magnitude of each profiled hazard is classified and quantified in the following manner:

- Catastrophic – More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and /or multiple deaths. (4)
- Critical – 25–50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses resulting in permanent disability. (3)
- Limited – 10–25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses do not result in permanent disability. (2)
- Negligible – Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid. (1)

By applying these percentages to the building counts for each jurisdiction, the impact of that hazard occurring within that jurisdiction can be estimated. These building damage estimates are included with the overview for each hazard that would result in property damage.

3.3.2 Community Assets

This section of the plan assesses the population, number of structures and estimated values. This data is provided based on HAZUS-MH data and 2000 US Census data. Values reflected here are on improvements (structures) and do not include land values. As would be expected, exposure is concentrated in populated areas such as Linn. There are insufficiencies in the data. HAZUS data was provided by SEMA and in some cases the flood data runs done for Osage County appear to include information for portions of surrounding counties. We have broken down data by census block for each city, but were not always able to break out data for the county, so some information on flood statistics may include data from portions of surrounding counties.

According to HAZUS-MH, there are an estimated 7,533 buildings in Osage County, with a total building replacement value (excluding contents) of $785,519,000 for Osage County. Residential housing makes up 74.5 percent of the total building value for Osage County, approximately $585,335,000. Non-residential building stock is valued at $200,184,000. Table 3.17 shows the breakout of type of buildings, exposure, and percentage of total building stock.

Table 3.17 Occupancy and Exposure of Osage County Building Stock

Occupancy	Exposure	Percent of Total
Residential	$585,335,000	75%
Commercial	$67,415,000	9%
Industrial	$83,566,000	11%
Agricultural	$12,206,000	2%
Religion	$4,532,000	1%
Government	$1,941,000	0.2%
Education	$13,856,000	1.8%
Total	$785,519,000	100.0%

Source: HAZUS-MH

Table 3.18 Village of Argyle Building Stock

Occupancy	Building Count	Percent of Total
Residential	129	98.4%
Commercial	1	0.8%
Industrial	0	0%
Agricultural	1	0.8%
Religion	0	0%
Government	0	0%
Education	0	0%
Total	131	100.0%

Source: HAZUS-MH

Table 3.19 City of Chamois Building Stock

Occupancy	Building Count	Percent of Total
Residential	301	92.0%
Commercial	14	4.0%
Industrial	3	1.0%
Agricultural	3	1.0%
Religion	3	1.0%
Government	2	0.6%
Education	1	0.4%
Total	327	100.0%

Source: HAZUS-MH

Table 3.20 Village of Freeburg Building Stock

Occupancy	Building Count	Percent of Total
Residential	278	87.4%
Commercial	10	3.1%
Industrial	23	7.3%
Agricultural	2	0.6%
Religion	1	0.4%
Government	2	0.6%
Education	2	0.6%
Total	887	100.0%

Source: HAZUS-MH

Table 3.21 City of Linn Building Stock

Occupancy	Building Count	Percent of Total
Residential	685	87.0%
Commercial	65	8.2%
Industrial	16	2.0%
Agricultural	7	1.0%
Religion	3	0.3%
Government	4	0.5%
Education	0	1.0%
Total	787	100.0%

Source: HAZUS-MH

Table 3.22 City of Meta Building Stock

Occupancy	Building Count	Percent of Total
Residential	221	97.0%
Commercial	4	1.8%
Industrial	0	0%
Agricultural	1	0.4%
Religion	1	0.4%
Government	1	0.4%
Education	0	0%
Total	228	100.0%

Source: HAZUS-MH

Table 3.23 City of Westphalia Building Stock

Occupancy	Building Count	Percent of Total
Residential	185	86.0%
Commercial	16	7.4%
Industrial	7	3.2%
Agricultural	3	1.4%
Religion	1	0.5%
Government	2	1.0%
Education	1	0.5%
Total	215	100.0%

Source: HAZUS-MH

Table 3.24 Unincorporated Osage County Building Stock

Occupancy	Building Count	Percent of Total
Residential	7,255	96.3%
Commercial	152	2.0%
Industrial	60	1.0%
Agricultural	24	0.3%
Religion	14	0.1%
Government	15	0.2%
Education	13	0.1%
Total	7,533	100.0%

Source: HAZUS-MH

For the purposes of this report, a critical facility is defined as one that provides essential public safety or mitigation functions during response or recovery operations or facilities that have the potential to suffer high losses during a disaster. Examples include fire department buildings, city halls, the courthouse, long-term care facilities, and hospitals. In addition, critical infrastructure facilities need to be considered such as highways, airports, water treatment facilities, pipelines and communications facilities. Table 3.25 has a more comprehensive list of potential critical facilities. Not all of these examples may exist in Osage County.

Table 3.25 Critical Facilities Definitions and Examples

Essential Facilities	High Potential Loss Facilities	Transportation and Lifelines
Hospitals and other medical facilities	Power plants	Highways, bridges and tunnels
Police stations	Dams and levees	Railroads and rail facilities
Fire stations	Military installations	Airports
Sheriff department facilities	Schools	Water treatment facilities
Emergency operations centers	Shelters	Pipelines/pump stations
911 centers	Day care centers	Communications centers
	Nursing homes	
	Government buildings	

Source: FEMA HAZUS

Table 3.26 is an inventory of critical facilities and infrastructure in Osage County, based on the data available. Data was collected from HAZUS-MH, directly from jurisdictions and in some cases from various sources that are listed in the endnotes.

Table 3.26 Critical Facilities and Infrastructure by Jurisdiction - Osage County

Facility	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Total
Airports	3	0	0	0	0	0	0	3
Bridges	79	1	0	0	0	3	0	83
Communications Centers	0	0	0	0	1	0	0	1
Dams	21	0		0	0	0	0	21
Daycare Centers[lxxxvii]	7	0	2	1	15	1	2	28
Elder Care/ Long Term Care Facilities[lxxxviiilxxxix]	0	0	0	0	2	0	2	5
Health Care Facility	0	1	0	0	3	0	0	4
Fire Stations	1	1	1	1	1	1	1	7
EMS Stations	0	0	0	0	1	1	1	3
Emergency Operations Centers	1	0		0	0	0	0	1

Facility	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Total
Government Facilities	15	0	2	2	4	1	2	26
Law Enforcement Facilities	1	0	0	0	1	0	0	2
Major Interstate Highways	2	0	0	1	1	0	1	2
Military Installations	0	0		0	0	0	0	0
Railroads	1	0		0	0	0	0	1
Pipelines	1	0		0	0	0	0	1
Schools[xc]	13	0	1	2	7	0	1	24
Emergency Shelters[xci]	0	1	1	1	1	1	1	6
Wastewater Treatment Facilities	0	0	1	1	1	0	1	4
Public Wells	5	0	2	1	1	1	1	11

Source: Osage County Hazard Mitigation Planning Committee

There are 5 long term care facilities for the elderly and disabled in Osage County. They are located in Linn, Belle and Westphalia. Table 3.27 provides specific information on the long term care facilities in Osage County.

Table 3.27 Long Term Elder Care and Elder Day Care Centers in Osage County

Elder Care Facility Name	Location	Capacity	Level of Licensure
Autumn Meadows	Linn	132	SNF
Victorian Estates I	Linn	22	RCF
Victorian Estates II	Belle	30	RCF
Westphalia Hills – A Stonebridge Community	Westphalia	64	SNF
Westphalia Hills – A Stonebridge Community	Westphalia	28	RCF

Assisted Living Facility=ALF; Residential Care Facility=RCF; Skilled Nursing Facility=SNF
Source: Missouri Department of Health and Senior Services

There are 28 child daycare facilities in Osage County. Smaller daycares that do not have enough children to require licensing are not included as data is not available on these facilities. Table 3.28 provides information on the licensed daycare facilities in Osage County.

Table 3.28 Licensed Child Care Facilities in Osage County

Facility Name	Location	Facility Type
Alverda Lynn Bushcer	Chamois	Family Home
Amy Marie Laubinger	Belle	Group Home
Bailey's Learn and Play, LLC	Loose Creek	Child Care Center
Becky Kremer	Bonnots Mill	Family Home
Betty Brant	Linn	Family Home
Brandy Lynn Prenger	Linn	Family Home
Busy Bee Learning Academy	Linn	Child Care facility
Cedar Ridge Child Care	Linn	Group Home
Central Missouri Community Action	Linn	Child Care Center
Chamois Head Start	Chamois	Child Care Center
Diedre Anne Scheulen	Linn	Family Home
Dorthy Ruettgers	Bonnots Mill	Family Home
Erin Lee Kelley	Linn	Family Home
FuneTime Learning Center	Westphalia	Group Home
Grace Rackers	Bonnots Mill	Family Home
Judy Dudenhoeffer	Linn	Family Home
Judy Rustemeyer	Linn	Family Home
Kathy Plassmeyer	Jefferson City	Family Home
Kim Jansen	Bonnots Mill	Family Home
Kindred Care, LLC	Linn	Child Care Center
Laverne Haller	Freeburg	Family Home
Lisa Renee Loerch	Linn	Family Home
Little Einsteins Learning Center	Linn	Group Home
Mandy Nilges	Linn	Family Home
Mary Jane Rinkemeyer	Meta	Family Home
Nicky Bartlett and Kim Hoffman	Linn	Family Home
Osage County R-III School District	Westphalia	Child Care Center
Tammy Robinson	Linn	Family Home

Source: Missouri Department of Health and Senior Services

Other Assets

Vulnerability assessment involves more than just an inventory of critical infrastructure. It is also important to include assets of historic, cultural, natural and economic importance. Reasons for including these types of assets in the assessment are varied. The county may place priority on certain assets due to their uniqueness or irreplaceable nature. Having a list of these assets before a disaster can aid in their protection and restoration following an incident. In the case of historic structures, the rules for rebuilding or restoring them may be different or more restrictive than for ordinary buildings. Osage County has many natural resource based assets that are important not only to recreation and tourism, but to the protection of threatened or endangered species. Natural resources such as wetland can help mitigate disasters such as floods. Damage to or the complete loss of some economic assets can have long-term devastating effects on a community and its ability to recover from a disaster.

The following assets are located in Osage County:

- Endangered, threatened, species of concern: Hellbender, bald eagle, cerulean warbler, gray bat, plains spotted skunk, Niangua darter, pallid sturgeon, Scaleshell mollusk, and Pink Mucket mollusk.
- Historic and Cultural Resources: Bonnots Mill Historic District; Chamois Public School; Dauphine Hotel in Bonnot's Mill; Huber's Ferry Farmstead Historic District near the junction of highways 50 and 63; Osage County Poorhouse in Linn; St. Joseph Church in Westphalia; Sacred Heart Catholic Church in Rich Fountain; Townley, Alvah Washington Farmstead Historic District in Chamois; and Dr. Enoch T. and Amy Zewicki House in Linn.
- Museums: Zewicki House Museum, Linn.
- Economic Resources: large employers in the county include Quaker Window Products in Freeburg; El Sevier Distribution Center in Linn; Diamond Pet Foods in Meta; and Play Mor Trailers in Westphalia.
- Natural Resources: there are 10 state public use areas and conservation areas in Osage County including Ben Branch Lake CA, Bonnots Mill Access, Dr. Bernard Bruns Access, Chamois Access, Cooper Hill CA, Painted Rock CA, Pointers Creek Access, Rollins Ferry Access, Smoky Waters CA, Meta Tower Site; three springs; and four major watersheds including the Gasconade, Maries, Osage and Missouri river basins.

Community Assets by Jurisdiction

The following table shows community assets by jurisdiction. Data has been collected from the various jurisdictions and from HAZUS-MH. (It has been determined that HAZUS-MH data is limited and may have errors.) Replacement values are, in some cases, estimates based on the available data. These assets have been identified for planning purposes as those structures and facilities that should receive priority consideration in hazard mitigation planning and projects in order to minimize risk for these assets.

Table 3.29 Specific Community Assets in Osage County by Jurisdiction

Name of Asset	Replacement Value ($)	Occupancy/Capacity
Unincorporated Area (Including County Government Assets)		
County buildings -includes courthouse, radio towers, administration buildings (6)	$3,759,000.00	N/A
Courthouse (1)	$2,038,000.00	N/A
Radio Towers (3)	$97,000.00	N/A
Administration Buildings (2)	$1,624,000.00	N/A
Argyle		
Government Buildings including waste water buildings (3)	$13,100.00	N/A
Rural Fire Department (1)	Information not provided	Information not provided
Waste Water Facility (1)	Information not provided	Information not provided
Chamois		
Government Buildings – includes park buildings, water and sewer buildings, maintenance shed (11)	$321,888.00	N/A

Name of Asset	Replacement Value ($)	Occupancy/Capacity
City Parks (5)	$40,425.00	N/A
Water and Sewer Buildings (5)	$265,713.00	N/A
Maintenance Shed (1)	$15,750.00	N/A
Freeburg		
Government Buildings -including storage sheds, and water and sewer buildings (9)	$419,800.00	N/A
Water and Sewer Buildings(8)	$394,800.00	N/A
Storage Building(1)	$25,000.00	N/A
Linn		
Government Buildings – includes city hall, park buildings, swimming pool, storage sheds, sewer and water buildings(23)	$1,824,400.00	N/A
Swimming Pool(2)	$35,000.00	N/A
Parks(10)	$146,650.00	N/A
Fire Station/Hall (1)	$380,000.00	N/A
Water and Sewer(9)	$1,211,250.00	N/A
Maintenance Garage(1)	$51,500.00	N/A
Meta		
Government Buildings (including city hall, recreation building, storage sheds, and park buildings) (7)	Information Not Provided	Information Not Provided
Rural Fire	Information Not Provided	Information Not Provided
Police (part of city hall)	Information Not Provided	Information Not Provided
Waste Water Plant and buildings (3)	Information Not Provided	Information Not Provided
City Wells and buildings (5)	Information Not Provided	Information Not Provided
Museum (2)	Information Not Provided	Information Not Provided
Westphalia		
Government Buildings -including city hall, storage sheds, water and sewer buildings (4)	$550,329.00	N/A
City Hall (1)	$16,065.00	N/A
Storage Shed (1)	$21,000.00	N/A
Sewer Treatment Plant (1)	$470,000.00	N/A
Unknown (1)	$43,264.00	N/A
Osage County R-I School District – Assessed Valuation $13,437,859		
Osage County Elementary School	Information Not Provided	114
Chamois High School	Information Not Provided	121
Osage County R-II School District – Assessed Valuation $55,313,971		
Osage County Elementary	Information Not Provided	325
Linn High School	Information Not Provided	323
Osage County R-III School District – Assessed Valuation $76,876,496		
Fatima Elementary School	Information Not Provided	390
Fatima High School	Information Not Provided	457

3.3.3 Vulnerability by Hazard

This section describes the overall vulnerability of Osage County to the hazards described earlier in this chapter. It also includes, where data is available, estimates of potential losses for buildings, infrastructure and critical facilities located in hazard prone areas. The hazards that will be discussed in this section are only those hazards that were classified through the CPRI process as being moderate or high priority. Hazards that were classified as low priority will not have detailed vulnerability assessments. A vulnerability overview will be provided for the following hazards that were ranked as low priority in the CPRI process:

- Dam Failure
- Drought
- Landslide
- Land Subsidence/Sinkhole
- Levee Failure

The vulnerability assessment for high and moderate hazards is limited by the data available and the analysis varies based on the data available and the type of hazard being assessed. Most weather related hazards affect the entire county and all of the jurisdictions and so cannot be mapped geographically. There is also the case for wildfires, which can occur anywhere, although the highest risk for property damage lies in the urban/wildfire interface zones. For weather related hazards, which include extreme heat, severe storm/wind/hail, hornado and severe winter storm, vulnerability is discussed in qualitative terms because good data on potential losses to structures and infrastructure is not available. Good data on structures and infrastructure is also not available for dam or levee failure. As these are both ranked low as hazards, the vulnerability assessment for them is an overview. In regards to unique construction characteristics or other conditions that may differentiate between jurisdictions, there appears to be no substantial differences between each of the participating jurisdictions. Construction and development trends are fairly uniform across the county. Mobile homes are found in every community and throughout the county. The county would benefit from collecting data on these issues to improve future planning efforts.

Of the high and moderate ranked hazards, flood is the highest ranking hazard that's effects vary between jurisdictions and has clearly defined hazard areas based on NFIP and HAZUS data. Floods will be discussed first and the remaining moderate and high ranked hazards will be presented in alphabetical order.

Flood Vulnerability of Osage County and Jurisdictions

Overview

Planning Significance: High. Overall vulnerability to flooding is highest in developed areas of the floodplains of the Missouri River and its tributaries, including the Gasconade, Osage and Maries rivers. Based on the vulnerability analysis and the loss estimates provided in Table 3.30, the unincorporated areas of the county would be most severely impacted by a 100-year flood, followed by the City of Chamois. The communities of Meta and Westphalia would also likely suffer damage, but it would be much less than of the other two jurisdictions.

Methodology

FEMA's software program for estimating potential losses from disasters, HAZUS-MH MR3 was used to generate the flood data for Osage County. HAZUS-MH was used to generate a 100-year floodplain for major rivers and creeks in the County that drain at least one square mile. The software produces a flood polygon and flood-depth grid that represents the base flood. While not as accurate as official flood maps, these floodplain boundaries are useful in GIS-based loss estimation. Once the floodplain was generated, the software's census-block level population and building inventory data was used to estimate numbers of residents potentially displaced by flooding as well as potential structural damages.

Flood Vulnerability: Estimated Potential Losses to Existing Development

HAZUS provides reports on the number of buildings impacted, cost of repairs and the loss of contents and business inventory. The loss of the use of a building, as well as the loss of income associated with the property can affect an entire community, whether the building be a business or rental property. Income loss data in HAZUS takes into account business interruption, rental income losses and the resources associated with repairing damages, and job and housing losses. These losses are calculated by HAZUS using a methodology based on the building damage estimates. Flood damage is directly related to the depth of the flood waters. For example, a two foot flood generally results in approximately 20 percent damage to the structure or replacement value. HAZUS uses depth-damage curves to estimate building losses as the flood depth varies across the area that has been inundated by flood waters.

HAZUS data was the best available data, but the information for Osage County is problematic because it includes portions of multiple counties – Callaway and Cole. In addition, HAZUS data may have some inaccuracies. The damaged building counts produced by HAZUS may be rounded and sometimes have errors that can be associated with the use of census block data for analysis.

A 100-year flood scenario was run to determine damage estimates for Osage County. HAZUS estimated that 34 residential structures would be affected by this size flood event. Twenty-three of those structures would sustain one to ten percent damage, five would sustain 11 to 20 percent damage, two would sustain 21 to 30 percent damage, two would sustain 31-40 percent damage, and two would sustain substantial damage.

According to HAZUS data, 95 percent of the structures located in Osage County are residential. Three percent of structures are commercial buildings. One percent are industrial buildings. The remainder are agricultural (.4 percent); religious (.2 percent); government (.2 percent); and education (.2 percent). The total financial exposure for structures in the county is an estimated $785,519,000.

After running the HAZUS analysis for the 100-year flood event, the building inventory loss estimates, which are linked to census block geography, were sorted by jurisdiction to show how the potential for losses varies across the county. Table 3.30 shows the estimated building losses by jurisdiction, as well as contents damage, inventory damage, relocation loss, income related

loss, rental income loss and wage loss. As mentioned earlier, there were some anomalies in the flood data provided. The information in Table 3.30 is based on the data provided. Efforts were made to separate Osage County data from Callaway and Cole counties' data by sorting by census block, but figures are estimated and may include some portions of Callaway and Cole counties in the unincorporated Gasconade County jurisdiction.

Table 3.30 Estimated Flood Losses by Jurisdiction

Jurisdiction	Building Damage	Contents Damage	Inventory Damage	Relocation Loss	Income Related Loss	Rental Income Loss	Wage Loss	Total	% of Total
Unincorporated Osage County	$10,833,000	$7,499,000	$297,000	$142,000	$683,000	$43,000	$1,159,000	$20,656,000	87.4%
Argyle	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Chamois	$1,663,000	$858,000	-0-	$151,000	-0-	$42,000	-0-	$2,714,000	11.4%
Freeburg	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Linn	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Meta	$155,000	$77,000	-0-	-0-	-0-	-0-	-0-	$232,000	1%
Westphalia	$25,000	$13,000	-0-	-0-	-0-	-0-	-0-	$38,000	.2%
TOTAL	$12,676,000	$8,447,000	$297,000	$293,000	$683,000	$85,000	$1,159,000	$23,640,000	100%

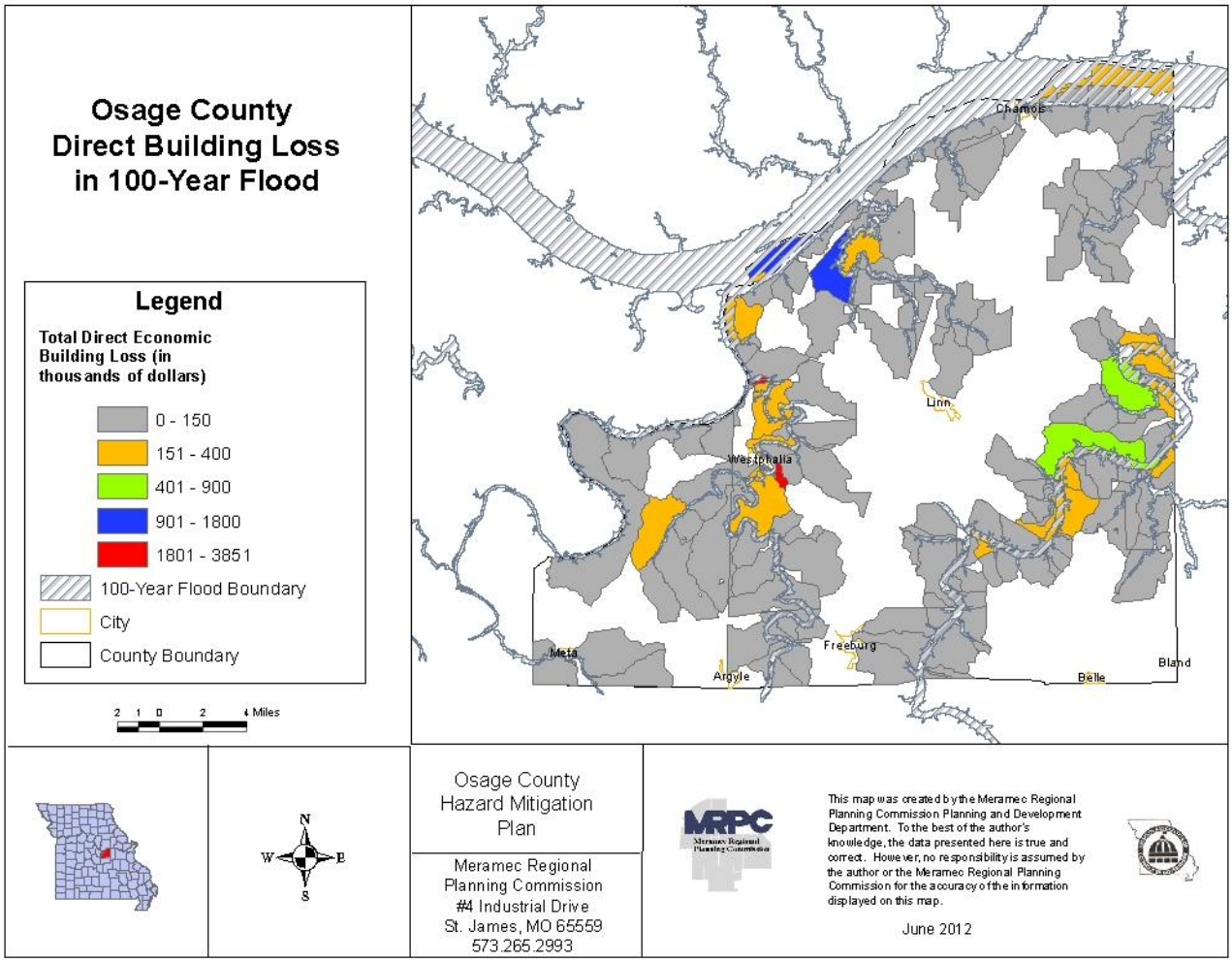
Source: HAZUS-MH MR3

Based on the results of the HAZUS analysis and review of floodplain maps, the unincorporated portions of Osage County are the most vulnerable to flood losses, accounting for more than 87 percent of the total losses. The City of Chamois is the community most susceptible to flood losses, accounting for more than 11 percent of the total losses in the county. The communities of Meta and Westphalia would also likely have damage, however the losses in those two communities would be much lower - one percent for Meta and .2 percent for Westphalia.

Total economic losses for Osage County in the 100-year flood scenario are estimated at $23.640 million. The total building damage losses were $12.676 million, with $1.927 million in losses related to income, wage and rental income losses. Insufficiencies in the data prohibited running reports that would show damage to waste water treatment facilities in the floodplain.

Figure 3-20 maps the estimated potential building losses in the county.

Figure 3-20



Tables 3.31 through 3.37 show the estimated number of buildings that could be damaged should a flood occur in each jurisdiction. As properties prone to flood damage do not include every building in the county, these damage counts were figured differently from the other hazard damage counts. As HAZUS cannot provide the estimated number of buildings damaged by jurisdiction, per the directions from the Missouri State Emergency Management Agency, planners overlaid floodplain and city boundaries with aerial photos and counted the number of structures found in the floodplain for each jurisdiction. The percentage of each type of occupancy was applied to the total number to get an estimate of the number of different types of structures. The maps showing the floodplain and critical facilities were also reviewed to determine if any critical facilities such as schools or government buildings were located in the floodplain. If not, those types of buildings were shown with zero damage. This method provided an estimate of the number and type of buildings that would be damaged in a 100-year flood.

Table 3.31 Estimated Damaged Building Count for Argyle - Flood

Occupancy	Total Building Count	Estimated Number of Buildings Damaged in 100-Year Flood
Residential	129	0
Commercial	1	0
Industrial	0	0
Agricultural	1	0
Religion	0	0
Government	0	0
Education	0	0
Total	131	0

Source: HAZUS-MH

Table 3.32 Estimated Damaged Building Count for Chamois - Flood

Occupancy	Total Building Count	Estimated Number of Buildings Damaged in 100-Year Flood
Residential	301	98
Commercial	14	4
Industrial	3	1
Agricultural	3	1
Religion	3	1
Government	2	1
Education	1	0
Total	327	106

Source: HAZUS-MH

Table 3.33 Estimated Damaged Building Count for Freeburg - Flood

Occupancy	Total Building Count	Estimated Number of Buildings Damaged in 100-Year Flood
Residential	278	0
Commercial	10	0
Industrial	23	0
Agricultural	2	0
Religion	1	0
Government	2	0
Education	2	0
Total	318	0

Source: HAZUS-MH

Table 3.34 Estimated Damaged Building Count for Linn - Flood

Occupancy	Total Building Count	Estimated Number of Buildings Damaged in 100-Year Flood
Residential	685	0
Commercial	65	0
Industrial	16	0
Agricultural	7	0
Religion	3	0
Government	4	0
Education	7	0
Total	787	0

Source: HAZUS-MH

Table 3.35 Estimated Damaged Building Count for Meta - Flood

Occupancy	Total Building Count	Estimated Number of Buildings Damaged in 100-Year Flood
Residential	221	19
Commercial	4	0
Industrial	0	0
Agricultural	1	0
Religion	1	0
Government	1	0
Education	0	0
Total	228	19

Source: HAZUS-MH

Table 3.36 Estimated Damaged Building Count for Westphalia - Flood

Occupancy	Total Building Count	Estimated Number of Buildings Damaged in 100-Year Flood
Residential	185	2
Commercial	16	0
Industrial	7	0
Agricultural	3	0
Religion	1	0
Government	2	0
Education	1	0
Total	215	2

Source: HAZUS-MH

Table 3.37 Estimated Damaged Building Count for Unicorporated Osage County - Flood

Occupancy	Total Building Count	Estimated Number of Buildings Damaged IN 100-Year Flood
Residential	7,255	274
Commercial	152	6
Industrial	60	2
Agricultural	24	1
Religion	14	1
Government	15	1
Education	13	0
Total	7,533	285

Source: HAZUS-MH

Flood Vulnerability: Potential Population Displaced

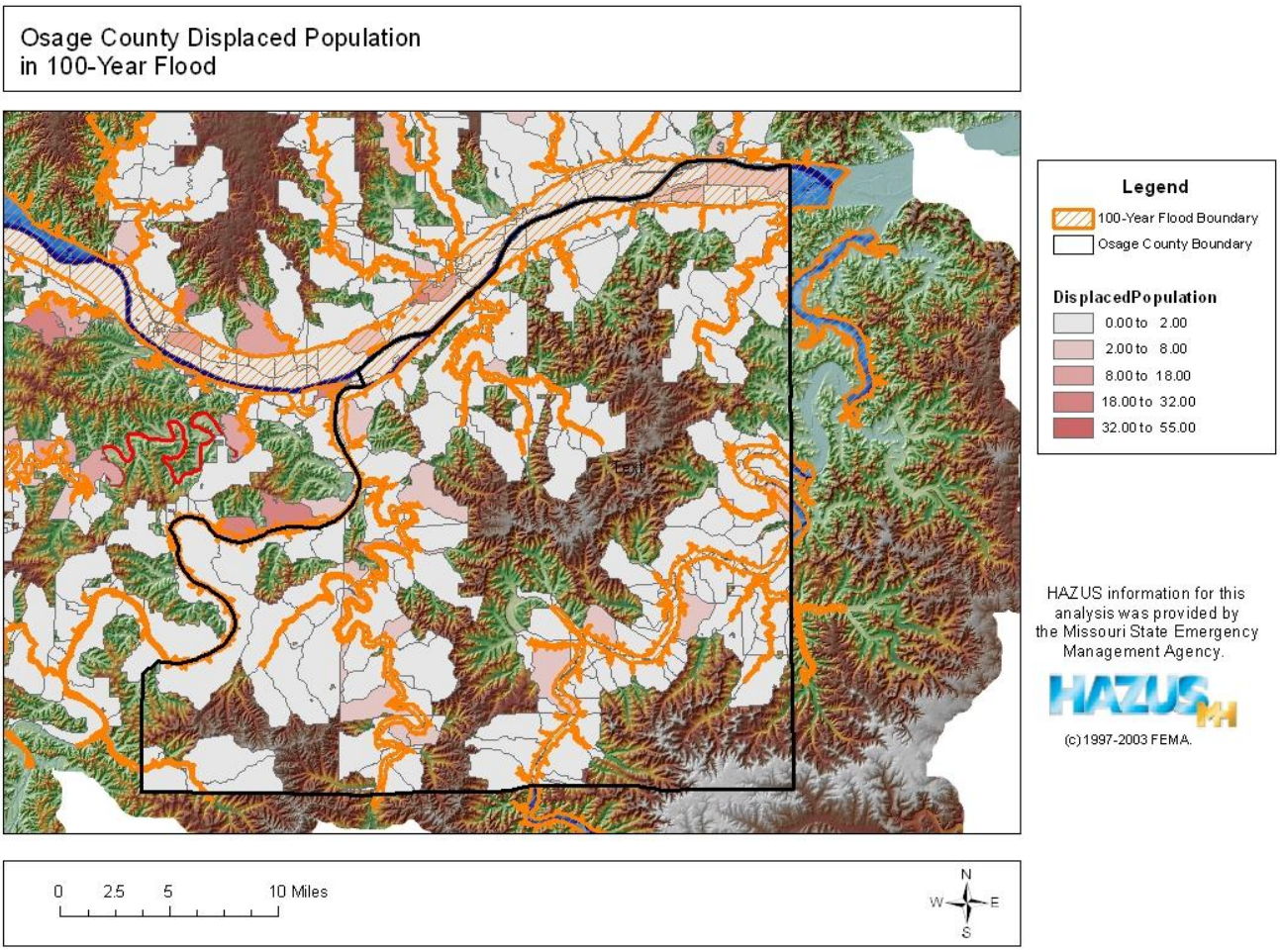
HAZUS-MH estimates for the population displaced during a 100-year flood event using U.S. Census data and flood depths. The software estimates that out of a total population of 13,878, approximately 411 people will be displaced due to the flood. Displacement includes households evacuated from within or very near the inundated area. Of this number, it is estimated that 82 will seek temporary shelter in public shelters.

Figure 3-21 classifies areas of Osage County by the number of residents who could potentially be displaced by a flood with an estimated one percent chance of occurrence in any given year (100-year flood event). As shown by the darker shaded areas on the map, specific areas of risk are located along the Missouri River, the Osage River, the Maries River and the Gasconade River.

Flood Vulnerability: Critical Facilities and Pipelines

Critical facilities data was pulled from the HAZUS-MH and was used along the floodplain generated by HAZUS-MH to identify any critical facilities in the floodplain. Figure 3-16 shows critical facilities in relation to the 100-year floodplain. Figure 3-17 shows transportation infrastructure in relation to the 100-year floodplain, including highways, bridges, bus stations, airports and railroads. Past history shows that Osage County secondary roads, low water crossings and bridges have sustained damage in past flood incidents. Figure 3-18 shows the pipelines in the county in relation to the 100-year floodplain. Figures 3-19 through 3-23 show critical facilities for each of the jurisdictions.

Figure 3-21



Flood Vulnerability: Critical Facility Locations by City

Figures 3-22 through 3-29 map the locations of critical facilities in relation to the 100-year floodplain for the incorporated cities of Osage County. Based on HAZUS-MH data, the communities of Chamois and Meta each have critical facilities located either in or adjacent to the 100-year floodplain. Facilities in Chamois that could be in danger include the Chamois Fire Department and both the elementary and high school. The Meta Fire Department is also located near the 100-year floodplain. Although the map of Westphalia makes it appear that the schools are adjacent to the floodplain, they are in fact located well above the 100-year flood.

