

Osage County Multi-Jurisdiction Natural Hazard Mitigation Plan



Meramec Regional Planning Commission • March 2018



CONTRIBUTORS

Osage County Hazard Mitigation Planning Committee

The individuals invited to participate in the Osage County hazard mitigation planning committee are as follows:

Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Organization
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Larry Kleithermes	Associate Commissioner	County	Osage Co.
Michael Bonham	Sherriff	Sherriff's Dept.	Osage Co.
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-	Water & Street Superintendent	Public Works	Chamois
-	Fire Chief	Fire Dept.	Chamois
-	EMD	Emergency Management	Chamois
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Dwight Massey	Mayor	City Admin.	Linn
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Richard Bray	Chief of Police	Police Dept.	Linn
Ron Hoffman	Fire Chief	Fire Dept.	Linn
Christopher Bursnall	Mayor	City Admin.	Meta
Linda Bode	Clerk	City Admin.	Meta
-	Fire Chief	Fire Dept.	Meta
Tammy Massman	Mayor	City Admin.	Westphalia
Kerry Bax	Clerk	City Admin.	Westphalia
Jim Roark	Fire Chief	Fire Dept.	Westphalia

Name	Title	Department	Jurisdiction/Agency/Organization
Lyle Best	Superintendent	School District	Osage Co. R-I
Lenice Basham	Superintendent	School District	Osage Co. R-II
Chuck Woody	Superintendent	School District	Osage Co. R-III

*Sign in sheets from planning meetings are included in Appendix B.

The individuals invited to represent stakeholders on the Osage County hazard mitigation planning committee are as follows:

Stakeholder Representatives

Name	Title	Agency/Organization
-	-	Ameren UE
-	-	Three Rivers Electric Cooperative
Michael A. Turner	Captain	MSHP, Troop F
-	-	MoDOT
-	-	Socket Internet Services
-	-	Mediacom Comm. Corp.
-	Administrator	Linn Living & Rehabilitation
-	Administrator	Westphalia Hills
-	-	American Red Cross
-	-	MO SEMA
-	-	U.S. Army Corps of Engineers
-	-	FEMA Region VII
Josh Hundley	Biologist	U.S. Fish & Wildlife Service
-	-	Missouri Dept. of Conservation
-	-	USDA, NRCS
-	-	Charter Communications
Dr. Shawn Strong	President	State Technical College of Missouri
-	-	Unterrified Democrat
-	-	Capital Region Medical Clinic
-	-	Community Health Center

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EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Osage County and participating cities and school districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses to the county and its communities and schools resulting from hazard events. The plan is an update of a plan that was approved on March 22, 2013. The original plan was approved in April 2005. 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) Hazard Mitigation Assistance Grant Programs.

The county Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the following 9 jurisdictions that participated in the planning process:

- Osage County
- City of Chamois
- Village of Freeburg
- City of Linn
- City of Meta
- City of Westphalia
- Osage Co. R-I School District
- Osage Co. R-II School District
- Osage Co. R-III School District

Osage County and the jurisdictions listed above developed a multi-jurisdictional Hazard Mitigation Plan that was originally approved by FEMA in April 2005 with an update approved by FEMA on March 22, 2013. This current planning effort serves as an update (hereafter referred to as the 2018 Hazard Mitigation Plan).

The plan update process followed a methodology prescribed by FEMA, which began with the formation of a Mitigation Planning Committee (MPC) comprised of representative from Osage County and participating jurisdictions. The MPC updated the risk assessment that identified and profiled hazards that pose a risk to Osage County and analyzed the vulnerability to these hazards. The MPC also examined the capabilities in place to mitigate them, with emphasis on changes that have occurred since the previously approved plan was adopted. The MPC determined that the planning area is vulnerable to several hazards that are identified, profiled and analyzed in this plan. Riverine and flash flooding, winter storms, severe thunderstorms/hail/lightening/high winds and tornadoes are among the hazards that historically have had a significant impact.

Based upon the risk assessment, the MCP reviewed goals for reducing risk from hazards. The goals are listed below:

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 MPC developed recommended mitigation actions, which are detailed in Chapter 4 of this plan. The MPC developed an implementation plan for each action, which identifies priority level, responsible agency, timeline, cost estimate, potential funding sources and progress to date.

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PREREQUISITES

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.

This plan has been reviewed by and adopted with resolutions or other documentation of adoption by all participating jurisdictions and schools districts. The documentation of adoptions is included in Appendix D.

The following jurisdictions participated in the development of this plan and have adopted the multi-jurisdictional plan.

- Osage County
- City of Chamois
- Village of Freeburg
- City of Linn
- City of Meta
- City of Westphalia
- Osage Co. R-I School District
- Osage Co. R-II School District
- Osage Co. R-III School District

Model Resolution

RESOLUTION NO. _____

A RESOLUTION TO ADOPT THE OSAGE COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, (Government/District) 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-Jurisdiction Natural Hazards 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, (Government/District) fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

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

WHEREAS, (Government/District) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Osage County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of (Government/District) demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this 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 (Government/District) adopts the Osage County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

Certifying Official

Date

Witness

Date

1 Introduction and Planning Process

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1.1 Purpose

Osage County and eight other jurisdictions prepared this local hazard mitigation plan to guide hazard mitigation planning for the purpose of better protecting the people and property of the county from the effects of natural hazard events. 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.” 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.

The mission of the Osage County Hazard Mitigation Plan is to substantially and permanently reduce the county’s vulnerability to natural hazards. This plan demonstrates the communities’ commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources for the next five years. 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.

This plan was also developed to make Osage County and participating cities and school districts eligible for certain federal disaster assistance as required by the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). Those programs include the Federal Emergency Management Agency’s (FEMA) Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program and Flood Mitigation Assistance Program. The plan has been prepared in accordance with the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and developed and organized within the rules and regulations established under 44 CFR 201.6 published in the *Federal Register* on February 26, 2002 and finalized in October 31, 2007. Those jurisdictions within Osage County that do not adopt the 2018 plan will not be eligible for funding through these grant programs.

1.2 Background and Scope

The 2018 Osage County Hazard Mitigation Plan is an update of the original plan developed and approved in April 2005. The most recent update was approved by FEMA on March 22, 2013. The revised document will be valid for five years from approval by FEMA. It is a multi-jurisdictional plan that covers the participating jurisdictions within the county's borders, all of whom adopted both the 2013 and 2018 plan, excluding Argyle:

- Osage County
- City of Chamois
- Village of Freeburg
- City of Linn
- City of Meta
- City of Westphalia
- Osage Co. R-I School District
- Osage Co. R-II School District
- Osage Co. R-III School District

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 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 through the planning process.

The plan is organized as follows:

- Executive Summary
- 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.

Table 1.1 Summary of 2017 Revisions to Plan

Chapter	Summary of Revisions
Chapter 1 Introduction and Planning Process	Updated with 2017 information and reformatted to follow the 4-4-17 model outline. Provided information on how the planning process followed the <i>Local Mitigation Planning Guidance (March 2013)</i> , the <i>Local Mitigation Plan Review Guide (October 1, 2011)</i> , and <i>Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013)</i> . Added information on RiskMAP
Chapter 2 Planning Area Profile and Capabilities	Updated with 2017 data and reformatted to follow the 4-4-17 model outline.
Chapter 3 Risk Assessment	Updated with 2017 data and reformatted to follow the 4-4-17 model outline.
Chapter 4 Mitigation Strategy	Updated with 2017 data and reformatted to follow the 4-4-17 model outline, including substituting action item worksheets for the narrative used in the previous plan to provide required information for each action item.
Chapter 5 Plan Implementation and Maintenance	Updated with 2017 data and reformatted to follow the 4-4-17 model outline.
Appendices	Updated with 2017 data and reformatted to follow the 4-4-17 model outline.

*2017 data encompasses the most recent available data.

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 (MPC) first organized in 2005 when the Missouri State Emergency Management Agency (SEMA) provided grant funds and contracted with the Meramec Regional Planning Commission (MRPC) to develop a hazard mitigation plan for the county. MRPC is a council of local governments in south central Missouri serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties. The initial plan was completed and approved in April 2005. An update was completed and approved in March 2013.

MRPC's role in developing and updating the Osage County Hazard Mitigation plan included assisting in the formation of the MPC and facilitating the planning meetings; soliciting public input; and producing the draft and final plan for review by the MPC, SEMA and FEMA. Staff carried out the research and documentation necessary for the planning process. In addition, MRPC compiled and presented the data for the plan, helped the MPC with the prioritization process and insured that the final document met the DMA requirements established by federal regulations and the most current planning guidance.

In recent years, SEMA has secured grants to review and update the Osage County Multi-Hazard Mitigation Plan and contracted with MRPC to facilitate the planning process for the plan update. MRPC staff has followed the most current planning guidance provided by FEMA for the purpose of insuring that the updated plan meets all of the requirements of the Disaster Mitigation Act as established by federal regulations.

The Osage County Multi-Hazard Mitigation Plan was developed as the result of a collaborative effort among Osage County, the cities/villages of Chamois, Freeburg, Linn, Meta, Westphalia, Osage R-I School District, Osage R-II School District, Osage Co. R-III School District, 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, the county health department, local businesses and utility companies. The mailing list is included in **Appendix B: Planning Process**. This cross-section of local representatives was chosen for their experience and expertise in emergency planning and community planning in Osage County. Staff worked with the Osage County MPC to collect and analyze information on hazards and disasters that have impacted the county as well as document mitigation activities that have occurred during the past five years.

Due to time and duty constraints, not all the jurisdictions that were invited to participate in the MPC were able to attend meetings. However, all of the jurisdictions, excluding Argyle, provided information to update the document, reviewed the plan and provided input. Interviews were conducted with stakeholders from the community and several planning meetings were conducted during the plan review and update.

The 2018 planning process began with a meeting held on April 14, 2017. MRPC staff provided an overview of the planning process and review of the existing hazard mitigation plan. The

group reviewed and discussed hazard mitigation goals and what progress had been made on hazard mitigation action items over the past four years. The second meeting was held on June 9, 2017. The MPC reviewed and updated the list of action items, making note of those that had been accomplished, those that were no longer applicable and adding a number of projects to the list. The group then reviewed the action items, applying the STAPLEE method (Social; Technical; Administrative; Political; Legal; Economic; Environmental) and applying cost benefit analysis to best determine priorities. A full description of the prioritization process is included in Chapter 4.

County road and bridge staff attended meetings on April 14, 2017 and June 9, 2017. County Associate Commissioners and staff provided a comprehensive list of completed mitigation projects as well as proposed new projects to be included in the plan update. Staff incorporated these action items and completed projects into the planning materials reviewed and prioritized by the MPC in June.

The final list of prioritized action items were mailed out to all jurisdictions and entities that had been invited to participate on the MPC. Recipients were asked to review and provide feedback if they had concerns about how any of the projects were ranked. The draft plan was made available on-line and MPC members were notified on where to find the document and asked to review and provide feedback.

All planning committee members were provided drafts of sections of the plan as they became available. Members of the planning committee reviewed the draft chapters and provided valuable input to MRPC staff. Additionally, through public committee meetings, press releases and draft plan posting on MRPC's website, ample opportunity was provided for public participation. Jurisdictions in surrounding counties were also notified of where to view the revised plan and encouraged to provide input. Any comments, questions and discussions resulting from these activities were given strong consideration in the development of this plan.

Osage County further assisted in the planning process by issuing public notice of the planning meetings as well as by providing meeting facilities at the courthouse. County officials attended and participated in meetings.

The MPC 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; and
- Assisting with public participation and plan adoption

The MPC did not formally meet on a regular basis as recommended in the plan. However, mitigation has become a regular topic of discussion among the majority of jurisdictions included in the plan. A number of mitigation projects have been completed in the county and hazard mitigation concepts are being incorporated into other planning projects.

Table 1.2 provides information on who actively participated in the planning process and who they represented:

Table 1.2 Jurisdictional Representatives Osage County Mitigation Planning Committee

Name	Title	Department	Jurisdiction/Agency/Organization	Direct Participation	Indirect Participation
Edward Fowler	Chief Deputy	Sheriff's Dept.	Osage Co.	X	
Susan Long	Administrator	Health Dept.	Osage Co.	X	
Dave Dudenhoeffer	Presiding Commissioner	County	Osage Co.	X	
Randy Atkin	Supervisor	Road & Bridge	Osage Co.	X	
Andrea Rice	911/EMA	Emergency Management	Osage Co.	X	
Larry Kliethermes	Assoc. Commissioner	County	Osage Co.	X	
John Glavin	Assoc. Commissioner	County	Osage Co.	X	
Jeff Buthod	Principle	School District	Osage Co. R-III	X	
Tom Wansing	President	Comm. Fire Association	Freeburg	X	
Linda Bode	City Clerk	City Admin.	Meta	X	
Harold Libbert	Meta	City Representative	Meta	X	
Lyle Best	Superintendent	School District	Osage Co. R-I	X	
Dorcas Ruff	City Clerk	City Admin.	Chamois	X	
Jeffery Brown	-	City Representative	Chamois	X	
Dr. Lenice Basham	Superintendent	School District	Osage Co. R-II		X
Chuck Woody	Superintendent	School District	Osage Co. R-III		X
Darryl Haller	Chairman of the Board	City Admin.	Freeburg		X
Tye DeCramer	Trooper	Highway Patrol	MSHP	X	
Kerry Bax	City Clerk	City Admin.	Westphalia		X
Carrie Grellner	City Clerk	City Admin.	Linn		X

1.5 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.

Osage County invited incorporated cities, school districts, utility companies, medical facilities, nursing facilities, county health department, and not-for-profits to participate in the hazard mitigation planning process. Letters and/or emails were sent to each of the following:

- Osage County
- Village of Argyle
- City of Chamois
- Village of Freeburg
- City of Linn
- City of Meta
- City of Westphalia
- Osage Co. R-I School District
- Osage Co. R-II School District
- Osage Co. R-III School District
- Ameren UE
- Three Rivers Electric Cooperative
- American Red Cross
- Osage Co. Health Dept.
- Capital Region Medical Clinic
- Community Health Center
- Linn Living & Rehabilitation
- Westphalia Hills
- Missouri Dept. of Conservation
- MoDOT
- MO SEMA
- Missouri State Highway Patrol
- FEMA Region VII
- USFWS
- USACE
- USDA, NRCS
- Socket Internet Services
- State Technical College of Missouri
- Unterrified Democrat

A copy of the mailing list and invitation letters are included in **Appendix B: Planning Process**.

The Disaster Mitigation Act requires that each jurisdiction must participate in the planning process and formally adopt the plan. There were a number of criteria established for participation. In order to be considered participating in the planning process, jurisdictions needed to do at least one of the following as well as adopt the plan:

- Providing a representative to serve on the planning committee;
- Participating in at least one or more meetings of the planning committee;
- Providing data for plan development through surveys and/or interviews;
- Provide information on existing mitigation actions from the previous plan and/or provide additional mitigation actions for the plan;
- Remove actions from the previous plan that were not implemented because they were impractical, inappropriate, not cost effective or were otherwise not feasible;
- Identify goals and mitigation actions for the plan;
- Prioritize mitigation actions/projects for the plan;
- Review and comment 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;
- Provide in-kind match documentation; and
- Formally adopt the plan prior to submittal of the final draft to SEMA and FEMA for final approval.

Not all jurisdictions were able to attend the MPC meetings. Most communities and school districts in Osage County are small and understaffed. It was not always feasible for representatives to travel to the meetings. However, all jurisdictions met at least one of the participation criteria. The jurisdictions that participated in the process, as well as their level of participation in the process are shown in **Table 1.3**. Documentation of meetings, including sign-in sheets are included in **Appendix B: Planning Process**.

Table 1.3 Jurisdictional Participation in the Planning Process

Jurisdiction	Meeting #1	Meeting #2	Interviews	Data Collection Survey/Call	Update/Develop/Prioritize Mitigation Actions	Review/Comment on Plan
Osage Co.	X	X		X	X	
Chamois		X		X	X	
Freeburg		X		X	X	
Linn				X	X	
Meta		X		X	X	
Westphalia				X	X	
Osage Co. R-I		X		X	X	
Osage Co. R-II				X	X	
Osage Co. R-III		X		X	X	

1.6 The Planning Steps

Osage County and MRPC worked together to develop the plan and based the planning process in FEMA’s *Local Mitigation Planning Guidance (March 2013)*, the *Local Mitigation Plan Review Guide (October 1, 2011)*, and *Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013)*. The planning guides used for the initial plan development are no longer current and were not used in the update. 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 committee based their activities on the 10-step planning process adapted from FEMA’s Community Rating System (CRS) and Flood Mitigation Assistance programs. By following the 10-step planning process, the plan met funding eligibility requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System and Flood Mitigation Assistance Program.

Table 1.4 Osage County Plan Update Process

Community Rating System (CRS) Planning Steps (Activity 510)	Local Mitigation Planning Handbook Tasks (44 CFR Part 201)
Step 1: Organize	Task 1: Determine the Planning Area and Resources Task 2: Build the Planning Team 44 CFR 201.6(c)(1)
Step 2: Involve the public	Task 3: Create an Outreach Strategy 44 CFR 201.6(b)(2) & (3)
Step 3: Coordinate	Task 4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)
Step 4: Assess the hazard	Task 5: Conduct a Risk Assessment 44 CFR 201.6(c)(2)(i) 44 CFR 201.6(c)(2)(ii) & (iii)
Step 5: Assess the problem	
Step 6: Set goals	Task 6: Develop a Mitigation Strategy 44 CFR 201.6(c)(3)(i); 44 CFR 201.6(c)(3)(iii)
Step 7: Review possible activities	
Step 8: Draft an action plan	
Step 9: Adopt the plan	Task 8: Review and Adopt the Plan
Step 10: Implement, evaluate, revise	Task 7: Keep the Plan Current Task 9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)

Step 1: Organize the Planning Team (Handbook Tasks 1 & 2)

The planning area was determined by the boundaries of Osage County. MRPC staff provided general information on the hazard mitigation plan review process at regular MRPC board meetings – providing both written and oral reports on the review process, schedules for the various plans; which ones had been funded; described match requirements; and asked mayors and commissioners to think about who should be included on the planning committees for each respective county.

The planning team was selected by contacting the leadership of each jurisdiction, explaining the process, and asking them to send appropriate representation to the planning meetings. In addition they were asked to provide input on who they wanted to include on the planning committee. Stakeholders such as electric cooperatives and sewer districts were also contacted

and invited. In addition, it was suggested that representatives of some of the local critical facilities be included on the planning committee, such as medical clinics and nursing homes. All meetings were also publicized to allow additional interested parties to attend and participate. Osage County offered to host the meetings, the following dates were selected – April 14, 2017 and June 9, 2017.

At the first meeting on April 14, 2017, MRPC staff made introductions and provided an overview of hazard mitigation planning and the Osage County Hazard Mitigation plan. The group reviewed and discussed the goals and objectives. A good deal of the meeting was spent sharing information on what progress had been made in five years and discussing current and future needs and adding new mitigation actions to the existing list. Staff wrapped up the meeting by explaining the process that would be used to prioritize the action items at the next meeting – using both the STAPLEE method and analyzing the cost benefit.

At the second meeting on June 9, 2017, the group reviewed the complete list of action items developed at the April 14, 2017 meeting. MRPC provided an explanation of the prioritization process using both STAPLEE and cost benefit scoring. The MCP then provided input on prioritizing all of the action items. Staff took those recommendations and developed a matrix of the action items with the STAPLEE and cost benefit scores. This matrix was mailed out to all of the individuals and organizations on the mailing list for the MPC with a request for feedback. All suggestions for changes were incorporated into the plan. The group also reviewed the list of critical facilities in the plan and provided feedback on any changes or additions to that list. It was decided at this meeting that staff would mail out data collection surveys to each of the jurisdictions and begin working on the plan. Plan chapters would be shared with the MPC via mail, email and website. If necessary the group would meet again but no date was set.

Osage County road and bridge staff attended both meetings and provided insight on county mitigation projects and action items in detail. The complete list of action items provided by the county was incorporated into the plan. The MPC reviewed and prioritized all of the action items at their June 9, 2017 meeting.

Table 1.5 Schedule of MPC Meetings outlines the dates that meetings were held and topics covered.

Documentation of the planning process can be found in **Appendix B: Planning Process**.

Table 1.5 Schedule of MPC Meetings

Meeting	Topics	Date
Planning Meeting #1	Overview of mitigation planning & Osage County plan; Discussion of goals & objectives; Discussion of changes to goals and action items; Discussion of natural hazard events of the last five years, any new data and any changes in mitigation needs	April 14, 2017
Planning Meeting #2	Review of action items & prioritization process; discussion and identification of critical facilities	June 9, 2017
Meeting with Road & Bridge staff	Road & Bridge staff came prepared with a list of mitigation projects that they wanted included in the plan document as well as a list of mitigation projects completed by the road department over the past five years for inclusion in the plan.	April 14, 2017 and June 9, 2017

Step 2: Plan for Public Involvement (Handbook Task 3)

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 MPC followed the same process for public involvement and input as was followed during the initial planning process. All MPC meetings were held at the Osage County Emergency Operations Center. Public notices were placed at the courthouse and press releases were completed prior to the meeting to make the public aware. Meetings were also posted on the MRPC webpage. The public was notified each time the plan or sections of the plan was presented for review and discussion. MPC members and public officials within the county as well as in surrounding counties were contacted, directed to the MRPC website (www.meramecregion.org) where a copy of the draft plan could be viewed or downloaded. The document was made available on the website on March 22, 2018. Hard copies of the final draft were placed at the Osage County Courthouse and city hall buildings for Chamois, Freeburg, Linn, Meta, and Westphalia. A hard copy of the draft could be obtained directly from MRPC by request. Members of the local media, both radio, newspaper and on-line were invited to attend planning meetings. Information was shared by these media outlets with the public on the planning process and where to find draft copies of the plan. Copies of public notices and press release are included in **Appendix A: Planning Process**.

No comments were received from the public.

Step 3: Coordinate with Other Departments and Agencies and Incorporate Existing Information (Handbook Task 3)

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.

Every effort was made to encourage input from stakeholders whose goals and interests interface with hazard mitigation in Osage County including:

- Neighboring communities
- Local and regional agencies involved in hazard mitigation activities
- Agencies with the authority to regulate development
- Businesses
- Academia
- Other private and non-profit interests

State stakeholders involved in the hazard mitigation planning process included the Missouri State Highway Patrol (MSHP). Representatives from HSHP attended the second planning meeting and provided input. No federal stakeholders were involved during the planning process.

Jurisdictional representatives on the MPC were asked to share and solicit information from within and outside of their jurisdictions. A broad spectrum of entities other than the jurisdictions named in the plan, were invited to participate in the planning process.

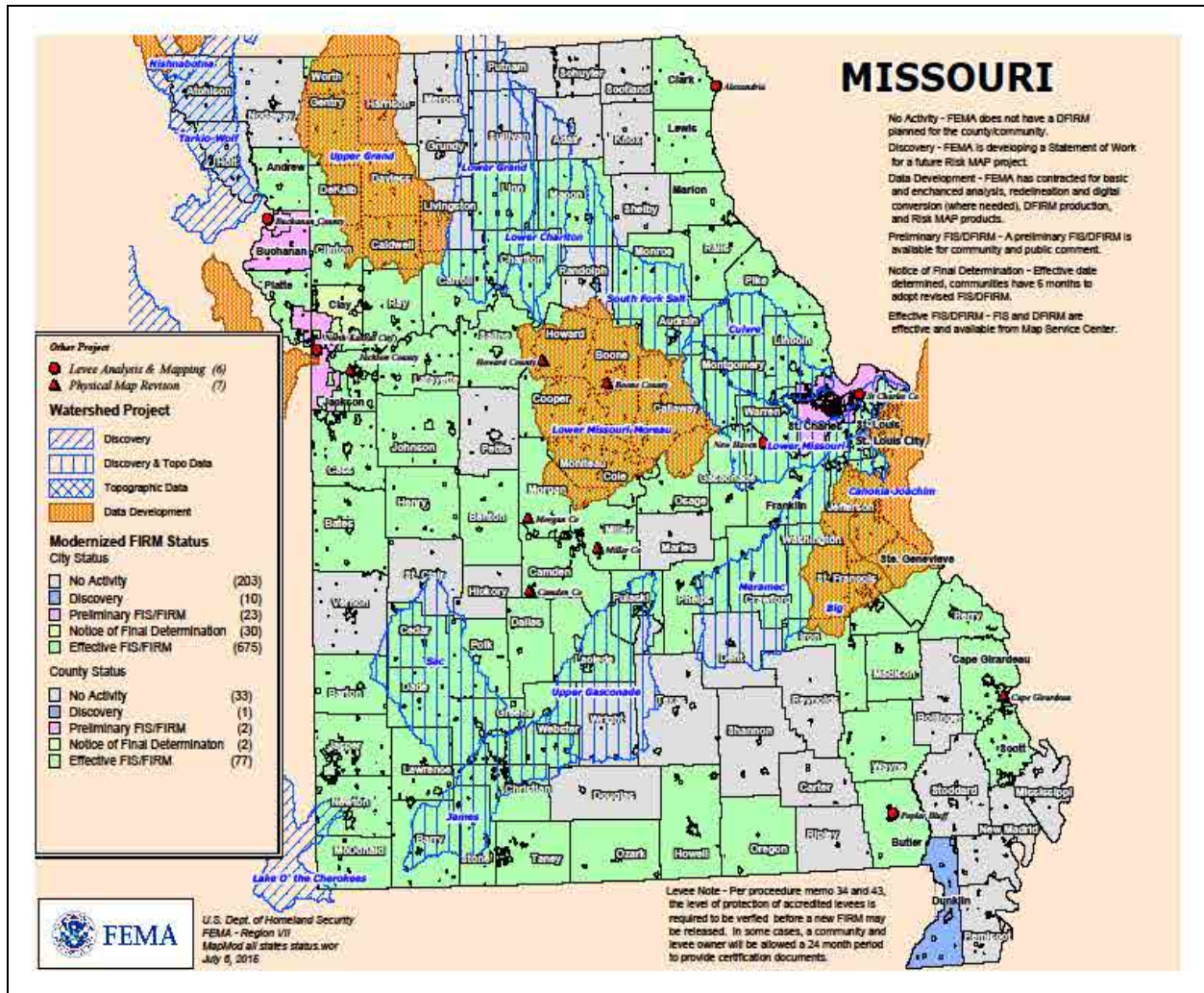
The survey provided to every jurisdiction asked how mitigation actions were being incorporated into other planning documents. The county road and bridge department did a good job of incorporating mitigation projects into their regular maintenance program. Those projects have been incorporated into the updated plan document. Hazard mitigation goals and action items have also be incorporated, where applicable, in the Community Economic Development Strategy (CEDS).

Coordination with FEMA Risk MAP Project

Osage County is currently in the Effective FIS/FIRM phase for Modernized FIRM Status, and Data Development phase for Watershed Projects. Risk MAP provides mitigation planning support in a variety of ways including helping in the assessment of risks and identifying action items to reduce vulnerability. In addition, this project will provide tools to improve the understanding of risk by local officials and the general public.

Figure 1.1 illustrates the current status of Missouri counties in regards to RiskMap projects.

Figure 1.1. Map of RiskMAP projects



Integration of Other Data, Reports, Studies and Plans

The MPC researched available plans, studies, reports and technical information during development of the update. The intent was to identify existing data and information, shared objectives and past and ongoing activities that would add to the update. The goal was to identify the existing capabilities and planning mechanisms to implement the mitigation strategy. Osage County is a rural area with the largest community’s population at approximately 1,485 (Linn). Not all of the participating communities have planning or zoning, subdivision regulations or other mechanisms for controlling the development of land. Some of the jurisdictions do have ordinances and planning documents. Following is a list of the documents that were reviewed:

- Local planning and zoning ordinances
- County EOP
- Crisis Plans (school districts)
- Comprehensive Plans
- Economic Development Plans

- Capital Improvement Plans
- Regional Transportation Plan
- Osage Co. Road & Bridge Policy and Procedure Manual
- Levee District Emergency Preparedness Plan
- Floodplain management ordinances and flood Insurance Risk Maps (FIRMs)

In addition to information available from local jurisdictions, a number of data sources, reports, studies and plans were used in updating the plan. Every attempt was made to gather the best available data to develop the vulnerability assessment and identify assets in the county. The Missouri State Hazard Mitigation Plan (2013) was reviewed and referenced throughout the document. Other data sources included dam information from the Missouri Department of Natural Resources and National Inventory of Dams (NID); fire reports from state agencies; Wildland/Urban Interface and Intermix data from the SILVIS Lab – Department of Forest Ecology and Management – University of Wisconsin; the Community Economic Development Strategy (CEDS); capital improvement plans from the participating jurisdictions; historic weather data and damage estimates from the National Oceanic and Atmospheric Administration; the critical facilities inventory conducted by MRPC; and road and bridge department plans/budgets.

All documents were reviewed so that the MPC would have a broad foundation of data upon which to base the planning area's risk assessment. Information from these documents and data sources are incorporated into the plan update as indicated throughout the update document.

Step 4: Assess the Hazard: Identify and Profile Hazards (Handbook Task 5)

The MPC reviewed the hazards that affected Osage County at the first planning meeting on April 14, 2017 including discussions of any hazard events that occurred during the last five years and all of the hazards included in the Missouri Hazard Mitigation plan. A variety of sources were used to identify and profile hazards. These included U.S. Census data, GIS data, HAZUS, the Missouri Spatial Data Information Service (MSDIS), statewide datasets compiled by state and federal agencies, existing plans and reports, personal interviews with MPC members and the survey completed by each jurisdiction. Data was compiled and compared to the original plan document and updates made in the 2013 revision. Every effort was made to use the most current and best data available. Additional information on the risk assessment and the conclusions drawn from the available data can be found in **Chapter 3**.

Step 5: Assess the Problem: Identify Assets and Estimate Losses

Assets for each jurisdiction were identified based on responses to the data collection survey distributed to all jurisdictions, interviews with MPC members and the critical facilities inventory conducted by MRPC. Additional sources included U.S. census, GIS data, MSDIS and HAZUS.

Losses were calculated using HAZUS data and the most recent U.S. census data available. Values reflected in the update are on structures only and do not include land values.

Jurisdictions provided information on their regulatory, personnel, fiscal and technical abilities by completing the data collection survey. The vulnerability assessment was completed using estimates from the 2013 State plan. For more information on planning area profiles and capabilities, please see **Chapter 2**.

Step 6: Set Goals (Handbook Task 6)

The goals from the initial hazard mitigation plan were reviewed at the first planning meeting on April 14, 2017. Those goals are as follows:

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.

The group indicated that the original goals were still applicable and met the needs of the jurisdictions and determined that there would be no changes to the goals.

Step 7: Review Possible Mitigation Actions and Activities

Mitigation strategy and specific action items were discussed at both MPC meetings. At the first MPC meeting the group reviewed the list in the existing plan and decided which actions could be eliminated; what needed to remain on the list; and what needed to be added. It was emphasized that any mitigation actions in the current plan that were not likely to be accomplished, due to cost factors or that did not address the risks identified in the risk assessment, should be removed from the list.

Discussions also included mitigation activities that had been completed or were in process that had not been in the original plan document. Each jurisdiction and stakeholder group was asked to provide information about mitigation activities that were needed as well as those that had been accomplished over the past five years. Meeting facilitators offered to share ideas for mitigation projects from the FEMA publication *Mitigation Ideas: As Resource for Reducing Risk to Natural Hazards (January 2013)* to help stimulate ideas and discussion.

Staff met with road and bridge representatives on April 14, 2017 and June 9, 2017 to thoroughly review their list of mitigation projects that had been completed as well as the list of projects that remained to be addressed.

As RiskMAP is in the Effective FIS/FIRM phase in Osage County, no projects have been identified through that process at this time.

In order to prioritize action items, the MPC was asked to use the STAPLEE method as well as assign a cost benefit to each activity. This allowed the group to consider a broad range of issues in order to decide which actions should be considered high, moderate or low priority. The prioritization process used by the MPC is explained as follows:

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

The benefit portion of the prioritization process helped the MPC focus on long-term mitigation solutions that demonstrated the future cost savings that could be realized by completing mitigation projects that safeguard lives and protect property.

Step 8: Draft an Action Plan

The MPC reviewed the final list of action items at the June 9, 2017 meeting and completed the prioritization process. The final list was then mailed out to all jurisdictions and members of the MPC for review and approval as everyone was not able to attend the meeting. Staff were directed by the MPC to take the finalized list after allowing time for comments, remove all action items that scored a 13 or below, and draft an action plan.

Step 9: Adopt the Plan (Handbook Task 8)

When the first draft of the plan was completed, staff posted the document on the MRPC website and provided a hard copy to the county courthouse. All MPC members, jurisdictions and surrounding jurisdictions were notified on where to find a copy of the plan to review. If requested, additional hard copies of the plan document were provided. After allowing time for comments, a letter was mailed out to all jurisdictions asking them to formally adopt the plan and providing a sample adoption resolution. A deadline was provided in order to insure receipt of adoption resolutions prior to submitting a final draft to FEMA for approval.

Step 10: Implement, Evaluate, and Revise the Plan (Handbook Tasks 7 & 9)

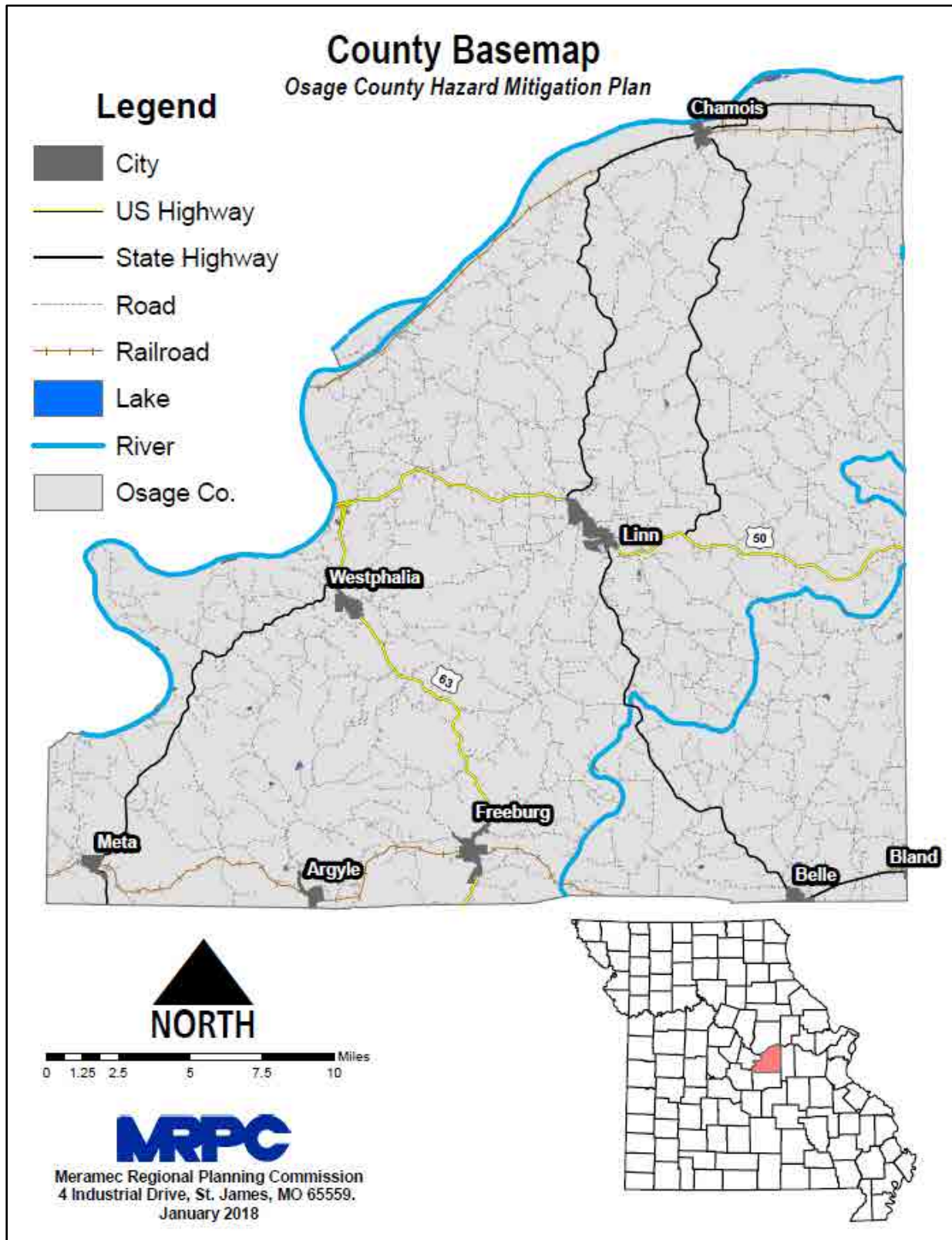
At both planning meetings (April 14, 2017 and June 9, 2017) MRPC staff advised the MPC and participating jurisdictions of the importance of continuing to meet periodically to discuss implementation of the plan as well as monitoring and maintaining the plan into the future. Chapter 5 provides details on Osage County’s strategy for implementation, evaluation and revising the plan.

2 PLANNING AREA PROFILE AND CAPABILITIES

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2.1 Osage County Planning Area Profile

Figure 2.1. Map of Osage County



Osage County has a population of approximately 13,704 according to the most recent census data¹. **Table 2.1** illustrates the percentage population growth since 2000 as compared to the statewide and national population growth. The median household income and percentage growth since 2000, as compared to statewide and national figures can be found in **Table 2.2**. Furthermore, median house value percentage growth for Osage County, Missouri, and the United States is provided in **Table 2.3**

Table 2.1. Percent Population Growth for County, State, and Nation 2000 - 2016

Demographic Region	Total Population		Change Over Period	
	2000	2016	Change	Percent
Osage County	13,062	13,704	642	4.9
Missouri	5,595,211	6,059,651	464,440	8.3
United States	282,162,411	318,558,162	36,395,751	12.9

Source: U.S. Census Bureau, Census 2000 Summary File 1; U.S. Census Bureau, 2012-2016 5-Year American Community Survey

Table 2.2. Median Household Income and Percentage Growth for County, State, and Nation 2000 - 2016

Demographic Region	Median Household Income (USD)		Change Over Period	
	2000	2016	Change	Percent
United States	\$41,994	\$55,322	\$13,328	31.7
Missouri	\$37,934	\$49,593	\$11,659	30.7
Osage County	\$39,565	\$54,119	\$14,554	36.8

Source: U.S. Census Bureau, Census 2000 Summary File 3; U.S. Census Bureau, 2012-2016 5-Year American Community Survey

Table 2.3. Median House Value Percentage Growth for County, State, and Nation 2000 - 2016

Demographic Region	Median House Value (USD)		Change Over Period	
	2000	2016	Change	Percent
United States	\$119,600	\$184,700	\$65,100	54.4
Missouri	\$89,900	\$141,200	\$51,300	57.1
Osage County	\$81,400	\$138,500	\$57,100	70.1

Source: U.S. Census Bureau, Census 2000 Summary File 3; U.S. Census Bureau, 2012-2016 5-Year American Community Survey

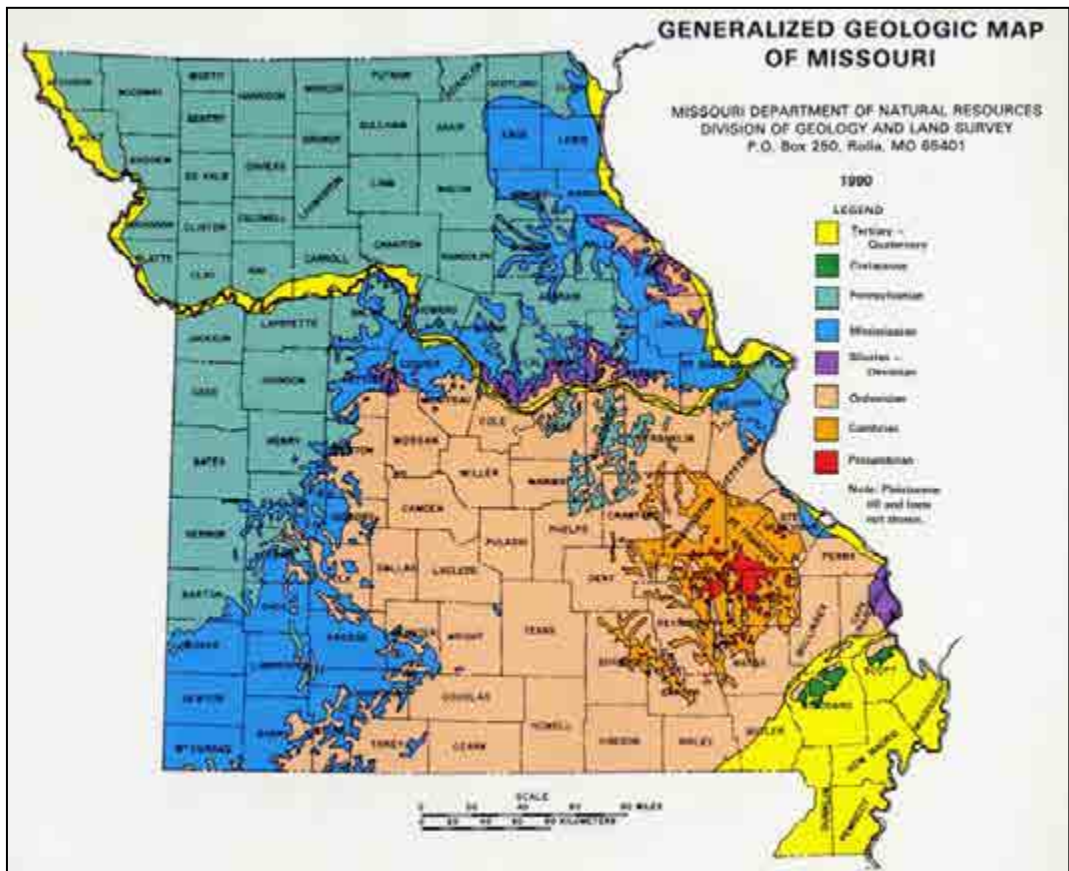
2.1.2 Geography, Geology and Topography

Osage County has a total land area of 611 square miles with 6.1 square miles of water. Approximately 42 percent of the land cover in the county is deciduous forest intermixed with 38 percent of grassland. Eight percent of the land cover within the county is cropland. The area has karst terrain, which is characterized by springs, caves, losing streams, and sinkholes. Incorporated jurisdictions within the county include the City of Argyle, City of Chamois, Village of Freeburg, City of Linn, City of Meta, and City of Westphalia.

¹ U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

The county seat, Linn, is located in central portion of the county, approximately 21 miles southeast of the state capital of Jefferson City, approximately 45 miles north of Rolla, Mo. and approximately 105 miles east of St. Louis, Mo. The county is bordered on the north by Callaway County. On the east side the county is bordered Cole and Miller Counties. To the south the county is bordered by Maries County. Gasconade County shares a border with Osage to the west.

Figure 2.2. Generalized Geologic Map of Missouri



The county is located in the Ozark Plateau – the largest outcrop area of Ordovician-age rocks in the United States. 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. Portions of this formation contain rock that dissolves and fractures over time from rainwater, thus resulting in the karst features found throughout the Ozarks.

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 Association.

Osage County is comprised of four HUC8 watersheds which include the 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. The watersheds located in Osage County can be seen in **Figure 2.3**.

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.

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.

The Lower Osage River watershed is found in central Missouri in the Missouri counties of Osage, Maries, Cole, Pulaski, Miller, Camden, Morgan, Benton, and Hickory and encompasses 2,474 square miles. The 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

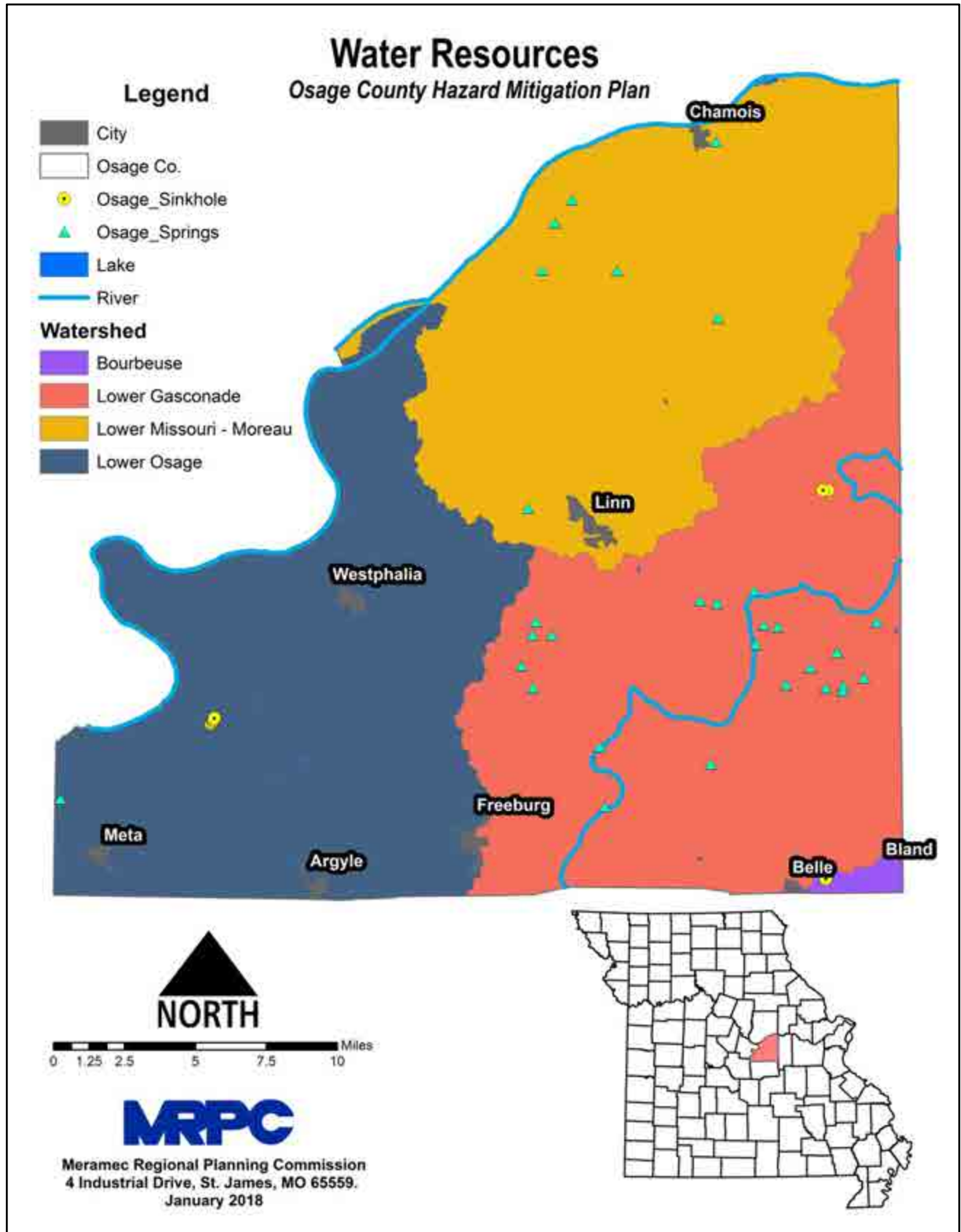
generally acidic with moderate to low fertility. Erosion rates are generally low although new housing developments, road construction, intensive confinement of livestock and overgrazing have denuded land causing locally-increased erosion and sediment pollution. Truman Dam and Bagnell Dam on the Osage River have significantly impacted the hydrology of the region. 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. 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. 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.

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.

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.

Figure 2.3. Osage County Watershed/Water Resources



2.1.3 Climate

Snow occurs between November and April, both inclusive, but most of the snow falls in December, January and February. An average of about 14 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 borderline 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. The average annual precipitation is 45.82 inches, which occurs on the average of less than 100 days per year. About half of these will be days with thunderstorms.

Because of its inland location, Missouri and Osage County are subject to frequent changes in temperature. The average annual temperature is 54.04°F. The average annual high temperature is 65.3°F with the average annual low at 42.8°F. The average high and low in January is 40°F and 20°F, respectively. In July the average high and low are 87°F and 66°F, respectively. A heat index of 115°F has been observed in Osage Co.

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°F 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°F. Temperatures below 0°F 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.

2.1.4 Population/Demographics

Table 2.4 provides population/demographic data for Osage County between 2000 and 2016 by jurisdiction. The unincorporated area of Osage County was determined by subtracting the populations of the incorporated areas from the overall county population.

Table 2.4. Osage County Population 2000-2016 by Jurisdiction

Jurisdiction	2000 Population	2016 Population	2000-2016 # Change	2000-2016 % Change
Unincorporated Osage County	10,096	10,484	388	3.8
*Argyle	164	228	64	39
Chamois	456	396	-60	-13.2
Freeburg	423	464	41	9.7
Linn	1,354	1,485	131	9.7
Meta	249	268	19	7.6
Westphalia	320	379	59	18.4

Source: U.S. Census Bureau, Census 2000 Summary File 3; U.S. Bureau of the Census, 2012-2016 5-Year American Community Survey; *Not included in the 2018 Osage Co. HMP

Table 2.5 provides information regarding the percent of individuals under the age of 5, and over 65

for the county, State, and Nation. In addition, average household size is illustrated in **Table 2.6**; including figures for Osage Co., Missouri, and the U.S. In 2016 there were an estimated 5,046 households within the county².

Table 2.5. Percent of Individuals Under the Age of 5, and Over 65 for County, State, and Nation (2016)

Location	% Under Age of 5	% Over Age of 65
Osage County	5.5	16.6
Missouri	6.2	15.3
United States	6.2	14.5

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Table 2.6. 2016 Average Household Size for County, State, and Nation

Location	Average Household Size
Osage County	2.66
Missouri	2.48
United States	2.64

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Social Vulnerability Index (SoVI ®)

The University of South Carolina developed the Social Vulnerability Index to evaluate and rank the ability to respond to, cope with, recover from, and adapt to natural disasters. The index synthesizes 30 socioeconomic variables which are primarily derived from the United States Census Bureau. **Table 2.7** depicts the Social Vulnerability Index for Osage County along with its national percentile.

Table 2.7. Social Vulnerability Index (SoVI ®)

State	County	SoVI Score (06 - 10)	National Percentile (06 - 10)
Missouri	Osage County	-4.079999924	6.2%

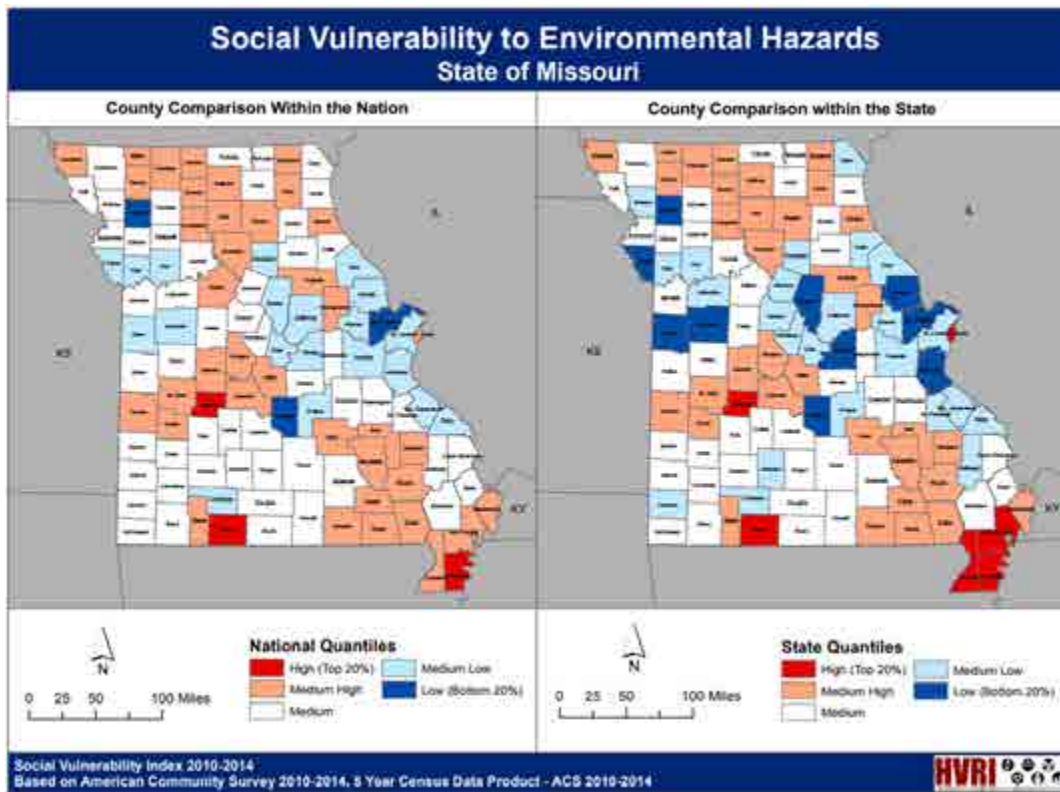
Source: <http://artsandsciences.sc.edu/geog/hvri/sovi-data>

The analysis of 30 socioeconomic variables includes the standardization of data, and reduction of variables into a condensed set of statistically optimized components; positive component loadings (+) are linked with amplified vulnerability, and negative component loadings (-) are linked with diminished vulnerability. Scores are represented as a numeric value, but have no inherent mathematical properties. To simplify the metrics of the SoVI ® Score, a negative number illustrates a county's resiliency to hazard events, and a positive number illustrates a decrease in resiliency³. Osage County's SoVI ® Score illustrates an increased resiliency to cope with natural disasters. Additionally, Osage County is included in the medium low category in comparison within the nation. **Figure 2.4** depicts Missouri's SoVI ® to environmental hazards between 2010 and 2014. Furthermore, **Figure 2.5** depicts the Nation's SoVI ® to environmental hazards between 2010 and 2014.

² U.S. Census Bureau, 2012-2016 5-Year American Community Survey

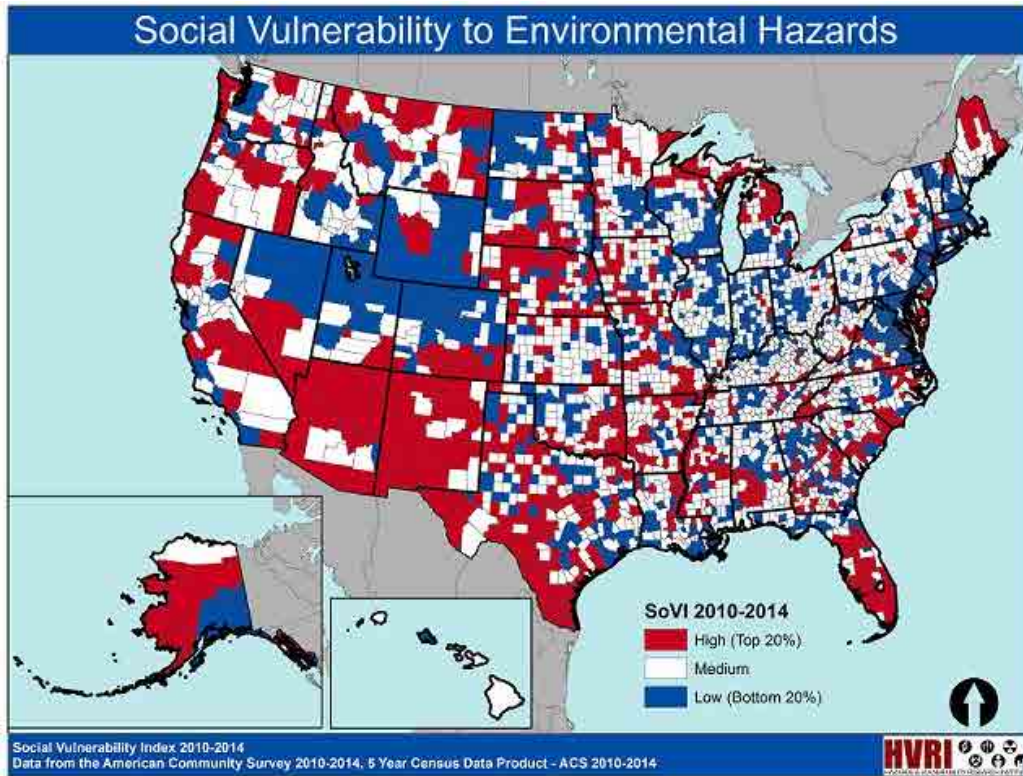
³ <http://webra.cas.sc.edu/hvri/products/sovifaq.aspx>

Figure 2.4. 2010 – 2014 Missouri Social Vulnerability to Environmental Hazards (SoVI ®)



Source: http://artsandsciences.sc.edu/geog/hvri/sites/sc.edu.geog.hvri/files/attachments/MO_1014.pdf

Figure 2.5. 2010 – 2014 U.S. Social Vulnerability to Environmental Hazards (SoVI ®)



Source: <http://artsandsciences.sc.edu/geog/hvri/sovi%C2%AE-0>

Table 2.8 provides additional demographic and economic indicators for Osage County.

Table 2.8. 2016 Unemployment, Poverty, Education, and Language Percentage Demographics, Osage County, Missouri

Jurisdiction	% in Labor Force	% of Population Unemployed	% of Families Below the Poverty Level	High School Diploma ONLY, ages 25+ (%)	Bachelor's degree or higher, ages 25+ (%)	% of population (language spoken at home other than English)
Osage County	64.2	3.0	3.5	45.0	19.1	1.9
*Argyle	62.2	4.3	0.0	53.8	11.2	1.0
Chamois	50.0	4.5	17.3	42.0	14.9	2.2
Freeburg	63.0	0.0	8.9	39.5	12.6	4.9
Linn	65.9	7.0	6.9	28.2	18.9	1.6
Meta	54.6	1.7	10.0	51.8	5.8	0.0
Westphalia	56.4	2.6	0.0	4.3	13.1	7.2

Source: U.S. Census Bureau, 2012-2016 American Community Survey, 5-Year American Community Survey

*Not included in the 2018 Osage Co. HMP

2.1.5 History

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 January 1841 and named after 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. Natural resources of economic importance include 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.

The City of Linn stretches 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.

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 location of the city and the progressiveness of its people had encouraged many businesses to locate there, including Roller Mills, cheese factory, farmer exchange, lumber yard, 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 Catholic immigrants from Westphalia, Germany, came up the "breaks of the Osage" and located in the bend of the Maries River, near the present site of Westphalia.

2.1.6 Occupations

Table 2.9 provides occupation statistics for the incorporated jurisdictions and incorporated county.

Table 2.9. Occupation Statistics, Osage County, Missouri

Place	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Natural Resources, Construction, and Maintenance Occupations	Production, Transportation, and Material Moving Occupations
Osage County	1,851	988	1,831	860	1,215
Argyle*	38	9	35	7	21
Chamois	32	28	36	22	30
Freeburg	43	32	60	39	58
Linn	173	172	158	55	136
Meta	17	24	32	16	27
Westphalia	44	46	47	28	25

Source: U.S. Census, 2012-2016 American Community Survey, 5-year Estimates.

*Not included in the 2018 Osage Co. HMP

2.1.7 Agriculture

Due to the rural nature of the area, agriculture and timber are significant factors in the local economy. According to the 2007 Census of Agriculture, the number of farms in the county was 1,181 encompassing 297,447 total acres. In addition, the average farm was 252 acres. According to the 2012 Census of Agriculture, Osage County had fallen to 1,115 farms encompassing 283,342 acres, with an average farm size of 254 acres. Furthermore, there are only approximately 30 farms with 1,000 or more acres in the county. Land in farms by land use for the county includes woodland (34.5%), pastureland (32.3%), cropland (29.1%), and other uses (4.2%). In 2012, 69,509 acres of cropland were harvested, with forage (hay, haylage, grass silage, and greenchop) being the top crop in the county. Moreover, 56,726 cattle and calves were raised. The market value of products sold included crop sales (\$13.9 million) and livestock sales (\$64.7 million). The

average market value of products sold per farm was \$70,544⁴.

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.

2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area

FEMA's Hazard Mitigation Assistance (HMA) grant program provides funding for mitigation activities which have the potential to reduce disaster losses and protect life and property from future disaster damages⁵. Previous FEMA HMA Grants issued in the planning area can be found in **Table 2.10**.

Table 2.10. FEMA HMA Grants in County from 1993-2011

Project Type	Sub applicant	Funding	Project Total (\$)
Unknown	State Technical College of Missouri	PDM-FY05	\$1,386,000
Total			\$1,386,000

Source: <https://www.fema.gov/openfema-dataset-hazard-mitigation-grants-v1>

2.2 Jurisdictional Profiles and Mitigation Capabilities

This section will include individual profiles for each participating jurisdiction. It will also include a discussion of previous mitigation initiatives in the planning area. There will be a summary table indicating specific capabilities of each jurisdiction that relate to their ability to implement mitigation opportunities. The unincorporated county is profiled first, followed by the incorporated communities, the special districts, and the public school districts.

2.2.1 Unincorporated 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 each, are elected for four-year terms. Other elected officials include the County Clerk, Prosecuting Attorney, Sheriff, Circuit Clerk, Recorder of Deeds, Collector of Revenue, Treasurer, Assessor, County Surveyor, Coroner, and Public Administrator.

⁴ 2012 Census of Agriculture, Missouri Farm Commodity Sales, USDA, National Agriculture Statistics Service

⁵ <https://www.fema.gov/media-library/assets/documents/103279>

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. Other county officials include the 911/Emergency Management Director/NFIP Floodplain Administrator, Health Dept. Administrator, Road and Bridge Supervisor, and Mapping Specialist.

Technical and Fiscal Resources

There are six fire departments located in the county. All are volunteer departments. Those departments include Argyle Volunteer Fire Dept., Chamois Fire Protection District., Freeburg Volunteer Fire Department, Linn Fire Protection District, Meta Fire & Rescue, and Westphalia Fire Protection District. Osage Co. is served by the Osage Co. Sherriff's Office. The county has a 911 Central Dispatch Center located at 205 East Main, Linn, MO. The county is served by three ambulance districts – Ozark Central Ambulance District, Maries-Osage Ambulance District, and Osage Ambulance District. The closest hospitals are located in Jefferson City, in adjoining Cole County; and Hermann, in Gasconade County. Within the county there are 12 outdoor warning sirens. Additional warning systems include Rave Mobile Safety. The county also possesses 2 fixed generators (Courthouse and Admin. Building), and multiple portable generators. There is one designated public tornado shelter, constructed in accordance with FEMA standards, located at 1 Technology Drive, Linn, MO 65051.

Fiscal tools or resources that the county could potentially use to help fund mitigation activities include Community Development Block Grants, Capital Improvements project funding, levy taxes for specific purposes, incur debt through general obligation bonds, and incur debt through special tax bonds.

Existing Plans and Policies

The county has a County Emergency Operations Plan, County Hazard Mitigation Plan, Debris Management Plan (in-progress), Regional Transportation Plan, and Regional CEDS (Comprehensive Economic Development Strategy). Osage County also participates in the National Flood Insurance Program. The County Emergency Management Director serves as the floodplain manager.

Other Mitigation Activities

The Office of Emergency Management, local fire departments, Sheriff's Office, 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 flood recovery awareness and Floodplain Ordinance, fire safety, storm preparedness, heat wave preparedness, and general press releases/social media outreach regarding hazards, preparedness, and mitigation.

Table 2.11. Demographic and Structure Risk Parameters For Unincorporated Osage County

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Unincorporated Osage County	1,522	172	487	493	1,719	638	427

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

Table 2.12. Unincorporated Osage County Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	N/A
County Emergency Operations Plan	Yes, Annual
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	N/A
County Mitigation Plan	Yes
Debris Management Plan	In process
Economic Development Plan	CEDS
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes, 2012 FIRM
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	Yes
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	Approved

Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	No
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	N/A
Hazard Analysis/Risk Assessment (County)	Yes, EOP
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	EPZ & Floodplain, Bagnell Dam
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	Yes
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	Cole County
Hazardous Materials Expert	No
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	Yes
Economic Development Department	No
Housing Department	Yes
Regional Planning Agencies	MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes
Financial Resources	
Ability to apply for Community Development Block Grants	Yes

Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2017

2.2.2 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.

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 in 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.

According to the 2016 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, Treasurer, Public Works Official, Fire Chief, and City Attorney.

Technical and Fiscal Resources

Chamois is a participating community in the National Flood Insurance Program. Law enforcement in the community is provided by the Osage County Sheriff’s Office. 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 city has two warning sirens; activated by the county and Ameren (nuclear generating station). The city possesses two generators within the public works department.

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, and 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

The city is a participant in the County Emergency Operations Plan, County Hazard Mitigation Plan, Regional Transportation Plan, and Regional CEDS (Comprehensive Economic Development Strategy). The city does not have Zoning or Building Codes/Ordinances. The city has a Floodplain Ordinance, Tree Trimming Ordinance, Nuisance Ordinance, and Landscape Ordinance.

Other Mitigation Activities

Public education and information programs are regularly included in the city’s monthly newsletter.

Table 2.13. Demographic and Structure Risk Parameters For Chamois

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Chamois	103	8	102	29	81	90	11

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

Table 2.14. City of Chamois Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder’s Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	No
County Emergency Operations Plan	Yes, Annual
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	-
County Mitigation Plan	Yes

Debris Management Plan	No
Economic Development Plan	CEDS (MRPC)
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	Yes
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	Yes
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	Unknown
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	Yes
Property Acquisition	Yes
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams	Yes
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	N/A
Evacuation Route Map	Yes
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No

Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	Yes
Hazardous Materials Expert	Yes
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	No
Sanitation Department	Yes, contract
Transportation Department	No
Economic Development Department	No
Housing Department	Yes
Regional Planning Agencies	MRPC
Historic Preservation	Independent
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes
Financial Resources	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	Yes
Ability to withhold spending in hazard prone areas	Yes

Source: Data Collection Questionnaire, 2017

2.2.3 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.

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.

According to the 2016 US Census, the village has a population of 464. There is a four member Board of Trustees and a Mayor. The village personnel include a Clerk, Attorney, Water and Sewer Superintendent, and Fire Chief.

Technical and Fiscal Resources

Freeburg does not participate in the National Flood Insurance Program, or have a Floodplain Ordinance. Law enforcement in the community is provided by the Osage County Sheriff’s Office. The Osage Ambulance District and Maries-Osage Ambulance District provides ambulance service for the city and surrounding area. The Freeburg Volunteer Fire Department provides fire protection. The village has one warning siren which is controlled by the county.

Fiscal tools or resources that the Village could potentially use to help fund mitigation activities include Capital Improvements funding, authority to levy taxes for specific purposes, fees for water, sewer, gas, or electric services, and incur debt through special tax bonds.

Existing Plans and Policies

The village participates in the County Hazard Mitigation Plan, Regional Transportation Plan, and Regional CEDS (Comprehensive Economic Development Strategy). The village does not have Zoning or Building Codes/Ordinances. Freeburg does have a Nuisance Ordinance and Tree Trimming Program.

Other Mitigation Activities

Freeburg does not currently provide education/awareness and emergency preparedness programs

Table 2.15. Demographic and Structure Risk Parameters For Freeburg

Jurisdiction	Population With a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Freeburg	49	22	56	19	86	47	16

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

Table 2.16. Village of Freeburg Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	No
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A
City Mitigation Plan	-
County Mitigation Plan	Yes
Debris Management Plan	No
Economic Development Plan	CEDS (MRPC)
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
Policies/Ordinance	
Zoning Ordinance	N/A
Building Code	N/A
Floodplain Ordinance	N/A
Subdivision Ordinance	N/A
Tree Trimming Ordinance	N/A
Nuisance Ordinance	Yes
Storm Water Ordinance	N/A
Drainage Ordinance	N/A
Site Plan Review Requirements	N/A
Historic Preservation Ordinance	N/A
Landscape Ordinance	N/A
Program	
Zoning/Land Use Restrictions	N/A
Codes Building Site/Design	N/A
Hazard Awareness Program	N/A
National Flood Insurance Program	No
NFIP Community Rating System (CRS) Participating Community	N/A
National Weather Service (NWS) Storm Ready	N/A
Firewise Community Certification	N/A

Building Code Effectiveness Grading (BCEGs)	N/A
ISO Fire Rating	6
Economic Development Program	N/A
Land Use Program	N/A
Public Education/Awareness	N/A
Property Acquisition	N/A
Planning/Zoning Boards	N/A
Stream Maintenance Program	N/A
Tree Trimming Program	Yes
Engineering Studies for Streams	N/A
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	N/A
Hazard Analysis/Risk Assessment (County)	N/A
Evacuation Route Map	N/A
Critical Facilities Inventory	N/A
Vulnerable Population Inventory	N/A
Land Use Map	N/A
Staff/Department	
Building Code Official	N/A
Building Inspector	N/A
Mapping Specialist (GIS)	N/A
Engineer	N/A
Development Planner	N/A
Public Works Official	N/A
Emergency Management Director	Osage Co. EMD
NFIP Floodplain Administrator	N/A
Bomb and/or Arson Squad	N/A
Emergency Response Team	N/A
Hazardous Materials Expert	N/A
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	N/A
Sanitation Department	Yes
Transportation Department	No
Economic Development Department	No
Housing Department	Yes
Regional Planning Agencies	MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes
Financial Resources	
Ability to apply for Community Development Block Grants	No
Ability to fund projects through Capital Improvements funding	Yes

Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation bonds	No
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2017

2.2.4 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.

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 began in 1961.

According to the 2016 US Census, the city has a population of 1,485. There is a four member Board of Aldermen and a Mayor. The city employs a City Clerk, Treasurer, Police Chief, Utilities Superintendent, and City Attorney.

Technical and Fiscal Resources

Linn is a participating community in the National Flood Insurance Program. Law enforcement in the community is provided by the Linn City Police Department, located at 1200 East Main Street, Linn, Mo 65051. There is a City/Rural Fire Protection District located in Linn, which serves the city and the surrounding area. The Osage Ambulance District provides ambulance service for the city and surrounding area as well. The city has two warning sirens. The warning sirens are controlled by the Osage County 911 Center. The city employs a Emergency Management Coordinator (Police Chief) and NFIP Floodplain Administrator.

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, and debt through special tax bonds.

Existing Plans and Policies

The city participates in the County Hazard Mitigation Plan, Regional Transportation Plan, and Regional CEDS (Comprehensive Economic Development Strategy). The city has a Zoning

Ordinance, Floodplain Ordinance, Subdivision Ordinance, Nuisance Ordinance, Site Plan Review Requirements, and Zoning/Land Use Restriction Programs. The city's ISO Fire Rating is 5.

Other Mitigation Activities

The Linn Fire Protection District currently provides education/awareness and emergency preparedness programs in the areas of fire safety as well as a burn house for training purposes.

Table 2.17. Demographic and Structure Risk Parameters For Linn

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Linn	324	21	208	168	167	57	16

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

Table 2.18. City of Linn Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	No
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A
City Mitigation Plan	-
County Mitigation Plan	Yes
Debris Management Plan	No
Economic Development Plan	CEDS (MRPC)
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Unknown
Floodplain Ordinance	Yes, 2006
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No

Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	5
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes, Full-time
Emergency Management Director	N/A
NFIP Floodplain Administrator	Mayor
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	N/A
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Yes
Regional Planning Agencies	MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	Yes

Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes
Financial Resources	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	N/A
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2017

2.2.5 City of Meta

Overview

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, free of timber, and nearby water from Sugar Creek. 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 railroad ordered Terrill to have the land surveyed and divided into lots which were ready for sale by August, 1902. People flocked to the area to buy lots. As people moved into town, oak frame constructions with tent coverings began to cultivate the area. Meta became known as a tent town – a primitive condition which lasted for over a year.

The community was named under rather unusual circumstances. While the town was first being formed, medics and engineers working on the railroad were staying at the Henrietta Schriefer home. Miss Meta Schriefer, one of Henrietta's daughters, cut off her finger while chopping wood. Medics sewed it back on, swearing that if the finger was saved; the town would be named after her. The wound healed and the settlement became known as Meta. The main street was named after Meta's sister, Bertha. The town was incorporated on November 14, 1904, and began the difficult task of establishing a workable community. Meta grew very rapidly after its creation, quickly reaching a population of nearly 500.

According to the 2016 US Census, the city has a population of 268. There is a four member Board of Aldermen and a Mayor. The city employs a City Clerk, Collector, City Attorney, Water

Superintendent, and Water Clerk.

Technical and Fiscal Resources

Meta participates in the National Flood Insurance Program. Law enforcement in the community is provided by the Osage County Sherriff's Office. Central Communications for the community is provided by Osage County. Ambulance service for Meta is provided by the Osage County Ambulance District, Maries County Ambulance District, and Miller County Ambulance District. The community is also served by Meta Fire & Rescue. There are two outdoor warning sirens within the community. The Mayor also acts as the Emergency Management Coordinator.

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, and fees for water, sewer, gas or electric services.

Existing Plans and Policies

The city participates in the County Hazard Mitigation Plan, Regional Transportation Plan, and Regional CEDS (Comprehensive Economic Development Strategy). The city has an Emergency Operations Plan last updated June 2014.

Other Mitigation Activities

Meta does not currently provide education/awareness and emergency preparedness programs.

Table 2.19. Demographic and Structure Risk Parameters For Meta

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Meta	45	0	36	18	35	48	4

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

Table 2.20. City of Meta Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes, June 2014
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A
City Mitigation Plan	-
County Mitigation Plan	Yes
Debris Management Plan	No
Economic Development Plan	CEDS (MRPC)
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No

Capabilities	Status Including Date of Document or Policy
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS)	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	7
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Director	Yes, Mayor

Capabilities	Status Including Date of Document or Policy
NFIP Floodplain Administrator	MRPC
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	N/A
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Yes
Regional Planning Agencies	MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	No
Financial Resources	
Ability to apply for Community Development	Yes
Ability to fund projects through Capital	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation	No
Ability to incur debt through special tax bonds	No
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2017

2.2.6 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, now located at the junction of Highways 50 and 63. These immigrants named their new home “New Westphalia Settlement,” after their homeland, Westphalia, Germany. Later the name changed to “New Westphalia.”

In 1838 Fathers Vergaegen, DeTheus, and Smedts bought 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.

According to the 2016 US Census, the city has a population of 379. There is a four member Board of Aldermen and a Mayor. The city employs a City Clerk, Attorney, Water District Clerk, and Fire Chief.

Technical and Fiscal Resources

Westphalia participates in the National Flood Insurance Program. Law enforcement in the community is provided by the Osage County Sherriff’s Office. Central Communications for the community is provided by Osage County. Ambulance service for Westphalia is provided by the Osage County Ambulance District. Westphalia Fire Protection District serves the community and surrounding area. There is one outdoor warning siren within the city. The city’s sewer plant houses two portable generators.

Fiscal tools or resources that the city could potentially use to help fund mitigation activities include authority to levy taxes for specific purposes and fees for water, sewer, gas, or electric services.

Existing Plans and Policies

The city participates in the County Hazard Mitigation Plan, Regional Transportation Plan, and Regional CEDS (Comprehensive Economic Development Strategy). The city has a Zoning Ordinance, Floodplain Ordinance, Subdivision Ordinance, and Landscape Ordinance.

Other Mitigation Activities

Westphalia does not currently provide education/awareness and emergency preparedness programs.

Table 2.21. Demographic and Structure Risk Parameters For Westphalia

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Westphalia	80	27	29	6	133	33	2

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

Table 2.22. City of Westphalia Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	N/A
Builder's Plan	N/A
Capital Improvement Plan	N/A
City Emergency Operations Plan	N/A
County Emergency Operations Plan	N/A
Local Recovery Plan	N/A
County Recovery Plan	N/A
City Mitigation Plan	-
County Mitigation Plan	Yes
Debris Management Plan	N/A
Economic Development Plan	CEDS (MRPC)

Capabilities	Status Including Date of Document or Policy
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	N/A
Flood Mitigation Assistance (FMA) Plan	N/A
Watershed Plan	N/A
Firewise or other fire mitigation plan	N/A
Critical Facilities Plan	N/A
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	N/A
Floodplain Ordinance	Yes
Subdivision Ordinance	Yes
Tree Trimming Ordinance	N/A
Nuisance Ordinance	N/A
Storm Water Ordinance	N/A
Drainage Ordinance	N/A
Site Plan Review Requirements	N/A
Historic Preservation Ordinance	N/A
Landscape Ordinance	Yes
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	N/A
Hazard Awareness Program	N/A
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS)	N/A
National Weather Service (NWS) Storm Ready	N/A
Firewise Community Certification	N/A
Building Code Effectiveness Grading (BCEGs)	N/A
ISO Fire Rating	6
Economic Development Program	N/A
Land Use Program	Yes
Public Education/Awareness	N/A
Property Acquisition	N/A
Planning/Zoning Boards	Yes
Stream Maintenance Program	N/A
Tree Trimming Program	N/A
Engineering Studies for Streams	N/A
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	N/A
Hazard Analysis/Risk Assessment (County)	N/A
Evacuation Route Map	N/A
Critical Facilities Inventory	N/A
Vulnerable Population Inventory	N/A
Land Use Map	N/A
Staff/Department	
Building Code Official	N/A
Building Inspector	N/A
Mapping Specialist (GIS)	N/A
Engineer	N/A
Development Planner	N/A

Capabilities	Status Including Date of Document or Policy
Public Works Official	N/A
Emergency Management Director	Osage Co. EMD
NFIP Floodplain Administrator	Mayor
Bomb and/or Arson Squad	N/A
Emergency Response Team	N/A
Hazardous Materials Expert	N/A
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	N/A
Sanitation Department	N/A
Transportation Department	N/A
Economic Development Department	N/A
Housing Department	Yes
Regional Planning Agencies	MRPC
Historic Preservation	N/A
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes
Financial Resources	
Ability to apply for Community Development	No
Ability to fund projects through Capital	No
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation	No
Ability to incur debt through special tax bonds	No
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2017

Table 2.23 summarizes the mitigation capabilities of Osage County and its jurisdictions.

Table 2.23. Mitigation Capabilities Summary Table

Capabilities	Unincorporated Osage Co.	Chamois	Freeburg	Linn	Meta	Westphalia
Planning Capabilities						
Comprehensive Plan	No	No	No	No	No	N/A
Builder's Plan	No	No	No	No	No	N/A
Capital Improvement Plan	No	No	No	No	No	N/A
City Emergency Operations Plan	N/A	No	No	No	Yes, June 2014	N/A
County Emergency Operations Plan	Yes, Annual	Yes, Annual	N/A	N/A	N/A	N/A
Local Recovery Plan	No	No	No	No	No	N/A
County Recovery Plan	No	No	N/A	N/A	N/A	N/A
City Mitigation Plan	-	-	-	-	-	-
County Mitigation Plan	Yes	Yes	Yes	Yes	Yes	Yes
Debris Management Plan	In process	No	No	No	No	N/A
Economic Development Plan	CEDS (MRPC)	CEDS (MRPC)	CEDS (MRPC)	CEDS (MRPC)	CEDS (MRPC)	CEDS (MRPC)
Transportation Plan	Regional Transportation Plan (MRPC)	Regional Transportation Plan (MRPC)	Regional Transportation Plan (MRPC)	Regional Transportation Plan (MRPC)	Regional Transportation Plan (MRPC)	Regional
Land-use Plan	No	No	No	No	No	N/A
Flood Mitigation	No	No	No	No	No	N/A
Watershed Plan	No	No	No	No	No	N/A
Firewise or other fire mitigation plan	No	No	No	No	No	N/A
Critical Facilities Plan (Mitigation/Response/Recovery)	No	No	No	No	No	N/A
Policies/Ordinance						
Zoning Ordinance	No	No	N/A	Yes	No	Yes
Building Code	No	No	N/A	Unknown	No	N/A
Floodplain Ordinance	Yes, 2012 FIRM	Yes	N/A	Yes, 2006	No	Yes
Subdivision Ordinance	No	No	N/A	Yes	No	Yes
Tree Trimming Ordinance	No	Yes	N/A	No	No	N/A

Nuisance Ordinance	No	Yes	Yes	Yes	No	N/A
Storm Water Ordinance	No	No	N/A	No	No	N/A
Drainage Ordinance	No	No	N/A	No	No	N/A
Site Plan Review Requirements	No	No	N/A	Yes	No	N/A
Historic Preservation Ordinance	No	No	N/A	No	No	N/A
Landscape Ordinance	No	Yes	N/A	No	No	Yes
Program						
Zoning/Land Use	No	No	N/A	Yes	No	Yes
Codes Building Site/Design	No	No	N/A	No	No	N/A
Hazard Awareness Program	Yes	Yes	N/A	No	No	N/A
National Flood Insurance Program	Yes	Yes	No	Yes	Yes	Yes
NFIP Community Rating System (CRS) Participating Community	No	No	N/A	No	No	N/A
National Weather Service (NWS) Storm Ready	Approved	No	N/A	No	No	N/A
Firewise Community Certification	No	No	N/A	No	No	N/A
Building Code Effectiveness Grading	No	No	N/A	No	No	N/A
ISO Fire Rating	No	Unknown	6	5	7	6
Economic Development Program	No	No	N/A	No	No	N/A
Land Use Program	No	No	N/A	No	No	Yes
Public Education/Awareness	Yes	Yes	N/A	No	No	N/A
Property Acquisition	No	Yes	N/A	No	No	N/A
Planning/Zoning Boards	No	No	N/A	Yes	No	Yes
Stream Maintenance	No	No	N/A	No	No	N/A
Tree Trimming Program	No	No	Yes	No	No	N/A
Engineering Studies for Streams (Local/County/Regional)	No	Yes	N/A	No	No	N/A
Mutual Aid Agreements	Yes	Yes	Yes	Yes	Yes	Yes
Studies/Reports/Maps						

Hazard Analysis/Risk Assessment (City)	N/A	No	N/A	No	No	N/A
Hazard Analysis/Risk Assessment (County)	Yes, EOP	N/A	N/A	No	No	N/A
Evacuation Route Map	No	Yes	N/A	No	No	N/A
Critical Facilities Inventory	No	No	N/A	No	No	N/A
Vulnerable Population Inventory	EPZ & Floodplain Bagnell Dam	No	N/A	No	No	N/A
Land Use Map	No	No	N/A	No	No	N/A
Staff/Department						
Building Code Official	No	No	N/A	No	No	N/A
Building Inspector	No	No	N/A	No	No	N/A
Mapping Specialist (GIS)	Yes	No	N/A	No	No	N/A
Engineer	No	No	N/A	No	No	N/A
Development Planner	No	No	N/A	No	No	N/A
Public Works Official	No	Yes	N/A	Yes, Full-time	No	N/A
Emergency Management Director	Yes	Yes	Osage Co. EMD	N/A	Yes, Mayor	Osage Co. EMD
NFIP Floodplain Administrator	Yes	Yes	N/A	Mayor	MRPC	Mayor
Bomb and/or Arson Squad	No	No	N/A	No	No	N/A
Emergency Response Team	Cole County	Yes	N/A	No	No	N/A
Hazardous Materials Expert	No	Yes	N/A	No	No	N/A
Local Emergency Planning Committee	MREPC	MREPC	MREPC	MREPC	MREPC	MREPC
County Emergency Management Commission	No	No	N/A	N/A	N/A	N/A
Sanitation Department	No	Yes, contract	Yes	No	No	N/A
Transportation Department	Yes	No	No	No	No	N/A
Economic Development Department	No	No	No	No	No	N/A
Housing Department	Yes	Yes	Yes	Yes	Yes	Yes
Regional Planning Agencies	MRPC	MRPC	MRPC	MRPC	MRPC	MRPC
Historic Preservation	No	Independent	No	No	No	N/A
Non-Governmental						

American Red Cross	Yes	No	No	No	No	No
Salvation Army	Yes	No	No	No	No	No
Veterans Groups	Yes	No	Yes	Yes	No	Yes
Environmental Organization	No	No	No	No	No	No
Homeowner Associations	No	No	No	No	No	No
Neighborhood Associations	No	No	No	No	No	No
Chamber of Commerce	No	No	No	No	No	No
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes	Yes	Yes	No	Yes
Financial Resources						
Ability to apply for Community Development Block	Yes	Yes	No	Yes	Yes	No
Ability to fund projects through Capital Improvements funding	Yes	Yes	Yes	Yes	Yes	No
Authority to levy taxes for a specific purpose	Yes	Yes	Yes	Yes	Yes	Yes
Fees for water, sewer, gas, or electric services	No	Yes	Yes	Yes	Yes	Yes
Impact fees for new development	No	Yes	No	Yes	No	No
Ability to incur debt through general obligation bonds	Yes	Yes	No	Yes	No	No
Ability to incur debt through special tax bonds	Yes	Yes	Yes	Yes	No	No
Ability to incur debt through private activities	No	Yes	No	N/A	No	No
Ability to withhold spending in hazard	No	Yes	No	No	No	No

Source: Data Collection Questionnaires, 2017

2.2.7 Public School District Profiles and Mitigation Capabilities

The following school districts are participating jurisdictions in this plan: Osage Co. R-I School District, Osage Co. R-II School District, and Osage Co. R-III School District. 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

Osage County R-I and Osage County R-III have NOAA all hazard radios on site to provide early warning of hazard events. In addition, each school district has fire alarms and intercom systems capable of providing specific instructions in the event of an emergency. All districts utilize a mass notification system. Osage Co. R-I utilizes School Messenger and Osage Co. R-II and R-III utilize TextCaster. Osage Co. R-II is the only district with an Emergency Manager. Some of Osage Co. R-III’s personnel write grants as needed.

Fiscal tools or resources that all school districts can potentially use to help fund mitigation activities include Capital Improvements Project Funding, Local Funds, General Obligation Funds, Special Tax Bonds, and State and Federal Funds/Grants.

Osage Co. R-I added a Preschool Trailer since the last plan update. Osage Co. R-II built a new elementary school and VoAg building in 2016. Osage Co. R-III anticipates the possibility of renovation of upper elementary school in the next 5 years.

Existing Plans and Policies

All school districts within the county have a Capital Improvements Plan, School Emergency Plan, and Weapons Policy. Osage Co. School Districts also participate in the Radiological Emergency Response Plan.

Other Mitigation Activities

All schools participating in the plan conduct regular fire, earthquake, and tornado drills at least once a year. All districts practice lock-down security training. None of the schools have a designated safe area for tornados in accordance with FEMA standards. All elementary schools participate in education/awareness programs provided by local fire departments.

Table 2.24. School District Buildings and Enrollment Data, 2017

District Name	Building Name	Enrolment
Osage Co. R-I School District		
	Osage Co. Elem.	111
	Chamois High	86
Osage Co. R-II School District		
	Osage Co. Elem.	260
	Linn High	367
Osage Co. R-III School District		

District Name	Building Name	Enrolment
	Fatima Elem.	369
	Fatima High	479

Source: <https://ogi.oa.mo.gov/DESE/schoolSearch/index.html>

Figure 2.6. Osage County School Districts

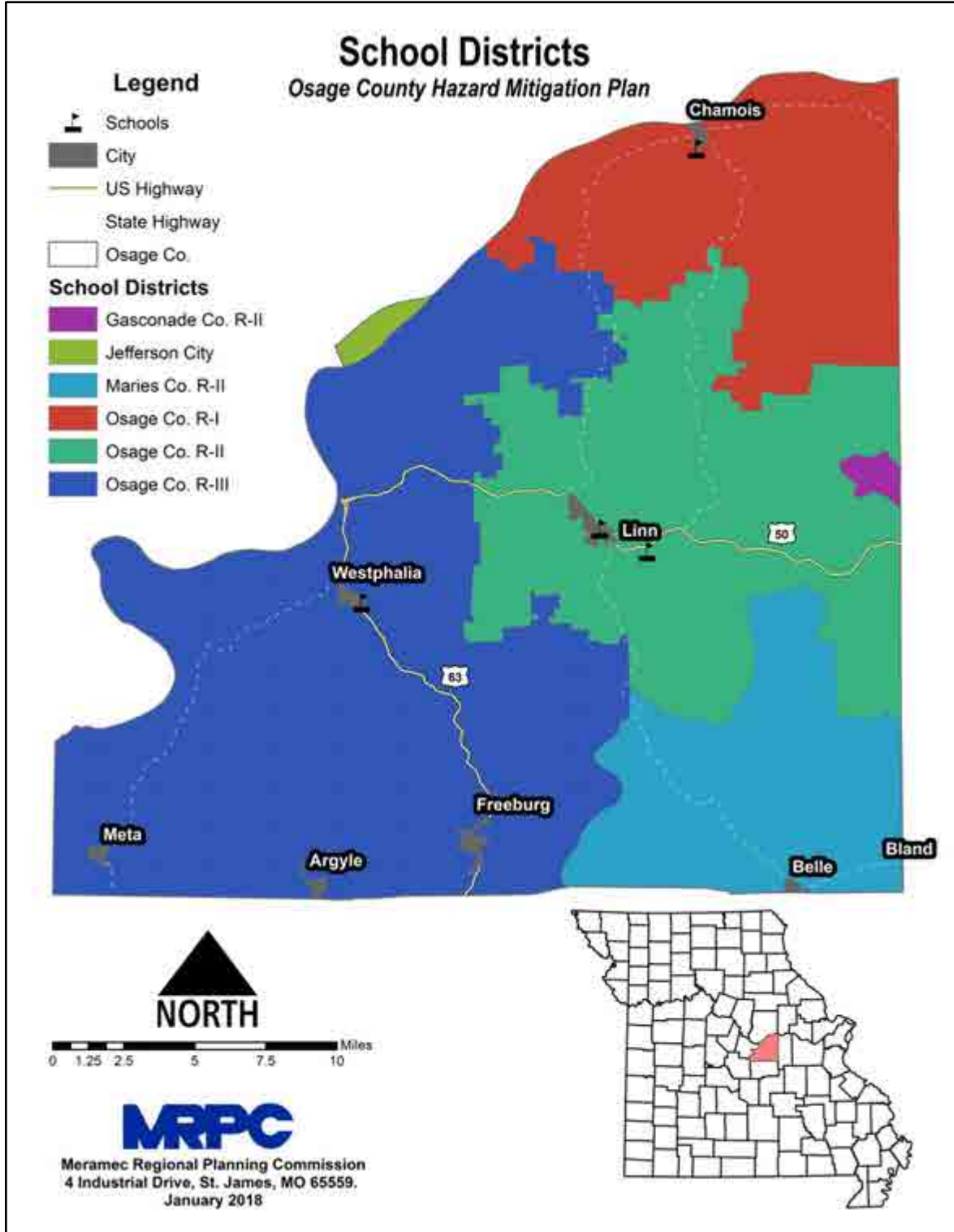


Table 2.25. Summary of Mitigation Capabilities- Osage Co. R-I, Osage Co. R-II, Osage Co. R-III

Capability	Osage Co. R-I	Osage Co. R-II	Osage Co. R-III
Planning Elements			
Master Plan/Date	April 2016	No	July 2017
Capital Improvement	February 2017	2016	March 2017
School Emergency Plan/Date	August 2016	2016	July 2017
Weapons Policy/Date	Yes	2016	July 2015
Personnel Resources			
Full-Time Building Official (Principle)	Yes	Yes	Yes
Emergency Manager	No	Yes	N/A
Grant Writer	No	N/A	Yes, various personnel
Public Information Officer	No	N/A	N/A
Financial Resources			
Capital Improvements Project Funding	Yes	Yes	Yes
Local Funds	Yes	Yes	Yes
General Obligation	Yes	Yes	Yes
Special Tax Bonds	Yes	Yes	Yes
Private Activities/Donations	Yes	Yes	No
State and Federal Funds/Grants	Yes	Yes	Yes
Other			
Public Education Programs	With Fire Dept.	With Fire Dept.	With Fire Dept.
Privately or Self-Insured?	Private 12/31/17	Self-Funded Consortium	MUSIC
Fire Evacuation Training	Annual	Yes	Yes
Tornado Sheltering Exercises	Annual	Yes	Yes
Public Address/Emergency Alert System	PA System, Fire & Tornado Alarm	PA System	Yes, in process of updating
NOAA Weather Radios	Yes	No	Yes
Lock-Down Security Training	Annual	Yes	Yes
Mitigation Programs	N/A	N/A	Yes
Tornado Shelter/Safe-room	N/A	N/A	Shelters for students
Campus Police	No	No	No

Source: Data Collection Questionnaires, 2017

2.2.8 Critical Facilities

The table below (**Table 2.26**) provides information for critical facilities in the planning area. Specific information includes a Hazus ID if applicable, jurisdiction, building name/owner, and address. Facilities addressed include emergency, fire department, law enforcement, medical, and schools. Furthermore, (**Table 2.27**) provides information in regards to colleges/universities located in the planning area.

Table 2.26. Osage County Critical Facilities by Type and Jurisdiction

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Emergency Facilities						
	Osage Co.	Osage Co. E-911	205 E. Main St.	Linn	MO	65051
	Osage Co.	Emergency Management Director	205 E. Main St.	Linn	MO	65051
Fire Department Facilities						
	Argyle	Argyle Volun. Fire Dept. #1	223 3 rd St.	Argyle	MO	65001
	Chamois	Chamois Volunteer Fire Dept.	200 S Main St.	Chamois	MO	65024
	Chamois	Chamois Volunteer Fire Dept.	338 E Missouri Ave.	Chamois	MO	65024
	Freeburg	Freeburg Comm. Fire Assoc. #1	600 Hwy. 63	Freeburg	MO	65035
	Freeburg	Freeburg Comm. Fire Assoc. #2	4339 HWY U	Rich Fountain	MO	65035
	Linn	Linn Fire Prot. Dist. #1	210 W. Main St.	Linn	MO	65051
MO000400	Linn	Linn Fire Prot. Dist. #2	1986 HWY A	Bonnots Mill	MO	65051
MO000679	Linn	Linn Fire Prot. Dist. #3	633 HWY 89 N	Linn	MO	65051
MO000401	Linn	Linn Fire Prot. Dist. #4	119 HWY 89 S	Linn	MO	65051
	Linn	Linn Fire Prot. Dist. #5	100 S. Clay St.	Linn	MO	65051
MO000402	Meta	Meta Fire & Rescue	112 E Third St.	Meta	MO	65058
	Westphalia	Westphalia Fire Prot. Dist.	3388 County Road 503	Westphalia	MO	65085
	Westphalia	Westphalia Fire Prot. Dist.	1926 HWY 63	Westphalia	MO	65085
Law Enforcement Facilities						
MO000165	Linn	Linn Police Dept.	1200 E Main St.	Linn	MO	65051
MO000015	Osage Co.	Osage County Sheriff's Office	106 Main St.	Linn	MO	65051
School Facilities						
MO001582	Bonnots Mill	St. Mary's School	1641 HWY C	Bonnots Mill	MO	65016
MO002940	Chamois	Chamois Elem.	614 S Poplar St.	Chamois	MO	65024
MO002941	Chamois	Chamois High	614 S Poplar St.	Chamois	MO	65024
MO001256	Freeburg	Holy Family School	110 W Oliver St.	Freeburg	MO	65035
MO002942	Linn	Linn Elem.	141 Wildcat Dr.	Linn	MO	65051

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
MO000710	Linn	Linn High	141 Wildcat Dr.	Linn	MO	65051
MO001253	Linn	St. George Elem. School	601 E Main St.	Linn	MO	65051
MO001581	Loose Creek	Immaculate Conception School	147 County Road 402	Loose Creek	MO	65054
MO001255	Rich Fountain	Sacred Heart School	4309 HWY U	Rich Fountain	MO	65035
MO001093	Westphalia	Fatima Elem.	143 E Main	Westphalia	MO	65085
MO001796	Westphalia	Fatima High	143 E Main	Westphalia	MO	65085
MO001254	Westphalia	St. Joseph Catholic School	123 E Main St.	Westphalia	MO	65085

Source: Meramec Region Community Data Mining for Hazard Mitigation Planning (2014); Facilities, Missouri_SEMA, ArcGIS Online.

State Technical College of Missouri is located in Linn, MO and is the only post-secondary schools in Osage County (**Table 2.27**).

Table 2.27. Osage County Colleges/Universities

College/University	Location	Description	Enrollment
State Technical College of Missouri	One Technology Drive, Linn, MO 65051	Associates Degree and Certificates	1,274 (2015)

3 RISK ASSESSMENT

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Hazard Profile	3.57
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Vulnerability	3.77
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Vulnerability	3.83
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	Hazard Profile	3.122
	Vulnerability.....	3.128
	Problem Statement.....	3.129
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	Hazard Profile	3.130
	Vulnerability.....	3.139
	Problem Statement.....	3.146
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	Hazard Profile	3.147
	Vulnerability.....	3.153
	Problem Statement.....	3.158
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	Hazard Profile	3.159
	Vulnerability.....	3.163
	Problem Statement.....	3.169

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 goal of the risk assessment is to estimate the potential loss in the planning area, including loss of life, personal injury, property damage, and economic loss, from a hazard event. The risk assessment process allows communities and school/special districts in the planning area to better understand their potential risk to the identified hazards. It will provide a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This chapter is divided into four main parts:

- **Section 3.1 Hazard Identification** identifies the hazards that threaten the planning area and provides a factual basis for elimination of hazards from further consideration;
- **Section 3.2 Assets at Risk** provides the planning area's total exposure to natural hazards, considering critical facilities and other community assets at risk;
- **Section 3.3 Future Land Use and Development** discusses areas of planned future development
- **Section 3.4 Hazard Profiles and Vulnerability Analysis** provides more detailed information about the hazards impacting the planning area. For each hazard, there are three sections: 1) Hazard Profile provides a general description and discusses the threat to the planning area, the geographic location at risk, potential severity/magnitude/extent, previous occurrences of hazard events, probability of future occurrence, risk summary by jurisdiction, impact of future development on the risk; 2) Vulnerability Assessment further defines and quantifies populations, buildings, critical facilities, and other community/school or special district assets at risk to natural hazards; and 3) Problem Statement briefly summarizes the problem and develops possible solutions.

3.1 Hazard Identification

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.

The primary phase in the development of a hazard mitigation plan is to identify specific hazards which may impact the planning area. To initiate this process, the Hazard Mitigation Planning Committee (HMPC) reviewed a list of natural hazards provided by the Federal Emergency Management Agency (FEMA). From that list, the HMPC selected pertinent natural hazards of concern that have the potential to impact Osage County. These selected natural hazards are further profiled and analyzed in this plan.

3.1.1 Review of Existing Mitigation Plans

Within the State of Missouri, local hazard mitigation plans customarily include only natural hazards, as only natural hazards are required by federal regulations. Nevertheless, there is an opportunity to include man made or technical hazards within the plan. However, it was decided that only natural hazards were appropriate for the purpose of this plan. 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
- Fires (Urban/Structural and Wild)
- Flooding
- Land Subsidence/Sinkholes
- Levee Failure
- Thunderstorm/High Winds/Lightning/Hail
- Tornado
- Severe Winter Weather

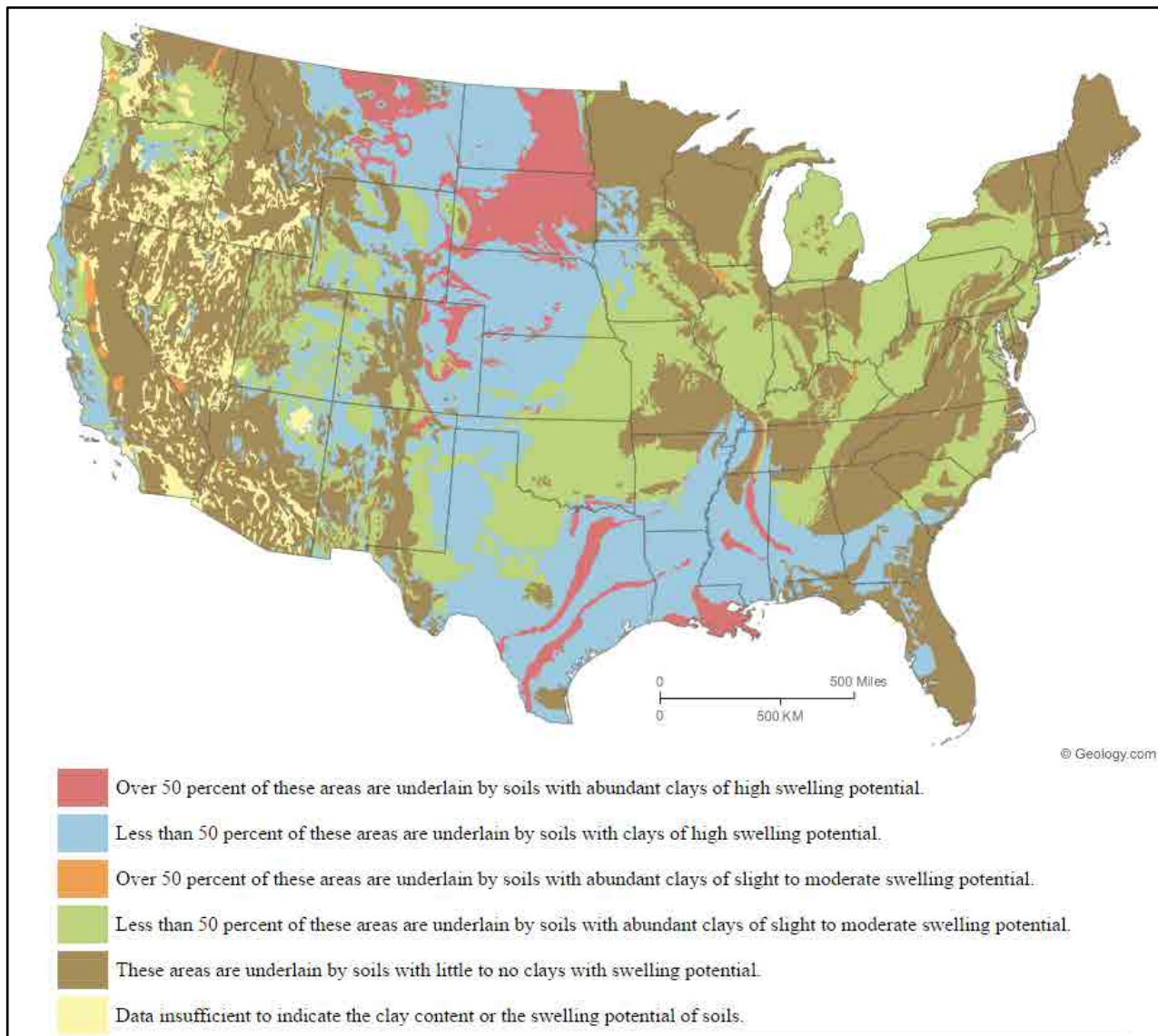
Hazards not occurring in the planning area, or considered insignificant were eliminated from this plan. **Table 3.1** outlines the hazards eliminated from the plan and the reasons for doing so. Additionally, some hazards were combined in the Osage County Plan to match the hazards listed in the Missouri State Hazard Mitigation Plan. The hazards covered in the previous Osage County Hazard Mitigation Plan vary slightly from this plan. Urban/structural fires were included with wildfires, landslides were left out of this plan following the guidance of the 2013 Missouri State Plan, and tornadoes are a separate hazard while lightning was added to thunderstorms.

Table 3.1. 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	No expansive soils exist within the planning area. According to the USGS National Geologic Map Database ¹ , the planning area is underlain by soils with little to no clays with swelling potential (Figure 3.1).
Hurricane	Planning area is located in the Midwest, not on any coast.
Volcano	There are no volcanic areas in the county.

¹ http://ngmdb.usgs.gov/Prodesc/proddesc_10014.htm

Figure 3.1. Swelling clays map of the conterminous United States



Source: http://ngmdb.usgs.gov/Prodesc/proddesc_10014.htm

3.1.2 Review 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 68 federally declared disasters since 1953. Of those, 38 have occurred between 2000 and 2016. All of these disasters have been weather related – severe wind and rain storms, tornadoes, flooding, hail, ice storms and winter storms. **Table 3.2** lists the federal disaster declarations for Osage County from 1990 to the 2017.

Table 3.2. FEMA Disaster Declarations that included Osage County, Missouri, 1990-2017

Disaster Number	Description	Incident Period & Declaration Date	Individual Assistance (IA) Public Assistance (PA)
DR-995	Missouri Severe Storms & Flooding	Incident Period: June 10, 1993-October 25, 1993 Declaration Date: July 09, 1993	-
DR-1054	Missouri Severe Storm, Tornadoes, Hail, Flooding	Incident Period: May 13, 1995-June 23, 1995 Declaration Date: June 02, 1995	-
DR-1270	Missouri Severe Storms & Flooding	Incident Period: April 03, 1999-April 14, 1999 Declaration Date: April 20, 1999	-
DR-1412	Missouri Severe Storms & Tornadoes	Incident Period: April 24, 2002-June 10, 2002 Declaration Date: May 06, 2002	PA

Disaster Number	Description	Incident Period & Declaration Date	Individual Assistance (IA) Public Assistance (PA)
DR-1463	Missouri Severe Storms, Tornadoes and Flooding	Incident Period: May 04, 2003- May 30, 2003 Declaration Date: May 06, 2003	IA, PA
EM-3232	Missouri Hurricane Katrina Evacuation	Incident Period: August 29, 2005-October 1, 2005 Declaration Date: September 10, 2005	PA
DR-1708	Missouri Severe Storms & Flooding	Incident Period: May 05, 2007- May 18, 2007 Declaration Date: June 11, 2007	IA
DR-1736	Missouri Severe Winter Storms	Incident Period: December 06, 2007-December 17, 2007 Declaration Date: December 27, 2007	PA
EM-3281	Missouri Severe Winter Storms	Incident Period: December 08, 2007-December 15, 2007 Declaration Date: December 12, 2007	-
DR-1676	Missouri Severe Winter Storms & Flooding	Incident Period: January 12, 2007-January 22, 2007 Declaration Date: January 15, 2007	PA
DR-1809	Missouri Severe Storms, Flooding, and a Tornado	Incident Period: September 11, 2008-September 24, 2008 Declaration Date: November 13, 2008	IA
DR-1749	Missouri Severe Storms & Flooding	Incident Period: March 17, 2008-May 09, 2008 Declaration Date: March 19, 2008	IA, PA
DR-1847	Missouri Severe Storms, Tornadoes, and Flooding	Incident Period: May 08, 2009- May 16, 2009 Declaration Date: June 19, 2009	IA, PA
EM-3303	Missouri Severe Winter Storm	Incident Period: January 26, 2009-January 28, 2009 Declaration Date: January 30, 2009	-
EM-3325	Missouri Flooding	Incident Period: June 01, 2011-August 01, 2011 Declaration Date: June 30, 2011	-

Disaster Number	Description	Incident Period & Declaration Date	Individual Assistance (IA) Public Assistance (PA)
EM-3317	Missouri Severe Winter Storm	Incident Period: January 31, 2011-February 05, 2011 Declaration Date: February 03, 2011	-
DR-1961	Missouri Severe Winter Storm & Snowstorm	Incident Period: January 31, 2011-February 05, 2011 Declaration Date: March 23, 2011	PA
DR-4144	Missouri Severe Storms, Straight-line Winds, and Flooding	Incident Period: August 02, 2013-August 14, 2013 Declaration Date: September 06, 2013	PA
DR-4130	Missouri Severe Storms, Straight-line Winds, Tornadoes, and Flooding	Incident Period: May 29, 2013-June 11, 2013 Declaration Date: July 18, 2013	PA
DR-4238	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Incident Period: May 15, 2015-July 27, 2015 Declaration Date: August 07, 2015	PA
EM-3374	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Incident Period: December 22, 2015-January 09, 2016 Declaration Date: January 02, 2016	-
DR-4250	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Incident Period: December 23, 2015-January 09, 2016 Declaration Date: January 21, 2016	IA
DR-4317	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Incident Period: April 28, 2017-May 11, 2017 Declaration Date: June 02, 2017	IA, PA

Source: Federal Emergency Management Agency: <http://www.fema.gov/disasters>

3.1.3 Research Additional Sources

List the additional sources of data on locations and past impacts of hazards in the planning area:

- Missouri Hazard Mitigation Plans (2010 and 2013)
- Previously approved planning area Hazard Mitigation Plan (12/1/2011)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources (MDNR)
- National Drought Mitigation Center Drought Reporter

- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- National Agricultural Statistics Service (Agriculture production/losses)
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Environmental Protection Agency
- Flood Insurance Administration
- Hazards US (HAZUS)
- Missouri Department of Transportation
- Missouri Division of Fire Marshal Safety
- Missouri Public Service Commission
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC);
- Pipeline and Hazardous Materials Safety Administration
- County and local Comprehensive Plans to the extent available
- County Emergency Management
- County Flood Insurance Rate Map, FEMA
- Flood Insurance Study, FEMA
- SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin
- U.S. Army Corps of Engineers
- U.S. Department of Transportation
- United States Geological Survey (USGS)
- Various articles and publications available on the internet (sources are cited in the body of the Plan)

Remarkably, the only centralized source of data for many of the weather-related hazards is the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC). Although it is usually the best and most current source, there are limitations to the data which should be noted. The NCDC documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. In addition, it is a partial record of other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occurs in connection with another event. Some information appearing in the NCDC may be provided by or gathered from sources outside the National Weather Service (NWS), such as the media, law enforcement and/or other government agencies, private companies, individuals, etc. An effort is made to use the best available information but because of time and resource constraints, information from these sources may be unverified by the NWS. Those using information from NCDC should be cautious as the NWS does not guarantee the accuracy or validity of the information.

The NCDC damage amounts are estimates received from a variety of sources, including those listed above in the Data Sources section. For damage amounts, the NWS makes a best guess using all available data at the time of the publication. Property and crop damage figures should be considered as a broad estimate. Damages reported are in dollar values as they existed at the time of the storm event. They do not represent current dollar values.

The database currently contains data from January 1950 to March 2014, as entered by the NWS. Due to changes in the data collection and processing procedures over time, there are unique periods of record available depending on the event type. The following timelines show the different time spans for each period of unique data collection and processing procedures.

1. Tornado: From 1950 through 1954, only tornado events were recorded.
2. Tornado, Thunderstorm Wind and Hail: From 1955 through 1992, only tornado, thunderstorm wind and hail events were keyed from the paper publications into digital data. From 1993 to 1995, only tornado, thunderstorm wind and hail events have been extracted from the Unformatted Text Files.
3. All Event Types (48 from Directive 10-1605): From 1996 to present, 48 event types are recorded as defined in NWS Directive 10-1605.

Injuries and deaths caused by a storm event are reported on an area-wide basis. When reviewing a table resulting from an NCDC search by county, the death or injury listed in connection with that county search did not necessarily occur in that county.

3.1.4 Hazards Identified

Table 3.3 lists the hazards that significantly impact each jurisdiction within the planning area and were chosen for further analysis in alphabetical order. However, not all hazards impact every jurisdiction such as dam failure. “X” indicates the jurisdiction is impacted by the hazard, and a “-” indicates the hazard is not applicable to that jurisdiction. As Osage County is predominately rural, limited variations occur across the county. However, jurisdictions with a high percentage of housing comprised of mobile homes, for example, could be more at risk to damages from a tornado. **0** depicts a summary of natural hazard profiles and severity ratings by participating jurisdictions.

Table 3.3. Hazards Identified for Each Jurisdiction

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme Heat	Fires (Urban/Structural and wild)	Flooding (River and Flash)	Land Subsidence/Sinkholes	Levee Failure	Thunderstorms/High Winds/ Lightning/Hail	Tornado	Severe Winter Weather
Osage Co.	X	X	X	X	X	X	X	X	X	X	X
Chamois	X	X	X	X	X	X	X	X	X	X	X
Freeburg	X	X	X	X	X	X	X	-	X	X	X
Linn	X	X	X	X	X	X	X	-	X	X	X
Meta	X	X	X	X	X	X	X	-	X	X	X
Westphalia	X	X	X	X	X	X	X	-	X	X	X
School Districts											
Osage Co. R-I	X	X	X	X	X	X	X	X	X	X	X
Osage Co. R-II	X	X	X	X	X	X	X	-	X	X	X
Osage Co. R-III	X	X	X	X	X	X	X	-	X	X	X

Table 3.4. Natural Hazard Probability (P) and Vulnerability (V) Ratings by Participating Jurisdiction

		Osage County	Chamois	Freeburg	Linn	Meta	Westphalia	Osage Co. R-I	Osage Co. R-II	Osage Co. R-III
Dam Failure	P	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Drought	P	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%
	V	L	L	L	L	L	L	L	L	L
Earthquake	P	1%	1%	1%	1%	1%	1%	1%	1%	1%
	V	L	L	L	L	L	L	L	L	L
Extreme Heat	P	100%	100%	100%	100%	100%	100%	100%	100%	100%
	V	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L
Fires (*Urban/Structural and Wild)	P	100%	100%	100%	100%	100%	100%	100%	100%	100%
	V	M	M	M	M	M	M	M	M	M
*Riverine Flood/Flash Flood	P	45%	45%	45%	45%	45%	45%	45%	45%	45%
	V	M	M	M	M	M	M	M	M	M
Land Subsidence/Sinkholes	P	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Levee Failure	P	5%	5%	0%	0%	0%	0%	5%	0%	0%
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Thunderstorm: *Heavy Rain/High Winds/Lightning/Hail	P	10%	10%	10%	10%	10%	10%	10%	10%	10%
	V	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L
Tornado	P	30%	30%	30%	30%	30%	30%	30%	30%	30%
	V	M	M	M	M	M	M	M	M	M
Severe Winter Weather/Snow/Ice/Severe Cold	P	100%	100%	100%	100%	100%	100%	100%	100%	100%
	V	L	L	L	L	L	L	L	L	L
Vulnerability Rating Key: L = Low, L-M = Low-Medium, M = Medium, M-H = Medium-High, H = High, NDA = No Data Avail. *indicates hazard utilized for probability.										

3.1.5 Multi-Jurisdictional Risk Assessment

For this multi-jurisdictional hazard mitigation plan, each hazard is profiled in which the risks are assessed on a planning area wide basis. Some hazards, such as dam failure, vary in risk across the county. If variations exist within the planning area, discussion is included in each profile. Osage County is uniform across the county in terms of climate, topography, and building construction characteristics. Weather-related hazards will impact the entire 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. Areas of urbanization include Chamois, Freeburg, Linn, Meta, and Westphalia. These urbanized areas have more assets at a greater density, and therefore have greater vulnerability to weather-related hazards. Rural areas include agricultural assets (livestock/crops) that are also vulnerable to damages. Differences among jurisdictions for each hazard will be discussed in greater detail in the vulnerability section of each hazard.

3.2 Assets at Risk

This section assesses the planning area’s population, structures, critical facilities, infrastructure, and other important assets that may be at risk to hazards.

3.2.1 Total Exposure of Population and Structures

Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2016 Census Bureau data. Building counts values are based on parcel data provided by the Missouri Spatial Data Information Service which can be found at the following website, <http://msdis.missouri.edu>. Contents exposure values were unable to be calculated due to incompatibility/technical issues with HAZUS MH 4.0. Total exposure for Unincorporated Osage County was obtained from the 2013 Osage Co. Hazard Mitigation Plan.

Table 3.5. Maximum Population and Building Exposure by Jurisdiction

Jurisdiction	2016 Population	Building Count	Building Exposure (\$)	Contents Exposure (\$)	*Total Exposure (\$)
*Argyle	228	213	-	-	-
Chamois	396	523	-	-	-
Freeburg	464	604	-	-	-
Linn	1,485	855	-	-	-
Meta	268	311	-	-	-
Westphalia	379	363	-	-	-
Unincorporated Osage County	10,484	23,341	-	-	-
Total	13,704	26,210	-	-	\$785,519,000

Sources: U.S. Census Bureau, 2012-2016 5-Year American Community Survey; 2013 Osage Co. Hazard Mitigation Plan; MO_2014_Missouri_Structures_Project_gdb; *Not included in 2018 Osage Co. HMP

Table 3.6. Building Values/Exposure by Usage Type

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Other	Total
*Argyle	-	-	-	-	-	-
Chamois	-	-	-	-	-	-
Freeburg	-	-	-	-	-	-
Linn	-	-	-	-	-	-
Meta	-	-	-	-	-	-
Westphalia	-	-	-	-	-	-
Unincorporated Osage County	\$585,335,000	\$67,415,000	\$83,566,000	\$12,206,000	\$20,329,000	\$785,519,000
Total	\$585,335,000	\$67,415,000	\$83,566,000	\$12,206,000	\$20,329,000	\$785,519,000

Source: 2013 Osage County Hazard Mitigation Plan
 *Not included in 2018 Osage Co. HMP

Table 3.7. Building Counts by Usage Type

Jurisdiction	Residential Counts	Commercial Counts	Industry Counts	Agricultural Counts	Other	Total
*Argyle	75	5	0	25	108	213
Chamois	168	11	10	0	334	523
Freeburg	219	26	0	24	335	604
Linn	426	37	5	1	386	855
Meta	121	18	25	0	147	311
Westphalia	137	23	0	19	184	363
Unincorporated Osage County	3,988	60	45	8,395	10,853	23,341
Total	5,134	180	85	8,464	12,347	26,210

Source: MO_2014_Missouri_Structures_Project_gdb
 *Not included in 2018 Osage Co. HMP

Table 3.8 below, provides additional information for school districts, including the number of buildings, building values (building exposure) and contents value (contents exposure). These numbers will represent the total enrollment and building count for the public school districts regardless of the county in which they are located.

Table 3.8. Population and Building Exposure by Jurisdiction-Public School Districts

Public School District	Enrollment	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Osage Co. R-I	197	9	8,798,619	1,384,319	10,182,938
Osage Co. R-II	627	4	19,821,391	1,547,000	21,368,391
Osage Co. R-III	848	5	19,003,124	1,230,308	20,233,432

Source: <https://ogi.oe.mo.gov/DESE/schoolSearch/index.html>; 2017 Data Collection Questionnaire

3.2.2 Critical and Essential Facilities and Infrastructure

This section will include information from the Data Collection Questionnaire and other sources concerning the vulnerability of participating jurisdictions' critical, essential, high potential loss, and transportation/lifeline facilities to identified hazards. Definitions of each of these types of facilities are provided below.

- Critical Facility: Those facilities essential in providing utility or direction either during the response to an emergency or during the recovery operation.
- Essential Facility: Those facilities that if damaged, would have devastating impacts on disaster response and/or recovery.
- High Potential Loss Facilities: Those facilities that would have a high loss or impact on the community.
- Transportation and lifeline facilities: Those facilities and infrastructure critical to transportation, communications, and necessary utilities.

Table 3.9 includes a summary of the inventory of critical and essential facilities and infrastructure in the planning area. The list was compiled from the Data Collection Questionnaire as well as the following sources:

- 2013 Osage County Hazard Mitigation Plan

Table 3.9. Inventory of Critical/Essential Facilities and Infrastructure by Jurisdiction

	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Highway Bridge	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	Total
Unincorporated Osage County	1	0	12	3	1	1	7	1	0	0	43	0	0	0	3	0	0	1	0	5	0	6	0	84
Chamois	0	0	1	1	0	0	1	1	0	0	1	0	0	0	0	0	0	1	2	1	1	3	1	14
Freeburg	0	0	0	-	-	0	1	1	0	0	0	0	0	-	0	0	-	0	-	1	-	10	1	14
Linn	0	0	2	-	-	0	1	1	0	0	2	0	0	-	0	2	-	0	-	1	-	19	1	29
Meta	0	0	0	-	-	0	1	1	0	0	2	0	0	-	0	0	-	0	-	0	-	5	1	10
Westphalia	0	0	1	0	0	0	1	1	0	0	0	0	0	-	1	0	-	0	0	2	0	4	1	11
Totals	1	0	16	4	1	1	12	6	0	0	48	0	0	0	4	2	0	2	2	10	1	47	5	162

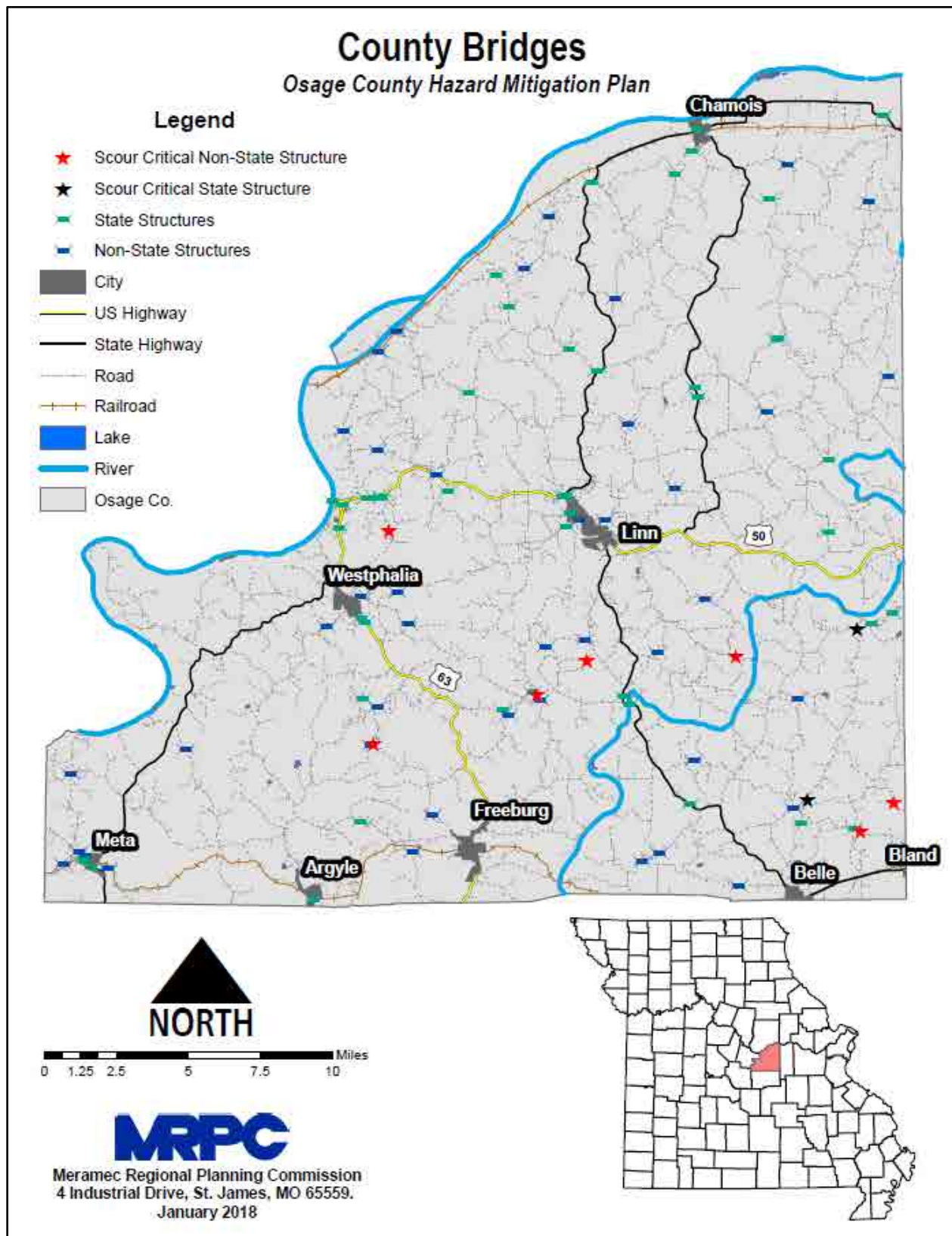
Source: 2017 Data Collection Questionnaires

According to the National Bridge Inventory there are a total of 100 bridges in Osage County². **Figure 3.2** shows the locations of State regulated bridges and non-State bridges in the planning area along with scour critical bridges. Scour critical refers to one of the database elements in the National Bridge Inventory. This element is quantified using a “scour index”, which is a number indicating the vulnerability of a bridge to scour during a flood. Bridges with a scour index between 1 and 3 are considered “scour critical”, or a bridge with a foundation determined to be unstable for the observed or evaluated scour condition. Nonetheless, there are 9 scour critical state and non-state structures within the county.

² <http://www.fhwa.dot.gov/bridge/nbi/no10/county.cfm>

Figure 3.2.

Osage County Bridges



Source: MSDIS, MoDOT 2016 Transportation Information

3.2.3 Other Assets

Assessing the vulnerability of the planning area to disaster also requires data on the natural, historic, cultural, and economic assets of the area. This information is important for many reasons.

- These types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- Knowing about these resources in advance allows for consideration immediately following a hazard event, which is when the potential for damages is higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- The presence of natural resources can reduce the impacts of future natural hazards, such as wetlands and riparian habitats which help absorb floodwaters.
- Losses to economic assets like these (e.g., major employers or primary economic sectors) could have severe impacts on a community and its ability to recover from disaster.

Threatened and Endangered Species: **Table 3.10** depicts Federally Threatened, Endangered, Proposed and Candidate Species in the county.

Table 3.10. Threatened and Endangered Species in Osage County

Common Name	Scientific Name	Status
Fish		
Niangua Darter	<i>Etheostoma nianguae</i>	Threatened (F) Endangered (S)
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	Endangered (F) (S)
Lake Sturgeon	<i>Acipenser fulvescens</i>	Endangered (S)
Flathead Chub	<i>Platygobio gracilis</i>	Endangered (S)
Mammal		
Gray bat	<i>Myotis grisescens</i>	Endangered (F) (S)
Indiana bat	<i>Myotis sodalis</i>	Endangered (F) (S)
Northern long-eared bat	<i>Myotis septentrionalis</i>	Threatened (F)
Mollusk		
Ebonyshell	<i>Fusconaia ebena</i>	Endangered (S)
Elephant Ear	<i>Elliptio crassidens</i>	Endangered (S)
Pink mucket	<i>Lampsilis abrupta</i>	Endangered (F) (S)
Scaleshell	<i>Leptoea leptodon</i>	Endangered (F) (S)
Snuffbox	<i>Epioblasma triquetra</i>	Endangered (S)
Spectaclecase	<i>Cumberlandia monodonta</i>	Endangered (F) (S)
Salamander		
Eastern Hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>	Endangered (S)
Flowering Plants		
Running Buffalo Clover	<i>Trifolium stoloniferum</i>	Endangered (F)

Note: S = State, F = Federal

Source: U.S. Fish and Wildlife Service, <http://www.fws.gov/midwest/Endangered/lists/missouri-cty.html>;

MDC Missouri Natural Heritage Program Search

Natural Resources: The Missouri Department of Conservation (MDC) provides a database of lands owned, leased, or managed for public use. **Table 3.11** provides the names and locations of conservation areas in Osage County.

Table 3.11. Conservation Areas in Osage County

Area Name	Address	Nearest City
Ben Branch Lake CA	From Linn, take Highway 89 northeast 10 miles, then County Road 314 west to the area.	Linn
Bonnot's Mill Access	From Bonnots Mill, take Riverview Drive west proceeding under the RR tracks, then County Road 416 west 0.50 mile to the access. Access is located 2.20 river miles above the mouth of the Osage River.	Bonnot's Mill
Bruns (Dr Bernard) Access	From Westphalia, take Highway 63 north, then County Road 609 east to the area.	Westphalia
Chamois Access	From Chamois, take Highway 100 west 0.10 miles.	Chamois
Cooper Hill CA	From Mt. Sterling, take Route A south 2.50 miles, then Route D west 2.75 miles to the village of Cooper	Mt. Sterling
Painted Rock CA	From Westphalia, take Highway 63 north, then Highway 133 west 7 miles to the area.	Westphalia
Pointers Creek Access	From Linn, take Route CC southeast 8 miles, then Route RA east to the access. (Route RA is impassable	Linn
Rollins Ferry Access	From Linn, take Highway 89 south 7 miles to the access.	Linn
Smoky Waters CA	From Osage City, take Engineer Road east 2 miles.	Osage City

Source: https://nature.mdc.mo.gov/discover-nature/find/places?area_name=&counties=5767&location%5Bdistance%5D=50&location%5Borigin%5D=

Table 3.12 provides information pertaining to community owned/operated parks within Osage County.

Table 3.12. Community Owned Parks in Osage County

Jurisdiction	Number of Parks	Park Name
Chamois	1	Chamois City Park
Freeburg	1	Freeburg City Park
Linn	2	Linn City Park Maguire Park
Meta	1	Meta Community Park
Westphalia	1	-

Historic Resources: The National Register of Historic Places is the official list of registered cultural resources worthy of preservation. It was authorized under the National Historic Preservation Act of 1966 as part of a national program. The purpose of the program is to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. The National Register is administered by the National Park Service under the Secretary of the Interior. Properties listed in the National Register include districts, sites, buildings, structures and objects that are significant in American history, architecture, archeology, engineering, and culture. **Table 3.13** provides information in regards to properties on the National Register of Historic Places in Osage County.

Table 3.13. Osage County Properties on the National Register of Historic Places

Property	Address	City	Date Listed
Bonnots Mill Historic District	Roughly Old Mill Rd., Riverside Dr., Highwater Rd., Iris Ave., Wildwood Ln., Hwy A and Main, Short and Church Hill St., Bonnots Mill	Bonnot's Mill	1/21/93
Chamois Public School	402 S. Main St.	Chamois	6/26/03
Dauphine Hotel	Off MO A	Bonnot's Mill	11/14/80
Huber's Ferry Farmstead Historic District	Jct. US 50 and US 63	-	1/15/99
Osage County Poorhouse	MO 621, 0.5 mi. S of Linn	Linn	2/13/98
St. Joseph Church	Main St.	Westphalia	4/11/72
Sacred Heart Catholic Church and Parsonage	SR U	Rich Fountain	9/09/82
Townley, Alvah Washington, Farmstead Historic District	304 S Market St.	Chamois	8/5/99
Zewicki, Dr. Enoch T. and Amy, House	402 E. Main St.	Linn	2/27/02

Source: Missouri Department of Natural Resources – Missouri National Register Listings by County
<http://dnr.mo.gov/shpo/mnrlist.htm>

Economic Resources: **Table 3.14** provides major non-government employers in the planning area. There are approximately 281 employer establishments within the county, employing on average 11.3 individuals each³.

Table 3.14. Major Non-Government Employers in Osage County

Employer Name	Product or Service	Employees
Elsevier	Distribution Center	125
Diamond Dog Food (Meta)	Manufacturer & Distribution	150
Osage Co. R-I	School	50
Osage Co. R-II	School	100
Osage Co. R-III	School	124
Play Mor Trailers	Manufacturer	80
Quaker Windows (Freeburg)	Manufacturing	900
State Technical College of Missouri	Higher Education	230

Source: 2017 Data Collection Questionnaires

Agriculture plays an important role in Osage County in terms of employment. The Agribusiness Employment Location Quotient for the County is greater than 1.5; meaning that there is a high share of agribusiness employment to its share of total national employment⁴. In addition, there were 207 individuals working in the agriculture industry, comprising 3.1% of the total workforce in 2016⁵. In addition, the market value of products sold in 2012 was \$78.6 million; 82% from livestock sales, and 12% from crop sales.

³ <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>

⁴ http://www.missourieconomy.org/pdfs/missouri_farms_and_agribusiness.pdf;

⁵ https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_DP03&prodType=table

3.3 Future Land Use and Development

Table 3.15 provides population growth statistics for Osage County.

Table 3.15. Osage County Population Growth, 2000-2016

Jurisdiction	Total Population 2000	Total population 2016	2000-2016 # Change	2000-2016 % Change
Unincorporated Osage County	10,096	10,484	388	3.8
*Argyle	164	228	64	39
Chamois	456	396	-60	-13.2
Freeburg	423	464	41	9.7
Linn	1,354	1,485	131	9.7
Meta	249	268	19	7.6
Westphalia	320	379	59	18.4

Source: U.S. Bureau of the Census, 2012-2016 5-Year American Community Survey; Census 2000 Summary File 1
 *Not included in the 2018 Osage Co. HMP

Typically population growth or decline is generally accompanied by an increase or decrease in the number of housing units. **Table 3.16** provides the change in numbers of housing units in the planning area from 2000-2016.

Table 3.16. Change in Housing Units, 2000-2016

Jurisdiction	Housing Units 2000	Housing Units 2016	2000-2016 # Change	2000-2016 % change
Unincorporated Osage County	4,494	4,991	497	11.1
*Argyle	77	120	43	55.8
Chamois	230	212	-18	-7.8
Freeburg	205	197	-8	-3.9
Linn	616	720	104	16.8
Meta	130	112	-18	-13.8
Westphalia	152	196	44	28.9

Source: U.S. Census Bureau, 2012-2016 5 Year American Community Survey; U.S. Bureau of the Census, Census 2000 Summary File 1

*Not included in the 2018 Osage Co. HMP

Since the last update of the Osage County Hazard Mitigation Plan (2013), multiple jurisdictions have reported new construction/developments. The City of Linn reported new residential developments, Westphalia reported the construction of a Dollar General, Osage Co. reported new development east of Linn, Osage Co. R-I added a new preschool trailer, and Osage Co. R-II built a new elementary school and VoAG addition in 2016.