Figure 3-22

Osage County Critical Facilities and the 100-Year Flood Plain

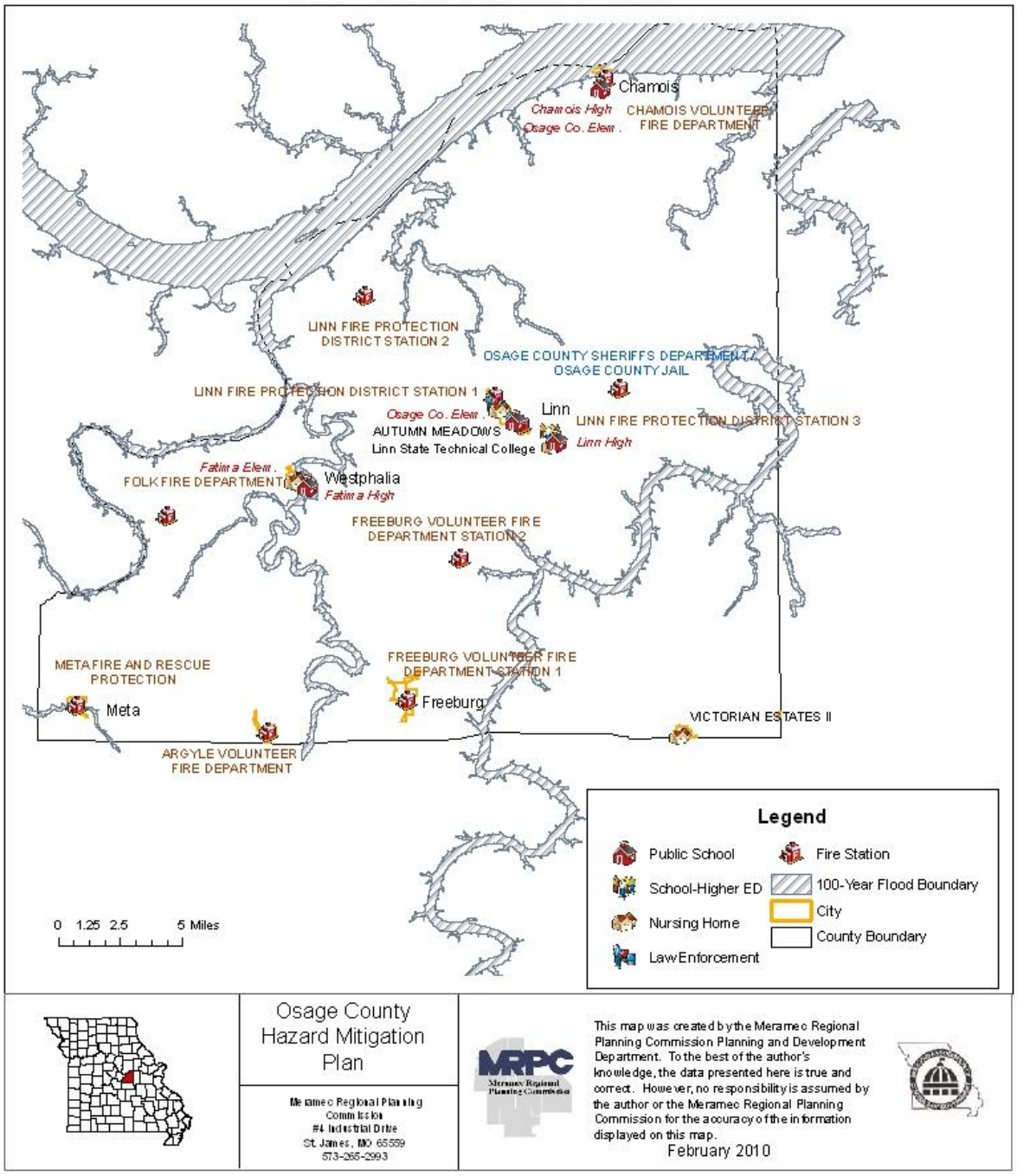


Figure 3-23

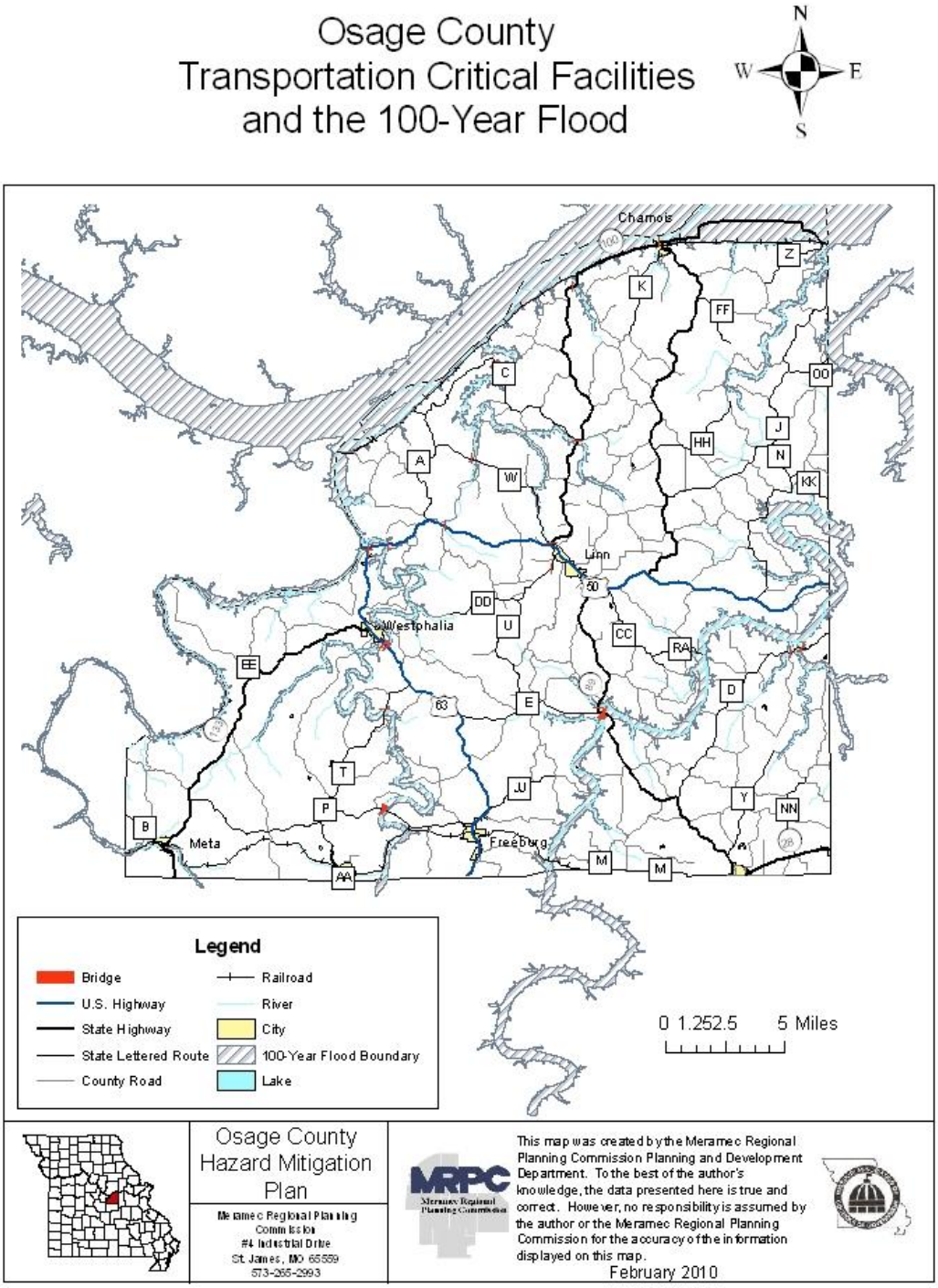

Osage County
Transportation Critical Facilities
and the 100-Year Flood
N
W
E
S
Chamois
Linn
Westphalia
Meta
Freeburg
Legend
Bridge
U.S. Highway
State Highway
State Lettered Route
County Road
Railroad
River
City
100-Year Flood Boundary
Lake
0 1.252.5 5 Miles
Osage County
Hazard Mitigation
Plan
Meramec Regional Planning
Commission
#4 Industrial Drive
St. James, MO 65559
573-265-2993
MRPC
Meramec Regional
Planning Commission
This map was created by the Meramec Regional Planning Commission Planning and Development Department. To the best of the author's knowledge, the data presented here is true and correct. However, no responsibility is assumed by the author or the Meramec Regional Planning Commission for the accuracy of the information displayed on this map.
February 2010

Figure 3-24

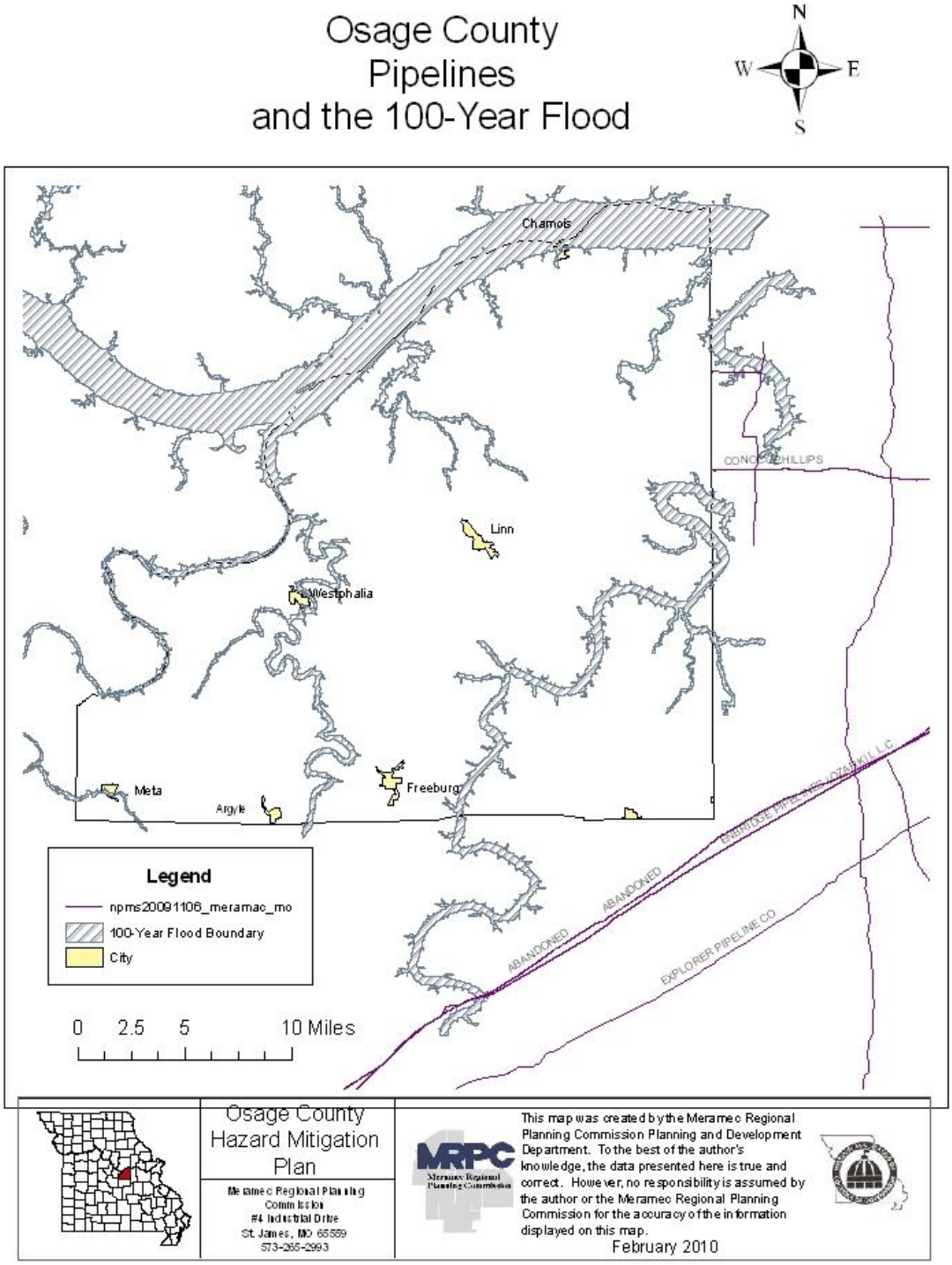

Osage County
Pipelines
and the 100-Year Flood
N
W
E
S
Chamois
Linn
Westphalia
Meta
Argyle
Freeburg
CONOCOPHILLIPS
ENBRIDGE PIPELINES (OZARK) L.L.C.
ABANDONED
ABANDONED
EXPLORER PIPELINE CO
Legend
npms20091106_meramac_mo
100-Year Flood Boundary
City
0 2.5 5 10 Miles
Osage County
Hazard Mitigation
Plan
Meramec Regional Planning
Commission
#4 Industrial Drive
St. James, MO 65559
573-265-2993
MRPC
Meramec Regional
Planning Commission
This map was created by the Meramec Regional Planning Commission Planning and Development Department. To the best of the author's knowledge, the data presented here is true and correct. However, no responsibility is assumed by the author or the Meramec Regional Planning Commission for the accuracy of the information displayed on this map.
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Figure 3-25

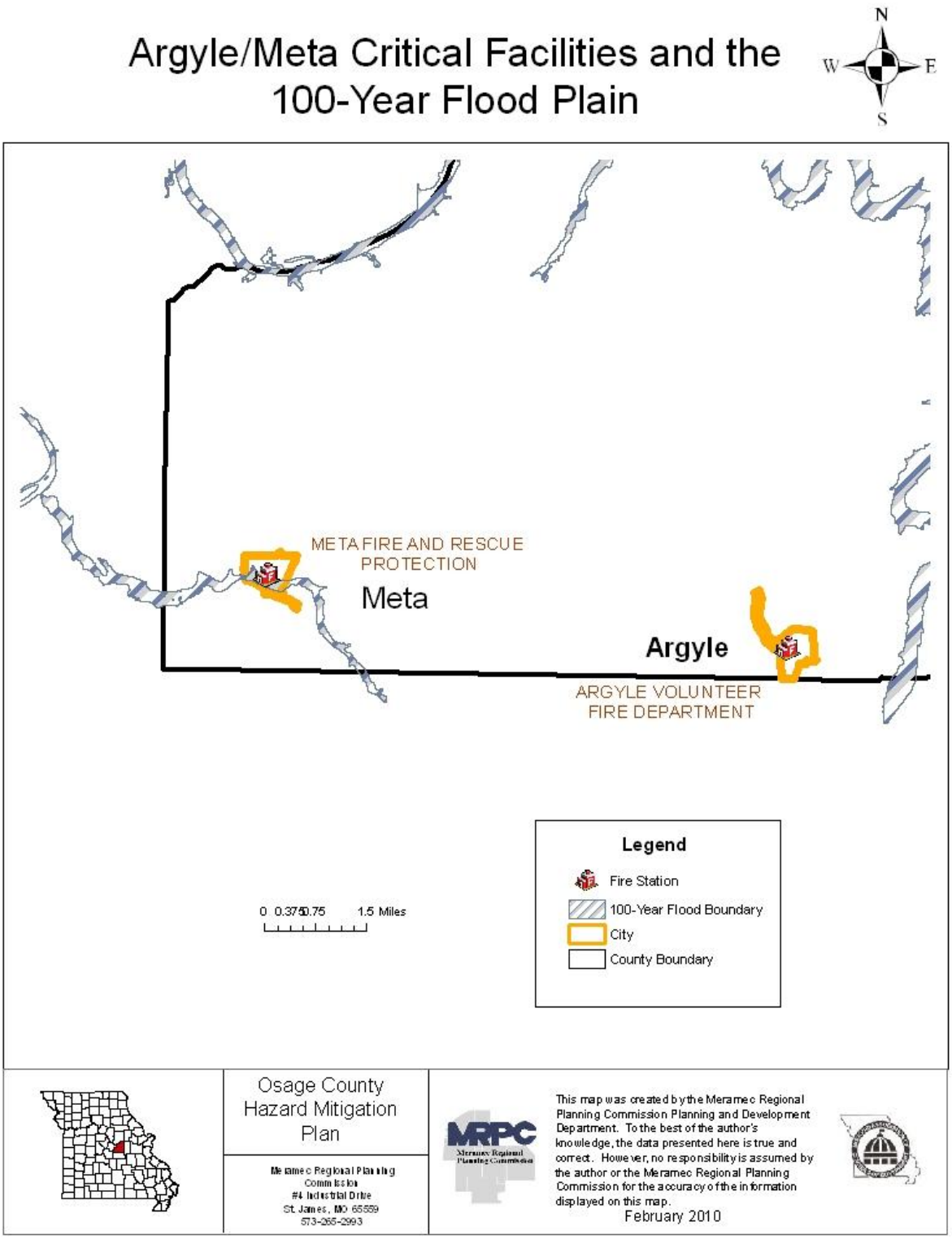
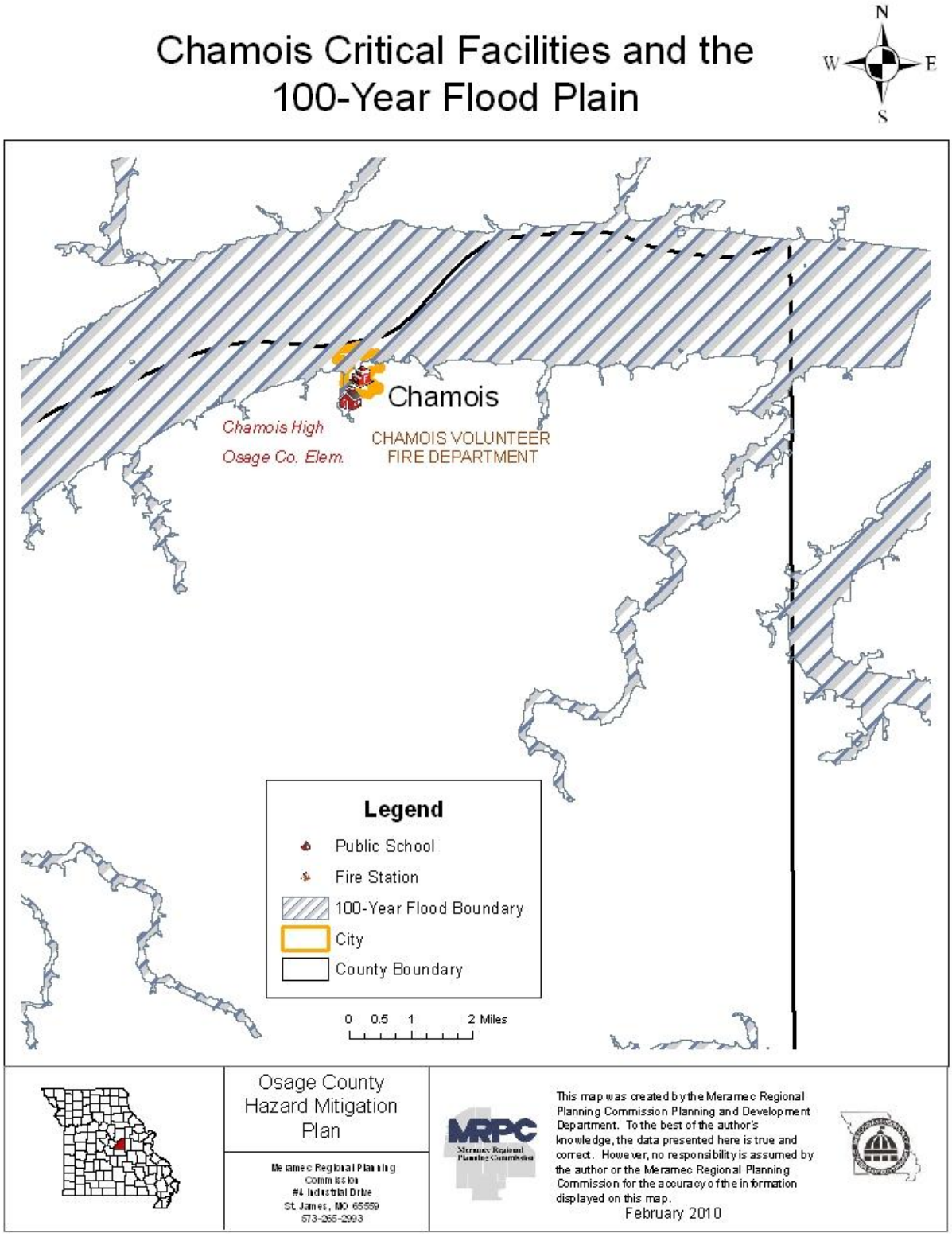

Argyle/Meta Critical Facilities and the 100-Year Flood Plain
N
W
E
S
META FIRE AND RESCUE PROTECTION
Meta
Argyle
ARGYLE VOLUNTEER FIRE DEPARTMENT
0 0.375 0.75 1.5 Miles
Legend
Fire Station
100-Year Flood Boundary
City
County Boundary
Osage County Hazard Mitigation Plan
Meramec Regional Planning Commission
#4 Industrial Drive
St. James, MO 65559
573-265-2993
MRPC
This map was created by the Meramec Regional Planning Commission Planning and Development Department. To the best of the author's knowledge, the data presented here is true and correct. However, no responsibility is assumed by the author or the Meramec Regional Planning Commission for the accuracy of the information displayed on this map.
February 2010

Figure 3-26


Chamois Critical Facilities and the 100-Year Flood Plain
N
W
E
S
Chamois
Chamois High
Osage Co. Elem.
CHAMOIS VOLUNTEER FIRE DEPARTMENT
Legend
Public School
Fire Station
100-Year Flood Boundary
City
County Boundary
0 0.5 1 2 Miles
Osage County Hazard Mitigation Plan
Meramec Regional Planning Commission
#4 Industrial Drive
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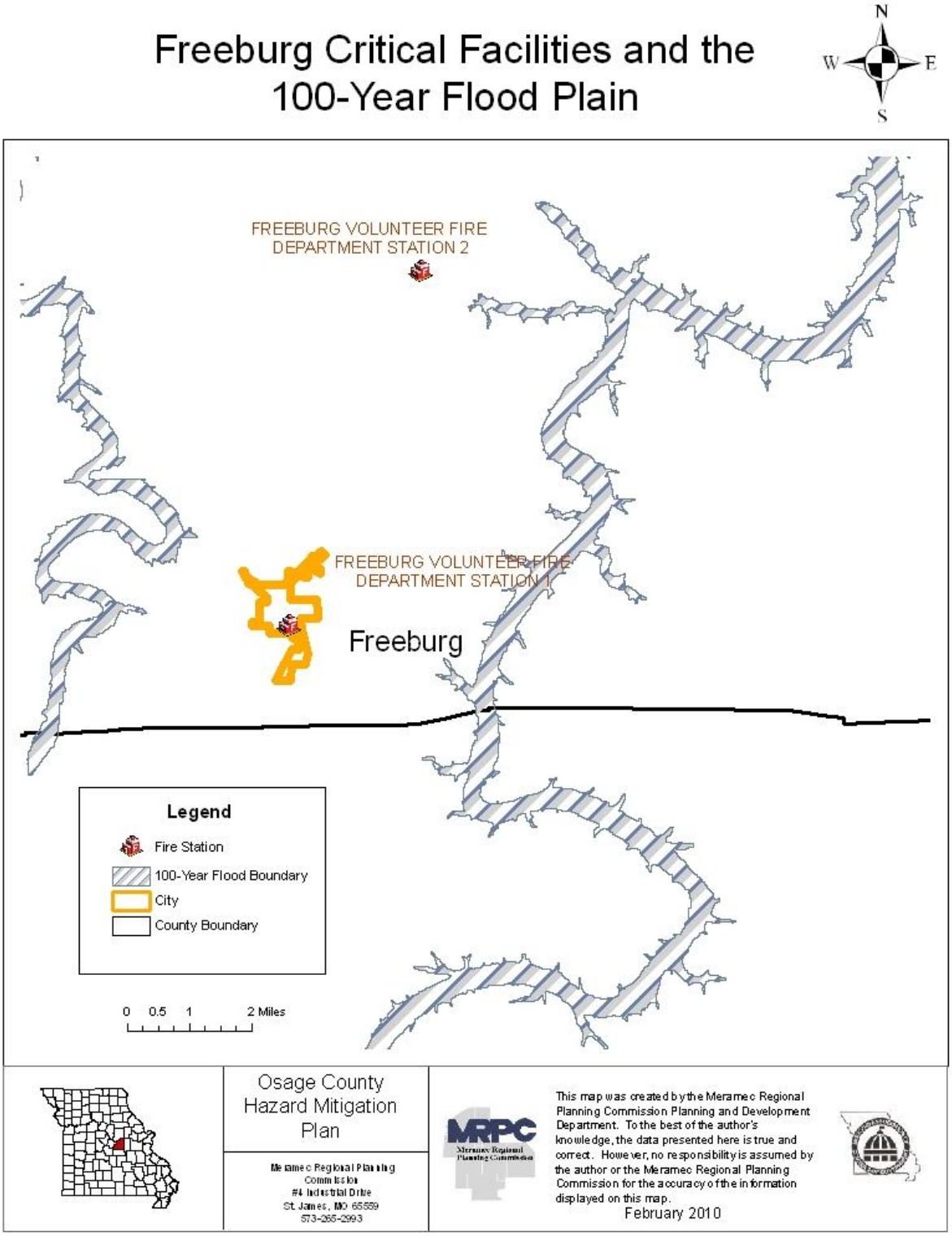
February 2010

Figure 3-27


Freeburg Critical Facilities and the 100-Year Flood Plain
N
W
E
S
FREEBURG VOLUNTEER FIRE DEPARTMENT STATION 2
FREEBURG VOLUNTEER FIRE DEPARTMENT STATION 1
Freeburg
Legend
Fire Station
100-Year Flood Boundary
City
County Boundary
0 0.5 1 2 Miles
Osage County Hazard Mitigation Plan
Meramec Regional Planning Commission
#4 Industrial Drive
St. James, MO 65559
573-265-2993
MRPC
Meramec Regional Planning Commission
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February 2010

Figure 3-28

Linn Critical Facilities and the 100-Year Flood Plain

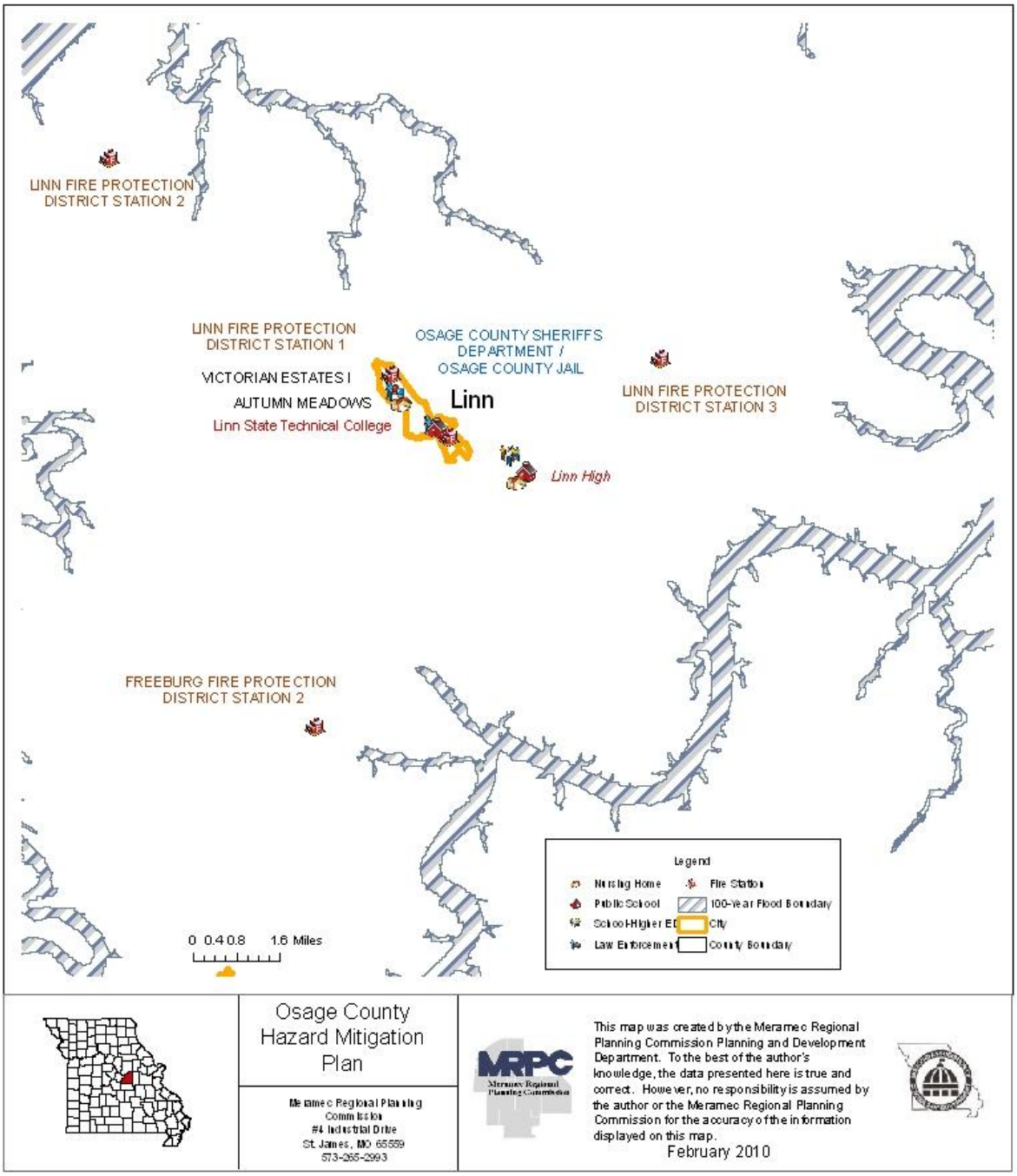
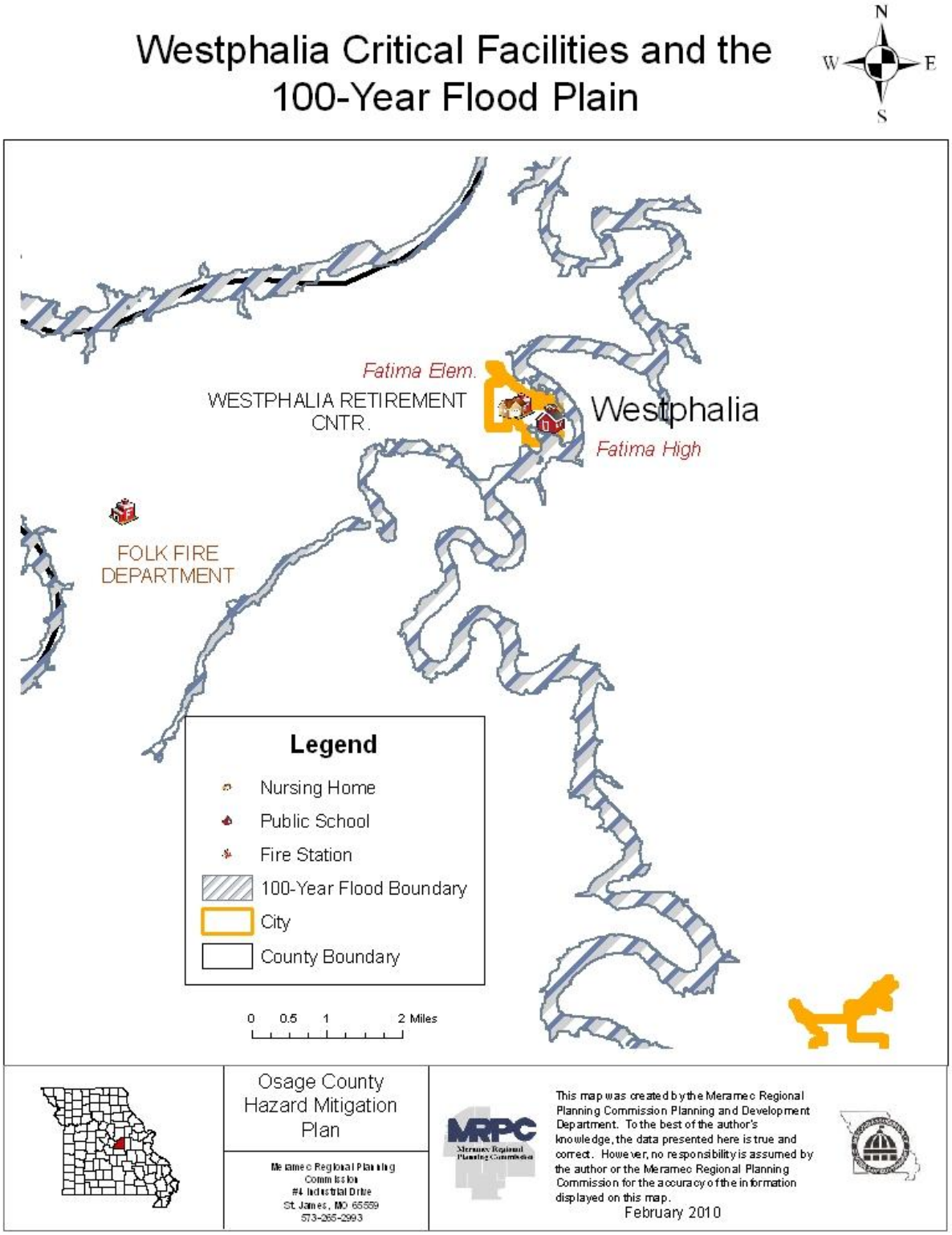


Figure 3-29


Westphalia Critical Facilities and the 100-Year Flood Plain
N
W
E
S
Fatima Elem.
WESTPHALIA RETIREMENT CNTR.
Westphalia
Fatima High
FOLK FIRE DEPARTMENT
Legend
Nursing Home
Public School
Fire Station
100-Year Flood Boundary
City
County Boundary
0 0.5 1 2 Miles
Osage County Hazard Mitigation Plan
Meramec Regional Planning Commission
#4 Industrial Drive
St. James, MO 65559
573-265-2993
MRPC
Meramec Regional Planning Commission
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February 2010

National Flood Insurance Program and Repetitive Loss Properties

Of the seven local government jurisdictions participating in this plan, six are currently participating in the national Flood Insurance Program (NFIP): Osage County, Argyle, Chamois, Linn, Meta and Westphalia. According to repetitive loss data provided by SEMA, there are seventeen properties in Osage County that have had repetitive losses. Ten are in unincorporated areas of the county, five are in Chamois and two are in Westphalia. All repetitive loss properties are residential. Fourteen are single-family dwellings; one is a two to four-family dwelling; and two are listed as condos. All of the properties have been flooded at least twice. Two have been damaged three times. Two have been damaged four times, and one has been damaged five times by flood. None of the properties have been mitigated.

Dam Failure Vulnerability of Osage County and Jurisdictions

Overview

Planning significance: Low. Due to ineffeciencies in the available data, it is not possible to provide detailed information on the construction types and values of structures that might be affected by this hazard. As discussed under the probability and magnitude sections of the profile for this hazard (Section 3.2.2), this hazard was ranked as Low for all of the jurisdictions – with Osage County and the community of Argyle's numerical risk score being slightly higher than the other jurisdictions. This rating was arrived at even though there are 12 dams rated as high hazard by the Missouri Department of Natural Resources. Due to the fact that there have been no incidents of dam failure in the county and because the majority of dams are located in undeveloped areas, overall this hazard was ranked as a low priority. During the vulnerability assessment it was determined that the City of Argyle and portions of Osage County were more vulnerable to this hazard. There is a high hazard dam located near Argyle that might cause damage to streets and/or buildings. But although the CPRI score was higher for these two jurisdictions, they still ranked as being at a low risk. There have been no incidents of significant problems with dams or dam failure in the county in the past. The majority of all the dams are located in rural, undeveloped areas. For these reasons dam failure was given a low planning priority rating and it has been determined that Osage County and its jurisdictions are not vulnerable to significant damage from dam failure.

In regards to future development, the county does not have planning and zoning to regulate development, so the only recourse is to educate the public on the dangers of dam failure and discourage future development in hazard prone areas. The city of Argyle has the potential for structures and/or streets to be damaged by a dam failure and should consider limiting additional development in those areas that might be affected by the failure of a dam located just outside the community.

Drought Vulnerability of Osage County and Jurisdictions

Overview

Planning significance: Low. As discussed under the probability and magnitude sections of the profile for this hazard (Section 3.2.3), historically, drought has not had a significant impact on Osage County or the jurisdictions located in the county. Drought is not a hazard that would typically result in damage to structures or infrastructure. The probability for drought in the area is low due to geographic location and historic weather patterns and due to high quality groundwater resources drought is not considered a significant threat to the area. The threat of drought would have no effect on future development in Osage County or its jurisdictions.

Earthquake Vulnerability

Overview

Planning significance: Moderate. As discussed under the probability and magnitude sections of the profile for this hazard (Section 3.2.4), there is a risk from earthquakes, but due to the distance to the nearest significant fault lines and the nature of the area's geology, it is expected that damage would be negligible. The greater significance will likely be the disruption of transportation and communications based on damage in southeast Missouri and the impact of evacuations from affected areas and staging of response and aid.

Potential Losses to Existing Development

It is highly unlikely that even a major earthquake in southeast Missouri would cause more than negligible damage in Osage County. According to the Modified Mercalli Scale, the earthquake would likely be felt by most residents and they might experience the movement of some heavy furniture and fallen plaster. Damage to existing development would be slight. The HAZUS-MH software was used to run a worst-case earthquake scenario and the reports generated by the system showed no damage to any segment of Osage County.