Jurisdictions also reported anticipated future developments within the next 5 years (2018-2023). The City of Chamois anticipates sewer improvements, Osage Co. anticipates the development of multiple

apartment complexes and a senior living center east of Linn, and Osage Co. R-III will possibly renovate the upper elementary school. Freeburg, Linn, Meta, and Westphalia do not anticipate future developments within the next 5 years.

New development can impact a jurisdiction's vulnerability to natural hazards. As the number of buildings, critical facilities, and assets increase, vulnerability increases as well. For example, real estate development can increase storm water runoff, which often increases localized flooding. However, some development such as infrastructure improvements can help reduce vulnerability risks. Unfortunately, quantitative data is not available to further examine each jurisdiction's new development and its correlation to natural hazard vulnerabilities.

Socioeconomic Profile

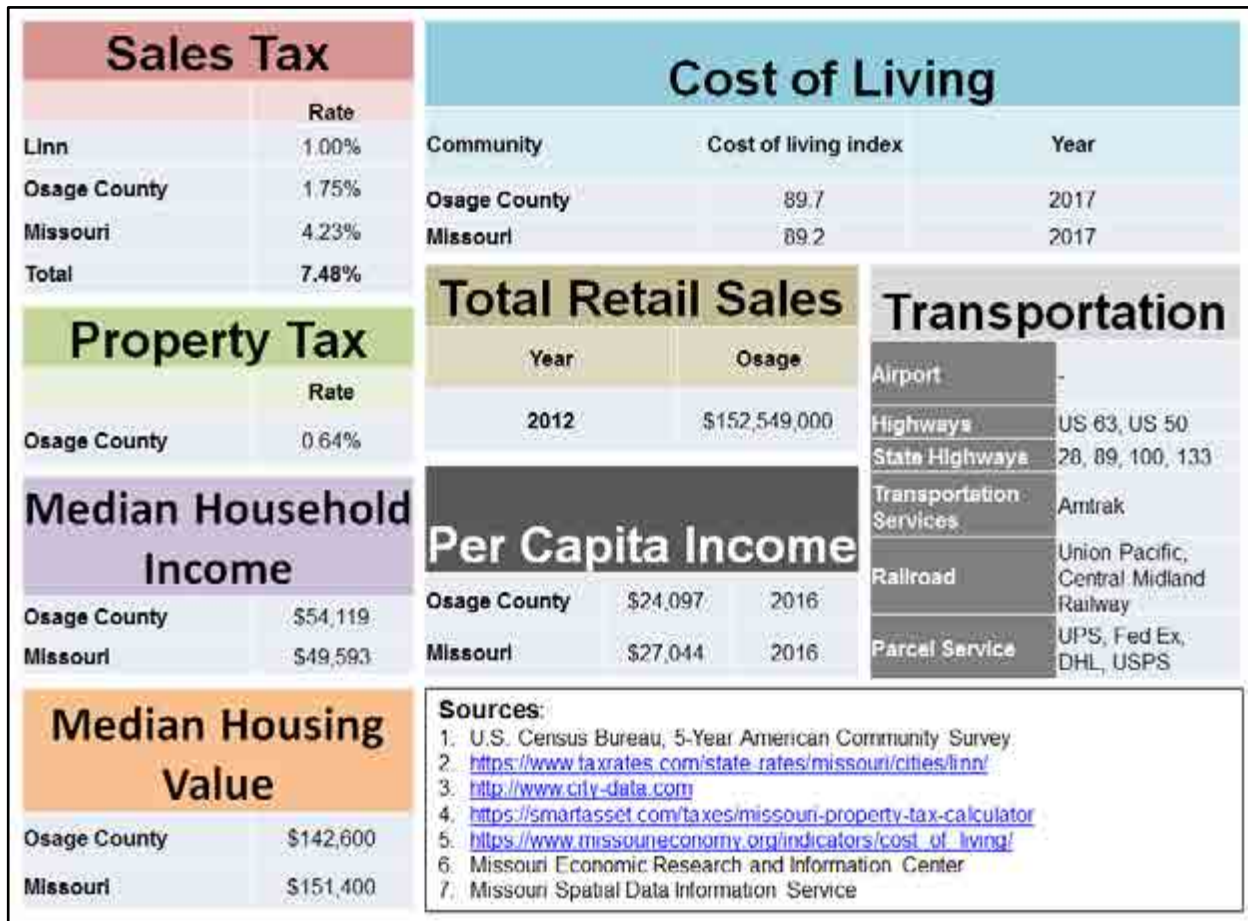
The University of Missouri Extension developed a Social and Economic Profile for Osage County. Population trend data suggests that Osage County will decrease by 211 individuals within the next 2 to 12 years⁶. Furthermore, business incentives are available in the County including MissouriWorks, a program for qualified job creators which enables the retention of withholding tax or tax credits that can be transferrable, refundable and/or saleable; BUILD, a financial incentive for the location or expansion of large business projects; sales tax exemptions exist for qualified manufacturers; and industrial infrastructure grants are available up to \$2 million or \$20,000 per job created⁷. **Figure 3.3** displays socioeconomic data for Osage County compared to the State of Missouri.

⁶ UM Extension Social and Economic Profile <http://mcdc.missouri.edu/cgi-bin/broker? PROGRAM=websas.cntypage.sas&county=29151>

⁷ <https://www.ded.mo.gov/Programs.aspx>

Figure 3.3.

Osage County Socioeconomic Profile



3.4 Hazard Profiles, Vulnerability, and Problem Statements

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 profile will consist of a general hazard description, location, severity/magnitude/extent, previous events, future probability, a discussion of risk variations between jurisdictions, and how anticipated development could impact risk. At the end of each hazard profile will be a vulnerability assessment, followed by a summary problem statement.

Hazard Profiles

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.

Each hazard identified in Section 3.1.4 will be profiled individually in this section in alphabetical order. The level of information presented in the profiles will vary by hazard based on the information available. With each update of this plan, new information will be incorporated to provide better evaluation and prioritization of the hazards that affect the planning area. Detailed profiles for each of the identified hazards include information categorized as follows:

Hazard Description: This section consists of a general description of the hazard and the types of impacts it may have on a community or school/special district.

Geographic Location: This section describes the geographic location of the hazard in the planning area. Where available, use maps to indicate the specific locations of the planning area that are vulnerable to the subject hazard. For some hazards, the entire planning area is at risk.

Severity/Magnitude/Extent: This includes information about the severity, magnitude, and extent of a hazard. For some hazards, this is accomplished with description of a value on an established scientific scale or measurement system, such as an EF2 tornado on the Enhanced Fujita Scale. Severity, magnitude, and extent can also include the speed of onset and the duration of hazard events. Describing the severity/magnitude/extent of a hazard is not the same as describing its potential impacts on a community. Severity/magnitude/extent defines the characteristics of the hazard regardless of the people and property it affects.

Previous Occurrences: This section includes available information on historic incidents and their impacts. Historic event records form a solid basis for probability calculations.

Probability of Future Occurrence: The frequency of recorded past events is used to estimate the likelihood of future occurrences. Probability was determined by dividing the number of recorded events by the number of years and multiplying by 100. This gives the percent chance of the event happening in any given year. For events occurring more than once annually, the probability will be reported 100% in any given year, with a statement of the average number of events annually.

The discussion on the probability of future occurrence should also consider changing future conditions, including the effects of long-term changes in weather patterns and climate on the identified hazards. NOAA has a new tool that can provide useful information for this purpose.

- NOAA Climate Explorer, <http://toolkit.climate.gov/climate-explorer2/>

Vulnerability Assessments

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)(C) :[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 in floods.

Following the hazard profile for each hazard will be the vulnerability assessment. The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to damages from natural hazards. The vulnerability assessments will be based on the best available county-level data, which is in the Missouri Hazard Mitigation Plan (2013). The county-level assessments in the State Plan were based on the following sources:

- Statewide GIS data sets compiled by state and federal agencies; and
- FEMA's HAZUS-MH loss estimation software.

The vulnerability assessments in the Osage County plan will also be based on:

- Written descriptions of assets and risks provided by participating jurisdictions;
- Existing plans and reports;
- Personal interviews with planning committee members and other stakeholders; and
- Other sources as cited.

Within the Vulnerability Assessment, the following sub-headings will be addressed:

Vulnerability Overview: This section will include a brief review of the vulnerability of each hazard.

Potential Losses to Existing Development: (including types and numbers, of buildings, critical facilities, etc.)

Future Development: This section will include information on anticipated future development in the county, and how that would impact hazard risk in the planning area.

Previous and Future Development: This section will include information on how changes in development have impacted the community's vulnerability to this hazard. Describe how any changes in development that occurred in known hazard prone areas since the previous plan have increased or decreased the community's vulnerability. Describe any anticipated future development in the county, and how that would impact hazard risk in the planning area.

Problem Statements

Each hazard analysis must conclude with a brief summary of the problems created by the hazard in the planning area, and possible ways to resolve those problems. Additionally, variations in risk between geographic areas will be included.

3.4.1 Dam Failure

Some specific sources for this hazard are:

- Missouri Department of Natural Resources, Dam and Reservoir Safety, <http://dnr.mo.gov/env/wrc/dam-safety/statemap.htm>
- Stanford University's National Performance of Dams Program; <http://npdp.stanford.edu/index.html>
- National Inventory of Dams, <http://geo.usace.army.mil/>
- MO DNR Dam & Reservoir Safety Program;
- National Resources Conservation Service <http://www.nrcs.usda.gov>
- DamSafetyAction.org, <http://www.damsafetyaction.org/MO/>
- Missouri Spatial Data Information Service, <http://msdis.missouri.edu>

Hazard Profile

Hazard Description

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams are typically constructed of earth, rock, concrete, or mine tailings. Dam failure is the uncontrolled release of impounded water resulting in downstream flooding, affecting both life and property. Dam failure can be caused by any of the following:

1. Overtopping - inadequate spillway design, debris blockage of spillways or settlement of the dam crest.
2. Piping: internal erosion caused by embankment leakage, foundation leakage and deterioration of pertinent structures appended to the dam.
3. Erosion: inadequate spillway capacity causing overtopping of the dam, flow erosion, and inadequate slope protection.
4. Structural Failure: caused by an earthquake, slope instability or faulty construction.

Information regarding dam classification systems under both the Missouri Department of Natural Resources (MDNR) and the National Inventory of Dams (NID), which differ, are provided in **Table 3.17** and **Table 3.18**, respectively.

Table 3.17. MDNR Dam Hazard Classification Definitions

Hazard Class	Definition
Class I	Contains 10 or more permanent dwellings or any public building
Class II	Contains 1 to 9 permanent dwellings or 1 or more campgrounds with permanent water, sewer, and electrical services or 1 or more industrial buildings
Class III	Everything else

Source: Missouri Department of Natural Resources, http://dnr.mo.gov/env/wrc/docs/rules_reg_94.pdf

Table 3.18. NID Dam Hazard Classification Definitions

Hazard Class	Definition
Low Hazard	A dam located in an area where failure could damage only farm or other uninhabited buildings, agricultural or undeveloped land including hiking trails, or traffic on low volume roads that meet the requirements for low hazard dams.
Significant Hazard	A dam located in an area where failure could endanger a few lives, damage an isolated home, damage traffic on moderate volume roads that meet certain requirements, damage low-volume railroad tracks, interrupt the use or service of a utility serving a small number of customers, or inundate recreation facilities, including campground areas intermittently used for sleeping and serving a relatively small number of persons.
High Hazard	A dam located in an area where failure could result in any of the following: extensive loss of life, damage to more than one home, damage to industrial or commercial facilities, interruption of a public utility serving a large number of customers, damage to traffic on high-volume roads that meet the requirements for hazard class C dams or a high-volume railroad line, inundation of a frequently used recreation facility serving a relatively large number of persons, or two or more individual hazards described for significant hazard dams.

Source: National Inventory of Dams

Geographic Location

Dams in Planning Area

According to the Department of Natural Resources there are 21 dams within Osage County; including Class 1 (3), Class 2 (9), and Class 3 (9) dams (**Table 3.19**). In addition, the state regulates 1 dam, Ben Branch Dam. The NID recognizes 21 dams in the planning area; including high (12), significant (1), and low (8) NID hazard class dams. None of the dams are owned or operated by the United States Army Corps of Engineers (USACE). **Table 3.20** provides the names, locations, and other pertinent information for all NID High Hazard Dams in the planning area.

Table 3.19. Osage County Dams Hazard Risk

Name of Dam	DNR Hazard Class	NID Hazard Class
ARGYLE LAKE DAM	2	High
BAKER DAM	2	High
BAUMHOER LAKE DAM	3	Low
BEN BRANCH DAM	1	High
BYINGTON LAKE DAM	1	High
COLLEGE HILL DAM	3	Low
DILL, LEE DAM	3	Low
FRANKEN LAKE DAM	3	Low
HUG DAM	3	Low
J G F FARMS DAM	3	Low
KUPER-SCOTT RANCH DAM	2	High
LAKE ACRES DAM	2	High
LAKE ISABELL DAM	3	Low

Name of Dam	DNR Hazard Class	NID Hazard Class
LUECKE LAKE DAM	3	Low
MUENKS DAM	2	High
PATTERSON LAKE DAM	2	High
PINNELL LAKE DAM	2	High
ROHLFING DAM - MONONAME 408	1	High
SCOTT LAKE DAM	3	Significant
WELSCHMEYER'S DAM	2	High
WILLIBRAND LAKE DAM	2	High

Source: Missouri Department of Natural Resources, Water Resources Program

Table 3.20. NID High Hazard Class Dams in the Osage County Planning Area

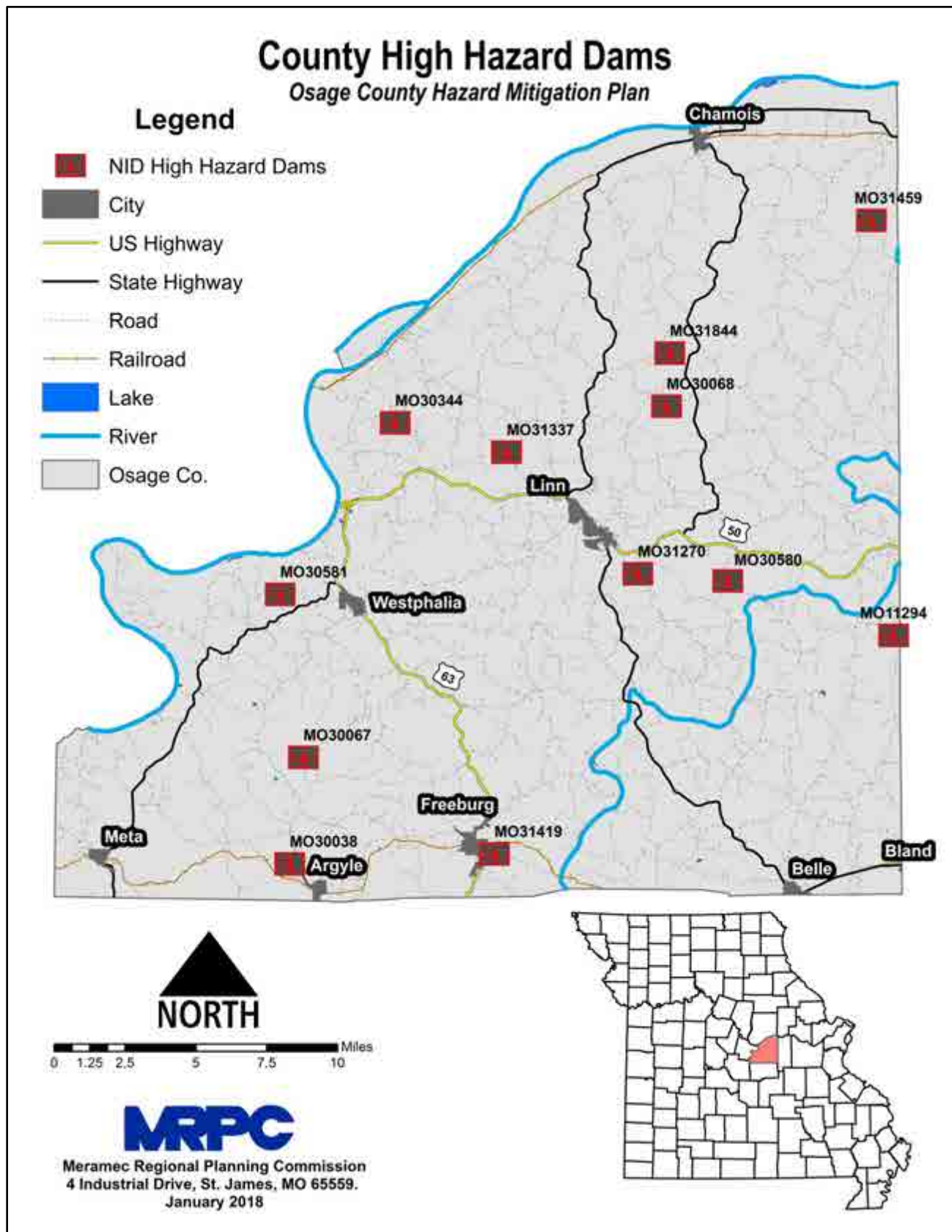
Dam Name	NIDID	Hazard Potential *	NID Height (Ft.)	NID Storage	River	Nearest City *	Distance To City (Mi.) *
ARGYLE LAKE DAM	MO30038	High	25	160	TR-LOOSE CREEK	ARGYLE	2
BAKER DAM	MO31459	High	25	54	TR-BAILEYS CREEK	MORRISON	0
BEN BRANCH DAM	MO31844	High	51	1,210	BEN BRANCH	LUYSTOWN	3
BYINGTON LAKE DAM	MO31270	High	33	159	OWENS CREEK	COOPER HILL	13
KUPER-SCOTT RANCH DAM	MO30344	High	25	67	JAEGER CREEK	OSAGE CITY	5
LAKE ACRES DAM	MO30068	High	30	144	TR-INDIAN CREEK	TEBBETTS	15
MUENKS DAM	MO31337	High	29	78	TR-MAASEN CREEK-LOOSE CREEK	CHAMOI	0
PATTERSON LAKE DAM	MO11294	High	31	166	TR-THIRD CREEK	COOPER HILL	1
PINNELL LAKE DAM	MO30581	High	25	107	TR-OSAGE RIVER	OSAGE CITY	8
ROHLFING DAM - MONONAME 408	MO30580	High	23	74	TR-POINTERS CREEK	COOPER HILL	8
WELSCHMEYER'S DAM	MO31419	High	28	75	TR-GASCONADE RIVER	MT STERLING	30
WILLIBRAND LAKE DAM	MO30067	High	25	334	TR-MARIES RIVER	WESPHALIA	4

Sources: National Inventory of Dams, http://nid.usace.army.mil/cm_apex/f?p=838:12.

Figure 3.3 depicts locations of NID high hazard dams located in the planning area. If a dam failure were to occur in Osage County, depending upon dam and location, the severity would range between negligible to life threatening. Road infrastructure, residential structures, commercial buildings, and public buildings are all vulnerable to losses. There are no areas of assembly in dam inundation zones.

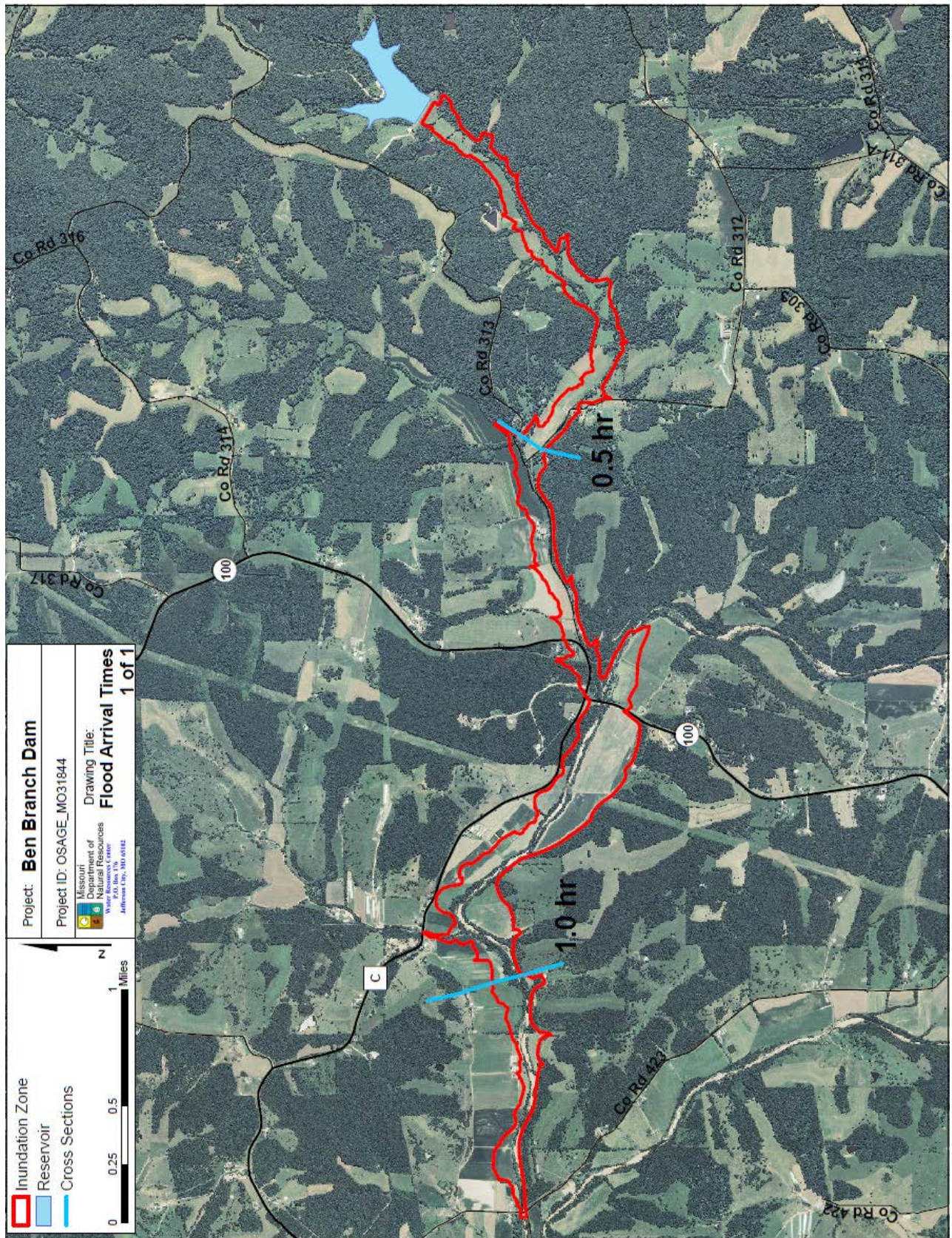
One dam inundation map, Ben Branch Dam, was available from the Missouri Department of Natural Resources (**Figure 3.4**). No other dam inundation maps were available for the remaining NID High Hazard Dams in the county.

Figure 3.3. NID High Hazard Dam Locations in Osage County



Source: MSDIS, MRPC

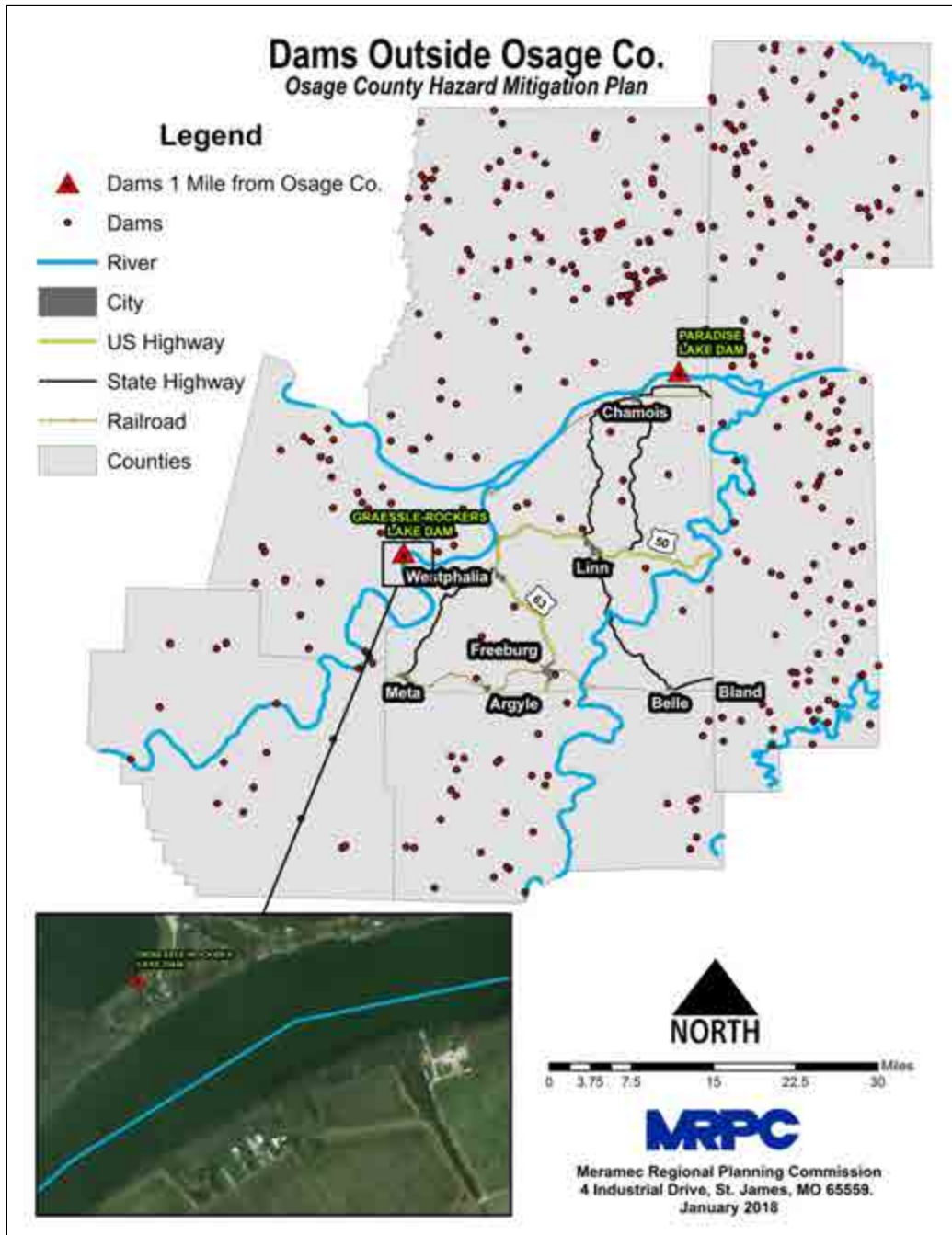
Figure 3.4. Ben Branch Dam Inundation Zone



Upstream Dams Outside the Planning Area

According to the Missouri Department of Natural Resources, Missouri Geological Survey, Water Resources Center, there are no regulated high hazard dams that would flow into Osage County from surrounding counties during a failure event. However, Graessle-Rockers Lake Dam in Cole County (Unregulated, High Hazard, Class 2) is located approximately 200 yards from Osage Co., across the Osage River. As seen in **Figure 3.5**, there are numerous structures in close proximity to the dam. During a failure event, loss of life and property damage are possible dependent upon severity of failure.

Figure 3.5. Upstream Dams Outside Osage County



Source: MSDIS, MRPC

Severity/Magnitude/Extent

The severity/magnitude of dam failure would be similar in some cases to the impacts associated with flood events (see the flood hazard vulnerability analysis and discussion). Based on the hazard class definitions, failure of any of the high hazard dams could result in a serious threat of loss of human life, serious damage to residential, industrial or commercial areas, public utilities, public buildings, or major transportation facilities. Catastrophic failure of any high hazard dams has the potential to result in greater destruction due to the potential speed of onset and greater depth, extent, and velocity of flooding. Worst case scenario would be a catastrophic failure at any of the high hazard class dams designated in **Table 3.20**.

Previous Occurrences

According to Stanford University's National Performance of Dams Program and the Missouri State Emergency Management Agency, there were 69 recorded dam incidents in Missouri between 1917 and 2008. Fourteen were considered failures^{8,9}. Fortunately, only one drowning has been associated with a dam failure in the state. 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 6000 feet wide and 7,000 feet long that carried a mix of trees, rebar, concrete, boulders and sand downhill and into the park¹⁰. 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 high¹¹. 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 hard¹².

Overall, many of Missouri's smaller dams are becoming a greater hazard as they continue to age and

⁸ http://npdp.stanford.edu/dam_incidents

⁹ 2013 Missouri State Hazard Mitigation Plan

¹⁰ United States Geological Survey. Damage Evaluation of the Taum Sauk Reservoir Failure using LiDAR. http://mcsqc.usgs.gov/publications/t_sauk_failure.pdf

¹¹ The Alert. Spring 2006. After the Deluge...What's Ahead for Taum Sauk? By Dan Sherburne.

¹² The Alert. Spring 2006. After the Deluge...What's Ahead for Taum Sauk? By Dan Sherburne.

deteriorate. While hundreds of them need to be rehabilitated, lack of available funding and often questions of ownership loom as obstacles difficult to overcome¹³.

Event Description

According to Stanford University’s National Performance of Dams Program, no dam incidents have been recorded for Osage County¹⁴.

Probability of Future Occurrence

Since it is unknown which dams, if any might fail at any given time, determining the probability of future occurrence is not possible¹⁵. In addition, dam failure within the county has not occurred according to available data. **Table 3.4** depicts dam failure probability as no data available (NDA).

Vulnerability

Vulnerability Overview

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for the vulnerability analysis of dam failure for Osage County. There are however data limitations regarding dams unregulated by the State of Missouri due to height requirements. These limitations hinder vulnerability analysis; nonetheless, failure potential still exists. **Table 3.21** provides vulnerability analysis data for the failure of State-regulated dams in Missouri.

Table 3.21. Vulnerability Analysis for Failure of State-regulated Dams in Missouri

County	Class 1	Class 2	Class 3	Total	Estimated # of Buildings Vulnerable	Average Exposure Value per Structure (\$)	Estimated Total Potential Building Exposure (\$)	Estimated Total Population Exposure	Estimated Building Losses (\$)
Osage	1	0	0	1	10	88,095	1,767,931	17	883,965

Source: 2013 Missouri State Hazard Mitigation Plan

For the vulnerability analysis of State regulated dams, the State developed the following assumptions for overview.

- Class 1 dams, the number of structures in the inundation area was estimated to be 10 buildings since this is the minimum threshold for a dam being considered a class 1 dam.

¹³ United States Geological Survey Fact Sheet 131-02. October 2002

¹⁴ http://www.npdp.standord.edu/dam_incidents

¹⁵ 2013 Missouri State Hazard Mitigation Plan

- Class 2 dams, the number of structures in the inundation area was estimated to be 5 buildings. This is the mid-range of buildings in the inundation area for a dam to be considered a class 2 dam.
- Class 3 dams, the number of structures in the inundation area was estimated to be 0 buildings since class 3 dams do not have any structures within their inundation area.

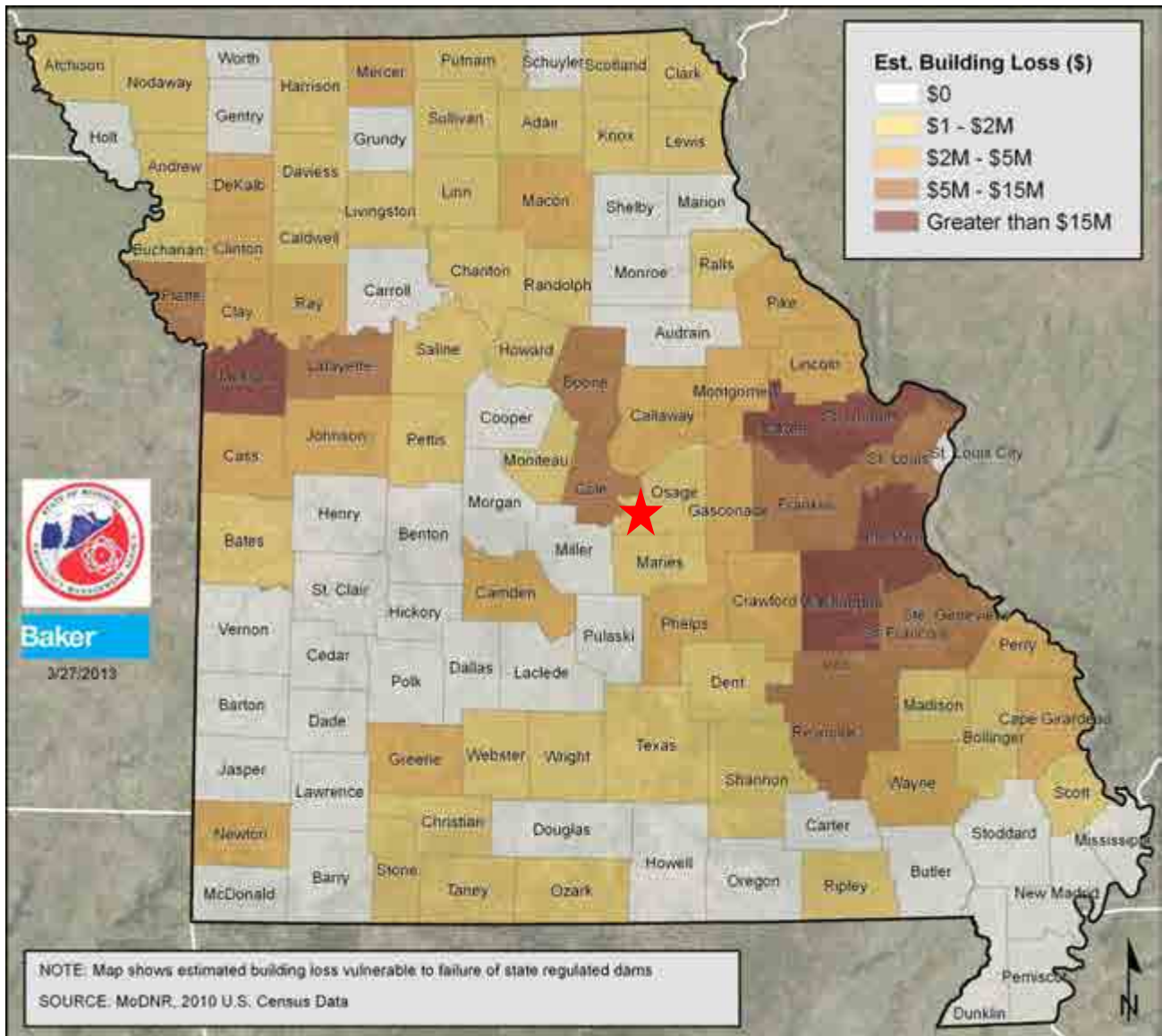
According to the 2013 Missouri State Hazard Mitigation Plan, there is an estimated 10 buildings vulnerable to the failure of Ben Branch Dam (**Figure 3.6**). Furthermore, the state quantified potential loss estimates in terms of property damages. To execute the analysis, the following assumptions were utilized.

- Average values for residential structures were obtained for each county from HAZUS-MH MR4. Residential structures were chosen as the most prevalent structure-type downstream of dams. Although certainly other building types are present, the numbers and values are not known.
- The estimated structure loss was estimated to be at 50 percent of the value of the structure. Actual losses will vary based on the depth of inundation.
- For population exposure, United States Census blockgroups were intersected with available State regulated dam inundation areas to identify the vulnerable population for each county¹⁶.

Figure 3.7 and **Figure 3.8** depict the total estimated building losses and population exposure by county, respectively. The estimated building loss from failure of Ben Branch Dam is \$883,965. The estimated population exposure to failure of Ben Branch Dam is 17.

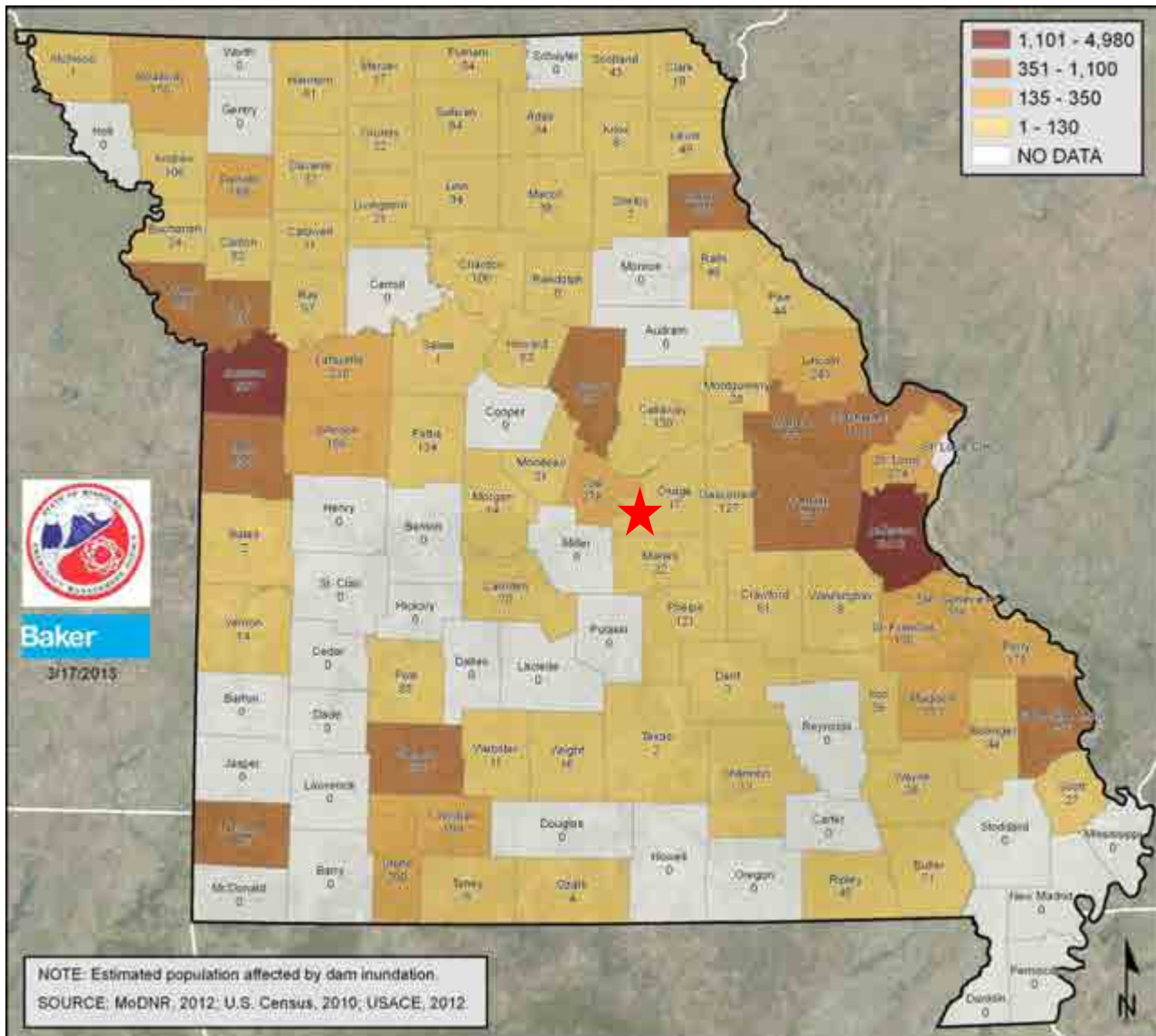
¹⁶ 2013 Missouri State Hazard Mitigation Plan

Figure 3.7. Estimated Building Losses from Failure of State-regulated Dams



Source: 2013 Missouri State Hazard Mitigation Plan
 *Red star indicates Osage County

Figure 3.8. Estimated Population Exposure to Failure of State-regulated Dams



Source: 2013 Missouri State Hazard Mitigation Plan
 *Red star indicates Osage County

Potential Losses to Existing Development: (including types and numbers, of buildings, critical facilities, etc.)

The worst case dam failure event at any high hazard dam in the county could lead to serious loss to road infrastructure, commercial and residential structures, and human life. However, all high hazard dams located within the county are rural in nature.

Impact of Future Development

Future development within the county that has potential to be influenced by dam failure includes any areas downstream of a dam within the 100 Year Floodplain.

Hazard Summary by Jurisdiction

Variations in vulnerability across the planning area depend upon multiple variables. Nonetheless, Osage County school districts and special districts do not have assets located in dam breach inundation areas. The only state regulated dam in the county has an estimated building loss of \$883,965. The estimated population exposure to failure of Ben Branch Dam is 17.

Problem Statement

In summary, the hazard risk for dam failure in Osage County ranges between high and low, dependent upon the dam. If a dam does fail, the expected impacts could vary from negligible to critical, and could potentially affect road infrastructure, residential structures, commercial buildings, public structures, and human life. It is recommended to 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. Installation of education programs to inform the public of dam safety measures and preparedness activities would be beneficial. In addition, the availability of training programs to encourage land owners how to properly inspect their dams, and develop emergency action plans would be advantageous.

3.4.2 Drought

Some specific sources for this hazard are:

- Maps of effects of drought, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln; <http://www.drought.unl.edu/>.
- Historical drought impacts, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln; at <http://droughtreporter.unl.edu/>.
- Recorded low precipitation, NOAA Regional Climate Center, (<http://www.hprcc.unl.edu>).
- Water shortages, Missouri's Drought Response Plan, Missouri Department of Natural Resources, <http://dnr.mo.gov/pubs/WR69.pdf>
- Populations served by groundwater by county, USGS-NWIS, <http://maps.waterdata.usgs.gov/mapper/index.html>
- Census of Agriculture, http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Missouri/and_
http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- Natural Resources Defense Council, <http://www.nrdc.org/globalWarming/watersustainability/>

Hazard Profile

Hazard Description

Drought is generally defined as a condition of moisture levels significantly below normal for an extended period of time over a large area that adversely affects plants, animal life, and humans. A drought period can last for months, years, or even decades. There are four types of drought conditions relevant to Missouri, according to the 2013 Missouri State Hazard Mitigation Plan, which are as follows.

- **Meteorological** drought is defined in terms of the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. A meteorological drought must be considered as region-specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.
- **Hydrological** drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (e.g., streamflow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, streamflow, and ground water and reservoir levels. As a result, these impacts also are out of phase with impacts in other economic sectors.
- **Agricultural** drought focus is on soil moisture deficiencies, differences between actual and potential evaporation, reduced ground water or reservoir levels, etc. Plant demand for water depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil.

- Socioeconomic drought refers to when physical water shortage begins to affect people¹⁷.

Geographic Location

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. The number of individuals within the county served by groundwater is 7,399¹⁸. However, rural residences with individual wells will likely be affected as well. Approximately 72% of the land in the county is utilized for agricultural purposes. Furthermore, livestock sales comprise 82% of the market of agricultural products sold in Osage County. A drought would directly impact livestock production and the agriculture economy in Osage County¹⁹.

Severity/Magnitude/Extent

The National Drought Monitor Center at the University of Nebraska at Lincoln summarized the potential severity of drought as follows. Drought can create economic impacts on agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to losses in yields in 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 disease to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn place 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. Finally, while drought is rarely a direct cause of death, the associated heat, dust and stress can all contribute to increased mortality²⁰.

Figure 3.9 depicts a U.S. Drought Monitor map of Missouri on February 6, 2018. This map illustrates the planning area, which could be in drought at any given moment in time. A red arrow indicates the location of the planning area (Osage County).

¹⁷ <http://www.drought.unl.edu/>

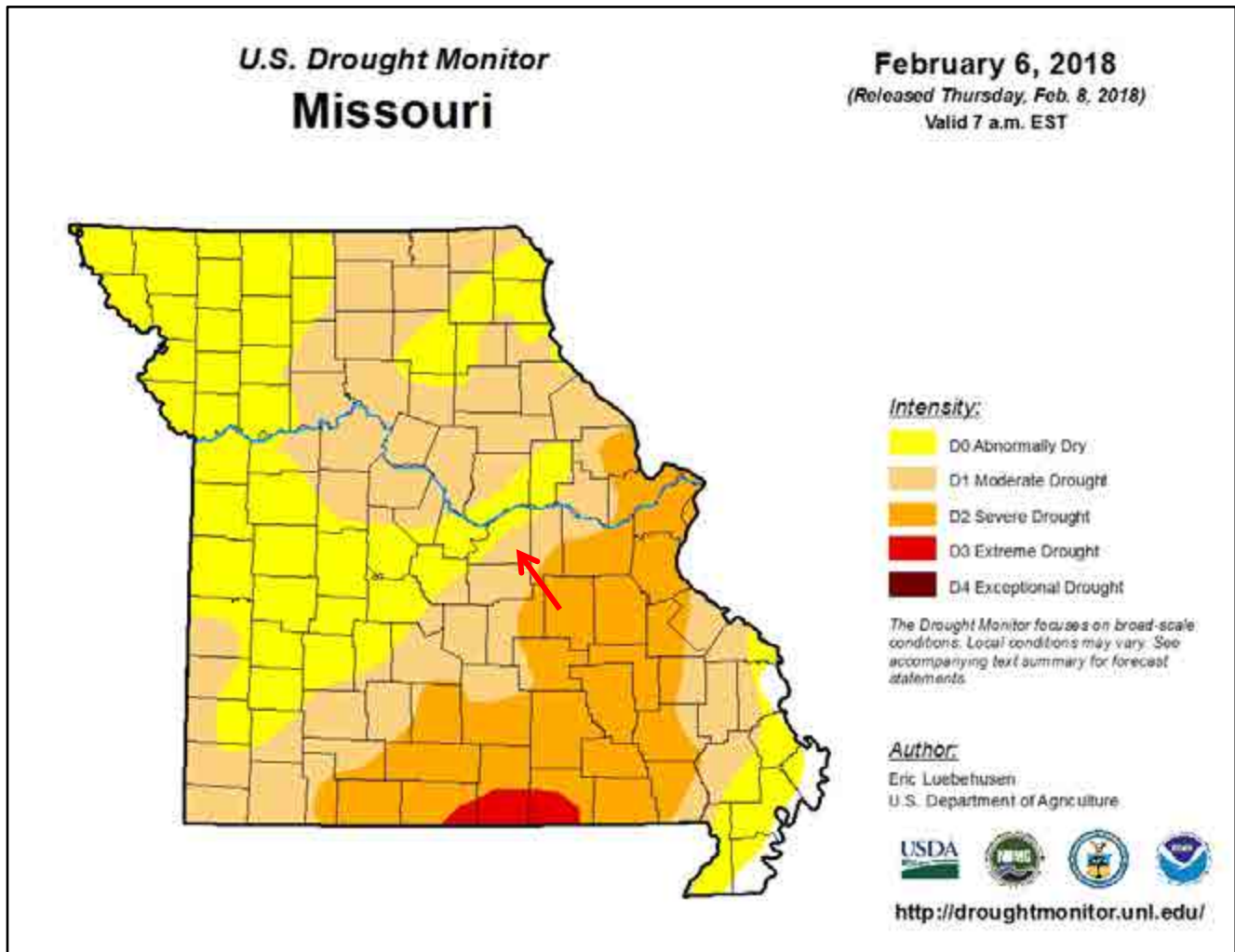
¹⁸ [2013 Missouri State Hazard Mitigation Plan](#)

¹⁹ https://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/cp29151.pdf

²⁰ Ibid

Figure 3.9.

U.S. Drought Monitor Map of Missouri on February 6, 2018



Source: U.S. Drought Monitor, <http://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?MO>

*Red arrow indicates Osage County

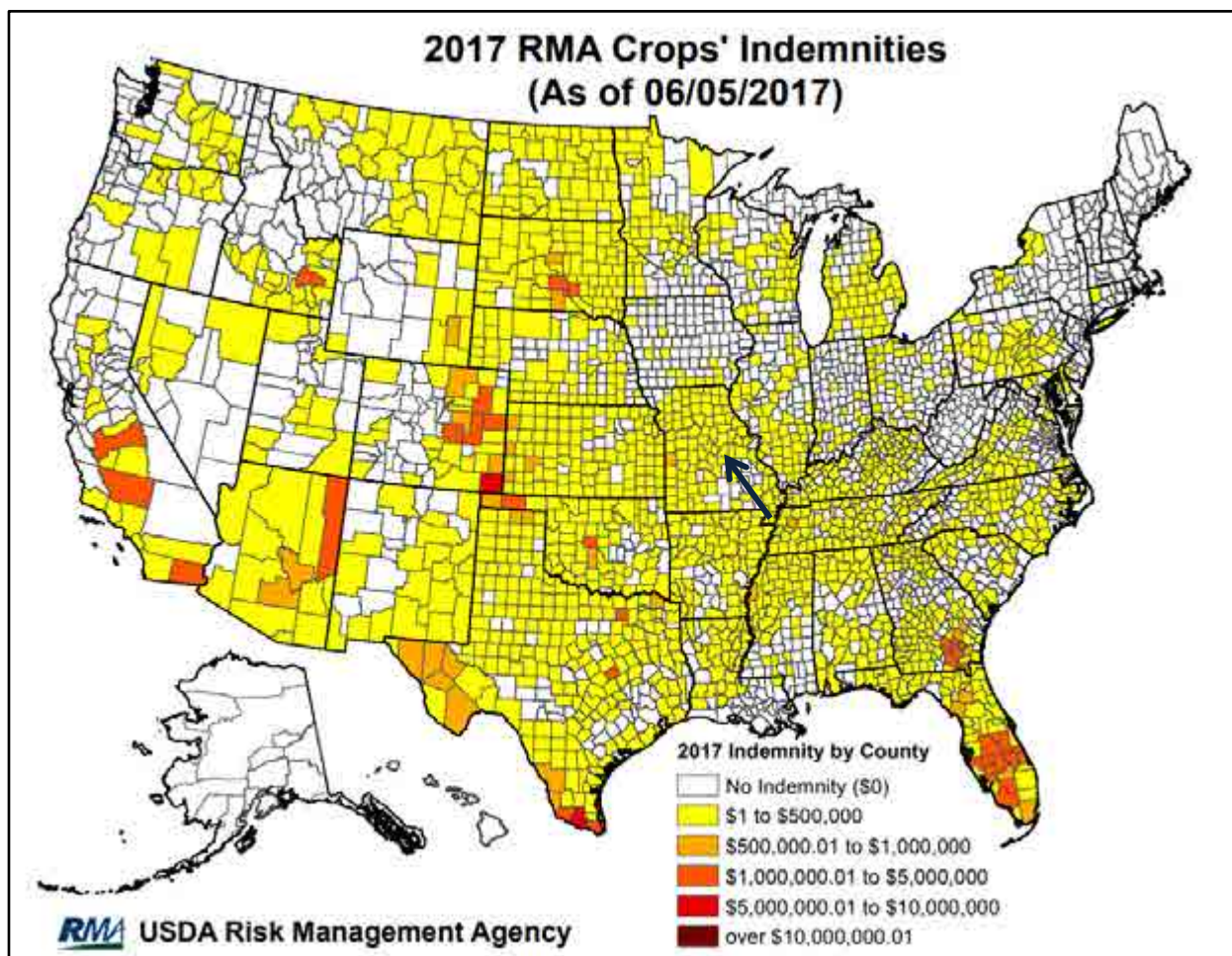
Table 3.22 details crop losses between 1998 and 2012 for Osage County. Additionally, Figure 3.10 illustrates RMA crop indemnities for 2017 across the United States. Osage County fell in the range of \$1 to \$500,000 in crop indemnities.

Table 3.22. Osage County Crop Losses 1998 – 2012 (USDA Risk Management Agency)

Total Crop Insurance Paid for Drought Damage 1998-2012	Crop Claims Ratio Rating	Annualized Crop Insurance Claims/Drought Damage	Crop Exposure (2007 Census of Agriculture)	Annual Crop Claims Ration	Crop Loss Ratio Rating
\$1,386,852	1	\$92,457	\$7,816,000	1.18 %	1

Source: 2013 Missouri State Hazard Mitigation Plan, USDA Risk Management Agency and USDA crop exposure

Figure 3.10. 2017 RMA Crop Indemnities for the United States



Source: <http://www.rma.usda.gov/data/indemnity/>

*Black arrow indicates Osage County

According to the USDA's Risk Management Agency, there have been 66 crop insurance payments due to drought since 1998. **Table 3.23** illustrates the year, number of payments, and total amount of crop insurance payments.

Table 3.23. Osage County Crop Indemnity Payments (1998-2017)

Year	Number of Payments	Total
1999	3	\$38,975
2000	1	\$229
2001	2	\$1,512
2002	3	\$44,997
2003	4	\$44,201
2005	7	\$57,367
2006	5	\$28,752
2007	6	\$38,134
2011	5	\$64,099
2012	15	\$1,096,113.08
2013	5	\$32,760

Year	Number of Payments	Total
2014	3	\$11,337
2016	3	\$2,085
2017	4	\$8,648

Source: <http://www.rma.usda.gov/data/cause.html>

The Palmer Drought Indices measure dryness based on recent precipitation and temperature. The indices are based on a “supply-and-demand model” of soil moisture. Calculation of supply is relatively straightforward, using temperature and the amount of moisture in the soil. However demand is more complicated as it depends on a variety of factors, such as evapotranspiration and recharge rates. These rates are harder to calculate. Palmer tried to overcome these difficulties by developing an algorithm that approximated these rates, and based the algorithm on the most readily available data — precipitation and temperature.

The Palmer Index has proven most effective in identifying long-term drought of more than several months. However, the Palmer Index has been less effective in determining conditions over a matter of weeks. It uses a “0” as normal, and drought is shown in terms of negative numbers; for example, negative 2 is moderate drought, negative 3 is severe drought, and negative 4 is extreme drought. Palmer’s algorithm also is used to describe wet spells, using corresponding positive numbers.

Palmer also developed a formula for standardizing drought calculations for each individual location based on the variability of precipitation and temperature at that location. The Palmer index can therefore be applied to any site for which sufficient precipitation and temperature data is available.

Figure 3.11 illustrates the Palmer Drought Severity Index sub-regions of Missouri. Osage County is categorized under the Northeast sub-region.

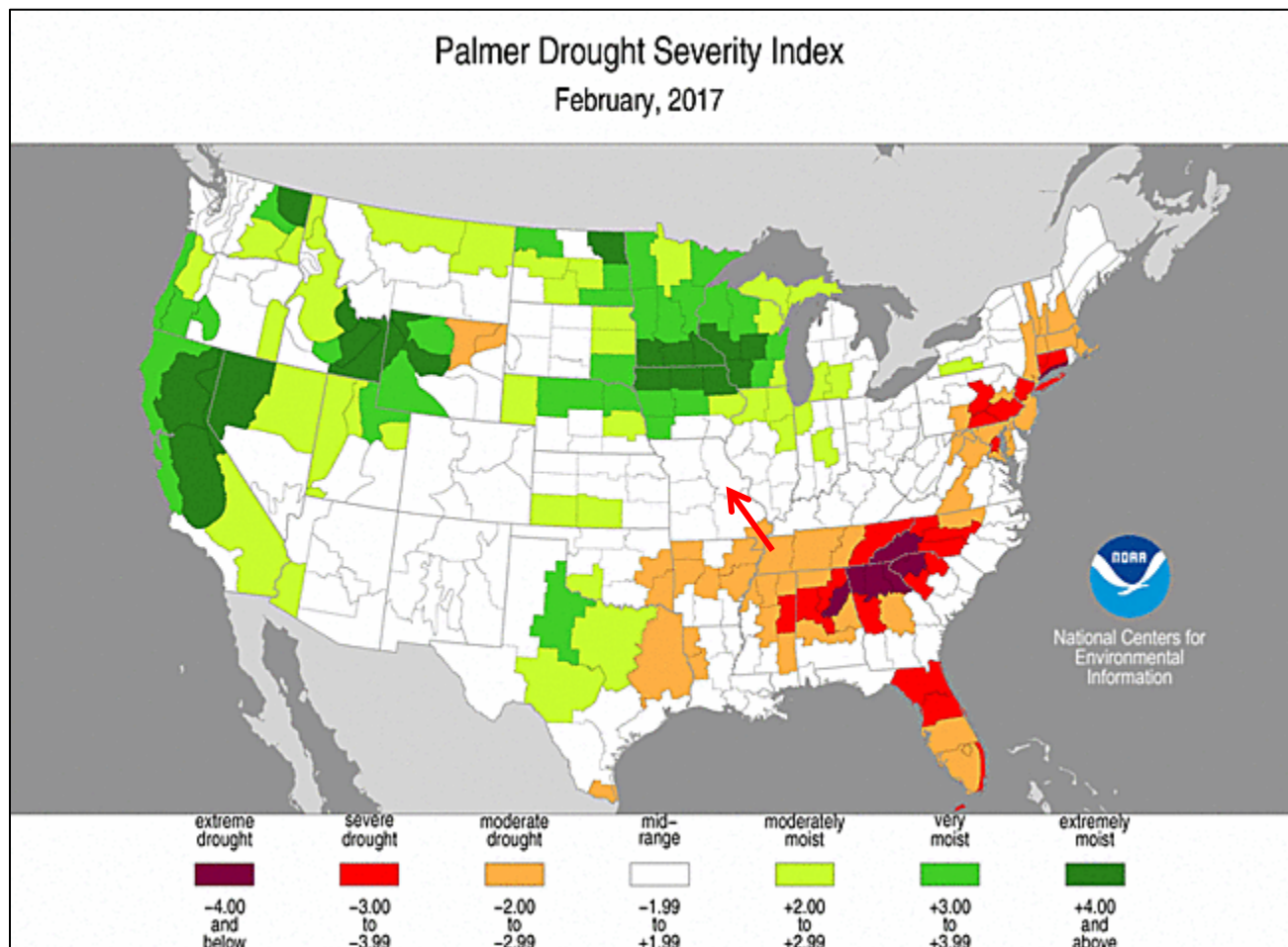
Figure 3.11. Palmer Drought Severity Index: Missouri Sub-regions



Source: 2013 Missouri State Hazard Mitigation Plan; *Red star indicates Osage County

Figure 3.12 is an example of the Palmer Modified Drought Index or the United States on September, 2016.

Figure 3.12. Palmer Modified Drought Index National Map February, 2017



Source: <http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/>; *Red arrow indicates Osage County

Data was collected from the Missouri Department of Natural Resources (2017 Census of Missouri Public Water Systems) to determine water source by jurisdiction. All Osage County jurisdictions utilize well water as their sole source of water (**Table 3.24**). Communities that exclusively depend upon ground water could experience hardship in the event of a long term drought.

Table 3.24. 2017 Water Source by Jurisdiction

Jurisdiction	% of source that is groundwater
Chamois	100
Freeburg	100
Linn	100
Meta	100
Westphalia	100

Source: Missouri Dept. of Natural Resources, 2016 Census of Missouri Public Water Systems

Previous Occurrences

Table 3.25 offers Palmer Drought Severity Index data for Osage County between 2010 and 2017. This information exemplifies drought conditions on a monthly basis for Missouri’s Northeast sub-region within the United States.

Table 3.25. Palmer Drought Severity Index for Osage County, MO (2010 – 2017)

Month	Year							
	2010	2011	2012	2013	2014	2015	2016	2017
Jan.	Extremely moist	Extremely moist	Mid-range	Mid-range	Moderate Drought	Moderately moist	Extremely moist	Mid-range
Feb.	Extremely moist	Extremely moist	Mid-range	Mid-range	Moderate Drought	Moderately moist	Very moist	Mid-range
March	Extremely moist	Extremely moist	Mid-range	Mid-range	Moderate Drought	Mid-range	Very moist	Mid-range
April	Extremely moist	Very moist	Mid-range	Moderately moist	Mid-range	Mid-range	Moderately moist	Mid-range
May	Extremely moist	Very moist	Mid-range	Very moist	Mid-range	Mid-range	Moderately moist	Mid-range
June	Extremely moist	Very moist	Moderate drought	Very moist	Mid-range	Very moist	Mid-range	Mid-range
July	Extremely moist	Mid-range	Severe drought	Mid-range	Mid-range	Extremely moist	Mid-range	Mid-range
Aug.	Extremely moist	Mid-range	Extreme drought	Mid-range	Mid-range	Extremely moist	Very moist	Mid-range
Sept.	Extremely moist	Mid-range	Severe drought	Mid-range	Moderately moist	Very moist	Very moist	Mid-range
Oct.	Extremely moist	Moderate drought	Severe drought	Mid-range	Very moist	Moderately moist	Moderately moist	Mid-range
Nov.	Extremely moist	Mid-range	Severe drought	Mid-range	Very moist	Very moist	Mid-range	Mid-range
Dec.	Extremely moist	Mid-range	Severe drought	Moderate drought	Moderately moist	Extremely moist	Mid-range	Moderate drought

Source: <http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/psi/201001-201511>

Probability of Future Occurrence

To calculate the probability of future occurrence of drought in Osage County, historical climate data was analyzed. There were 38 months of recorded drought (**Table 3.26**) over a 20 year span (January, 1998 to December, 2017). The number of months in drought (38) was divided by the total number of months (240) and multiplied by 100 for the annual average percentage probability of drought (**Table 3.27**). Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increase change of drought.

Table 3.26. Palmer Drought Severity Index for Osage County, MO (1998 – 2017)

Month	Year											
	January	February	March	April	May	June	July	August	September	October	November	December
1998												
1999										x	x	x
2000	x	x	x	x	x							
2001												
2002												
2003	x	x	x									
2004												
2005							x				x	x
2006	x	x	x	x	x	x	x	x	x			
2007										x	x	
2008												
2009												
2010												
2011										x		
2012						x	x	x	x	x	x	x
2013												x
2014	x	x	x									
2015												
2016												
2017												x

Source: <http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/zin/199409-201511>

*x indicates drought

Table 3.27. Annual Average Percentage Probability of Drought in Osage County, MO

Location	Annual Avg. % P of Drought
Osage County	15.83%

Source: NOAA National Centers for Environmental Information, Historical Palmer Drought Indices

*P = probability; see page 3.24 for definition.

Vulnerability

Vulnerability Overview

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for the drought vulnerability analysis. **Table 3.28** depicts the ranges for drought vulnerability factor ratings created by SEMA. The array ranges between 1 (low) and 5 (high). The factors considered include crop loss ratio rating and annualized crop claims paid. These two factors were utilized as agricultural losses data is readily available; thus making them the best factors to determine drought vulnerability throughout the State. Osage County is determined as having a low vulnerability to crop loss (**Table 3.22**) as a result of a drought. Additionally, SEMA has divided the State into 3 regions in regards to drought susceptibility (**Figure 3.13**). Osage County is included in Region B (Moderate Susceptibility). Region B is described as having groundwater sources that are suitable in meeting domestic and municipal water needs, but due to required well depths, irrigation wells are very expensive. Also, the topography is commonly unsuitable for row-crop irrigation²¹.

²¹ 2013 Missouri State Hazard Mitigation Plan

Figure 3.13. Drought Susceptibility in Missouri

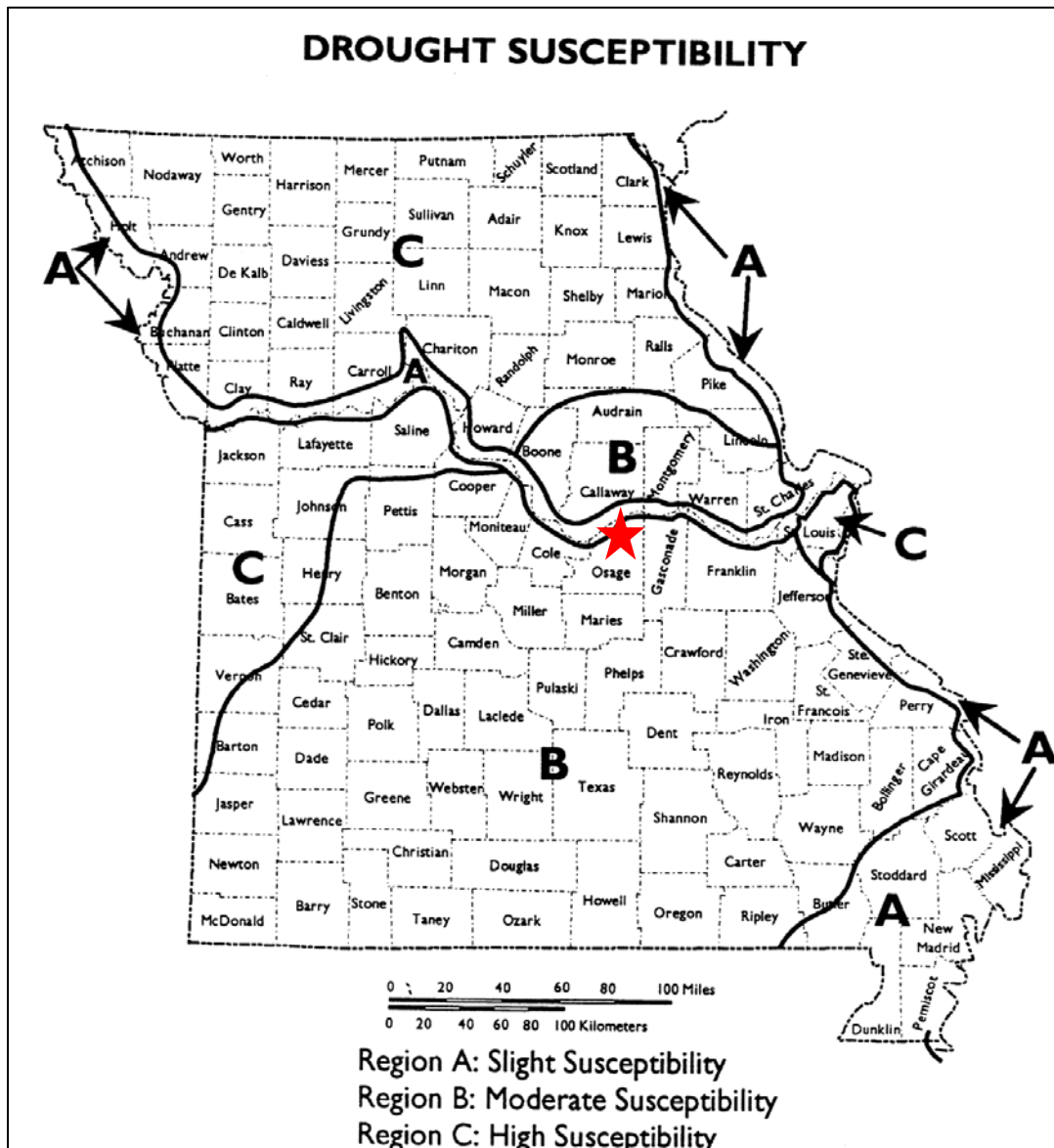


Table 3.28. Ranges for Drought Vulnerability Factor Ratings

Factors Considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Crop Loss Ratio Rating	0 – 2%	2 – 4%	4 – 6%	6 – 8%	>8%
Annualized Claims Paid	<\$500,000	\$500,000-\$1.5 M	\$1.5M-\$2.5 M	\$2.5 M-\$3.5 M	>\$3.5 M

Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.29. Vulnerability of Osage County to Drought

County	Total Crop Insurance Paid for Drought Damage 1998 - 2012	Crop Claims Ratio Rating	Annualized Crop Insurance Claims/Drought Damage	Crop Exposure (2007 Census of Agriculture)	Annual Crop Claims Ratio	Crop Loss Ratio Rating
Osage	\$1,386,852	1	\$92,457	\$7,816,000	1.18 %	1

Source: 2013 Missouri State Hazard Mitigation Plan

Potential Losses to Existing Development

Drought is not limited to a hazard that affects just agriculture, 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, or tourism. Additionally, extreme droughts have the ability to damage roads, water mains, and building foundations. On average, drought costs the U.S. economy about \$7 billion to \$9 billion a year, according to the National Drought Mitigation Center. Moreover, drought prone regions are also prone to increased fire hazards²².

Impact of Future Development

Impacts of drought on future development within Osage County would be negligible. Population trend analysis from the University of Missouri Extension suggests that Osage County will decrease by 211 individuals within the next 2 to 12 years²³. However, if the population increases, water use and demand would be expected to increase; potentially straining water supply systems. Chamois anticipates new sewer infrastructure within the next 5 years. However, long term drought could expose vulnerabilities during construction/upgrades of sewer infrastructures. Furthermore, any agriculture related development in terms of crop or livestock production would also be at risk.

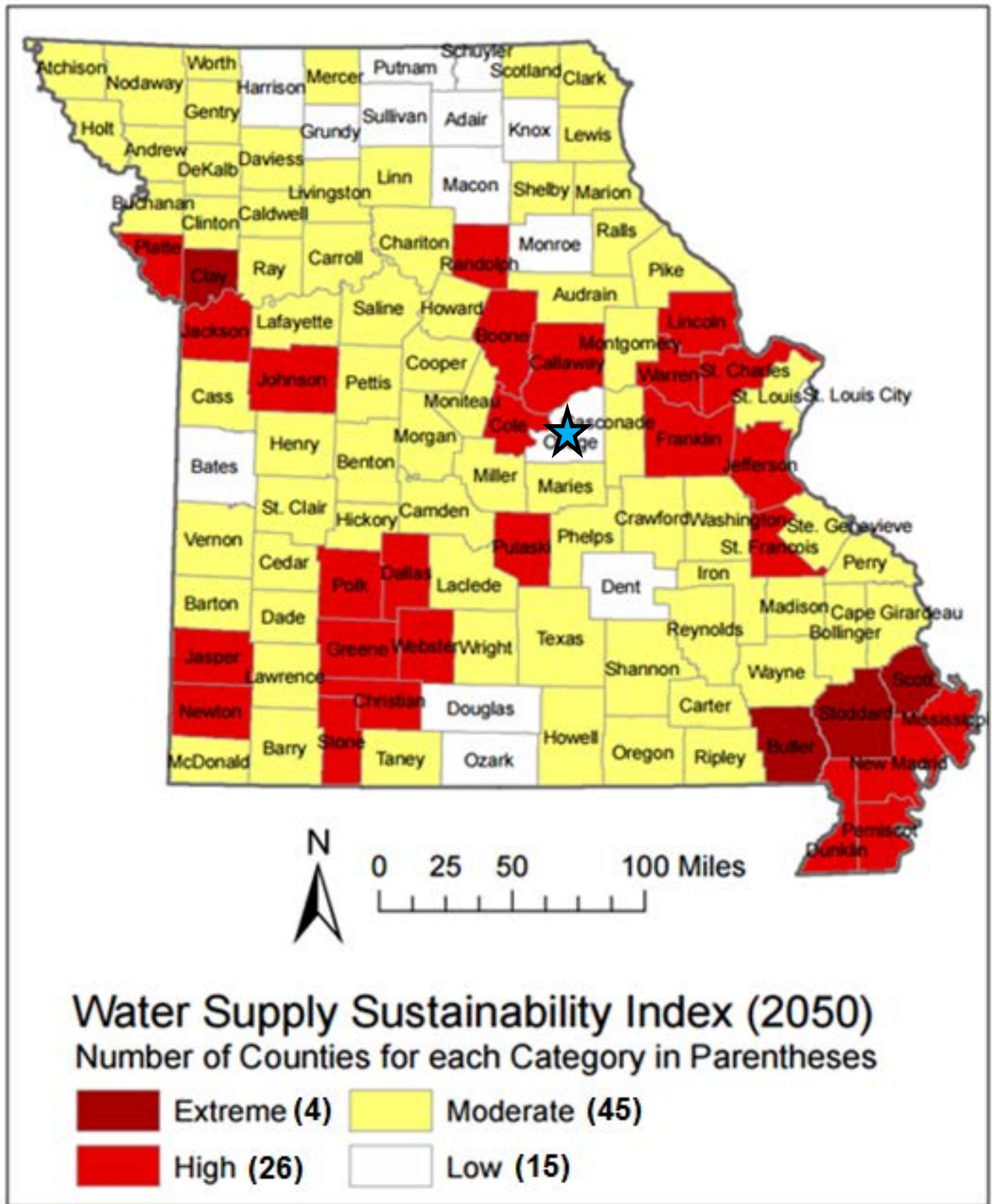
Impact of Climate Change

A new analysis, performed for the Natural Resources Defense Council, examined the effects of climate change on water supply and demand in the contiguous United States. The study found that more than 1,100 counties will face higher risks of water shortages by mid-century as a result of climate change. Two of the principal reasons for the projected water constraints are shifts in precipitation and potential evapotranspiration (PET). Climate models project decreases in precipitation in many regions of the U.S., including areas that may currently be described as experiencing water shortages of some degree. Osage County is predicted to experience low water shortages as a result of global warming (**Figure 3.14**) by the year 2050.

²² 2015 Boone County Hazard Mitigation Plan

²³ UM Extension Social and Economic Profile <http://mcdc.missouri.edu/cgi-bin/broker? PROGRAM=websas.cntypage.sas&county=29151>

Figure 3.14. Water Supply Sustainability Index (2050) with Climate Change Impacts



Source: Natural Resources Defense Council (NRDC), Climate Change, Water, and Risk
 *Blue star indicates Osage County

Hazard Summary by Jurisdiction

The variations between jurisdictions are non-existent to minimal. All jurisdictions within Osage County utilize ground/well water as their municipal water source. In cities, the drought conditions would be the same as those experienced in rural areas, but the magnitude would be different with only lawns and local gardens impacted. Long term drought, spanning months at a time, could negatively impact the amount of potable drinking water available to the various jurisdictions within the county. In an event of long term drought various jurisdictions may be required to impose restrictions on water use.

Problem Statement

In summary, drought within Osage County is considered low risk. Additionally, climate change predictions suggest low risks by the year 2050. Osage County has a relatively strong agricultural economy. Drought would impact commodities, specifically livestock and crops. Potential impacts to local economies and infrastructures are foreseeable in the event of a long term drought.

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 jurisdictions 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.

3.4.3 Earthquakes

Some specific sources for this hazard are:

- U.S. Seismic Hazard Map, United States Geological Survey, http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lq.jpg;
- 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone map, <http://www.igsb.uiowa.edu/Browse/quakes/quakes.htm>;
- Probability of magnitude 5.0 or greater within 100 Years, United States Geological Survey, <https://geohazards.usgs.gov/eqprob/2009/index.php>

Hazard Profile

Hazard Description

An earthquake is a sudden motion or trembling that is caused by a release of energy accumulated within or along the edge of the earth's tectonic plates. Earthquakes occur primarily along fault zones and tears in the earth's crust. Along these faults and tears in the crust, stresses can build until one side of the fault slips, generating compressive and shear energy that produces the shaking and damage to the built environment. Heaviest damage generally occurs nearest the earthquake epicenter, which is that point on the earth's surface directly above the point of fault movement. The composition of geologic materials between these points is a major factor in transmitting the energy to buildings and other structures on the earth's surface.

The closest fault to Osage County is the New Madrid Seismic Zone (NMSZ). The NMSZ is the most active seismic area in the United States east of the Rocky Mountains. Unfortunately, the faults in the NMSZ are poorly understood due to concealment by alluvium deposits. Moreover, the NMSZ is estimated to be 30 years overdue for a 6.3 magnitude earthquake²⁴.

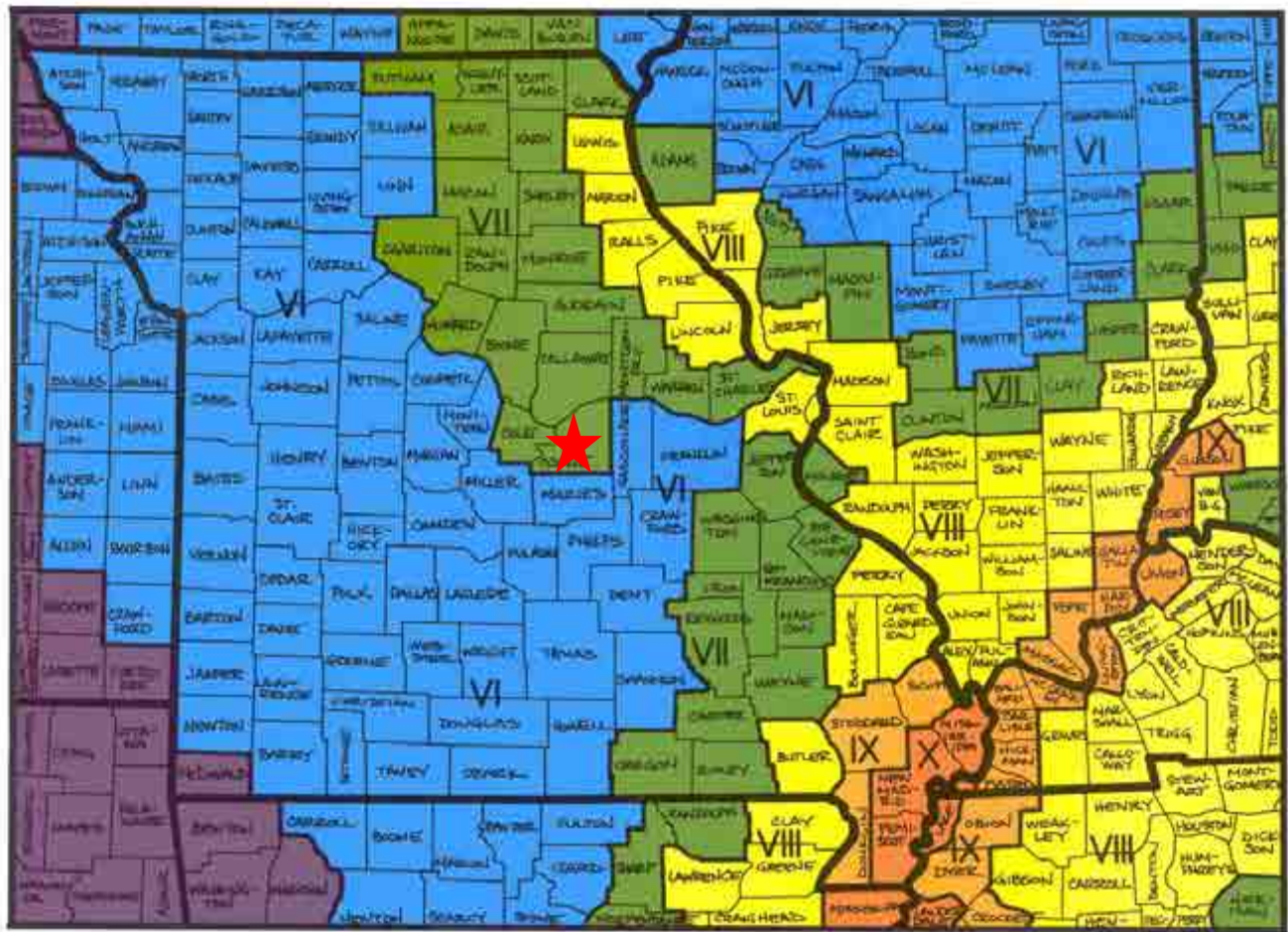
Geographic Location

There are eight earthquake source zones in the Central United States, one of which is located within the state of Missouri—the New Madrid Fault. Other seismic 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.

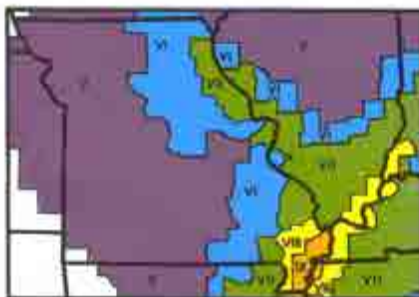
Figure 3.15 depicts impact zones for a magnitude 7.6 earthquake along the New Madrid Fault along with associated Modified Mercalli Intensities. Osage County is indicated by a red star. Furthermore, the Modified Mercalli Intensities for potential 6.7 and 8.6 magnitude earthquakes are illustrated. In the event of a 6.7 magnitude earthquake, Osage County would experience a Modified Mercalli Intensity of VI (**Figure 3.16**). This intensity is categorized as being almost felt by everyone. Poorly built buildings are damaged slightly. Dishes, glassware, and windows are broken. People will have trouble walking. Plaster in walls might crack and some furniture is overturned. Additionally, in the occurrence of 7.6 and 8.6 magnitude earthquakes; the county would experience Modified Mercalli Intensities of VII and VIII respectively. Earthquake intensities will not vary across the planning area, which is the case for most Missouri counties. **Figure 3.16** and **Table 3.30** further define Richter Scale intensities.

²⁴ Missouri Department of Natural Resources, Facts about the New Madrid Seismic Zone

Figure 3.15. Impact Zones for Earthquake Along the New Madrid Fault

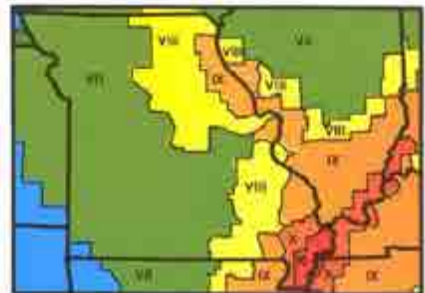


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.



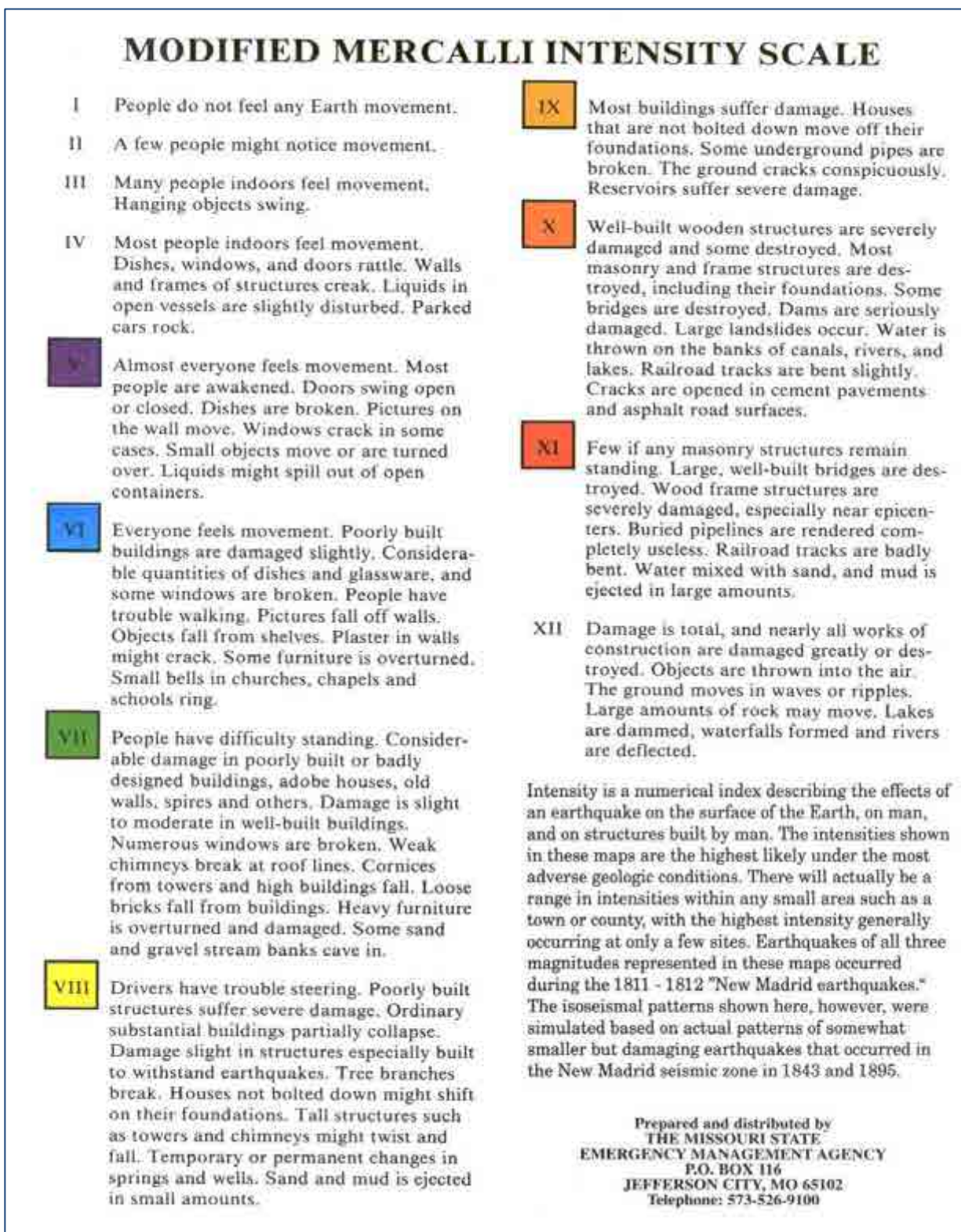
This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 6.7 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

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.



Source: sema.dps.mo.gov; *Red star indicates Osage County

Figure 3.16. Projected Earthquake Intensities



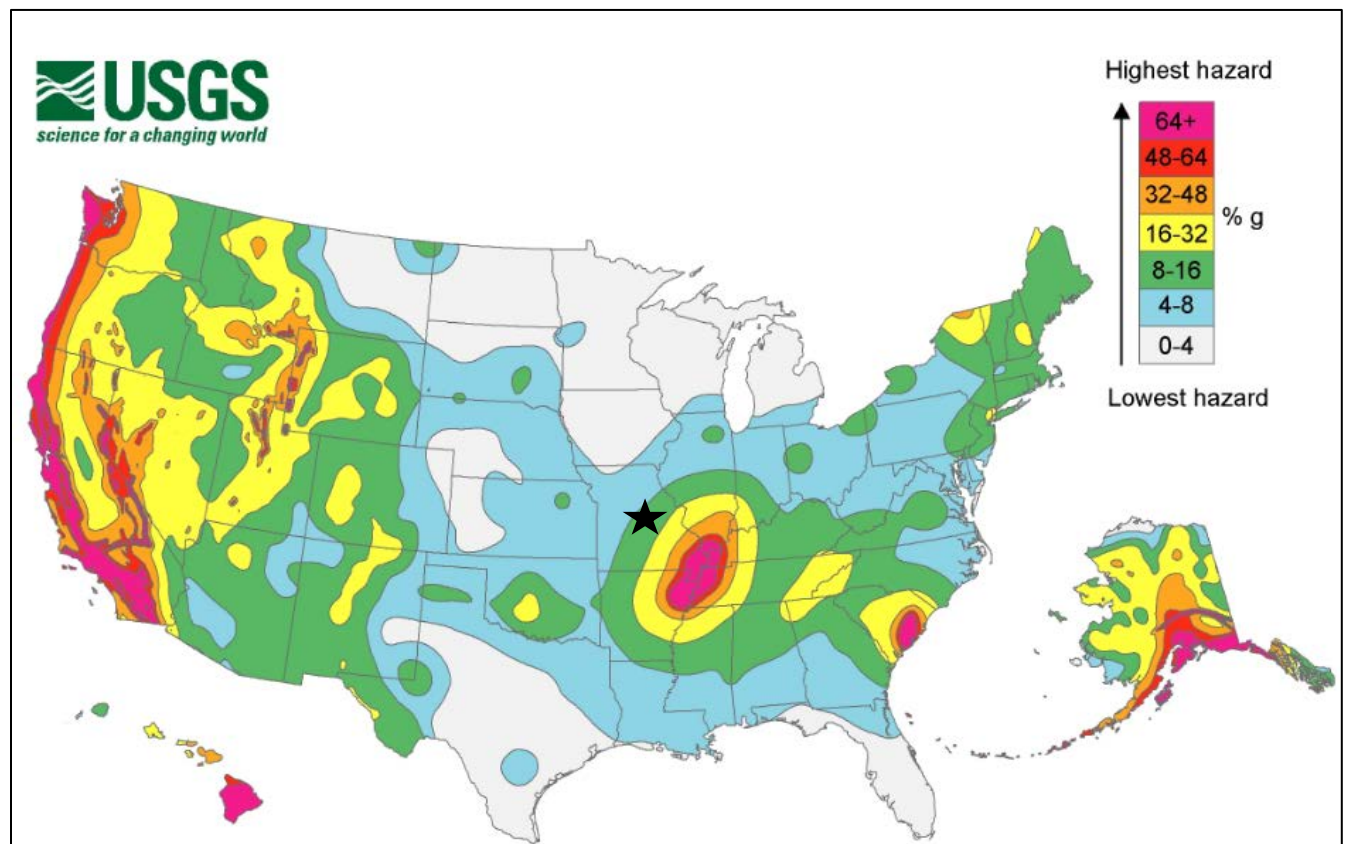
Source: sema.dps.mo.gov

Table 3.30. Richter Scale of Earthquake Magnitude

Magnitude Level	Category	Effects	Earthquake per Year
Less than 1.0 to 2.9	Micro	Generally not felt by people, though recorded on local instruments	More than 100,000
3.0-3.9	Minor	Felt by many people; no damage	12,000-100,000
4.0-4.9	Light	Felt by all; minor breakage of objects	2,000-12,000
5.0-5.9	Moderate	Some damage to weak structures	200-2,000
6.0-6.9	Strong	Moderate damage in populated areas	20-200
7.0-7.9	Major	Serious damage over large areas; loss of life	3-20
8.0 and higher	Great	Severe destruction and loss of life over large areas	Fewer than 3

Figure 3.17 illustrates the seismicity in the United States. A black star indicates the location of Osage County. The seismic hazard map displays earthquake peak ground acceleration (PGA) that has a 2% chance of being exceeded in 50 years; which has a value between 8-16% g.

Figure 3.17. United States Seismic Hazard Map



Source: USGS, <http://earthquake.usgs.gov>

*Black star indicates Osage County

Severity/Magnitude/Extent

The extent or severity of earthquakes is generally measured in two ways: 1) the Richter Magnitude Scale is a measure of earthquake magnitude; and 2) the Modified Mercalli Intensity Scale is a measure of earthquake severity. The two scales are defined as follows.

Richter Magnitude Scale

The Richter Magnitude Scale was developed in 1935 as a device to compare the size of earthquakes. The magnitude of an earthquake is measured using a logarithm of the maximum extent of waves recorded by seismographs. Adjustments are made to reflect the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. Each whole number increase in magnitude represents a tenfold increase in measured amplitude; an estimate of energy. For example, comparing a 5.3 and a 6.3 earthquake shows that a 6.3 earthquake is ten times bigger than a magnitude 5.3 earthquake on a seismogram, but is 31.622 times stronger (energy release)²⁵.

Modified Mercalli Intensity Scale

The intensity of an earthquake is measured by the effect of the earthquake on the earth's surface. The intensity scale is based on the responses to the quake, such as people awakening, movement of furniture, damage to chimneys, etc. The intensity scale currently used in the United States is the Modified Mercalli (MM) Intensity Scale. It was developed in 1931 and is composed of 12 increasing levels of intensity. They range from imperceptible shaking to catastrophic destruction, and each of the twelve levels is denoted by a Roman numeral. The scale does not have a mathematical basis, but is based on observed effects. Its use gives the laymen a more meaningful idea of the severity.

Previous Occurrences

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 a.m., 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

²⁵ Measuring the Size of an Earthquake, <http://earthquake.usgs.gov/learn/topics/measure.php>

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.ⁱ

Several area residents observed a small seismic occurrence during the early morning hours of July 8, 2003 in Crawford County. According to information from the USGS, a micro-earthquake 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.

Small earthquakes continue to occur frequently in Missouri. Averages 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 buildings²⁶.

Probability of Future Occurrence

Osage County has reported a total of zero earthquakes since 1931. The county, located in central Missouri, a good distance from the southeast corner of the state that has the potential for moderate damage should a significant earthquake occur.

In 2002, the University of Memphis estimated a 25% to 40% chance for one occurrence of a 6.0 magnitude earthquake in the next fifty years (by year's end 2052) in the New Madrid Seismic Zone. Ideally, if an occurrence is to happen within the next 50 years, it would occur at the midway point (25 years) year 2027. Given this hypothetical situation, there would be one chance in twenty-five (1/25 .04 or 4%) of an occurrence, and it represents an annualized percentage since the divisor (25) is the number of years; estimating that the earthquake will happen at the end of the 25th year over the intervening period. The 4% number becomes the "object of interest" (objective) and it has an estimated chance of happening.

The University of Memphis has fundamentally estimated this 4% objective has a 25% to 40% chance of occurrence. If we apply these percentages to the annualized figure of 4%, the result is the overall annualized percentages. At the 25% level, the likelihood of an earthquake happening in a given year is 1.0% (4% x 25%). At the 40% level, the likelihood of an earthquake happening in a given year is 1.6% (4% x 40%)²⁷. For the purpose of this plan, the 1.0% probability of an earthquake occurring in a given year will be utilized.

Vulnerability

Vulnerability Overview

SEMA utilized Hazus 2.1 to analyze vulnerability and estimate losses to earthquakes. Hazus is a program developed by FEMA which is a nationally applicable standardized methodology that encompasses models for assessing potential losses from earthquakes, floods, and hurricanes. Geographic Information Systems (GIS) is utilized to assess physical, economic, and social impacts of disasters²⁸. For the vulnerability analysis, an annualized loss scenario for each county was analyzed. Secondly, statistics from an event with a 2% probability of exceedance in 50 years was analyzed, suggesting outcomes of a worst case scenario.

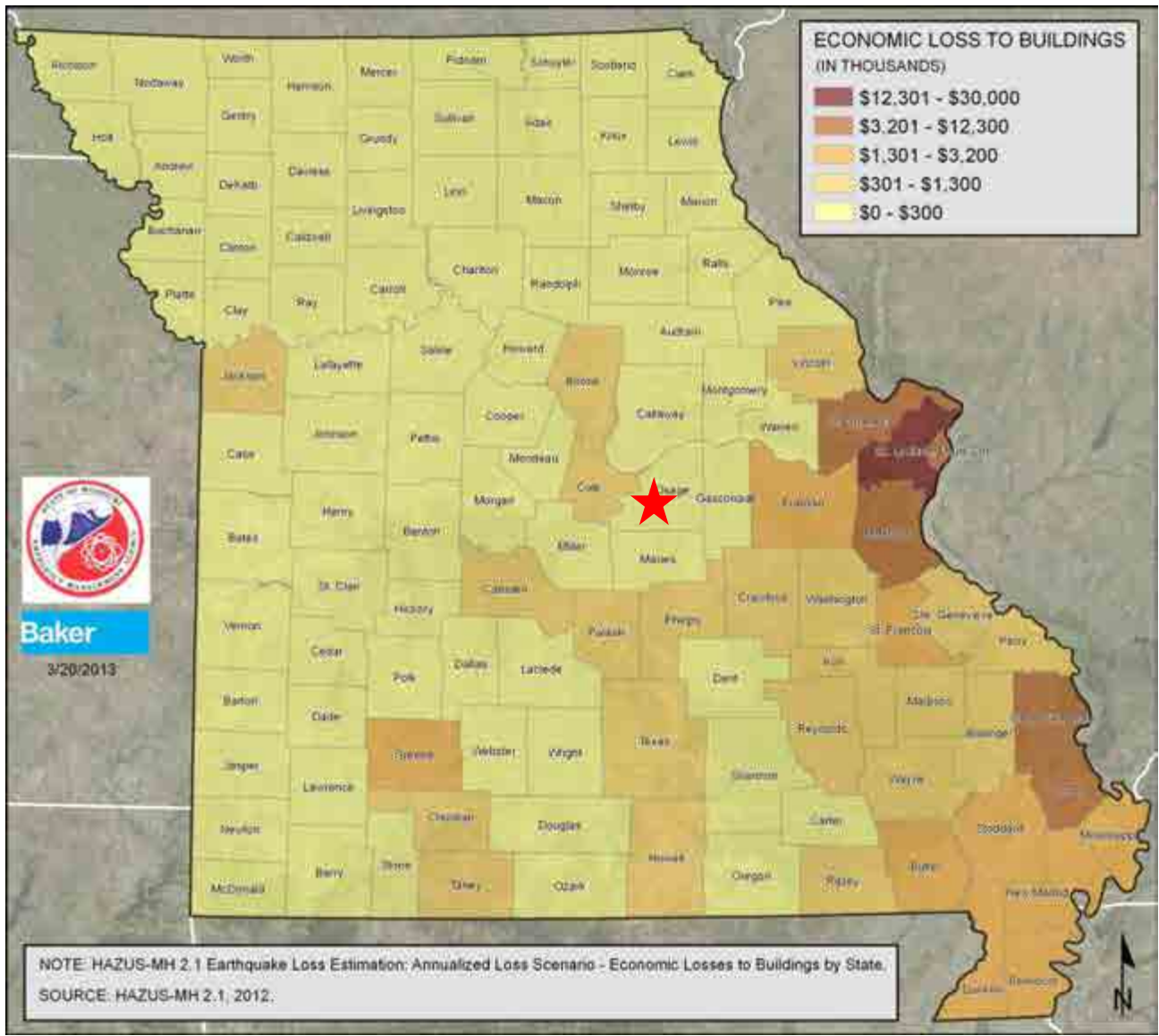
²⁶ Missouri State Hazard Mitigation Plan May 2007

²⁷ SEMA

²⁸ www.fema.gov/hazus

Annualized loss is the maximum potential annual dollar loss resulting from eight return periods (100, 200, 500, 750, 1,000, 1,500, 2,000, and 2,500 years) averaged on a 'per year' basis²⁹. The Hazus earthquake loss estimation is depicted in **Figure 3.18** and **Table 3.31**. Osage County's buildings are suggested to lose between \$0 and \$300,000 in any one year; thus ranking the county as having the 34th highest expected loss in the state, or low vulnerability. This loss ratio indicates impacts on local economies in the event of an earthquake, and the difficulty for jurisdictions to recover from said event.

Figure 3.18. Hazus Earthquake Loss Estimation: Annualized Loss Scenario –Total Economic Losses to Buildings.



Source: 2013 Missouri State Hazard Mitigation Plan
 *Red star indicates Osage County

²⁹ 2013 Missouri State Hazard Mitigation Plan

Table 3.31. Hazus Earthquake Loss Estimation: Annualized Loss Scenario

Location	Building Loss Total (\$)*	Loss Ratio %**	Income Loss Total (\$)*	Total Economic Loss to Buildings (\$)*	Loss Ratio Rank
Osage	96	0.01	23	119	34

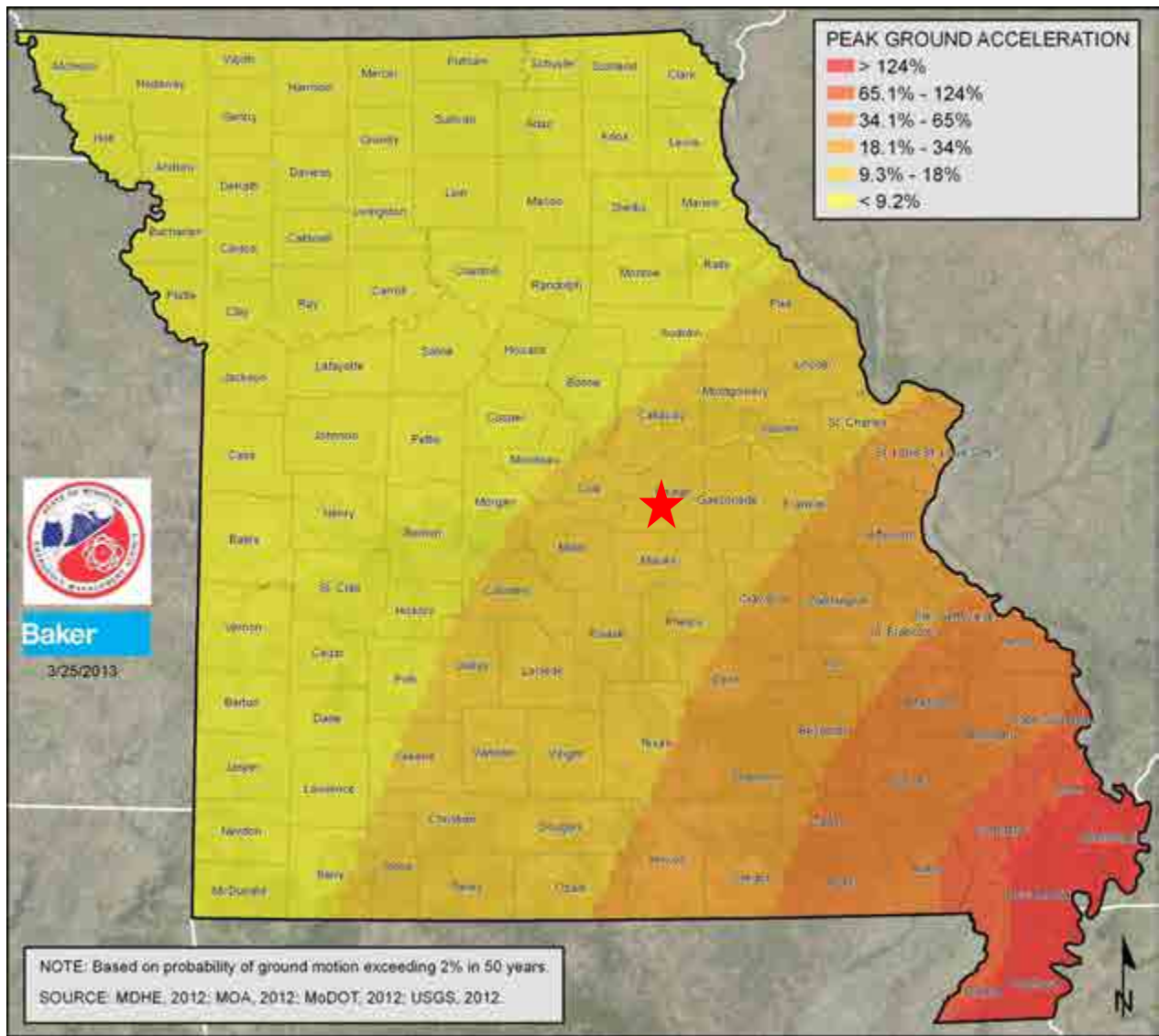
Source: Hazus 2.1

*All \$values are in thousands

**Loss ratio is the sum of structural and nonstructural damage divided by the entire building inventory value within a county

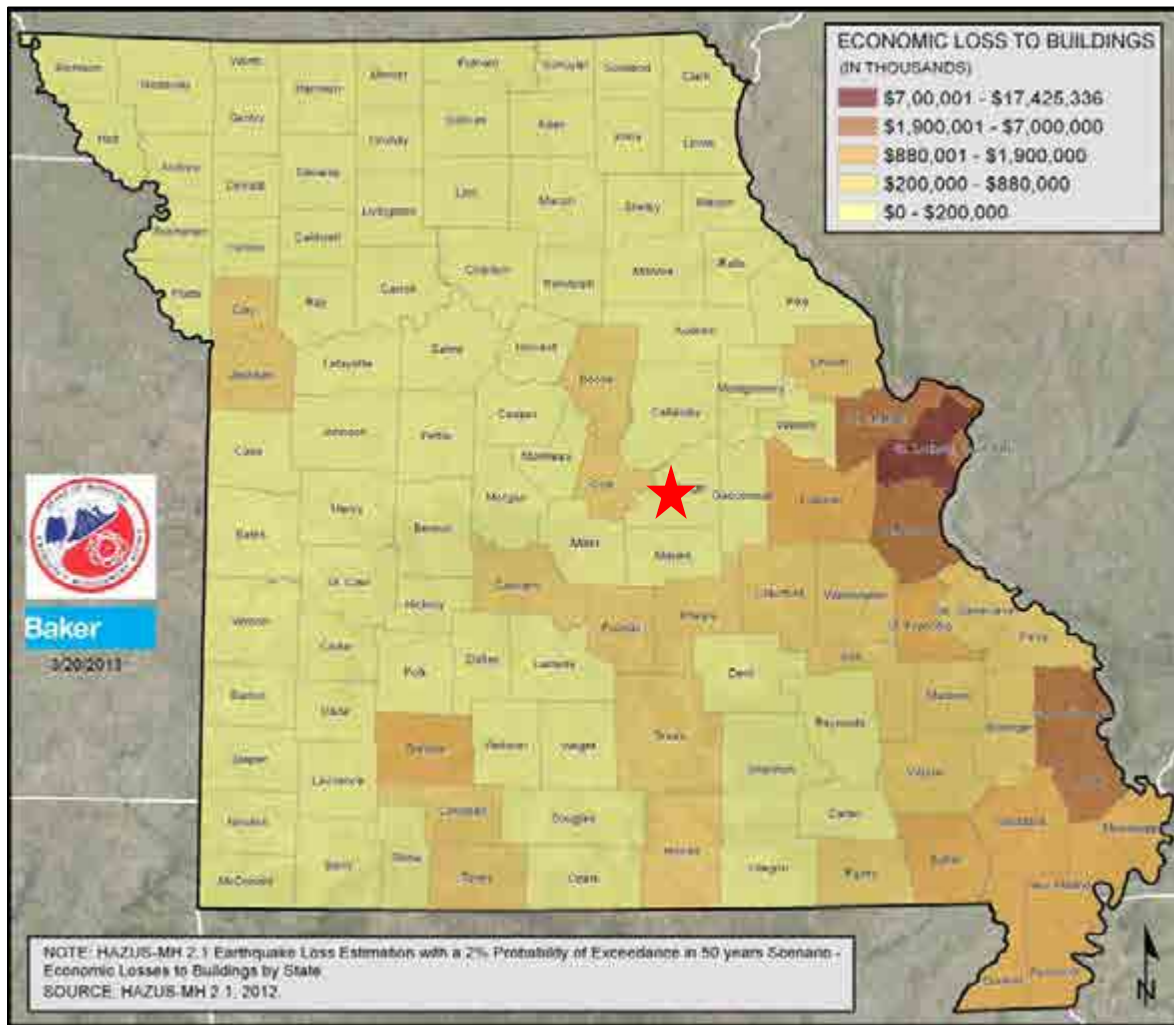
Likewise, SEMA developed a second scenario which incorporated a 2% probability of exceedance in 50 years. This model was to demonstrate a worst case scenario. **Figure 3.19** provides estimates of peak ground acceleration and spectral acceleration (ground shaking potential) at intervals of 0.3 and 1.0 seconds, respectively. These acceleration events have a 2% probability of exceedance in the next 50 years. A 7.7 magnitude earthquake was utilized in this scenario, which is typically utilized for New Madrid fault planning scenarios in Missouri. Osage County is estimated to have peak ground acceleration between 9.3 and 18%. Furthermore, **Figure 3.20** illustrates total economic loss to buildings including content and inventory loss, and wage/income loss in the event of the modeled earthquake. Osage County is anticipated to lose between \$0 and \$200,000 in a 50 year scenario. Moreover, in the same event the county is estimated to experience between 3.1% and 7% loss (damage) of the total building inventory (**Figure 3.21**). **Table 3.32** further exemplifies the county's loss ratio.

Figure 3.19. Hazus Earthquake 2% Probability of Exceedance in 50 Years – Ground Shaking Potential



Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Osage County

Figure 3.20. Hazus Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Total Economic Loss to Buildings



Source: 2013 Missouri State Hazard Mitigation Plan
 *Red star indicates Osage County

Table 3.32. Hazus-MH Earthquake Loss Estimation: 2% Probability of Exceedance in 50 Years Scenario Results Building Impacts by County, Ranked by Highest Building Losses

County	Structural Damage (\$)*	Non-Structural Damage (\$)*	Contents Damage and Inventory Loss (\$) *	Loss Ratio (%) **	Income Loss (\$)*	Total Economic Loss to Buildings (\$)*, ***	Loss Ratio Rank
Osage	13,465	40,069	15,234	3.75	15,511	84,279	42

Source: 2013 Missouri State Hazard Mitigation Plan, Hazus 2.1

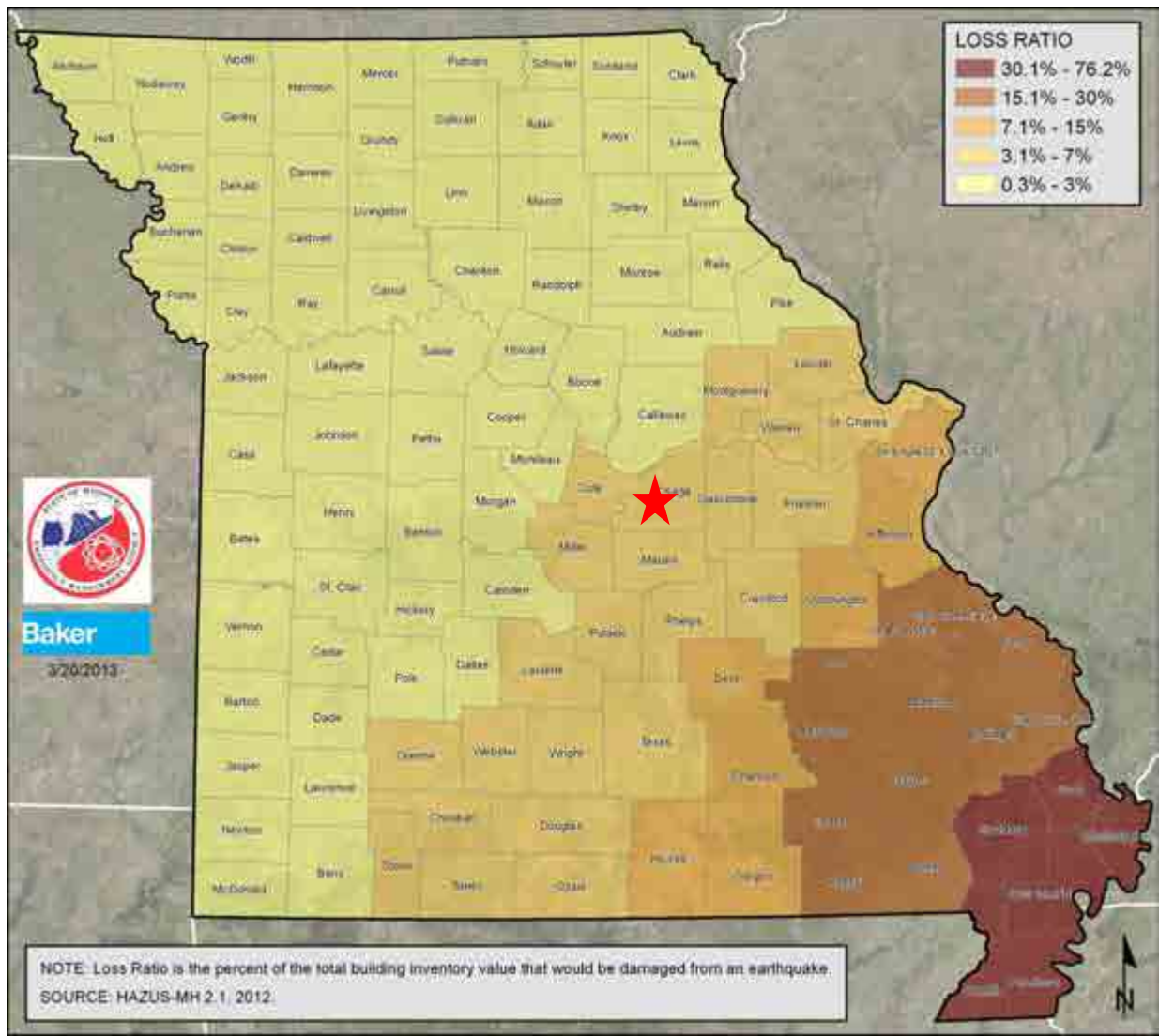
*All \$ values are in thousands

**Loss ratio is the sum of structural and nonstructural damage divided by the entire building inventory value within a county

***Total economic loss to buildings includes inventory loss, relocation loss, capital-related loss, wages loss, and rental income loss

****Note: Total loss numbers provide an estimate of total losses and due to rounding, these numbers may differ slightly from the global summary report outputs from HAZUS

Figure 3.21. Hazus Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Loss Ratio



Source: 2013 Missouri State Hazard Mitigation Plan
 *Red star indicates Osage County

In terms of social impacts for the same earthquake event, **Table 3.33** defines casualty severity, displaced households, and short-term shelter needs that are utilized in **Table 3.34**. During this scenario, Osage County is estimated to have 18 injuries requiring medical attention without hospitalization, 3 injuries requiring hospitalization, 0 life threatening injuries, and 1 death. Moreover, 26 displaced households are anticipated, along with 16 individuals requiring short-term shelter needs.

Table 3.33. Casualty Severity, Displaced Households, and Short-Term Shelter Needs

Casualty Severity Level 1	Injuries will require medical attention but hospitalization is not needed
Casualty Severity Level 2	Injuries will require hospitalization but are not considered life-threatening
Casualty Severity Level 3	Injuries will require hospitalization and can become life threatening if not promptly treated
Casualty Severity Level 4	Victims are killed by the earthquake
Displaced Households	The number of households that are expected to be displaced from their homes due to the earthquake
Short-Term Shelter Needs	The number of displace people that will require accommodations in temporary public shelters

Source: Hazus 2.1

Table 3.34. Social Impact Estimates by County from the 2% Probability of Exceedance in 50 Years Scenario 2 a.m. Time of Occurrence

County	MMI Zone	Level 1	Level 2	Level 3	Level 4	Total	Displaced Households	Short-Term Shelter Needs
Osage	VII	18	3	0	1	22	26	16

Source: 2013 Missouri State Hazard Mitigation Plan

Potential Losses to Existing Development

Economic loss to buildings in the event of an earthquake can be found in the Vulnerability Overview. Infrastructures across the planning area would also be expected to experience losses. Additional losses expected would be environmental and economic.

Impact of Future Development

Future development at risk includes sewer improvements in Chamois, apartment complexes and senior living center in Osage Co., and Osage Co. R-III renovations. Future development will not increase the risk of an earthquake, rather contributing to the overall exposure of damaged property. As new development arises, minimum standards of building codes should be established in all jurisdictions to decrease the potential damage/loss should an earthquake occur.

The Revised Statutes of MO, Section 160.451 require that: The governing body of each school district which can be expected to experience an intensity of ground shaking equivalent to a Modified Mercalli Intensity of VII or above from an earthquake occurring along the New Madrid Fault with a potential magnitude of 7.6 on the Richter Scale shall establish an earthquake emergency procedure system in every school building under its jurisdiction³⁰.

³⁰ 2015 Boone County Hazard Mitigation Plan

Hazard Summary by Jurisdiction

Since earthquake intensity is not likely to vary greatly throughout the planning area, the risk will be the same throughout. Osage County is not near the New Madrid Shock Zone, but it will most likely endure mild secondary effects from the earthquake, such as fire, structure damage, utility disruption, environmental impacts, and economic disruptions/losses. However, damages could differ if there are structural variations in the planning area's built environment. For example, if one community has a higher percentage of residences built prior to 1939 than the other participants, that community is likely to experience higher damages. **Table 3.35** depicts the percent of residences built prior to 1939 in Osage County. Meta (45.1%), Chamois (42.4%), and Freeburg (21.1%) have the most residences susceptible to damage in the event of an earthquake. If a major earthquake should occur, Osage County would likely be deeply impacted by the number of refugees traveling through the area seeking safety and assistance.

Table 3.35. Percent of Osage County Residences Built Prior to 1939

Jurisdiction	% of Residences built prior to 1939
Unincorporated Osage County	13.5
Chamois	42.4
Freeburg	21.1
Linn	9.7
Meta	45.1
Westphalia	14.1

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5 – Year Estimates

Problem Statement

In the event of a 7.7 magnitude earthquake (worst case scenario), Osage County is estimated to have 18 injuries requiring medical attention without hospitalization, 3 injuries requiring hospitalization, 0 life threatening injuries, and 1 death. Moreover, 26 displaced households are expected, along with 16 individuals requiring short-term shelter needs. Additionally, the county is expected to encounter \$0 to \$200,000 in total economic losses to buildings. Moreover, Meta, Chamois, and Freeburg are particularly at risk due to the percent of residences built prior to 1939.

Jurisdictions should encourage purchase of earthquake hazard insurance. As well as establishing structurally sound emergency shelters in several parts of the county. In addition, stringent minimum standards of building codes should be established. Lastly, outreach and education should be utilized more frequently to prepare citizens for the next occurrence.

3.4.4 Extreme Heat

Hazard Profile

Some specific sources for this hazard are:

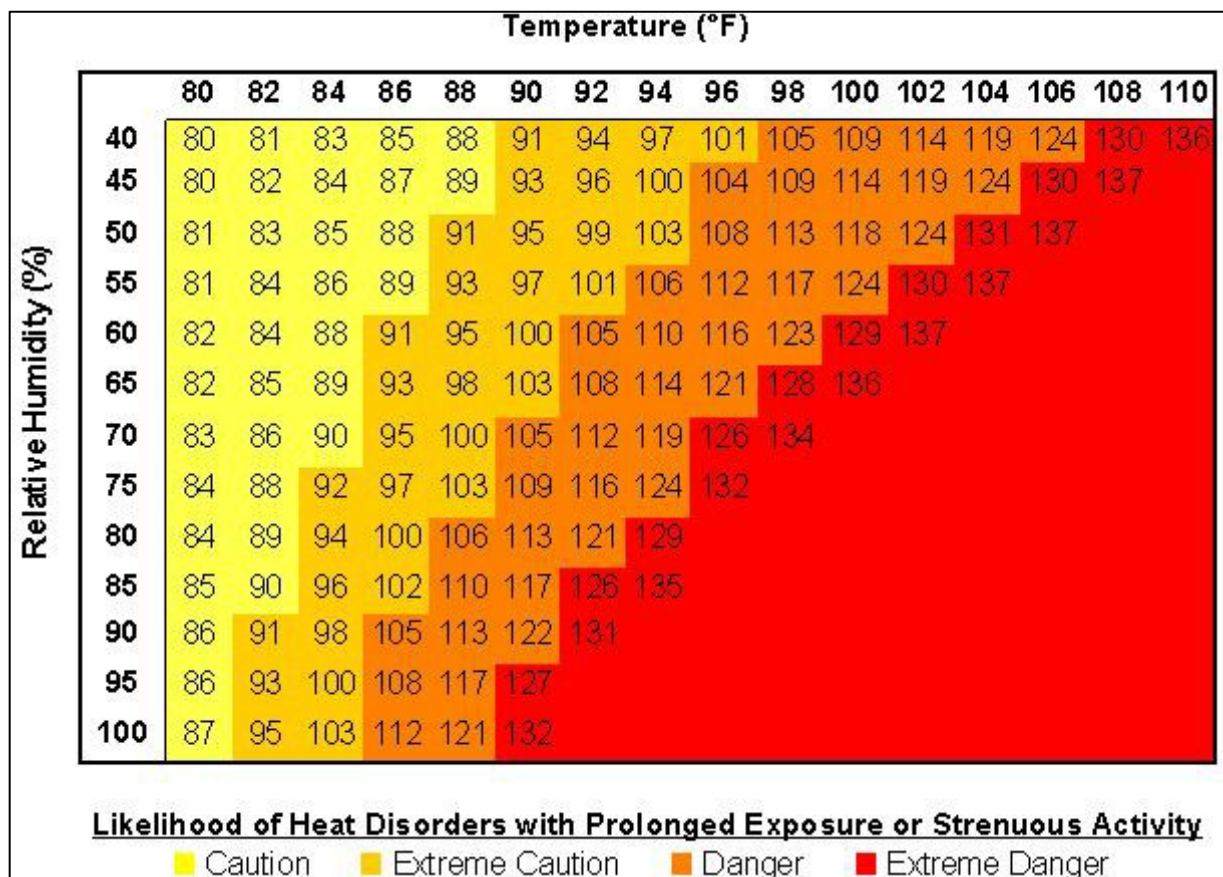
- National Climatic Data Center, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>
- Heat Index Chart & typical health impacts from heat, National Weather Service; National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml ;
- Daily temperatures averages and extremes, High Plains Regional Climate Summary, http://www.hprcc.unl.edu/data/historical/index.php?state=ia&action=select_state&submit=Select+State;
- Hyperthermia mortality, Missouri; Missouri Department of Health and Senior Service, <http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper1.pdf>;
- Hyperthermia mortality by Geographic area, Missouri Department of Health and Senior Services, <http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2.pdf>;

Hazard Description

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. The remainder of this section profiles extreme heat. Extreme cold events are profiled in combination with Winter Storm in **Section 3.4.11**. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. These high temperatures generally occur from June through September, but are most prevalent in the months of July and August. Regional reports indicate all of Missouri is subject to heat wave during the summer months. Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index chart shown in **Figure 3.22** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

High humidity, a common factor in Missouri, can magnify the effects of extreme 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.

Figure 3.22. Heat Index (HI) Chart



Source: National Weather Service (NWS)

Note: Exposure to direct sun can increase Heat Index values by as much as 15°F. The shaded zone above 105°F corresponds to a HI that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

Geographic Location

Extreme heat is considered to be an area-wide hazard event. In such a case, the chance of variation in temperatures across Osage County is minimal to nonexistent.

Severity/Magnitude/Extent

Extreme heat can cause stress to crops and animals. According to USDA Risk Management Agency, Osage County’s losses to insurable crops during a 20-year time period from 1998 to 2017 were \$28,403. Extreme heat can also strain electricity delivery infrastructure overloaded during peak use of air conditioning during extreme heat events. Another type of infrastructure damage from extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

From 1979 to 2014, there were approximately 9,000 fatalities in the U.S. attributed to heat. This translates to an annual national average of 264 deaths³¹. Fortunately, there were no recorded heat related deaths in the planning area, according to the Bureau of Environmental Epidemiology³². The

³¹ https://www.epa.gov/sites/production/files/2016-08/documents/print_heat-deaths-2016.pdf

³² <http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2b.pdf>

National Weather Service stated that among natural hazards, no other natural disaster—not lightning, hurricanes, tornadoes, floods, or earthquakes—causes more deaths.

Those at greatest risk for heat-related illness include infants and children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather. In agricultural areas, the exposure of farm workers, as well as livestock, to extreme temperatures is a major concern.

Table 3.36 lists typical symptoms and health impacts due to exposure to extreme heat.

Table 3.36. Typical Health Impacts of Extreme Heat

Heat Index (HI)	Disorder
80-90° F (HI)	Fatigue possible with prolonged exposure and/or physical activity
90-105° F (HI)	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105-130° F (HI)	Heatstroke/sunstroke highly likely with continued exposure

Source: National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml

The National Weather Service has an alert system in place (advisories or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for issuing excessive heat alerts is when for two or more consecutive days: (1) when the maximum daytime Heat Index is expected to equal or exceed 105 degrees Fahrenheit (°F); and the night time minimum Heat Index is 80°F or above. A heat advisory is issued when temperatures reach 105 degrees and a warning is issued at 115 degrees.

Previous Occurrences

Table 3.37 provides data in relation to record heat events between 1998 and 2017 in Osage County. Maximum heat index values and temperatures are shown for each extreme temperature event. Fortunately, there were zero recorded injuries and fatalities during this time. In addition, **Figure 3.23** illustrates heat related deaths by county in Missouri between 2000 and 2013.

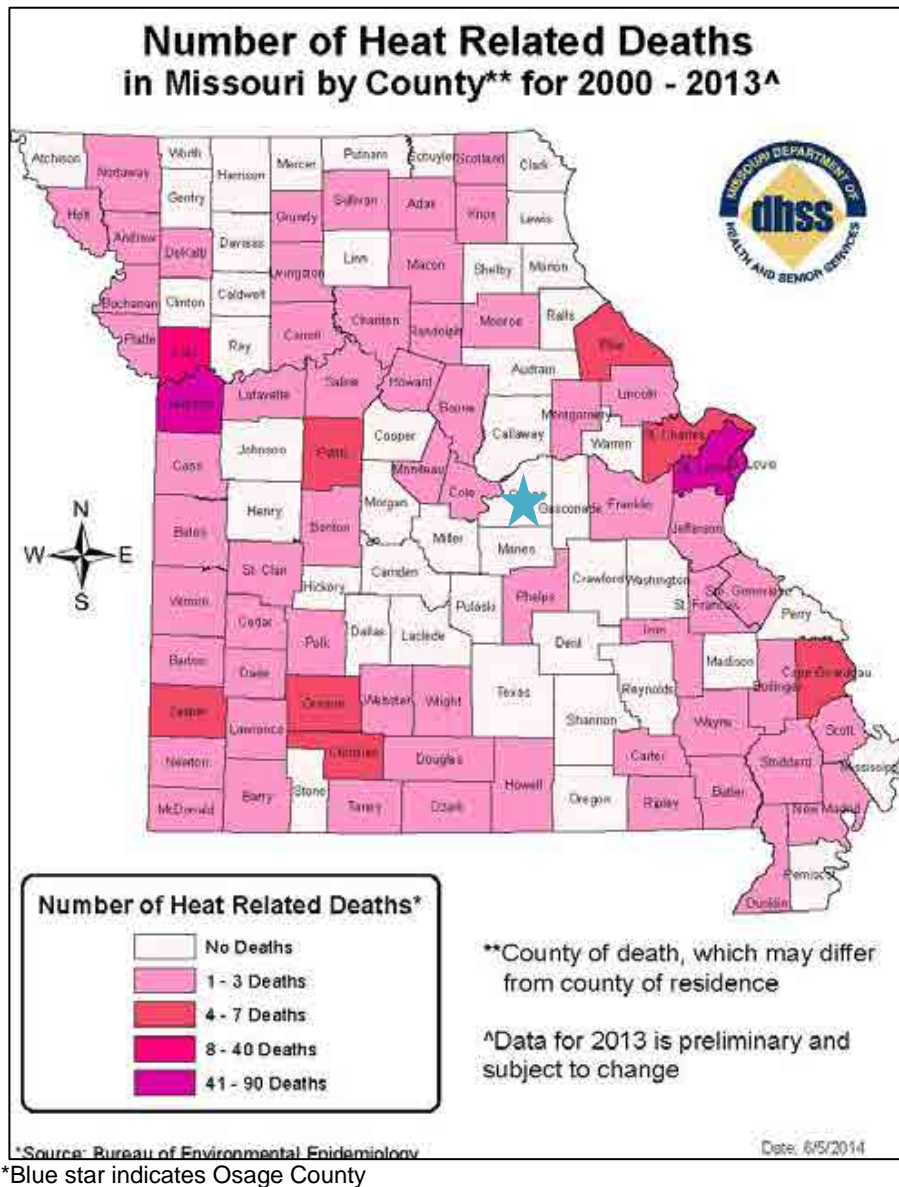
Table 3.37. Osage County Recorded Heat Events 1998 – 2017

Month, Year	# of Event Days	Fatalities	Injuries	Temperature (F°)	Heat Index Values (F°)
7/18/1999	13	0	0	90-100	105-115
7/7/2001	3	0	0	90s	105-110
7/17/2001	1	0	0	95-99	110-115
7/21/2001	3	0	0	95-99	105-115
7/29/2001	2	0	0	90s	105-110
8/1/2001	2	0	0	95-99	105
8/7/2001	2	0	0	95-99	102-110
8/21/2001	1	0	0	90-100	105-110
7/8/2002	2	0	0	95-99	105-110
7/20/2002	2	0	0	95-99	105-115
7/26/2002	5	0	0	95-99	105-115
8/1/2002	5	0	0	101	-
8/15/2003	6	0	0	95-105	-
8/24/2003	4	0	0	95-100	105-110
7/20/2004	2	0	0	95	105-110
7/20/2005	6	0	0	110-105	105-120
7/17/2006	6	0	0	110-105	105-120
7/29/2006	2	0	0	100	105-110
8/1/2006	2	0	0	100	-
8/5/2007	9	0	0	100+	-
6/21/2009	6	0	0	90-99	100-107
6/18/2010	5	0	0	95	100-105
7/14/2010	1	0	0	90+	105-110
7/17/2010	1	0	0	95	105
7/22/2010	2	0	0	95-99	105-110
8/2/2010	2	0	0	101+	110
8/8/2010	6	0	0	100	110-115
7/1/2011	2	0	0	90s	105
7/10/2011	2	0	0	100+	-
7/17/2011	4	0	0	90+	105-110
8/1/2011	2	0	0	100	105-115

Month, Year	# of Event Days	Fatalities	Injuries	Temperature (F°)	Heat Index Values (F°)
8/6/2011	2	0	0	95-99	105-110
8/31/2011	1	0	0	103	105-110
9/1/2011	3	0	0	100+	105
6/27/2012	3	0	0	100-108	-
7/1/2012	7	0	0	100-107	-
7/16/2012	3	0	0	100-106	-
7/22/2012	5	0	0	106-108	-
7/31/2012	1	0	0	105	105-110
8/1/2012	1	0	0	105	105-110
8/31/2013	1	0	0	100	105-110
9/1/2013	1	0	0	100	105-110
8/20/2014	7	0	0	95-99	105-110
7/12/2015	2	0	0	95-99	110
7/17/2015	2	0	0	95-99	105-110
7/25/2015	4	0	0	95-99	110
6/15/2016	2	0	0	95-99	105
6/22/2016	1	0	0	95	105
7/18/2016	7	0	0	95-99	110
7/18/2017	6	0	0	95-108	-
Total	170	0	0	-	-

Source: <http://www.ncdc.noaa.gov/stormevents/>

Figure 3.23. Heat Related Deaths in Missouri 2000 - 2013



Probability of Future Occurrence

Table 3.38 illustrates the annual average percent probability of extreme heat in Osage County. The County’s likelihood of enduring an extreme heat event per year is 100% (50 events/20 years x 100 = 2.5). The average number of events per year is 2.5. Extreme heat events can be found in Table 3.37.

Table 3.38. Annual Average % Probability of Extreme Heat in Osage County

Location	Annual Avg. % P	Avg. Number of Events
Osage County	100%	2.5

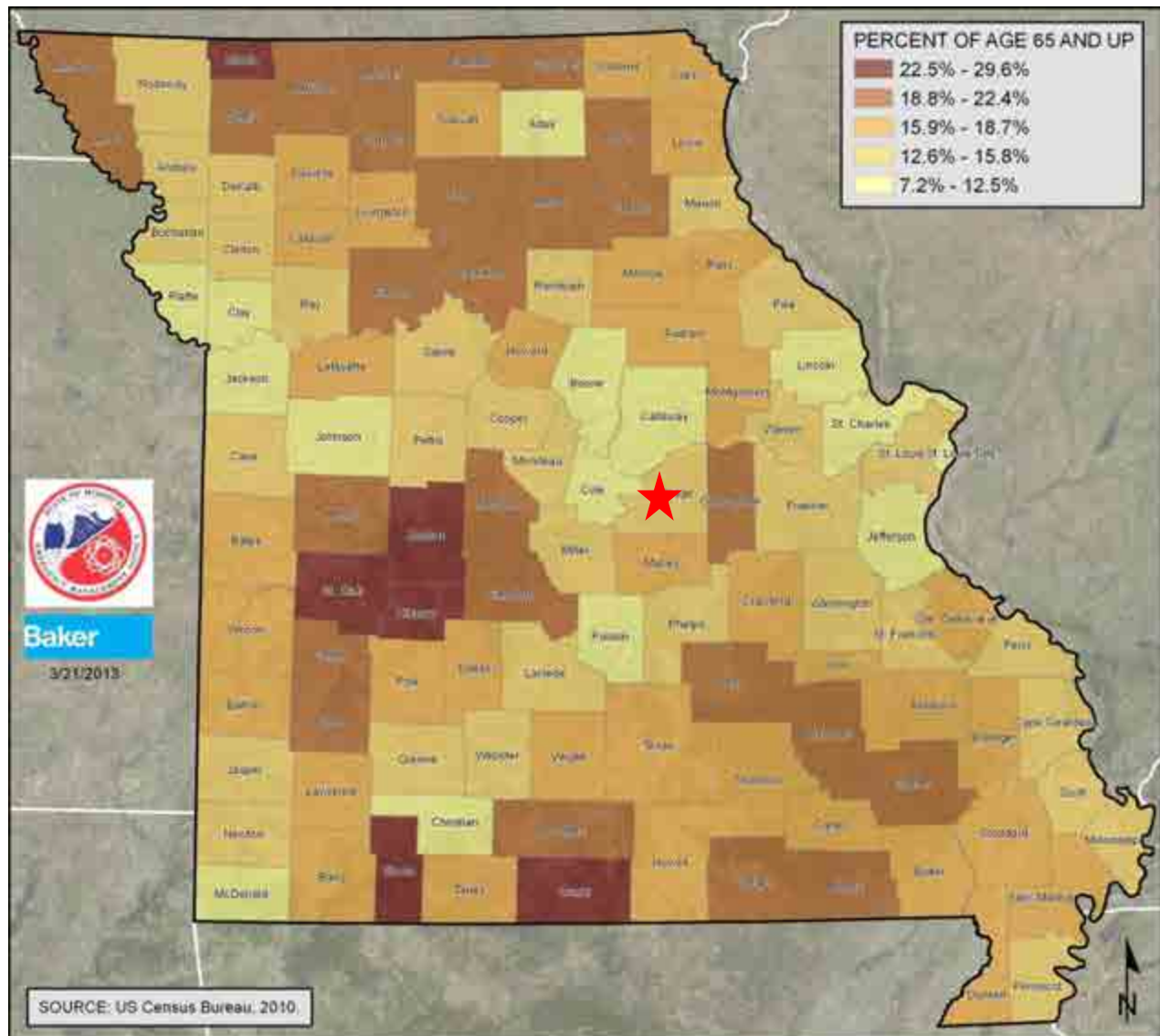
*P = probability; see page 3.24 for definition.