Future Development

It is anticipated that the threat of earthquake would have no effect on future development in Osage County.

Extreme Heat Vulnerability of Osage County and Jurisdictions

Overview

Planning significance: High. The entire planning area is susceptible to the hazards associated with extreme heat. Extreme heat is not a hazard that would result in damage to structures or infrastructure. The most vulnerable portions of the population are people age 65 and over and

those who live in poverty. The elderly are often more prone to suffering from heat related illness. People living at or below the poverty line often cannot afford air conditioning. Based on information from the 2000 U.S. Census, Table 3.38 compares the percentage of persons over age 65 and the percentage of persons below the federal poverty line living in Osage County and its jurisdictions to averages for Missouri and the United States.

Table 3.38 Osage County Demographic and Economic Characteristics (2000)

Jurisdiction	2010 Population	Age 65 and Over (%)	Individuals Below the Poverty Level (%)
United States	308,745,538	13.1	13.8
Missouri	5,988,927	14.0	14.0
Osage County	13,878	14.9	8.3
Argyle	162	25.3	9.1
Chamois	396	16.4	20.7
Freeburg	437	19.2	7.5
Linn	1,459	12.5	19.5
Meta	229	12.2	2.8
Westphalia	389	37.8	4.0

Source: 2010 U. S. Census and 2006-2010 American Community Survey 5-year Estimates

Chamois and Linn have a much higher percentage of residents below the poverty level than the county overall and the state and national averages. The county, Argyle, Chamois, Freeburg and Westphalia all have a higher than average percentage of individuals age 65 or older. Meta and Linn have a slightly lower than average number of individuals age 65 or older. Both of these populations are vulnerable to the effects of heat waves. The power grid in Osage County is vulnerable to brown outs or outages during periods of high use associated with extreme heat when the use of air conditioning places additional stress on the power distribution system.

Potential Losses to Existing Development

Extreme heat does not generally have an impact on infrastructure or property and it is difficult to identify specific hazard areas. Stress on livestock and crops are also likely effects of severe heat, but are also difficult to quantify.

Long-term care facilities for the elderly and disabled are especially vulnerable to extreme heat events. These facilities are listed in Table 3.27 in Section 3.3.2. The power distribution system is also known to be at risk during extreme heat events, however, there is little data to estimate potential financial losses as a result of power failure during these types of events. Extended power failures certainly have a negative impact on economic activities in the affected areas, but power outages associated with extreme heat are generally brown outs or short term power losses.

Future Development

A growing population increases the number of people vulnerable to extreme heat events. New development also increases the stress on the existing power distribution system. In the past ten

years there has been growth in both development and population in areas in and around Linn and Westphalia. It is anticipated that growth will continue at a slow but steady level into the future.

Landslide Vulnerability of Osage County and Jurisdictions

Overview

Planning significance: Low. Due to insufficiencies in the available data, it is not possible to provide detailed information on the types and values of structures that might be affected by this hazard. As discussed under the magnitude section of the profile for this hazard (Section 3.2.7), historically, landslides have not had a significant impact on Osage County or the jurisdictions located within the county. The threat of a landslide causing damage in this area is very low due to the nature of the geology and soil types. As there have been no recorded landslides in the county or its communities, and the probability for damage from this hazard is very low, landslides are not considered a significant threat to the area. The threat of landslides would have no effect on future development in Osage County.

Land Subsidence/Sinkhole Vulnerability of Osage County and Jurisdictions

Overview

Planning significance: Low. Due to insufficiencies in the available data, it is not possible to provide detailed information on the types and values of structures that might be affected by this hazard. As discussed under the past history and magnitude sections of the profile for this hazard (Section 3.2.8), there is only one sinkhole documented in Osage County, and there have been no recorded incidents of sinkhole collapse that caused injury or property damage. The one recorded sinkhole is located in a rural, undeveloped part of the county. The potential for this hazard certainly exists, but based on history and analysis, it is not considered a significant threat to the area. The threat of land subsidence/sinkholes would have no effect on future development in Osage County.

Levee Failure Vulnerability of Osage County and Jurisdictions

Overview

Planning significance: Low. Due to insufficiencies in the available data, it is not possible to provide detailed information on the types and values of structures that might be affected by this hazard. As discussed under the past history and magnitude sections of the profile for this hazard (Section 3.2.9), there is one levee district organized in Osage County: the Chamois to Morrison A-1 Levee District. This levee district has a 10-year certification of protection assessed by the U.S. Army Corps of Engineers. The levee protects farmland from flooding and a very small number of farm structures. The Morrison Levee was overtopped in the 1993 flood, but did not have a structural failure. Although data applying to flooding is somewhat applicable to levee failure, the structures affected by just levees cannot be extrapolated from the data for flooding. A small portion of Osage County would

be affected by failure of the Chamois to Morrison A-1 Levee. The potential for levee failure exists in Osage County, but due to the small number of levees, the low number of incidents and the low number of structures that would be affected, this hazard is not considered a significant threat to the area. After 1993, most of the homeowners affected by that flood moved out of the area protected by the levee. It is anticipated that due to past flooding and rising awareness of the threat of levee failure would discourage additional development in hazard prone areas.

Severe Storms Hail/Wind Vulnerability of Osage County and Jurisdictions

Overview

Planning significance: High. The entire county and all of its jurisdictions are vulnerable to severe storms, including hail and wind storms. Assets that are likely to incur the most damage from either of these types of severe storms are built structures. Crops are also at risk but row cropping is not widespread in Osage County and is mainly limited to bottomlands. Large hail and strong winds can damage crops and result in major crop losses. Structural damage that can occur with either wind or hail damage includes damage to roofs, siding and windows. But as all of this type of damage is generally covered under private insurance policies, data on the extent of these losses is not available.

Personal injury is also a potential threat during severe storms from lightening, windblown debris and large diameter hailstones.

Potential Losses to Existing Development

According to data from the National Climatic Data Center (NCDC), from 1950 through 2009, Osage County reported a total of $25,000 in property damage from thunder and hail storms, in addition to one storm that caused $700,000 in damages across a multiple county area. Most of the property damage caused from storms is covered by private insurance and data is not available. As stated earlier, most damage from these types of storms occurs to vehicles, roofs, siding and windows and cost data is not available for property damage covered by private insurance.

Based on CPRI scores and the rating system used to determine magnitude of impact, which includes percentages for damage, we can estimate the number of buildings that might be impacted by severe storms for each jurisdiction. Using HAZUS data, the census tracts were separated out to get the building counts for each jurisdiction.

Damage counts in the following Tables 3.39 – 3.48 are based on the magnitude score given to each jurisdiction and applying the corresponding estimated percentage of damage to the total building count. As the percentage of damage is expressed in a range (i.e. 10 to 25 percent), a range is provided for the maximum damage estimate and the minimum damage estimate. Numbers have been rounded to the nearest whole number. All of the jurisdictions rated the magnitude for severe storms/wind/hail as limited – 10 to 25 percent of property severely damaged. All damage estimates have been figured using 10 percent and 25 percent. School districts properties are included in the city and county tables, however, separate tables were

developed for each school district based on nine percent and one percent damage to the total number of school buildings as provided by each school district. Due to the smaller number of buildings involved, a percentage of damage is shown and numbers have not been rounded for school districts in order to provide a clearer picture of estimated damage.

Table 3.39 Estimated Damaged Building Count for Argyle - Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	129	32	13
Commercial	1	0	0
Industrial	0	0	0
Agricultural	1	0	0
Religion	0	0	0
Government	0	0	0
Education	0	0	0
Total	131	32	13

Source: HAZUS-MH

Table 3.40 Estimated Damaged Building Count for Chamois - Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	301	75	30
Commercial	14	4	1
Industrial	3	1	0
Agricultural	3	1	0
Religion	3	1	0
Government	2	1	0
Education	1	0	0
Total	327	83	31

Source: HAZUS-MH

Table 3.41 Estimated Damaged Building Count for Freeburg - Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	278	70	28
Commercial	10	3	1
Industrial	23	6	2
Agricultural	2	1	0
Religion	1	0	0
Government	2	1	0
Education	2	1	0
Total	318	83	31

Source: HAZUS-MH

Table 3.42 Estimated Damaged Building Count for Linn - Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	685	171	69
Commercial	65	16	7
Industrial	16	4	2
Agricultural	7	2	1
Religion	3	1	0
Government	4	1	0
Education	7	2	1
Total	787	197	80

Source: HAZUS-MH

Table 3.43 Estimated Damaged Building Count for Meta - Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	221	55	22
Commercial	4	1	0
Industrial	0	0	0
Agricultural	1	0	0
Religion	1	0	0
Government	1	0	0
Education	0	0	0
Total	228	56	22

Source: HAZUS-MH

Table 3.44 Estimated Damaged Building Count for Westphalia - Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	185	46	19
Commercial	16	4	2
Industrial	7	2	1
Agricultural	3	1	0
Religion	1	0	0
Government	2	1	0
Education	1	0	0
Total	215	54	22

Source: HAZUS-MH

Table 3.45 Estimated Damaged Building Count for Unicorporated Osage County - Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	7,255	1,814	726
Commercial	152	38	15
Industrial	60	15	6
Agricultural	24	6	2
Religion	14	4	1
Government	15	4	2
Education	13	3	1
Total	7,533	1,884	753

Source: HAZUS-MH

Table 3.46 Estimated Damaged Building Count for Osage County R-1 School District - Storms

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 25% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 10% Minimal Damage
2	.5	.2

Source: www.dese.mogov/directory

Table 3.47 Estimated Damaged Building Count for Osage County R-1 School District - Storms

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 25% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 10% Minimal Damage
2	.5	.2

Source: www.dese.mogov/directory

Table 3.48 Estimated Damaged Building Count for Osage County R-1 School District - Storms

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 25% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 10% Minimal Damage
2	.5	.2

Source: www.dese.mogov/directory

Future Development

Development trends in Osage County are not likely to increase vulnerability to this type of hazard.

Severe Winter Storm Vulnerability of Osage County and Jurisdictions

Overview

Planning Significance: High. All of Osage County is vulnerable to the effects of winter storms. During periods of heavy snow or ice transportation can be extremely hazardous. The most significant damage from winter storms is accumulating ice. Freezing rain and drizzle collects on utility lines and supporting poles and can cause the collapse of this infrastructure. This results in widespread power outages. As these storms occur during cold weather, the population that loses power also becomes vulnerable to the cold as heating systems are often dependent upon electricity. As with extreme heat events, the elderly are considered to be more vulnerable to injury or death during these types of disasters.

Potential Losses to Existing Development

Homes and businesses with trees are more vulnerable to damage from winter storms, not only to utility lines but to the structures themselves. Falling trees and limbs can cause considerable damage to property and injury or death to occupants. Power distribution infrastructure is the most vulnerable and the most critical during these types of storms. Downed power lines can cause electrocution of unwary residents or even power company employees. Emergency responders can be hampered in their response by treacherous or impassable roads. Power outages can impact local economies if businesses are not able to stay open. Another hazard that frequently occurs during power outages is carbon monoxide related injuries or death due to the improper use of alternate heating or cooking sources.

Based on CPRI scores and the rating system used to determine magnitude of impact, which include percentages for damage, we can estimate the number of buildings that might be impacted by severe winter storms for each jurisdiction. Using HAZUS data, the census tracts were separated out to get the building counts for each jurisdiction.

Damage counts in the following Tables 3.49 – 3.58 are based on the magnitude score given to each jurisdiction and applying the corresponding estimated percentage of damage to the total building count. As the percentage of damage is expressed in a range (i.e. 10 to 25 percent), a range is provided for the maximum damage estimate and the minimum damage estimate. Numbers have been rounded to the nearest whole number. All of the jurisdictions rated the magnitude for severe winter storms as negligible – less than 10 percent of property severely damaged. All damage estimates have been figured using nine percent and one percent. School district properties are included in the city and county tables, however, separate tables were developed for each school district based on nine percent and one percent damage to the total number of buildings involved, a percentage of damage is shown and numbers have not been rounded for school districts in order to provide a clearer picture of estimated damage.

Table 3.49 Estimated Damaged Building Count for Argyle – Winter Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	129	32	13
Commercial	1	0	0
Industrial	0	0	0
Agricultural	1	0	0
Religion	0	0	0
Government	0	0	0
Education	0	0	0
Total	131	32	13

Source: HAZUS-MH

Table 3.50 Estimated Damaged Building Count for Chamois - Winter Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	301	75	30
Commercial	14	4	1
Industrial	3	1	0
Agricultural	3	1	0
Religion	3	1	0
Government	2	1	0
Education	1	0	0
Total	327	83	31

Source: HAZUS-MH

Table 3.51 Estimated Damaged Building Count for Freeburg - Winter Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	278	70	28
Commercial	10	3	1
Industrial	23	6	2
Agricultural	2	1	0
Religion	1	0	0
Government	2	1	0
Education	2	1	0
Total	318	83	31

Source: HAZUS-MH

Table 3.52 Estimated Damaged Building Count for Linn - Winter Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	685	171	69
Commercial	65	16	7
Industrial	16	4	2
Agricultural	7	2	1
Religion	3	1	0
Government	4	1	0
Education	7	2	1
Total	787	197	80

Source: HAZUS-MH

Table 3.53 Estimated Damaged Building Count for Meta - Winter Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	221	55	22
Commercial	4	1	0
Industrial	0	0	0
Agricultural	1	0	0
Religion	1	0	0
Government	1	0	0
Education	0	0	0
Total	228	56	22

Source: HAZUS-MH

Table 3.54 Estimated Damaged Building Count for Westphalia - Winter Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	185	46	19
Commercial	16	4	2
Industrial	7	2	1
Agricultural	3	1	0
Religion	1	0	0
Government	2	1	0
Education	1	0	0
Total	215	54	22

Source: HAZUS-MH

Table 3.55 Estimated Damaged Building Count for Unicorporated Osage County - Winter Storms

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 25% Worst Case Damage	Estimated Number of Buildings Damaged with 10% Minimal Damage
Residential	7,255	1,814	726
Commercial	152	38	15
Industrial	60	15	6
Agricultural	24	6	2
Religion	14	4	1
Government	15	4	2
Education	13	3	1
Total	7,533	1,884	753

Source: HAZUS-MH

Table 3.56 Estimated Damaged Building Count for Osage County R-1 School District - Winter Storms

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 25% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 10% Minimal Damage
2	.5	.2

Source: www.dese.mogov/directory

Table 3.57 Estimated Damaged Building Count for Osage County R-1 School District - Winter Storms

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 25% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 10% Minimal Damage
2	.5	.2

Source: www.dese.mogov/directory

Table 3.58 Estimated Damaged Building Count for Osage County R-1 School District - Winter Storms

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 25% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 10% Minimal Damage
2	.5	.2

Source: www.dese.mogov/directory

Future Development

Future development could potentially increase risk through the addition of utility lines that would increase exposure of these systems.

Tornado Vulnerability of Osage County and Jurisdictions

Overview

Planning Significance: Moderate. Based on the history of frequency and severity of tornados in Osage County, this hazard was ranked as a moderate risk. As with all weather related hazards, the entire county and all of its jurisdictions are vulnerable to tornados. According to the NCDC, a total of nine tornados have occurred in Osage County between 1950 and 2009. The largest and most destructive was classified as an F3. The rest have been F1 or smaller in size. Total damages were $3.8 million during that period. Of that total, $2.5 million was caused by the one F3 tornado event. A total of four people in two separate events have been injured in tornados in the county but there have been no deaths attributed to tornados.

Warning time for tornados can be relatively short. Children, the elderly and the disabled are all more vulnerable to this type of hazard because of the speed of the onset. There is a need for additional storm shelters/safe rooms in Osage County that can provide protection for residents and in particularly vulnerable populations. There are a number of residences in the area that do not have basements or cellars and several schools have identified the construction of tornado safe rooms as a high priority.

Potential Losses to Existing Development

Osage County has never experienced a tornado larger than an F3. All but one of the nine tornados that have occurred since 1950 have been F1 or smaller. Historical data does not preclude the possibility of a larger tornado and safe rooms/storm shelters should be constructed to provide protection during the most severe of tornados. Based on historical data available, tornados occur in Osage County every six to seven years. Of the nine recorded events, four caused no damage, two caused $25,000 in damage, one caused $250,000 in damage, one caused $1 million in damages and one caused $2.5 million in damages. If the total losses are averaged over the 60 year period, the annual cost of tornados in Osage County is $63,333.

Based on CPRI scores and the rating system used to determine magnitude of impact, which includes percentages for damage, we can estimate the number of buildings that might be impacted by tornados for each jurisdiction. Using HAZUS data, the census tracts were separated out to get the building counts for each jurisdiction.

Damage counts in the following Tables 3.59 – 3.68 are based on the magnitude score given to each jurisdiction and applying the corresponding estimated percentage of damage to the total building count. As the percentage of damage is expressed in a range (i.e. 10 to 25 percent), a range is provided for the maximum damage estimate and the minimum damage estimate. Numbers have been rounded to the nearest whole number. All of the jurisdictions rated the magnitude for tornados as negligible – less than 10 percent of property severely damaged. All damage estimates have been figured using nine percent and one percent. School district properties are included in the city and county tables, however, separate tables were developed for each school district based on nine percent and one percent damage to the total number of

buildings involved, a percentage of damage is shown and numbers have not been rounded for school districts in order to provide a clearer picture of estimated damage.

Table 3.59 Estimated Damaged Building Count for Argyle – Tornado

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	129	12	1
Commercial	1	0	0
Industrial	0	0	0
Agricultural	1	0	0
Religion	0	0	0
Government	0	0	0
Education	0	0	0
Total	131	12	1

Source: HAZUS-MH

Table 3.60 Estimated Damaged Building Count for Chamois - Tornado

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	301	29	3
Commercial	14	1	0
Industrial	3	0	0
Agricultural	3	0	0
Religion	3	0	0
Government	2	0	0
Education	1	0	0
Total	327	30	3

Source: HAZUS-MH

Table 3.61 Estimated Damaged Building Count for Freeburg - Tornado

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	278	25	3
Commercial	10	1	0
Industrial	23	2	0
Agricultural	2	0	0
Religion	1	0	0
Government	2	0	0
Education	2	0	0
Total	318	28	3

Source: HAZUS-MH

Table 3.62 Estimated Damaged Building Count for Linn - Tornado

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	685	62	7
Commercial	65	6	1
Industrial	16	1	0
Agricultural	7	1	0
Religion	3	0	0
Government	4	0	0
Education	7	1	0
Total	787	71	8

Source: HAZUS-MH

Table 3.63 Estimated Damaged Building Count for Meta - Tornado

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	221	20	2
Commercial	4	0	0
Industrial	0	0	0
Agricultural	1	0	0
Religion	1	0	0
Government	1	0	0
Education	0	0	0
Total	228	20	2

Source: HAZUS-MH

Table 3.64 Estimated Damaged Building Count for Westphalia - Tornado

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	185	17	2
Commercial	16	1	2
Industrial	7	1	0
Agricultural	3	0	0
Religion	1	0	0
Government	2	0	0
Education	1	0	0
Total	215	19	4

Source: HAZUS-MH

Table 3.65 Estimated Damaged Building Count for Unicorporated Osage County - Tornado

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	7,255	653	73
Commercial	152	14	2
Industrial	60	5	1
Agricultural	24	2	0
Religion	14	1	0
Government	15	1	0
Education	13	1	1
Total	7,533	677	77

Source: HAZUS-MH

Table 3.66 Estimated Damaged Building Count for Osage County R-1 School District - Tornado

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 9% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 1% Minimal Damage
2	.18	.02

Source: www.dese.mogov/directory

Table 3.67 Estimated Damaged Building Count for Osage County R-1 School District - Tornado

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 9% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 1% Minimal Damage
2	.18	.02

Source: www.dese.mogov/directory

Table 3.68 Estimated Damaged Building Count for Osage County R-1 School District - Tornado

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 9% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 1% Minimal Damage
2	.18	.02

Source: www.dese.mogov/directory

Future Development

Future development projects, particularly those that serve vulnerable populations such as children and the elderly, should consider tornado hazards in the planning and construction phase

of development. New construction of schools and nursing homes should make safe rooms a priority.

Wildfire Vulnerability of Osage County and Jurisdictions

Overview

Planning significance: High for unincorporated areas and Moderate for cities. As discussed under the past history and magnitude sections of the profile for this hazard (Section 3.2.11), historically there have been 564 fires reported in Osage County between January 2000 and November 2009. The total acreage burned from those incidents was 6,017 acres. Five residences and six outbuildings were damaged, and seven residences, 15 outbuildings and one commercial building were destroyed during the course of these fires. Fortunately there were no reported deaths or injuries from these fires. Unfortunately, there is little data available on wildfires and few reported cases of damage to more than forest and pastureland. Due to the rural nature of the county this hazard should be considered a high priority. For the cities in the county, the risk is somewhat lower. Wildfires are detected more quickly and response time by fire departments is typically faster in populated areas. The planning significance for cities was considered moderate.

Potential Losses to Existing Development

In a rural, wooded region like Osage County, there is certainly potential for damage to existing development. The trend toward developing subdivisions outside of incorporated areas in isolated rural areas contributes to the potential for damage to property from wildfires. Historically, considering the large number of wildfires reported, Osage County has not suffered a great deal of property damage from this hazard, but the potential exists.

Based on CPRI scores and the rating system used to determine magnitude of impact, which includes percentages for damage, we can estimate the number of buildings that might be impacted by wildfires for each jurisdiction. Using HAZUS data, the census tracts were separated out to get the building counts for each jurisdiction.

Damage counts in the following Tables 3.69 – 3.78 are based on the magnitude score given to each jurisdiction and applying the corresponding estimated percentage of damage to the total building count. As the percentage of damage is expressed in a range (i.e. 10 to 25 percent), a range is provided for the maximum damage estimate and the minimum damage estimate. Numbers have been rounded to the nearest whole number. All of the jurisdictions rated the magnitude for wildfire as negligible – less than 10 percent of property severely damaged. All damage estimates have been figured using nine percent and one percent. School district properties are included in the city and county tables, however, separate tables were developed for each school district based on nine percent and one percent damage to the total number of buildings involved, a percentage of damage is shown and numbers have not been rounded for school districts in order to provide a clearer picture of estimated damage.

Table 3.69 Estimated Damaged Building Count for Argyle – Wildfire

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	129	12	1
Commercial	1	0	0
Industrial	0	0	0
Agricultural	1	0	0
Religion	0	0	0
Government	0	0	0
Education	0	0	0
Total	131	12	1

Source: HAZUS-MH

Table 3.60 Estimated Damaged Building Count for Chamois - Wildfire

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	301	29	3
Commercial	14	1	0
Industrial	3	0	0
Agricultural	3	0	0
Religion	3	0	0
Government	2	0	0
Education	1	0	0
Total	327	30	3

Source: HAZUS-MH

Table 3.61 Estimated Damaged Building Count for Freeburg - Wildfire

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	278	25	3
Commercial	10	1	0
Industrial	23	2	0
Agricultural	2	0	0
Religion	1	0	0
Government	2	0	0
Education	2	0	0
Total	318	28	3

Source: HAZUS-MH

Table 3.62 Estimated Damaged Building Count for Linn - Wildfire

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	685	62	7
Commercial	65	6	1
Industrial	16	1	0
Agricultural	7	1	0
Religion	3	0	0
Government	4	0	0
Education	7	1	0
Total	787	71	8

Source: HAZUS-MH

Table 3.63 Estimated Damaged Building Count for Meta - Wildfire

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	221	20	2
Commercial	4	0	0
Industrial	0	0	0
Agricultural	1	0	0
Religion	1	0	0
Government	1	0	0
Education	0	0	0
Total	228	20	2

Source: HAZUS-MH

Table 3.64 Estimated Damaged Building Count for Westphalia - Wildfire

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	185	17	2
Commercial	16	1	2
Industrial	7	1	0
Agricultural	3	0	0
Religion	1	0	0
Government	2	0	0
Education	1	0	0
Total	215	19	4

Source: HAZUS-MH

Table 3.65 Estimated Damaged Building Count for Unicorporated Osage County - Wildfire

Occupancy	Total Building Count	Estimated Number of Buildings Damaged with 9% Worst Case Damage	Estimated Number of Buildings Damaged with 1% Minimal Damage
Residential	7,255	653	73
Commercial	152	14	2
Industrial	60	5	1
Agricultural	24	2	0
Religion	14	1	0
Government	15	1	0
Education	13	1	1
Total	7,533	677	77

Source: HAZUS-MH

Table 3.66 Estimated Damaged Building Count for Osage County R-1 School District - Wildfire

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 9% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 1% Minimal Damage
2	.18	.02

Source: www.dese.mogov/directory

Table 3.67 Estimated Damaged Building Count for Osage County R-1 School District - Wildfire

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 9% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 1% Minimal Damage
2	.18	.02

Source: www.dese.mogov/directory

Table 3.68 Estimated Damaged Building Count for Osage County R-1 School District - Wildfire

Total Building Count	Estimated Number/Percentage of Buildings Damaged with 9% Worst Case Damage	Estimated Number/Percentage of Buildings Damaged With 1% Minimal Damage
2	.18	.02

Source: www.dese.mogov/directory

Future Development

New development, particularly residential or commercial buildings that are located outside of incorporated areas and farther from fire services, should consider fire suppressive landscaping

and other measures to reduce vulnerability. Residents should be educated on the dangers of wildfire and provided information on how to make their property less vulnerable.

3.3.4 Future Land Use and Development

Table 3.69 shows the changes in population for Osage County and its jurisdictions.

Table 3.69 Historic Population Trends for Osage County and Jurisdictions

Jurisdiction	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia
2010 Population	13,768	162	396	437	1,459	229	389
% Change	+5.4	-1.2	-13.1	+3.3	+7.7	-8	+21.5
2000 Population	13,062	164	456	423	1,354	249	320
% Change	+8.6	-7.8	+1.5	-5.1	+17.9	0	+11.4
1990 Population	12,018	178	449	446	1,148	249	287
% Change	+.13	-17.5	-17.7	-19.4	-5.2	-25.8	+.7
1980 Population	12,014	216	546	554	1,211	336	285
% Change	+9.2	-17.5	-11.2	-3.9	-6	-13.1	-14.1
1970 Population	10,994	262	615	577	1,289	387	332
% Change	+1.1	+164	-6.5	+44.6	+22.7	+7.5	+5
1960 Population	10,867	99	658	399	1,050	360	316

Source: U.S. Census Bureau

According to the Missouri Office of Administration, Division of Budget and Planning, the population for Osage County is projected to grow slightly over the next 15 years. Much of the growth over the past two decades can be attributed to growth in adjacent Cole County and the nearby state capitol, Jefferson City, as well as the growth of Linn State Technical College in Linn. Smaller communities such as Argyle, Meta and Chamois have had steady declines in population and that will likely continue. Westphalia and Linn, due to being located on major highways and within easy commuting distance of Jeffers City will likely continue to see moderate growth.

3.3.5 Summary of Key Issues

In comparison to the 2005 Hazard Mitigation plan, no significant changes have been made in the vulnerability assessment other than providing a more in-depth study, analysis and incorporating additional data and hazards. The general premise and outcomes remain largely the same with additional and updated information and clarification provided for all hazards. A more in-depth method of scoring and ranking the hazards was used in the plan revision. Table 3.70 shows the results of the Hazard Ranking in order of High to Low Planning Significance based on the methodology described in section 3.1.

Table 3.70 Osage County Hazard Ranking High to Low Planning Significance

Hazard Type	Probability	Magnitude	Warning Time	Duration	CPRI	Planning Priority
Extreme Heat	4	4	1	3	3.45	High
Flood						
-Freeburg, Linn, R-II, R-III	4	2	4	2	2.9	High
-County, Argyle, Chamois, Meta, Westphalia, R-I	4	2	4	3	3.0	High
Severe Storm (Hail storm/Wind storm)	4	1	4	1	3.0	High
Wildfire – County	4	1	4	2	2.9	High
Cities	3	1	4	2	2.45	Moderate
Schools	1	1	4	2	1.55	Low
Severe Winter Storm	4	1	1	3	2.55	High
Tornado	2	2	4	1	2.2	Moderate
Earthquake	2	1	4	4	2.05	Moderate
Dam Failure						
-County, Argyle	1	2	4	3	1.95	Low
-Chamois, Linn, Meta, Westphalia, R-I, R-II, R-III	1	1	4	3	1.65	Low
Levee Failure						
-County	1	2	2	4	1.75	Low
-Cities, schools	1	1	2	4	1.45	Low
Land Subsidence/ Sinkholes	1	1	4	3	1.45	Low
Landslide	1	1	4	1	1.45	Low
Drought	1	1	1	4	1.3	Low

Sources: Osage County hazard mitigation planning committee, Missouri Hazard Mitigation Plan (2007), Missouri Hazard Analysis (2008)

The HMPC will focus efforts for hazard mitigation projects on those hazards that have a High or Moderate planning priority ranking. The following section highlights key issues brought out by the risk assessment.

Flood

- Freeburg and Meta do not currently participate in the National Flood Insurance Program
- Homes and businesses throughout the county and in all of the communities have been impacted by riverine or flash flooding
- Several roads, bridges and low water crossings in the county are vulnerable to flooding including: County Roads 508 and 542 near Meta; Highway W northwest of Linn, Highway P west of Koeltztown, Highway 89 north of Belle, County Road 412 near Loose Creek, County Road 416 near Bonnot's Mill, Highway N in Freedom, Highway

W north of Linn, Highway CC at the junction of Highway 50, County Road 806 south of Highway CC, Highway 50 east of Linn and near Mt. Sterling, Highways Y and NN in southeastern Osage County, Highway E, and Highway RA southeast of Linn
- The communities of Argyle, Chamois, Meta Westphalis and Osage County R-I school are vulnerable to flooding
- A number of homes and businesses that flooded in the past did not have flood insurance
- There are a number of low water bridges in the county that could be mitigated
- There are a number of vulnerable properties that could be considered for flood buyouts.
- The county has experienced loss of life from flooding

Severe Storm Hail Storm/ Wind Storm

- Severe storms can damage power lines through sheer force of wind or windblown debris such as tree limbs
- Mobile homes and other unsecured buildings such as carport awnings and sheds are vulnerable to windstorms
- Roofs are frequently damaged by wind and/or hail

Earthquake

- The New Madrid Fault has the potential to cause catastrophic damage to eastern and southeast Missouri
- Although Osage County is not located in an area that will likely not see very much damage from an earthquake, the area may be impacted by loss of communications, transportation disruption of roads, rail and pipelines and the likely flow of refugees out of the impacted area and response going into the impacted region

Extreme Heat

- Stress on the power distribution system can lead to brown outs or power outages
- Need to identify and publicize cooling centers
- Elderly populations and those living below the poverty line are especially vulnerable. All of the communities in Osage County with the exception of Linn and Meta have a higher than state and national average percentage of people over the age of 65. Chamois and Linn have a higher than state and national average percentage of individuals living below the poverty level
- The county has experienced the loss of life from extreme heat

Severe Winter Storm

- Ice accumulation damages power lines and power infrastructure causing prolonged power outages for large portions of the region
- Roads become hazardous for motorists and emergency responders
- Schools and businesses close due to power outages and poor travel conditions

Tornado

- Mobile homes and unsecured structures such as carport awnings and sheds are particularly vulnerable

- Public may not be aware of the locations of shelters
- May need to increase the number of weather shelters and publicize their availability
- Not all schools, public buildings or other facilities serving vulnerable populations may have adequate safe rooms

Wildfire

- Osage County has frequent wildfires and is considered at high risk for wildfire. Those areas of the county where population and vegetation densities are greater are at higher risk of property damage and potential for injuries should a wildfire occur.
- Homes and businesses located in more remote areas are at risk from wildfires due to proximity to woodland and distance from fire services
- Although the magnitude of a wildfire may be lessened in the incorporated areas due to the proximity to fire services, they are not exempt from the dangers of wildfires

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4 MITIGATION STRATEGY

44 CFR Requirement 201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section presents the mitigation strategy developed by the Osage County Hazard Mitigation Planning Committee (HMPC) based on the risk assessment. The mitigation strategy was developed by the HMPC. The group first agreed on general goal statements that would guide the jurisdictions in their efforts to reduce the impact of disasters in Osage County. Then the group looked at developing and prioritizing a list of specific mitigation actions that could be taken to further the overall goals and directly reduce the County's vulnerability to hazards.

Introduction to Mitigation

Definition of Mitigation

Mitigation is defined by FEMA as "...sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects." It describes the ongoing effort at the Federal, State, local, and individual levels to lessen the impact of disasters upon families, homes, communities and economy.

Mitigation includes not only avoiding the development of vulnerable sections of the community, but also making existing development in hazard-prone areas safer. For example, identifying areas in the community that are susceptible to damage from natural hazards and taking steps to make these areas less vulnerable, through flood buyouts.

Mitigation also includes steering growth to less risky areas, through nonstructural measures such as avoiding construction in the most flood-prone areas for example. Keeping buildings and people out of harm's way is the essence of mitigation. In fact, incorporating mitigation into decisions related to the community's growth can result in a safer, more resilient community, and one that is more attractive to new families and businesses.

Missouri is subject to many types of natural hazards: floods, tornadoes, winter storms, earthquakes, droughts, winter storms and occasionally, wildfires. Technological hazards such as chemical explosions, manmade explosions, hazardous material or HAZMAT spills, and terrorism, all of which can have significant economic and social impacts exist also. Some, such as floods and HAZMAT spills, can occur any time of the year and almost anywhere in the state. And as we all know, their occurrence in some places in our state is inevitable. However, due to time and funding limitations, this plan will focus on natural hazards only.

Categories of Mitigation

Mitigation measures may be grouped into six categories.

- Prevention

- Property protection
- Natural resource protection
- Emergency services
- Structural projects
- Public information

Prevention Measures

Prevention measures are intended to keep a hazard risk problem from getting worse. They ensure that future development does not increase hazard losses. Communities can achieve significant progress toward hazard resistance through prevention measures. This is particularly true in areas that have not been developed or where capital investment has not been substantial.

Using prevention measures, future development can be guided away from hazards, while maintaining other community goals such as economic development and quality of life.

Some examples of prevention measures are:

- Planning and zoning
- Open space preservation
- Land development regulations
- Storm water management

Property Protection Measures

Property protection measures are used to modify buildings subject to hazard risk, or their surroundings, rather than to prevent the hazard from occurring. A community may find these to be inexpensive measures because often they are implemented or cost-shared with property owners. These measures directly protect people and property at risk. (Protecting a building does not have to affect the building's appearance and is therefore a popular measure for historic and cultural sites.)

Some examples of property protection measures are:

- Acquisition – public procurement and management of lands that are vulnerable to damage from hazards
- Relocation – permanent evacuation of hazard-prone areas through movement of existing hazard-prone development and population to safer areas
- Rebuilding – modifying structures to reduce damage by future hazard events
- Flood-proofing – protecting a flood-prone building using one or more of several different methods

Natural Resource Protection Measures

Natural resource protection measures are intended to reduce the intensity of hazard effects as well as to improve the quality of the environment and wildlife habitats. Parks, recreation, or conservation agencies or organizations usually implement these activities.

Examples of natural resource protection include:

- Erosion and sediment control
- Wetlands protection

Emergency Services Measures

Emergency services measures protect people before and after a hazard event. Most counties and many cities have emergency management offices to coordinate warning, response and recovery during a disaster.

Emergency services include:

- Warning
- Capacity of Response (Not a Mitigation Measure)
- Critical facilities protection
- Health and safety maintenance

Structural Mitigation Measures

Structural measures directly protect people and property at risk. They are called "structural" because they involve construction of man-made structures to control hazards.