Vulnerability

Vulnerability Overview

Osage County, along with the rest of the state of Missouri is vulnerable to extreme heat. However, those jurisdictions with higher percentages of individuals below the age of 5, and above the age of 65 tend to be more at risk (**Table 3.39**). **Figure 3.24** depicts the distribution of the elderly population across Missouri. In 2010, 12.6 to 15.8% of the county was comprised of individuals ages 65 and up.

Figure 3.24. Distribution of Elderly Population



Source: 2013 Missouri State Hazard Mitigation Plan

*Red star indicates Osage County

Potential Losses to Existing Development

During extreme heat events structural, road, and electrical infrastructure are vulnerable to damages. Depending upon temperatures and duration of extreme heat, losses will vary.

Impact of Future Development

Population trends from 2000 to 2016 for Osage County and various jurisdictions indicate that 5 out of 6 jurisdictions were growing. Population growth can result in increased age groups that are more susceptible to extreme heat. Additionally, as populations increase, so does the strain on each jurisdiction's electricity and road infrastructure. Local government and the City Emergency Management Director should take extreme heat in consideration while electrical upgrades are underway.

Hazard Summary by Jurisdiction

Those at greatest risk for heat-related illness and deaths include children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. To determine jurisdictions within the planning area with populations more vulnerable to extreme heat, demographic data was obtained from the 2012-2016 census on population percentages in each jurisdiction comprised of those under age 5 and over age 65. Data was not available for overweight individuals and those on medications vulnerable to extreme heat. **Table 3.39** below summarizes vulnerable populations in the participating jurisdictions. Note that school and special districts are not included in the table because students and those working for the special districts are not customarily in these age groups.

Table 3.39. County Population Under Age 5 and Over Age 65 (2012-2016)

Jurisdiction	% Population Under 5 Years	% Population 65 Years and over
Incorporated Osage County	5.5	16.6
Chamois	7.3	20.5
Freeburg	4.1	18.5
Linn	11.3	11.2
Meta	6.7	13.1
Westphalia	1.6	35.1

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Due to lack of data, strategic buildings that lack air-conditioning could not be analyzed for this report. Additionally, school policy data regarding extreme heat was not available.

Problem Statement

In summary, the risks of extreme heat can impact the health/lives of citizens within the county, specifically the young and elderly. Linn and Westphalia have the highest percent of individuals under 5 and over 65, respectively. These two jurisdictions are most vulnerable to extreme heat.

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 tornadoes. 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.

3.4.5 Fires (Urban/Structural and Wild)

The specific sources for this hazard are:

- Missouri Department of Conservation Wildfire Data Search at <http://mdc4.mdc.mo.gov/applications/FireReporting/Report.aspx>
- Statistics, Missouri Division of Fire Safety;
- National Statistics, US Fire Administration;
- Fire/Rescue Mutual Aid Regions in Missouri;
- Forestry Division of the Missouri Dept. of Conservation;
- National Fire Incident Reporting System (NFIRS), <http://www.dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.asp>
- Firewise Missouri, <http://www.firewisemissouri.org/wildfire-in-missouri.html>
- University of Wisconsin Slivis Lab, http://silvis.forest.wisc.edu/maps/wui_main

Hazard Profile

Hazard Description

The incident types considered for urban/structural fire include all fires in the following categories: 1) general fires, 2) structure fire, 3) fire in mobile property used as a fixed structure, and 4) mobile property (vehicle) fire. The fire incident types for wildfires include: 1) natural vegetation fire, 2) outside rubbish fire, 3) special outside fire, and 4) cultivated vegetation, crop fire.

The Missouri Division of Fire Safety (MDFS) indicates that approximately 80 percent of the fire departments in Missouri are staffed with volunteers. Whether paid or volunteer, these departments are often limited by lack of resources and financial assistance. The impact of a fire to a single-story building in a small community may be as great as that of a larger fire to a multi-story building in a large city.

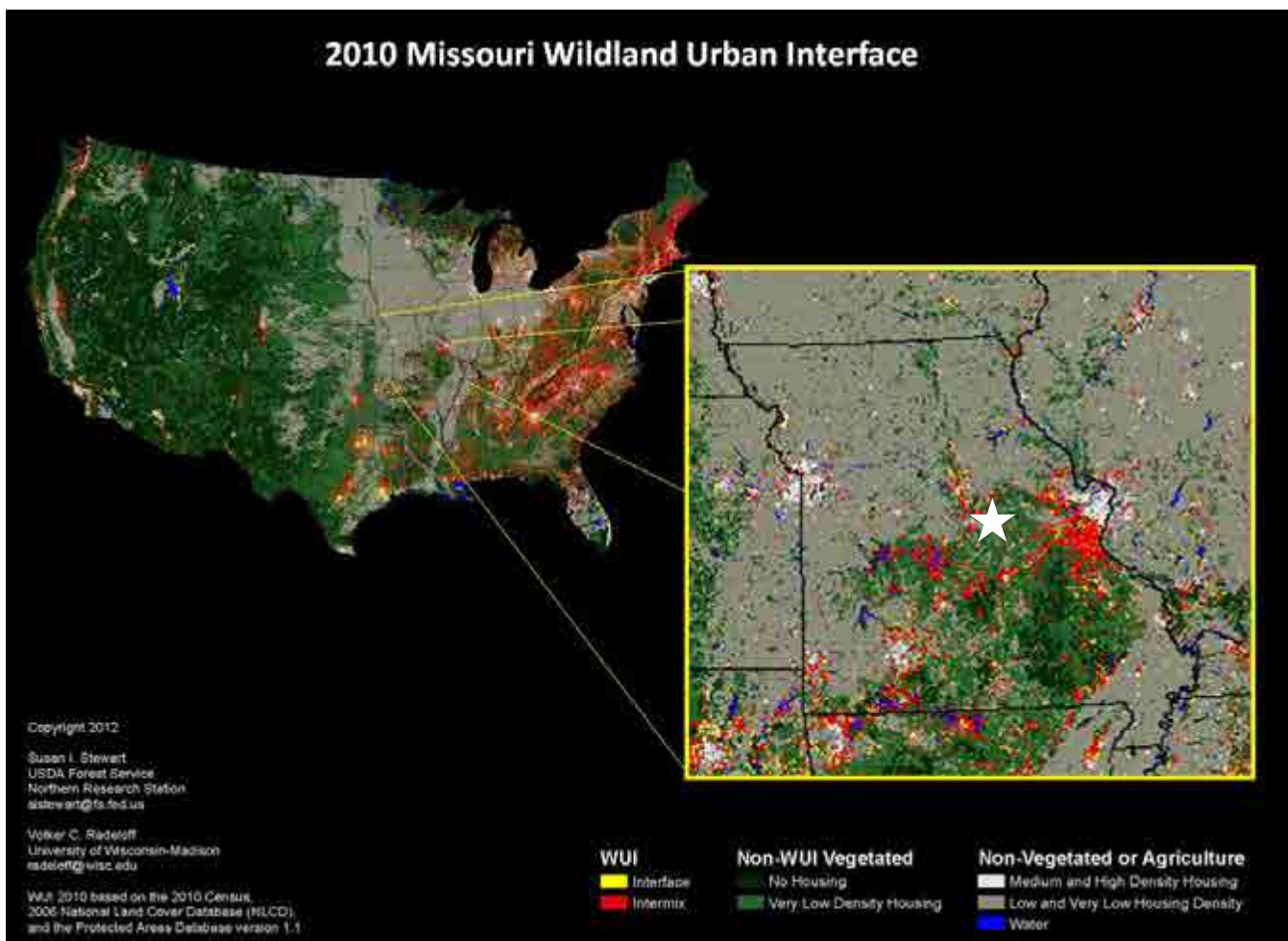
The Forestry Division of the Missouri Department of Conservation (MDC) is responsible for protecting privately owned and state-owned forests and grasslands from wildfires. To accomplish this task, eight forestry regions have been established in Missouri for fire suppression. The Forestry Division works closely with volunteer fire departments and federal partners to assist with fire suppression activities. Currently, more than 900 rural fire departments in Missouri have mutual aid agreements with the Forestry Division to obtain assistance in wildfire protection if needed.

Most of Missouri fires occur during the spring season between February and May. The length and severity of both structural and wildland fires depend largely on weather conditions. Spring in Missouri is usually characterized by low humidity and high winds. These conditions result in higher fire danger. In addition, due to the recent lack of moisture throughout many areas of the state, conditions are likely to increase the risk of wildfires. Drought conditions can also hamper firefighting efforts, as decreasing water supplies may not prove adequate for firefighting. It is common for rural residents burn their garden spots, brush piles, and other areas in the spring. Some landowners also believe it is necessary to burn their forests in the spring to promote grass growth, kill ticks, and reduce brush. Therefore, spring months are the most dangerous for wildfires. The second most critical period of the year is fall. Depending on the weather conditions, a sizeable number of fires may occur between mid-October and late November.

Geographic Location

The risk of structural fire does not vary widely across the planning area. However, damages due to wildfires are expected to be higher in communities with more wildland–urban interface (WUI) areas. WUI refers to the zone of transition between unoccupied land and human development and needs to be defined in the plan. Within the WUI, there are two specific areas identified: 1) Interface and 2) Intermix. The interface areas are those areas that abut wildland vegetation and the Intermix areas are those areas that intermingle with wildland areas (**Figure 3.25**). To determine specific WUI areas and variations, data was obtained from ArcGIS, Streets and SILVIS (**Figure 3.26**). According to the WUI area map of Osage County, each jurisdiction resides in a WUI area.

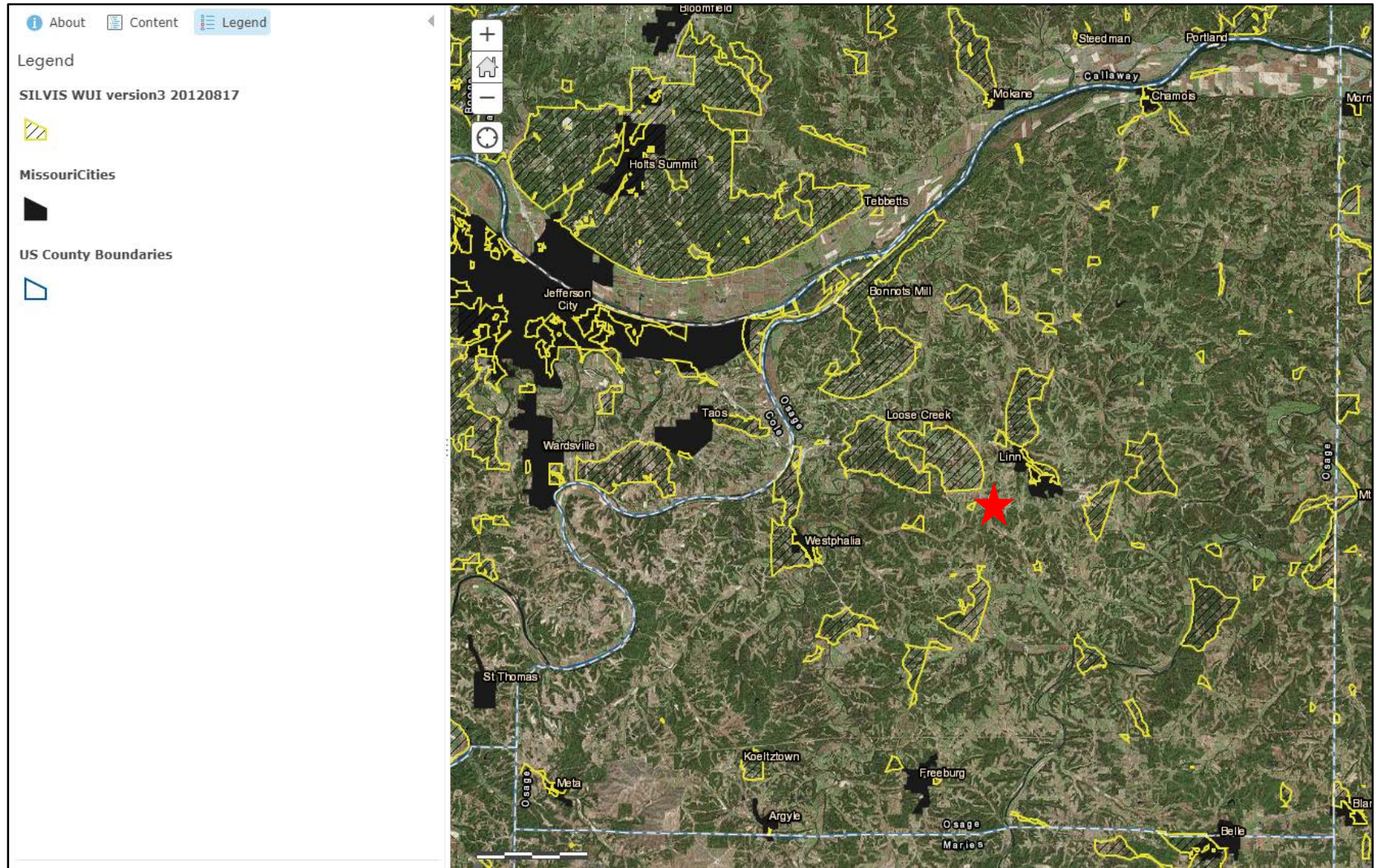
Figure 3.25. 2010 Missouri Wildland Urban Interface (WUI)



Source: <http://silvis.forest.wisc.edu/maps/wui>

Note: White star roughly estimates Osage County's location

Figure 3.26. Osage County Wildlife Urban Interface



Source: ArcGIS, Streets
*Red star indicates Osage County

Severity/Magnitude/Extent

Structural and urban fires are a daily occurrence throughout the state. Statewide, approximately 100 fatalities occur annually, as well as numerous injuries affecting the lives of the victims, their families, and many others—especially those involved in fire and medical services. Unlike other disasters, structural fires can be caused by human criminal activity: arson. All citizens pay the costs of arson whether through increased insurance rates, higher costs to maintain fire and medical services, or the costs of supporting the criminal justice system.

Wildfires damage the environment, killing some plants and occasionally animals. Firefighters have been injured or killed, and structures can be damaged or destroyed. The loss of plants can heighten the risk of soil erosion and landslides. Although Missouri wildfires are not the size and intensity of those in the Western United States, they could impact recreation and tourism in and near the fires.

Wildland fires in Missouri have been mostly a result of human activity rather than lightning or some other natural event. Wildfires in Missouri are usually surface fires, burning the dead leaves on the ground or dried grasses. They do sometimes “torch” or “crown” out in certain dense evergreen stands like eastern red cedar and shortleaf pine. However, Missouri does not have the extensive stands of evergreens found in the western US that fuel the large fire storms seen on television news stories.

While very unusual, crown fires can and do occur in Missouri native hardwood forests during prolonged periods of drought combined with extreme heat, low relative humidity, and high wind. Tornadoes, high winds, wet snow and ice storms in recent years have placed a large amount of woody material on the forest floor that causes wildfires to burn hotter and longer. These conditions also make it more difficult for fire fighters suppress fires safely.

Often wildfires in Missouri go unnoticed by the general public because the sensational fire behavior that captures the attention of television viewers is rare in the state. Yet, from the standpoint of destroying homes and other property, Missouri wildfires can be quite destructive.

No information in regards to the severity of damages from structural fires is available for Osage County.

Previous Occurrences

Between 2009 and 2012 there was an annual average of 41 urban/structural fires in Osage County. Additionally, the average annual property loss was \$194,863. Total deaths and injuries reported totaled 7 and 25, respectively³³.

Between 1998 and 2017, wildfires consumed 1,525.18 acres in Osage County³⁴. Between 2004 and 2012, there were 137 wildfires in the county, which consumed 982.5 acres and damaged 3 buildings³⁵.

Records for school and special districts are not available at this time.

³³ 2013 Missouri State Hazard Mitigation Plan

³⁴ <http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx>

³⁵ 2013 Missouri State Hazard Mitigation Plan

Probability of Future Occurrence

From the data obtained from the Missouri Department of Conservation³⁶ (**Appendix: E**), 225 wildfire events occurred in Osage County between 1998 and 2017. This information was utilized to determine the annual average percent probabilities of wildfires. Since multiple occurrences are anticipated per year (225 events/20 years), the probability of wildfires per year is 100% with an average of 11.25 events per year (**Table 3.40**). In addition, 3 buildings were considered damaged due to wildfires between 2004 and 2012. The average percent probability of structure damage due to wildfires is 33.3% (3 events/9 years x 100) (**Table 3.41**). Lastly, according to the 2013 Missouri State Hazard Mitigation Plan the probability of structural/urban fires in Osage County per year is 100% with an average of 41 structural fires annually³⁷ (**Table 3.42**).

Table 3.40. Annual Average Percentage Probability of Wildfires in Osage County

Location	Annual Avg. % P	Avg. Number of Events
Osage County	100%	11.25

*P = probability; see page 3.24 for definition.

Table 3.41. Annual Average Percentage Probability of Structural Damage due to Wildfires in Osage County

Location	Annual Avg. % P
Osage County	33.3%

*P = probability; see page 3.24 for definition.

Table 3.42. Annual Average Percentage Probability of Structural/Urban Fires in Osage County

Location	Annual Avg. % P	Avg. Number of Events
Osage County	100%	41

*P = probability; see page 3.24 for definition.

Vulnerability

³⁶ <http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx>

³⁷ 2013 Missouri State Hazard Mitigation Plan

Vulnerability Overview

Data was collected from the National Fire Incident Reporting System (NFIRS) between 2009 and 2012. The data was analyzed to delineate overall statewide vulnerability for urban/structural fires in Osage County. Unfortunately, only 61 percent of fire departments in the State of Missouri reported occurrences to NFIRS. **Table 3.43** depicts the ranges for urban/structure fire vulnerability ratings. Furthermore, **Table 3.44** illustrates vulnerability analysis utilizing statistical data for urban/structural fires for Osage County between 2009 and 2012³⁸. The overall vulnerability of urban/structure fires in Osage County is medium (3).

Table 3.43. Ranges for Urban/Structure Fire Vulnerability Factor Ratings

Factors Considered	Low (1)	Medium-Low (2)	Medium (3)	Medium-High (4)	High (5)
Housing Density (3 per sq. mile)	<50	50 to 99	100 to 199	200 to 499	>500
Urban Fire Likelihood (# of events/ yrs. Of data)	0 to 49	50 to 99	100 to 299	300 to 499	500+
Building Exposure (\$)	<\$0.5B	\$0.5B to \$0.9B	\$1B to \$1.9B	\$2B to \$5.9B	>\$6B
Annualized Property Loss Ratio Rating (annual Property loss/exposure)	0-.000099	.0001 to .000299	.0003 to .000599	.0006 to .000999	.001+
Death/Injury Rating (2x # of deaths + # of injuries)	0 to 4	5 to 9	10 to 19	20 to 49	50+
Death/Injury/Number of events Rating (Death Injury Rating factor/ # of events)	0 to 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4+
Overall Vulnerability Rating (Average of all ratings)	1 to 1.67	1.67 to 2.35	2.36 to 3.03	3.04 to 3.71	3.72 to 4.4

Source: 2013 Missouri State Hazard Mitigation Plan

³⁸ 2013 Missouri State Hazard Mitigation Plan

Table 3.44. Statistical Data and Factor Ratings for Urban/Structure Fire Vulnerability (2004 to 2008)

County	Housing Units /sq. mi.	Housing Density Rating	Annual # Average	Likelihood Rating	Total Building Exposure (\$)	Building Exposure Rating	Average Annual Property Loss (\$)	Annual Property Loss Ratio	Property Loss Ratio Rating	Total Deaths/Injuries	Death/Injury Factor	Death/Injury Factor Rating	Death/Injury/# of Fires Factor	Death/Injury/# of Fires Factor Rating	Average of Factors	Overall Vulnerability Rating	
Osage	10.8	1	41	1	1,427,835,000	3	194,863	0.000136	2	7	25	39	4	0.95	5	3	3

Source: 2013 Missouri State Hazard Mitigation Plan

For wildfires, data was obtained from the Missouri Department of Conservation (MDC). **Table 3.45** depicts the ranges for wildfire vulnerability factor ratings, including the two factors considered; likelihood and annualized acres burned. **Table 3.46** illustrates the statistical data and factor ratings for wildfire vulnerability. The data collected from MDC included wildfire reported between 2004 and 2012. The overall vulnerability rating of wildfires in Osage County is medium-low (2).

Table 3.45. Ranges for Wildfire Vulnerability Factor Ratings

Factors Considered	Low (1) Level 1 Range	Medium-low (2) Level 2 Range	Medium (3) Level 3 Range	Medium-high (4) Level 4 Range	High (5) Level 5 Range
Likelihood Rating	<29.56	29.56 to 59.11	59.12 to 88.67	88.68 to 118.23	>118.23
Annualized Acres Burned Rating	<100	100 to 199	200 to 499	500 to 999	>999
Vulnerability (Average of values above)	0.0 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0

Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.46. Statistical Data and Factor Ratings for Wildfire Vulnerability

County	Wildfires 2004 -2012	Average Annual # of Wildfires	Likelihood Rating 1-5	Acres Burned	Average Annual Acres Burned	Average Acres Burned Rating	Total Buildings Damaged	Overall Vulnerability
Osage	137	15.2	1	982.5	109	2	3	2

Source: 2013 Missouri State Hazard Mitigation Plan

Potential Losses to Existing Development

According to the 2013 Missouri State Hazard Mitigation Plan, the average annual property loss due to urban/structure fires was \$194,863 (2009 to 2012). Unfortunately, due to lack of data, a monetary value could not be associated with wildfire loss. However the annual average percent probability for structural loss due to wildfires is 33.3 %.

Impact of Future Development

Few future developments are anticipated in WUI areas, however due to lack of data, it is difficult to enumerate. Additionally, as previously mentioned, each jurisdiction within the county resides in a WUI area. This increases the risk of fire hazards for future development.

Hazard Summary by Jurisdiction

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. Nonetheless, homes and businesses located in unincorporated areas are at higher risk from wildfires due to proximity to woodland and distance from fire services. Variations in both structural/urban and wildfires are not able to be determined at this time due to lack of data. However, both fire types are expected to occur on an annual basis across the county.

Problem Statement

Both structural/urban fires and wildfires are expected to occur on an annual basis. To mitigate adverse impacts a comprehensive community awareness and educational campaign on wildfire danger should be designed and implemented. This campaign should include the development of capabilities, systems, and procedures for pre-deploying fire-fighting resources during times of high wildfire hazards; training of local fire departments for wildfire scenarios; encouraging the development and dissemination of maps relating to the fire hazards (WUI areas) to help educate and assist builders and homeowners in being engaged in wildfire mitigation activities; and guidance of emergency services during response.

3.4.6 Flooding (Flash and River)

Some specific sources for this hazard are:

- Watershed map, Environmental Protection Agency, http://cfpub.epa.gov/surf/county.cfm?fips_code=19169
- FEMA Map Service Center, Digital Flood Insurance Rate Maps (DFIRM) for all jurisdictions, if available, msc.fema.gov/portal
- NFIP Community Status Book, <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book>
- NFIP claims status, BureauNet, <http://bsa.nfipstat.fema.gov/reports/reports.html>
- Flood Insurance Administration—Repetitive Loss List (this must be requested from the State Floodplain Management agency or FEMA)
- National Climatic Data Center, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>

Hazard Profile

Hazard Description

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. Riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt or ice melt. The areas adjacent to rivers and stream banks that carry excess floodwater during rapid runoff are called floodplains. A floodplain is defined as the lowland and relatively flat area adjoining a river or stream. The terms “base flood” and “100- year flood” refer to the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year. Floodplains are part of a larger entity called a basin, which is defined as all the land drained by a river and its branches.

Flooding caused by dam failure is discussed in **Section 3.1**. It will not be addressed in this section.

A flash flood occurs when water levels rise at an extremely fast rate as a result of intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil, or impermeable surfaces. Flash flooding can happen in Special Flood Hazard Areas (SFHAs) as delineated by the National Flood Insurance Program (NFIP), and can also happen in areas not associated with floodplains.

Ice jam flooding is a form of flash flooding that occurs when ice breaks up in moving waterways, and then stacks on itself where channels narrow. This creates a natural dam, often causing flooding within minutes of the dam formation.

In some cases, flooding may not be directly attributable to a river, stream, or lake overflowing its banks. Rather, 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, often referred to as sheet flooding, is becoming increasingly prevalent as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow.

Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving

over the same area. Flash flooding is a dangerous form of flooding which can reach full peak in only a few minutes. Rapid onset allows little or no time for protective measures. Flash flood waters move at very fast speeds and can move boulders, tear out trees, scour channels, destroy buildings, and obliterate bridges. Flash flooding can result in higher loss of life, both human and animal, than slower developing river and stream flooding.

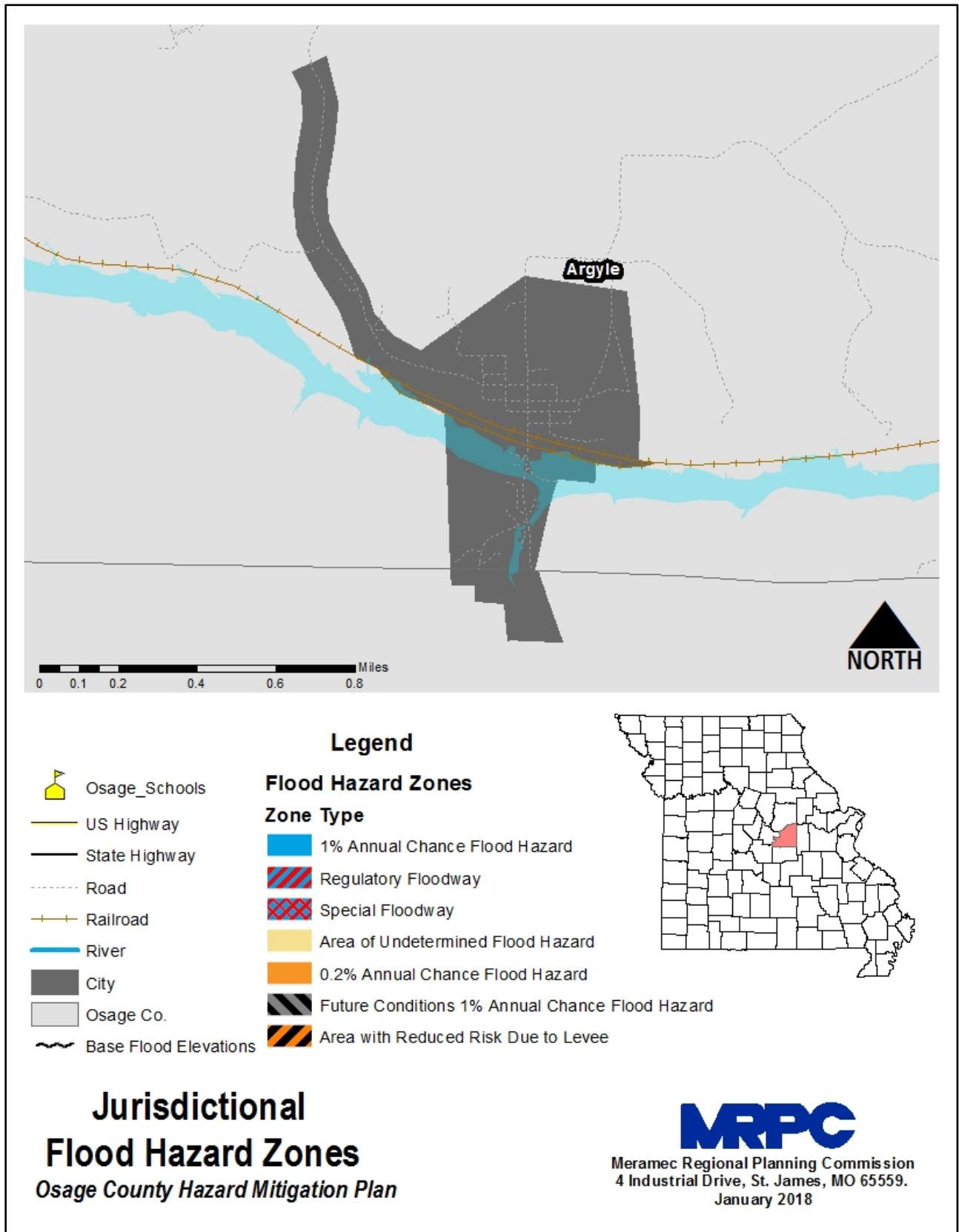
In certain areas, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. This combined with rainfall trends and rainfall extremes all demonstrate the high probability, yet generally unpredictable nature of flash flooding in the planning area.

Although flash floods are somewhat unpredictable, there are factors that can point to the likelihood of flash floods occurring. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. This, along with knowledge of the watershed characteristics, modeling techniques, monitoring, and advanced warning systems has increased the warning time for flash floods.

Geographic Location

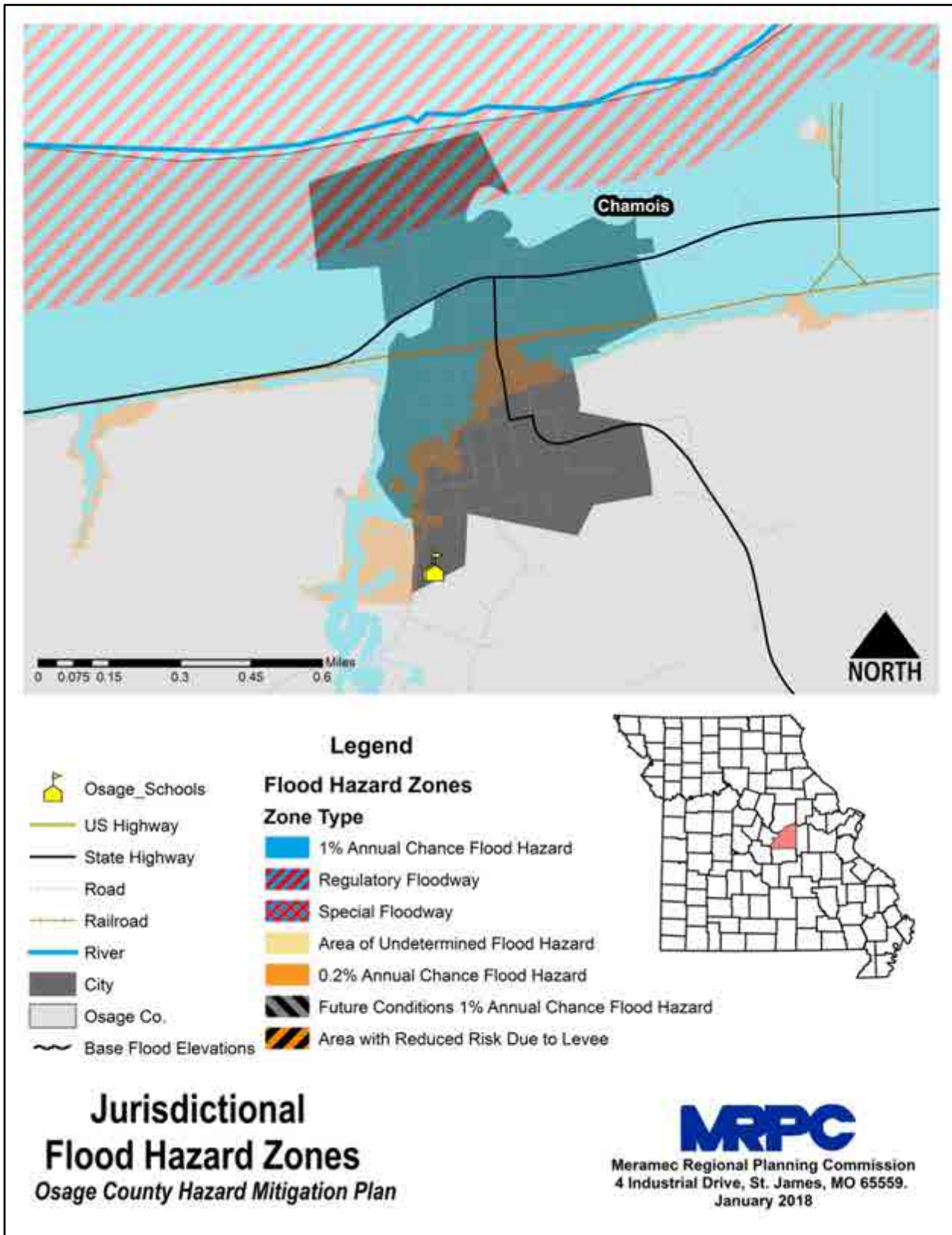
Riverine flooding is most likely to occur in SFHAs. Below are SFHA's for all jurisdictions except Unincorporated Osage County (**Figure 3.27** to **Figure 3.32**). Included in the maps are public schools within each jurisdiction. **Table 3.47** shows Osage County NCDC flood events by location between 1998 and 2017.

Figure 3.27. Argyle, Missouri Special Flood Hazard Areas (SFHAs)



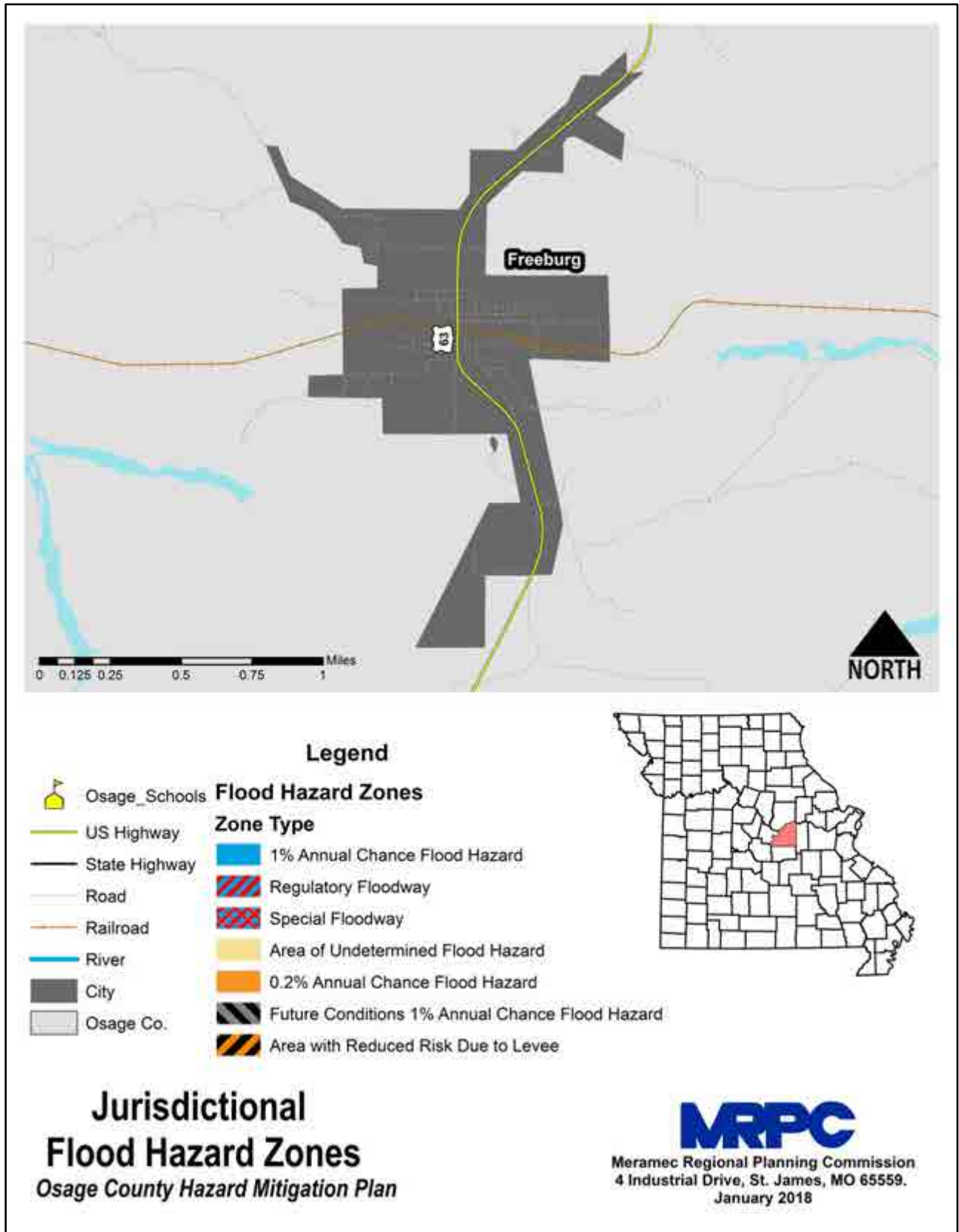
Source: FEMA NFHL, MSDIS; Not participating in 2018 Osage Co. HMP

Figure 3.28. Chamois, Missouri Special Flood Hazard Areas (SFHAs)



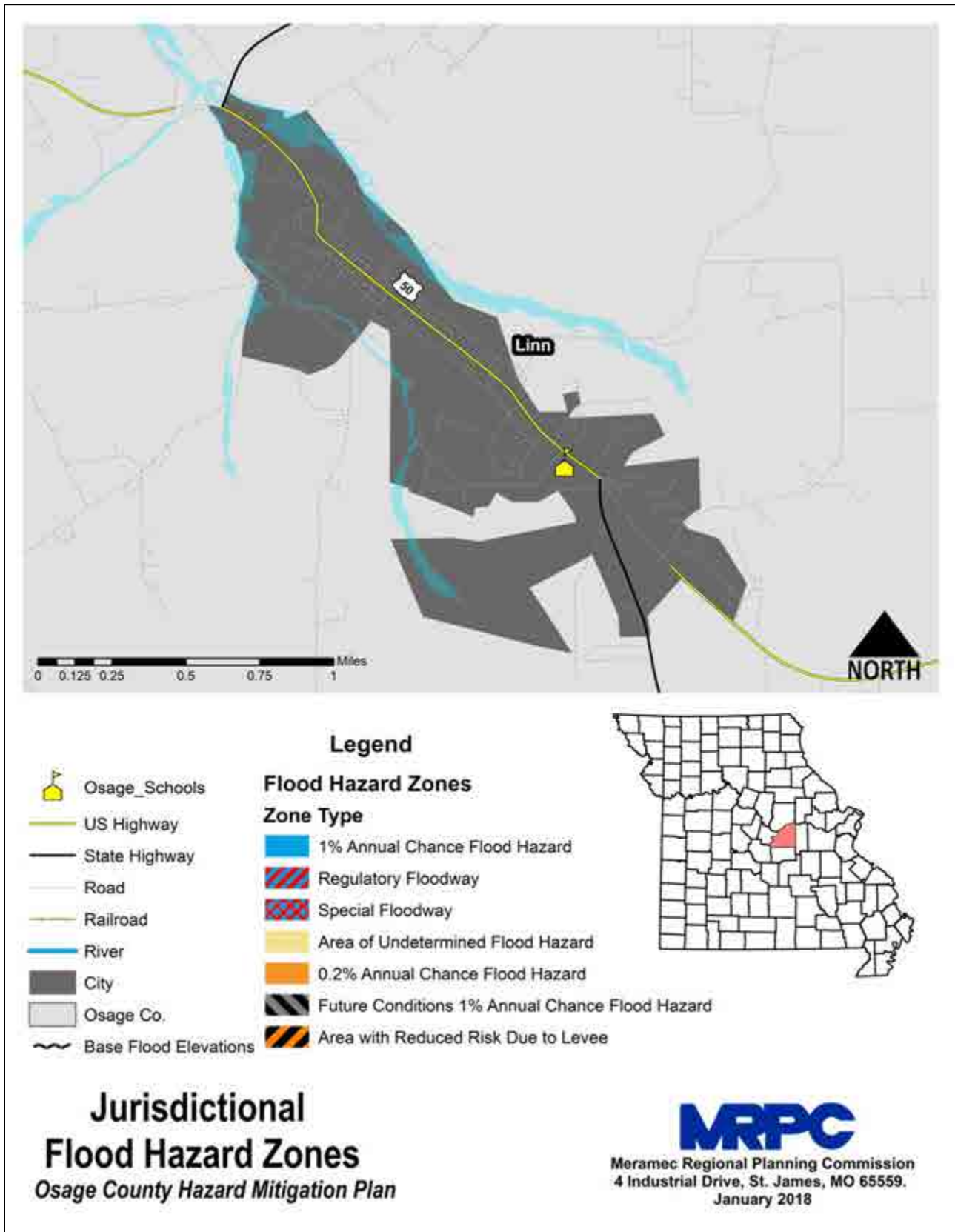
Source: FEMA NFHL, MSDIS

Figure 3.29. Freeburg, Missouri Special Flood Hazard Areas (SFHAs)



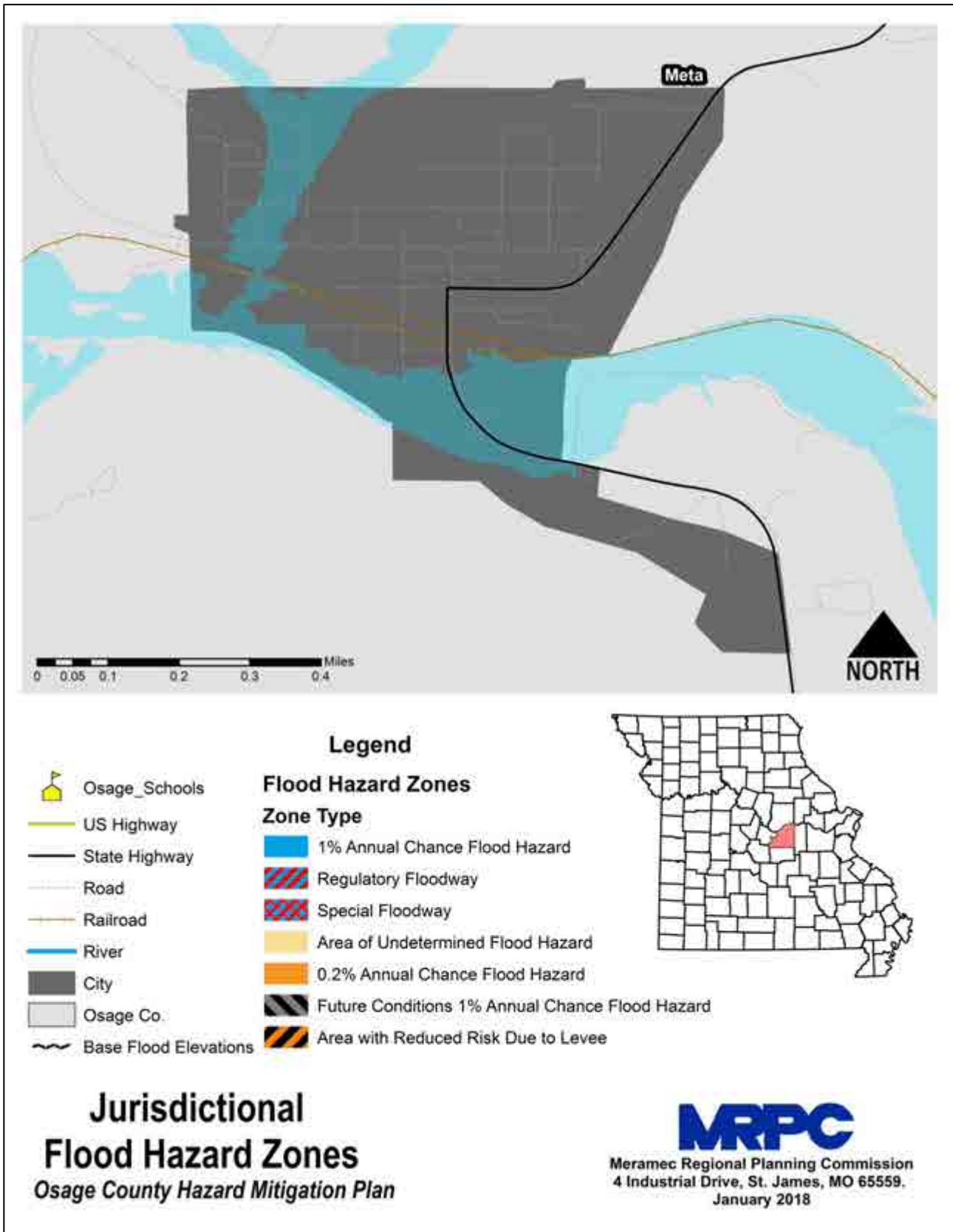
Source: FEMA NFHL, MSDIS

Figure 3.30. Linn, Missouri Special Flood Hazard Areas (SFHAs)



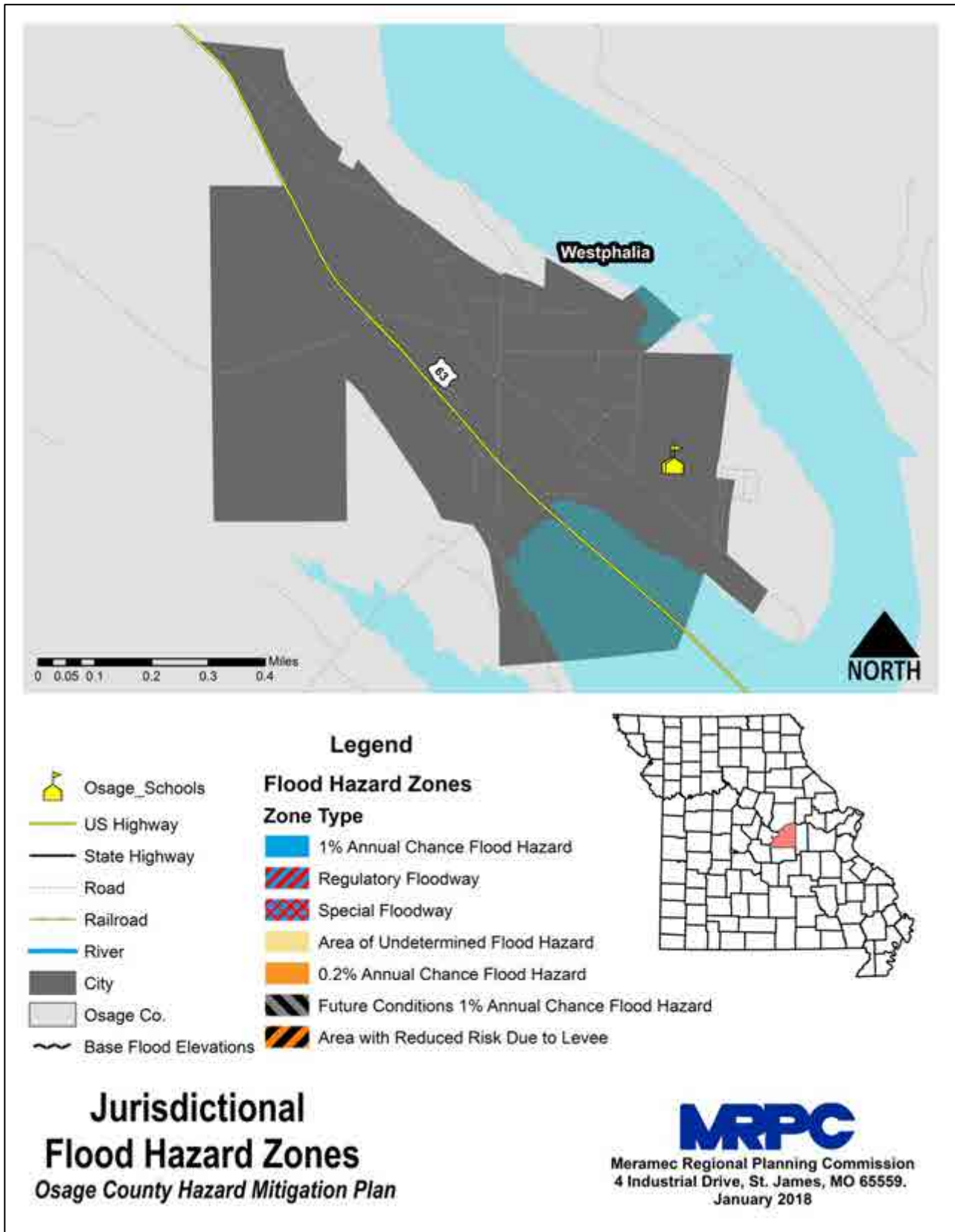
Source: FEMA NFHL, MSDIS

Figure 3.31. Meta, Missouri Special Flood Hazard Areas (SFHAs)



Source: FEMA NFHL, MSDIS

Figure 3.32. Westphalia, Missouri Special Flood Hazard Areas (SFHAs)



Source: FEMA NFHL, MSDIS

Table 3.47. Osage County NCDC Flood Events by Location, 1998-2017

Location	# of Events
Osage (Zone)	3
Bonnot's Mill	2
Meta	1
Argyle	1
Shubert	1
Rich Fountain	1
Gascondy	1

Source: National Climatic Data Center

Flash flooding occurs in SFHAs and locations in the planning area that are low-lying. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. After review of NCDC data, Unincorporated Osage County is the most prone jurisdiction to flash flooding events. **Table 3.48** provides information in regards to flash flood events between 1998 and 2017.

Table 3.48. Osage County NCDC Flash Flood Events by Location, 1998-2017

Location	# of Events
Countywide	4
North Portion of County	1
North Central Portion of County	1
Central Portion of County	1
South Portion of County	1
Southeast Portion of County	1
Westphalia	2
Freeburg	1
Shubert	2
Frankenstein	1
Argyle	1
Chamois	2
Meta	2
Byron	1
Gascondy	1

Source: National Climatic Data Center

Severity/Magnitude/Extent

Missouri has a long and active history of flooding over the past century, according to the 2013 State Hazard Mitigation Plan. Flooding along Missouri's major rivers generally results in slow-moving disasters. River crest levels are forecast several days in advance, allowing communities downstream sufficient time to take protective measures, such as sandbagging and evacuations. Nevertheless, floods exact a heavy toll in terms of human suffering and losses to public and private property. By contrast, flash flood events in recent years have caused a higher number of deaths and major property damage in many areas of Missouri.

Flooding presents a danger to life and property, often resulting in injuries, and in some cases, fatalities. Floodwaters themselves can interact with hazardous materials. Hazardous materials stored in large containers could break loose or puncture as a result of flood activity. Examples are bulk propane tanks. When this happens, evacuation of citizens is necessary.

Public health concerns may result from flooding, requiring disease and injury surveillance.

Community sanitation to evaluate flood-affected food supplies may also be necessary. Private water and sewage sanitation could be impacted, and vector control (for mosquitoes and other entomology concerns) may be necessary.

When roads and bridges are inundated by water, damage can occur as the water scours materials around bridge abutments and gravel roads. Floodwaters can also cause erosion undermining road beds. In some instances, steep slopes that are saturated with water may cause mud or rock slides onto roadways. These damages can cause costly repairs for state, county, and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard. Further information regarding scour critical bridges can be found in **Section 3.2.2**.

Between 1998 and 2017, there were 116 recorded crop insurance claims totaling \$2,089,400.40 in loss due to flooding within Osage County³⁹.

National Flood Insurance Program (NFIP) Participation

Table 3.49 lists jurisdictions within the planning area that participate in NFIP. In addition, **Table 3.50** provides the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction.

Table 3.49. NFIP Participation in Osage County

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	E Prc Date
290268	Osage County	Y	09/19/12	02/02/90
290270	Chamois	Y	09/19/12	11/15/84
	Freeburg	N	-	-
290708	Linn	Y	09/19/12(M)	04/28/06
290271	Meta	Y	09/19/12(M)	04/09/12
290272	Westphalia	Y	09/19/12(M)	09/10/84

Source: NFIP Community Status Book, 2/16/18; BureauNet, <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book>; M= No elevation determined – all Zone A, C, and X; NSFHA = No Special Flood Hazard Area; E=Emergency Program

Table 3.50. NFIP Policy and Claim Statistics as of [12/31/17]

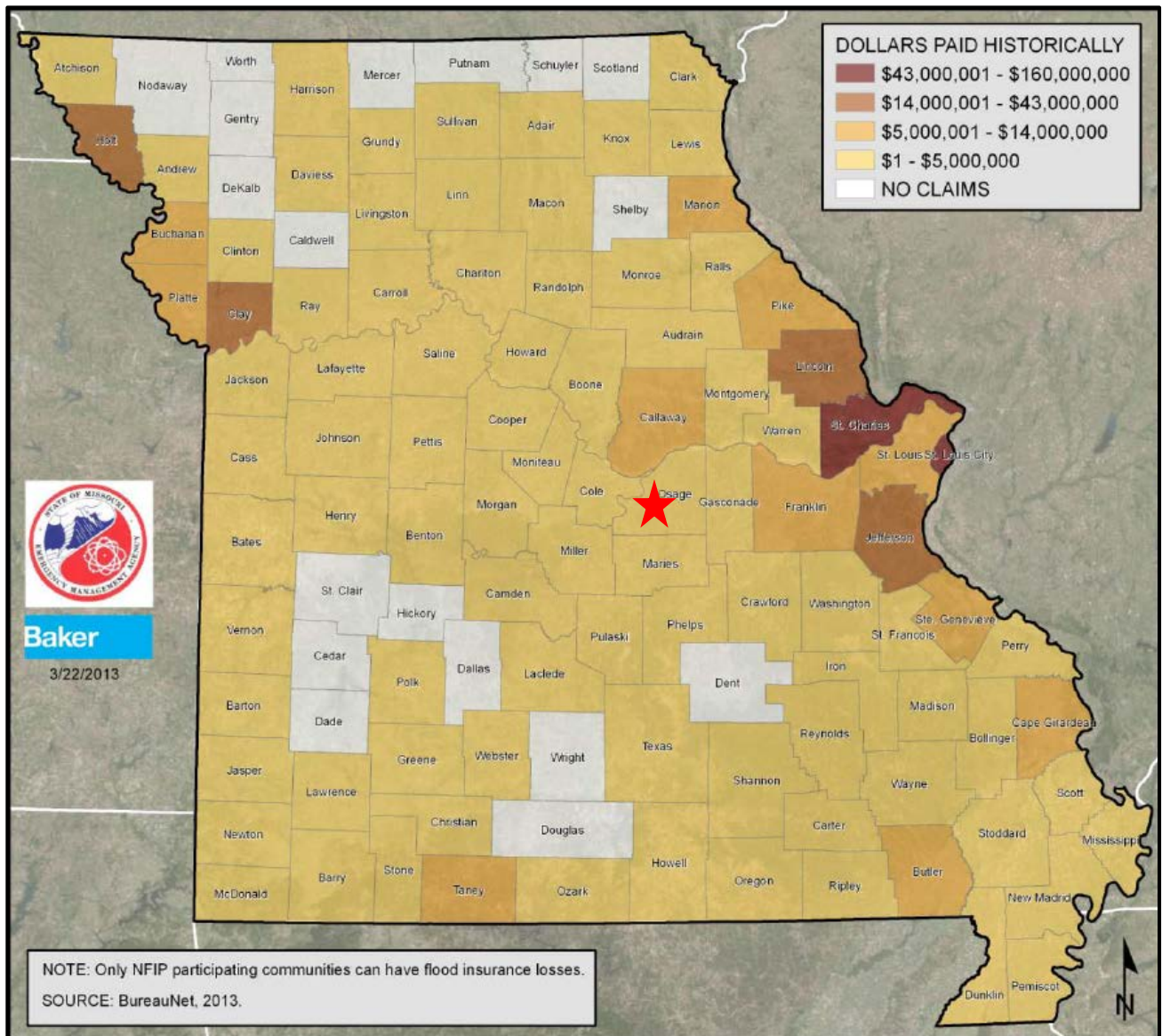
Community Name	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Osage County	130	118	2	10	3,235,237.59
Chamois	59	52	0	7	498,629.14
Meta	1	1	0	0	21,588.38
Westphalia	10	9	0	1	66,381.20

Source: NFIP Community Status Book, [2/16/18]; BureauNet, <http://bsa.nfipstat.femxa.gov/reports/reports.html>; *Closed Losses are those flood insurance claims that resulted in payment.

The following figures depict the dollars paid historically for flood insurance losses in Missouri by county from 1978 to Jan. 2013 (**Figure 3.33**), and historical flood loss claims in Missouri by county, 1979 to Jan. 2013 (**Figure 3.34**).

³⁹ <http://www.rma.usda.gov/data/cause.html>

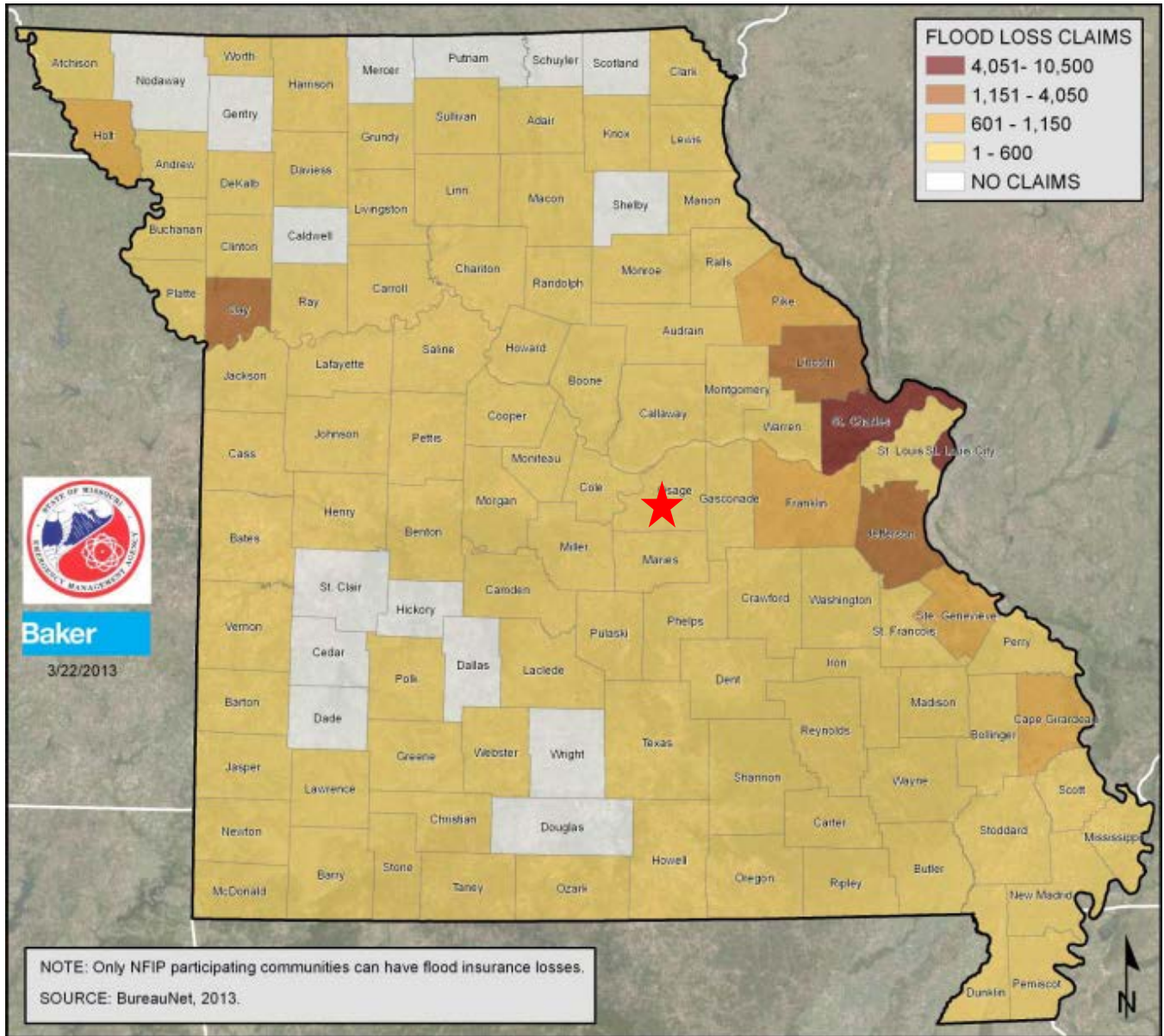
Figure 3.33. Dollars Paid Historically for Flood Insurance Losses in Missouri by County, 1978 to Jan. 2013



Source: 2013 Missouri State Hazard Mitigation Plan

*Red star indicates Osage County

Figure 3.34. Historical Flood Loss Claims in Missouri by County, 1978 to Jan. 2013



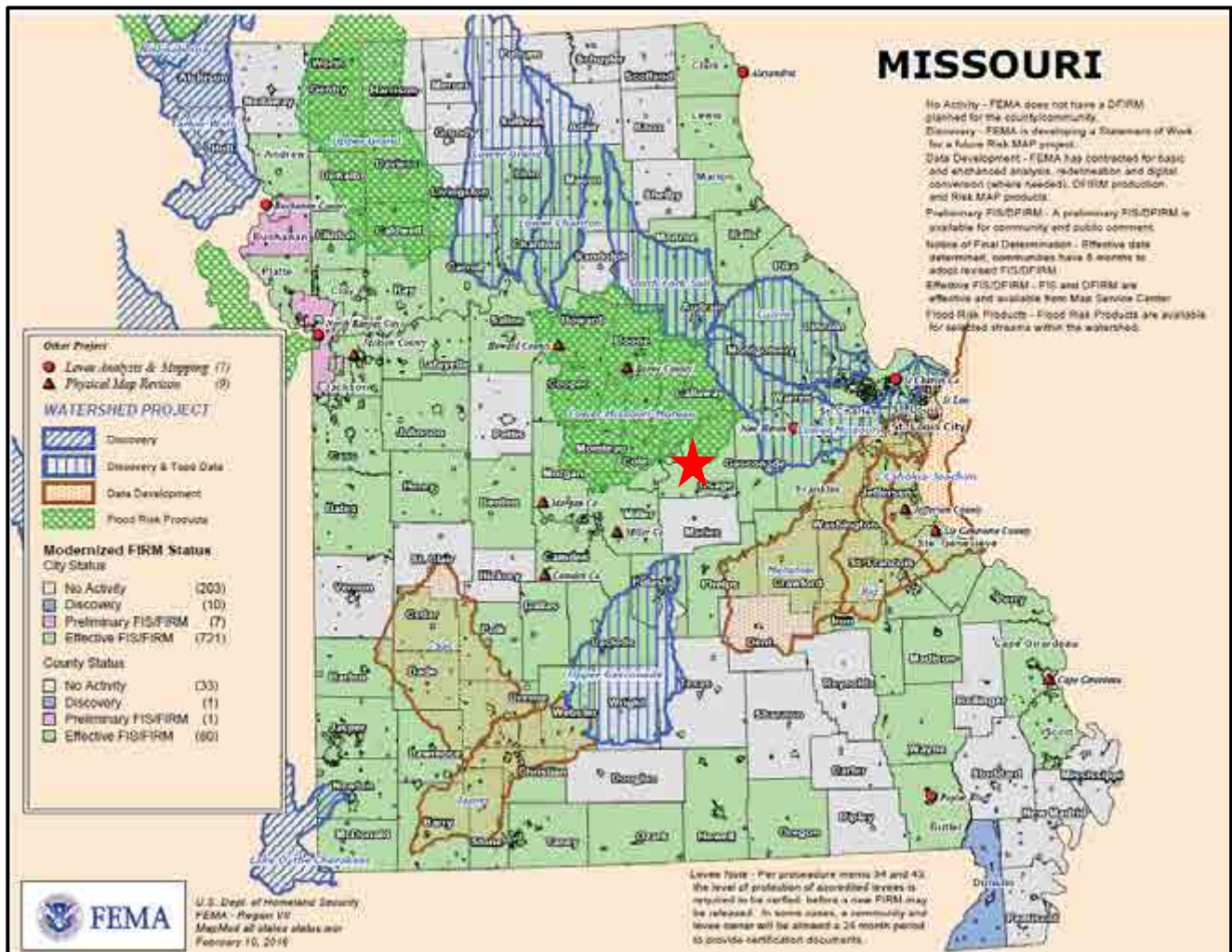
Source: 2013 Missouri State Hazard Mitigation Plan

*Red star indicates Osage County

RiskMAP

Risk mapping, assessment, and planning is a FEMA program which provides communities with flood information and tools to enhance their mitigation plan and take action to better protect their citizens. The northeastern half of Osage County is in the flood risk product development stage. The remaining portion of the county has an effective FIS/FIRM. **Figure 3.35** below depicts various watershed projects and FIRM statuses for Missouri.

Figure 3.35. RiskMAP 2015



Source: SEMA, 2016

*Red star indicates Osage County

Repetitive Loss/Severe Repetitive Loss Properties (data requested from SEMA)

Repetitive Loss Properties are those properties with at least two flood insurance payments of \$5,000 or more in a 10-year period. According to the Flood Insurance Administration, jurisdictions included in the planning area have a combined total of 24 repetitive loss properties (5 in Chamois, 18 in Osage Co., and 1 in Westphalia) with 67 losses as of 11/30/2017. Of those properties, there are 24 residential and 0 commercial properties (non-mitigated).

Total payments (building and contents) were \$885,401.34. The average payment was \$17,701.27.

In Osage Co., one residential and one commercial property have been mitigated, with 4 losses. The total building payments were \$102,750.43 with an average payment of \$25,687.61.

Severe Repetitive Loss (SRL): A SRL property is defined it as a single family property (consisting of one-to-four residences) that is covered under flood insurance by the NFIP; and has (1) incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding \$5,000 and with cumulative amounts of such claims payments exceeding \$20,000; or (2) for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. According to FEMA there is 1 SRL properties in Osage County.

Previous Occurrences

Table 3.51 provides information regarding Presidential Flooding Disaster Declarations between 1998 and 2017 for Osage County.

Table 3.51. Osage County Presidential Flooding Disaster Declarations 1998 to 2017

Declaration No.	Year of Declaration Date	State	Incident Description
DR-1270	1999	MO	Severe Storms & Flooding
DR-1412	2002	MO	Severe Storms, Tornadoes, and Flooding
DR-1463	2003	MO	Severe Storms, Tornadoes, and Flooding
DR-1708	2007	MO	Severe Storms & Flooding
DR-1676	2007	MO	Severe Winter Storms & Flooding
DR-1809	2008	MO	Severe Storms, Flooding, and Tornado
DR-1749	2008	MO	Severe Storms & Flooding
DR-1847	2009	MO	Severe Storms, Tornadoes, and Flooding
DR-3325	2011	MO	Flooding
DR-4144	2013	MO	Severe Storms, Straight-Line Winds, and Flooding
DR-4130	2013	MO	Severe Storms, Straight-Line Winds, Tornadoes, and Flooding
DR-4238	2015	MO	Severe Storms, Straight-Line Winds, Tornadoes, and Flooding
DR-3374	2016	MO	Severe Storms, Straight-Line Winds, Tornadoes, and Flooding
DR-4250	2016	MO	Severe Storms, Straight-Line Winds, Tornadoes, and Flooding
DR-4317	2017	MO	Severe Storms, Straight-Line Winds, Tornadoes, and Flooding

FEMA, Disaster Declarations for Missouri, Flooding

Data was obtained from the NCDL regarding flash and river flooding over the last 20 years. **Table 3.52** and **Table 3.53** provide this information. Additionally, narratives available for each event are included.

Table 3.52. NCDC Osage County Riverine Flood Events Summary, 1998 to 2017

Year	# of Events	# of Deaths	# of Injuries	Property Damages (\$)	Crop Damages (\$)
1998	1	0	0	0	0
2001	1	0	0	0	0
2002	1	0	0	0	0
2007	1	0	0	5.00K	25.00K
2008	2	0	0	0	0
2010	1	0	0	0	0
2015	1	0	0	0	0
2017	1	0	0	0	0

Source: NCDC, data accessed [02/20/2018]

Narratives on flood events:

1. **10/06/1998:** Heavy rain over west Missouri and further upstream caused flooding on the Missouri River in central and eastern Missouri. On average, river stages rose to 5 to 7 feet over flood stage. The stages quickly fell and were back below flood levels after 5 to 6 days. Damage was minimal, primarily because wetlands and low-land agricultural areas were the only locations flooded. Many of the wetlands had been established as a result of the Great Flood of 1998.
2. **06/04/2001:** The Mississippi River flooded in May, and in June the Missouri River took over. Heavy rain across the Missouri River Basin sent the river over its banks to heights in some places not seen since the flooding in 1995. Despite the high river levels, damages were minimal compared to what they could have been. This is because many homes and businesses were relocated out of the flood plain after the devastating flooding of the early and mid-90s. The bulk of the flooding this time occurred in newly established wetlands or in farmhands on the river side of levees. Some towns, however were affected.

In the river towns of McBaine, Lupus and Easley of central Missouri, most residents took the high water in stride. Roads heading into town flooded causing residents to use boats to get to homes. A few homes had water up to 6 feet in their basements, but many stayed dry because they had been elevated after prior floods. At other points along the river, including Osage City, Portland, Gasconade, Washington, Matson and St. Charles, the story was pretty much the same. Parks along the river were flooded, as were the roads along the river, including Route 94 which runs along the river from Jefferson City to St. Charles. In Jefferson City, the river managed to stay just below the top of the levees., which were built to hold back water from 30 to 31 feet. The river crested at 30.1 feet. Nevertheless, the Jefferson City Airport was evacuated and 4 parking lots in the Capitol Complex were flooded. Over 1300 acres of the Katy Trail State Park also flooded in the central Missouri area.

3. **05/08/2002:** Several heavy rain events caused the Missouri River to flood from Central Missouri east to its confluence with the Mississippi River. Most of the flooding started around the 8th and ended by the 20th. The exception being at Gasconade, MO where the river remained in flood until May 28. The river peaked from about 6 to 11 feet over flood stage. Several roads along the river were closed at various times and many acres of farm land went under water. The Katy Trail Sate Park, a bike and hiking trail that runs along the river from Central Missouri to St. Charles, was damaged at several locations along the river. Damage to homes and businesses was virtually nonexistent due to relocations and buy outs after the Great Flood of 1993.

4. **05/08/2007:** Very heavy rain across Nebraska, Kansas and Northwest Missouri resulted in flooding along the Missouri River. The river crested from 4 to 9 feet over flood stage at various points from Jefferson City to St. Charles, MO. Damage was minimal. The primary flooding was to farmland and roads along the river. Some riverfront parks were also flooded.
5. **03/19/2008:** Heavy rain in March produced major flooding on the Gasconade and Meramec rivers in eastern Missouri. The trigger was a four to seven inch rainfall which produced the flooding from the 19th to the 22nd. The Gasconade River at Rich Fountain crested at 33.0 feet which was the second highest level ever recorded. The Meramec River at Steelville crested at 26.84 feet, the 2nd highest crest of record. At Valley Park, the crest of 37.83 represented the 3rd highest of record, while crests at Sullivan, Pacific, and Eureka all represented the 4th highest of record. Damage along the Gasconade River was mild, mainly to secondary homes or cabins along the river. Highway E was closed due to flooding and US Highway 50 was closed for about 24 hours near Mt. Sterling due to flooding when the river crested on the 21st. The Meramec River produced the most damaging flooding. Homes, businesses and roads in Pacific and Eureka were flooded. Highway 141 in Valley Park, a major north south commuting route through western St. Louis County had to be closed at the intersection of I-44 due to flooding. Initial damage estimates for individual and public assistance were from \$20 to \$25 million.
6. **09/14/2008:** A cold front moved through the region and interacted with the remnants of Hurricane Ike. Widespread heavy rain was reported across Missouri and Illinois causing major flooding across the region. Many small creeks in the St. Louis Metropolitan area that had not flooded for years became raging rivers flooding roads, homes and businesses. Also, winds from the remnants of Hurricane Ike caused tree, power line and building damage in some locations.
7. **06/05/2010:** The Missouri River went into flood early in the month and stay that way into July. Moderate flooding occurred which only affected some roadways and farmland along the river.
8. **12/27/2015:** A prolonged period of rainfall occurred from the early morning hours of December 26th to the evening of December 28th. The heaviest rainfall occurred in a 50 to 75 mile wide swath from southwest Missouri through the Greater St. Louis Metropolitan Area and into central Illinois. Three day rainfall totals within this swath ranged from 6 to 12 inches, with lighter amounts extending both northwest and southeast to the state border. Some of the precipitation fell as a wintry mix of freezing rain, sleet and snow across northwest portions of the state. All of this rain caused historic river flooding for the many rivers throughout the region. This resulted in floods of record on the Bourbeuse River at Union, the Meramec River at Pacific, Eureka, Valley Park, and Arnold, and major flooding on the Missouri River (at Gasconade and Hermann), the Mississippi River at Winfield Lock and Dam and points downstream, the Cuivre River at Old Monroe, Dardenne Creek, the Gasconade River, the Moreau River, the Illinois River, and the Kaskaskia River at Vandalia. The only location not reporting flooding after this event was the Salt River near New London, where the Clarence Cannon Dam regulates the flow. All other forecast points reported at least minor flooding. Seven flooding deaths were reported in our area due to the heavy rains. Approximately 1500 structures were either damaged or destroyed by the flood waters in the forecast area. At this time dollar amount damages are expected to top \$1 billion dollars.
9. **04/30/2017:** A strong spring storm system brought multiple rounds of thunderstorms and heavy rain to the southeast half of Missouri during the weekend of April 29th-30th. Rainfall totals surpassed nine inches in some locations and this led to flash flooding and historic flooding along some of the tributaries of the Missouri and Mississippi Rivers. Areas along the

Meramec River were especially hard hit as new records were set at Steelville, Sullivan, and Eureka. The previous records had just recently been set during the late December flooding of 2015. Two major highways, I-44 and I-55 were shut down for a number of days due to the record river flooding from this event. A few thunderstorms also became severe during the afternoon of April 29th, with two weak tornadoes documented.

10. **05/01/2017:** A strong spring storm system brought multiple rounds of thunderstorms and heavy rain to the southeast half of Missouri during the last couple days of April. Rainfall totals surpassed nine inches in some locations and this led to historic flooding along some of the tributaries of the Missouri and Mississippi Rivers. Areas along the Meramec River were especially hard hit as new records were set at Steelville, Sullivan, and Eureka. The previous records had just recently been set during the late December flooding of 2015. Two major highways, I-44 and I-55 were shut down for a number of days due to the record river flooding from this event.

Table 3.53. NCDC Osage County Flash Flood Events Summary, 1998 to 2017

Year	# of Events	# of Deaths	# of Injuries	Property Damages (\$)	Crop Damages (\$)
1998	3	0	0	0	0
2000	1	0	0	0	0
2002	4	0	0	0	0
2006	1	0	0	0	0
2008	1	0	0	0	0
2009	2	0	0	0	0
2010	2	0	0	0	0
2012	3	0	0	0	0
2015	2	0	0	0	0
2016	2	0	0	0	0
2017	1	0	0	0	0

Source: NCDC, data accessed [02/20/2018]

Narratives on flood events:

1. **07/04/1998:** Rainfall of 2 to 6 inches caused scattered flooding across the area. Many county roads and low-water crossings became impassable. Several streets and intersections in Columbia were covered with water ranging from 6 inches to 2 feet.
2. **07/26/1998:** Rainfall up to 6 inches caused widespread flooding across the area. Besides flooding of small streams and creeks, the Osage, Maries, and Gasconade Rivers all surged over their banks. A construction crane being used to build a new bridge over the Osage River was ripped from its moorings and washed about 2 miles downstream. Countless gravel roads across the area suffered significant wash-out damage.
3. **07/29/1998:** Heavy rain returned to Central Missouri again causing flooding across the area. One of the hardest hit areas was the town of Elston, Cole County. Gray's Creek surged out of its banks sending a wall of water several feet deep through the town. Some vehicles were flooded, and a few outbuildings swept away. A few homes had water inside just under 1 foot deep. Otherwise, county roads suffered additional damage that was started during the heavy rain event on Sunday 7/26.
4. **05/27/2000:** Rainfall of 2 to 3 inches, on top of a 2 to 4 inch rain which fell a few days earlier, caused flash flooding across portions of central Missouri. Numerous county roads became

impassable. Highways 179, 87 and 50 in Moniteau County all had to be closed at various times. Part of Highway 50 in Osage County had to be closed for a while as well. A campground in Osage County had to be evacuated due to a flooded creek.

5. **05/09/2002:** Another round of 2-4 inches of rain on already saturated ground led to more flash flooding across the area. Numerous roads across the area became impassable due to high water. Many of the small creeks and streams, already high because of previous rain, quickly flooded again.
6. **05/12/2002:** The third heavy rain event of the month brought 3-6 inches of rain over Mother's Day weekend resulting in widespread flash flooding across much of Central and Eastern Missouri. Some weather watchers reported nearly a foot of rain in a 15 day period. Countless creeks and small streams flooded leaving roads underwater. In rural areas, many roads and bridges were severely damaged by floodwater. Urban areas were also overrun by water as storm water drainage systems were quickly overwhelmed. Many people in cities suffered flooded basements. In Centralia, in Boone County, street flooding left people stranded. In Montgomery County, Routes Y, K, J, CC, E and others were flooded and closed. In Franklin County, several roads were closed in Pacific, Robertsville, Catawissa and others. In Gasconade County, Routes N and D were flooded and closed. In Lincoln County, several roads were closed in Troy, Winfield and across the south portion of the county. In St. Louis County, roads were flooded, especially in southern and western areas.
7. **08/18/2002:** Rainfall of 3 to 5 inches fell across Osage County causing flash flooding. The heaviest rain fell across the north central part of the county. Numerous county roads became impassable.
8. **08/20/2002:** Heavy rain flooded and made several roads across central Osage County impassable.
9. **08/26/2006:** Overnight rainfall of at least 3 inches in some locations caused scattered flash flooding across the county. A couple of creeks flooded roads making them impassable.
10. **03/31/2008:** Three to four inches of rain fell over Osage county over a short period of time on already saturated soils. Numerous roads were closed due to flooding including County Roads 508 and 542 near Meta, Highway W northwest of Linn, and Highway P west of Koeltztown.
11. **05/08/2009:** Between 2 and 3 inches of rain fell in a short amount of time causing flash flooding. Highway 89 had two feet of water over it about 4 miles north of Belle.
12. **11/15/2009:** Between 2 and 3 inches of rain fell in a short amount of time on already saturated soils causing flash flooding. Numerous roads were flooded including County Road 412 near Loose Creek and County Road 416 near Bonnots Mill.
13. **06/08/2010:** Up to three inches of rain fell in a short amount of time on already saturated soils, causing flash flooding. Numerous roads were flooded including a secondary road near the intersection of U.S. Highway 50 and State Highway 89, just east of Linn. Also, Highway N in Freedom was closed due to flooding, as well as Highway W just north of Linn.
14. **07/09/2010:** Up to five inches of rain fell in just four hours on already saturated soils causing flash flooding. Numerous roads were flooded including Highway CC at the intersection with U.S. Highway 50 and County Road 806 southeast of Highway CC.

15. **03/15/2012:** Up to two inches of rain fell in a short amount of time causing flash flooding. Several roads were flooded including U.S. Highway 50 just east of Linn and Highways Y and NN in far southeastern Osage County.
16. **03/17/2012:** Up to three inches of rain fell in a short amount of time causing flash flooding. Numerous secondary roads were flooded and several creeks were out of their banks.
17. **04/14/2012:** Up to four inches of rain fell in a short amount of time causing flash flooding. Several roads were flooded including Highway RA southeast of Linn.
18. **07/01/2015:** Up to three inches of rain fell onto already saturated soils causing flash flooding. Numerous roads were flooded including Route T north of Argyle and Route P west of Freeburg.
19. **12/26/2015:** Between 3 and 5 inches of rain fell causing flash flooding. Numerous roads were flooded including U.S. Highway 50 at several locations along it. Also, Route RA was closed.
20. **08/05/2016:** Up to 5 inches of rain fell onto saturated soils causing flash flooding. Numerous roads across southern Osage County were flooded. Highway T near Koeltztown was washed out. Also, Highway P near County Road 524 was washed out. In Freeburg, a water rescue had to be performed after someone drove into a flooded section of roadway and their car stalled.
21. **08/12/2016:** Up to two inches of rain fell onto already saturated soils causing flash flooding. Several roads were flooded including Highway 100 between Chamois and Morrison.
22. **04/29/2017:** Between 4 and 6 inches of rain caused flash flooding. Numerous roads were flooded including Route RA southeast of Linn.

Probability of Future Occurrence

From the data obtained from the NCDC⁴⁰, there were 9 riverine flood events (**Table 3.53**) over a period of 20 years. This information was utilized to determine the annual average percent probability of riverine flooding (**Table 3.54**). The probability of riverine flooding in Osage County per year is 45% (9 events/20 years x 100 = 45%). Furthermore, data was obtained for flash flooding within the county. Osage County endured 22 flash flooding events (**Table 3.52**) over a 20 year period. The probability of flash flooding in Osage County per year is 100% with an annual average of 1.1 events (22 events/20 years x 100)(**Table 3.55**).

Table 3.54. Annual Average % Probability of Riverine Flooding in Osage County

Location	Annual Avg. % P
Osage County	45%

*P = probability; see page 3.24 for definition.

⁴⁰ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

Table 3.55. Annual Average % Probability of Flash Flooding in Osage County

Location	Annual Avg. % P	Avg. Number of Events
Osage County	100%	1.1

*P = probability; see page 3.24 for definition.

Vulnerability

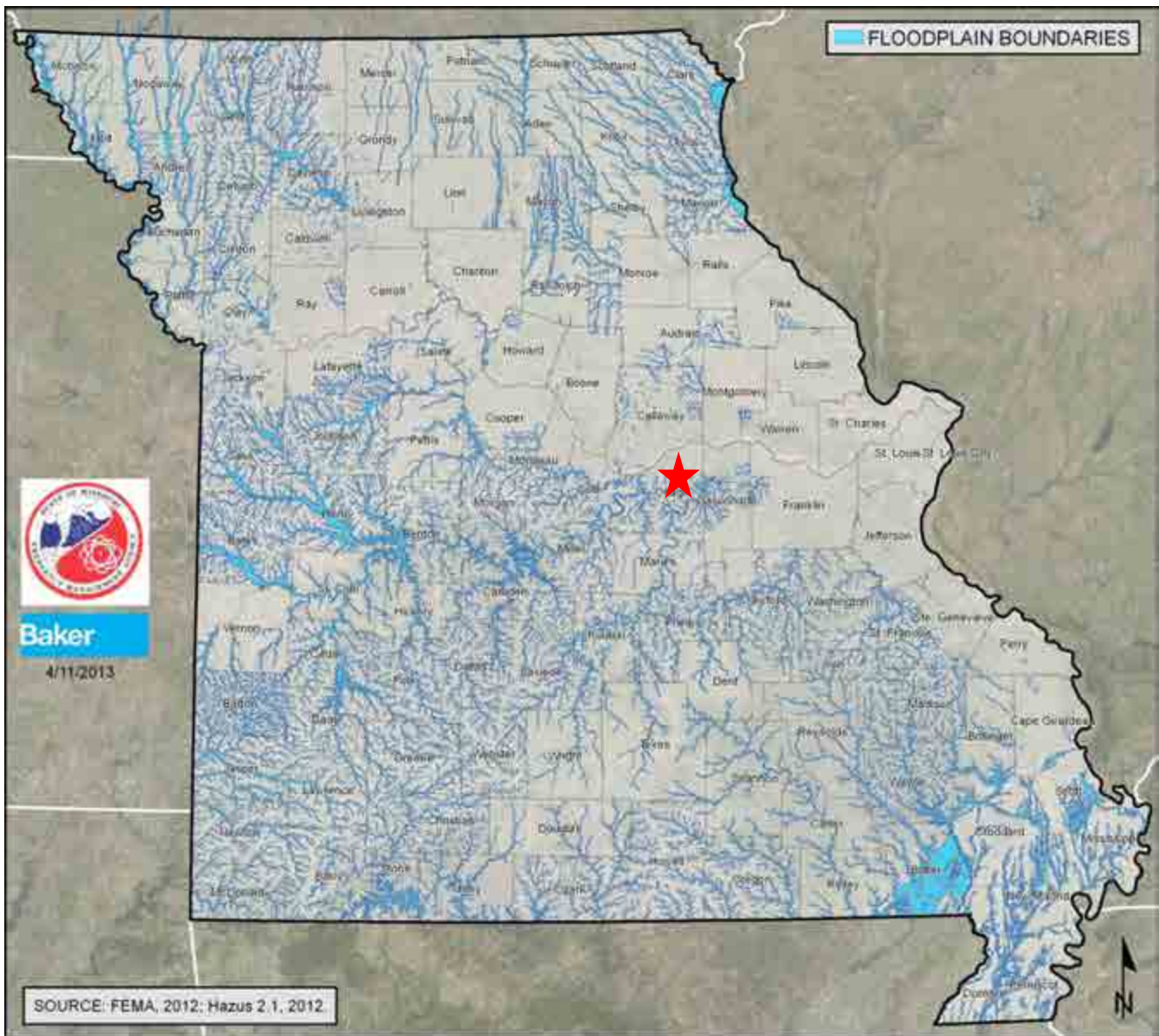
Vulnerability Overview

For the vulnerability analysis of riverine and flash flooding for Osage County, data was obtained from the 2013 Missouri State Hazard Mitigation Plan. The 2013 Plan was updated by enhancing the flood vulnerability assessment and loss estimation capabilities of Hazus by leveraging a number of improved local data inputs. This was achieved by integrating DFIRM depth grids for 51 additional counties. Furthermore, the State re-analyzed the previous 29 depth grids used in 2010, to utilize the latest enhancements available in Hazus 2.1; bringing the total number of regions analyzed using DFIRM depth grids to 80 jurisdictions. The subsequent set of improved data inputs included an enhanced building inventory database, which is an improvement over the standard Hazus 2.1 stock data. That data, coupled with the DFIRM depth grids, enabled Level 2 Hazus flood analysis for all 114 counties⁴¹.

Figure 3.36 depicts the 100-year floodplain boundaries for all counties within Missouri. These DFIRM floodplains are comprised of streams based on a <1 sq. mile drainage area.

⁴¹ 2013 Missouri State Hazard Mitigation Plan

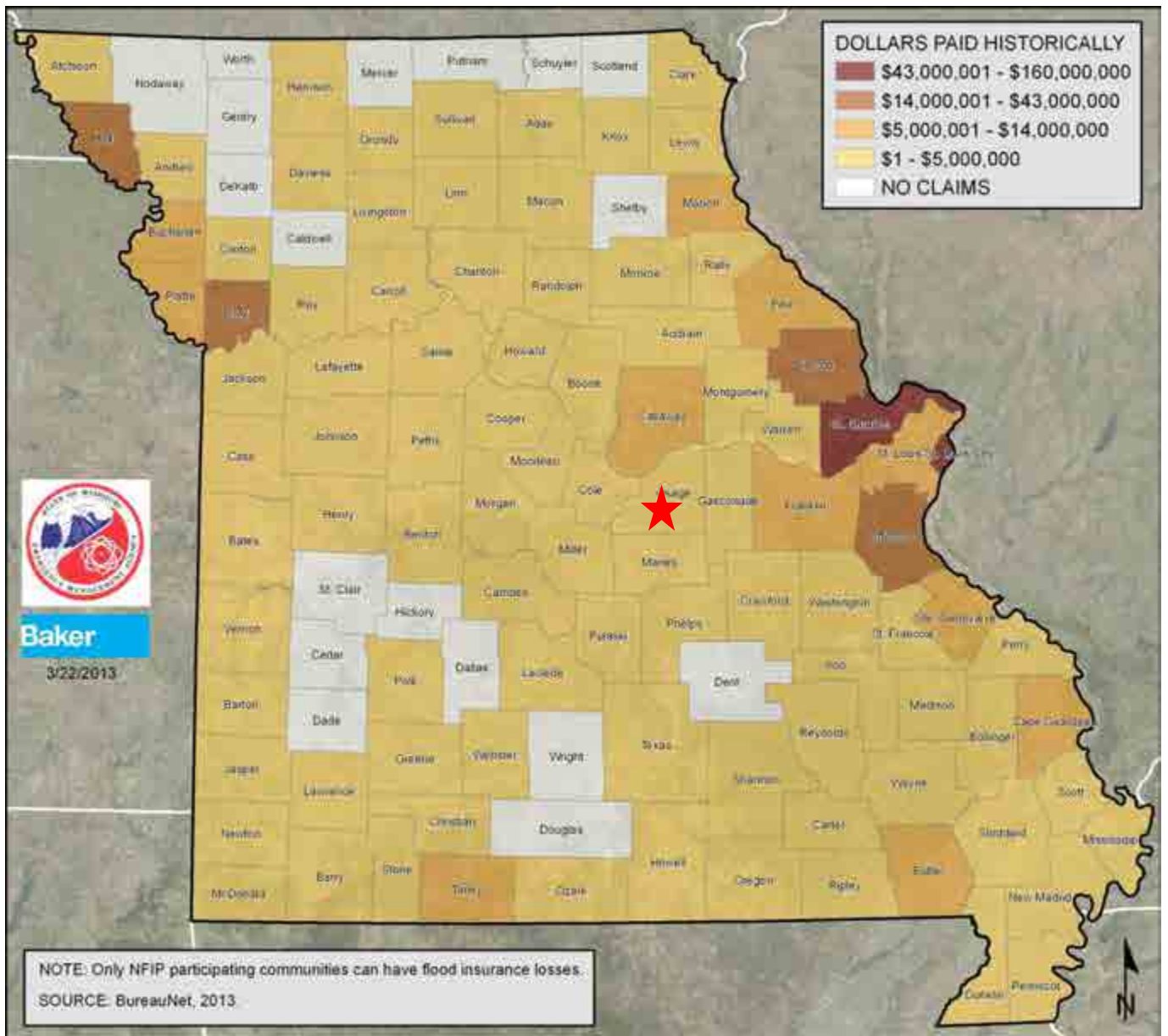
Figure 3.36. DFIRM and Hazus Countywide Base-Flood Scenarios: Modeled Floodplain Boundaries



Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Osage County

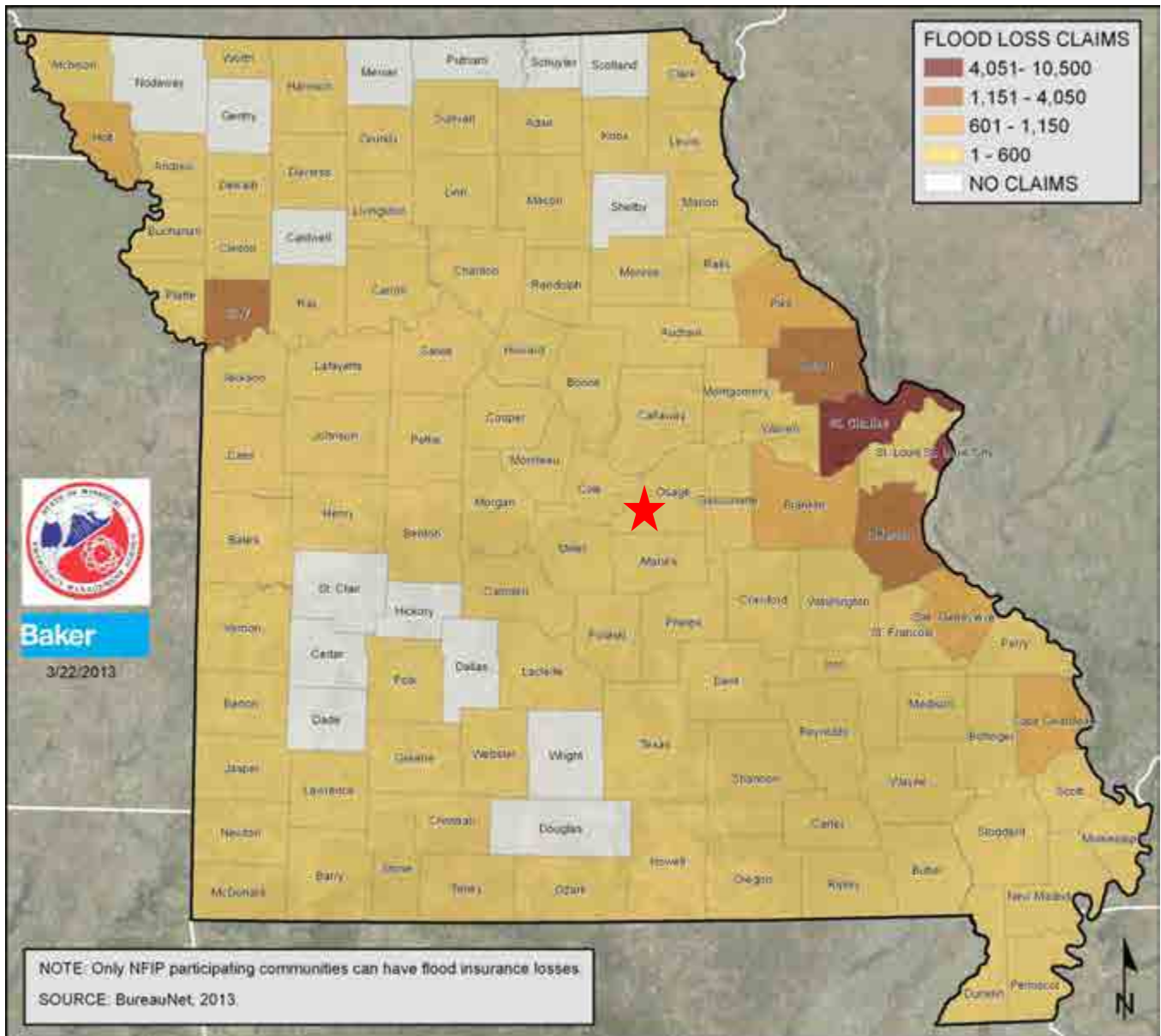
In addition, the state analyzed NFIP flood-loss data to establish areas in Missouri that are most at risk to flooding. **Figure 3.37** illustrates the dollars paid historically for flood insurance losses in Missouri by county from 1978 to 2013. Moreover, **Figure 3.38** depicts flood loss claims in Missouri during the same timeline.

Figure 3.37. Dollars Paid Historically for Flood Insurance Losses in Missouri by County, 1978 –2013



Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Osage County

Figure 3.38. Flood Loss Claims in Missouri by County, 1978 – 2013



Source: 2013 Missouri State Hazard Mitigation Plan

*Red star indicates Osage County

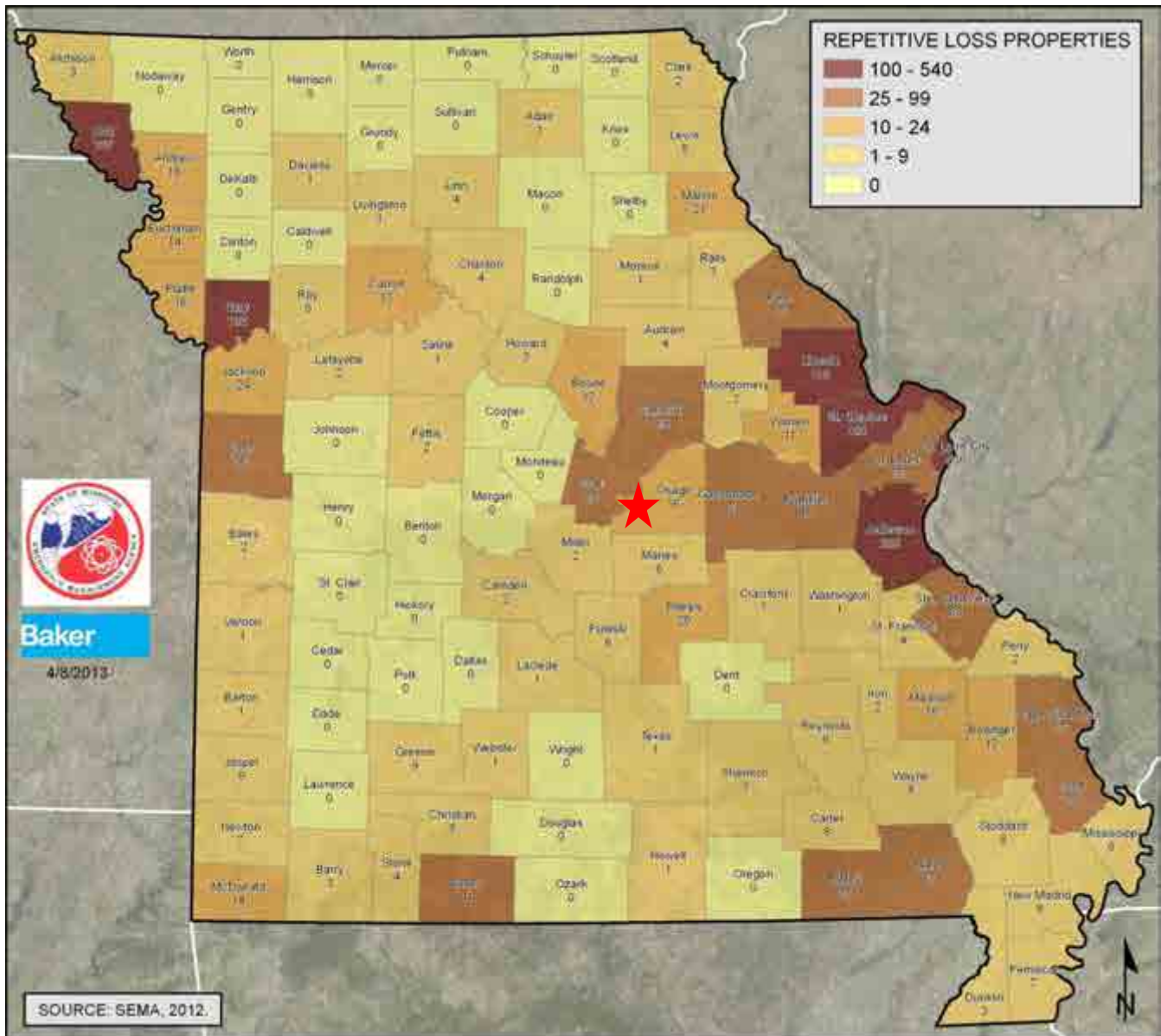
Table 3.56 and **Figure 3.39** illustrate the number of repetitive loss properties in Osage County.

Table 3.56. Osage County’s Repetitive Loss Property Summary

County	Number of Repetitive Loss Properties	Number of Losses	Total Paid (\$)	Loss Ratio	Average Payment
Osage	16	44	\$743,487	2.6	\$16,897

Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.39. Repetitive Flood Loss Properties by County, 1978 - 2009



Source: 2013 Missouri State Hazard Mitigation Plan

*Red star indicates Osage County

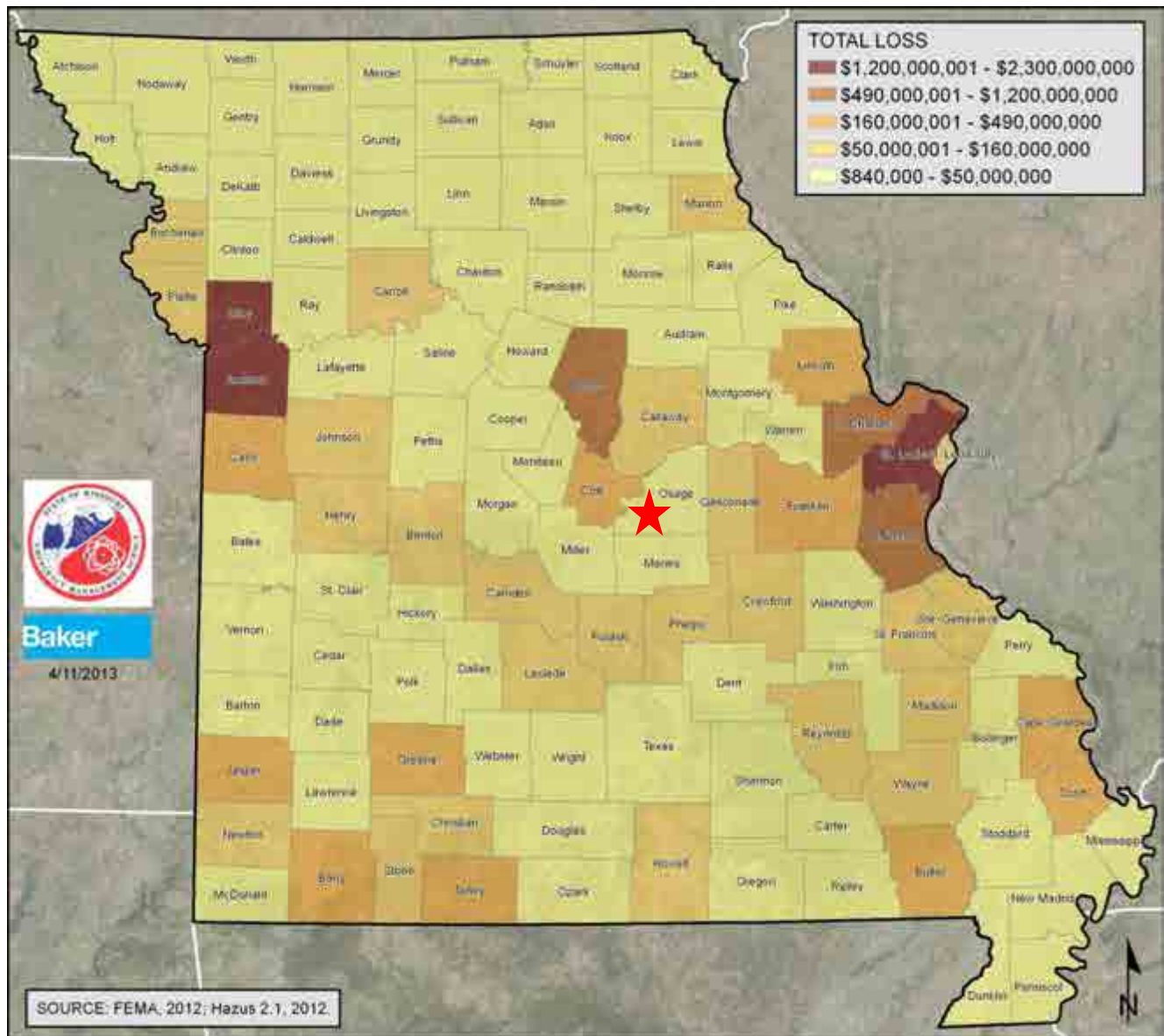
Furthermore, the state analyzed potential loss estimates to flooding. The purpose of the analysis is to determine where flood losses can occur and the degree of severity. These results were generated from DFIRM data and Hazus floodplain data. **Table 3.57** provides information regarding total direct building loss and income loss to Osage County. In addition, **Figure 3.40** and **Figure 3.41** depict Hazus countywide base-flood (100 year) scenarios including building and income loss for total loss and loss ratio respectively.

Table 3.57. Total Direct Building Loss and Income Loss to Osage County

County	Structural Damage	Contents Damage	Inventory Loss	Total Direct Loss	Total Income Loss	Total Direct and Income Loss	Calc. Loss Ratio
Osage	\$22,096,801.79	\$13,837,705.18	\$333,557.27	\$36,268,064.23	\$51,400.63	\$36,319,464.86	3.70

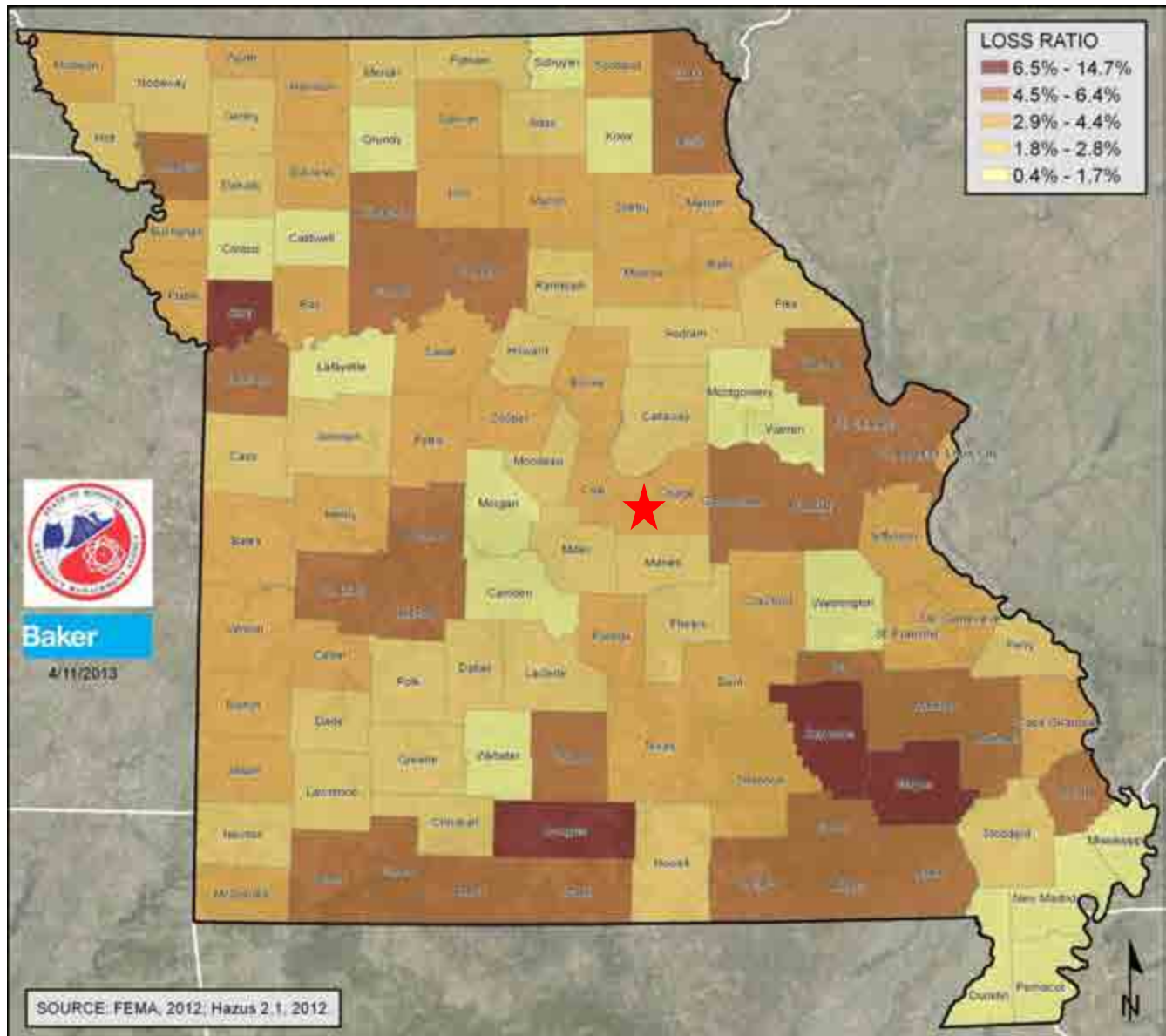
Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.40. Hazus Countywide Base-Flood Scenarios: Building and Income Loss



Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Osage County

Figure 3.41. Hazus Countywide Base-Flood Scenarios: Building Loss Ratio



Source: 2013 Missouri State Hazard Mitigation Plan
 *Red star indicates Osage County

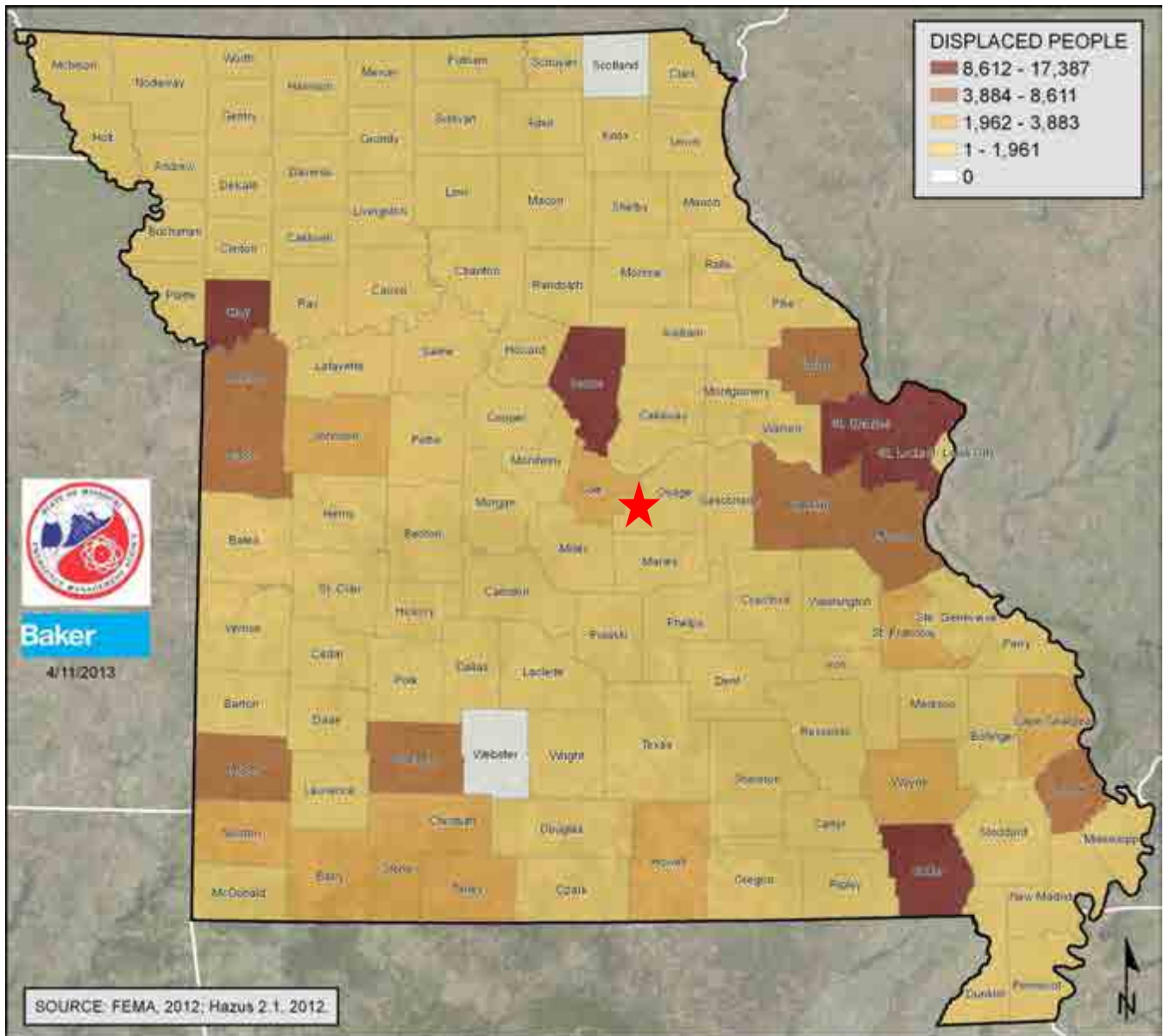
Lastly, the State determined the estimated number of displaced households and need for shelters within Osage County in the event of a 100 year flood. **Table 3.58** and **Figure 3.42** illustrate this information.

Table 3.58. Estimated Displaced households and Shelter Needs for Osage County

County	Displaced Households	Displaced Population Requiring Shelter
Osage	1,095	220

Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.42. Hazus Countywide Base-Flood Scenarios: Displaced People



Source: 2013 Missouri State Hazard Mitigation Plan

*Red star indicates Osage County

Utilizing the countywide building loss ratio, the overall vulnerability of riverine flooding/flash flooding in Osage County is medium.

Potential Losses to Existing Development

Every jurisdiction in Osage County contains a portion of the 100 Year Floodplain except for Freeburg. According to the HAZUS model, Osage County has a building loss ratio of 2.9% to 4.4% for countywide base-flood scenarios. With the annual average probability for flooding at 45% and 100% for flash floods, Osage County’s existing development is vulnerable. Especially development located in low-lying areas, near rivers or streams, or where drainage systems are not adequate are all prone to flooding.

According to the 2017 Questionnaire, no school districts within the county have buildings located within the floodplain. Lastly, two buildings damaged historically to flooding have been mitigated, leaving fewer areas of potential destruction.

Impact of Future Development

Impact of future development is correlated to floodplain management and regulations set forth by the county and jurisdictions⁴². Future development within low-lying areas near rivers and streams, or where interior drainage systems are not adequate to provide drainage during heavy rainfall events should be avoided. Additionally, future development would also increase impervious surface causing additional water run-off and drainage problems during heavy rainfall events.

Hazard Summary by Jurisdiction

Vulnerability to flooding slightly varies across the planning area. The jurisdictions most vulnerable to flooding include Unincorporated Osage County, Chamois, Linn, Meta, and Westphalia. Freeburg does not reside in the floodplain.

Problem Statement

The county has already adopted a Floodplain Management Ordinance concerning construction in the floodplain. The county should consider 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 successfully complete the projects.

⁴² 2015 Boone County Hazard Mitigation Plan

3.4.7 Land Subsidence/Sinkholes

Some specific sources for this hazard are:

- <http://www.dnr.mo.gov/geology/geosrv/envgeo/sinkholes.htm> <http://strangesounds.org/2013/07/u-s-sinkhole-map-these-maps-show-that-around-40-of-the-u-s-lies-in-areas-prone-to-sinkholes.html>
- <http://www.businessinsider.com/where-youll-be-swallowed-by-a-sinkhole-2013-3>
- <http://water.usgs.gov/edu/sinkholes.html>
- <http://pubs.usgs.gov/fs/2007/3060/>

Hazard Profile

Hazard Description

Sinkholes are common where the rock below the land surface is limestone, carbonate rock, salt beds, or rocks that naturally can be dissolved by ground water circulating through them. As the rock dissolves, spaces and caverns develop underground. The sudden collapse of the land surface above them can be dramatic and range in size from broad, regional lowering of the land surface to localized collapse. However, the primary causes of most subsidence are human activities: underground mining of coal, groundwater or petroleum withdrawal, and drainage of organic soils. In addition, sinkholes can develop as a result of subsurface void spaces created over time due to the erosion of subsurface limestone (karst).

Land subsidence occurs slowly and continuously over time, as a general rule. On occasion, it can occur abruptly, as in the sudden formation of sinkholes. Sinkhole formation can be aggravated by flooding.

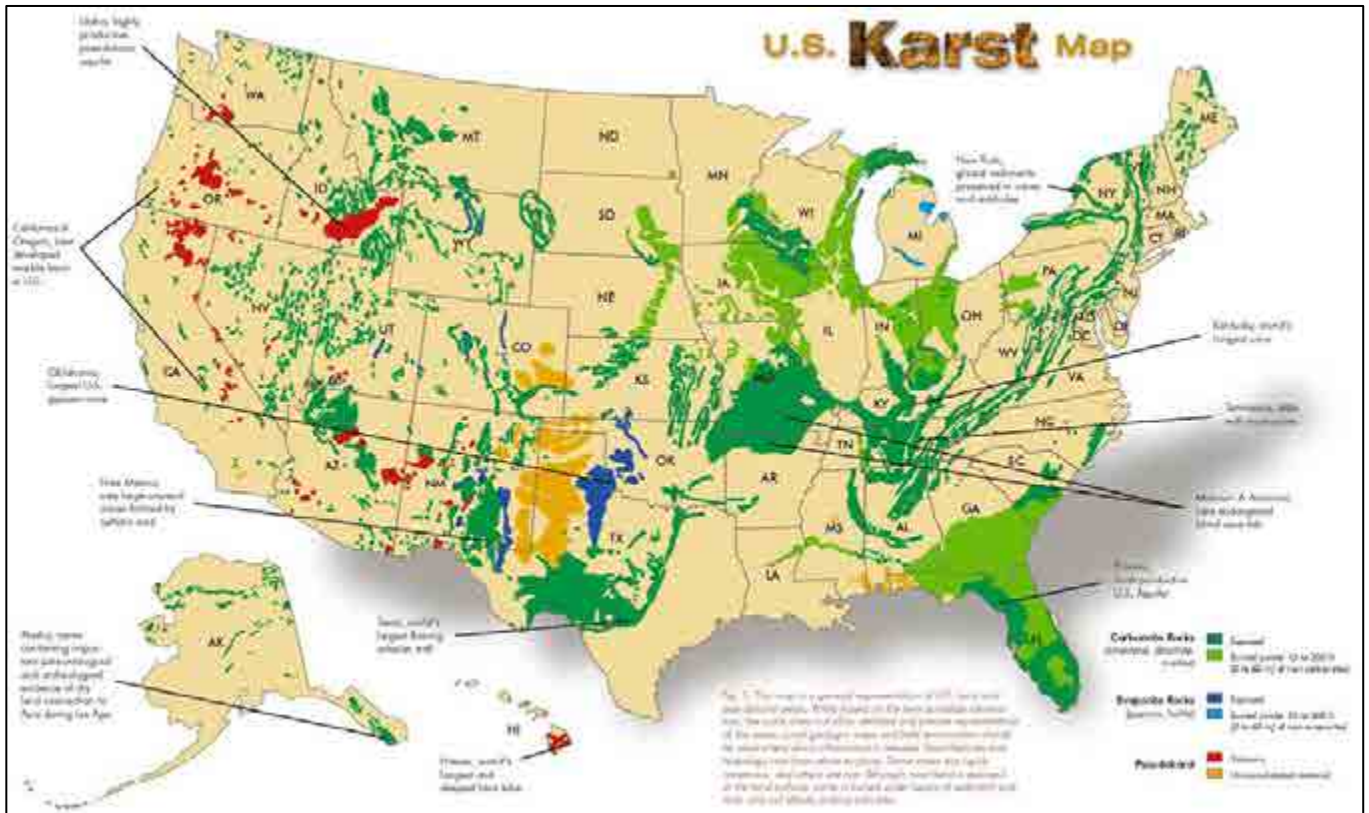
In the case of sinkholes, the rock below the surface is rock that has been dissolving by circulating groundwater. As the rock dissolves, spaces and caverns form, and ultimately the land above the spaces collapse. In Missouri, sinkhole problems are usually a result of surface materials above openings into bedrock caves eroding and collapsing into the cave opening. These collapses are called "cover collapses" and geologic information can be applied to predict the general regions where collapse will occur. Sinkholes range in size from several square yards to hundreds of acres and may be quite shallow or hundreds of feet deep.

According to the U.S. Geological Survey (USGS), the most damage from sinkholes tends to occur in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. Fifty-nine percent of Missouri is underlain by thick, carbonate rock that makes Missouri vulnerable to sinkholes. Sinkholes occur in Missouri on a fairly frequent basis. Most of Missouri's sinkholes occur naturally in the State's karst regions (areas with soluble bedrock). They are a common geologic hazard in southern Missouri, but also occur in the central and northeastern parts of the State. Missouri sinkholes have varied from a few feet to hundreds of acres and from less than one to more than 100 feet deep. The largest known sinkhole in Missouri encompasses about 700 acres in western Boone County southeast of where Interstate 70 crosses the Missouri River. Sinkholes can also vary in shape like shallow bowls or saucers whereas other have vertical walls. Some hold water and form natural ponds.

Geographic Location

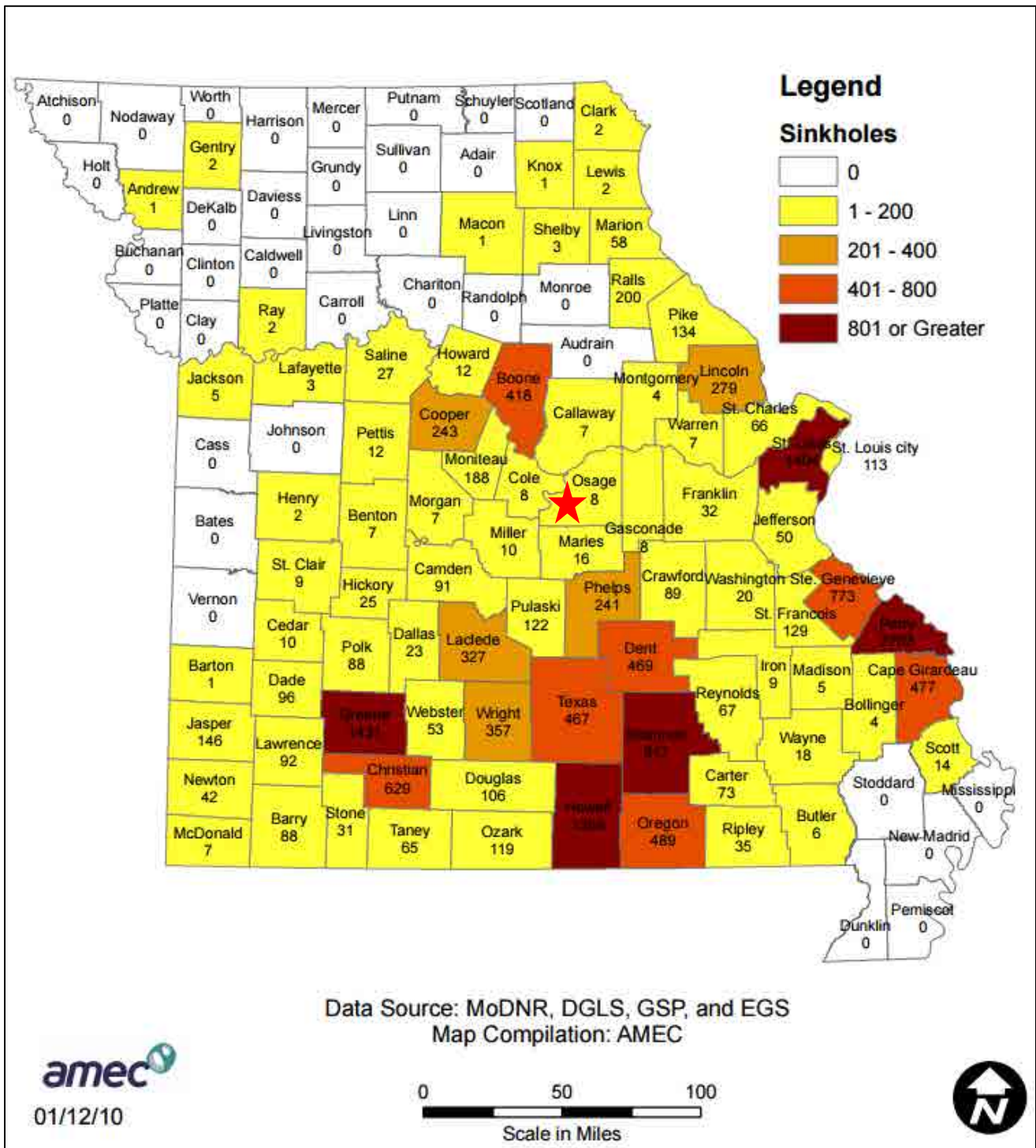
Figure 3.43 depicts karst topography across the United States. Missouri's karst topography is comprised of carbonate rocks such as limestone, dolomite, and marble. Variability in areas prone to sinkholes does not differ greatly across the county. There are approximately 8 sinkholes that have been recorded within Osage County (**Figure 3.44**). According to **Figure 3.45** there are approximately 368 mines in Osage County. According to the Missouri Department of Natural Resources, Osage County primarily produces sand, gravel, limestone, and clay. Activities such as mining or drilling are known to be responsible for the formation of sinkholes.

Figure 3.43. U.S. Karst Map



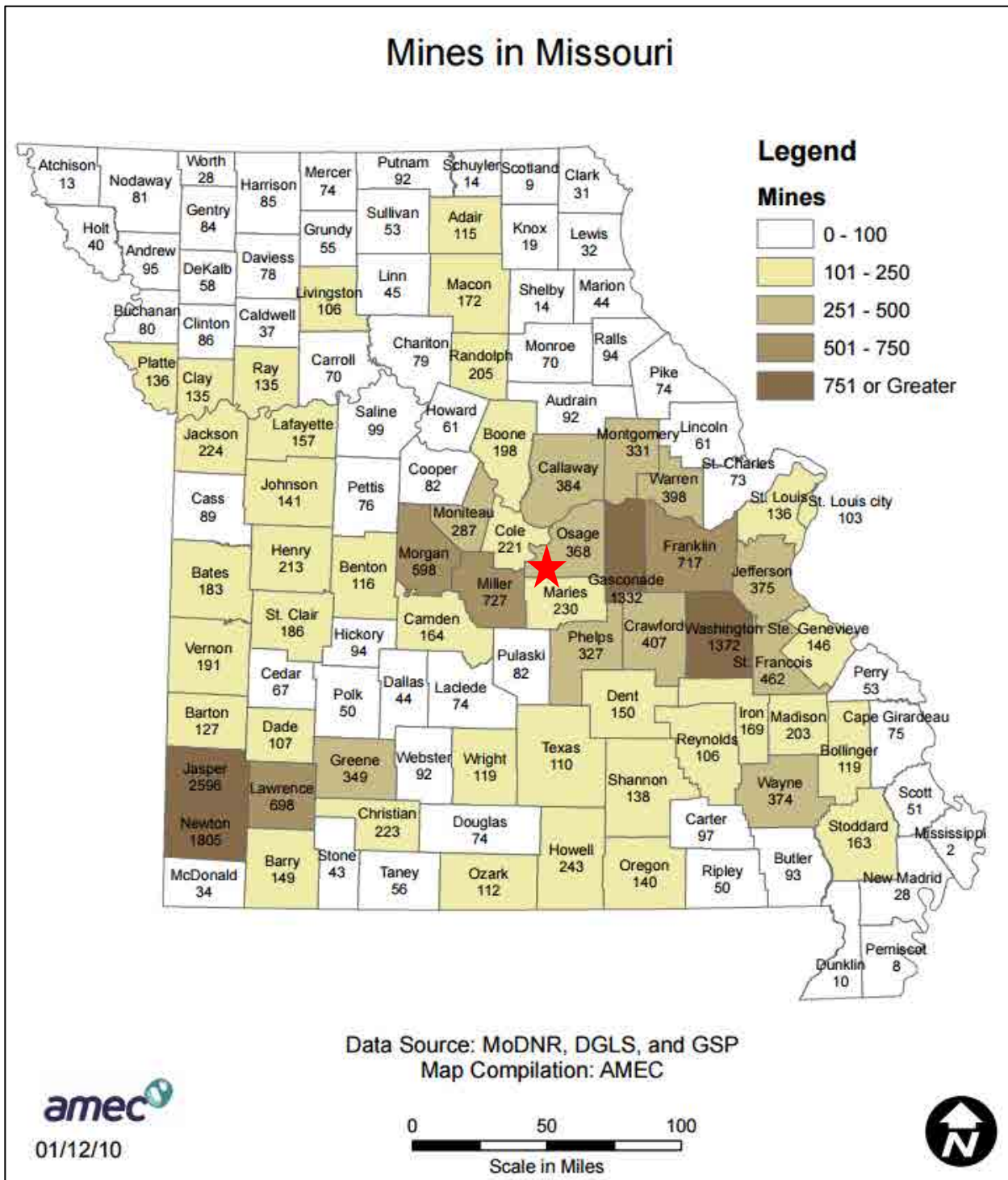
Source: http://www.northeastern.edu/protect/wp-content/uploads/US_KarstMap.jpg

Figure 3.44. Sinkholes in Missouri



Source: http://sema.dps.mo.gov/programs/mitigation_management.php; *Red star indicates Osage County

Figure 3.45. Mines in Missouri



Source: https://emgis.oe.mo.gov/dps/mitigation/MO_mines.pdf; *Red star indicates Osage County

Severity/Magnitude/Extent

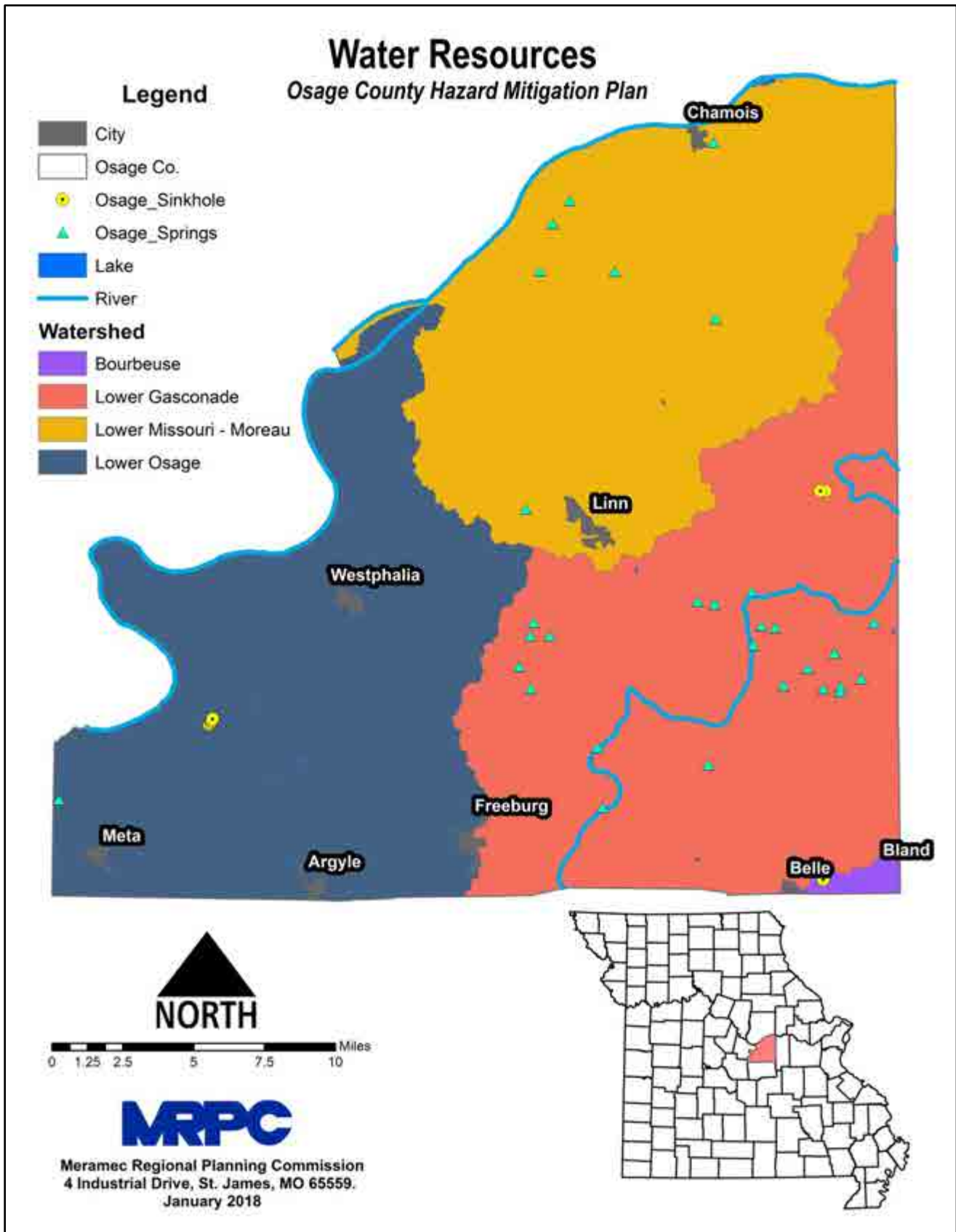
Sinkholes vary in size and location, and these variances will determine the impact of the hazard. A sinkhole could result in the loss of a personal vehicle, a building collapse, or damage to infrastructure such as roads, water, or sewer lines. Groundwater contamination is also possible from a sinkhole. Because of the relationship of sinkholes to groundwater, pollutants captured or dumped in sinkholes could affect a community's groundwater system. Sinkhole collapse could be triggered by large earthquakes. Sinkholes located in floodplains can absorb floodwaters but make detailed flood hazard studies difficult to model.

The 2013 State Plan included only seven documented sinkhole "notable events". The plan stated that sinkholes are common to Missouri and the probability is high that they will occur in the future. To date, Missouri sinkholes have historically not had major impacts on development nor have they caused serious damage. Thus, the severity of future events is likely to be low.

Previous Occurrences

Although there are few sinkholes and sinkhole areas in Osage County, incidents have occurred in other parts of southern Missouri. Fortunately, there are no recorded incidents of death due to sinkholes in the county. Based on **Figure 3.46**, recorded sinkholes are rural in nature and reside within unincorporated parts of the county.

Figure 3.46. Osage County Watershed/Water Resources



Probability of Future Occurrence

Due to the lack of data for previous sinkhole events in Osage County, a probability could not be calculated.

Vulnerability

Vulnerability Overview

Unfortunately, no statistics are available for the number of subsurface locations that may potentially collapse in the future, forming a sinkhole. However, areas have been identified that have the greatest vulnerability for future sinkholes including Cape Girardeau, Dent, Greene, Howell, Laclede, Oregon, Perry, Shannon, St. Louis, and Texas Counties⁴³.

Potential Losses to Existing Development

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 vicinity⁴⁴. 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

Impact of Future Development

Future development over or near abandoned mines and in locations at risk of sinkhole formation will increase the hazard vulnerability. Information regarding regulations limiting construction near sinkholes is very limited. The 2013 Missouri State Hazard Mitigation Plan only lists two counties that limit construction near mines or sinkholes including Greene and Christian Counties.

Hazard Summary by Jurisdiction

Figure 3.46 illustrates 8 sinkholes in Osage County. The jurisdiction most likely to be impacted by sinkholes is Unincorporated Osage County.