Structural projects for flood control may include:

- Reservoirs
- Levees and floodwalls
- Diversions
- Channel modifications
- Storm sewers
- A structural solution for landslides is the construction of a debris basin

Public Information Mitigation Measures

Public information activities inform and remind people about hazardous areas and the measures necessary to avoid potential damage and injury. Public information activities for mitigation are directed toward property owners, potential property owners, business owners and visitors.

A few examples of public information activities to achieve mitigation are:

- Providing hazard maps and other hazard information
- Outreach programs that provide hazard and mitigation information to people when they have not asked for it
- How might outreach programs accomplish this?
- Print media
- Radio/TV spots and interviews
- Videotape
- Mass mailings
- Notices to residents and property owners in a specific, hazard-prone area

- Displays in widely used facilities such as public buildings and malls
- Presentations at meetings of neighborhood groups
- Real estate disclosure
- Information in the public library or a library developed specifically for mitigation information
- Available technical assistance
- School age and adult education

How does mitigation differ from preparedness, response and recovery?

Mitigation includes long-term activities that reduce or eliminate a hazard and/or a hazard's damage. Building codes, floodplain management, tornado safe rooms/storm shelters, flood buyouts and planning are examples of mitigation. Preparedness activities are designed to develop individual and community capabilities to respond to and recover from disasters. Preparedness activities include training, exercises and stocking emergency supplies. Response actions include those immediate activities that save lives, protect property and stabilize the situation when disaster strikes. The activities that return the community to normal or pre-disaster conditions fall under the heading of recovery.

Mitigation Plan Benefits

Hazard Mitigation Planning offers many community benefits. Principally, it can:

• **Save lives and property -** Communities can save lives and reduce property damage from natural hazards through mitigation actions, such as keeping families and homes out of harm's way.

• **Meet the Needs of the Community -** Each community is different in terms of its economics, size, geography, governance, demography, land uses, and hazards. Therefore each community's mitigation plan will vary to some degree. Mitigation planning identifies problems and solutions that are specific to your community.

• **Achieve Multiple Objectives -** Developing a "multi-objective" plan that can help the community to better sustain itself:

- Find the most appropriate solutions
- Address multiple problems with a single solution
- Maintain or improve local environmental and economic integrity
- Demonstrate commitment to improving community health and safety

Multi-objective planning creates opportunities to develop a broader resource support base that no longer relies solely upon disaster programs to resolve disaster problems. The solutions may be imbedded in other projects such as transportation, economic development, recreation and environmental enhancements.

• **Reduce vulnerability to future hazards -** With a mitigation strategy in place, the community will be better prepared to take steps that will permanently reduce the risk of future losses for individuals and businesses.

- Preparing and following a Hazard Mitigation Plan can reduce business disruptions following a disaster. Usually it is assumed that business disruptions stem from direct building damages or from infrastructure damages such as a lengthy utility outage. Sometimes, these damages are the result of building a business in a hazardous location (the floodplain for example), and sometimes, the damages may be caused by poor construction, especially in the absence of building codes. However, even if a business is not directly damaged by a disaster and utilities are not adversely affected, the operations of a business may still be disrupted for some time should something like flooding or debris block customer and/or supplier access to the business. For this reason, hazard mitigation planning is important to every stakeholder in the community.
- Building a community without regard to natural hazards or rebuilding one after a disaster "just like it was before" eradicates the community's power to reduce its vulnerability to natural hazards.
- While it is natural to want to return things to the way they were after a disaster, it is important to remember that, in many cases, the disaster damage will not be as severe if a mitigation plan is developed and implemented before a disaster occurs.

• **Guide & Speed Post-Disaster Recovery -** The planning process guides post-disaster recovery in many ways. By identifying and ranking projects before the next disaster, the community will be in a better position to obtain post-disaster funding because much of the background work necessary for applying for Federal funding will already be done. The plan:

- Prepares the community to deal with post-disaster situations by identifying actions that should be done immediately following the disaster.
- Helps the community to develop policies that promote a rapid and efficient recovery, and capitalize on post-disaster opportunities for safety improvements.
- Having a plan that includes post-disaster actions will ensure that opportunities for future mitigation are not overlooked in the urgency to rebuild.

• **Enhances Funding Opportunities** – The mitigation process works through the use of various possible sources of federal, state and local project funding. Successful completion of the Hazard Mitigation Plan can also fulfill the planning requirements for several federal programs such as the Hazard Mitigation Grant Program (only post-disaster mitigation grant program), the Pre-Disaster Mitigation (PDM) grant program, the Flood Mitigation Assistance (FMA) program and the Community Rating System (CRS) program. This plan also may qualify the community for recognition for other federal programs such as the National Weather Service's StormReady program.

• **Promotes Public Participation** - The planning process promotes public participation by:

- Helping generate ideas for solutions and ensuring recognition and local ownership of the plan.

- Providing groups and individuals concerned about the potential effects of disasters many opportunities to participate in problem solving and in plan implementation.

Goal & Objective Development

The Osage County Hazard Mitigation Planning Committee developed the goals and objectives by reviewing a list of needs compiled at previous meetings. Committee members created goals and objectives that would meet the needs of Osage County and reduce hazards by the greatest amount. During the 2009 update, the advisory committee reviewed all the goals and objectives and provided input on what had been accomplished in the last five years.

4.1 Goals

44 CFR Requirement 201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long term vulnerabilities to the identified hazards.

The HMPC developed goals to provide direction for reducing hazard-related losses in Osage County. These were based upon the results of the risk assessment and a review of mitigation goals from other state and local plans. These included the Missouri State Hazard Mitigation Plan, and local hazard mitigation plans from neighboring counties as well as the Osage County Local Emergency Operations Plan.

The following overall goals and mitigation objectives were reviewed and accepted by the HMPC as best reflecting the needs of Osage County, and were reconfirmed at the five-year review.

Goal 1: Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.

Goal 2: Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.

Goal 3: Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.

Goal 4: Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.

Goal 5: Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefit of special interests.

Goal 6: Secure resources for investment in hazard mitigation.

4.2 Identification, Analysis and Update of Mitigation Measures

44 CFR Requirement 201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

44 CFR Requirement 201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts and changes in priorities

At the first HMPC meeting information was distributed defining mitigation and the differences between mitigation and response activities to help the committee better define needs and action items. The following mitigation needs were developed by the Osage County hazard mitigation planning committee during the initial development of the plan (2004). Each mitigation need was posted on the wall and committee members then discussed possible action items that could be included in the plan to address each of the identified needs. The Osage County hazard mitigation planning committee reviewed these goals and objectives for the update of the plan. No changes were made to the overarching goals. During the revision process it was determined that several listed issues needed to be revised or had been addressed and were no longer considered a need. Minor changes were made to existing action items to reflect needs that have been partially or fully addressed. Some action items were added and are listed after Table 4.1.

The mitigation actions identified in the original plan document were divided into four categories and are defined as follows:

- Completed – actions have been completed
- Retained – actions have not been completed but are deemed importanat and appropriate for the updated plan – or – the actions are on-going mitigation activitites
- Modified – actions were in the original plan document, but he focus or language has been modified to some degree to better define the action item
- Deleted – actions were deemed unrealistic or inappropriate or no longer applicable for the jurisdictions involved

The review and categorization of the original plan's action items are listed in Table 4.1.

Table 4.1 – Review & Assessment of 2004 Plan Action Items

Action Item Number	Mitigation Action	Assessment for Update
1	Need road and bridge upgrades to improve drainage and reduce flooding.	Retained – one low-water bridge project has been completed in Osage County, but there are a number of additional road and bridge sites still in need of upgrades/improvements. The county and communities are currently involved in a project to assess and prioritize bridge and low water crossing projects.
2	Need more resources (money, people,	Deleted – non-mitigation action item – more related

Action Item Number	Mitigation Action	Assessment for Update
	equipment)	to response or preparedness
3	Need trees trimmed near power lines	Modified - to "Need to continue to keep trees trimmed near power lines" this is an on-going activity
4	Need trees trimmed and dead ones removed along streets/roads	Modified - to "Need to continue to keep trees trimmed and dead ones removed along streets/ roads" this is an on-going activity
5	Need public awareness for general safety (preparedness, hazard awareness)	Modified - to "Need to continue to promote public awareness for general safety" – this is an ongoing activity with information provided through "Ready-in-3" brochures and information posted on the county EMD website and Facebook page
6	Need more methods of warning	Modified – to "Need to continue to expand and improve warning systems" – this is an on-going activity, with a number of programs implemented including Emergency Notification System (reverse 9-1-1), AlertFM, Smart 9-1-1 warning systems installed in every community & weather updates provided on EMD website and Facebook page. Combined with #12.
7	Need ordinance requiring any new development to provide storm water basins	Deleted – determined to be unrealistic in very small rural communities and unincorporated areas
8	Improve emergency services/response in rural areas	Deleted – non-mitigation action item – more related to response or preparedness
9	Need warning siren in Meta	Deleted – this action item has been accomplished. Siren provided by Osage County.
10	Need local agreements between public agencies and private contractors to work together to implement mitigation actions	Modified to "Need to continue to work toward agreements between public and private entities to work together to implement mitigation actions:" – some progress has been made in this area, i.e. Smart Prepare Beta testing being done in Osage Co.
11	Need to look at idea of implementing a tax for warning systems	Deleted – determined to be unrealistic and the jurisdictions currently have a number of warning systems in place – sirens, reverse 9-1-1, Alert FM, Smart 9-1-1
12	Need to expand and improve warning systems	Deleted – combined with #6.
13	Need to encourage citizens to have weather radio, emergency medical kit, water, flashlights, blankets, medicine, etc., to have if evacuated or have to endure without utilities	Modified to "Need to continue to encourage citizens to have weather radio, Alert FM, emergency medical kit, water, flashlights, blankets, medicine, etc. to have if evacuated or have to endure without utilities" – county EMD office is currently doing a number of activities in this area – promoting Alert FM, Ready-in-3, family preparedness, etc. in publications, media, website and FaceBook page.
14	Need to encourage residents to follow national building codes even if city hasn't adopted any	Deleted – determined to be impractical, this needs to be accomplished by cities adopting building codes

Action Item Number	Mitigation Action	Assessment for Update
15	Need more training (fire drills, evacuation drills, participation in statewide drills, incident command, etc.)	Deleted – non-mitigation action item – more related to response or preparedness
16	Need to encourage business/government / schools to have a disaster plan and implement it	Modified to "Need to continue to encourage business/government to have a disaster plan and implement it" – All jurisdictions are covered under the county LEOP and sample business disaster plans are provided on the EMD website
17	Need a program/directory for checking on elderly residents during severe weather	Retained – county is currently Beta testing a software program – Smart Prepare – that allows residents to upload information to the County on personal information that may be helpful during a disaster or responding to a 9-1-1 call from that home
18	Need generators in smaller communities for outages of critical services	Modified to "Need to continue to review and evaluate the need for generators throughout the county" – combined with #19 – the county has obtained four generators that can be deployed throughout the county through Region F HSOC grants
19	Need more generators in larger communities for critical services	Modified – combined with #19
20	Need to develop evacuation plans and procedures (consider school busses)	Deleted – non-mitigation action item – more related to response or preparedness
21	Need mobile unit for mass care that can be used by any local government	Deleted – non-mitigation action item – more related to response or preparedness and a mobile unit has been obtained through Region F HSOC grants
22	Need to make residents aware of fire hazards (fire prevention)	Modified to "Need to continue to make residents aware of fire hazards" – fire prevention information is provided through distribution of brochures and information posted on the EMD website & FaceBook
23	Need to educate residents on how to shut down utilities, use fire extinguishers	Deleted – non-mitigation action item – more related to response or preparedness
24	Need to secure propane tanks in flood prone areas	Deleted – this has been accomplished through aggressive floodplain management policies and monitoring
25	Need to improve public media communications for warnings, updates (radio, cable stations, local channels)	Modified to "Need to continue to improve public media communications for warnings, updates (radio, cable stations, local channels, social media, internet) – the county EMD has developed excellent strategies for using traditional media sources as well as website and FaceBook to improve public communications
26	Need building codes in all cities	Deleted – currently unrealistic
27	Need to look for more appropriate storm shelters	Modified to "Need to continue to look for appropriate storm shelters throughout the county" – county EMD has developed an extensive list of shelters throughout the county and provided training for shelter workers. Shelters are listed on EMD website

Action Item Number	Mitigation Action	Assessment for Update
28	Need to educate the public about sirens	Modified to "Need to continue to educate the public about sirens and warning systems used in Osage County" – information on warning sirens and other warning systems available in the county are provided through the EMD office, in publications and on the EMD website

The following mitigation actions were added for the update of the plan:

- Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.
- Continue to evaluate and update emergency operation plans.
- Continue to conduct emergency preparedness exercises periodically.
- Continue to provide CERT training and encourage the development of CERT teams.
- Regularly review and update school emergency plans
- Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.
- Schools need to conduct emergency preparedness exercises on a regular basis.
- Encourage the construction of tornado safe rooms in every school that does not have one.
- Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies.

4.2.1 Mitigation Goals, Objectives and Actions

A list of the mitigation goals, objectives and action items for the Osage County Multi-Hazard Mitigation Plan (2013) follows. Actions which address reducing the effects of hazards on new and/or existing buildings and infrastructure are indicated in parentheses following the actions (New, Existing, Both).

This list of goals, objectives and actions is followed by an overview of the mitigation actions with the hazards each action is addressing and the participating jurisdiction(s) to which it applies (Figure 4.2). More information on the implementation and administration of the specific mitigation actions for each participating jurisdiction is included in Section 4.3.2.

Goal 1: Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.

Objectives

1.1 Advise the public about health and safety precautions to guard against injury and loss of life from natural hazards.

1.1.1 Action Item: Continue public education/awareness efforts on personal emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc) through the distribution of materials, press releases and postings on website/FaceBook.
1.1.2 Action Item: Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.
1.1.3 Action Item: Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.
1.1.4 Action item: Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2 Use the latest technology to provide adequate warning, communication, and mitigation of hazard events.

1.2.1 Action Item: Need to continue to examine ways to expand and improve warning systems.
1.2.2 Action Item: Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.
1.2.3 Action Item: Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.
1.2.4 Action Item: Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.
1.2.5 Action Item: Continue to promote participation in the Smart Prepare Beta test and encourage residents to upload information for use by 9-1-1 and response agencies to improve response during emergencies/disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather.
1.2.6 Action Item: Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.

1.3 Reduce the danger to, and enhance protection of, dangerous areas during hazard events.

1.3.1 Action Item: Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.
1.3.2 Action Item: Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
1.3.3 Action Item: Continue to review and evaluate the need for generators for critical systems and response support in all communities.
1.3.4 Action Item: Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms. (Both)

1.3.5 Action Item: Encourage the construction of tornado safe rooms in every school that does not have one. (New)

Goal 2: Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.

Objectives

2.1 Implement cost-effective activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to natural hazards.

2.1.1 Action Item: Continue to encourage businesses/government/schools to develop and implement emergency plans. (Both)
2.1.2 Action Item: Continue to evaluate and update emergency operation plans. (Both)
2.1.3 Action items: Continue to conduct emergency preparedness exercises periodically. (Both)
2.1.4 Action Item: Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning. (Both)
2.1.5 Action Item: Regularly review and update school emergency plans. (Both)
2.1.6 Action Item: Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.
2.1.7 Action Item: Conduct emergency preparedness exercises in schools on a regular basis.

2.2 Discourage new development and encourage preventive measures for existing development in areas vulnerable to natural hazards, thereby reducing repetitive losses to the National Flood Insurance Program.

2.2.1 Action Item: Educate and raise awareness of residents and contractors on the dangers of floodplain development and the benefits of the National Flood Insurance Program. (Both)
2.2.2 Action Item: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements. (Both)

2.3 Use regulations to ensure that development will not put people in harm's way or increase threats to existing properties.

2.3.1 Action Item: Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds. (Both)

Goal 3: Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face,

their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.

Objectives

3.1 Heighten public awareness of the full range of natural hazards by developing education and outreach programs.

3.1.1 Action Item: Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events and through EMD website and FaceBook. (Both)
3.1.2 Action Item: Continue to provide regular press releases from county EMD office concerning hazards, where they strike, frequency, preparedness and how to mitigate. (Both)

3.2 Provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.

3.2.1 Action Item: Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.
3.2.2 Action Item: Ask SEMA mitigation specialists to present information to city councils, county commission, school districts, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.
3.2.3 Action Item: Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county. (Both)

3.3 Publicize and encourage the adoption of appropriate hazard mitigation measures by county and city governments.

3.3.1 Action Item: Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning. (Both)
3.3.2 Action Item: Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management. (Both)

3.4 Educate the public on actions they can take to prevent or reduce the loss of life or property from all natural hazards.

3.4.1 Action Item: Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)
3.4.2 Action Item: Publicize county or citywide drills.
3.4.3 Action Item: Continue to provide information on EMD website and FaceBook on preparedness and mitigation. (Both)

Goal 4: Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.

Objectives

4.1 Build and support local partnerships to continuously become less vulnerable to hazards.

4.1.1 Action Item: Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.
4.1.2 Action Item: Joint training (and drills) between agencies, public and private entities (including schools/businesses).
4.1.3 Action Item: Pool different agency resources to achieve widespread mitigation planning results. (Both)

4.2 Encourage active participation and responsibility of chief elected officials in mitigation planning and activities.

4.2.1 Action Item: Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects. (Both)
4.2.2 Action Item: Continue to encourage the incorporate of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans. (Both)

Goal 5: Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefit of special interests.

Objectives

5.1 Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

5.1.1 Action Item: Encourage all communities to develop stormwater management plans. (Both)
5.1.2 Action Item: Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures. (Both)

5.2 Promote beneficial uses of hazardous areas while expanding open space and recreational opportunities.

5.2.1 Action Item: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area. (Existing)
5.2.2 Action Item: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space. (Existing)

Goal 6: Secure resources for investment in hazard mitigation

Objectives

6.1 Research the use of local and outside sources of funding

6.1.1 Action Item: Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.
6.1.2 Action Item: Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met. (Both)
6.1.3 Action Item: Work with state/local/federal agencies to include mitigation in all economic and community development projects. (Both)
6.1.4 Action Item: Encourage local jurisdictions to budget for mitigation projects. (Both)

6.2 Encourage participation of property owners in investing in hazard mitigation projects on their own property.

6.2.1 Action Item: Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole. (Both)
6.2.2 Action Item: Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases, brochures, EMD website and FaceBook. (Both)

6.3 In the event of a disaster declaration, be prepared to apply for hazard mitigation grants for prioritized projects.

6.3.1 Action Item: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property. (Both)

Table 4.2 Mitigation Actions Hazards Addressed, Applicable Jurisdictions

		Hazards												Jurisdictions									
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III
1.1.1	Continue public education/awareness efforts on personal emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc) through the distribution of materials, press releases and postings on website/FaceBook.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.1.2	Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.1.3	Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.	X	X	X	X	X	X	X	X	X	X	X	X	X									
1.1.4	Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.2.1	Need to continue to examine ways to expand and improve warning systems.								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.2.2	Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.2.3	Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.					X			X	X	X	X		X									

		Hazards												Jurisdictions									
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III
1.2.4	Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.									X	X			X	X	X	X	X	X	X	X	X	X
1.2.5	Continue to promote participation in the Smart Prepare Beta test & encourage residents to upload information for use by 9-1-1 & response agencies to improve response during emergencies/ disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather	X		X	X	X			X	X	X	X	X	X	X	X	X	X	X	X			
1.2.6	Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	X						X	X		X		X	X									
1.3.1	Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.									X	X	X		X	X	X	X	X	X	X			
1.3.2	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.					X								X	X	X	X	X	X	X			
1.3.3	Continue to review and evaluate the need for generators for critical systems and response support in all communities.	X		X		X			X	X	X	X	X	X	X	X	X	X	X	X			
1.3.4	Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.									X	X			X	X	X	X	X	X	X	X	X	X

		Hazards												Jurisdictions									
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III
1.3.5	Encourage the construction of tornado safe rooms in every school that does not have one.										X										X	X	X
2.1.1	Continue to encourage businesses/government/schools to develop and implement emergency plans.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2.1.2	Continue to evaluate and update emergency operation plans.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2.1.3	Continue to conduct emergency preparedness exercises periodically.	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2.1.4	Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	X						X	X		X		X	X									
2.1.5	Regularly review and update school emergency plans.	X	X	X	X	X	X	X	X	X	X	X	X								X	X	X
2.1.6	Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.	X	X	X	X	X	X	X	X	X	X	X	X								X	X	X
2.1.7	Conduct emergency preparedness exercises in schools on a regular basis.	X	X	X	X	X	X	X	X	X	X	X	X								X	X	X
2.2.1	Educate and raise awareness of residents and contractors on the dangers of floodplain development and the benefits of the National Flood Insurance Program.					X								X	X	X		X		X			
2.2.2	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.					X								X	X	X		X		X			
2.3.1	Encourage local governments to develop and implement	X				X			X	X	X			X									

		Hazards												Jurisdictions									
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III
	regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.																						
3.1.1	Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events and through OEM website and FaceBook page.	X	X	X	X	X	X	X	X	X	X	X	X	X									
3.1.2	Continue to provide regular press releases from county EMD office concerning hazards, where they strike, frequency, preparedness and how to mitigate.	X	X	X	X	X	X	X	X	X	X	X	X	X									
3.2.1	Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.				X	X			X	X	X	X		X									
3.2.2	Ask SEMA mitigation specialists to present information to city councils, county commission, school districts, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3.2.3	Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3.3.1	Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3.3.2	Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new	X	X	X	X	X	X	X	X	X	X	X	X	X									

		Hazards												Jurisdictions									
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III
	regulations, especially in regards to floodplain management																						
3.4.1	Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X			
3.4.2	Publicize county or citywide drills.	X		X		X			X	X	X	X	X	X	X	X	X	X	X	X			
3.4.3	Continue to provide information on EMD website and FaceBook on preparedness and mitigation.	X	X	X	X	X	X	X	X	X	X	X	X	X									
4.1.1	Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.1.2	Joint training (and drills) between agencies, public and private entities (including schools/businesses).	X		X		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.1.3	Pool different agency resources to achieve widespread mitigation planning results.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.2.1	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
4.2.2	Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.	X	X	X	X	X	X	X	X	X	X	X	X	X									
5.1.1	Encourage all communities to develop stormwater management plans.					X				X		X		X	X	X	X	X	X	X			
5.1.2	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

		Hazards												Jurisdictions									
Action No.	Mitigation Action Item	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Levee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamois	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III
5.2.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.					X								X	X	X		X		X			
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.					X								X	X	X		X		X			
6.1.1	Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6.1.2	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	X		X		X	X	X	X					X									
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
6.1.4	Encourage local jurisdictions to budget for mitigation projects.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6.2.1	Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
6.2.2	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases, brochures, EMD website and FaceBook	X	X	X	X	X	X	X	X	X	X	X	X	X									
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

4.3 NFIP Participation and Action Items Supporting NFIP

44 CFR Requirement 201.6I(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Details of NFIP participation and current flood maps have been included in the Flood Profile in Chapter 3. The NFIP participation status of jurisdictions is shown again in Figure 4.3.

Table 4.3 Osage County Jurisdiction Participation in NFIP

Jurisdictions Participating in NFIP
Osage County
Argyle
Chamois
Linn
Westphalia
Jurisdiction NOT Participating in NFIP
Freeburg
Meta

Source: SEMA

Osage County, Argyle, Chamois, Linn and Westphalia are all members of the NFIP. The Emergency Management Director for Osage County also serves as the floodplain manager for the county and all NFIP member cities. The following mitigation actions pertain to continued compliance with the NFIP for all member jurisdictions:

2.2.1 Educate and raise awareness of residents and contractors on the dangers of floodplain development and the benefits of the National Flood Insurance Program.

2.2.2 Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

2.3.1 Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.

3.1.1 Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation and reducing vulnerability at public facilities and events.

3.1.3 Continue to provide information floodplain management, preparedness, mitigation, etc. through EMD website and FaceBook.

5.2.1 Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

5.2.2 Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

4.4 Prioritization of Hazard Mitigation Action Items

[The mitigation strategy section shall include] an action plan describing how the actions identified in section I(3)(ii) will be prioritized, implemented and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

4.4.1 STAPLEE and Benefit/Cost Review Scoring

After the list of mitigation actions for all jurisdictions in Osage County had been developed, as recommended by FEMA, a STAPLEE review and Benefit/Cost review was completed on the action items. STAPLEE is a tool used to assess the costs and benefits and overall feasibility of mitigation actions. STAPLEE stands for the following:

- **Social:** Will the action be acceptable to the community? Could it have an unfair effect on a particular segment of the population?
- **Technical:** is the action technically feasible? Are there secondary impacts? Does it offer a long-term solution?
- **Administrative:** Are there adequate staffing, funding and maintenance capabilities to implement the project?
- **Political:** Will there be adequate political and public support for the project?
- **Legal:** Does your jurisdiction have the legal authority to implement the action?
- **Economic:** is the action cost-beneficial? Is there funding available: Will the action contribute to the local economy?
- **Environmental:** Will there be negative environmental consequences from the action? Does it comply with environmental regulations? Is it consistent with community environmental goals?

Each question was scored based on a 0 to 3 point value system:

3 = Definitely YES
2 = Maybe YES
1 = Probably NO
0 = Definitely NO

For the Benefit/Cost Review portion of the prioritization process, these two aspects were scored as follows:

Benefit – two (2) points were added for each of the following avoided damages (8 points maximum = highest benefit)

- Injuries and/or casualties
- Property damages
- Loss-of-function/displacement impacts
- Emergency management costs/community costs

Cost – points were subtracted according to the following cost scale (-5 points maximum = highest cost)

- (-1) = Minimal – little cost to the jurisdiction involved
- (-3) = Moderate – definite cost involved but could likely be worked into operating budget
- (-5) = Significant – cost above and beyond most operating budgets; would require extra appropriations to finance or to meet matching funds for a grant

Note: For the Benefit/Cost Review, the benefit and cost of actions which used the word "encourage" were evaluated as if the action or strategy being encouraged was actually to be carried out.

Total Score – The scores for the STAPLEE Review and Benefit/Cost Review were added to determine a Total Score for each action.

Priority Scale – To achieve an understanding of how a Total Score might be translated into a Priority Rating, a sample matrix was filled out for the possible range of ratings an action might receive on both the STAPLEE and Benefit/Cost Review. The possible ratings tested ranged between:

- A hypothetical action with "Half probably NO and half maybe YES" answers on STAPLEE (i.e. poor STAPLEE score) and Low Benefit/High Cost: Total Score = 7
- A hypothetical action with "All definitely YES" on STAPLEE and High Benefit/Little Cost: Total Score = 28

An inspection of the possible scores within this range led to the development of the following Priority Scale based on the Total Score in the STAPLEE- Benefit/Cost Review process:

20 – 28 points = High Priority
14 - 19 points = Medium Priority
13 points and below = Low Priority

It should be noted that most of the actions attained a High priority rating: this is reflective of the fact that many actions which would have scored poorly on the STAPLEE review were deleted for the update during the initial discussion/review of the actions in the original plan (see Table 4.1). Also, many of the actions are ongoing and already in place but remain high priorities for the jurisdictions.

The STAPLEE review, Benefit/Cost review and Final Priority for each of the mitigation actions is shown in Table 4.4

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES			1 = Prob NO 0 = Def NO										
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
1.1.1	Continue public education/awareness efforts on personal emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc) through the distribution of materials, press releases and postings on website/FaceBook.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.1.2	Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.1.3	Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.	3	3	3	3	3	2	3	20	IC, PD, LF EMCC	8	-1	7	27	H
1.1.4	Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.2.1	Need to continue to examine ways to expand and improve warning systems.	3	3	2	3	3	2	3	19	IC	2	-1	1	20	H
1.2.2	Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.	3	3	3	3	3	3	3	21	IC,EMCC	4	-1	3	24	H
1.2.3	Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.	3	3	3	3	3	3	3	21	IC, EMCC	4	-1	3	24	H
1.2.4	Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.	3	3	3	3	3	3	3	21	IC, EMCC	4	-1	3	24	H
1.2.5	Continue to promote participation in the Smart Prepare Beta test and encourage residents to upload information for use by 9-1-1 and response agencies to improve response during emergencies/disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather	3	2	3	3	3	2	3	19	IC, EMCC	4	-1	3	22	H
1.2.6	Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES			1 = Prob NO 0 = Def NO										
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
1.3.1	Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.	3	3	3	3	3	2	2	19	IC, PD, LF, EMCC	8	-3	5	24	H
1.3.2	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.	3	3	2	3	3	2	2	18	IC, PD, LF, EMCC	8	-1	7	25	H
1.3.3	Continue to review and evaluate the need for generators for critical systems and response support in all communities.	3	3	3	3	3	2	2	19	IC, LF, EMCC	6	-1	5	24	H
1.3.4	Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.	3	3	3	3	3	1	3	19	IC, EMCC	4	-5	-1	18	M
1.3.5	Encourage the construction of tornado safe rooms in every school that does not have one.	3	3	3	3	3	1	3	19	IC, EMCC	4	-5	-1	18	M
2.1.1	Continue to encourage businesses/government/schools to develop and implement emergency plans.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-3	5	26	H
2.1.2	Continue to evaluate and update emergency operation plans.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
2.1.3	Continue to conduct emergency preparedness exercises periodically.	3	2	3	3	3	2	3	19	IC, PD, LF, EMCC	8	-3	5	24	H
2.1.4	Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
2.1.5	Regularly review and update school emergency plans.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
2.1.6	Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-3	5	25	H
2.1.7	Conduct emergency preparedness exercises in schools on a regular basis.	3	2	3	3	3	2	3	19	IC, PD, LF, EMCC	8	-3	5	24	H
2.2.1	Educate & raise awareness of residents & contractors on dangers of floodplain development and the benefits of the National Flood Insurance Program.	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES			1 = Prob NO 0 = Def NO										
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
2.2.2	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
2.3.1	Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.	2	2	2	1	2	2	2	13	IC, PD	4	-1	3	16	M
3.1.1	Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
3.1.2	Continue to provide regular press releases from county EMD office concerning hazards, where they strike, frequency, preparedness and how to mitigate.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
3.2.1	Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.	3	3	3	3	3	2	3	20	IC, EMCC	4	-1	3	23	H
3.2.2	Ask SEMA mitigation specialists to present information to city councils, county commission, school districts, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.	3	3	3	2	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
3.2.3	Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-3	5	22	H
3.3.1	Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H
3.3.2	Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
3.4.1	Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
3.4.2	Publicize county or citywide drills.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES			1 = Prob NO 0 = Def NO										
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Loss Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
3.4.3	Continue to provide information on EMD website and FaceBook on preparedness and mitigation.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
4.1.1	Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
4.1.2	Joint training (and drills) between agencies, public and private entities (including schools/businesses).	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
4.1.3	Pool different agency resources to achieve widespread mitigation planning results.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
4.2.1	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.	3	2	3	2	3	3	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
4.2.2	Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-3	5	22	H
5.1.1	Encourage all communities to develop stormwater management plans.	2	2	1	1	3	1	3	13	PD	2	-5	-3	10	L
5.1.2	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-3	5	25	H
5.2.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.	1	2	2	1	2	1	3	12	PD, EMCC	4	-5	-1	11	L
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.	2	2	2	1	2	1	3	13	PD, EMCC	4	-1	3	16	M
6.1.1	Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
6.1.2	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.	3	2	2	2	3	2	2	16	IC, PD, LF, EMCC	8	-1	7	23	H

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES			1 = Prob NO 0 = Def NO										
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Loss Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
6.1.4	Encourage local jurisdictions to budget for mitigation projects.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-5	3	23	H
6.2.1	Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.	2	1	1	1	2	2	2	11	IC, PD, LF, EMCC	8	-5	3	14	M
6.2.2	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases, brochures, EMD website and FaceBook	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.	3	3	2	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H

Requirement 201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Requirement 201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other panning mechanisms such as comprehensive or capital improvement plans, when appropriate.

4.4.2 Implementation and Administration in Participating Jurisdictions

After completion of the STAPLEE and Benefit/Cost Reviews and prioritization of the mitigation action items, the action items were assigned to specific jurisdictions and plans were developed for implementation and administration.

The mitigation actions for each participating jurisdiction are shown in the following pages. The implementation and administration of each action item is listed in the section for the jurisdiction which is serving as the lead for the action. A description of the method for integrating the hazard mitigation plan action items into other planning processes in the jurisdiction is included after the actions.

Osage County

The following are mitigation actions for which Osage County is the lead. It should be noted that the County is the lead for many actions which mitigate for hazards in multiple jurisdictions in the planning area. This is mainly due to the fact that the county EMD also serves as the EMD for all of the communities in the county and currently is responsible for many of the action items listed. [Note: Some action items are listed under multiple goals – these have been combined where possible and when all other factors are the same and noted by action number in Table 4.5.]