Problem Statement

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.

⁴³ 2013 Missouri State Hazard Mitigation Plan

⁴⁴ <http://sinkhole.org/commonsigns.php>

3.4.8 Levee Failure

Some sources of data for this hazard include:

- National Levee Database, <http://nld.usace.army.mil/egis/f?p=471:1:0::NO>
- FEMA Map Service Center for Flood Insurance Rate Maps and Flood Insurance Studies, msc.fema.gov/portal
- <https://www.fema.gov/fema-levee-resources-library>

Hazard Profile

Hazard Description

Levees are earth embankments constructed along rivers and coastlines to protect adjacent lands from flooding. Floodwalls are concrete structures, often components of levee systems, designed for urban areas where there is insufficient room for earthen levees. When levees and floodwalls and their appurtenant structures are stressed beyond their capabilities to withstand floods, levee failure can result in injuries and loss of life, as well as damages to property, the environment, and the economy.

Levees can be small agricultural levees that protect farmland from high-frequency flooding. Levees can also be larger, designed to protect people and property in larger urban areas from less frequent flooding events such as the 100-year and 500-year flood levels. For purposes of this discussion, levee failure will refer to both overtopping and breach as defined in FEMA's Publication "So You Live Behind a Levee" (<http://content.asce.org/ASCELeveeGuide.html>). Following are the FEMA publication descriptions of different kinds of levee failure.

Overtopping: When a Flood Is Too Big

Overtopping occurs when floodwaters exceed the height of a levee and flow over its crown. As the water passes over the top, it may erode the levee, worsening the flooding and potentially causing an opening, or breach, in the levee.

Breaching: When a Levee Gives Way

A levee breach occurs when part of a levee gives way, creating an opening through which floodwaters may pass. A breach may occur gradually or suddenly. The most dangerous breaches happen quickly during periods of high water. The resulting torrent can quickly swamp a large area behind the failed levee with little or no warning.

Earthen levees can be damaged in several ways. For instance, strong river currents and waves can erode the surface. Debris and ice carried by floodwaters—and even large objects such as boats or barges—can collide with and gouge the levee. Trees growing on a levee can blow over, leaving a hole where the root wad and soil used to be. Burrowing animals can create holes that enable water to pass through a levee. If severe enough, any of these situations can lead to a zone of weakness that could cause a levee breach. In seismically active areas, earthquakes and ground shaking can cause a loss of soil strength, weakening a levee and possibly resulting in failure. Seismic activity can also cause levees to slide or slump, both of which can lead to failure.

Geographic Location

Missouri is a state with many levees. Currently, there is no single comprehensive inventory of levee systems in the state. Levees have been constructed across the state by public entities and private entities with varying levels of protection, inspection oversight, and maintenance. The lack of a comprehensive levee inventory is not unique to Missouri.

There are two concurrent nation-wide levee inventory development efforts, one led by the United State Army Corps of Engineers (USACE) and one led by Federal Emergency Management Agency (FEMA). The National Levee Database (NLD), developed by USACE, captures all USACE related levee projects, regardless of design levels of protection. The Midterm Levee Inventory (MLI), developed by FEMA, captures all levee data (USACE and non-USACE) but primarily focuses on levees that provide 1% annual-chance flood protection on FEMA Flood Insurance Rate Maps (FIRMs).

It is known that agricultural levees and other non-regulated levees within the planning area exist that are not inventoried or inspected. These privately owned levees are not designed to provide protection from the 1-percent annual chance flood scenario.

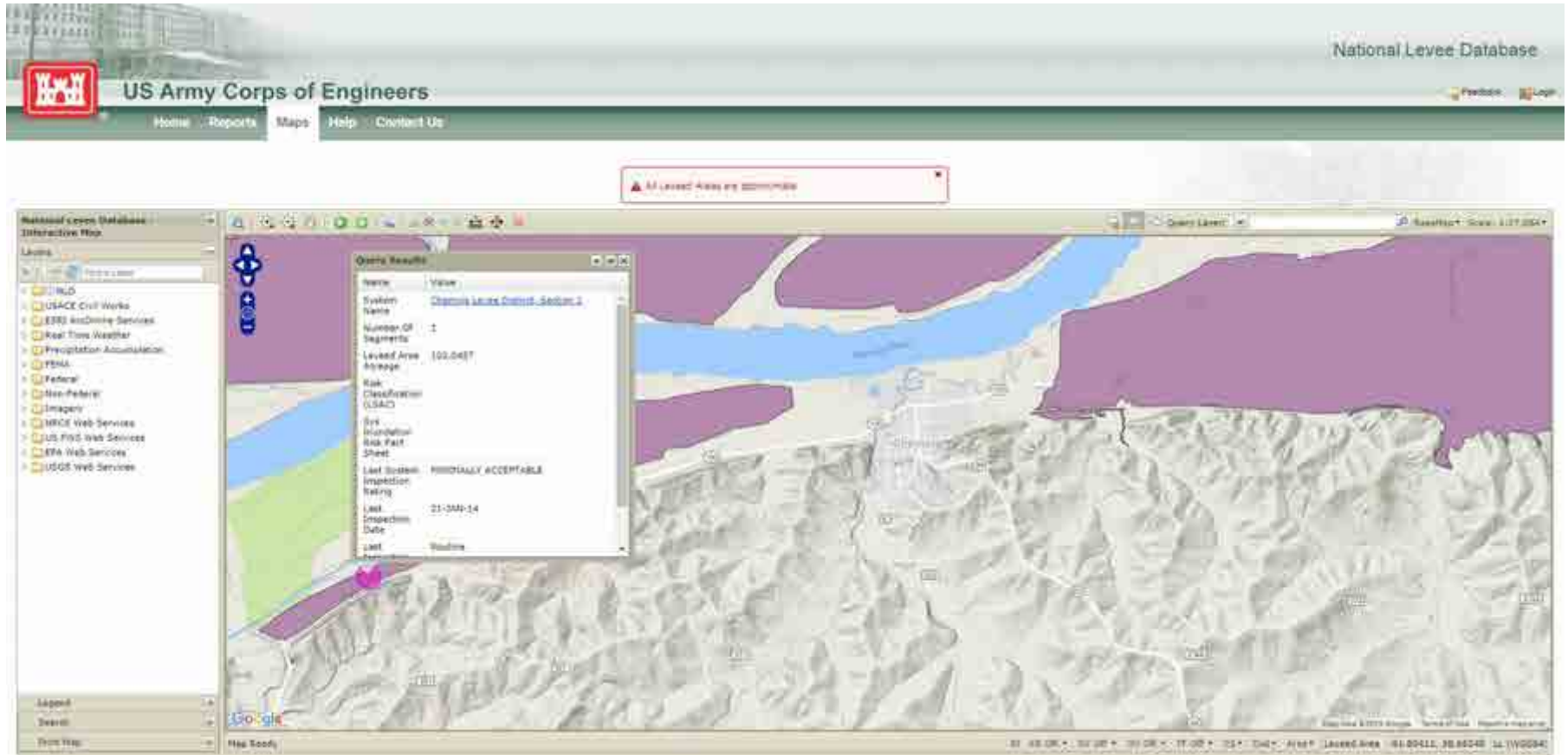
According to the USACE, there are three USACE maintained levees within Osage County. Detailed levee data can be found in **Table 3.59**. Leveed areas can be seen in Error! Reference source not found. to **Figure 3.49**. According to the maps, there are no schools or special district assets located in said protected areas.

Table 3.59. Osage County Levees

County	System Name/Sponsor	Length (miles)	Inspection Date	Inspection Rating	Leveed Area Type	Leveed Area Acreage
Osage	Chamois Levee District, Section 2	2.89	21-Jan-2014	Minimally Acceptable	Agricultural	367.74
Osage	Chamois Levee District, Section 1	1.81	21-Jan-2014	Minimally Acceptable	Agricultural	102.05
Gasconade, Osage	A-1 Levee Association	11.83	06-Aug-2012	Minimally Acceptable	Agricultural	4,696.26

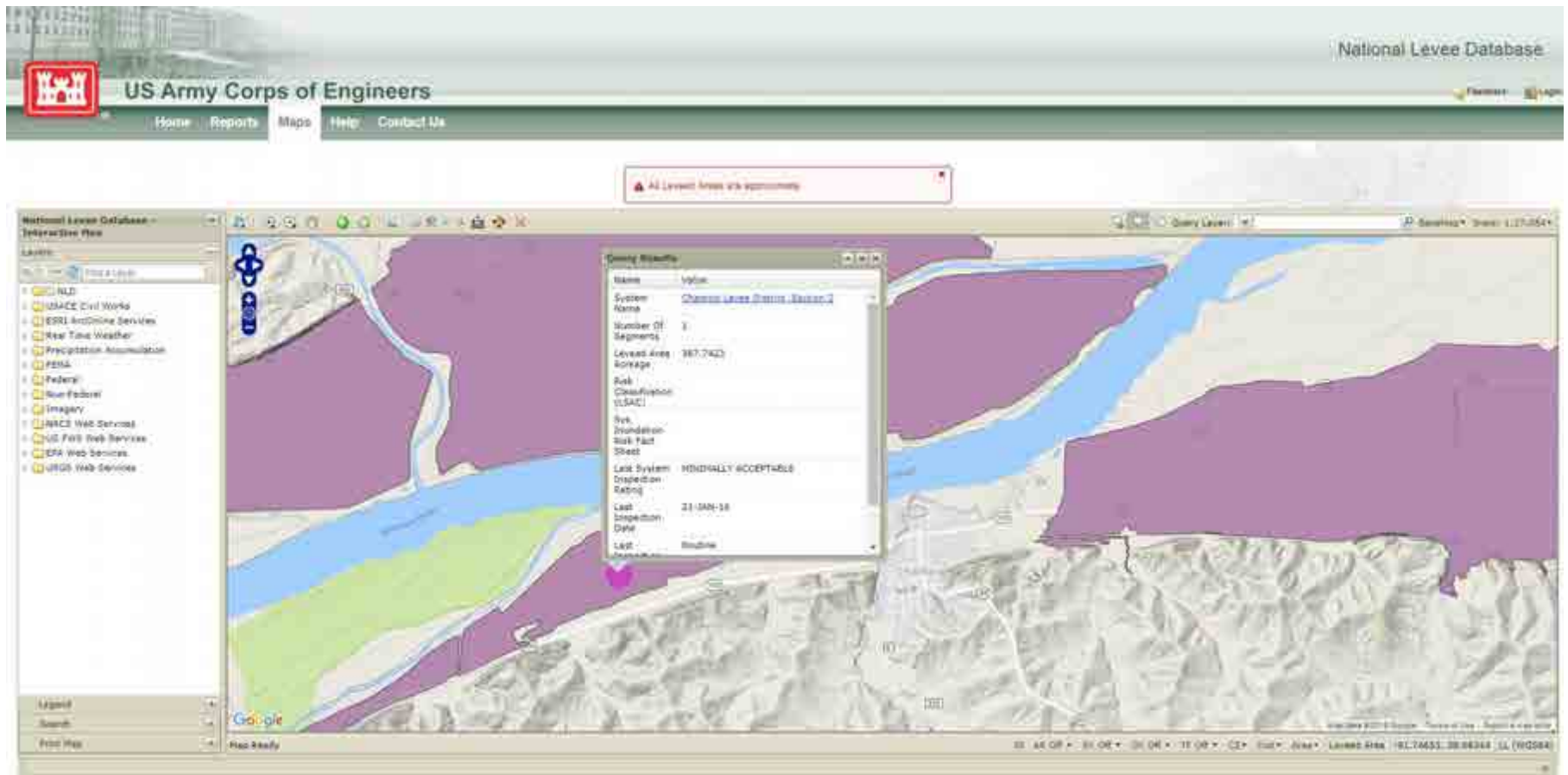
Source: <http://nld.usace.army.mil/egis/f?p=471:1:>

Figure 3.47. Chamois Levee District, Section 1



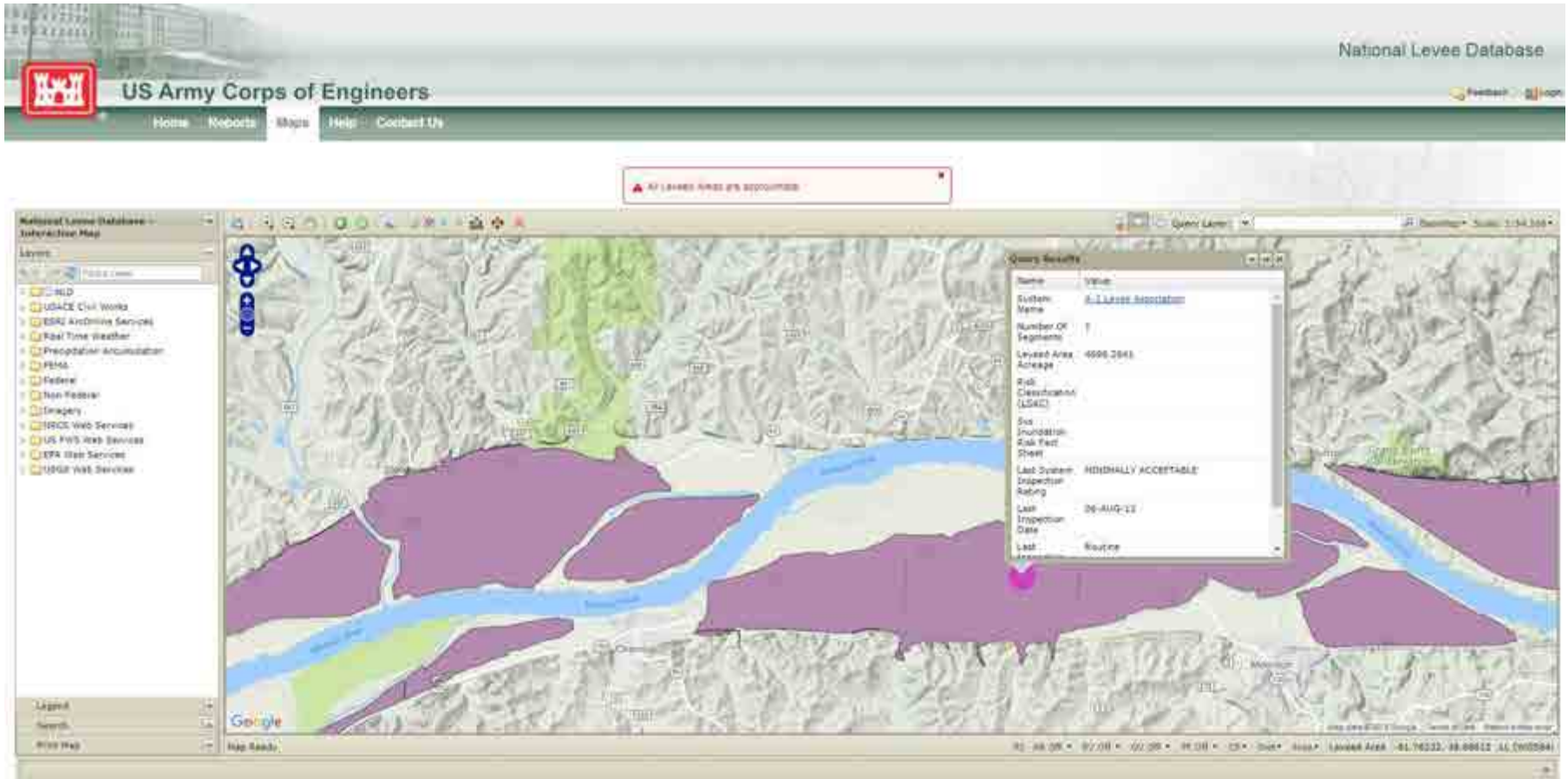
Source: <http://nld.usace.army.mil/egis/f?p=471:32:15985001603795::NO>

Figure 3.48. Chamois Levee District, Section 2



Source: <http://nld.usace.army.mil/egis/f?p=471:32:15985001603795::NO>

Figure 3.49. A-1 Levee Association



Source: http://nld.usace.army.mil/egis/f?p=471:32:15985001603795:LOAD_SEARCH:NO:32

Severity/Magnitude/Extent

Levee failure is typically an additional or secondary impact of another disaster such as flooding or earthquake. The main difference between levee failure and losses associated with riverine flooding is magnitude. Levee failure often occurs during a flood event, causing destruction in addition to what would have been caused by flooding alone. In addition, there would be an increased potential for loss of life due to the speed of onset and greater depth, extent, and velocity of flooding due to levee breach.

As previously mentioned, agricultural levees and levees that are not designed to provide flood protection from at least the 1-percent annual chance flood likely do exist in the planning area. However, none of these levees are shown on the Preliminary DFIRM, nor are they enrolled in the USACE Levee Safety Program. As a result, an inventory of these types of levees is not available for analysis. Additionally, since these types of levees do not provide protection from the 1-percent annual chance flood, losses associated with overtopping or failure are captured in the Flood Section of this plan.

The USACE regularly inspects levees within its Levee Safety Program to monitor their overall condition, identify deficiencies, verify that maintenance is taking place, determine eligibility for federal rehabilitation assistance (in accordance with P.L. 84-99), and provide information about the levees on which the public relies. Inspection information also contributes to effective risk assessments and supports levee accreditation decisions for the National Flood Insurance Program administered by the Federal Emergency Management Agency (FEMA).

The USACE now conducts two types of levee inspections. Routine Inspection is a visual inspection to verify and rate levee system operation and maintenance. It is typically conducted each year for all levees in the USACE Levee Safety Program. Periodic Inspection is a comprehensive inspection led by a professional engineer and conducted by a USACE multidisciplinary team that includes the levee sponsor. The USACE typically conducts this inspection every five years on the federally authorized levees in the USACE Levee Safety Program.

Both Routine and Periodic Inspections result in a rating for operation and maintenance. Each levee segment receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or Unacceptable. **Figure 3.50** below defines the three ratings.

Figure 3.50. Definitions of the Three Levee System Ratings

Levee System Inspection Ratings	
Acceptable	All inspection items are rated as Acceptable.
Minimally Acceptable	One or more levee segment inspection items are rated as Minimally Acceptable or one or more items are rated as Unacceptable and an engineering determination concludes that the Unacceptable inspection items would not prevent the segment/system from performing as intended during the next flood event.
Unacceptable	One or more levee segment inspection items are rated as Unacceptable and would prevent the segment/system from performing as intended, or a serious deficiency noted in past inspections (previous Unacceptable items in a Minimally Acceptable overall rating) has not been corrected within the established timeframe, not to exceed two years.

According to the USACE, all levees within the county received an inspection rating of minimally acceptable.

Previous Occurrences

According to the Osage Co. Emergency Management Director, at least one failure event occurred in the past 20 years. In May 2017, the South Levee, District 29E was overtopped and a hole started to erode. Due to the lack of a comprehensive levee/event database, specific information pertaining to failure events is not available.

Probability of Future Occurrence

According to the available data, at least one levee failure occurred within the last 20 years. This information was utilized to determine the annual average percent probability of levee failure. The probability of levee failure in Osage County per year is 5% (1 event/20 years x 100 = 5%).

Table 3.60. Annual Average % Probability of Levee Failure in Osage County

Location	Annual Avg. % P
Osage County	5%

*P = probability; see page 3.24 for definition.

Vulnerability

Vulnerability Overview

Areas most vulnerable to levee failure are identified in **Figure 3.47** to **Figure 3.49**. These areas are in close proximity to Chamois. However, the protected leveed areas are classified as “agricultural” land. Therefore special districts and assets should not be present. Nonetheless, multiple privately owned levees exist within the county. Unfortunately these levees tend to be neglected until a failure occurs. The overall vulnerability rating for levees within Osage Co. cannot be determined due to data limitations.

Potential Losses to Existing Development

Due to data limitations, potential losses to existing development could not be calculated. However, any development within leveed areas should anticipate losses during the event of failure.

Impact of Previous and Future Development

Future development in leveed areas would increase the vulnerability for potential losses. Therefore development in these areas should be avoided.

Hazard Summary by Jurisdiction

Communities in close proximity to USACE leveed areas include Chamois. However, the leveed areas are considered agricultural. Privately owned levees are present; however a maintained inventory does not exist.

Problem Statement

There are substantial data limitations for levees within Missouri. Unfortunately, DFIRM maps recognizing levees within the planning area were not available. However, three leveed areas within the county were identified by the USACE. Flooding is the most common hazard associated with levee failure, and is area specific. During the event of levee failure, potential loss would be similar to that of flooding.

3.4.9 Thunderstorm/High Winds/Lightning/Hail

Some Specific Sources for this hazard are:

- FEMA 320, Taking Shelter from the Storm, 3rd edition, http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf Lightning Map, National Weather Service, http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf National Weather Service, http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf
- Death and injury statistics from lightning strikes, National Weather Service.
- Wind Zones in the U.S. map, FEMA, http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm;
- Annual Windstorm Probability (65+knots) map U.S. 1980-1994, NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif
- Hailstorm intensity scale, The Tornado and Storm Research Organization (TORRO), <http://www.torro.org.uk/site/hyscale.php>;
- NCDC data;
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- National Severe Storms Laboratory – hail map, http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif

Hazard Profile

Hazard Description

Thunderstorms

A thunderstorm is defined as a storm that contains lightning and thunder which is caused by unstable atmospheric conditions. When cold upper air sinks and warm moist air rises, storm clouds or ‘thunderheads’ develop resulting in thunderstorms. This can occur singularly, as well as in clusters or lines. The National Weather Service defines a thunderstorm as “severe” if it includes hail that is one inch or more, or wind gusts that are at 58 miles per hour or higher. At any given moment across the world, there are about 1,800 thunderstorms occurring. Severe thunderstorms most often occur in Missouri in the spring and summer, during the afternoon and evenings, but can occur at any time. Other hazards associated with thunderstorms are heavy rains resulting in flooding (**Section 3.4.6**) and tornadoes (**Section 3.4.9**)

High Winds

A severe thunderstorm can produce winds causing as much damage as a weak tornado. 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.

Lightning

All thunderstorms produce lightning which can strike outside of the area where it is raining and has been known to fall more than 10 miles away from the rainfall area. Thunder is simply the sound that lightning makes. Lightning is a huge discharge of electricity that shoots through the air causing vibrations and creating the sound of thunder.

Hail

According to the National Oceanic and Atmospheric Administration (NOAA), hail is precipitation that is formed when thunderstorm updrafts carry raindrops upward into extremely cold atmosphere causing them to freeze. The raindrops form into small frozen droplets. They continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet. This frozen droplet can continue to grow and form hail. As long as the updraft forces can support or suspend the weight of the hailstone, hail can continue to grow before it hits the earth.

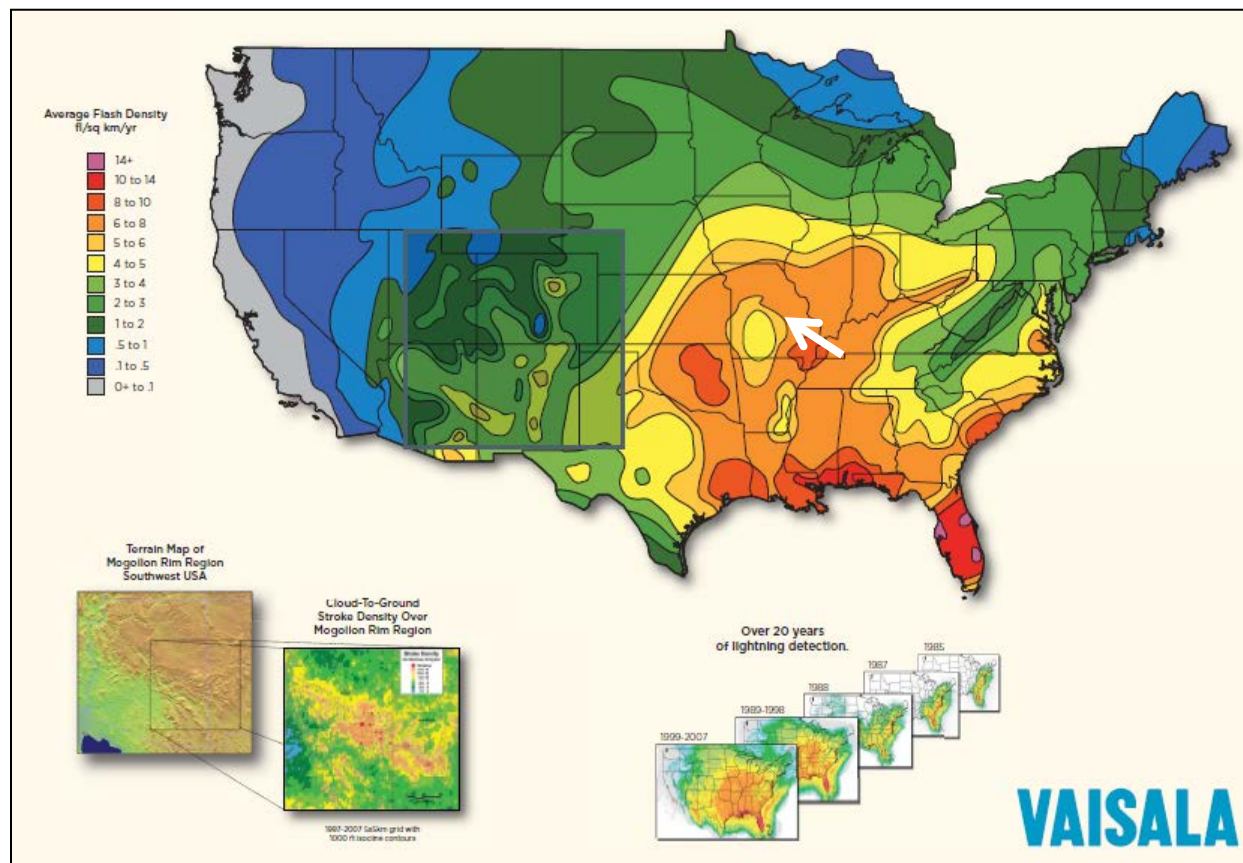
At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼” diameter or pea sized hail requires updrafts of 24 miles per hour, while a 2 ¾” diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest hailstone in diameter recorded in the United States was found in Vivian, South Dakota on July 23, 2010. It was eight inches in diameter, almost the size of a soccer ball. Soccer-ball-sized hail is the exception, but even small pea-sized hail can do damage.

Geographic Location

Thunderstorms, high winds, hail, and lightning events are an area-wide hazard that can take place anywhere across the United States. Furthermore, these events do not vary greatly across the planning area; they are more frequently reported in urbanized areas. Additionally, densely developed urban areas are more likely to experience damaging events.

Figure 3.51 depicts the location and frequency of lightning in Missouri. Additionally, the map indicates that the flash density of Osage County ranges between 6 and 8 flashes per square kilometer per year.

Figure 3.51. Location and Frequency of Lightning in Missouri



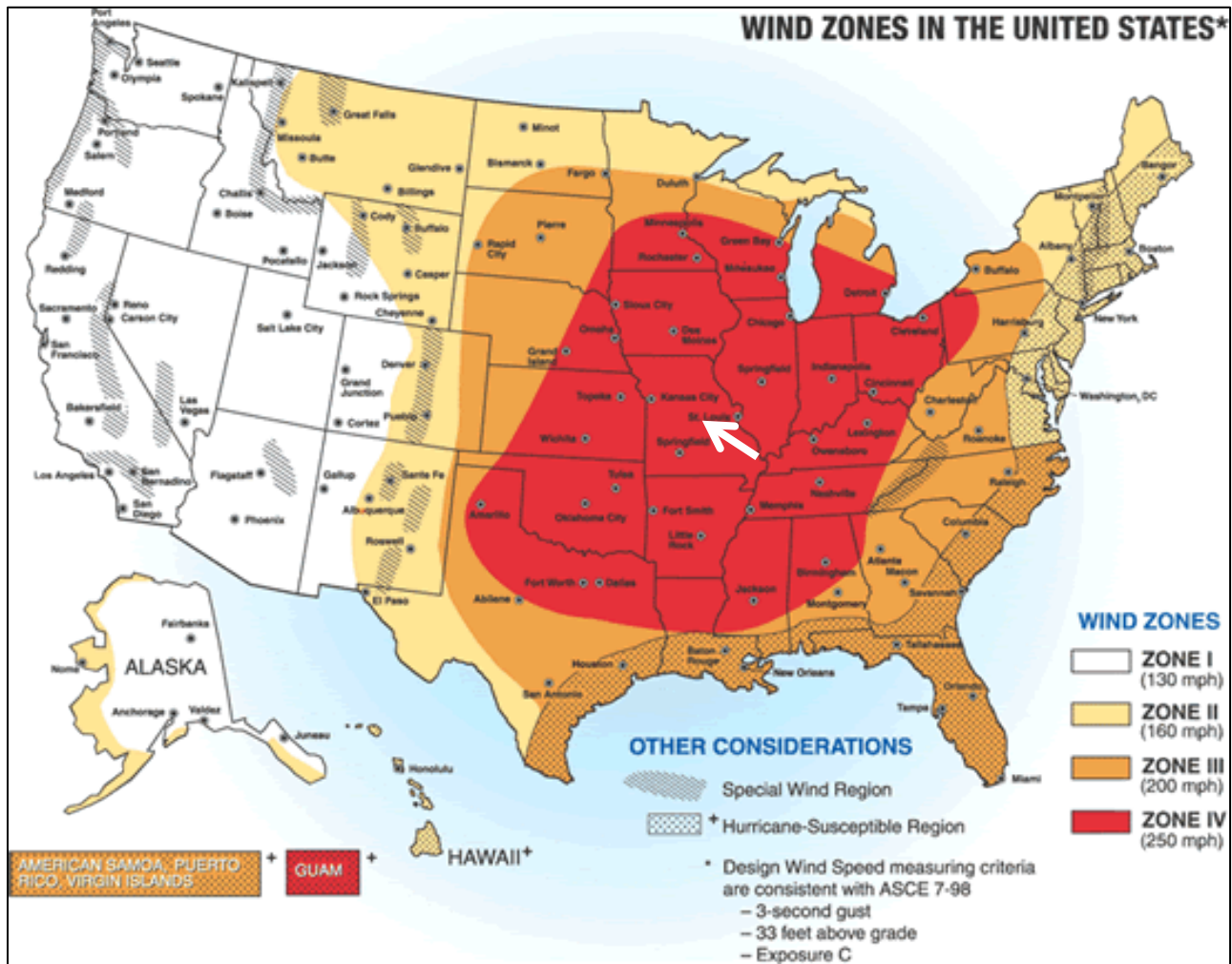
Source: National Weather

Service, http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf.

* Osage County is indicated by a white arrow.

There are four wind zones that are characterized across the United States. These zones range from Zone I to Zone IV. All of Missouri as well as most of the Midwest fall within Zone IV. Within Zone IV, winds can reach up to 250 mph (**Figure 3.52**).

Figure 3.52. Wind Zones in the United States



Source: <http://extension.missouri.edu/webster/images/weather/US-WindZones01.gif>

* Osage County is indicated by a white arrow.

Severity/Magnitude/Extent

Severe thunderstorm losses are usually attributed to the associated hazards of hail, downburst winds, lightning and heavy rains. Losses due to hail and high wind are typically insured losses that are localized and do not result in presidential disaster declarations. However, in some cases, impacts are severe and widespread and assistance outside state capabilities is necessary. Hail and wind also can have devastating impacts on crops. Severe thunderstorms/heavy rains that lead to flooding are discussed in the flooding hazard profile. Hailstorms cause damage to property, crops, and the environment, and can injure and even kill livestock. In the United States, hail causes more than \$1 billion in damage to property and crops each year. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are also commonly damaged by hail. Hail has been known to cause injury to humans, occasionally fatal injury.

In general, assets in the county vulnerable to thunderstorms with lightning, high winds, and hail include people, crops, vehicles, and built structures. Although this hazard results in high annual losses, private property insurance and crop insurance usually cover the majority of losses. Considering insurance coverage as a recovery capability, the overall impact on jurisdictions is reduced.

Most lightning damages occur to electronic equipment located inside buildings. But structural damage can also occur when a lightning strike causes a building fire. In addition, lightning strikes can cause damages to crops if fields or forested lands are set on fire. Communications equipment and warning transmitters and receivers can also be knocked out by lightning strikes.

Based on information provided by the Tornado and Storm Research Organization (TORRO), **Table 3.61** below describes typical damage impacts of the various sizes of hail.

Table 3.61. Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	DiameterSize (inches)	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, 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 tiled 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 – 75	2.4 – 3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	76 – 90	3.0 – 3.5	Large orange > soft ball	Severe damage to aircraft bodywork
Super Hailstorms	91 – 100	3.6 – 3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.
Super Hailstorms	>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 (TORRO), Department of Geography, Oxford Brookes University

Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity. <http://www.torro.org.uk/site/hyscale.php>

Straight-line winds are defined as any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). It is these winds, which can exceed 100 miles per hour, which represent the most common type of severe weather. They are responsible for most wind damage related to thunderstorms. Since thunderstorms do not have narrow tracks like tornadoes, the associated wind damage can be extensive and affect entire (and multiple) counties. Objects like trees, barns, outbuildings, high-profile vehicles, and power lines/poles can be toppled or destroyed, and roofs, windows, and homes can be damaged as wind speeds increase.

Between 1998 and 2017, there were 4 recorded crop insurance claims for high wind, resulting in \$16,140 in indemnity payments. There were 0 recorded claims for lightning, hail, and thunderstorms.

The onset of thunderstorms with lightning, high wind, and hail is generally rapid. Duration is less than six hours and warning time is generally six to twelve hours. Nationwide, lightning kills 75 to 100 people each year. Lightning strikes can also start structural and wildland fires, as well as damage electrical systems and equipment.

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Previous Occurrences

Due to the lack of available parameters, heavy rain is utilized in the place of thunderstorms in **Table 3.62**. Moreover, thunderstorm wind and strong wind was included with high winds. NCDC data was obtained for lightning, and hail events between 1996 and 2015 as well (**Table 3.63**, **Table 3.64**, and **Table 3.65**). However, limitations to the use of NCDC reported lightning events include the fact that only lightning events that result in fatality, injury and/or property and crop damage are in the NCDC.

Table 3.62. NCDC Osage County Heavy Rain Events Summary, 1998 to 2017

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Rainfall (Inch)
2005	1	0	0	0	3-6
2008	1	0	0	0	2-4
Total	2	0	0	0	-

Source: NCDC, data accessed [02/20/2018]

Table 3.63. NCDC Osage County High Wind Events Summary, 1998 to 2017

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
1998	2	0	0	0	56
1999	3	0	0	0	60
2000	3	0	0	0	55
2001	3	0	0	0	52
2002	1	0	0	0	43
2003	2	0	0	0	56
2005	2	0	0	0	55
2006	1	0	0	0	60
2007	1	0	0	0	52
2008	3	0	0	0	56
2009	1	0	0	1.00K	39
2010	2	0	0	0	83
2011	3	0	0	18.00K	70
2012	2	0	0	0	56
2013	1	0	0	0	52
2014	2	0	0	0	56
2015	2	0	0	0	56
2016	2	0	0	0	70
2017	3	0	0	0	61
Total	39	0	0	19.00K	-

Source: NCDC, data accessed [02/20/2018]

Table 3.64. NCDC Osage County Lightning Events Summary, 1998 to 2017

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damage
-	0	0	0	0	0
Total	0	0	0	0	0

Source: NCDC, data accessed [02/20/2018]

Table 3.65. NCDC Osage County Hail Events Summary, 1998 to 2017

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
1998	2	0	0	0	1
1999	2	0	0	0	1
2000	1	0	0	0	1
2001	2	0	0	0	1.5
2002	1	0	0	0	.75

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
2003	2	0	0	0	2.75
2004	3	0	0	0	3
2005	3	0	0	0	1
2006	6	0	0	0	1
2008	2	0	0	0	1
2009	1	0	0	0	1
2011	4	0	0	0	2.50
2012	3	0	0	0	1.25
2013	4	0	0	0	1
2015	3	0	0	0	2.5
2016	1	0	0	0	2
2017	1	0	0	0	1.75
Total	41	0	0	0	-

Source: NCDC, data accessed [02/20/2018]

Probability of Future Occurrence

From the data obtained from the NCDC⁴⁵, annual average percent probabilities were calculated for heavy rainfall, high winds, lightning, and hail. Heavy rainfall has a 10 percent annual average percent probability of occurrence (2 events/20 years x 100) (**Table 3.66**). Heavy rainfall events can be found in **Table 3.62**.

Since multiple high wind occurrences are anticipated each year (39 events/20 years), the probability of high winds is 100% with an average of 1.95 events per year (**Table 3.67**). High wind events can be found in **Table 3.63**.

In Osage County, there were no recorded lightning events (**Table 3.64**) between 1998 and 2017 (**Table 3.68**).

Lastly, the annual average percent probability of hail occurrence is 100% (41 events/20 years) with an average of 2.05 events per year (**Table 3.69**). Hail events can be found in **Table 3.65**.

Table 3.66. Annual Average % Probability of Heavy Rain in Osage County

Location	Annual Avg. % P
Osage County	10%

*P = probability; see page 3.24 for definition.

⁴⁵ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

Table 3.67. Annual Average % Probability of High Winds in Osage County

Location	Annual Avg. % P	Avg. # of Events
Osage County	100%	1.95

*P = probability; see page 3.24 for definition.

Table 3.68. Annual Average % Probability of Lightning in Osage County

Location	Annual Avg. % P
Osage County	-

*P = probability; see page 3.24 for definition.

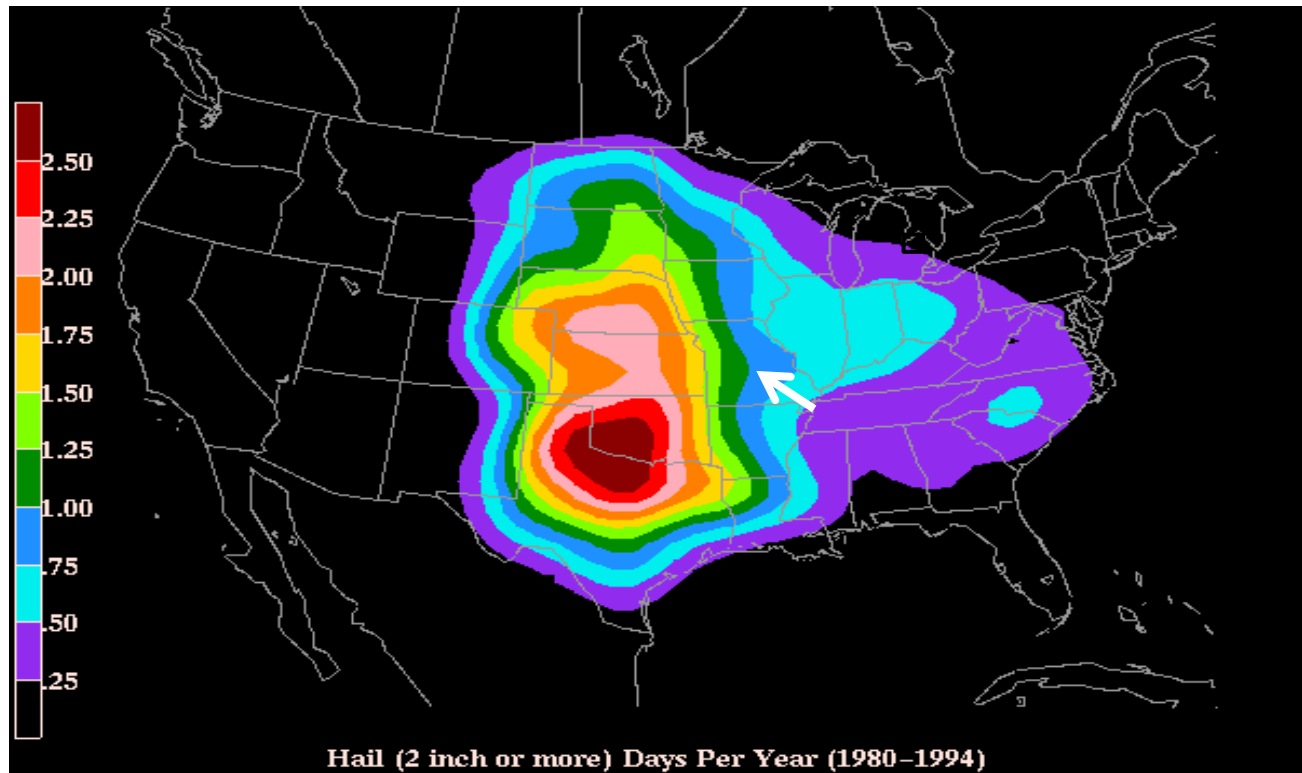
Table 3.69. Annual Average % Probability of Hail in Osage County

Location	Annual Avg. % P	Avg. # of Events
Osage County	100%	2.05

*P = probability; see page 3.24 for definition.

Figure 3.53 depicts a map based on hailstorm data from 1980-1994. It shows the probability of hailstorm occurrence (2" diameter or larger) based on number of days per year. The location of Osage County is identified with a white arrow.

Figure 3.53. Annual Hailstorm Probability (2" diameter or larger), 1980- 1994



Source: NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif

* White arrow indicates Osage County

Vulnerability

Vulnerability Overview

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for vulnerability overview and analysis. Since severe thunderstorms occur frequently throughout Missouri, specific parameters were analyzed for each hazard. These parameters include damaging winds in excess of 67 mph (58 kts.), hail in excess of 0.75 inches, and damaging lightning strikes. **Table 3.70** illustrates housing density, building exposure, and crop exposure for Osage County. Moreover, **Table 3.71** provides additional statistical data for the vulnerability analysis.

Table 3.70. Osage County Housing Density, Building Exposure and Crop Exposure

County	Housing Units/sq. mi.	Total Building Exposure (\$)	Crop Exposure (2007 Census of Ag.)	Social Vulnerability Index
Osage	6.9	\$1,427,835,000	\$7,816,000	2

Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.71. Additional Statistical Data Compiled for Vulnerability Analysis

County	Total Hail Incidences	Total hail Property Loss (\$)	Total Crop Insurance Paid for Hail Damage (\$)	Total Wind Incidence (\$)	Total Wind Property Loss (\$)	Total Crop Insurance Paid for wind Damage (\$)	Total Lightning Incidences	Total Lightning Property Loss (\$)
Osage	66	\$0	\$0	30	\$43,000	\$14,080	0	\$0

Source: 2013 Missouri State Hazard Mitigation Plan

Five factors were utilized in the overall vulnerability analysis of lightning. These factors include housing density, likelihood of occurrence, building exposure, average annual property loss ratio, and social vulnerability. For hail and wind, crop exposure and average annual crop insurance claims were also utilized. To better analyze the vulnerability analysis of severe thunderstorms, rating values were established; low, medium-low, medium, medium-high, and high (**Table 3.72**).

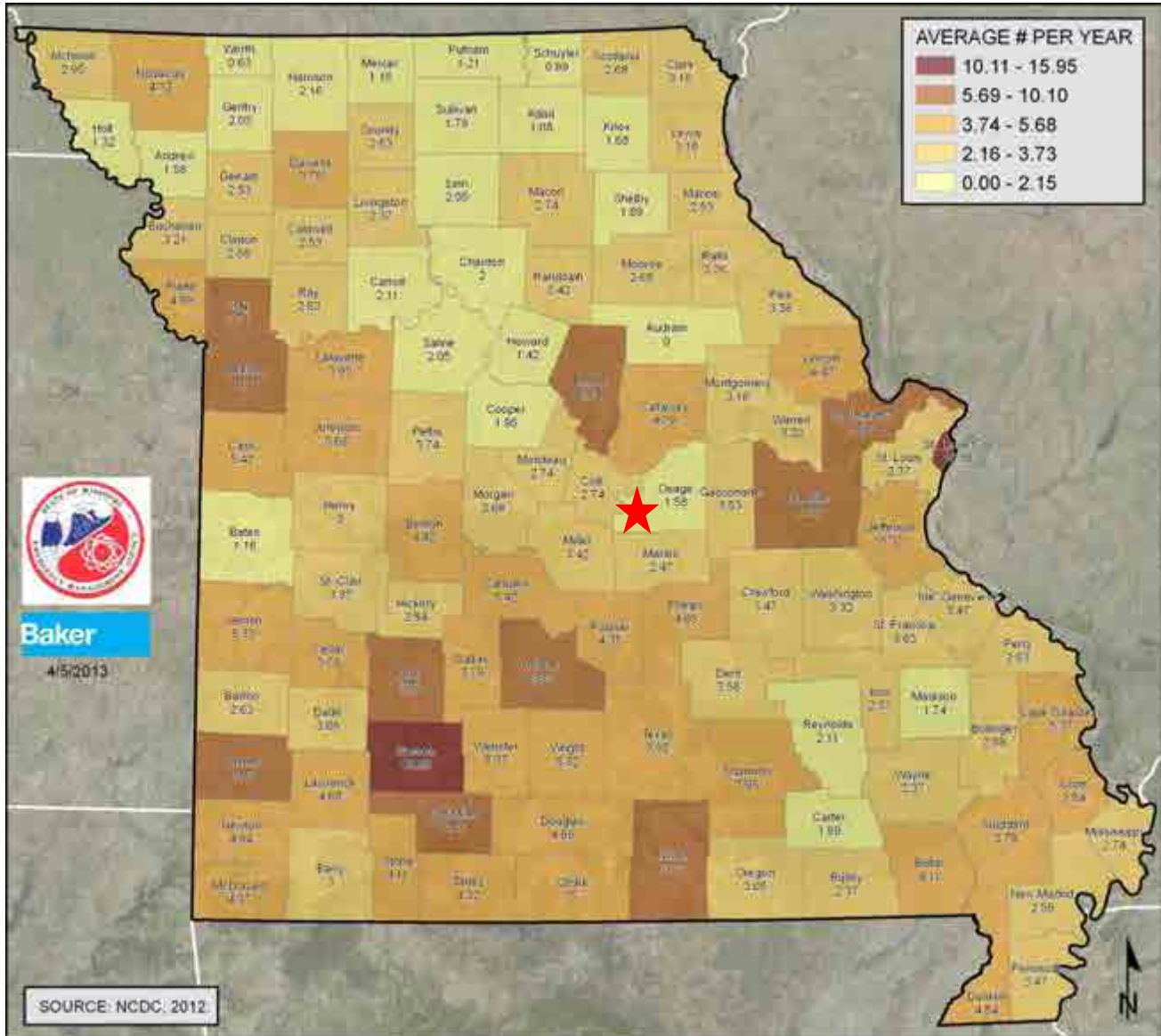
Table 3.72. Ranges for Severe Thunderstorm Vulnerability Factor Ratings

Factors considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Common Factors					
Housing Density (# per sq. mile)	<50	50 to 99	100 to 299	300 to 499	>500
Crop Exposure (\$ in millions) (hail and wind only)	<\$10,000	\$10,000 to \$24,999	\$25,000 to \$49,999	\$50,000 to \$99,999	>\$100,000
Social Vulnerability	1	2	3	4	5
Wind					
Likelihood of Occurrence (# of events/ yrs. Of data)	0 to 2.15	2.16 to 3.73	3.74 to 5.68	5.60 to 10.10	10.11 to 15.95
Average Annual Property Loss Ratio (annual property loss/exposure)	0.00 - 0.000027	0.000028 - 0.000092	0.000093 - 0.000231	0.000232 - 0.000489	0.000490 - 0.001273
Wind Crop Loss Ratio (annual crop claims/exposure)	0 - 0.000084	0.000085 - 0.000250	0.000251 - 0.000250	0.000715 - 0.001398	0.001399 - 0.003574
Hail					
Likelihood of Occurrence (# of events/ yrs. Of data)	0.78 to 3.10	3.11 to 5.26	5.27 to 7.89	7.90 to 12.10	12.11 to 18.48
Average Annual Property Loss Ratio (annual property loss/exposure)	0 - 0.000034	0.000035 - 0.000149	0.000280 - 0.000269	0.000280 - 0.000460	0.000461 - 0.001090
Hail Crop Loss Ratio (annual crop claims/exposure)	0 - 0.0000270	0.000271 - 0.000974	0.000975 - 0.000974	0.002305 - 0.003698	0.003699 - 0.007516
Lightning					
Likelihood of Occurrence (# of events/ yrs. Of data)	0 to 0.05	0.06 to 0.15	0.16 to 0.26	0.27 to 0.42	0.43 to 0.74
Average Annual Property Loss Ratio (annual property loss/exposure)	0 - 0.000001	0.000002 - 0.000003	0.000004 - 0.000006	0.000007 - 0.000015	0.000016 - 0.000037

Source: 2013 Missouri State Hazard Mitigation Plan

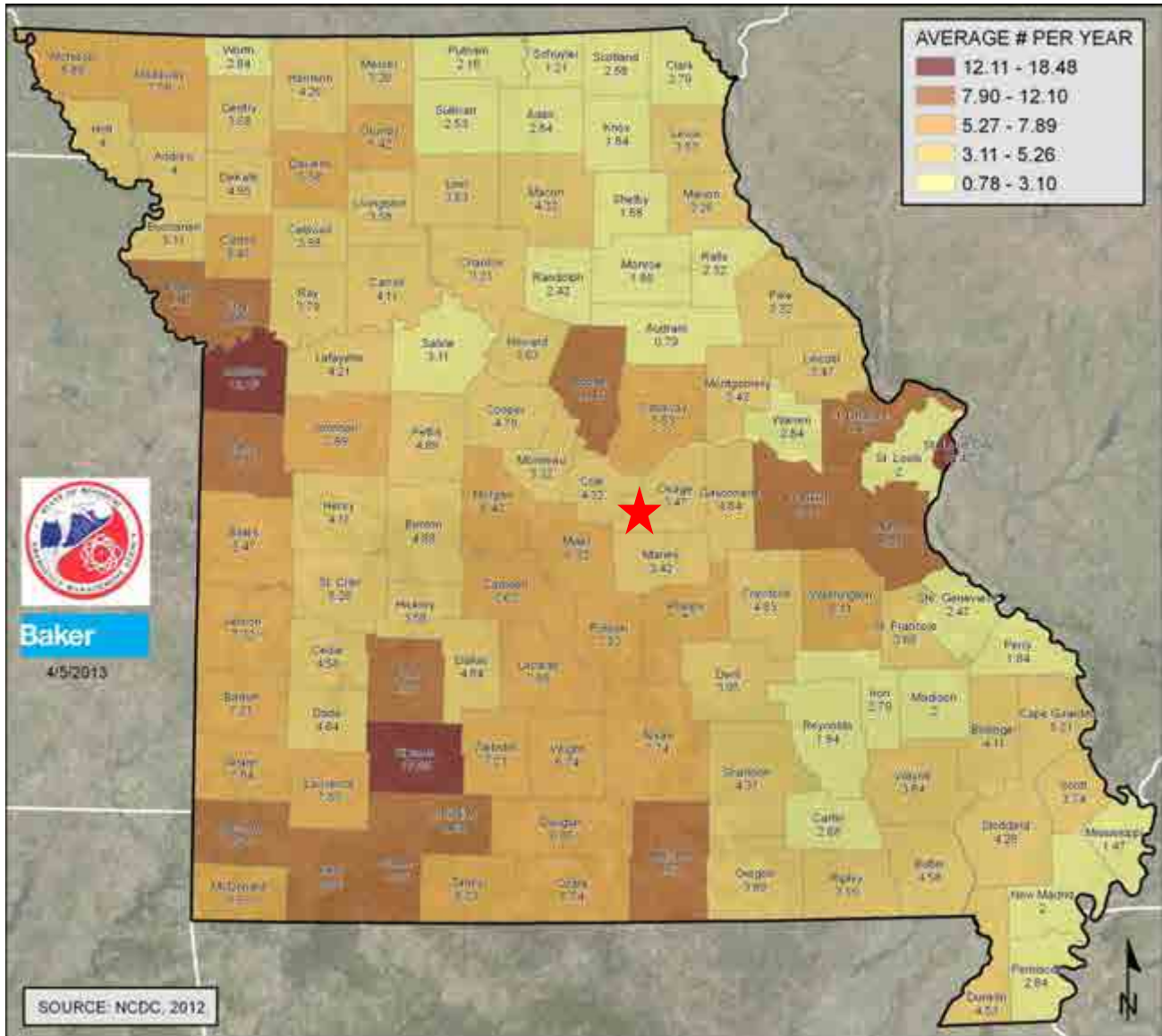
Figure 3.54 through Figure 3.56 depicts the likelihood of occurrence of high winds, hail, and lightning events in Missouri.

Figure 3.54. Likelihood of Occurrence of High Wind Events (67 MPH and higher)



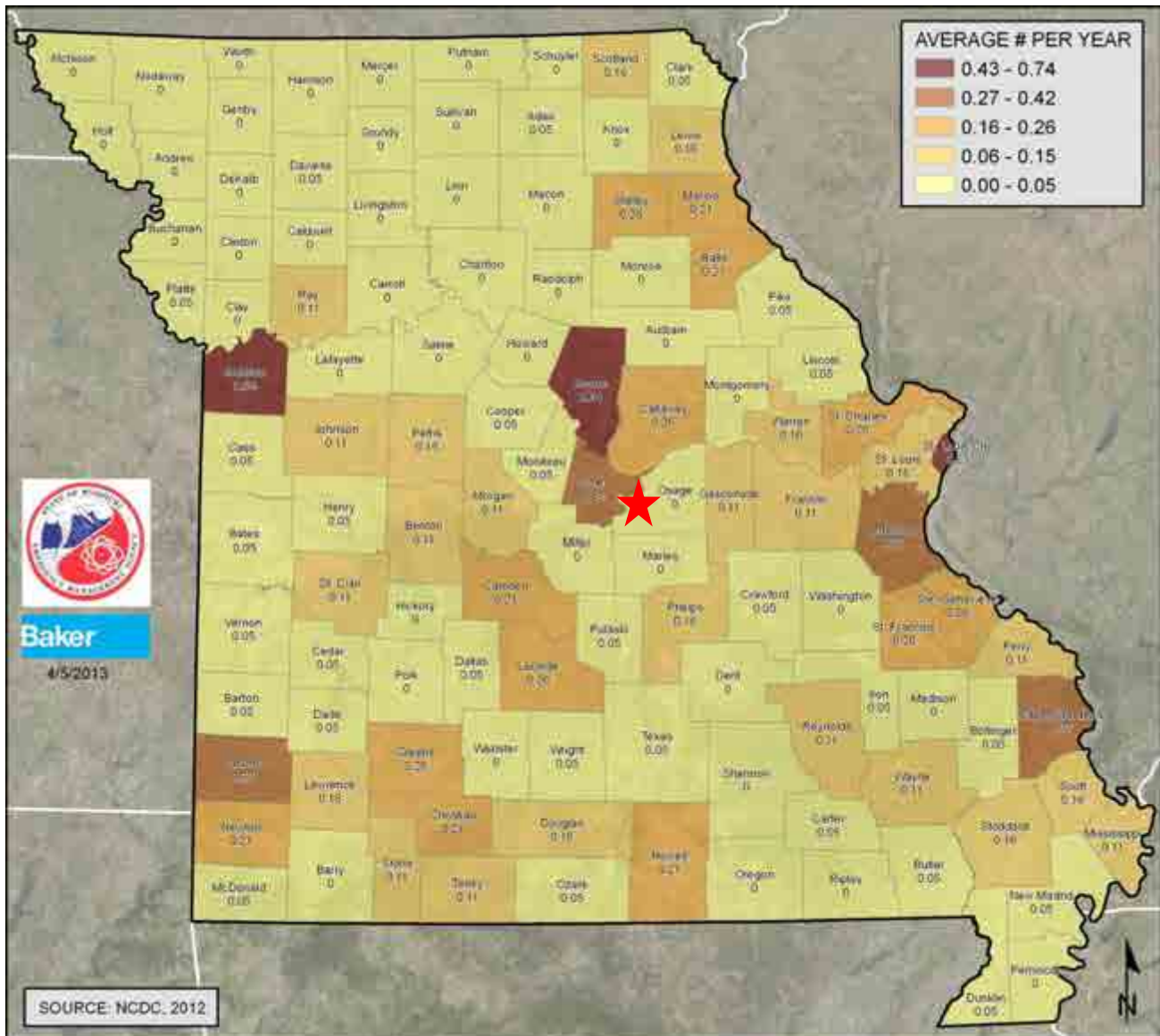
Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Osage County

Figure 3.55. Likelihood of Occurrence of Damaging Hail Events (.75 inches and larger)



Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Osage County

Figure 3.56. Likelihood of Occurrence of Damaging Lightning Events



Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Osage County

After ranges were applied to all factors in the analysis for wind, hail, and lightning, they were weighted equally and factored together to determine an overall vulnerability rating. Following, a combined vulnerability rating was calculated. The following data provides the calculated ranges applied to determine overall vulnerability of Missouri counties to severe thunderstorms (**Table 3.73**). **Table 3.74** provides the calculated vulnerability rating for the severe thunderstorm hazard. **Figure 3.57** that follows provides the mapped results of this analysis by county⁴⁶.

⁴⁶ 2013 Missouri State Hazard Mitigation Plan

Table 3.73. Ranges for Severe Thunderstorm Combined Vulnerability Rating

	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Severe Thunderstorm Combined Vulnerability	9 to 11	12 to 14	15 to 17	18 to 20	21 to 26

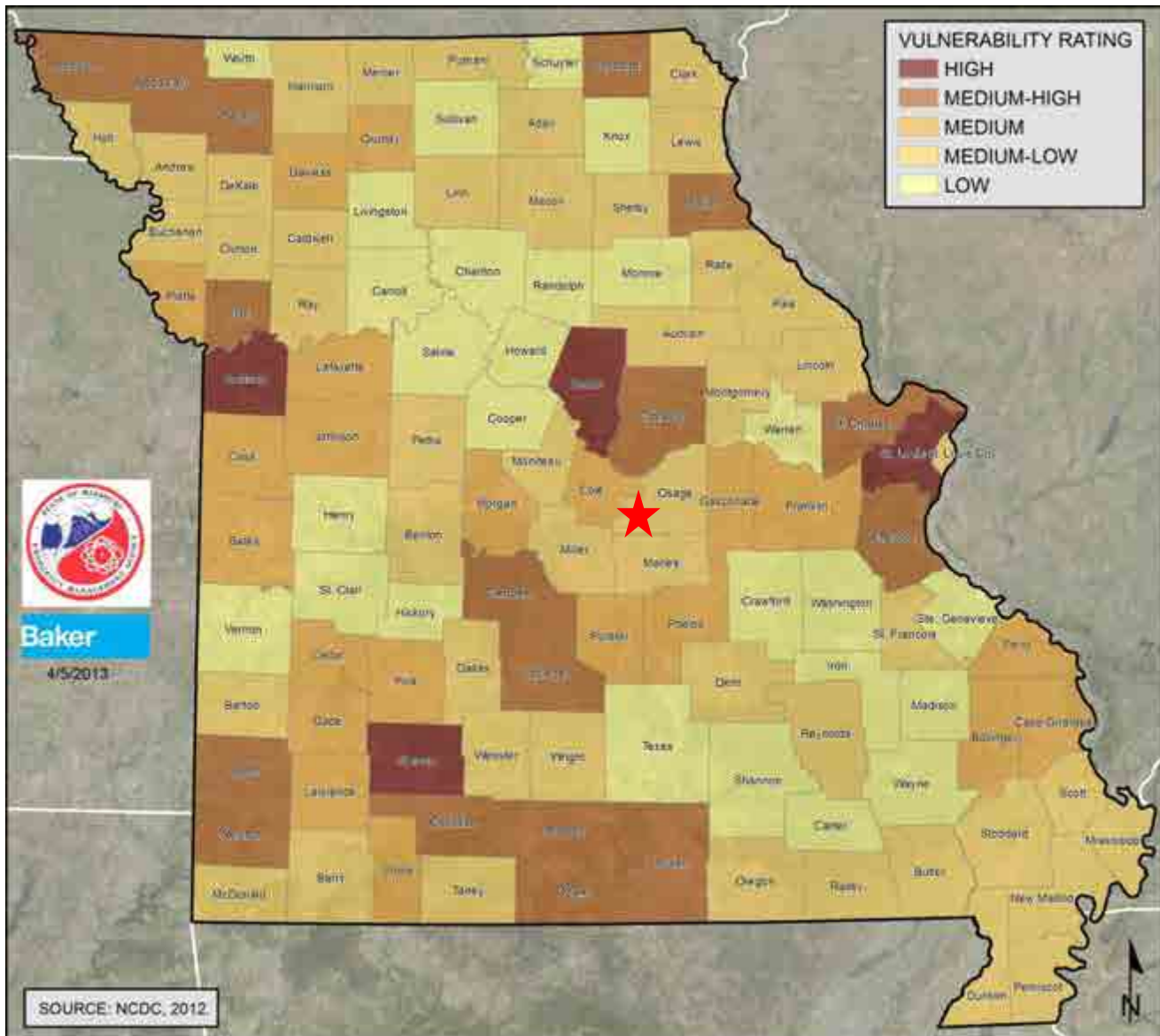
Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.74. Severe Thunderstorm Combined Vulnerability Rating

County	Housing Density Rating	Wind Likelihood Rating	Annualized Wind Property Loss	Annualized Wind Crop Loss	Hail Likelihood Rating	Annualized Hail Property Loss	Annualized Hail Crop Loss	Lightning Likelihood Rating	Annualized Lightning Property Loss	Total Thunderstorm Vulnerability	Combined Vulnerability
Osage	1	1	1	3	2	1	1	1	1	12	Medium-Low

Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.57. Vulnerability Summary for Severe Thunderstorms



Source: 2013 Missouri State Hazard Mitigation Plan
 *Red star indicates Osage County

Potential Losses to Existing Development

According to the NCD, Osage County experienced approximately \$19,000 in property damages from severe thunderstorms between 1998 and 2017. Most of the property damage caused by storms is covered by private insurance and data is not available. In addition, most damage from severe thunderstorms occurs to vehicles, roofs, siding, and windows. However, there is a variety of impacts from severe thunderstorms. Moreover, secondary effects from hazards, falling trees and debris, can cause destruction within the planning area⁴⁷.

⁴⁷ 2015 Boone County Hazard Mitigation Plan

Future Development

As previously mentioned, the population within Osage County is expected to decrease by 211 individuals within the next 2 to 12 years. Nevertheless, it is difficult to determine future impacts. Anticipated development in each jurisdiction will result in increased exposure (**Page 3.23**). Likewise, increased development of residential structures will increase jurisdiction's vulnerability to damages from severe thunderstorms/ high winds/lightning/hail.

Hazard Summary by Jurisdiction

Although thunderstorms/high winds/lightning/hail events are area-wide, there are demographics indicating higher losses in one jurisdiction as compared to another. Jurisdictions with high percentages of housing built before 1939 are more prone to damages from severe thunderstorms. The jurisdictions with the highest percent of houses built before 1939 include Meta, Chamois, and Freeburg. Additionally, Freeburg, Unincorporated Osage County, and Chamois have higher percentages of mobile homes and unsecured buildings, which are more prone to damages.

Problem Statement

Early warnings are possibly the best hope for residents when severe weather strikes. Cities that do not already possess warning systems should plan to purchase a system. Additional public awareness also includes coverage by local media sources. Storm shelters are another important means of mitigating the effects of 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.

3.4.10 Tornado

Some specific sources for this hazard are:

- Enhanced F Scale for Tornado Damage, NWS, www.spc.noaa.gov/faq/tornado/ef-scale.html;
- Enhanced Fujita Scale's damage indicators and degrees of damage table, NOAA Storm Prediction Center, www.spc.noaa.gov/efscale/ef-scale.html;
- Tornado Activity in the U.S. map (1950-2006), FEMA 320, Taking Shelter from the Storm, 3rd edition;
- Tornado Alley in the U.S. map, <http://www.tornadochaser.net/tornalley.html>
- Enhanced Fujita Scale, www.spc.noaa.gov/efscale/ef-scale.html
- National Climatic Data Center, <http://www.ncdc.noaa.gov/stormevents/>
- Tornado History Project, map of tornado events, <http://www.tornadohistoryproject.com/tornado/Missouri>

Hazard Profile

Hazard Description

The NWS defines a tornado as “a violently rotating column of air extending from a thunderstorm to the ground.” It is usually spawned by a thunderstorm and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. Often, vortices remain suspended in the atmosphere as funnel clouds. When the lower tip of a vortex touches the ground, it becomes a tornado.

High winds not associated with tornadoes are profiled separately in this document in **Section 3.4.9, Thunderstorm/High Wind/Hail/Lightning.**

Essentially, tornadoes are a vortex storm with two components of winds. The first is the rotational winds that can measure up to 500 miles per 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 tornadoes have been documented in all 50 states, most of them occur in the central United States due to its unique geography and presence of the jet stream. The jet stream is a high-velocity stream of air that separates the cold air of the north from the warm air of the south. During the winter, the jet stream flows west to east from 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 northward in the spring and its recession south during the fall, the jet stream crosses Missouri, causing the large thunderstorms that breed tornadoes.

A typical tornado can be described as a funnel-shaped cloud in contact with the earth's surface that is “anchored” to a cloud, usually a cumulonimbus. This contact on average lasts 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. However, tornadoes can stay on the ground for upward of 300 miles and can be up to a mile wide. The National Weather Service, in reviewing tornadoes occurring in Missouri between 1950 and 1996, calculated the mean path length at 2.27 miles and the mean path area at 0.14 square mile.

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 tornadoes have been known to move in any direction. Tornadoes are most likely to occur in the afternoon and evening, but have been known to occur at all hours of the day and night.

Geographic Location

In Missouri, tornadoes occur most frequently between April and June, with April and May usually producing the most tornadoes. However, tornadoes can arise at any time of the year. While tornadoes can happen at any time of the day or night, they are most likely to occur between 3 p.m. and 9 p.m. Furthermore, tornadoes can occur anywhere across the state of Missouri, including Osage County.

Severity/Magnitude/Extent

Tornadoes are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 miles per hour and damage paths can be more than one mile wide and 50 miles long. Tornadoes have been known to lift and move objects weighing more than 300 tons a distance of 30 feet, toss homes more than 300 feet from their foundations, and siphon millions of tons of water from water bodies. Tornadoes also can generate a tremendous amount of flying debris or “missiles,” which often become airborne shrapnel that causes additional damage. If wind speeds are high enough, missiles can be thrown at a building with enough force to penetrate windows, roofs, and walls. However, the less spectacular damage is much more common.

Tornado magnitude is classified according to the EF- Scale (or the Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (**Table 3.75**) attempts to rank tornadoes according to wind speed based on the damage caused. This update to the original F Scale was implemented in the U.S. on February 1, 2007.