The tables that follow indicate the jurisdictions(s) for which the county is leading the action. Actions lead by the County for other jurisdictions are repeated in list form under each participating jurisdiction to which they apply.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.5 Action Items Assigned to Osage County

Action 1.1.1	Continue public education/awareness efforts on personal emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc) through the distribution of materials, press releases and postings on website/FaceBook.
Priority	High
Plan for Implementation & Administration	Public education/awareness efforts on the subject of personal emergency preparedness will be continued by providing a variety of printed materials (brochures, press releases, etc.) on the topic to the public at public buildings such as the courthouse, county administration building, city halls, etc., and at public events such as fairs and festivals. In addition, the information will be posted on the Osage County Emergency Management website – www.osagecountyema.com and on the emergency management FaceBook page.
Lead	County Office of Emergency Management, County Commission
Partners	City governments, emergency response agencies, county health department, schools
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All hazards
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
Action 1.1.2	Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.
Priority	High
Plan for Implementation & Administration	Information on hazards, prevention and preparedness will be continued by providing a variety of printed materials (brochures, press releases, etc.) on the topics to the public at public buildings such as the courthouse, county administration building, city halls, etc., and at public events such as fairs and festivals. In addition, the information will continue to be posted on the Osage County Emergency Management website – www.osagecountyema.com and on the emergency management FaceBook page.
Lead	County Office of Emergency Management, County Commission
Partners	City governments, emergency response agencies, county health department, schools
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All hazards
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
1.1.3	Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.
Priority	High
Plan for Implementation & Administration	Information on and samples of emergency plans and continuity plans for businesses are available on the Osage County Emergency Management website – www.osagecountyema.com .
Lead	County Office of Emergency Management, County Commission
Partners	City governments, emergency response agencies, county health department
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All hazards

Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta and Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC
1.1.4	Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.
Priority	High
Plan for Implementation & Administration	County EMD will coordinate periodic CERT and Teen CERT trainings in the county. Citizens will be notified through local media as well as on the OEM website – www.osagecountyema.com and FaceBook page. The EMD will work to generate interest in the classes and encourage the development of teams.
Lead	County Office of Emergency Management, County Commission
Partners	City governments, schools
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All hazards
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
1.2.1	Need to continue to examine ways to expand and improve warning systems.
Priority	High
Plan for Implementation & Administration	County EMD and County Commission will continue to review changing technologies and existing systems (sirens, Reverse 9-1-1, AlertFM, website, etc.) to find ways to improve the county's current warning systems. This will be part of the annual review of the county LEOP.
Lead	County Office of Emergency Management, County Commission
Partners	City governments, schools
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Levee failure, severe storm, tornado, severe winter weather, wildfire
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC
1.2.2	Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.
Priority	High
Plan for Implementation & Administration	County EMD will continue to promote and educate the public on existing warning systems in the county and how to interpret the warnings provided. This will be accomplished through press releases to local media and postings on the OEM website – www.osagecountyema.com and FaceBook page.
Lead	County Office of Emergency Management, County Commission
Partners	City governments, schools
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Levee failure, severe storm, tornado, severe winter weather, wildfire
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, EMCC

1.2.3	Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.
Priority	High
Plan for Implementation & Administration	County EMD will continue to cultivate relationships with local radio stations and work with them to ensure that appropriate warnings are provided by making regular contact.
Lead	County Office of Emergency Management, County Commission
Partners	Local radio stations
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Severe storm, tornado, severe winter weather
Applicable Jurisdictions	Osage County
Benefits (Losses Avoided)	IC, EMCC
1.2.4	Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.
Priority	High
Plan for Implementation & Administration	County EMD will continue to educate and raise awareness of the public on the warning systems available in Osage County and how to interpret the warnings provided. This will be accomplished through press releases to local media and postings on the OEM website – www.osagecountyema.com and FaceBook page.
Lead	County Office of Emergency Management, County Commission
Partners	Local governments, schools
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Severe storm, tornado, severe winter weather
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, EMCC
1.2.5	Continue to promote participation in the Smart Prepare Beta test and encourage residents to upload information for use by 9-1-1 and response agencies to improve response during emergencies/disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather
Priority	High
Plan for Implementation & Administration	County EMD will continue to educate and raise awareness of the public about the Smart Prepare Beta test the county is participating in. This program allows individuals to upload personal information on themselves that would be useful for 9-1-1 and emergency responders (i.e. health conditions, medications, etc.). This will be accomplished through press releases to local media and postings on the OEM website – www.osagecountyema.com and FaceBook page.
Lead	County Office of Emergency Management, County Commission
Partners	Local Governments
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Severe storm, tornado, severe winter weather
Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta and Westphalia
Benefits (Losses Avoided)	IC, EMCC
1.2.6, 2.1.4	Monitor developments in data availability concerning the impact of levee failure, dam

	failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.
Priority	High
Plan for Implementation & Administration	County EMD and County Commission will continue to monitor developments in data availability on impacts of levee failure, dam failure, tornados, sinkholes, land subsidence & wildfire. This will be done in cooperation with SEMA, FEMA, MDC, MDNR & MRPC. As additional information becomes available, the County EMD will incorporate information into the hazard mitigation plan to improve future planning efforts.
Lead	County Office of Emergency Management, County Commission
Partners	SEMA, FEMA, MRPC, MDC, MDNR
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Levee failure, dam failure, tornados, sinkholes, land subsidence, wildfire
Applicable Jurisdictions	Osage County
Benefits (Losses Avoided)	IC, EMCC
1.3.1	Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.
Priority	High
Plan for Implementation & Administration	County Commission and County EMD will encourage local jurisdictions and utilities to continue aggressive tree trimming and dead tree removal programs through contacts with local communities and electric coops.
Lead	County Commission
Partners	County EMD, local governments, electric cooperatives
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Severe storm, tornado, severe winter weather
Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta and Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC
1.3.2	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
Priority	High
Plan for Implementation & Administration	County Commission will periodically review roads and bridges and determine which bridges, low water crossings and sections of road are potential hazard mitigation projects. The list will be prioritized for the purpose of having a list of projects to search for potential funding.
Lead	County Commission
Partners	Local governments, MRPC
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta and Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC
1.3.3	Continue to review and evaluate the need for generators for critical systems and response support in all communities.

Priority	High
Plan for Implementation & Administration	County EMD, with help from local governments and emergency response agencies, will periodically review and evaluate the need for generators for critical systems and response agencies throughout the county to determine if there are additional needs for this equipment. If so, the county EMD will seek funding for additional generators.
Lead	County Office of Emergency Management, County Commission
Partners	Local governments, emergency response agencies, Region F HSOC
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Dam Failure, Earthquake, Flood, Levee Failure, Severe Storm, Tornado, Severe Winter Weather, Wildfire
Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta and Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC
1.3.4	Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.
Priority	Medium
Plan for Implementation & Administration	County EMD will periodically review the need for tornado safe rooms/storm shelters in high population facilities and areas and work with potential locations for the designation of storm shelter or the construction of safe rooms.
Lead	County Office of Emergency Management, County Commission
Partners	Local governments, schools, large employers
Projected Cost/Funding	Significant/Grants
Criterion for Completion	Ongoing
Hazards Addressed	Tornados, Severe Storms
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, EMCC
2.1.1	Continue to encourage businesses/government/schools to develop and implement emergency plans.
Priority	High
Plan for Implementation & Administration	County EMD provides samples of emergency plans for businesses and communities through the OEM website - www.osagecountyema.com and includes all of the cities in the County LEOP.
Lead	County Office of Emergency Management, County Commission
Partners	Local businesses, local government, schools
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All hazards
Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta, Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC
2.1.2	Continue to evaluate and update emergency operation plans.
Priority	High
Plan for Implementation & Administration	County EMD is responsible for periodically reviewing and updating the Osage County LEOP which includes all of the communities.
Lead	County Office of Emergency Management, County Commission
Partners	Local government, schools, emergency response agencies

Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All hazards
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
2.1.3	Continue to conduct emergency preparedness exercises periodically.
Priority	High
Plan for Implementation & Administration	County EMD will work with SEMA, MRPC, MREPC, local responders and communities to develop, coordinate and participate in emergency preparedness exercises on a regular basis.
Lead	County Office of Emergency Management, County Commission
Partners	Local governments, emergency response agencies, SEMA, MRPC, MREPC
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All hazards
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
2.2.1	Educate and raise awareness of residents and contractors on the dangers of floodplain development and the benefits of the National Flood Insurance Program.
Priority	High
Plan for Implementation & Administration	County EMD administers the floodplain management program for Osage County and provides information on floodplain permit and building requirements through brochures, press releases, and the OEM website – www.osagecountyema.com .
Lead	County Office of Emergency Management, County Commission
Partners	SEMA, FEMA
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Applicable Jurisdictions	Osage County, Argyle, Chamois, Linn, Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC
2.2.2	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.
Priority	High
Plan for Implementation & Administration	County EMD administers floodplain management program for Osage County. The permit process requires engineering reports to be submitted with the permit to verify that construction is occurring in accordance with the ordinance. Once construction is completed, the property owner must provide an engineering report verifying that construction has been completed at least one foot above base flood level.
Lead	County Office of Emergency Management, County Commission
Partners	
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Applicable Jurisdictions	Osage County, Argyle, Chamois, Linn, Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC

2.3.1	Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.
Priority	Medium
Plan for Implementation & Administration	County EMD currently enforces regulations in the floodplain in regards to securing tanks and mobile homes and will encourage communities to extend those requirements beyond the floodplain in order to address hazards during high winds as well as floods.
Lead	County Office of Emergency Management, County Commission
Partners	Local governments
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Flood, Tornado, Severe Storm/Wind
Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta and Westphalia
Benefits (Losses Avoided)	IC, PD
3.1.1, 3.4.3	Continue to provide a broad spectrum of information on floodplain management, all hazard preparedness, mitigation, and reducing vulnerability at public facilities and events and through the OEM website and FaceBook page.
Priority	High
Plan for Implementation & Administration	County EMD will continue to distribute information through local media in press releases, brochures at events and in public facilities, and through the OEM website – www.osagecountyema.com and Facebook page.
Lead	County Office of Emergency Management, County Commission
Partners	Local governments, emergency response agencies, county health department
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
3.1.2	Continue to provide regular press releases from county EMD office concerning hazards, where they strike, frequency, preparedness and how to mitigate.
Priority	High
Plan for Implementation & Administration	County EMD will provide press releases to local media on hazard information and means of mitigating hazards as well as post information on the OEM website – www.osagecountyema.com and Facebook page. Coordinate these efforts with SEMA's statewide drills, awareness activities.
Lead	County Office of Emergency Management, County Commission
Partners	SEMA
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All hazards
Applicable Jurisdictions	Osage County
Benefits (Losses Avoided)	IC, PD, LF EMCC
3.2.1	Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.
Priority	High
Plan for Implementation &	County EMD provides contests to raise awareness and gives AlertFM units as prizes.

Administration	Promotes the program through periodic press releases to local media, brochures and through the OEM website – www.osagecountyema.com and FaceBook page.
Lead	County Office of Emergency Management, County Commission
Partners	
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Extreme Heat, Flood, Levee Failure, Severe Storm, Tornado, Severe Winter Storm
Applicable Jurisdictions	All jurisdictions
Benefits (Losses Avoided)	IC, EMCC
3.2.2, 4.2.1	Ask SEMA mitigation specialists to present information to city councils, county commission, school districts, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.
Priority	High
Plan for Implementation & Administration	County EMD will work with various local governments, MREPC and MRPC to coordinate opportunities for SEMA hazard mitigation specialists to present information on mitigation programs, projects and potential funding.
Lead	County Office of Emergency Management, County Commission
Partners	Local government, SEMA, MREPC, MRPC
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
3.2.3	Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.
Priority	High
Plan for Implementation & Administration	County Commission and County EMD will make contacts with other local jurisdictions to work together to identify, assess and prioritize mitigation projects in the county as part of the regular review of the hazard mitigation plan and in conjunction with other similar projects like the bridge and low water crossing assessment currently being done by MRPC.
Lead	County Office of Emergency Management, County Commission
Partners	Local Jurisdictions, MRPC, SEMA
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
3.3.1, 4.2.2	Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other county and community planning activities.
Priority	High
Plan for Implementation & Administration	County EMD will work with other jurisdictions to review the hazard mitigation plan on a regular basis – annually or whenever disasters occur in the county. In addition, all jurisdictions will be encouraged to merge the hazard mitigation action items with other community plans and planning activities.
Lead	County Office of Emergency Management, County Commission

Partners	Local Jurisdictions, SEMA, MRPC
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
3.3.2	Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management
Priority	High
Plan for Implementation & Administration	County EMD/Floodplain Manager will provide updates on mitigation activities in the county to local media to keep the public informed. Changes in regulations, particularly in floodplain management will also be publicized through media and OEM website – www.osagecountyema.com and FaceBook page.
Lead	County Office of Emergency Management, County Commission
Partners	Local jurisdictions, SEMA, FEMA
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
3.4.1	Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)
Priority	High
Plan for Implementation & Administration	County EMD will work with SEMA and local media to launch publicity/information campaigns to educate residents on what they can do to reduce their risks during threatening conditions such as drought and heat waves. This will include press releases and public service announcements.
Lead	County Office of Emergency Management, County Commission
Partners	SEMA
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta and Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC
3.4.2	Publicize county or citywide drills.
Priority	High
Plan for Implementation & Administration	County EMD will work with local governments, agencies and emergency response agencies to publicize and encourage participation in drills being conducted in any of the jurisdictions. Publicizing will include emails, press releases and postings on OEM website – www.osagecountyema.com and FaceBook page.
Lead	County Office of Emergency Management, County Commission
Partners	Local jurisdictions, SEMA, emergency response agencies
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing – as needed

Hazards Addressed	All Hazards
Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta and Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC
4.1.1	Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.
Priority	High
Plan for Implementation & Administration	County EMD will incorporate mitigation planning into existing meetings currently being held for training and emergency planning.
Lead	County Office of Emergency Management, County Commission
Partners	Local jurisdictions, emergency response agencies, SEMA, MRPC
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
4.1.2	Joint training (and drills) between agencies, public and private entities (including schools/businesses).
Priority	High
Plan for Implementation & Administration	County EMD will work with all jurisdictions and emergency response agencies to coordinate trainings, drills and exercises that area inclusive of both public and private entities such as schools and businesses.
Lead	County Office of Emergency Management, County Commission
Partners	Local Jurisdictions, SEMA, MREPC, MRPC, emergency response agencies
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
4.1.3	Pool different agency resources to achieve widespread mitigation planning results.
Priority	High
Plan for Implementation & Administration	County EMD and County Commission will make contact with other jurisdictions, emergency response agencies, county health department, SEMA, MRPC and find ways to work together to identify, prioritize, fund and implement mitigation projects throughout the county, as well as incorporate mitigation into all planning activities.
Lead	County Office of Emergency Management, County Commission
Partners	All Jurisdictions, local emergency response agencies, county health department, SEMA, MRPC
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF EMCC
5.1.2	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
Priority	High
Plan for Implementation &	County EMD will review and update the county LEOP to determine where and how

Administration	hazard mitigation activities can be incorporated into the plan as well as any other emergency operations procedures.
Lead	County Office of Emergency Management, County Commission
Partners	Local Jurisdictions, county health department, emergency response agencies
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	2014
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
5.2.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.
Priority	Low
Plan for Implementation & Administration	County Floodplain Manager will encourage Osage County Commission, Argyle, Chamois, Linn and Westphalia city governments will look for opportunities to purchase repetitive loss properties in flood prone areas, particularly after a flood event. After flood damage has occurred, and before repairs have been made is the best time to contact property owners and make buyout offers.
Lead	County Floodplain Manager
Partners	Osage County Commission, Argyle, Chamois, Linn, Westphalia, SEMA, MRPC
Projected Cost/Funding	High/Grants
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Applicable Jurisdictions	Osage County, Argyle, Chamois, Linn, Westphalia
Benefits (Losses Avoided)	PD, EMCC
6.1.1	Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.
Priority	High
Plan for Implementation & Administration	County EMD will stay in contact with and work with local jurisdictions, MRPC, SEMA and FEMA to stay abreast of funding opportunities for mitigation projects throughout the county.
Lead	County EMD
Partners	Local Jurisdictions, SEMA, FEMA and MRPC
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
6.1.2	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
Priority	High
Plan for Implementation & Administration	Osage County Commission will include hazard mitigation issues in grant applications for upgrades to or replacements of roads and bridges. The county is currently involved in a regional project to identify and prioritize bridges and low water crossings that need to be mitigated to reduce risk during flood events. Once this project is completed, the county will receive a report which should be reviewed and considered before any future upgrades are initiated.

Lead	Osage County Commission
Partners	Road and Bridge Department, city government were applicable, MRPC, SEMA, FEMA
Projected Cost/Funding	Minimal/Operating budget
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Applicable Jurisdictions	Osage County
Benefits (Losses Avoided)	IC, PD, LF, EMCC
6.1.4	Encourage local jurisdictions to budget for mitigation projects.
Priority	High
Plan for Implementation & Administration	County EMD will include discussions on budgeting for mitigation projects with all local jurisdictions at various flood plain management, mitigation planning and emergency management meetings.
Lead	County Office of Emergency Management, County Commission
Partners	All Local Jurisdictions
Projected Cost/Funding	Significant/Grants
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC
6.2.1	Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.
Priority	Medium
Plan for Implementation & Administration	County EMD will include discussions on these types of programs with all jurisdictions at meetings held on related issues (floodplain, emergency planning, etc.)
Lead	County Office of Emergency Management, County Commission
Partners	Osage County, Argyle, Chamois, Freeburg, Linn, Meta, Westphalia
Projected Cost/Funding	Significant/Grants
Criterion for Completion	Ongoing
Hazards Addressed	Dam Failure, Earthquake, Flood, Landslide, Land Subsidence/Sinkhole, Levee Failure, Severe Storm, Tornado, Severe Winter Weather, Wildfire
Applicable Jurisdictions	Osage County, Argyle, Chamois, Freeburg, Linn, Meta, Westphalia
Benefits (Losses Avoided)	IC, PD, LF, EMCC
6.2.2	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases, brochures, EMD website and FaceBook.
Priority	High
Plan for Implementation & Administration	County EMD, with assistance from all jurisdictions and partner agencies will develop press releases on the benefits of hazard mitigation projects, but for public infrastructure as well as on the part of private property owners. The information will be distributed through local media as well as on the OEM website – www.osagecountyema.com and the FaceBook page.
Lead	County Office of Emergency Management, County Commission
Partners	All jurisdictions, SEMA, FEMA, MRPC
Projected Cost/Funding	Minimal/Operating Budget
Criterion for Completion	Ongoing

Hazards Addressed	All Hazards
Applicable Jurisdictions	Osage County
Benefits (Losses Avoided)	IC, PD, LF, EMCC
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.
Priority	High
Plan for Implementation & Administration	County EMD will periodically ask jurisdictions to complete this action and provide results to the County EMA.
Lead	County Office of Emergency Management, County Commission
Partners	All Jurisdictions
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	2014, repeat in 2016
Hazards Addressed	All Hazards
Applicable Jurisdictions	All Jurisdictions
Benefits (Losses Avoided)	IC, PD, LF, EMCC

Integration of Hazard Mitigation Actions into Current Planning Processes

The mitigation actions in this plan will be integrated into the work plans of the departments leading the actions; many of the actions are already integrated into the activities of county personnel. Any funding required for mitigation will be considered during the annual budgeting process in the County.

The local emergency operations plan (LEOP) covers all aspects of emergency preparedness in Osage County, including all jurisdictions listed in this plan. The LEOP is an inclusive document with a broad range of information concerning all the facets of emergency management and planning. The mitigation actions in the Osage County Hazard Mitigation Plan will be integrated into the LEOP as applicable.

Argyle

Mitigation actions for Argyle are shown in the following table and subsequent list. The actions in the table are those for which Argyle itself will take the lead. Those listed at the end of the table are mitigation actions which Osage County will lead on behalf of numerous jurisdictions, including Argyle.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.5 Action Items Assigned to Village of Argyle

5.1.1	Encourage all communities to develop storm water management plans.
Priority	Low
Plan for Implementation & Administration	The street commissioner and village trustees need to consider the benefits of developing a storm water management plan and look into methods of developing and funding the project.
Lead	Street Commissioner
Partners	MRPC
Projected Cost/Funding	Significant/Grants
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.
Priority	Low
Plan for Implementation & Administration	Village trustees need to discuss and consider adopting zoning regulations that would zone repetitive loss properties as open space to reduce risk in the community.
Lead	Village Trustees
Partners	County floodplain manager
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Complete review and make decision by Jan. 2015
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Priority	High
Plan for Implementation & Administration	Village Trustees need to work with SEMA, FEMA, MRPC and other economic development agencies to include community mitigation projects and programs in all economic and community development projects planned for Argyle.
Lead	Village Trustees
Partners	SEMA, FEMA, MRPC, DED, RD
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC

In addition to the above mitigation actions for which the Village of Argyle is the lead, Osage County will be the lead on the following actions which also serve as mitigation actions for the Village of Argyle:

1.1.1 Continue public education/awareness efforts on person emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc.) through the distribution of materials, press releases and postings on website/FaceBook.

1.1.2 Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.

1.1.3 Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.

1.1.4 Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2.1 Need to continue to examine ways to expand and improve warning systems.

1.2.2 Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.

1.2.3 Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.

1.2.4 Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.

1.2.5 Continue to promote participation in the Smart Prepare Beta test and encourage residents to upload information for use by 9-1-1 and response agencies to improve response during emergencies/disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather.

1.2.6 Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning. (Also 2.1.4)

1.3.1 Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.

1.3.2 Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

1.3.3 Continue to review and evaluate the need for generators for critical systems and response support in all communities.

1.3.4 Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.

2.1.1 Continue to encourage businesses/government/schools to develop and implement emergency plans.

2.1.2 Continue to evaluate and update emergency operation plans.

2.1.3 Continue to conduct emergency preparedness exercises periodically.

2.2.1 Educate and raise awareness of residents and contractors on the dangers of floodplain development and the benefits of the National Flood Insurance Program.

2.2.2 Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

2.3.1 Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.

3.1.1 Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events.

3.2.1 Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.

3.2.2 Ask SEMA mitigation specialists to present information to city councils, county commission, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.

3.2.3 Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.

3.3.1 Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.

3.3.2 Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management

3.4.1 Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave).

3.4.2 Publicize county or citywide drills.

3.4.3 Continue to provide information on EMD website and FaceBook on preparedness and mitigation.

4.1.1 Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.

4.1.2 Joint training (and drills) between agencies, public and private entities (including schools/businesses).

4.1.3 Pool different agency resources to achieve widespread mitigation planning results.

4.2.1 Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

4.2.2 Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

5.2.1 Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

6.1.1 Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.

6.1.3 Work with state/local/federal agencies to include mitigation in all economic and community development projects.

6.1.4 Encourage local jurisdictions to budget for mitigation projects.

6.2.1 Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Information on the implementation and administration of these actions is described under Osage County in this section.

Integration of Hazard Mitigation Actions into Current Planning Processes

The Village of Argyle is a very small community of fewer than 200 people. The community has a very minimal budget with which to work and little or no funding for planning activities. Decision making in the village is typically done on an “as needed” basis. Planning that does occur in the village is carried out by the Board of Trustees with recommendations from city employees/volunteers or as part of larger, county planning activities. The hazard mitigation actions will be carried out on a volunteer basis by the Board of Trustees and where applicable, the Water and Street Commissioner.

Chamois

Mitigation actions for Chamois are shown in the following table and subsequent list. The actions in the table are those for which Chamois itself will take the lead. Those listed at the end of the table are mitigation actions which Osage County will lead on behalf of numerous jurisdictions, including Chamois.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.6 Action Items Assigned to City of Chamois

5.1.1	Encourage all communities to develop storm water management plans.
Priority	Low
Plan for Implementation & Administration	The water and street superintendent and board of aldermen need to consider the benefits of developing a storm water management plan and look into methods of developing and funding the project.
Lead	Water and Street Commissioner
Partners	MRPC
Projected Cost/Funding	Significant/Grants
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.
Priority	Low
Plan for Implementation & Administration	Board of Aldermen need to discuss and consider adopting zoning regulations that would zone repetitive loss properties as open space to reduce risk in the community.
Lead	Board of Aldermen
Partners	County floodplain manager
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Complete review and make decision by Jan. 2015
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Priority	High
Plan for Implementation & Administration	Board of Aldermen need to work with SEMA, FEMA, MRPC and other economic development agencies to include community mitigation projects and programs in all economic and community development projects planned for Chamois.
Lead	Board of Aldermen
Partners	SEMA, FEMA, MRPC, DED, RD

Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC

In addition to the above mitigation actions for which the City of Chamois is the lead, Osage County will be the lead on the following actions which also serve as mitigation actions for the City of Chamois:

1.1.1 Continue public education/awareness efforts on person emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc.) through the distribution of materials, press releases and postings on website/FaceBook.

1.1.2 Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.

1.1.3 Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.

1.1.4 Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2.1 Need to continue to examine ways to expand and improve warning systems.

1.2.2 Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.

1.2.3 Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.

1.2.4 Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.

1.2.5 Continue to promote participation in the Smart Prepare Beta test and encourage residents to upload information for use by 9-1-1 and response agencies to improve response during emergencies/disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather.

1.2.6 Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning. (Also 2.1.4)

1.3.1 Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.

1.3.2 Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

1.3.3 Continue to review and evaluate the need for generators for critical systems and response support in all communities.

1.3.4 Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.

2.1.1 Continue to encourage businesses/government/schools to develop and implement emergency plans.

2.1.2 Continue to evaluate and update emergency operation plans.

2.1.3 Continue to conduct emergency preparedness exercises periodically.

2.2.1 Educate and raise awareness of residents and contractors on the dangers of floodplain development and the benefits of the National Flood Insurance Program.

2.2.2 Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

2.3.1 Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.

3.1.1 Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events.

3.2.1 Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.

3.2.2 Ask SEMA mitigation specialists to present information to city councils, county commission, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.

3.2.3 Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.

3.3.1 Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.

3.3.2 Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management

3.4.1 Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave).

3.4.2 Publicize county or citywide drills.

3.4.3 Continue to provide information on EMD website and FaceBook on preparedness and mitigation.

4.1.1 Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.

4.1.2 Joint training (and drills) between agencies, public and private entities (including schools/businesses).

4.1.3 Pool different agency resources to achieve widespread mitigation planning results.

4.2.1 Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

4.2.2 Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

5.2.1 Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

6.1.1 Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.

6.1.3 Work with state/local/federal agencies to include mitigation in all economic and community development projects.

6.1.4 Encourage local jurisdictions to budget for mitigation projects.

6.2.1 Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Information on the implementation and administration of these actions is described under Osage County in this section.

Integration of Hazard Mitigation Actions into Current Planning Processes

The City of Chamois is a small community of fewer than 400 people. The community has a small budget with which to work and little funding for planning activities. Planning that occurs in the city is carried out by the Board of Aldermen with recommendations from city employees or as part of larger, county planning activities. The hazard mitigation actions will be carried out on a volunteer basis by the Board of Aldermen and where applicable, the Water and Street Superintendent. Any funding needed for mitigation projects and programs will be considered by the Board of Aldermen during the annual budgeting process.

Freeburg

Mitigation actions for Freeburg are shown in the following table and subsequent list. The actions in the table are those for which Freeburg itself will take the lead. Those listed at the end of the table are mitigation actions which Osage County will lead on behalf of numerous jurisdictions, including Freeburg.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.7 Action Items Assigned to Village of Freeburg

5.1.1	Encourage all communities to develop storm water management plans.
Priority	Low
Plan for Implementation & Administration	The water and sewer superintendent and village trustees need to consider the benefits of developing a storm water management plan and look into methods of developing and funding the project.
Lead	Water and Sewer Commissioner
Partners	MRPC
Projected Cost/Funding	Significant/Grants
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Priority	High

Plan for Implementation & Administration	Village Trustees need to work with SEMA, FEMA, MRPC and other economic development agencies to include community mitigation projects and programs in all economic and community development projects planned for Freeburg.
Lead	Village Trustees
Partners	SEMA, FEMA, MRPC, DED, RD
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC

In addition to the above mitigation actions for which the Village of Freeburg is the lead, Osage County will be the lead on the following actions which also serve as mitigation actions for the Village of Freeburg:

1.1.2 Continue public education/awareness efforts on person emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc.) through the distribution of materials, press releases and postings on website/FaceBook.

1.1.2 Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.

1.1.3 Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.

1.1.4 Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2.1 Need to continue to examine ways to expand and improve warning systems.

1.2.2 Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.

1.2.3 Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.

1.2.4 Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.

1.2.5 Continue to promote participation in the Smart Prepare Beta test and encourage residents to upload information for use by 9-1-1 and response agencies to improve response during emergencies/disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather.

1.2.6 Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning. (Also 2.1.4)

1.3.1 Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.

1.3.2 Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

1.3.3 Continue to review and evaluate the need for generators for critical systems and response support in all communities.

1.3.4 Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.

2.1.1 Continue to encourage businesses/government/schools to develop and implement emergency plans.

2.1.2 Continue to evaluate and update emergency operation plans.

2.1.3 Continue to conduct emergency preparedness exercises periodically.

2.3.1 Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.

3.1.1 Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events.

3.2.1 Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.

3.2.2 Ask SEMA mitigation specialists to present information to city councils, county commission, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.

3.2.3 Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.

3.3.1 Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.

3.3.2 Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management

3.4.1 Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave).

3.4.2 Publicize county or citywide drills.

3.4.3 Continue to provide information on EMD website and FaceBook on preparedness and mitigation.

4.1.1 Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.

4.1.2 Joint training (and drills) between agencies, public and private entities (including schools/businesses).

4.1.3 Pool different agency resources to achieve widespread mitigation planning results.

4.2.1 Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

4.2.2 Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

6.1.1 Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.

6.1.3 Work with state/local/federal agencies to include mitigation in all economic and community development projects.

6.1.4 Encourage local jurisdictions to budget for mitigation projects.

6.2.1 Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Information on the implementation and administration of these actions is described under Osage County in this section.

Integration of Hazard Mitigation Actions into Current Planning Processes

Planning in the village is carried out by the Board of Trustees with recommendations from city departments. The hazard mitigation actions will be integrated into the work plans of the appropriate department where possible. Any funding needed for mitigation projects and programs will be considered by the Board of Trustees during the annual budgeting process.

Linn

Mitigation actions for Linn are shown in the following table and subsequent list. The actions in the table are those for which Linn itself will take the lead. Those listed at the end of the table are mitigation actions which Osage County will lead on behalf of numerous jurisdictions, including Linn.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.8 Action Items Assigned to City of Linn

5.1.1	Encourage all communities to develop storm water management plans.
Priority	Low
Plan for Implementation & Administration	The water, street and utilities superintendent and board of aldermen need to consider the benefits of developing a storm water management plan and look into methods of developing and funding the project.
Lead	Water, Street and Utilities Commissioner
Partners	MRPC
Projected Cost/Funding	Significant/Grants
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.
Priority	Low
Plan for Implementation & Administration	Board of Aldermen need to discuss and consider adopting zoning regulations that would zone repetitive loss properties as open space to reduce risk in the community.
Lead	Board of Aldermen
Partners	County floodplain manager
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Complete review and make decision by Jan. 2015
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD

6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Priority	High
Plan for Implementation & Administration	Board of Aldermen need to work with SEMA, FEMA, MRPC and other economic development agencies to include community mitigation projects and programs in all economic and community development projects planned for Linn.
Lead	Board of Aldermen
Partners	SEMA, FEMA, MRPC, DED, RD
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC

In addition to the above mitigation actions for which the City of Linn is the lead, Osage County will be the lead on the following actions which also serve as mitigation actions for the City of Linn:

1.1.3 Continue public education/awareness efforts on person emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc.) through the distribution of materials, press releases and postings on website/FaceBook.

1.1.2 Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.

1.1.3 Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.

1.1.4 Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2.1 Need to continue to examine ways to expand and improve warning systems.

1.2.2 Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.

1.2.3 Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.

1.2.4 Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.

1.2.5 Continue to promote participation in the Smart Prepare Beta test and encourage residents to upload information for use by 9-1-1 and response agencies to improve response during emergencies/disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather.

1.2.6 Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning. (Also 2.1.4)

1.3.1 Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.

1.3.2 Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

1.3.3 Continue to review and evaluate the need for generators for critical systems and response support in all communities.

1.3.4 Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.

2.1.1 Continue to encourage businesses/government/schools to develop and implement emergency plans.

2.1.2 Continue to evaluate and update emergency operation plans.

2.1.3 Continue to conduct emergency preparedness exercises periodically.

2.2.1 Educate and raise awareness of residents and contractors on the dangers of floodplain development and the benefits of the National Flood Insurance Program.

2.2.2 Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

2.3.1 Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.

3.1.1 Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events.

3.2.1 Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.

3.2.2 Ask SEMA mitigation specialists to present information to city councils, county commission, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.

3.2.3 Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.

3.3.1 Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.

3.3.2 Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management

3.4.1 Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave).

3.4.2 Publicize county or citywide drills.

3.4.3 Continue to provide information on EMD website and FaceBook on preparedness and mitigation.

4.1.1 Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.

4.1.2 Joint training (and drills) between agencies, public and private entities (including schools/businesses).

4.1.3 Pool different agency resources to achieve widespread mitigation planning results.

4.2.1 Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

4.2.2 Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

5.2.1 Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

6.1.1 Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.

6.1.3 Work with state/local/federal agencies to include mitigation in all economic and community development projects.

6.1.4 Encourage local jurisdictions to budget for mitigation projects.

6.2.1 Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Information on the implementation and administration of these actions is described under Osage County in this section.

Integration of Hazard Mitigation Actions into Current Planning Processes

Planning in the city is carried out by the Board of Aldermen with recommendations from city departments. The hazard mitigation actions will be integrated into the work plans of the appropriate department where ever possible. Any funding needed for mitigation projects and programs will be considered by the Board of Aldermen during the annual budgeting process.

Meta

Mitigation actions for Meta are shown in the following table and subsequent list. The actions in the table are those for which Meta itself will take the lead. Those listed at the end of the table are mitigation actions which Osage County will lead on behalf of numerous jurisdictions, including Meta.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.9 Action Items Assigned to City of Meta

5.1.1	Encourage all communities to develop storm water management plans.
Priority	Low
Plan for Implementation & Administration	The water superintendent and board of aldermen need to consider the benefits of developing a storm water management plan and look into methods of developing and funding the project.
Lead	Water Superintendent
Partners	MRPC
Projected Cost/Funding	Significant/Grants
Criterion for Completion	Ongoing

Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Priority	High
Plan for Implementation & Administration	Board of aldermen need to work with SEMA, FEMA, MRPC and other economic development agencies to include community mitigation projects and programs in all economic and community development projects planned for Meta.
Lead	Board of Aldermen
Partners	SEMA, FEMA, MRPC, DED, RD
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC

In addition to the above mitigation actions for which the City of Meta is the lead, Osage County will be the lead on the following actions which also serve as mitigation actions for the City of Meta:

1.1.4 Continue public education/awareness efforts on person emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc.) through the distribution of materials, press releases and postings on website/FaceBook.

1.1.2 Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.

1.1.3 Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.

1.1.4 Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2.1 Need to continue to examine ways to expand and improve warning systems.

1.2.2 Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.

1.2.3 Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.

1.2.4 Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.

1.2.5 Continue to promote participation in the Smart Prepare Beta test and encourage residents to upload information for use by 9-1-1 and response agencies to improve response during emergencies/disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather.

1.2.6 Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning. (Also 2.1.4)

1.3.1 Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.

1.3.2 Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

1.3.3 Continue to review and evaluate the need for generators for critical systems and response support in all communities.

1.3.4 Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.

2.1.1 Continue to encourage businesses/government/schools to develop and implement emergency plans.

2.1.2 Continue to evaluate and update emergency operation plans.

2.1.3 Continue to conduct emergency preparedness exercises periodically.

2.3.1 Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.

3.1.1 Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events.

3.2.1 Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.

3.2.2 Ask SEMA mitigation specialists to present information to city councils, county commission, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.

3.2.3 Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.

3.3.1 Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.

3.3.2 Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management

3.4.1 Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave).

3.4.2 Publicize county or citywide drills.

3.4.3 Continue to provide information on EMD website and FaceBook on preparedness and mitigation.

4.1.1 Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.

4.1.2 Joint training (and drills) between agencies, public and private entities (including schools/businesses).

4.1.3 Pool different agency resources to achieve widespread mitigation planning results.

4.2.1 Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

4.2.2 Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

6.1.1 Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.

6.1.3 Work with state/local/federal agencies to include mitigation in all economic and community development projects.

6.1.4 Encourage local jurisdictions to budget for mitigation projects.

6.2.1 Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Information on the implementation and administration of these actions is described under Osage County in this section.

Integration of Hazard Mitigation Actions into Current Planning Processes

The City of Meta is a small community of fewer than 250 people. The community has a minimal budget with which to work and little funding for planning activities. Planning that does occur in the city is carried out by the Board of Aldermen with recommendations from city employees/ volunteers or as part of larger, county planning activities. The hazard mitigation actions will be carried out on a volunteer basis by the Board of Trustees and where applicable, the Water Superintendent.

Westphalia

Mitigation actions for Westphalia are shown in the following table and subsequent list. The actions in the table are those for which Westphalia itself will take the lead. Those listed at the end of the table are mitigation actions which Osage County will lead on behalf of numerous jurisdictions, includingWestphalia.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.10 Action Items Assigned to City of Westphalia

5.1.1	Encourage all communities to develop storm water management plans.
Priority	Low
Plan for Implementation & Administration	The board of aldermen needs to consider the benefits of developing a storm water management plan and look into methods of developing and funding the project.
Lead	Board of Aldermen
Partners	MRPC
Projected Cost/Funding	Significant/Grants
Criterion for Completion	Ongoing
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as

	open space.
Priority	Low
Plan for Implementation & Administration	Board of aldermen need to discuss and consider adopting zoning regulations that would zone repetitive loss properties as open space to reduce risk in the community.
Lead	Board of Aldermen
Partners	County floodplain manager
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Complete review and make decision by Jan. 2015
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Priority	High
Plan for Implementation & Administration	Board of Aldermen need to work with SEMA, FEMA, MRPC and other economic development agencies to include community mitigation projects and programs in all economic and community development projects planned for Argyle.
Lead	Board of Aldermen
Partners	SEMA, FEMA, MRPC, DED, RD
Projected Cost/Funding	Minimal/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC

In addition to the above mitigation actions for which the City of Westphalia is the lead, Osage County will be the lead on the following actions which also serve as mitigation actions for the City of Westphalia:

1.2.1 Continue public education/awareness efforts on person emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc.) through the distribution of materials, press releases and postings on website/FaceBook.

1.1.2 Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.

1.1.3 Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.

1.1.4 Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2.1 Need to continue to examine ways to expand and improve warning systems.

1.2.2 Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.

1.2.3 Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.

1.2.4 Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.

1.2.5 Continue to promote participation in the Smart Prepare Beta test and encourage residents to upload information for use by 9-1-1 and response agencies to improve response during emergencies/disasters, including developing a directory of the elderly/disabled who need wellness checks during severe weather.

1.2.6 Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Osage County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning. (Also 2.1.4)

1.3.1 Encourage continuation of tree trimming programs, dead tree removal programs by utilities and local governments.

1.3.2 Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

1.3.3 Continue to review and evaluate the need for generators for critical systems and response support in all communities.

1.3.4 Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.

2.1.1 Continue to encourage businesses/government/schools to develop and implement emergency plans.

2.1.2 Continue to evaluate and update emergency operation plans.

2.1.3 Continue to conduct emergency preparedness exercises periodically.

2.2.1 Educate and raise awareness of residents and contractors on the dangers of floodplain development and the benefits of the National Flood Insurance Program.

2.2.2 Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

2.3.1 Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds.

3.1.1 Continue to provide a broad spectrum of information on floodplain management, preparedness, mitigation, and reducing vulnerability at public facilities and events.

3.2.1 Encourage local residents to purchase weather radios or Alert FM through press releases, brochures, website, FaceBook.

3.2.2 Ask SEMA mitigation specialists to present information to city councils, county commission, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.

3.2.3 Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.

3.3.1 Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.

3.3.2 Continue to provide information through press releases, brochures, website and FaceBook regarding adopted mitigation measures to keep public abreast of changes and/or new regulations, especially in regards to floodplain management

3.4.1 Encourage local jurisdictions, EMD office and other organizations to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave).

3.4.2 Publicize county or citywide drills.

3.4.3 Continue to provide information on EMD website and FaceBook on preparedness and mitigation.

4.1.1 Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.

4.1.2 Joint training (and drills) between agencies, public and private entities (including schools/businesses).

4.1.3 Pool different agency resources to achieve widespread mitigation planning results.

4.2.1 Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

4.2.2 Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

5.2.1 Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

6.1.1 Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.

6.1.3 Work with state/local/federal agencies to include mitigation in all economic and community development projects.

6.1.4 Encourage local jurisdictions to budget for mitigation projects.

6.2.1 Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Information on the implementation and administration of these actions is described under Osage County in this section.

Integration of Hazard Mitigation Actions into Current Planning Processes

The City of Westphalia is a small community of fewer than 400 people. The community has a minimal budget with which to work and little funding for planning activities. Planning in the city is carried out by the Board of Aldermen with recommendations from city employees, or as part of larger, county planning activities. The hazard mitigation actions will be carried out on a volunteer basis by the Board of Aldermen.

Osage County R-I School District

Mitigation actions for the Osage County R-I School District are shown in Table 4.11 and following list. The action items in the table are those for which the school district itself will take the lead. Those listed at the end of the table are mitigation actions which the County will lead on behalf of numerous jurisdictions, including the Osage County R-I School District.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.11 Action Items Assigned to Osage County R-1 School District

1.3.5	Encourage the construction of tornado safe rooms in every school that does not have one.
Priority	Medium
Plan for Implementation & Administration	The school superintendent and school should search for ways to fund construction of tornado safe rooms to serve each school – either as construction projects on their own or incorporate tornado safe rooms into planned future construction projects.
Lead	School Superintendent
Partners	County EMD, SEMA, FEMA,
Projected Cost/Funding	Significant/Grants
Criterion for Completion	2018
Hazards Addressed	Tornado
Benefits (Losses Avoided)	IC, EMCC
2.1.5	Regularly review and update school emergency plan.
Priority	High
Plan for Implementation & Administration	The school superintendent, school board and other key school district personnel should annually review and update the school emergency plan as part of regular administrative activities.
Lead	School Superintendent
Partners	County EMD, SEMA
Projected Cost/Funding	Low/operating budget
Criterion for Completion	Annually
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC
2.1.6	Educate School staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.
Priority	High
Plan for Implementation & Administration	Superintendent should insure that all school staff are educated on an annual basis on the school emergency plan and their responsibilities within the plan.
Lead	Superintendent
Partners	County EMD, SEMA
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Annually
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
2.1.7	Conduct emergency preparedness exercises in schools on a regular basis.
Priority	High
Plan for Implementation & Administration	Superintendent will plan and coordinate at least one preparedness exercise for the school district on an annual basis and may work with the County EMD and other emergency response agencies in developing and implementing the exercise.
Lead	Superintendent
Partners	County EMD, local emergency response agencies, county health department, SEMA, MREPC, Region F HSOC
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Ongoing

Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC

In addition to the above mitigation actions for which Osage County R-I School District is the lead, Osage County will be the lead on the following actions which also serve as mitigation actions for the school district.

1.1.1 Continue public education/awareness efforts on person emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc.) through the distribution of materials, press releases and postings on website/FaceBook.

1.1.2 Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.

1.1.4 Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2.1 Need to continue to examine ways to expand and improve warning systems.

1.2.2 Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.

1.2.4 Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.

1.3.4 Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.

2.1.1 Continue to encourage businesses/government/schools to develop and implement emergency plans.

2.1.2 Continue to evaluate and update emergency operation plans.

2.1.3 Continue to conduct emergency preparedness exercises periodically.

3.2.2 Ask SEMA mitigation specialists to present information to city councils, county commission, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.

3.2.3 Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.

3.3.1 Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.

4.1.1 Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.

4.1.2 Joint training (and drills) between agencies, public and private entities (including schools/businesses).

4.1.3 Pool different agency resources to achieve widespread mitigation planning results.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

6.1.1 Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.

6.1.4 Encourage local jurisdictions to budget for mitigation projects.

6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Information on the implementation and administration of these actions is described under Osage County in this section.

Integration of Actions into Current Planning Processes

Current facility needs, staff training needs and emergency plans are reviewed and updated as needed on an annual basis.

The school district, both the school district superintendent and school board, will work together to insure that school district planning documents will be updated and revised to include the mitigation actions in the Osage County Natural Hazard Mitigation Plan. The school district will communicate with the County EMD, local elected officials and emergency response agencies to make sure that all organizations involved stay informed of school district activities in regard to hazard mitigation.

Osage County R-II School District

Mitigation actions for the Osage County R-II School District are shown in Table 4.12 and following list. The action items in the table are those for which the school district itself will take the lead. Those listed at the end of the table are mitigation actions which the County will lead on behalf of numerous jurisdictions, including the Osage County R-II School District.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.12 Action Items Assigned to Osage County R-II School District

1.3.5	Encourage the construction of tornado safe rooms in every school that does not have one.
Priority	Medium
Plan for Implementation & Administration	The school superintendent and school should search for ways to fund construction of tornado safe rooms to serve each school – either as construction projects on their own or incorporate tornado safe rooms into planned future construction projects.
Lead	School Superintendent
Partners	County EMD, SEMA, FEMA,
Projected Cost/Funding	Significant/Grants
Criterion for Completion	2018
Hazards Addressed	Tornado
Benefits (Losses Avoided)	IC, EMCC
2.1.5	Regularly review and update school emergency plan.
Priority	High
Plan for Implementation & Administration	The school superintendent, school board and other key school district personnel should annually review and update the school emergency plan as part of regular administrative activities.
Lead	School Superintendent
Partners	County EMD, SEMA
Projected Cost/Funding	Low/operating budget
Criterion for Completion	Annually
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC
2.1.6	Educate School staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.
Priority	High
Plan for Implementation & Administration	Superintendent should insure that all school staff are educated on an annual basis on the school emergency plan and their responsibilities within the plan.
Lead	Superintendent
Partners	County EMD, SEMA
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Annually
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
2.1.7	Conduct emergency preparedness exercises in schools on a regular basis.
Priority	High
Plan for Implementation &	Superintendent will plan and coordinate at least one preparedness exercise for the

Administration	school district on an annual basis and may work with the County EMD and other emergency response agencies in developing and implementing the exercise.
Lead	Superintendent
Partners	County EMD, local emergency response agencies, county health department, SEMA, MREPC, Region F HSOC
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC

In addition to the above mitigation actions for which Osage County R-II School District is the lead, Osage County will be the lead on the following actions which also serve as mitigation actions for the school district.

1.1.1 Continue public education/awareness efforts on person emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc.) through the distribution of materials, press releases and postings on website/FaceBook.

1.1.2 Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.

1.1.4 Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2.1 Need to continue to examine ways to expand and improve warning systems.

1.2.2 Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.

1.2.4 Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.

1.3.4 Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.

2.1.1 Continue to encourage businesses/government/schools to develop and implement emergency plans.

2.1.2 Continue to evaluate and update emergency operation plans.

2.1.3 Continue to conduct emergency preparedness exercises periodically.

3.2.2 Ask SEMA mitigation specialists to present information to city councils, county commission, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.

3.2.3 Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.

3.3.1 Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.

4.1.1 Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.

4.1.2 Joint training (and drills) between agencies, public and private entities (including schools/businesses).

4.1.3 Pool different agency resources to achieve widespread mitigation planning results.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

6.1.1 Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.

6.1.4 Encourage local jurisdictions to budget for mitigation projects.

6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Information on the implementation and administration of these actions is described under Osage County in this section.

Integration of Actions into Current Planning Processes

Current facility needs, staff training needs and emergency plans are reviewed and updated as needed on an annual basis.

The school district, both the school district superintendent and school board, will work together to insure that school district planning documents will be updated and revised to include the mitigation actions in the Osage County Natural Hazard Mitigation Plan. The school district will communicate with the County EMD, local elected officials and emergency response agencies to make sure that all organizations involved stay informed of school district activities in regard to hazard mitigation.

Osage County R-III School District

Mitigation actions for the Osage County R-III School District are shown in Table 4.13 and following list. The action items in the table are those for which the school district itself will take the lead. Those listed at the end of the table are mitigation actions which the County will lead on behalf of numerous jurisdictions, including the Osage County R-III School District.

The benefits (losses avoided) key for the charts is as follows:

- I/C – Injuries or Casualties
- PD – Property Damages
- LF – Loss of function/displacement impacts
- EMCC – Emergency Management/Community Costs

Table 4.13 Action Items Assigned to Osage County R-III School District

1.3.5	Encourage the construction of tornado safe rooms in every school that does not have one.
Priority	Medium
Plan for Implementation & Administration	The school superintendent and school should search for ways to fund construction of tornado safe rooms to serve each school – either as construction projects on their own or incorporate tornado safe rooms into planned future construction projects.
Lead	School Superintendent
Partners	County EMD, SEMA, FEMA,
Projected Cost/Funding	Significant/Grants
Criterion for Completion	2018
Hazards Addressed	Tornado
Benefits (Losses Avoided)	IC, EMCC
2.1.5	Regularly review and update school emergency plan.
Priority	High
Plan for Implementation & Administration	The school superintendent, school board and other key school district personnel should annually review and update the school emergency plan as part of regular administrative activities.
Lead	School Superintendent
Partners	County EMD, SEMA
Projected Cost/Funding	Low/operating budget
Criterion for Completion	Annually
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC
2.1.6	Educate School staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.
Priority	High
Plan for Implementation & Administration	Superintendent should insure that all school staff are educated on an annual basis on the school emergency plan and their responsibilities within the plan.
Lead	Superintendent
Partners	County EMD, SEMA
Projected Cost/Funding	Moderate/operating budget

Criterion for Completion	Annually
Hazards Addressed	Flood
Benefits (Losses Avoided)	PD
2.1.7	Conduct emergency preparedness exercises in schools on a regular basis.
Priority	High
Plan for Implementation & Administration	Superintendent will plan and coordinate at least one preparedness exercise for the school district on an annual basis and may work with the County EMD and other emergency response agencies in developing and implementing the exercise.
Lead	Superintendent
Partners	County EMD, local emergency response agencies, county health department, SEMA, MREPC, Region F HSOC
Projected Cost/Funding	Moderate/operating budget
Criterion for Completion	Ongoing
Hazards Addressed	All Hazards
Benefits (Losses Avoided)	IC, PD, LF, EMCC

In addition to the above mitigation actions for which Osage County R-III School District is the lead, Osage County will be the lead on the following actions which also serve as mitigation actions for the school district.

1.1.1. Continue public education/awareness efforts on person emergency preparedness (turning off utilities, preparing emergency survival kits that include water, blankets, flashlights, etc.) through the distribution of materials, press releases and postings on website/FaceBook.

1.1.2 Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/FaceBook.

1.1.4 Continue to provide CERT training opportunities that include training on shutting off utilities, using fire extinguishers, etc., and encourage the development of CERT teams throughout the county.

1.2.1 Need to continue to examine ways to expand and improve warning systems.

1.2.2 Promote use of weather radios or AlertFM, reverse 9-1-1, county EMD website and FaceBook by local residents and schools to insure advanced warning about threatening weather.

1.2.4 Continue to educate and raise awareness of the public on warning sirens and other types of warning systems available in the county.

1.3.4 Encourage the development of tornado safe rooms/storm shelters in areas with high population densities, such as schools and large employers that do not currently have access to safe rooms.

2.1.1 Continue to encourage businesses/government/schools to develop and implement emergency plans.

2.1.2 Continue to evaluate and update emergency operation plans.

2.1.3 Continue to conduct emergency preparedness exercises periodically.

3.2.2 Ask SEMA mitigation specialists to present information to city councils, county commission, Meramec Regional Planning Commission, Meramec Regional Emergency Planning Committee.

3.2.3 Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.

3.3.1 Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.

4.1.1 Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.

4.1.2 Joint training (and drills) between agencies, public and private entities (including schools/businesses).

4.1.3 Pool different agency resources to achieve widespread mitigation planning results.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

6.1.1 Work with local, regional, state and federal agencies to learn about new mitigation funding opportunities.

6.1.4 Encourage local jurisdictions to budget for mitigation projects.

6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Information on the implementation and administration of these actions is described under Osage County in this section.

Integration of Actions into Current Planning Processes

Current facility needs, staff training needs and emergency plans are reviewed and updated as needed on an annual basis.

The school district, both the school district superintendent and school board, will work together to insure that school district planning documents will be updated and revised to include the mitigation actions in the Osage County Natural Hazard Mitigation Plan. The school district will communicate with the County EMD, local elected officials and emergency response agencies to make sure that all organizations involved stay informed of school district activities in regard to hazard mitigation.

4.5 Funding Sources

There are a number of ways in which local hazard mitigation projects can be funded. A list and description of funding sources follows.

4.5.1 Local Funds

Local funding sources are primarily generated from property and sales tax revenues. These funds are generally allocated directly to schools, public works and other essential government functions. In rural areas and small communities there is likely little room in local government budgets for mitigation related activities. However, in those situations where mitigation is part of essential government functions, it may be possible to incorporate a mitigation project and use local funds. For example, if a bridge is scheduled for repair or replacement, the project could be engineered to make the bridge safer and less vulnerable to overtopping. It may also be possible to use local funds to leverage additional funds from other sources. For instance using local general revenue funds to match a hazard mitigation grant from state or federal sources to build a tornado safe room at a local school.

4.5.2 Non-Governmental Funds

Other sources of local funds could include private donations of funds or of goods and services. These could come from local charities, churches, Red Cross chapters, hospitals, businesses or other local not-for-profit groups. Local grant funds from sources such as community foundations are another potential source of funding for mitigation projects.

4.5.3 Federal Funds

The majority of federal dollars available for hazard mitigation projects is funneled through the FEMA Mitigation Grant program. Another possible source would be Community Development Block Grants (CDBG) after a Presidential Disaster Declaration.

FEMA Mitigation Grant Program – Jurisdictions which have adopted an up-to-date FEMA approved hazard mitigation plan are eligible for hazard mitigation funding through FEMA grant programs. These programs include the following:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM) -
- Flood Mitigation Assistance (FMA)
- Repetitive Flood Claims (RFC)

- Severe Repetitive Loss (SRL)

HMGP is funding provided following a Presidential Disaster Declaration. PDM, FMA, RFC and SRL are grant programs funded through a yearly appropriation from Congress. The funding cycles vary, but the following are approximate times for when grant rounds are open:

- June/July – FEMA publishes the "Unified Guidance" for these grant programs.
- Notices of Interest (NOI) for possible mitigation projects are due to SEMA as soon as possible following the publication of "Unified Guidance".
- Mid-October – Grant applications are due to SEMA.
- December – SEMA forwards applications to FEMA

Eligibility of mitigation activities vary between grant programs. The type of project and eligible grant programs is illustrated in Table 4.14. Any projects submitted for funding must match the goals and objectives of the Osage County Hazard Mitigation Plan in order to be eligible for funding.

Table 4.14 Eligible Activities for FEMA Mitigation Grant Programs

Activity	HMGP	PDM	FMA	RFC	SRL
1. Mitigation Projects	X	X	X	X	X
Property Acquisition and Structure Demolition or Relocation	X	X	X	X	X
Structure Elevation	X	X	X	X	X
Mitigation Reconstruction					X
Dry Flood-proofing of Historic Residential Structures	X	X	X	X	X
Dry Flood-proofing of non-residential Structures	X	X	X	X	X
Minor Localized Flood Reduction Projects	X	X	X	X	
Structural Retrofitting of Existing Buildings	X	X			
Non-Structural Retrofitting of Existing Buildings and Facilities	X	X			
Safe Room Construction	X	X			
Infrastructure Retrofit	X	X			
Soil Stabilization	X	X			
Wildfire Mitigation	X	X			
Post-Disaster Code Enforcement	X				
5% Initiative Projects	X				
2. Hazard Mitigation Planning	X	X	X		
3. Management Costs	X	X	X	X	X

Source: www.fema.gov/library/viewRecord.do?Id-3648

4.4.4 Application and Cost Share Requirements

The application process for the FEMA Mitigation Grant programs includes a Benefit Cost Analysis (BCA). A potential project must have a Benefit Cost Ratio (BCR) of at least 1.0 to be considered for funding; a ratio of 1.0 indicates at least $1 benefit for each $1 spent on the project. A BCA is the first step in determining if a project can potentially be funded.

Cost share requirements and the application format for these five programs are illustrated in Figure 4.15. Contributions of cash, in-kind services or materials, or any combination thereof may be accepted as part of the non-federal cost share. For FMA, not more than one half of the non-federal match may be provided from in-kind contributions.

Figure 4.15 FEMA Mitigation Grant Programs Match Requirements & Application Format

Grant Program	Federal/ Local Match	Notes	Application Type
HMGP	75/25		Paper
PDM	75/25		e-grants
PDM (Small, impoverished community)	90/10	Qualification requirements for "small impoverished": • Community of 3,000 or less identified by the State as rural that is not a remote area within the corporate boundary of a larger city • Average per capita annual income not exceeding 80% of the national per capita income, based on best available data (http://www.bea.gov) • Local unemployment rate exceeding by 1% or more the most recently reported, average yearly national unemployment rate (http://www.bls.gov/eag/eag.us.htm) • Meets other criteria required by the State/Tribe/Territory in which the community is located.	e-grants
FMA	75/25		e-grants
FMA (Severe repetitive loss property)	90/10	In Missouri, this cost share is less than the usual 75/25 because the State has an approved "enhanced" state mitigation plan.	e-grants
RFC	100/0	RFC is only available to applicants who cannot meet the cost share requirement of FMA.	e-grants
SRL	90/10	In Missouri, this cost share is less than the usual 75/25 because the State has an approved "enhanced" state mitigation plan.	e-grants

Hazard Mitigation Grant Program (HMGP)

The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP assists states and local communities in implementing long-term mitigation measure following a Presidential Disaster Declaration. After a major disaster, communities may be able to identify additional areas where mitigation can help prevent losses in the future.

HMGP funding is allocated using a sliding scale formula based on the percentage of funds spent on Public and Individual Assistance programs for each Presidential Disaster Declaration. Due to the Enhanced Missouri State Hazard Mitigation Plan, the State of Missouri receives 20percent of the federal total of a disaster declaration as additional mitigation funds through the HMGP.

In Missouri, the mitigation funds are initially awarded to projects in the counties included in the disaster declaration. If funds remain, applications are opened up to any county state-wide.

The HMGP can be used to fund projects to protect either public or private property. The proposed projects must fit within the state and local government's overall mitigation strategy for the disaster area and comply with program guidelines.

Eligibility for funding under the HMGP is limited to state and local government, certain private not-for-profit organizations or institutions that serve a public function, Indian tribes and authorized tribal organizations. Applicants work through their state which is responsible for setting priorities for funding and administering the program. In Missouri the state agency responsible is SEMA. More information on the HMGP can be found at FEMA's website – fema.gov/government/ grant/hmgp/.

Flood Mitigation Assistance Program (FMA)

FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. Applicants must be participants in good standing with the NFIP and properties to be mitigated must have flood insurance.

States administer the FMA program and are responsible for selecting projects for funding from the applicants submitted by all communities within the state. The state forwards selected applications to FEMA for eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

FMA funding for the state depends upon the number of repetitive losses in the state. The frequency of flooding in Missouri, coupled with the losses incurred in recent years, has caused Missouri's funding to rise. This is a good program for smaller projects such as mitigating low water crossings. For FMA, not more than one half of the non-Federal match funds may be provided from in-kind contributions. More information on the FMA program is available at fema.gov/government/grant/fma/.

Repetitive Flood Claims Grant Program (RFC)

The Repetitive Flood Claims (RFC) grant program was authorized in 1968 to assist states and communities in reducing flood damages to NFIP insurance properties that have had one or more claims to the NFIP. In order to apply for funding through this 100% federal share program, a community must show that it can't meet FMA requirements due to lack of cost share match funding or due to a lack of administrative capacity to manage the activities. This does not mean that it must be a low-income community. More information on the RFC grant program is available at fema.gov/government/grant/rfc/.

Severe Repetitive Loss Grant Program (SRL)

The Severe Repetitive Loss (SRL) grant program was authorized in 2004 to provide funding to reduce or eliminate the long-term risk of flood damage to sever repetitive loss (SRL) properties insured under the NFIP. A SRL property is defined as a property that is covered under an NFIP policy and:

(a) Has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; OR
(b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both (a) and (b), at least two of the referenced claims must have occurred within any ten-year period and must be greater than 10 days apart. There are very specific requirements for this grant program and they should be reviewed thoroughly before applying. More information on this program is available at fema.gov/government/grant/srl/.

Community Development Block Grant (CDBG) Program

The objective of the CDBG program is to assist communities in rehabilitating substandard dwelling structures and to expand economic opportunities – primarily for low-to-moderate-income families. After a Presidential Disaster Declaration, CDBG funds may be used for long-term needs such as acquisition, reconstruction and redevelopment of disaster affected areas. There is no low-to-moderate income requirement following a Presidential Disaster Declaration.

5 PLAN MAINTENANCE PROCESS

The plan maintenance section of this document details the formal process that will ensure that the Osage County Hazard Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the plan annually and producing a plan revision every five years. This section describes how the county will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how Osage County government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the County Local Emergency Operations Plan, CEDS and floodplain management.

5.1 Monitoring, Evaluating and Updating the Plan

44 CFR Requirement 201.6(c)(4): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating and updating the mitigation plan within a five-year cycle.

Periodic revisions and updates of the Plan are required by Missouri SEMA to ensure that the goals and objectives for Osage County are kept current. More importantly, revisions may be necessary to ensure the plan is in full compliance with Federal regulations and state statutes. This portion of the plan outlines the procedures for completing such revisions and updates.

A key component of the ongoing plan monitoring, evaluating and updating will be the Osage County Hazard Mitigation Planning Committee (HMPC). In order to carry out the activities necessary for maintaining the plan, the HMPC will need to remain in place and meet periodically. The coordination of this group, as indicated in the mitigation strategy, should be a responsibility of the county EMD. On-going activities of the HMPC are:

- Meet on an annual basis, at a minimum, to monitor and evaluate the implementation of the hazard mitigation plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Actively pursue the implementation of mitigation actions, focusing first on high priority measures that are no or low in cost;
- Actively search for methods of funding mitigation measures through grants and/or cost share programs;
- Monitor and assist with the implementation and updating of the plan;
- Promote mitigation activities through the identification of plan recommendations that overlap or influence other community goals, plans and activities or when those actions affect the community's vulnerability to hazards;
- Keep the governing bodies of jurisdictions, county commission and city councils, aware of HMPC activities, plan progress and modifications;
- Keep the public informed of hazard mitigation activities and encourage public input and participation in mitigation planning and implementation.

The primary responsibilities of the HMPC will be to see that the hazard mitigation plan is successfully implemented and that the governing jurisdictions and general public are kept informed of that progress. The HMPC will also be responsible for encouraging public participation and input into the on-going planning and implementation process.

5.2 Plan Maintenance

Periodic revisions and updates of the Plan are required by Missouri SEMA to ensure that the goals and objectives for Osage County are kept current. More importantly, revisions may be necessary to ensure the plan is in full compliance with Federal regulations and state statutes. This portion of the plan outlines the procedures for completing such revisions and updates.

The three background studies (Hazard Identification and Analysis, Capabilities Assessment, and Community Vulnerability Assessment) and the goals and objectives should be reviewed at a minimum of every five years to determine if there have been any significant changes in Osage County that would affect the hazard mitigation plan. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques, and changes to federal or state legislation are examples of changes that may affect the plan.

Further, following a disaster declaration, the plan will need to be revised to reflect any lessons learned or to address specific circumstances arising out of the disaster.

The results of this five-year review should become summarized in a report prepared for this mitigation plan under the direction of the Osage County Emergency Management Director and the HMPC. The report will include an evaluation of the effectiveness and appropriateness of the plan, and will recommend, as appropriate, any required changes or amendments to the plan.

The HMPC should continue to recruit members and should include all those individuals identified in the plan as having responsibilities in hazard mitigation as well as representatives from various government agencies, county officials, city employees, utility service employees, emergency responders and planners, regional planners and any concerned residents. Upon meeting, the committee members will also report on the status of their projects and will include which implementation processes worked well, any difficulties encountered, how coordination efforts were proceeding, and which strategies should be revised.

The emergency management office, with the help of the HMPC will update and make changes to the plan before submitting it to the jurisdictions for review and input. Following local review, the revised plan will be submitted to the state hazard mitigation officer at the Missouri State Emergency Management Agency (SEMA) and the FEMA Region VII office per requirements of the Disaster Mitigation Act of 2000. The revised plan will also need to be formally adopted by participating jurisdictions following State and Federal approval. If no changes are necessary to the plan, the state hazard mitigation officer will be given a justification for this determination. A disaster or other circumstance, such as changing regulations, may require that this five-year revision schedule be changed.

5.3 Incorporation of Hazard Mitigation into Existing Planning

44 CFR Requirement 201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Wherever possible, participating jurisdictions will use existing plans and programs to implement the hazard mitigation measures. Each jurisdiction will pursue mitigation actions based upon their capabilities and funding availability. Planning for reducing loss of life and property to natural hazards will be on-going. This planning document has been written to build upon the foundation of existing plans and programs and recommends implementing mitigation action items, whenever possible, through the following avenues:

- Comprehensive Economic Development Survey document
- Osage County Local Emergency Operations Plan (LEOP)
- Comprehensive plans of participating jurisdictions
- Master plans of participating jurisdictions
- Ordinances of participating jurisdictions
- Capital improvement plans and budgets
- Other plans in the planning area that currently exist or that are developed in the future, such as stormwater management plans, subdivision development ordinances, economic development plans and parks and recreation plans

Through active involvement in the Meramec Regional Planning Commission, Osage County and its cities address regional planning and economic goals through the region's Comprehensive Economic Development Survey. The hazard mitigation plan provides a series of recommendations—several of which are closely related to the goals and objectives of existing planning programs. Osage County will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

Upon adoption, the Osage County Hazard Mitigation Plan will serve as a baseline of information on the natural hazards that impact the county and each of its cities. These goals and objectives will help local governments and other organizations plan for natural hazard mitigation in their own planning documents. The participating jurisdictions will encourage the incorporation of hazard mitigation principles into all other planning documents that are developed or updated in the future. Within two years of formal adoption of the mitigation plan, the recommendations listed in the plan should be incorporated into the process of existing planning mechanisms at the county level. The meetings of the hazard mitigation planning committee will provide an opportunity for committee members to report back on the progress made on the integration of mitigation planning elements into county/city planning documents and procedures.

Much of the information included in this plan, particularly the hazard analysis, can be used by the County EMD in the annual review and update of the county LEOP. By coordinating the annual review and update of these two planning documents, the County EMD can insure that the two plans will be integrated and complement one another.

HMPC members will also be responsible for assisting in plan review and update, as well as the integration of hazard mitigation principles and actions into planning documents in their respective jurisdictions.

5.4 Continued Public Participation in Plan Maintenance Process

44 CFR Requirement 201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

Osage County is dedicated to involving the public directly in review and updates of the hazard mitigation plan and will encourage the public to participate on the HMPC and to provide input into the plan document and implementation activities. The hazard mitigation planning committee members are responsible for the annual review and update of the plan.

The public will also have the opportunity to provide feedback about the plan. Copies of the plan will be catalogued and kept at all of the appropriate agencies in the county. A public meeting will also be held after each five-year evaluation or when deemed necessary by the hazard mitigation planning committee. The meetings will provide the public a forum for which they can express its concerns, opinions, or ideas about the plan. The county will be responsible for publicizing the meetings and maintaining public involvement through the public access channel, website and newspapers.

The update process will also provide an opportunity to publicize the plan, the HMPC's activities and successful hazard mitigation projects. Publicizing these activities will also be an opportunity to gather input from the public. Information will be released through local media outlets – both newspapers and internet websites. A public hearing will be held to receive public comment on plan maintenance and updating will be held during the review process. Public notice will be posted and public input will be invited through local media outlets.

5.5 Summary of Plan Changes

The Osage County Multi-Hazard Mitigation Plan underwent a number of changes from the plan approved in 2004 and the plan revision that was approved in 2013. Essentially, the plan was completely reformatted to meet more stringent requirements and guidelines provided by FEMA. Although the 2004 plan was used as the starting point for the revision process, the revised plan bears little resemblance to the plan completed in 2004.

A summary of those changes are outlined in the table below:

Table 5.1 Osage County Hazard Mitigation Plan Revisions 2004 - 2013

Chapter/Section	2004 Plan Document	2013 Revised Plan
Executive Summary	Part of Introduction	Plan purpose; participating jurisdictions; methodology of planning process; goals; summary of mitigation programs & action items; prerequisites; model adoption resolution
Introduction	Assurance statements of compliance; basis for planning authority; adoption; acknowledgements & special thanks; planning process; participants and jurisdictions represented; timeframe; executive summary	Plan purpose; background and scope; plan organization; planning process. The Introduction was reorganized as Chapter 1.
Section I/Chapter 1	Community profile including history, forms of government, population data, topography, climate, watershed info, environmentally sensitive areas, transportation, utilities, public facilities, emergency response services, building & fire codes, employment, media coverage	See above
Section II/Chapter 2	Hazard Analysis including risk assessment, hazard profile information on relevant hazards, worksheets, vulnerability assessment, cascading emergencies	Planning area profile & capabilities. All aspects of the profile & capabilities were expanded dramatically from the 2004 version. History, geography, topography, soil types, climate, population/demographics, schools, business/industry, agriculture, environmentally sensitive areas and species. Jurisdictional descriptions & capabilities
Section III/Chapter 3	Capability Assessment including existing plans, mitigation programs, capability assessment in regards to relevant hazards, local resources/capabilities, SEMA capabilities, worksheets	Risk Assessment including identification of relevant hazards; profiles of hazards; vulnerability assessment by hazard; future land use & development; summary of key issues
Section IV/Chapter 4	Vulnerability Assessment including overview of commitment, local laws, regulations & policies on hazard mitigation; incorporation of hazard mitigation into local planning; prioritization; cost-effectiveness; funding options; recommendations; policies and development trends; worksheets	Mitigation Strategy including goals; identification and analysis of mitigation actions; implementation of mitigation actions; mitigation actions supporting NFIP Changes, deletions and additions were made to the action items and all activities that had occurred since 2004 were included in the update.
Section V/Chapter 5	Mitigation program including definition & categories of mitigation; benefits; goal & objective development; identification and analysis of mitigation measures; mitigation strategy and program development; actions by	Plan implementation & maintenance including monitoring, evaluating & updating; incorporating hazard mitigation into existing plans; public involvement Changes made to the plan document were added.

Chapter/Section	2004 Plan Document	2013 Revised Plan
	jurisdiction; 5 year matrix	
Section VI	Plan maintenance including adoption; monitoring, evaluating & updating;5 year review; implementation; public involvement	No Chapter 6
Appendices	Appendix 1: hazard mitigation financial resource guide Appendix 2: repetitive loss listing Appendix 3: list of acronyms Appendix 4: bibliography	Appendix A: Planning process documentation Appendix B: References Appendix C: Adoption Resolutions Appendix D: Federal/State Mitigation programs, activities and initiatives

Appendix A

Planning Process

April 20, 2009

«First_Name» «Last_Name»
«Position»
«Address»
«City», «State_» «Zip»

Dear «First_Name»:

The Osage County Multi-Jurisdictional Hazard Mitigation Plan that was put into place in November 2004 must be revised every five years. It is time to begin reviewing and revising this plan so that Osage County can meet the deadlines set forth and remain eligible for Hazard Mitigation grant funding. The current plan describes the process for identifying hazards, assessing risks and vulnerabilities, and identifying and prioritizing mitigation actions.

All entities that might apply for hazard mitigation grants in the future must not only adopt the revised plan but participate in its updating. We encourage you to join us at the Osage County Courthouse on Tuesday, April 28, 2009 at 10:00 a.m. to begin reviewing and revising the current plan. The plan can be accessed from our website, www.meramecregion.org, scroll toward the bottom on the left side of the page, and look for the following; *For Other Downloads (Nomination Forms, Grant Applications, Newsletters, Hazard Mitigation Plans) click here*. After you click, the link will take you to the list of Hazard Mitigation Plans that we are working on. Click on Osage County to download the existing approved plan. This document is several pages and may take a few minutes to download depending on your internet access.

Your input is crucial to update the plan and ensure that Osage County and entities located in Osage County remain eligible for funds available through this program. One of our first items of business will be to develop a list of hazard mitigation activities that have occurred in the last five years in Osage County. The plan must not only plan for future projects but provide information on what has been accomplished since the plan was originally adopted. For instance, we have had ice storms and flooding events since this plan was put in place. Based on the events that took place, what has been done to rectify power lines being taken down by ice covered branches? Has any bridge or road work been done to prevent floodwater from eroding roadways? Has your school district incorporated a safe room for tornadoes? These are just a few examples and we encourage you to begin listing any projects that have been done that could be included in this revision.

If you have questions, please do not hesitate to contact me. If you are unable to attend but have information to share, please feel free to email me at tprice@meramecregion.org.

Sincerely,

Tonya Price
MRPC
573-265-2993
tprice@meramecregion.org

James Wright
Chamois Fire Protection District
Box 242
Chamois, MO 65024

Darnell Schroeder
Meta Fire & Rescue
P.O. Box 97
Meta, MO 65058

Kerry Montgomery
Osage Ambulance District
P.O. Box 557
Linn, MO 65051

Richard Bray, Jr.
Chief of Police
1200 E. Main Street
Linn, MO 65051

Russell Scheulen
Presiding Commissioner
P.O. Box 826
Linn, MO 65051

Joe Schmidt
Mayor
City Hall
Argyle, MO 65001

Terry Libbert
Mayor
P.O. Box 65
Meta, MO 65058

David Struemph
Freeburg Water and Sewer Super.
P.O. Box 121
Freeburg, MO 65035

Andrea (Andi) Rice
Osage County EMD
P.O. Box 192
Linn, MO 65051

Sheila Turner
City of Linn
P.O. Box 498
Linn, MO 65051

Ed Brunnert
Argyle Street Commissioner
City Hall
Argyle, MO 65001

Alvin Bexten
Westphalia Community Fire Depart.
P.O. Box 55
Westphalia, MO 65085

Leon Reinkemeyer
Argyle Volunteer Fire Department
P.O. Box 56
Argyle, MO 65001

Lisa Vincent
Osage County Communications
P.O. Box 192
Linn, MO 65051

Vincent Samson
Associate Commissioner
P.O. Box 826
Linn, MO 65051

Darryl Haller
Chairperson, Village of Freeburg
P.O. Box 121
Freeburg, MO 65035

Christopher Dickneite
Mayor
P.O. Box 36
Westphalia, MO 65085

Vicki Sallin
Osage County Health Dept.
P.O. Box 824
Linn, MO 65051

Kim Evans
Osage County DFS
P.O. Box 1036
Linn, MO 65051

Diana Bogle
City of Chamois
City Hall
Chamois, MO 65024

Ron Hoffman
Fire Chief
P.O. Box 634
Linn, MO 65051

Joe Veit
Comm-Unity Ambulance District
P.O. Box 132
Meta, MO 65058

Carl Fowler
Osage County Sheriff
P.O. Box 619
Linn, MO 65051

Larry Fredich
Linn Water, Street and Utilities
P.O. Box 498
Linn, MO 65051

Elmer Senevey
Associate Commissioner
P.O. Box 826
Linn, MO 65051

Dwight Massey
Mayor
P.O. Box 498
Linn, MO 65051

Elaine Baber
Mayor
City Hall
Chamois, MO 65024

Ruth Bock
Osage County Health Dept.
300 Schiller Street
Hermann, MO 65041

Kerry Bax
Clerk
P.O. Box 36
Westphalia, MO 65085

Kaye Kampeter
Water Clerk
P.O. Box 65
Meta, MO 65058

Ryan Nowlin
Superintendent, Osage Co. R-I
614 S. Poplar St.
Chamois, MO 65024

Mary Elsensohn
Superintendent, Osage Co. R-II
1212 E. Main St.
Linn, MO 65051

Joe Scott
Superintendent, Osage Co. R-III
P.O. Box 37
Westphalia, MO 65085

Byron Baker
President, Linn Industrial Development Corporation
P.O. Box 1098
Linn, MO 65051

Stanley Strope
Osage County Clerk
P.O. Box 826
Linn, MO 65051

Kim Brunnert
City Clerk
P.O. Box 22
Argyle, MO 65001

Sarah Honey
City Clerk
City Hall
Chamois, MO 65024

David Bogle
Superintendent
City Hall
Chamois, MO 65024

Allen Gradel
Clerk, Village of Freeburg
P.O. Box 121
Freeburg, MO 65035

John Hilke
Fire Chief
P.O. Box 121
Freeburg, MO 65035

Anton Libbert
Water Superintendent
P.O. Box 65
Meta, MO 65058

Connie Gladden
City Clerk
P.O. Box 65
Meta, MO 65058

Larry Kliethermes
City of Westphalia
P.O. Box 36
Westphalia, MO 65085

Advisory Committee Meetings

Advisory Committee Meeting

Osage County Hazard Mitigation Plan Update

AGENDA

10:00 a.m. ~ April 28, 2009

Osage County Courthouse

I. Welcome and Introductions – Tammy Snodgrass/Tonya Price

II. Review of Action Items
MRPC staff will go over what SEMA and FEMA are requiring in the plan updates and what deadlines are in effect.

III. Review of Current Osage County Hazard Mitigation Plan
Staff will provide a review of the existing hazard mitigation plan and provide copies of the Capabilities Section and Mitigation Program Section

IV. Discussion of Goals and Objectives and Progress Made in Five Years
Staff will lead the discussion on what actions have been taken over the past five years on hazard mitigation projects/programs.

V. Discussion of Possible Changes to Goals and Objectives for Next Five Years

VI. Setting of Date and Time for Next Meeting

VII. Adjourn

NOTICE OF OPEN MEETING

Date and time of posting **2:00 p.m. on Friday, April 24, 2009**

Notice is hereby given that the **Osage Co. Hazard Mitigation Plan Advisory Committee**

will conduct a meeting at **10 a.m.** on **Tues., April 28** , 20**09**

at **Osage Co. Courthouse**.

The tentative agenda of this meeting includes:

Welcome and Introductions; Review of Action Items; Review of Current Washington County Hazard Mitigation Plan, Discussion of Goals and Objectives; Possible Changes to Goals and Objectives in the Next 5 Years; Setting of Date and Time of Next Meeting; Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Name: **Meramec Regional Planning Commission**

Address: **4 Industrial Drive, St. James, MO 65559**

Telephone: **573-265-2993**

If you require any accommodation (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting please notify this office at (573) 265-2993 no later than forty-eight (48) hours prior to the scheduled commencement of this meeting.

Date 4/28/09

Training Event HAZARD MITIGATION PLAN

NAME	AGENCY	ADDRESS	EMAIL ADDRESS
Donna Zeilmann	ARC	31 WeBGonAcres, Bonnots Mill 65016	dzeilmann@ wildblue.net
[illegible] Wright	Chamois City		Wright 70 2002 @yahoo.com
Richard Schollmeyer	Chamois MO		
Joe Scott	Osage Co R-3	PO Box 37, Westphalia, MO	scottj@fatima.k12.mo.us
Russell Scheulen	OSAGE Co. Com	581 HWY DD Loose Creek	scheulen@AGRISTAR.net
Vincent A Samson	Osage Co. Comm	112 Country Wood Ln, Bonnots Mill	vsamson@osageconnect.Net
Dale Michie	Gasconade Osage Health Dept	300 Schiller Street Hermann	michis@lpha.mopublic.org
[illegible]	Osage County EMA	P.O. Box 192 Linn, MO	director911@midamerica.net
[illegible] 9/28/09			

Advisory Committee Meeting

Osage County Hazard Mitigation Plan Update

AGENDA

10:00 a.m. ~ May 21, 2009

Osage County Courthouse

I. Welcome and Introductions – Tonya Price and Maria Kardon

II. Continued Review of Action Items
MRPC staff will go over what SEMA and FEMA are requiring in the plan updates and what deadlines are in effect.

III. Review of Current Osage County Hazard Mitigation Plan
Staff will provide a review of the existing hazard mitigation plan and provide copies of the Capabilities Section and Mitigation Program Section

IV. Discussion of Goals and Objectives and Progress Made in Five Years
Staff will lead the discussion on what actions have been taken over the past five years on hazard mitigation projects/programs.

V. Discussion of Possible Changes to Goals and Objectives for Next Five Years

VI. Setting of Date and Time for Next Meeting

VII. Adjourn

NOTICE OF OPEN MEETING

Date and time of posting: **May 19, 4:00 p.m.**

Notice is hereby given that the **Osage County Hazard Mitigation Advisory Committee** will meet at **10:00 a.m.** on **Monday, May 11, 2009** at the Osage County Courthouse located in Linn, MO.

The tentative agenda of this meeting includes:

- **Welcome**
- **Review of Action Items**
- **Review of Current Osage County Hazard Mitigation Plan**
- **Discussion of Goals and Objectives and Progress Made in Five Years**
- **Discussion of Possible Changes to Goals and Objectives**
- **Set Date and Time for Next Meeting**
- **Adjournment**

Representatives of the news media may obtain copies of this notice by contacting:

Tonya Price or Tammy Snodgrass
#4 Industrial Drive
St. James, MO 65559
573-265-2993

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

The Osage County Hazard Mitigation Committee held an initial meeting last week to begin reviewing the current plan. This plan was written five years ago and it is time to revise and update that plan. A second meeting has been scheduled for **Thursday, May 21, 2009 at 10:00** to continue the review process.

The document is available for you to download and review at, www.meramecregion.org/pages/downloads

Thank you for your time in reviewing the document as this is a county wide plan and anyone who may want to apply for Hazard Mitigation Grant funds must be included in the process and adopt the plan for their business or organization.

If you have any questions, comments or concerns, please feel free to contact us at 573-265-2993. You many also email changes to tprice@meramecregion.org.

Thank you for your assistance, Tammy Snodgrass and Tonya Price.

Hazard Mitigation Plan Review Meeting
Osage County
May 21, 2009
10:00 a.m.

	Name	Business	Email Address	Phone #
1.	Patrick Caldwell	FSD	Patrick.E.Caldwell@dss.mo.gov	573-821-3723
2.	Sheri Schuchardt	FSD	Sheri.Schuchardt@dss.mo.gov	573-897-36
3.	Jim Wright	CPD/Inspec	Wright202002@yahoo.com	573-763-556
4.	Kenny Helton	MFRFPD	helton kenny@yahoo.com	573 680-05
5.	Donna Zeilmann	ARC	dzeilmann@wildblue.net	573 690-074
6.	Sara Michie	Health Dep	michis@lpha.mopublic.org	573-486-312
7.	Joe Scott	Osage CoR-3	scottj@fatima.k12.mo.us	
8.	Russell Scheulen Co. Com.		Scheulen@AGRISTAR.net	
9.	Andrea Rice	Osage County EMA	director911@rmdamerica.net	
10.				
11.				
12.				
13.				
14.				

Public Notices

February 21, 2013

FOR IMMEDIATE RELEASE: SHANNON BECK OR BONNIE PRIGGE, MRPC, 573-265-2993

DRAFT OF OSAGE COUNTY HAZARD MITIGATION PLAN UPDATE AVAILABLE FOR PUBLIC REVIEW

The draft update of the Osage County Hazard Mitigation Plan is now available on the web for public review. Meramec Regional Planning Commission, in partnership with Osage County, has been updating the plan. Public meetings were held with city and county officials, school leaders, emergency management agencies and interested individuals.

Persons wishing to review the draft plan may access it on the county EMA website at www.osagecountyema.com .

Paper copies of the plan will be available for review at the Osage County Administration Building and at city halls within the county.

The deadline for comments and suggestions is March 31, 2013.

The county must have an approved hazard mitigation plan in order for Osage County schools, cities, agencies and others to access state hazard mitigation grant funds. The plan includes an assessment of natural hazards, showcases past accomplishments and set goals and action items to reduce the impact of natural hazards in the future.

Comments may be submitted in writing to MRPC, Attn. Tammy Snodgrass, 4 Industrial Drive, St. James, MO 65559, or by email at tsnodgrass@meramecregion.org.

MRPC will submit the plan to the State Emergency Management Agency and the Federal Emergency Management Agency for final approval. For more information on the plan, contact Tammy Snodgrass at (573) 265-2993.

2/21/13

POSTCARD MAILED TO ALL JURISDICTIONS IN AND ADJACENT TO OSAGE COUNTY:

2/21/13

Attention Members of the Osage County Hazard Mitigation Planning Committee, County Jurisdictions and neighboring Jurisdictions:
The final draft of the Osage County Hazard Mitigation Plan is now available for review on the Osage County website – www.osagecountyema.com .
A hard copy of the draft document is available at the Osage County Administration Building for public viewing as well. Please take some time to review the planning document, especially sections that have specifics regarding your jurisdiction. We have submitted the draft to SEMA for review, but they are allowing us some time for public input. Please notify me no later than March 15, 2013 with any recommended changes or corrections. Osage County jurisdictions will still have another opportunity to review and adopt the plan after it has been approved by FEMA. Please contact Tammy Snodgrass via email at tsnodgrass@meramecregion.org or (573) 265-2993 if you have questions or wish to make comment.

Mayor Ronald Shafferkoetter
City of Bland

P O Box 40

Bland MO 65014
City of Morrison
Attn: City Hall

405 Hwy 100

Morrison MO 65061
Mayor Steve Vogt
City of Belle

P O Drawer 813

Belle MO 65013
Maries County Commission
Pres. Comm. Ray Schwartze

P O Box 205

Vienna MO 65582
Mayor Eric Struemph
Jefferson City

320 E. McCarty St

Jefferson City MO 65109
City of Saint Thomas
City Hall

107 E. Flower St.

Saint Thomas MO 65076
Miller County Commission
Pres. Comm. Tom Wright

P. O. Box 12

Tuscombia MO 65082
Mayor Paul Sale
City of Lake Ozark

2426 Bagnell Dam Blvd.

Lake Ozark MO 65049
Callaway County Commission
Gary Jungermann

10th E. 5th St.

Fulton MO 65251

Mayor Kelly Head
City of Gasconade

493 Oak St.

Gasconade MO 65061
Mayor Dixon Somerville
City of Owensville

107 W. Sears

Owensville MO 65066
Mayor Jamie Jones
City of Vienna

P O Box 196

Vienna MO 65582
Gasconade County Commission
Pres. Comm. Nick Baxter

119 E. First St.

Hermann MO 65041
Mayor Ritchie Jenkins
City of Russellville

P.O. Box 128

Russellville MO 65074
Village of Wardsville
City Hall

5805 Wardsville Rd.

Jefferson City MO 65101
Mayor Jim Schhupp
City of Iberia

803 Hwy 42

Iberia MO 65486
Mayor Penny Lyons
City of Osage Beach

1000 City Parkway

Osage Beach MO 65065
Mayor Shawn Baita
City of Auxvasse

P. O. Box 489

Auxvasse MO 65231

Mayor Ron Van Booven
City of Hermann

1902 Jefferson St.

Hermann MO 65041
Mayor Shannon Grus
City of Rosebud

P O Box 197

Rosebud MO 63091
Sheriff Carl Fowler
Osage County Sheriff

P O Box 619

Linn MO 65051
Centertown City Hall
City Hall

1227 Broadway

Centertown MO 65023
Mayor Kevin Myers
City of St. Martins

6909 A Business 50 W

Jefferson City MO 65109
Cole County Commission
Pres. Comm. Marc Ellinger

301 E. High St.

Jefferson City MO 65101
Mayor Ronald Bly
City of Eldon

101 S. Oak

Eldon MO 65026
Saint Elizabeth City Hall
Attn: Clerk

250 Plum St.

Saint Elizabeth MO 65075
Mayor Charles Luthan
City of Fulton

P. O. Box 130

Fulton MO 65251

Mayor Lucas Fitzpatrick
City of Holts Summit
P. O. Box 429
Holts Summit MO 65043

Kingdom City-City Hall
Attn: Clerk
P.O. Box 49
Kingdom City MO 65262

Mokane City Hall
Attn: Clerk
301 Third St.
Mokane MO 65059

Authorized Representation Resolutions

MRPC
A Council of Local Governments
Serving the Meramec Area

MERAMEC REGIONAL PLANNING COMMISSION
4 Industrial Drive
St. James, MO 65559-1689
(573) 265-2993
FAX (573) 265-3550

MEMORANDUM

TO: Osage County School Districts, Electric Cooperatives, Water and Sewer Districts and other Public Entities

FROM: Tamara Snodgrass, Environmental Programs Manager, Meramec Regional Planning Commission

SUBJECT: Osage County Hazard Mitigation Plan and future eligibility for Hazard Mitigation Program Grants

DATE: March 9, 2010

I am writing to make you aware of what is required of cities, school districts and other public entities in order to be considered part of the Osage County Hazard Mitigation Plan and be eligible for future funding opportunities.

As many of you are aware, Osage County and entities located within Osage County have not been able to apply for various grant programs because the county did not have an approved Multi-Jurisdictional Hazard Mitigation Plan. This has been a problem for Osage County in the past. Examples of eligible projects would be tornado safe rooms for school districts, burying power lines for electric cooperatives or purchasing generators for pump stations for rural water or sewer districts.

FEMA and SEMA now require that any public entity that wants to apply for hazard mitigation related grant funds must actively participate in the hazard mitigation planning process. Active participation means attending meetings, reviewing and commenting on the plan, providing data or assisting in prioritizing goals or projects. Not all entities have the time or staff to spend on the hazard mitigation planning process. There is an alternative that I want to make you aware of and encourage you to implement.

There is an option, called "authorized representative" where you can authorize the "Plan Author", Meramec Regional Planning Commission, to prepare the plan on your organization's behalf. If you want to do this, you will need to adopt a resolution doing so and send a copy to Meramec Regional Planning Commission. A copy of a sample resolution is attached.

I will continue to keep you informed of progress on the plan. When the plan has been approved by both SEMA and FEMA, you will still be required to adopt the plan and submit a resolution of adoption at that time.

I strongly encourage you to consider adopting a resolution for authorized representation in order to insure that you will be recognized by SEMA and FEMA as part of the county plan. If you choose to take this option, please provide Meramec Regional Planning Commission with a copy of a signed resolution **before Friday, March 26, 2010**. I hope to submit the plan for review by Tuesday, March 30, 2010 and I must have your resolution included in the plan before the date of submittal.

If you have any questions or concerns, please do not hesitate to contact myself or Lisa Warnke at (573) 265-2993 or by email at tsnodgrass@meramecregion.org or lwarnke@meramecregion.org.

TS

Enclosure

SAMPLE RESOLUTION

Resolution for Authorized Representation
Resolution #_____

Name of Jurisdiction: _____Town A or School District_____

Governing Body: _____City Council or School Board_____

Address: _____Street, City, Zip Code_____

Whereas, Town A or School District has limited capacity to undertake extensive participation in the preparation of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission is able to act on behalf of Town A or School District in the analysis and development of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 CFR 201.6; and

Whereas, Meramec Regional Planning Commission shall make available a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

Now therefore be it resolved, Town A or City Council authorizes Meramec Regional Planning Commission on behalf of Town A or City Council to prepare the County B Multi-Jurisdictional Hazard Mitigation Plan which shall be reviewed and considered by adoption by Town A City Council or School District Board upon completion.

Adopted this ____ day of _____, 20__ at the meeting of the City Council or School Board.

_____
Authorizing Signature

MEMORANDUM

TO: Osage County School Districts, Electric Cooperatives, Water and Sewer Districts and other Public Entities

FROM: Tamara Snodgrass, Environmental Programs Manager, Meramec Regional Planning Commission

SUBJECT: Osage County Hazard Mitigation Plan and future eligibility for Hazard Mitigation Program Grants

DATE: May 4, 2010

I am writing to make you aware of what is required of cities, school districts and other public entities in order to be considered part of the Osage County Hazard Mitigation Plan and be eligible for future funding opportunities.

As many of you are aware, Osage County and entities located within Osage County have not been able to apply for various grant programs because the county did not have an approved Multi-Jurisdictional Hazard Mitigation Plan. This has been a problem for Osage County in the past. Examples of eligible projects would be tornado safe rooms for school districts, burying power lines for electric cooperatives or purchasing generators for pump stations for rural water or sewer districts.

FEMA and SEMA now require that any public entity that wants to apply for hazard mitigation related grant funds must actively participate in the hazard mitigation planning process. Active participation means attending meetings, reviewing and commenting on the plan, providing data or assisting in prioritizing goals or projects. Not all entities have the time or staff to spend on the hazard mitigation planning process. There is an alternative that I want to make you aware of and encourage you to implement.

There is an option, called “authorized representative” where you can authorize the “Plan Author”, Meramec Regional Planning Commission, to prepare the plan on your organization’s behalf. If you want to do this, you will need to adopt a resolution doing so and send a copy to Meramec Regional Planning Commission. A copy of a sample resolution is attached.

I will continue to keep you informed of progress on the plan. When the plan has been approved by both SEMA and FEMA, you will still be required to adopt the plan and submit a resolution of adoption at that time.

I strongly encourage you to consider adopting a resolution for authorized representation in order to insure that you will be recognized by SEMA and FEMA as part of the county plan. If you choose to take this option, please provide Meramec Regional Planning Commission with a copy of a signed resolution **before Friday, May 14, 2010**. I must have your resolution included in the plan before the submittal.

If you have any questions or concerns, please do not hesitate to contact myself or Jessica Mattingly at (573) 265-2993 or by email at tsnodgrass@meramecregion.org or jmattingly@meramecregion.org.

TS

Enclosure

SAMPLE RESOLUTION

Resolution for Authorized Representation
Resolution #_____

Name of Jurisdiction: _____**Town A or School District**_____

Governing Body: _____**City Council or School Board**_____

Address: _____**Street, City, Zip Code**_____

Whereas, Town A or School District has limited capacity to undertake extensive participation in the preparation of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission is able to act on behalf of Town A or School District in the analysis and development of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 CFR 201.6; and

Whereas, Meramec Regional Planning Commission shall make available a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

Now therefore be it resolved, Town A or City Council authorizes Meramec Regional Planning Commission on behalf of Town A or City Council to prepare the County B Multi-Jurisdictional Hazard Mitigation Plan which shall be reviewed and considered by adoption by Town A City Council or School District Board upon completion.

Adopted this ____ day of _____, 20__ at the meeting of the City Council or School Board.

_____
Authorizing Signature

Resolution for Authorized Representation

Resolution # 08-10-1

Name of Jurisdiction: Village of Argyle

Governing Body: Board

Address: P.O. Box 22, Argyle, MO 65001

Whereas, ~~the Village of Argyle~~ has limited capacity to undertake extensive participation in the preparation of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission is able to act on behalf of the Village of Argyle in the analysis and development of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 CFR 201.6; and

Whereas, Meramec Regional Planning Commission shall make available a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

Now therefore be it resolved, ~~the Village of Argyle~~ authorizes Meramec Regional Planning Commission on behalf of ~~the~~ Village of Argyle to prepare the hazard mitigation plan which shall be reviewed and considered by adoption by the Village of Argyle upon completion.

Adopted this 12 day of ~~Oct~~ Aug., 2010 at the meeting of the Argyle Board.

Authorizing Signature

Resolution for Authorized Representation

Resolution # 127

Name of Jurisdiction: Village of Freeburg

Governing Body: City Council

Address: 304 Highway 63 South Freeburg, MO 65035

Whereas, Village of Freeburg has limited capacity to undertake extensive participation in the preparation of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission is able to act on behalf of Village of Freeburg in the analysis and development of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 CFR 201.6; and

Whereas, Meramec Regional Planning Commission shall make available a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

Now therefore be it resolved, Village of Freeburg authorizes Meramec Regional Planning Commission on behalf of Village of Freeburg to prepare the Osage County Multi-Juridictional Hazard Mitigation Plan which shall be reviewed and considered by adoption by Village of Freeburg upon completion.

Adopted this 3rd day of May, 2010 at the meeting of the City Council.

Daryl Heller, Mayor

Authorizing Signature

IN THE CITY OF LINN, MISSOURI

RESOLUTION FOR AUTHORIZED REPRESENTATION
RESOLUTION NO. 1032

Name of Jurisdiction: City of Linn
Governing Body: City Council
Address: 1200 East Main Street, Linn, MO, 65051

Whereas, the City of Linn as limited capacity to undertake extensive participation in the preparation of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission is able to act on behalf of the City of Linn in the analysis and development of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 CFR 201.6; and

Whereas, Meramec Regional Planning Commission shall make available a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

Now therefore be it resolved, The City of Linn authorizes Meramec Regional Planning Commission on behalf of the City Council to prepare the Osage County Hazard Mitigation Plan which shall be reviewed and considered by adoption by the City Council upon completion.

Adopted this 12th day of May, 2010 at the meeting of the City Council of the City of Linn by the following vote:

	Aye	Nay
Alderman Parrish:	X	—
Alderman Thompson:	X	—
Alderman Voss:	X	—
Alderman Brandt:	X	—
Mayor (in case of tie):	—	—

Dwight Massey, Mayor

Attest:

Kim Stirnaman, City Clerk

RESOLUTION 2012-2

RESOLUTION FOR AUTHORIZED REPRESENTATION
CITY OF META
BOARD OF ALDERMAN
102 EAST THIRD STREET
META, MO 65058

WHEREAS, City of Meta has limited capacity to undertake extensive participation in the preparation of a hazard mitigation plan; and

WHEREAS, Meramec Regional Planning Commission is able to act on behalf of City of Meta in the analysis and development of a hazard mitigation plan; and

WHEREAS, Meramec Regional Planning Commission shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 CFR 201.6; and

WHEREAS, Meramec Regional Planning Commission shall make available a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

Now therefore be it resolved, City of Meta, Board of Alderman authorizes Meramec Regional Planning Commission on behalf of City of Meta, Board of Alderman to prepare the Osage County B Multi-Jurisdictional Hazard Mitigation Plan which shall be reviewed and considered by adoption by City of Meta, Board of Alderman upon completion.

Adopted this 12th day of September 2012 at the meeting of the City of Meta, Board of Alderman.

ALDERMEN	AYE	NAY
Loethen	✓	
Kampeter	✓	
Sherrell	✓	
Schubert	✓	
Mayor (in case of tie vote)		

Michael Distler, Mayor

SEAL

Attest:

Carrie Roberds, City Clerk

Resolution for Authorized Representation

Resolution # 2

Name of Jurisdiction: City of Westphalia

Governing Body: City Council

Address: P.O. Box 36, Westphalia, mo 65085

Whereas, City of Westphalia has limited capacity to undertake extensive participation in the preparation of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission is able to act on behalf of City of Westphalia in the analysis and development of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 CFR 201.6; and

Whereas, Meramec Regional Planning Commission shall make available a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

Now therefore be it resolved, City of Westphalia authorizes Meramec Regional Planning Commission on behalf of City of Westphalia to prepare the Osage Co. Multi-Jurisdictional Hazard Mitigation Plan, which shall be reviewed and considered by adoption by City of Westphalia upon completion.

Adopted this 30th day of March, 2010 at the meeting of the City of Westphalia.

Authorizing Signature

Approved 5-13-10

Resolution for Authorized Representation

Name of Jurisdiction: OSAGE COUNTY R-1 SCHOOL DISTRICT

Governing Body: BOARD OF EDUCATION

Address: CHAMOIS, MO 65024

Whereas, Osage County R-1 School District has limited capacity to undertake extensive participation in the preparation of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 CFR 201.6; and

Whereas; Meramec Regional Planning Commission shall make available a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

Now therefore be it resolved, Osage County R-1 School Board of Education authorizes Meramec Regional Planning Commission on behalf of Osage County R-1 School District to prepare the Osage County Hazard Mitigation Plan which shall be reviewed and considered by adoption by the Osage County R-1 School District upon completion.

Adopted this 13th day of May, 2010 at the meeting of the Osage County R-1 School Board of Education.

Robert J Boker

Authorizing Signature

Resolution for Authorized Representation

Resolution #_____

Name of Jurisdiction: Osage County R-II School District

Governing Body: Board of Education

Address: 1212 E. Main, Linn, MO 65051

Whereas, Osage Co. R-II has limited capacity to undertake extensive participation in the preparation of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission is able to act on behalf of Osage Co. R-II in the analysis and development of a hazard mitigation plan; and

Whereas, Meramec Regional Planning Commission shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 CFR 201.6; and

Whereas, Meramec Regional Planning Commission shall make available a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

Now therefore be it resolved, the Board of Education authorizes Meramec Regional Planning Commission on behalf of Osage Co. R-II to prepare the hazard mitigation plan which shall be reviewed and considered by adoption by the Board of Education upon completion.

Adopted this 17 day of May, 2010 at the meeting of the Osage Co. R-II Board of Education

Dale P. Sallee

Authorizing Signature, President

Appendix B

References

Repetitive Loss Properties
Osage County, MO

Community Name	Community Number	Mitigated?	Occupancy Type	Date of Loss	Date of Loss	Date of Loss	Date of Loss	Date of Loss	Date of Loss
Osage County	290268	No	ASSMD CONDO	05/19/1995	05/18/1995	07/29/1993	07/28/1993	07/28/1993	07/26/1993
Osage County	290268	No	Single Family	09/27/1993	02/26/1985				
Osage County	290268	No	Single Family	09/28/1993	02/24/1985				
Osage County	290268	No	Single Family	07/14/1993					
Osage County	290268	No	Single Family	05/18/1995	04/11/1994				
Osage County	290268	No	Single Family	05/30/1995	4/14/1994				
Osage County	290268	No	Single Family	05/19/1995	07/30/1993				
Osage County	290268	No	Single Family	05/19/1995	07/29/1993				
Osage County	290268	No	Single Family	05/18/1995	07/29/1993	07/07/1993			
Chamois, City of	290270	No	Two to Four Family	05/18/1995	07/28/1993	07/07/1993	10/04/1986		
Chamois, City of	290270	No	Single Family	07/30/1993	10/05/1986				
Chamois, City of	290270	No	Single Family	07/28/1993	07/06/1993	06/06/1993			
Chamois, City of	290270	No	Single Family	05/20/1995	07/24/1993				
Westphalia, City of	290272	No	Single Family	01/05/2005	05/17/1995				
Westphalia, City of	290272	No	Single Family	07/06/1993	06/17/1985	12/03/1982	04/12/1979		

LIST OF ACRONYMS

ASM: Archaeological Survey of Missouri
BFE: Base Flood Elevation
BLM: Bureau of Land Management
CDBG: Community Development Block Grant
CEDS: Comprehensive Economic Development Strategy
CERI: Center for Earthquake Research and Information at the University of Memphis CFR: Code
of Federal Regulations
CPC: Climate Prediction Center
CRS: Community Rating System
DMA 2000: Disaster Mitigation Act of 2000
EDA: Economic Development Administration
EPA: Environmental Protection Agency
FEMA: Federal Emergency Management Agency
FIRM: Flood Insurance Rate Map
FMA: Flood Mitigation Assistance (FEMA Program)
FTE: Full Time Equivalent
GIS: Geographic Information System
HMGP: Hazard Mitigation Grant Program
HMST: Hazard Mitigation Survey Team
HUD: Housing and Urban Development (United States, Department of)
ICC: Increased Cost of Compliance
LMI: Labor Market Information
MACOG: Missouri Association of Councils of Governments
MCC: Midwestern Climate Center
MoDOT: Missouri Department of Transportation
MPA: Missouri Press Association
NAWQA: National Water Quality Assessment Program
NCDC: National Climate Data Center
NEHRP: National Earthquake Hazards Reduction Program
NFIP: National Flood Insurance Program
NFPA: National Fire Protection Association
NHMP: Natural Hazard Mitigation Plan
NIBS: National Institute of Building Sciences
NIFC: National Interagency Fire Center
NOAA: National Oceanic and Atmospheric Administration
NRHP: National Register of Historic Places
NRCS: Natural Resources Conservation Service
NWS: National Weather Service
PDM: Pre-Disaster Mitigation Program
PDSI: Palmer Drought Severity Index
SBA: Small Business Administration
SEMA: Missouri State Emergency Management Agency
SHMO: State Hazard Mitigation Officer

SPC: Storm Prediction Center
USACE: United States Army Corps of Engineers
USDA: United States Department of Agriculture
USFA: United States Fire Administration
USFS: United States Forest Service
USFWS: United States Fish and Wildlife Service
USGS: United States Geological Survey

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Appendix C

Adoption Resolutions

Appendix D

Federal/State Mitigation Programs, Activities and Initiatives

Building Disaster Resistant Communities

Hazard Mitigation Financial Resource Guide

A Guide for Locating Financial Assistance for Hazard Mitigation & Ancillary Activities

Missouri State Emergency Management Agency

Program / Activity	*Type of Assistance*	Agency & Contact
General Emergency Grants, Loans & Assistance	**Pre/Post Disaster Mitigation, Relief, Recovery, Training, & Technical Assistance.**	
Hazard Mitigation Grant Program	Grants to States and communities for implementing long-term hazard mitigation measures following a major disaster declaration.	Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9116 Fax: (573) 526-9193
Disaster Mitigation Planning and Technical Assistance	Technical and planning assistance for capacity building and mitigation project activities focusing on creating disaster resistant jobs and workplaces.	Department of Commerce (DOC), Economic Development Administration (EDA) (Note: May have grant funding): (800) 345-1222 EDA's Disaster Recovery Coordinator: (202) 482-6225 www.doc.gov/eda Missouri State Emergency Management Agency (SEMA) (Technical Assistance Only): Tel: (573) 526-9116 Fax: (573) 526-9193
Pre-Disaster Mitigation Project Impact, etc.	Funding and technical assistance to communities and States to implement a sustained pre-disaster mitigation program.	Missouri State Emergency Management Agency (SEMA) (Technical Assistance Only) Tel: (573) 526-9116 Fax: (573) 526-9193

Emergency Management / Mitigation Training	Training in disaster mitigation, preparedness, planning.	Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9116 Fax: (573) 526-9193
Post-Disaster Economic Recovery Grants and Assistance	Grant funding to assist with the long-term economic recovery of communities, industries, and firms adversely impacted by disasters.	Department of Commerce (DOC) – Economic Development Administration (EDA) EDA Headquarters Disaster Recovery Coordinator: (202) 482-6225 Missouri Department of Economic Development CDBG Program Tel: (573) 751-4146

Physical Disaster Loans and Economic Injury Disaster Loans	Disaster loans to non-farm, private sector owners of disaster damaged property for uninsured losses. Loans can be increased by up to 20 percent for mitigation purposes.	Small Business Administration (SBA) National Headquarters Associate Administrator for Disaster Assistance: (202) 205-6734
Public Assistance Program (Infrastructure)	Grants to States and communities to repair damaged infrastructure and public facilities, and help restore government or government-related services. Mitigation funding is available for work related to damaged components of the eligible building or structure.	Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9112 Fax: (573) 526-9193 cmay@sema.state.mo.us
Public Infrastructure Grants (CDBG) Annual Competition – Public Facilities Annual Competition – Neighborhoods Annual Competition – Infrastructure Downtown Revitalization Emergencies	*Public Facilities:* Grants for public improvement or facilities except work on general public office buildings, includes water facilities, flood and drainage facilities, fire protection facilities/equipment and bridges. *Neighborhoods:* Grants for housing and some public facilities. *Infrastructure:* Grants for storm sewers, drainage and land acquisitions. *Downtown Revitalization:* Grants for improving public infrastructure and facilities in a central business district. *Emergencies:* Grants for public	Missouri Department of Economic Development CDBG Program Tel: (573) 751-4146 Tel: (573) 751-3600 Fax: (573) 526-4157

	improvement or facilities except work on general public office buildings, includes water facilities and solid waste disposal facilities.	

Community Development Block Grant (CDBG) State Administered Program	Grants to States to develop viable communities (e.g., housing, a suitable living environment, expanded economic opportunities) in non-entitled areas, for low- and moderate-income persons.	US Department of Housing and Urban Development (HUD) State CDBG Program Manager Or State and Small Cities Division, Office of Block Grant Assistance, HUD Headquarters: (202) 708-3587 Missouri Department of Economic Development CDBG Program Tel: (573) 751-4146 Tel: (573) 751-3600 Fax: (573) 526-4157
Community Development Block Grant (CDBG) Entitlement Communities Program	Grants to entitled cities and urban counties to develop viable communities (e.g., decent housing, a suitable living environment, expanded economic opportunities), principally for low- and moderate-income persons.	HUD City and county applicants should call the Community Planning and Development staff of their appropriate HUD field office. As an alternative, they may call the Entitlement Communities Division, Office of Block Grant Assistance, HUD Headquarters: (202) 708-1577, 3587 Missouri Department of Economic Development CDBG Program

		Tel: (573) 751-4146
Disaster Recovery Initiative	Grants to fund gaps in available recovery assistance after disasters (including mitigation).	HUD Community Planning and Development Divisions in their respective HUD field offices or HUD Community Planning and Development: (202) 708-2605 Missouri Department of Economic Development Missouri Housing Development Commission (816) 759-6600

Public Housing Modernization Reserve for Disasters and Emergencies	Funding to public housing agencies for modernization needs resulting from natural disasters (including elevation, floodproofing, and retrofit).	HUD Director, Office of Capital Improvements: (202) 708-1640 Missouri Department of Economic Development Missouri Housing Development Commission (816) 759-6600
Indian Housing Assistance (Housing Improvement Program)	Project grants and technical assistance to substantially eliminate sub-standard Indian housing.	Department of Interior (DOI)-Bureau of Indian Affairs (BIA) Division of Housing Assistance, Office of Tribal Services: (202) 208-5427
Section 504 Loans for Housing	Repair loans, grants and technical assistance to very low-income senior homeowners living in rural areas to repair their homes and remove health and safety hazards.	US Department of Agriculture (USDA) – Rural Housing Service (RHS) Contact local RHS Field Office, or RHS Headquarters, Director, Single Family Housing Direct Loan Division: (202) 720-1474
Section 502 Loan and Guaranteed Loan Program	Provides loans, loan guarantees, and technical assistance to very low and low-income applicants to purchase,	USDA-RHS Contact the Local RHS Field Office, or the Director, Single Family Housing

	build, or rehabilitate a home in a rural area.	Guaranteed Loan Division, RHS: (202) 720-1452
Farm Ownership Loans	Direct loans, guaranteed / insured loans, and technical assistance to farmers so that they may develop, construct, improve, or repair farm homes, farms, and service buildings, and to make other necessary improvements.	USDA-FSA Director, Farm Programs Loan Making Division, FSA: (202) 720-1632 Missouri Department of Agriculture (573) 751-4211

HOME Investments Partnerships Program	Grants to States, local government and consortia for permanent and transitional housing (including support for property acquisition and rehabilitation) for low-income persons.	HUD Community Planning and Development, Grant Programs, Office of Affordable Housing, HOME Investment Partnership Programs: (202) 708-2685 (202) 708 0614 extension 4594 1-800-998-9999 Missouri Department of Economic Development Missouri Housing Development Commission (816) 759-6600
Rural Development Assistance – Housing	Grants, loans, and technical assistance in addressing rehabilitation, health and safety needs in primarily low-income rural areas. Declaration of major disaster necessary.	USDA-Rural Housing Service (RHS) Community Programs: (202) 720-1502 Single Family Housing: (202) 720-3773 Multi Family Housing: (202) 720-5177 Missouri State Rural Development Office Tel: (573) 876-0976 Fax: (573) 876-0977
Rural Development	Direct and guaranteed rural economic loans and business	USDA-Rural Utilities Service (RUS)

Assistance -- Utilities	enterprise grants to address utility issues and development needs.	Program Support: (202) 720-1382 Missouri State Rural Development Office Tel: (573) 876-0976 Fax: (573) 876-0977
Rural Development Assistance – Community Facility Direct Loans/Grants	Grants, loans, and technical assistance in addressing rehabilitation, health, safety, and emergency (fire, ambulance, sirens, etc.) facilities and equipment needs in primarily low-income rural areas.	USDA-Rural Housing Service (RHS) Community Programs: (202) 720-1502 Missouri State Rural Development Office Tel: (573) 876-0976 Fax: (573) 876-0977

Rural Community Fire Protection	Grants for rural fire projects or assistance, including dry fire hydrants, equipment and training.	Missouri Department of Conservation (573) 751-4115 x-3111-Program Information (573) 346-2210-Applications, Program Information, & Grant Management www.conservation.state.mo.us/forest/
Section 108 Loan Guarantee Program	Loan guarantees to public entities for community and economic development (including mitigation measures).	HUD Community Planning and Development staff at appropriate HUD field office, or the Section 108 Office in HUD Headquarters: (202) 708-1871 Missouri Department of Economic Development Missouri Housing Development Commission (816) 759-6600

Floods/Flood Control ***Grants, Loans & Assistance***	**Floods/Flood Control Technical/Planning Assistance and Program Support.**	
National Flood Insurance Program	Makes available flood insurance to residents of communities that adopt and enforce minimum floodplain management requirements.	Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9141 Fax: (573) 526-9198 griedel@sema.state.mo.us
Flood Mitigation Assistance	Grants to States and communities for pre-disaster mitigation to help reduce or eliminate the long-term risk of flood damage to structures insurable under the National Flood Insurance Program. Note: Requires flood mitigation plan to be developed by the community seeking grant funding.	Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9116 Fax: (573) 526-9193
Flood Control Planning Assistance	Technical and planning assistance for the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources.	Department of Defense (DOD) US Army Corps of Engineers (USACE) Contact the Floodplain Management Staff in the Appropriate USACE Regional Office N.W. MO – Omaha District: (212) 264-7813 N.E. MO – Rock Island District: (309) 794-5249

		W. Central MO – Kansas City District: (816) 983-3205 E. Central MO – St. Louis District: (314) 331-8095 Southern MO – Little Rock District: (501) 324-5551 S. E. MO – Memphis District: (800) 317-4156

Non-Structural Alternatives to Structural Rehabilitation of Damaged Flood Control Works	Direct planning and construction grants for non-structural alternatives to the structural rehabilitation of flood control works damaged in floods or coastal storms. $9 million FY99	DOD-USACE Emergency Management contact in respective USACE field office: N.W. MO – Omaha District: (212) 264-7813 N.E. MO – Rock Island District: (309) 794-5249 W. Central MO – Kansas City District: (816) 983-3205 E. Central MO – St. Louis District: (314) 331-8095 Southern MO – Little Rock District: (501) 324-5551 S. E. MO – Memphis District: (800) 317-4156
Floodplain Management Services	Technical and planning assistance at the local, regional, or national level needed to support effective floodplain management.	DOD-USACE (U.S. Army Corps of Engineers) N.W. MO – Omaha District: (212) 264-7813 N.E. MO – Rock Island District: (309) 794-5249 W. Central MO – Kansas City District: (816) 983-3205 E. Central MO – St. Louis District:

		(314) 331-8095 Southern MO – Little Rock District: (501) 324-5551 S. E. MO – Memphis District: (800) 317-4156 Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9116 Fax: (573) 526-9193
Land Protection	Technical assistance for run-off retardation and soil erosion prevention to reduce hazards to life and property.	USDA-NRCS Applicants should contact the National NRCS office: (202) 720-4527

Stormwater Grant Program	Grants for planning and construction of stormwater facilities. • Only 1st Class Counties, cities in 1st Class Counties, & St. Louis City eligible. • Funds based on population base. • County offices can approve/deny a city application (if population less than 25,000). Missouri 1st Class Counties: Boone, Cole, Jefferson, Buchanan, Franklin, Platte, Camden, Greene, St. Charles, Cape Girardeau, Jackson, St. Louis, Clay, Jasper	Missouri Department of Natural Resources (DNR) Stormwater Grant Program Tel: (573) 751-1302
Dam Safety Programs	Technical assistance, training, and grants to help improve State dam safety programs.	Missouri Department of Natural Resources (DNR) Dam Safety Program Tel: (573) 368-2177 Fax: (573) 368-2111 1-800-334-6946 TDD: 1-800-379-2419E-mail: dams@mail.dnr.state.mo.us

Earthquake ***Grants, Loans & Assistance***	**Earthquake Mitigation, Relief, Recovery, Technical/Planning/Training Grant/Loan Assistance and Program Support.**	
National Earthquake Hazard Reduction Program	Technical and planning assistance for activities associated with earthquake hazards mitigation.	FEMA, DOI-USGS Earthquake Program Coordinator: (703) 648-6785 Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9131 Fax: (573) 634-7966 Egray01@mail.state.mo.us
Geological Survey Program	Acquire, maintain and manage basic geological data; identify and evaluate geological hazards. The Geological Survey Program assists Missourians, industry, and government in the wise use of the state's minerals, land, and water resources.	Department of Natural Resources Division of Geology and Land Survey Geological Survey Program (573) 368-2300 TDD: 1-800-379-2419 gspgeol@mail.dnr.state.mo.us
Other Earthquake Hazards Reduction Programs	Training, planning and technical assistance under grants to States or local jurisdictions.	DOI-USGS Earthquake Program Coordinator: (703) 648-6785 Missouri State Emergency Management

		Agency (SEMA) Tel: (573) 526-9131 Fax: (573) 634-7966 **Egray01@mail.state.mo.us**

All-Hazard Mapping ***Grants, Loans & Assistance***	**All-Hazard Analysis & Mapping of Flood Plains, Watersheds, Earthquake Areas, At-Risk Populations Grant/Loan Assistance, Training, Technical Assistance and Program Support.**	
National Flood Insurance Program: Flood Mapping;	Flood insurance rate maps and flood plain management maps for all NFIP communities;	Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9141 Fax: (573) 526-9198 griedel@sema.state.mo.us
National Flood Insurance Program: Technical Mapping Advisory Council	Technical guidance and advice to coordinate FEMA's map modernization efforts for the National Flood Insurance Program.	DOI-USGS USGS – National Mapping Division: (573) 308-3802 Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9141 Fax: (573) 526-9198 griedel@sema.state.mo.us
National Digital Orthophoto Program	Develops topographic quadrangles for use in mapping of flood and other hazards.	DOI-USGS USGS – National Mapping Division: (573) 308-3802

		Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9141 Fax: (573) 526-9198 griedel@sema.state.mo.us
Stream Gaging and Flood Monitoring Network	Operation of a network of over 7,000 streamgaging stations that provide data on the flood characteristics of rivers.	DOE-USGS Chief, Office of Surface Water, (703) 648-5303

Mapping Standards Support	Expertise in mapping and digital data standards to support the National Flood Insurance Program.	DOI-USGS USGS – National Mapping Division: (573) 308-3802 Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9141 Fax: (573) 526-9198 griedel@sema.state.mo.us
National Earthquake Hazards Reduction Program	Seismic mapping for U.S.	DOI-USGS Earthquake Program Coordinator: (703) 648-6785 Missouri State Emergency Management Agency (SEMA) Tel: (573) 526-9131 Fax: (573) 634-7966 Egray01@mail.state.mo.us

Ancillary Flood & Natural Resource Projects ***Grants, Loans & Assistance***	**Watershed Management, Clean Water, Conservation, Environmental, Forestry, Grant/Loan Assistance, Technical Aid, and Program Support**	

Natural Resources Financial Assistance	DNR participates in a variety of financial and technical assistance programs that are available to Missouri communities. • User Charge Analysis - Computer software assisted analysis of water and wastewater user charge systems. • Agriculture Loan Program - Loans to individual farmers for animal waste treatment facilities. • Cooperative Remonumentation Program - Contract with county commissions to remonument corners of the U.S. Public Land Survey System. • County Boundary Resurvey Program - Contract with county commissions to remonument county boundary lines where the location of the line is indefinite. • Geodetic Control Densification Project - Contract with county, city government and municipal utilities to	Missouri Department of Natural Resources (DNR) Tel: (573) 751-3443 1-800-334-6946 TDD: 1-800-379-2419 E-mail: webmanager@mail.dnr.state.mo.us Technical Assistance Program (573) 526-6627 Missouri Department of Agriculture (573) 751-2129 State Surveyor (573) 368-2301 State Surveyor (573) 368-2301

	establish horizontal and vertical control monuments used for mapping and the development of land survey information system.	

	• Hazardous Substance Emergency Relief Loan Fund - Loans to political subdivisions or volunteer fire protection associations for reimbursement of actual costs incurred in responding to a hazardous substance emergency.	State Surveyor (573) 368-2301
	• Local Government Reimbursement Program – Reimbursement up to $25,000 for cost incurred in responding to a hazardous substance emergency.	Environmental Services Program (573) 526-3346
	• Leaking Underground Storage Tank Cleanup Assistance - At eligible sites with pre-approved plans and costs, the Underground Storage Tank Fund can assist the responsible party with the cleanup costs.	U. S. EPA, Local Government Reimbursement Help Line 1-800-431-9209
	• Private Activity Bond Financing Issuance of tax-exempt and taxable revenue bonds for private and public companies for facilities and improvements with environmental and energy resource impacts.	Hazardous Waste Management Program (573) 751-3176

		Environmental Improvement and Energy Resources Authority (573) 751-4919
Environmental Quality Incentives Program (EQIP)	Technical, educational, and limited financial assistance to encourage environmental enhancement. DNR Completed Audits, Cost-Share, Fees and Taxes, Financial Assurance Review, Grants, Loans, Non-Profit Reimbursement, State Revolving Fund (SRF), Vehicle Emissions Repair Assistance (VERA)	USDA-NRCS NRCS County Offices Or NRCS EQUIP Program Manager: (202) 720-1834 www.nrcs.usda.gov Columbia, MO District Office – USDA-NRCS Tel: (573) 876-0912 Fax: (573) 875-0913

	Air Pollution Control Program Air Pollution Control Sales Tax Exemptions, Vehicle Emissions Repair Assistance Environmental Services Program Hazardous Substance Emergency Relief Loan Fund Hazardous Waste Program Brownfield Pilot Projects, Fees and Taxes, Financial Assurance Review, Leaking Underground Storage Tank Cleanup Assistance, Natural Resources Damage Assessments, Petroleum Storage Tank Cleanup Assistance, Voluntary Cleanup Program Financial Incentives Public Drinking Water Program Rural Drinking Water Grant Program, State Revolving Fund (SRF Leveraged Loan Program Soil and Water Conservation	Missouri Department of Natural Resources (DNR) Tel: (573) 751-3443 Division of Environmental Quality 1-800-334-6946 TDD: 1-800-379-2419 E-mail: tap@mail.dnr.state.mo.us

	Program Assistance to Districts, Cost-Share Grants, Cooperative Grants with the Missouri Department of Conservation, Loan Interest-Share, Research Grants, Special Area Land Treatment Program (SALT) Solid Waste Management Program	

	Completed District Audits, District Grants, District Administration Grants, Non-Profit Group Waste Tire Cleanup Cost Reimbursement Instruction Sheet, Financial Assurance Instruments, Waste Tire Grant information, Financial Assistance, Waste Reduction and Recycling Projects Technical Assistance Program Agricultural Assistance, Business Assistance, Government Assistance, On-site Assessment Team, Pollution Prevention, Small Business Assistance Water Pollution Control Program Nonpoint Source Minigrants, Nonpoint Source Animal Waste Treatment Facility Loan Program, Nonpoint Source Project Grants, State 40 Percent Construction Wastewater Grant Program, State Revolving Fund (SRF) Leveraged Load Program - Wastewater, Storm Water Grant and Loan Program, Water Pollution Equipment Sales Tax Exemption	
Clean Water Act Section 319 Grants	Grants to States to implement non-point source programs,	EPA

	including support for non-structural watershed resource restoration activities.	Office of Water Chief, Non-Point Source Control Branch: (202) 260-7088, 7100 Missouri Department of Natural Resources (DNR) Tel: (573) 751-3443

		Division of Environmental Quality Public Drinking Water Program 1-800-334-6946 TDD: 1-800-379-2419 E-mail: drinkingwater@mail.dnr.state.mo.us
Clean Water State Revolving Funds	Loans at actual or below-market interest rates to help build, repair, relocate, or replace wastewater treatment plants.	EPA EPA Office of Water State Revolving Fund Branch Branch Chief: (202) 260-7359 A list of Regional Offices is available upon request
Wetlands Protection – Development Grants	Grants to support the development and enhancement of State and tribal wetlands protection programs.	US Environmental Protection Agency (EPA) EPA Wetlands Hotline: (800) 832-7828 Or EPA Headquarters, Office of Water Chief, Wetlands Strategies and State Programs: (202) 260-6045 Missouri Department of Natural Resources (DNR)

		Tel: (573) 751-3443
Watershed Protection and Flood Prevention Program and Soil and Water Conservation Program	Technical and financial assistance for installing works of improvement to protect, develop, and utilize land or water resources in small watersheds under 250,000 acres.	USDA-NRCS Director, Watersheds and Wetlands Division: (202) 720-3042 (202) 690-4614 www.nrcs.usda.gov Columbia, MO District Office – USDA-NRCS Tel: (573) 876-0912 Fax: (573) 875-0913 Missouri Department of Natural Resources (DNR) Tel: (573) 751-3443 Division of Environmental Quality Soil and Water Conservation Program 1-800-334-6946 TDD: 1-800-379-2419 E-mail: soils@mail.dnr.state.mo.us

Watershed Surveys and Planning Small Watershed Protection Act (PL 566)	Surveys and planning studies for appraising water and related resources, and formulating alternative plans for conserva-tion use and development. Grants and advisory/counseling services to assist w/planning and implementing improvement.	US Department of Agriculture (USDA) – National Resources Conservation Service (NRCS) Watersheds and Wetlands Division: (202) 720-4527 Deputy Chief for Programs: (202) 690-0848 www.nrcs.usda.gov Columbia, MO District Office – USDA-NRCS Tel: (573) 876-0912
Emergency Watershed Protection Program	Provides technical and financial assistance for relief from imminent hazards in small watersheds, and to reduce vulnerability of life and property in small watershed areas damaged by severe natural hazard events.	USDA – NRCS National Office – (202) 690-0848 Watersheds and Wetlands Division: (202) 720-3042
Wetlands Reserve Program	Financial and technical assistance to protect and restore wetlands through easements and restoration agreements.	USDA-NRCS National Policy Coordinator NRCS Watersheds and Wetlands Division: (202) 720-3042
Project Modifications for Improvement of the Environment	Provides for ecosystem restoration by modifying structures and/or operations or water resources projects constructed by the USACE, or	DOD-USACE Chief of Planning @ appropriate USACE Regional Office

	restoring areas where a USACE project contributed to the degradation of an area.	N.W. MO – Omaha District: (212) 264-7813 N.E. MO – Rock Island District: (309) 794-5249 W. Central MO – Kansas City District: (816) 983-3205 E. Central MO – St. Louis District: (314) 331-8095 Southern MO – Little Rock District: (501) 324-5551 S. E. MO – Memphis District: (800) 317-4156

Aquatic Ecosystem Restoration	Direct support for carrying out aquatic ecosystem restoration projects that will improve the quality of the environment.	DOD-USACE Chief of Planning @ appropriate USACE Regional Office (U.S. Army Corps of Engineers) N.W. MO – Omaha District: (212) 264-7813 N.E. MO – Rock Island District: (309) 794-5249 W. Central MO – Kansas City District: (816) 983-3205 E. Central MO – St. Louis District: (314) 331-8095 Southern MO – Little Rock District: (501) 324-5551 S. E. MO – Memphis District: (800) 317-4156 Streams for the Future Fisheries Division Missouri Department of Conservation (573) 751-4115
Water Resources Development Act or Challenge 21	Financial and technical assistance to prepare comprehensive plans for the development, use and conservation of water and related land resources.	DOD-USACE Chief of Planning @ appropriate USACE Regional Office (U.S. Army Corps of Engineers) N.W. MO – Omaha District:

		(212) 264-7813 N.E. MO – Rock Island District: (309) 794-5249 W. Central MO – Kansas City District: (816) 983-3205 E. Central MO – St. Louis District: (314) 331-8095 Southern MO – Little Rock District: (501) 324-5551 S. E. MO – Memphis District: (800) 317-4156 Streams for the Future Fisheries Division Missouri Department of Conservation (573) 751-4115

Beneficial Uses of Dredged Materials	Direct assistance for projects that protect, restore, and create aquatic and ecologically-related habitats, including wetlands, in connection with dredging an authorized Federal navigation project.	DOD-USACE Same as above
North American Wetland Conservation Fund	Cost-share grants to stimulate public/private partnerships for the protection, restoration and management of wetland habitats.	DOI-FWS North American Waterfowl and Wetlands Office: (703) 358-1784
Soil Survey	Maintains soil surveys of counties or other areas to assist with farming, conservation, mitigation or related purposes.	USDA-NRCS NRCS – Deputy Chief for Soil Science and Resource Assessment: (202) 720-4630
Land Acquisition	Acquires or purchases easements on high-quality lands and waters for inclusion into the National Wildlife Refuge System.	DOI-FWS Division of Realty National Coordinator: (703) 358-1713
Transfers of Inventory Farm Properties to Federal and State Agencies for Conservation Purposes	Transfers title of certain inventory farm properties owned by FSA to Federal and State agencies for conservation purposes (including the restoration of wetlands and floodplain areas to reduce	US Department of Agriculture (USDA) – Farm Service Agency (FSA) Farm Loan Programs National Office: (202) 720-3467, 1632

	future flood potential)	
Federal Land Transfer / Federal Land to Parks Program	Identifies, assesses, and transfers available Federal real property for acquisition for State and local parks and recreation, such as open space.	DOI-NPS General Services Administration Offices Fort Worth, TX: (817) 334-2331 Boston, MA: (617) 835-5700 Or Federal Lands to Parks Leader NPS National Office: (202) 565-1184

Recreation and Parks Grants	Grants available to cities, counties and school districts to be used for outdoor recreation facilities and land acquisition.	Missouri Department of Natural Resources Division of Parks Tel: (573) 751-8560 Fax: (573) 526-4395
Partners for Fish and Wildlife	Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats.	Department of Interior (DOI) – Fish and Wildlife Service (FWS) National Coordinator, Ecological Services: (703) 358-2201 A list of State and Regional contacts is available from the National Coordinator upon request.
Tree Planting Program	Grants for Planting Trees for improving Missouri's erosion control, conservation, stream bank stabilization, etc.	Missouri Department of Conservation (573) 751-4115 x-3111-Program Information (573) 751-4115 x-3116-Applications, Program Information, & Grant Management www.conservation.state.mo.us/forest/
Conservation Contracts	Debt reduction for delinquent and non-delinquent borrowers in exchange for conservation contracts placed on environmentally sensitive real property that secures FSA loans.	USDA-FSA Farm Loan Programs FSA National Office: (202) 720-3467, 1632 or local FSA office

Historic Preservation Fund Grants	Federal matching grants, known as the Historic Preservation Fund (HPF), to assist the various states in carrying out historic preservation activities. Authorized by the National Historic Preservation Act of 1966. The program is sponsored by the Department of the Interior, National Park Service (NPS), and in Missouri, is administered through the Historic Preservation Program (HPP) of the Missouri Department of Natural Resources.	Missouri Department of Natural Resources (DNR) Tel: (573) 751-3443 Division of State Parks Historic Preservation Program 1-800-334-6946 TDD: 1-800-379-2419 E-mail: moshpo@mail.dnr.state.mo.us
The Foundation Directory	Annual source of information about grants & loans from federal and private sources. Available for a fee.	The Foundation Directory (800) 424-9836 www.fconline.fdncenter.org/

Federal Assistance Monitor	Published by CD Publications. Semi-monthly report on federal and private grants. Available for a fee.	CD Publications 8204 Fenton Street Silver Springs, MD 20910 Tel: (301) 588-6380 www.cdpublications.com/

Basic & Applied Research/Development ***Grants, Loans & Assistance***	**Research and Educational Assistance Information, Grants/ Loans and Technical Assistance.**	
Center for Integration of Natural Disaster Information	Technical Assistance: Develops and evaluates technology for information integration and dissemination	Department of Interior (DOI) –US Geological Survey (USGS) The Center for Integration of Natural Hazards Research: (703) 648-6059 hazinfo@usga.gov
Hazard Reduction Program	Funding for research and related educational activities on hazards.	National Science Foundation (NSF), Directorate for Engineering, Division of Civil and Mechanical Systems, Hazard Reduction Program: (703) 306-1360
Decision, Risk, and Management Science Program	Funding for research and related educational activities on risk, perception, communication, and management (primarily technological hazards)	NSF – Directorate for Social, Behavioral and Economic Science, Division of Social Behavioral and Economic Research, Decision, Risk, and Management Science Program (DRMS): (703) 306-1757 www.nsf.gov/sbe/drms/start.htm
Societal Dimensions of Engineering, Science, and Technology Program	Funding for research and related educational activities on topics such as ethics, values, and the assessment, communication, management and perception of	NSF – Directorate for Social, Behavioral and Economic Science, Division of Social, Behavioral and Economic Research, Societal Dimensions of

	risk	Engineering, Science and Technology Program: (703) 306-1743
National Earthquake Hazard Reduction Program (NEHRP) in Earth Sciences	Research into basic and applied earth and building sciences.	NSF – Directorate for Geosciences, Division of Earth Sciences: (703) 306-1550

Other Planning Information, Including Demographics, Societal Data, Transportation, Agricultural, Industrial & Other Commercial Economic Statistics	**Low and/or No Cost Information Helpful for Determining At-Risk Populations and Potential Economic Damages & Information to Help Determine Avoidance of Losses.**	
Demographics, Societal Statistics and Economic Statistics	Free Planning Information Concerning Jobs, Business and Economic Statistics, Population and Housing Statistics, and Help with Census Products (i.e., statistics, maps, reports, etc.), State Government, etc. Note: For statistics regarding clean water, wetlands, conservation, disasters, natural resources, rivers, and other subjects covered separately in this document, use the contact information already provided in those subject matter areas of this document. (For example, contact the Missouri Department of Natural Resources (DNR), Division of State Parks, Historic Preservation Program for statistics about Missouri's Historic Preservation Program,	U.S. Census Bureau Washington DC 20233 General telephone inquiries: 301-457-4608 webmaster@census.gov Bureau of Economic Analysis (BEA) 1441 L Street NW Washington DC 20230 Public Information Office 202-606-9900 BEA Order Desk 800-704-0415 bea.doc.gov webmaster@bea.doc.gov Bureau of Labor Statistics Division of Information Services 2 Massachusetts Avenue, N.E. Room 2860 Washington, D. C. 20212 202-691-5200 800-877-8339

	by looking for the contact information under **Historic Preservation Fund Grants** on page 14 of this document).	Fax 202-691-7890 blsdata_staff@bls.gov
Demographics, Societal Statistics and Economic Statistics (Continued)	Free Information Concerning Jobs, Business and Economic Statistics, Population and Housing Statistics, and Help with Census Products (i.e., statistics, maps, reports, etc.), State Government, etc. *Note: For statistics regarding clean water, wetlands, conservation, disasters, natural resources, rivers, and other subjects covered separately in this document, use the contact information already provided in those subject matter areas of this document.* *(For example, contact the Missouri Department of Natural Resources (DNR), Division of State Parks, Historic Preservation Program for statistics about Missouri's Historic Preservation Program, by looking for the contact information under **Historic Preservation Fund Grants** on page 14 of this document).*	Missouri State Census Data Center Missouri State Library 600 W. Main Street PO Box 387 Jefferson City, MO 65102 Ms.Debbie Pitts (573) 526-7648 FAX (573) 751-3612 pittsd@sosmail.state.mo.us Small Business Research Information Center 104 Nagogami Terrace University of Missouri-Rolla Rolla, MO 65409 Mr. Fred Goss Ms. Cathy Frank (573) 341-6484 Office of Administration 124 Capitol Building P.O. Box 809 Jefferson City, MO 65102 Mr. Ryan Burson (573) 751-2345 bursor@mail.oa.state.mo.us Office of Social & Economic Data Analysis University of Missouri-Columbia 626 Clark Hall Columbia, MO 65211 Mr. John Blodgett (573) 884-2727 FAX(573) 884-4635 Ms. Evelyn J. Cleveland

		blodgettj@umsystem.edu clevelande@umsystem.edu Geographic Resources Center University of Missouri-Columbia 17 Stewart Hall Columbia, MO 65211
Assistance to Firefighters Grants Program	*Grants are used for personal protective equipment, firefighting equipment, vehicles, training and wellness and fitness programs.*	Mr. Tim Haithcoat (573) 882-2324 haithcoatt@missouri.edu Center for Economic Information University of Missouri-Kansas City 207 Haag Hall Kansas City, MO 64131 Mr. Peter Eaton (816) 235-2832 FAX (816) 235-5263 peaton@cctr.umkc.edu Missouri Agricultural Statistics Service 601 Business Loop 70 West Suite 240

		Columbia, MO 65203 800-551-1014 573-876-0950 573-876-0973 nass-mo@nass.usda.gov Missouri Department of Transportation Department of Transportation Building 105 West Capitol Avenue P. 0. Box 270 Jefferson City 65102 573-751-2551 Regional Office Information is available at modot.state.mo.us/local/local U.S. Fire Administration (USFA) USFA Grants Office Tel: (866) 274-0960 FAX: (866) 274-0942 E-mail:usfagrants@fema.gov

Demographics, Societal Statistics and Economic Statistics	Free Planning Information Concerning Jobs, Business and Economic Statistics, Population and Housing Statistics, and Help with Census Products (i.e., statistics, maps, reports, etc.), State Government, etc. Note: For statistics regarding clean water, wetlands, conservation, disasters, natural	U.S. Census Bureau Washington DC 20233 General telephone inquiries: 301-457-4608 webmaster@census.gov Bureau of Economic Analysis (BEA) 1441 L Street NW Washington DC 20230

	resources, rivers, and other subjects covered separately in this document, use the contact information already provided in those subject matter areas of this document. (For example, contact the Missouri Department of Natural Resources (DNR), Division of State Parks, Historic Preservation Program for statistics about Missouri's Historic Preservation Program, by looking for the contact information under **Historic Preservation Fund Grants** on page 14 of this document).	Public Information Office 202-606-9900 BEA Order Desk 800-704-0415 bea.doc.gov webmaster@bea.doc.gov Bureau of Labor Statistics Division of Information Services 2 Massachusetts Avenue, N.E. Room 2860 Washington, D. C. 20212 202-691-5200 800-877-8339 Fax 202-691-7890 blsdata_staff@bls.gov Missouri State Census Data Center Missouri State Library 600 W. Main Street PO Box 387 Jefferson City, MO 65102 Ms.Debbie Pitts (573) 526-7648 FAX (573) 751-3612 pittsd@sosmail.state.mo.us

Demographics, Societal Statistics and Economic Statistics (Continued)	Free Information Concerning Jobs, Business and Economic Statistics, Population and Housing Statistics, and Help with Census Products (i.e., statistics, maps, reports, etc.), State Government, etc. *Note: For statistics regarding clean water, wetlands, conservation, disasters, natural resources, rivers, and other subjects covered separately in this document, use the contact information already provided in those subject matter areas of this document.* *(For example, contact the Missouri Department of Natural Resources (DNR), Division of State Parks, Historic Preservation Program for statistics about Missouri's Historic Preservation Program, by looking for the contact information under* ***Historic Preservation Fund Grants*** *on page 14 of this document).*	Small Business Research Information Center 104 Nagogami Terrace University of Missouri-Rolla Rolla, MO 65409 Mr. Fred Goss Ms. Cathy Frank (573) 341-6484 Office of Administration 124 Capitol Building P.O. Box 809 Jefferson City, MO 65102 Mr. Ryan Burson (573) 751-2345 bursor@mail.oa.state.mo.us Office of Social & Economic Data Analysis University of Missouri-Columbia 626 Clark Hall Columbia, MO 65211 Mr. John Blodgett (573) 884-2727 FAX(573) 884-4635 Ms. Evelyn J. Cleveland blodgettj@umsystem.edu clevelande@umsystem.edu Geographic Resources Center University of Missouri-Columbia 17 Stewart Hall Columbia, MO 65211 Mr. Tim Haithcoat (573) 882-2324 haithcoatt@missouri.edu

Assistance to Firefighters Grants Program	*Grants are used for personal protective equipment, firefighting equipment, vehicles, training and wellness and fitness programs.*	Center for Economic Information University of Missouri-Kansas City 207 Haag Hall Kansas City, MO 64131 Mr. Peter Eaton (816) 235-2832 FAX (816) 235-5263 peaton@cctr.umkc.edu Missouri Agricultural Statistics Service 601 Business Loop 70 West Suite 240 Columbia, MO 65203 800-551-1014 573-876-0950 573-876-0973 nass-mo@nass.usda.gov Missouri Department of Transportation Department of Transportation Building 105 West Capitol Avenue P. 0. Box 270 Jefferson City 65102 573-751-2551 Regional Office Information is available at modot.state.mo.us/local/local U.S. Fire Administration (USFA) USFA Grants Office Tel: (866) 274-0960 FAX: (866) 274-0942 E-mail:usfagrants@fema.gov

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	(For example, contact the Missouri Department of Natural Resources (DNR), Division of State Parks, Historic Preservation Program for statistics about Missouri's Historic Preservation Program, by looking for the contact information	202-691-5200 800-877-8339 Fax 202-691-7890 blsdata_staff@bls.gov Missouri State Census Data Center Missouri State Library 600 W. Main Street PO Box 387 Jefferson City, MO 65102 Ms.Debbie Pitts (573) 526-7648 FAX (573) 751-3612 pittsd@sosmail.state.mo.us
	under **Historic Preservation Fund Grants** on page 14 of this document).	Mr. Fred Goss Ms. Cathy Frank (573) 341-6484
Demographics, Societal Statistics and Economic Statistics (Continued)	Free Information Concerning Jobs, Business and Economic Statistics, Population and Housing Statistics, and Help with Census Products (i.e., statistics, maps, reports, etc.), State Government, etc. *Note: For statistics*	Small Business Research Information Center 104 Nagogami Terrace University of Missouri-Rolla Rolla, MO 65409 Office of Administration 124 Capitol Building P.O. Box 809 Jefferson City, MO 65102 Mr. Ryan Burson (573) 751-2345

	regarding clean water, wetlands, conservation, disasters, natural resources, rivers, and other subjects covered separately in this document, use the contact information already provided in those subject matter areas of this document. *(For example, contact the Missouri Department of Natural Resources (DNR), Division of State Parks, Historic Preservation Program for statistics about Missouri's Historic Preservation Program, by looking for the contact information under* ***Historic Preservation Fund Grants*** *on page 14 of this document)*	bursor@mail.oa.state.mo.us Office of Social & Economic Data Analysis University of Missouri-Columbia 626 Clark Hall Columbia, MO 65211 Mr. John Blodgett (573) 884-2727 FAX(573) 884-4635 Ms. Evelyn J. Cleveland blodgettj@umsystem.edu clevelande@umsystem.edu Geographic Resources Center University of Missouri-Columbia 17 Stewart Hall Columbia, MO 65211 Mr. Tim Haithcoat (573) 882-2324 haithcoatt@missouri.edu Center for Economic Information University of Missouri-Kansas City 207 Haag Hall Kansas City, MO 64131

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Assistance to Firefighters Grants Program		

Local Community Resources	**Community Budget** **Chamber of Commerce** **Local Businesses & Industries** **Civic Groups** **Red Cross** **Utility Companies** **Electric Coops** **Federal & State Government**	Developed by each local community. For example – More than 50 companies and service organizations have signed as partners with the City of Hannibal in helping to make the city safer. Continental Cement has agreed to supply the cement, lime and sand for pouring concrete walls and the floor of a tornado safe room in the 2001-2001 Building Trades Department Home. FirStar Bank and Hannibal National Bank have agreed to provide a ½% discount on Home Equity Fixed Rate Loans utilized for home repair in the event of a declared disaster. Southwestern Bell is providing free of charge a Project Impact page in next year's phone book. Pillsbury, United Cities Gas, Abel Oil, Abney Home Improvement, and Gateway Financial Resources have all made financial donations to Hannibal's partnership with SEMA and FEMA as a participating *Project Impact* community. Bolivar has partnered with SEMA and FEMA and signed several partner businesses that will provide concrete forms, concrete, and other materials to assist the community to construct a community tornado/storm safe room for about 150 people in the new sports complex. WalMart, Empire Gas and Radio Shack have teamed to help the community provide NOAA weather warning radios to non-profit daycare centers, schools and nursing homes. Neosho has partnered with SEMA, FEMA and the NRCS to perform flood buyouts, develop flood retention basins

		and construct a new greenway and recreational area. Neosho's citizens partnered when they passed a city sales tax to help pay the local match for the projects. Piedmont has partnered with SEMA, FEMA, Conservation, the NWS/NOAA, MO DNR, private organizations, local businesses and private citizens to conduct flood buyouts, creek clean ups, a creek bank stabilization project, develop a new severe weather warning system and construct a new greenway and park.