Table 3.75. Enhanced F Scale for Tornado Damage

Fujita Scale			Derived EF Scale		Operational Scale	
F #	Fastest 1/4 - Mile (mph)	3 Second Gust (mph)	EF #	3 Second Gust (mph)	EF #	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

Source: The National Weather Service, www.spc.noaa.gov/faq/tornado/ef-scale.html

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.76**. The damage descriptions are summaries. For the actual EF scale it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator.

Table 3.76. Enhanced Fujita Scale with Potential Damage

Enhanced Fujita Scale			
Scale	Wind Speed (mph)	Relative Frequency	Potential Damage
EF0	65-85	53.5%	<u>Light</u> . Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e. those that remain in open fields) are always rated EF0).
EF1	86-110	31.6%	<u>Moderate</u> . Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	10.7%	<u>Considerable</u> . Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes complete destroyed; large trees snapped or uprooted; light object missiles generated; cars lifted off ground.
EF3	136-165	3.4%	<u>Severe</u> . Entire stores of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	0.7%	<u>Devastating</u> . Well-constructed houses and whole frame houses completely levelled; cars thrown and small missiles generated.
EF5	>200	<0.1%	<u>Explosive</u> . Strong frame houses levelled off foundations and swept away; automobile-sized missiles fly through the air in excess of 300 ft.; steel reinforced concrete structure badly damaged; high rise buildings have significant structural deformation; incredible phenomena will occur.

Source: NOAA Storm Prediction Center, <http://www.spc.noaa.gov/efscale/ef-scale.html>

Enhanced weather forecasting has provided the ability to predict severe weather likely to produce tornadoes days in advance. Tornado watches can be delivered to those in the path of these storms several hours in advance. Lead time for actual tornado warnings is about 30 minutes. Tornadoes have been known to change paths very rapidly, thus limiting the time in which to take shelter. Tornadoes may not be visible on the ground if they occur after sundown or due to blowing dust or driving rain and hail.

Previous Occurrences

Table 3.77 illustrates NCDC data reported for tornado events and damages from 1998 to 2017 in the planning area. Prior to 1993, only highly destructive tornadoes were recorded.

There are limitations to the use of NCDC tornado data that must be noted. For example, one tornado may contain multiple segments as it moves geographically. A tornado that crosses a county line or state line is considered a separate segment for the purposes of reporting to the NCDC. Also, a tornado that lifts off the ground for less than 5 minutes or 2.5 miles is considered a separate segment. If the tornado lifts off the ground for greater than 5 minutes or 2.5 miles, it is considered a separate tornado. Tornadoes reported in Storm Data and the Storm Events Database are in segments.

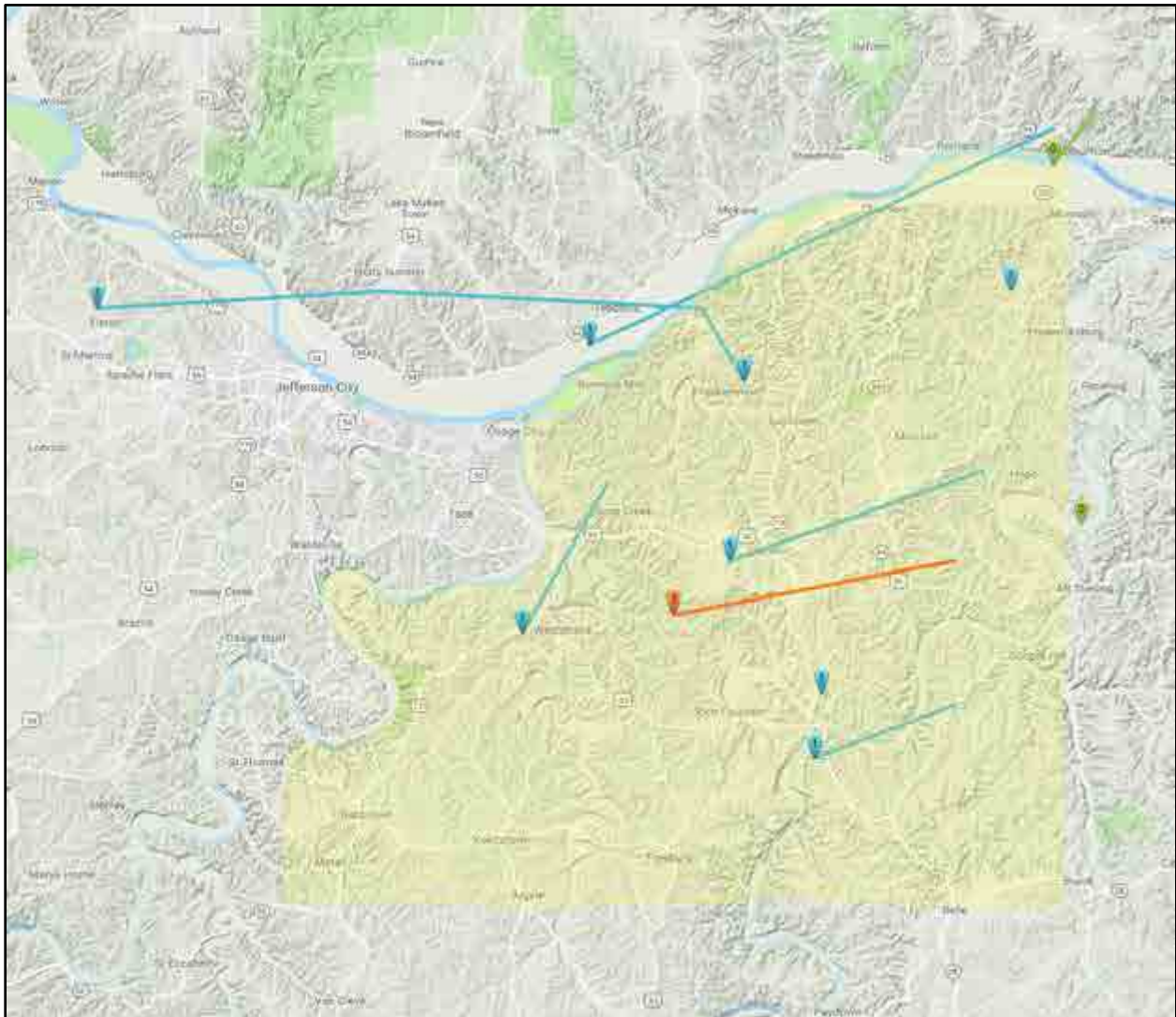
Table 3.77. Recorded Tornadoes in Osage County, 1998 – 2017

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
04/08/1999	2W Linn	9ENE Linn	8	200	F1	0	0	1M	-
03/12/2013	5 SW Chamois	6NE Chamois	8.5	150	F1	0	0	-	-
03/12/2013	7ENE Chamois	8ENE Chamois	.7	50	F0	0	0	-	-
03/10/2010	2WSW Westphalia	1WNW Loose Creek	6.61	60	EF1	0	0	0	0
02/27/2011	2WSW Judge	2WSW Judge	0.24	50	EF1	0	0	0	0
03/06/2017	0W Argyle	1ENE Freeburg	7.26	75	EF1	0	0	0	0

Source: National Climatic Data Center, <http://www.ncdc.noaa.gov/stormevents/>

Figure 3.58 depicts historic tornado paths across Osage County.

Figure 3.58. Osage County Map of Historic Tornado Paths



Source: <http://www.tornadohistoryproject.com/tornado/Missouri>

According to the USDA Risk Management Agency’s record, there was one insurance payment in Osage County for crop damages as a result of tornadoes between 1998 and 2017.

Probability of Future Occurrence

From the data obtained from the NCDC⁴⁸, an annual average percent probability was calculated for tornadoes within Osage County (**Table 3.78**). There is a 30 percent annual average probability of a tornado occurrence (6 events/20 years x 100). Tornado events can be found in **Table 3.77**. In addition, **Figure 3.59**, obtained from the 2013 Missouri State Hazard Mitigation Plan, also illustrates tornado probabilities across the State.

⁴⁸ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

Vulnerability

Vulnerability Overview

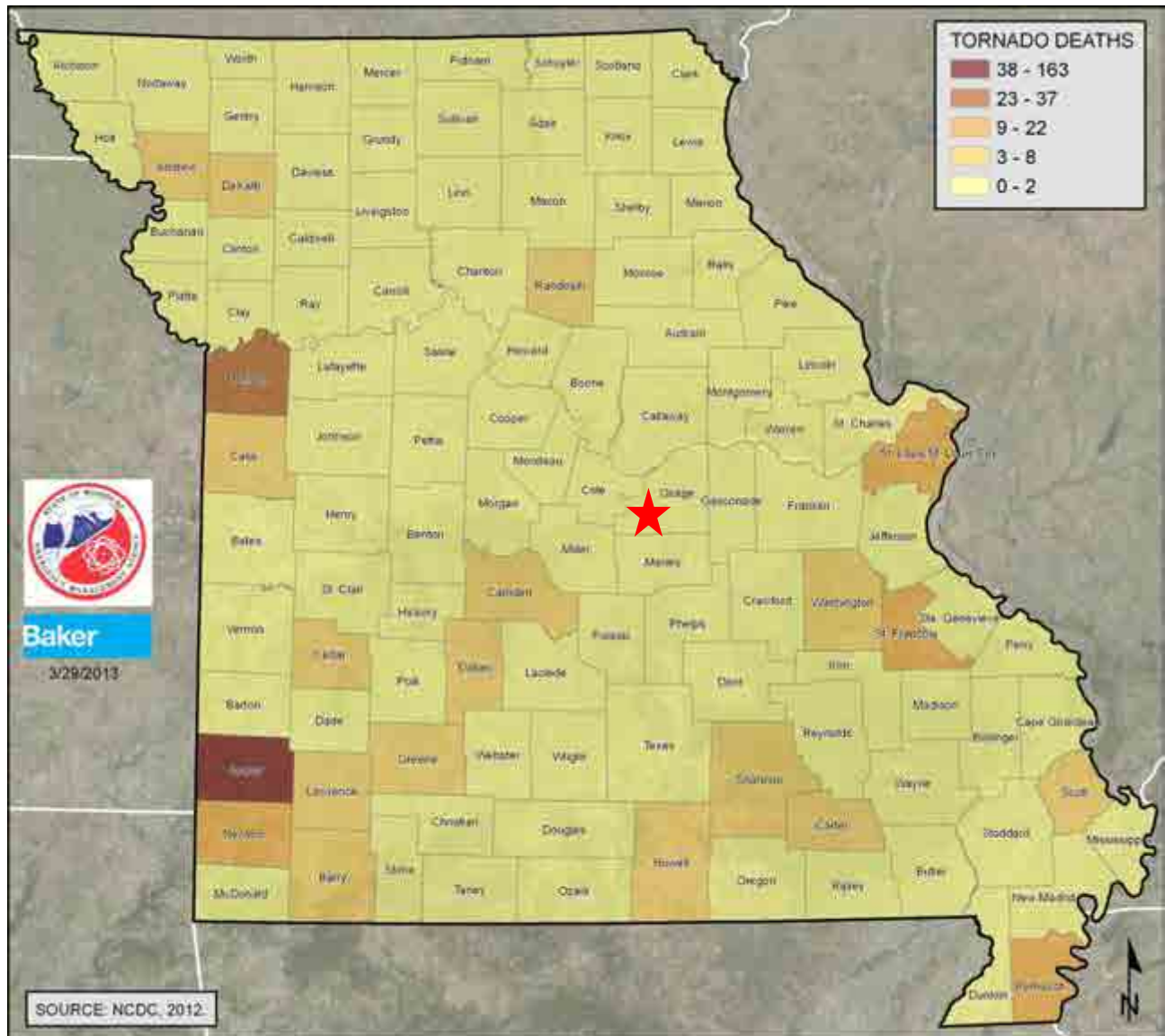
Osage County resides in a region of the United States that has a high frequency of dangerous and destructive tornadoes. This region seen in **Figure 3.60** is referred to as “Tornado Alley”. Furthermore, **Figure 3.61** illustrates areas where perilous tornadoes historically have occurred in Missouri.

Figure 3.60. Tornado Alley in the U.S.



Source: <http://www.tornadochaser.net/tornalley.html>

Figure 3.61. Missouri Tornado Deaths by county, 1950 – March 17, 2012



Source: 2013 Missouri State Hazard Mitigation Plan
 *Red star indicates Osage County

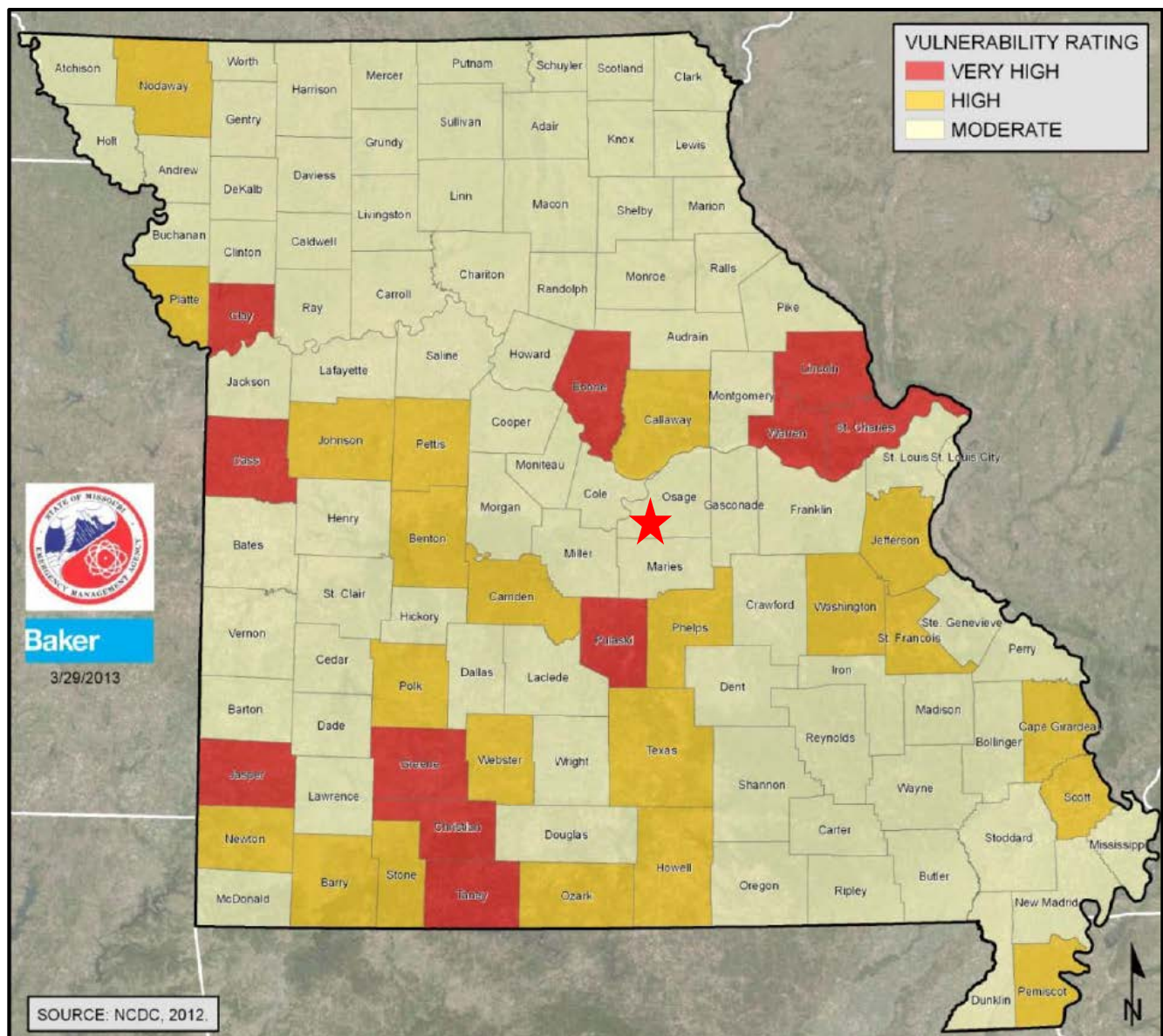
Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for tornado vulnerability. The analysis depicts the likelihood of future tornado impacts, average annual property loss ratio, population change, and house change. Factors were ranked from 1 to 3; moderate, high, and very high, respectively. The factor scores are totaled to estimate Osage County’s vulnerability to tornadoes (**Table 3.79**). Since tornadoes are probable to occur across the state, the lowest risk factor is still considered moderate. **Figure 3.62** depicts the vulnerability summary for tornadoes across Missouri by county.

Table 3.79. Factors and Ranges Considered in Tornado Vulnerability Analysis

Factors Considered	Moderate (1)	High (2)	Very High (3)
Likelihood of Occurrence (# of events/ yrs. Of data)	6 - 24	25 - 49	50 - 68
Loss Ratio %	0 - .113	0.114 - .226	0.227 - 0.340
Population % Change	Below 6	7 - 22	23 - 39
Housing % Change	Below 12	13 - 25	26 - 39
Overall Vulnerability Rating	4 and 5 Rating	6 and 7 Rating	3 and 9 Rating

Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.62. Vulnerability Summary for Tornadoes



Source: 2013 Missouri State Hazard Mitigation Plan

*Red star indicates Osage County

Table 3.80 provides information in regards to tornado probability, potential loss, and risk summary for Osage County. This table was calculated to determine 10 counties with the largest annualized historic tornado losses between 1950 and July 31, 2012 (**Table 3.81** and **Figure 3.63**).

Table 3.80. Tornado Probability, Potential Loss, and Risk Summary

County	# of Tornadoes	Likelihood of Occurrence	Probability Rating	Total Exposure (\$)	Annualized Historic Loss	Loss Ratio	Loss Ratio Rating	Population Growth % Change	Pop. Change Rating	House % Change	Housing Ratio Rating	Total Vulnerability
Osage	10	16.26 %	1	\$1,427,835,000	\$118,544	0.008 %	1	6.3 %	1	8.25 %	1	Moderate

Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.81. Top 10 Counties Ranked by Annualized Historic Tornado Loss 1950 – July 2012

County	Annualized Historic Loss 1950 - July 31, 2012
Jasper	\$48,523,987
Greene	\$2,305,620
Pettis	\$2,031,696
Cass	\$1,890,914
Phelps	\$1,876,552
Newton	\$1,793,334
Crawford	\$1,569,054
Perry	\$1,172,592
Howell	\$1,200,223
Gasconade	\$1,132,245

Source: 2013 Missouri State Hazard Mitigation Plan

well. In order to protect jurisdictions from increased tornado vulnerabilities future analysis, training, and implementation should be considered at the planning, engineering, and architectural design stages.

Hazard Summary by Jurisdiction

As previously stated, a tornado event could occur anywhere in the planning area. However, some jurisdictions would suffer heavier damages because of the age of housing or high concentration of mobile homes. See **Table 3.35** for jurisdictions most vulnerable to damage due to the age of the structure. Furthermore, data was obtained from the U.S. Census Bureau for the number of mobile homes in Osage County. From the information provided in **Table 3.82**, Freeburg, Unincorporated Osage County, and Chamois are most vulnerable to losses due to the number of mobile homes residing within the jurisdiction.

Table 3.82. Percentage of Mobile Homes in Osage County, 2016

Jurisdiction	Number of Mobile Homes	Percentage of Mobile Homes*
Unincorporated Osage County	480	7.3%
Chamois	11	5.2%
Freeburg	16	8.1%
Linn	16	2.2%
Meta	4	3.6%
Westphalia	2	1.0%

Source: U.S. Census Bureau, 2012-2016 5-Year American Community Survey

*Number of mobile homes per jurisdiction/total housing units per jurisdiction

**Total housing units for all jurisdictions = 6,548

Problem Statement

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. Jurisdictions 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. Additional public awareness also includes coverage by local media sources. 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.

3.4.11 Winter Weather/Snow/Ice/Severe Cold

Some specific sources for this hazard are:

- Wind chill chart, National Weather Service, <http://www.nws.noaa.gov/om/winter/windchill.shtml>;
- Average Number of House per year with Freezing Rain, American Meteorological Society. "Freezing Rain Events in the United States." <http://ams.confex.com/ams/pdfpapers/71872.pdf>;
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- Any local Road Department data on the cost of winter storm response efforts.
- National Climatic Data Center, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>

Hazard Profile

Hazard Description

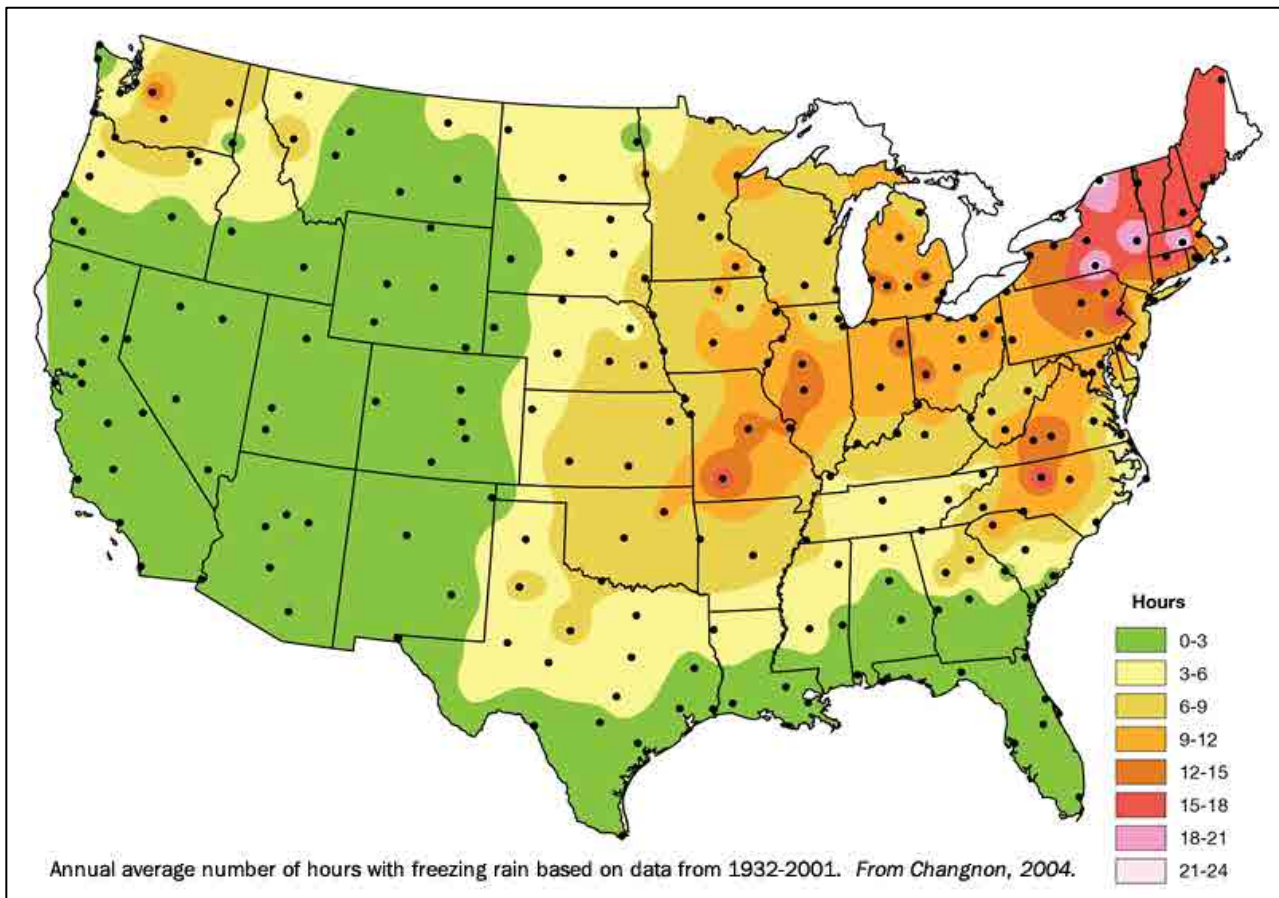
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows.

- **Blizzard**—Winds of 35 miles per hour or more with snow and blowing snow reducing visibility to less than ¼ mile for at least three hours.
- **Blowing Snow**—Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls**—Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- **Snow Showers**—Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- **Freezing Rain**—Measurable 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 coating or glaze of ice. Most freezing-rain events are short lived and occur near sunrise between the months of December and March.
- **Sleet**—Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects.

Geographic Location

Severe winter weather typically strikes Missouri more than once every year. Osage County receives winter weather events from heavy snows to freezing rain annually. Major snowstorms typically occur once each year, causing multiple school closings, as well as suspending business and government activity. Osage County is vulnerable to heavy snow, ice, extreme cold temperatures and freezing rain. **Figure 3.64** illustrates statewide average number of hours per year with freezing rain. Osage County receives approximately 12 to 15 hours.

Figure 3.64. NWS Statewide Average Number of Hours per Year with Freezing Rain



Source: Chagnon, 2004, http://mrcc.isws.illinois.edu/living_wx/icestorms/

Severity/Magnitude/Extent

Severe winter storms include extreme cold, heavy snowfall, ice, and strong winds which can push the wind chill well below zero degrees in the planning area. Heavy snow can bring a community to a standstill by inhibiting transportation (in whiteout conditions), weighing down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make transportation difficult and hazardous. Ice can also become a problem on roadways if the air temperature is high enough that precipitation falls as freezing rain rather than snow.

Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower a building's heating system and cause water and sewer pipes to freeze and rupture. Extreme cold also increases the likelihood for ice jams on flat rivers or streams. When combined with high winds from winter storms, extreme cold becomes extreme wind chill, which is hazardous to health and safety.

The National Institute on Aging estimates that more than 2.5 million Americans are elderly and especially vulnerable to hypothermia, with the isolated elders being most at risk. About 10 percent of people over the age of 65 have some kind of bodily temperature-regulating defect, and 3-4 percent of all hospital patients over 65 are hypothermic.

Also at risk are those without shelter, those who are stranded, or who live in a home that is poorly insulated or without heat. Other impacts of extreme cold include asphyxiation (unconsciousness or death from a lack of oxygen) from toxic fumes from emergency heaters; household fires, which can be caused by fireplaces and emergency heaters; and frozen/burst pipes.

Buildings with overhanging tree limbs are more vulnerable to damage during winter storms when limbs fall. Businesses experience loss of income as a result of closure during power outages. In general heavy winter storms increase wear and tear on roadways though the cost of such damages is difficult to determine. Businesses can experience loss of income as a result of closure during winter storms.

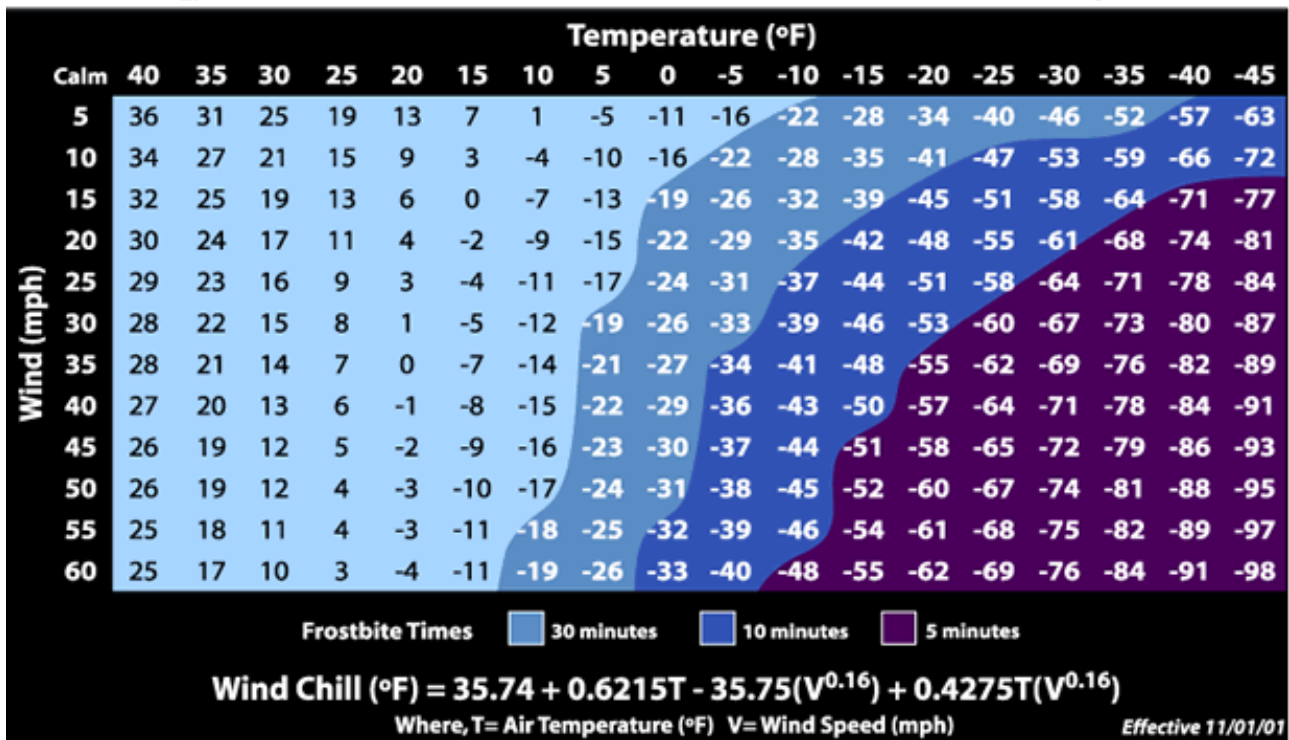
Overhead power lines and infrastructure are also vulnerable to damages from winter storms. In particular, ice accumulation during winter storms can damage power lines and equipment. Damages also occur to lines and equipment from falling trees and tree limbs weighted down by ice. Potential losses could include cost of repair or replacement of damaged facilities, and lost economic opportunities for businesses.

Secondary effects from loss of power could include burst water pipes in homes without electricity during winter storms. Public safety hazards include risk of electrocution from downed power lines. Specific amounts of estimated losses are not available due to the complexity and multiple variables associated with this hazard. Standard values for loss of service for utilities reported in FEMA's 2009 BCA Reference Guide, the economic impact as a result of loss of power is \$126 per person per day of lost service.

Wind can greatly amplify the impact of cold ambient air temperatures. Provided by the National Weather Service, **Figure 3.65** below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Winter storms, cold, frost, and freeze all can influence or negatively impact crop production. However, data obtained from the USDA's Risk Management Agency for insured crop losses indicates that there were 9 claims paid in Osage County between 1997 and 2017 for severe winter weather.

Figure 3.65. Wind Chill Chart



Source: National Weather Service, <http://www.nws.noaa.gov/om/winter/windchill.shtml>

Previous Occurrences

Data was obtained from the NCDC for winter weather reported events and damages between 1998 and 2017 (Table 3.83). This data includes variables such as blizzard, cold/wind chill, extreme cold/wind chill, heavy snow, ice storm, sleet, winter storm, and winter weather. Additionally, narratives for specific events are listed below.

Table 3.83. NCDC County A Winter Weather Events Summary, 1998 - 2017

Year	Number of Events	Type of Event	# of Injuries	Property Damages	Crop Damages
1998	3	Winter Storm	0	0	0
1999	1	Winter Storm	0	0	0
2000	4	Winter Storm, Heavy Snow, Extreme Cold/wind Chill	0	0	0
2002	4	Winter Storm	0	0	0
2003	3	Winter Storm	0	0	0
2004	2	Winter Storm	0	0	0
2005	1	Winter Storm	0	0	0
2006	2	Winter Storm	0	0	0
2007	2	Ice Storm	0	102K	0
2008	3	Winter Weather, Sleet	0	0	0

Year	Number of Events	Type of Event	# of Injuries	Property Damages	Crop Damages
2010	2	Cold/wind Chill, Winter Weather	0	0	0
2011	4	Heavy Snow, Winter Storm, Blizzard	0	0	0
2013	2	Winter Storm, Heavy Snow	0	0	0
2014	3	Winter Storm, Cold/wind Chill	0	0	0
Total	36	-	0	102K	0

Source: NCDC, data accessed [02/21/2018]

Notable Winter Narratives:

1. **1/12/2007:** An arctic boundary settled south of the area on the 12th and 13th of January bringing subfreezing temperatures to the northwestern half of the county warning area. Three rounds of precipitation occurred during this period, with the first being the most destructive of all. Significant tree and limb damage was reported as a result of this storm, together with widespread power outages. More than 100,000 homes and businesses lost power during this storm. About 1.5 inches of sleet fell and a 1/2 inch of ice accumulation hit parts of Central and Northeast Missouri. From 1/4 to 1/2 inch of ice accumulated from freezing rain across Eastern Missouri and parts of Southwest Illinois. Flooding of low lying areas and low water crossings occurred across the eastern Ozarks late Friday night and Saturday morning. One fatality occurred in St. Francois County when a man attempted to cross a flooded roadway. The damage figures listed for the various counties are for public assistance only.

Probability of Future Occurrence

From the data obtained from the NCDC⁵⁰, annual average percent probabilities were calculated for winter weather within Osage County (**Table 3.84**). There were 36 recorded events (**Table 3.83**) over a 20 year period. There is 100 percent annual average probability of winter weather occurrence (36 events/20 years x 100), with an average of 1.8 events per year.

Table 3.84. Annual Average % Probability of Winter Weather in Osage County

Location	Annual Avg. % P	Avg. # of Events
Osage County	100%	1.8

*P = probability; see page 3.24 for definition.

Vulnerability

Vulnerability Overview

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for vulnerability information regarding Osage County. Various data sources were utilized for statistical analysis

⁵⁰ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

including the following:

- National Climatic Data Center (NCDC)
- FEMA's Public Assistance Funds
- Crop Insurance Claims data from the USDA's Risk Management Agency
- HAZUS-MR4
- U.S. Census Data
- USDA's Census of Agriculture

The following Table (**Table 3.85**) includes data elements for severe winter weather.

Table 3.85. Osage County Housing Density, Building Exposure, Crop Exposure, Social Vulnerability Index, Total incidents, Total Property Loss, and Total Crop Insurance Paid Data

County	Housing Units/sq. mi.	Total Building Exposure (\$)	Crop Exposure (2007) (\$)**	Total Incidences	Total \$ Property Los (\$)	Total Crop Insurance Paid (\$)
Osage	6.9	\$1,427,835,000	\$7,816,000	38	42,973,496	\$3,427

Seven factors were utilized to determine overall severe winter storm vulnerability. These factors include housing density, likelihood of occurrence, building exposure, crop exposure, average annual property loss ratio, average annual crop insurance claims and social vulnerability. Furthermore, 5 rating values were developed for each factor. **Table 3.86** illustrates vulnerability analysis rating factors.

Table 3.86. Vulnerability Analysis Rating Factors

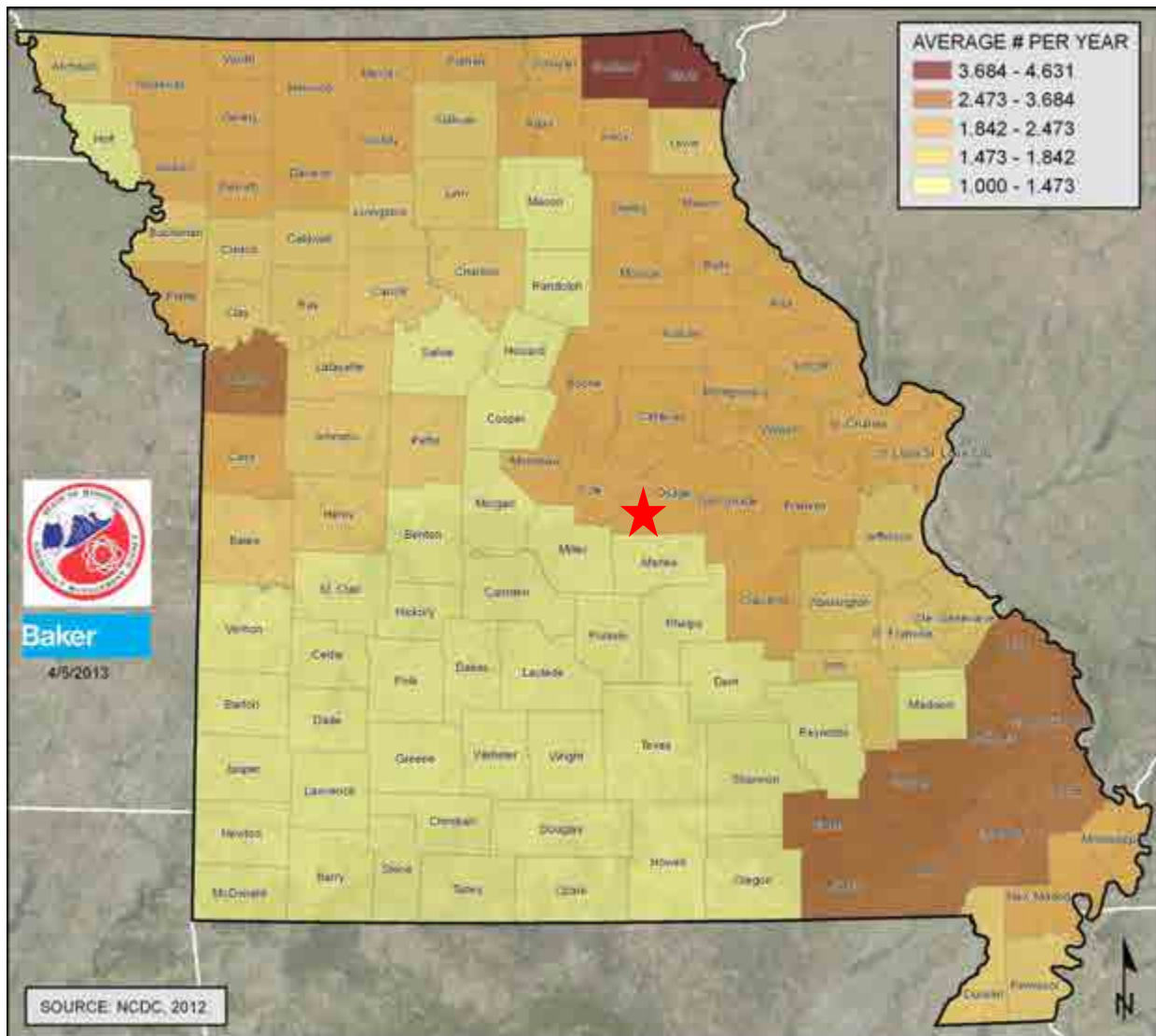
Factors considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Housing Density (# per sq. mile)	<50	50 - 99	100 - 299	300 - 499	>500
Crop Exposure (4)	<\$10M	\$10M to \$24M	\$25M to \$49M	\$50M to \$99M	>\$100M
Social Vulnerability	1	2	3	4	5
Likelihood of Occurrence (# of events/ yrs. Of data)	1.000 - 1.473	1.473 - 1.842	1.842 - 2.473	2.473 - 3.684	3.684 - 4.631

Factors considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Annualized Property Loss Ratio (annual property loss/exposure)	0.0 - 0.000110	0.000111 - 0.000274	0.000275 - 0.000636	0.000637 - 0.001397	0.001398 - 0.003270

Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.66 illustrates the likelihood of occurrence of severe winter weather across Missouri. Osage County was estimated to have an average of 1.842 to 2.473 severe winter weather events per year.

Figure 3.66. Likelihood of Occurrence of Severe Winter Weather



Source: 2013 Missouri State Hazard Mitigation Plan
 *Red star indicates Osage County

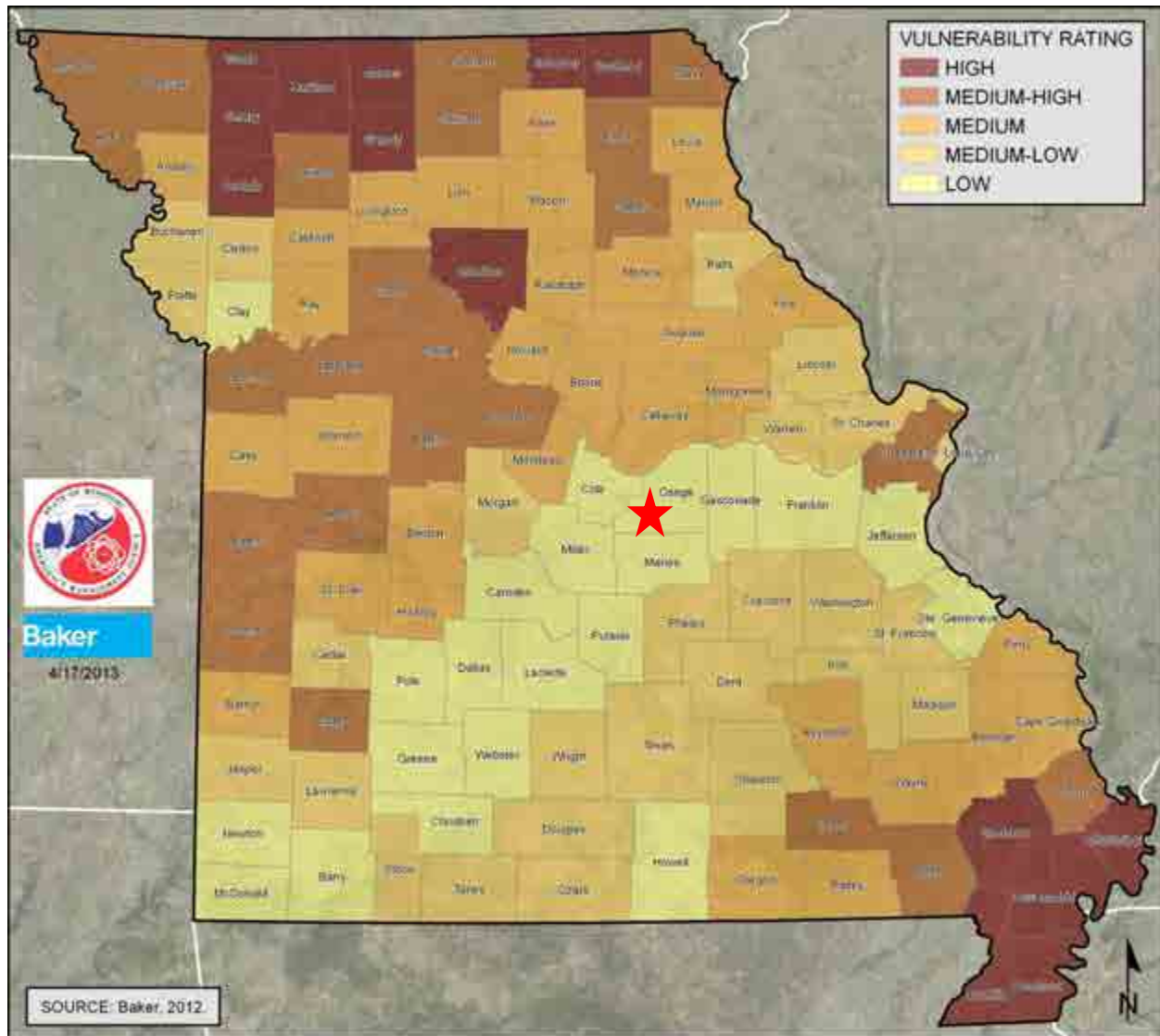
Table 3.87 depicts the calculated vulnerability rating for each factor considered in the vulnerability analysis for severe winter weather hazards. The overall vulnerability rating for severe winter weather in Osage County is low. Moreover, **Figure 3.67** illustrates vulnerability ratings for each county within Missouri.

Table 3.87. Osage County Vulnerability Analysis for Severe Winter Weather

County	Housing Density Rating	Likelihood Rating	Property Loss Rating	Crop Exposure Rating	Crop Loss Ratio Rating	Social Vulnerability Index	Total Score and Vulnerability	Vulnerability Rating
Osage	1	3	1	1	1	2	9	Low

Source: 2013 Missouri State Hazard Mitigation Plan

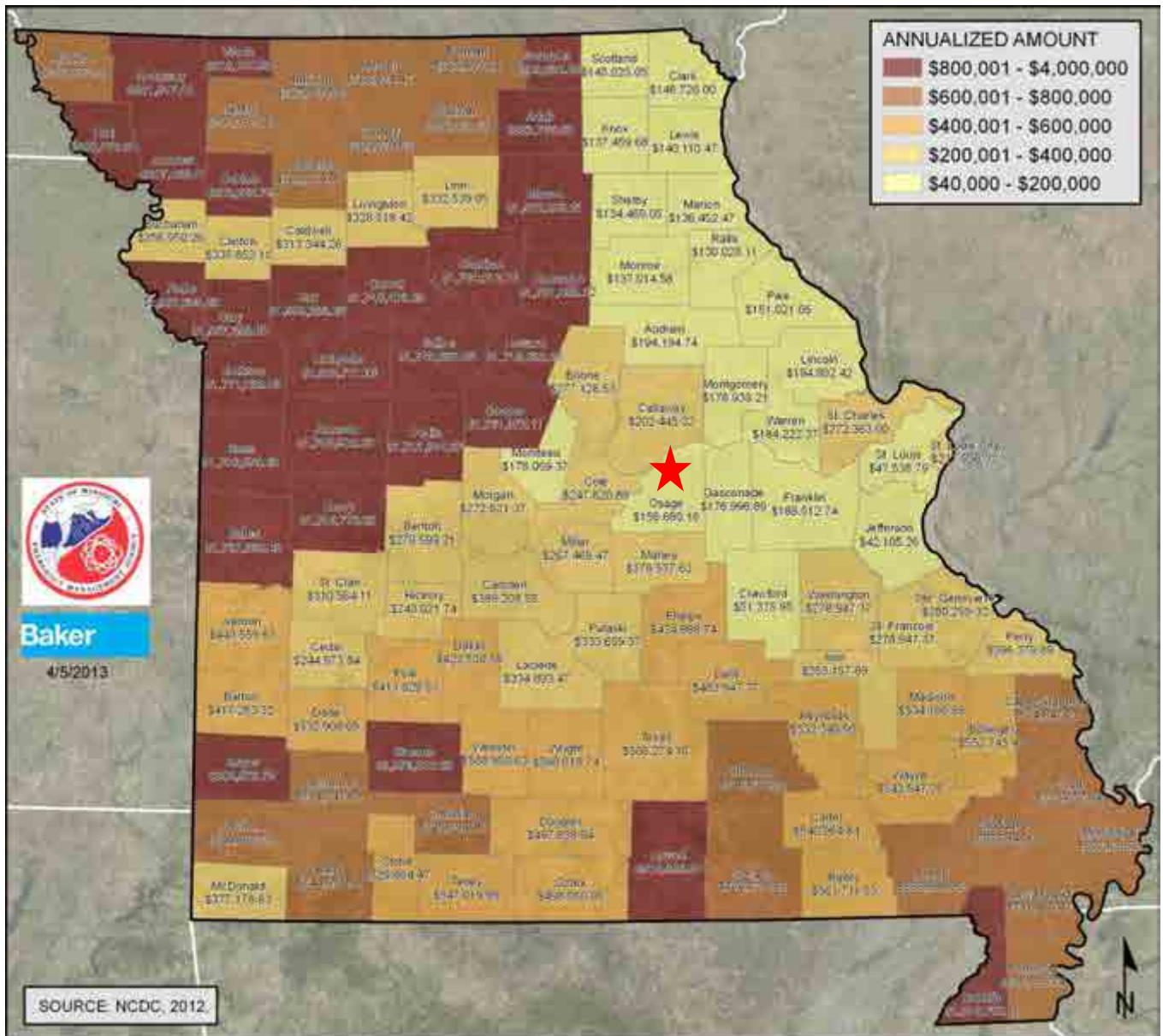
Figure 3.67. Vulnerability Summary for Severe Winter Storm



Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Osage County

Annualized severe winter weather damages were obtained from the 2013 Missouri State Hazard Mitigation Plan. Osage County is estimated as having \$40,000 to \$200,000 in damages per year due to severe winter weather (Figure 3.68).

Figure 3.68. Annualized Severe Winter Weather Damages



Source: 2013 Missouri State Hazard Mitigation Plan

*Red star indicates Osage County

Potential Losses to Existing Development

The next severe winter storm will most likely close schools and businesses for multiple days, and make roadways hazardous for travel. Heavy ice accumulation may damage electrical infrastructures, causing prolonged power outages for large portions of the region. In addition, freezing temperatures

make water lines vulnerable to freeze/thaw. Fallen tree limbs also pose a threat to various structures/infrastructures across the county.

Future Development

Data for future development for the planning area is sparse. However, winter weather will affect the county as a whole. Any future development is at risk to damages and increased exposure.

Hazard Summary by Jurisdiction

Variations in impacts are not anticipated for severe winter weather across the planning area. Yet, areas with high number of mobile homes tend to experience increased damages. Freeburg, Unincorporated Osage County, and Chamois have the highest abundance of mobile homes, making the area more prone to increase exposure to damage.

Problem Statement

In summary, Osage County is expected to experience at least one to two severe winter weather events annually; however the county has a low vulnerability rating. Jurisdictions should enhance their weather monitoring to be better prepared for severe weather hazards. If 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. Citizens should also be educated about the benefits of being proactive to alleviate property damage as well preparing for power outages.

4 MITIGATION STRATEGY

4 MITIGATION STRATEGY 4.1

4.1 Goals..... 4.1

4.2 Identification and Analysis of Mitigation Actions..... 4.2

4.3 Implementation of Mitigation Actions 4.6

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 updated by the Mitigation Planning Committee (MPC) based on the updated risk assessment. The mitigation strategy was developed through a collaborative group process. The process included review of general goal statements to guide the jurisdictions in lessening disaster impacts as well as specific mitigation actions to directly reduce vulnerability to hazards and losses. The following definitions are taken from FEMA’s *Local Hazard Mitigation Review Guide (October 1, 2012)*.

- **Mitigation Goals** are general guidelines that explain what you want to achieve. Goals are long-term policy statements and global visions that support the mitigation strategy. The goals address the risk of hazards identified in the plan.
- **Mitigation Actions** are specific actions, projects, activities, or processes taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan’s mission and goals.

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.

This planning effort is an update to Osage County’s existing hazard mitigation plan originally approved by FEMA in April 2005 and updated and approved by FEMA on March 22, 2013. Therefore, the goals from the updated 2013 Osage County Hazard Mitigation Plan were reviewed to see if they were still valid, feasible, practical, and applicable to the defined hazard impacts. The MPC conducted a discussion session during their first meeting to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the 2013 State Hazard Mitigation Plan goals were reviewed. As the existing goals were broad, still applicable, and supported the 2013 State Hazard Mitigation Plan goals, the MPC saw no reason to make any changes. The Osage County goals are as follows:

- 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 and Analysis of Mitigation Actions

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.

During the first MPC meeting, the committee discussed what needed to be updated in the risk assessment. Changes in risk since adoption of the previously approved plan were discussed. Since the last update, there has not been death due to natural hazard events. Action items were reviewed and suggestions made for changes to address the changes in risk. Discussions from the actions from the previous plan included completed actions, on-going actions, and actions upon which progress had not been made. The MPC discussed SEMA's identified funding priorities and the types of mitigation actions generally recognized by FEMA.

The MPC determined to include problem statements in the plan update at the end of each hazard profile, which had not been done in the previously approved plan. The problem statements summarize the risk to the planning area presented by each hazard, and include possible methods to reduce that risk.

The focus of Meeting #2 was to review, prioritize and update the mitigation strategy. The MPC reviewed the list of actions proposed in the previous mitigation plan and proposed additional mitigation actions. Facilitators also provided suggestions for actions based on what some of the surrounding counties had included in their plans. Participants were also encouraged to refer to the current State Plan and provided a link to the FEMA's publication, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)*. This document was developed by FEMA as a resource for identification of a range of potential mitigation actions for reducing risk to natural hazards and disasters.

During the review of the plan document, MPC members were encouraged to review the details of the risk assessment vulnerability analysis specific to their jurisdiction.

The MPC reviewed the actions from the previously approved plan for progress made since the plan had been adopted. Copies of the list of actions for each jurisdiction were provided to MPC members at planning meetings and were emailed out to all members. Action items were reviewed and the MPC provided updates on the status of action items during both planning meetings and the meeting with the road and bridge department. Each action item was reviewed and assigned one of the following:

- Completed, with a description of the progress,

- Not Started/Continue in Plan Update, with a discussion of the reasons for lack of progress,
- In Progress/Continue in Plan Update, with a description of the progress made to date or
- Deleted, with a discussion of the reasons for deletion.

Based on the status updates, there were 19 completed actions, 12 deleted actions, 23 continuing actions, and 5 additional actions.

Table 4.1 provides a summary of the action statuses for each jurisdiction. See **Appendix D: Completed/Deleted Mitigation Actions** for a summary of the completed and deleted actions from the previous plan.

Table 4.1. Summary of Completed and Deleted Actions from the Previous Plan

Completed Actions	Completion Details (date, amount, funding source)
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.	The county holds cert training once a month, submits press releases on social media and website, and holds Ready in 3 events.
1.1.2: Continue to provide information on hazards, prevention and preparedness through distribution of materials, press releases and postings on website/Facebook.	The County EMD and Health Dept. regularly disseminates information for heat waves, cooling shelters, preparedness, and Smart 911 notification system.
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.	The county provides training opportunities on a monthly basis.
1.2.1: Need to continue to examine ways to expand and improve warning systems.	The county implemented Smart 911 and utilizes social media on a regular basis. Additionally, when the budget approves, new sirens will be installed.
1.2.2 Promote use of emergency notification systems (Smart 911, weather radios, website, social media) by local residents and schools to insure advance warning about threatening weather.	The county regularly promotes emergency notifications systems to local residents and schools.
2.1.1 Continue to encourage businesses/ Government/schools to develop and implement emergency plans.	The county has a program in place to encourage businesses to develop emergency plans. The county maintains a county-wide LEOP. The school districts have emergency plans in place.
2.1.3: Continue to conduct emergency preparedness exercise periodically.	The county participates in mandated regional drills for the nuclear plant in Callaway County.
2.1.5: Regularly review and update school emergency plans.	Schools within the county are updating emergency plans on a regular basis as required by DESE.

2.1.7: Conduct emergency preparedness exercises in schools on a regular basis	All schools conduct emergency preparedness exercises on a regular basis.
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.	This item is being done on a regular basis by the county EMD.
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.	This item is being done on a regular basis by the county EMD.
3.1.2: Continue to provide regular press releases from county EMD office concerning hazards, where they strike, frequency, preparedness and how to mitigate.	The county is utilizing Smart 911, website, social media, etc. concerning hazards.
3.2.1: Encourage local residents to purchase weather radios or Alert FM through press release, brochures, website, Facebook.	The county encourages weather radios as well as Smart 911 for emergency notifications.
3.4.2: Publicize county or citywide drills	The county regularly publicizes county or citywide drills.
3.4.3: Continue to provide information on EMD website and Facebook on preparedness and mitigation.	This is being done on a regular basis.
4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.	This is being done on a regular basis.
4.1.2: Joint training (and drills) between agencies, public and private entities (including schools/businesses).	This action has been addressed and will continue to be addressed in the future.
4.1.3: Pool different agency resources to achieve widespread mitigation planning results	The county along with jurisdictional agencies pool resources such as generators, radios, and other equipment and participate in the joint maintenance of the equipment.
6.1.2: Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	This is a standard for the county and cities.
Deleted Actions	Reason for Deletion

1.2.3: Continue to partner with local radio stations to ensure that appropriate warning is provided to county residents of impending disasters.	The planning group felt that this was out-of-date – that there are better methods of providing warning.
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.	The planning group felt that is action item was repetitive,
1.2.5: Continue to promote participation in the Smart 911 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.	The county is currently utilizing Smart 911 and promoting it.
1.3.3: Continue to review and evaluate the need for generators for critical systems and response support in all communities.	Due to poor response from critical facilities, this item is being deleted. County offered to pay for generator if facility bought transfer switch. The facility did not want to buy transfer switch.
1.3.5: Encourage the construction of tornado safe rooms in every school that does not have one.	Combined with action item 1.3.4.
2.1.1: Continue to encourage businesses/government/schools to develop and implement emergency plans.	The planning group ranked this as a low priority and did not want to pursue it further
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.	This action item is repetitive and the same as 1.2.6
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.	The planning group ranked this as a low priority, as schools are regularly engaged with staff trainings and procedures.
3.2.2: Ask SEMA mitigation specialist to present information to city counties, county commission, school districts, Meramec Regional Planning Commission, and Meramec Regional Planning Committee	This action item is being combined with action item 4.2.1
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).	The planning group viewed this action item as repetitive; it has been addressed in previous action items.
5.1.2: Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	This action item is being combined with action item 2.1.2

6.1.1: Work with local, regional, state, and federal agencies to learn about new mitigation funding opportunities.	This action item was combined with 4.2.1.
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Source: Previously approved County Hazard Mitigation Plan; MPC committee; data collection questionnaires

4.3 Implementation of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include an action strategy describing how the actions identified in paragraph (c)(2)(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 benefits review of the proposed projects and their associated costs.

Jurisdictional MPC members were encouraged to meet with others in their community to discuss the actions to be included in the updated mitigation strategy. Throughout the MPC consideration and discussion, emphasis was placed on the importance of a benefit-cost analysis in determining project priority. The Disaster Mitigation Act requires benefit-cost review as the primary method by which mitigation projects should be prioritized. The MPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the Missouri State Hazard Mitigation Plan. The benefit/cost review at the planning stage primarily consisted of a qualitative analysis, and was not the detailed process required grant funding application. For each action, the plan sets forth a narrative describing the types of benefits that could be realized from action implementation. The cost was estimated as closely as possible, with further refinement to be supplied as project development occurs.

FEMA's STAPLEE methodology was used to assess the costs and benefits, overall feasibility of mitigation actions, and other issues impacting project. During the prioritization process, the MPC worked together to review and assign scores. The process posed questions based on the STAPLEE elements as well as the potential mitigation effectiveness of each action. Scores were based on the responses to the questions as follows:

Definitely yes = 3 points
 Maybe yes = 2 points
 Probably no = 1
 Definitely no = 0

The following questions were asked for each proposed action.

- S: Is the action socially acceptable?
- T: Is the action technically feasible and potentially successful?
- A: Does the jurisdiction have the administrative capability to successfully implement this action?
- P: Is the action politically acceptable?
- L: Does the jurisdiction have the legal authority to implement the action?
- E: Is the action economically beneficial?
- E: Will the project have an environmental impact that is either beneficial or neutral? (score "3" if positive and "2" if neutral)

Will the implemented action result in lives saved?
 Will the implanted action result in a reduction of disaster damage?

In addition to the STAPLEE process, each action item was also reviewed for Benefit/Cost. These

two aspects of the prioritization process 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.

In addition, the group considered the cost of mitigation versus the long-term savings in relation to potential lives saved and property damage avoided.

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

The results of the STAPLEE process and Benefit/Cost analysis were then mailed out to all MPC members for feedback and consensus.

The final scores are listed below in the analysis of each action. Correspondence regarding the STAPLEE process is included in Appendix C: A spreadsheet with the action items and final scores is illustrated in Figure 4.1.

Jurisdictional Floodplain Management Programs

Every jurisdiction in Osage County, except Freeburg, regulates development in the floodplain by reviewing permit applications for all development including new and existing structures. Elevation certificates are required for all new construction, and existing structures with 50% or more damage following a flood are required to elevate. Floodplain maps are available in hard copy at each jurisdiction's courthouse or municipal building. Furthermore floodplain maps can be found online through FEMA's website <https://msc.fema.gov/portal>. Lastly, Osage Co. is the only jurisdiction currently participating in active monitoring activities within the floodplain.

Table 4.1. Jurisdictional Floodplain Ordinance Adoption Date

Community Name	Ordinance Adoption Date
Osage County	2012
Chamois	6-12-2012
*Freeburg	Not participating in the NFIP
Linn	2006
Meta	4-11-2012
Westphalia	3-1-2006, amended 9-19-2012

Source: Data Collection Questionnaires

* Listed as not participating in the NFIP per FEMA's Community Status Book Report¹; NSFHA (SEMA)

¹ www.fema.gov/cis/mo.html

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 1 = Prob NO 2 = Maybe YES 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
1.1.3	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
1.2.6	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.	2	1	2	2	2	1	2	12	IC, PD, LF, EMCC	8	-1	7	19	M
1.3.1	Provide information on tree trimming and dead tree removal programs to utility companies and local government.	3	2	2	3	3	2	2	17	IC, PD, LF, EMCC	8	-3	5	22	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	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-2	6	24	H
1.3.4	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).	3	2	2	3	3	1	2	16	IC, LF, EMCC	6	-5	1	17	M
1.3.5	Plan to identify standing pools of water (zika virus) and increase community awareness.	3	3	3	3	3	3	3	21	IC, LF, EMCC	8	-1	7	28	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
2.1.8	Elevate County Road 275 due to flooding.	2	2	2	2	3	3	1	15	PD, LF, EMCC	6	-3	3	18	M
2.1.9	Elevate structures to be compliant with flood ordinance.	1	2	2	1	3	1	2	12	IC, PD, LF, EMCC	8	-5	3	15	M
2.1.10	Increase culvert size as replacements are installed.	1	2	2	2	3	3	3	16	IC, PD, LF, EMCC	8	-1	7	23	H
2.1.11	Add culverts in areas as needed.	3	3	2	3	3	2	3	19	IC, EMCC	4	-2	4	21	H

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES		1 = Prob NO		2 = Maybe YES		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
2.2.1	Educate and raise awareness of residents, contractors, and cities on the dangers of floodplain development and the benefits of the National Flood Insurance Program.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
2.2.2	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements in cities.	3	2	2	3	3	3	3	19	IC, LF, EMCC	6	-1	5	24	H
3.2.3	Encourage local jurisdictions to participate in efforts to identify, assess and prioritize hazard mitigation projects throughout the county.	2	2	2	2	2	2	2	14	IC, PD, LF, EMCC	8	-3	5	19	M
3.3.1	Participating jurisdictions should regularly re-evaluate hazard mitigation plan and merge with other community planning.	2	2	2	2	2	2	1	11	IC, PD, LF, EMCC	8	-3	5	16	M
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	2	2	2	3	3	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
3.3.3	Dam safety and maintenance awareness including public announcements/reminders	2	2	1	2	3	1	2	13	IC, LF, EMCC	8	-3	5	18	M
3.3.4	Awareness campaign for well testing/protection	2	2	2	2	3	2	3	16	IC	2	-1	1	17	M
4.2.1	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.	2	2	2	1	3	2	2	14	IC, PD, LF, EMCC	8	-3	5	19	M
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.	2	1	1	2	3	1	2	12	IC, PD, LF, EMCC	8	-5	3	15	M
5.1.1	Provide information to all communities on the benefits and costs of developing storm water management plans.	2	1	1	2	3	1	3	13	IC, PD, LF, EMCC	8	-3	5	18	M
5.2.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.	1	2	1	1	2	2	2	11	IC, PD, LF, EMCC	8	-5	3	14	M
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.	1	2	2	1	2	2	2	12	IC, PD, LF, EMCC	8	-3	5	17	M
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.	2	1	1	2	2	1	3	12	IC, PD, LF, EMCC	8	-3	5	17	M
6.1.4	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.	2	1	1	2	2	1	3	12	IC, PD, LF, EMCC	8	-3	5	17	M

Figure 4.4 Prioritization of Hazard Mitigation Actions		3 = Def YES		1 = Prob NO		2 = Maybe YES		0 = Def NO.							
		S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
6.2.1	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole	2	2	2	2	2	1	2	13	IC, PD, LF, EMCC	8	-3	5	18	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.	2	2	1	2	3	1	2	13	IC, PD, LF, EMCC	8	-3	5	18	M
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.	2	3	2	2	3	2	3	17	PD, EMCC	4	-2	2	19	M
6.3.2	Encourage businesses (e.g. pharmacies) to invest in generators.	3	2	2	2	3	3	3	18	IC, LF, EMCC	8	-2	6	24	H

Osage County

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

Action 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.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Businesses are not always prepared to efficiently and effectively operate following a hazardous event – especially an event which results in power outage, loss of utilities, or structural damage. This action item will improve the preparedness of businesses.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.3
Name of Action or Project:	Promote development and implementation of emergency plans by businesses by providing examples on EMD website and raising awareness through public and social media.
Action or Project Description:	EMD will promote business emergency plans by providing examples through EMD website and other media outlets.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
Estimated Cost:	\$4,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	2 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
Progress Report	
Action Status	Continuing
Report of Progress	During the last update of the CEDS, a chapter on economic recovery and resiliency was added which is a tool for local leaders to reduce vulnerability to natural hazards and expedite recovery public and private infrastructure. Implementation progress has been restricted due to lack of funding to develop a program to encourage and assist businesses and public entities in developing emergency plans. EMDs are encouraged to share resources available through SEMA and FEMA on emergency planning for businesses and public entities and through chambers of commerce. Osage County EMD has a list of businesses and has sent out information and templates on business emergency plans.

Action 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.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with absence of data concerning natural disasters.
Hazard(s) Addressed:	Dam Failure, Land Subsidence/Sinkholes, Levee Failure, Tornado, and Wildfire/Urban Structural
Action or Project	
Action/Project Number:	1.2.6
Name of Action or Project:	Monitor developments in data availability for the purpose of improving hazard mitigation planning.
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission, local planners
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOPs, floodplain ordinance
Progress Report	
Action Status	In progress and on-going
Report of Progress	Some work has been done on this action item. The Missouri Department of Natural Resources has been working on a levee study that includes Osage County. When that data is made available, it will be incorporated into future revisions of the planning document.

Action 1.3.1: Provide information on tree trimming and dead tree removal programs to utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Power outages due to dead trees/over-hanging limbs
Hazard(s) Addressed:	Severe Storm (Hail/Wind), Tornado, and Severe Winter Weather
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
Action or Project Description:	Jurisdictions will continue to trim dead trees and over hanging limbs to prevent power outages during severe weather.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,500 - \$9,500
Benefits:	Losses avoided by implementing this action include damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Departments
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	The county’s road and bridge dept., along with electrical co-op will continue to trim dead trees and over hanging limbs to protect electrical lines and property.

Action 1.3.2: Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and inadequate road/bridge structures and impacts on residents and their property.
Hazard(s) Addressed:	Flood, earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
Action or Project Description:	Continue to examine road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown due to variables.
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Osage County Road and Bridge Department, Chamois Water and Street Superintendent, Freeburg Street Superintendent, Linn Water/Street/Utility Superintendent, Meta Water and Street Superintendent, Westphalia Water and Street Superintendent
Action/Project Priority:	24 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Local government capital improvement plans, budgets for road, bridge and utilities
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	The Osage County Road and Bridge Department reviews each project undertaken and searches for ways to improve it by upsizing culverts; moving projects to improve drainage, etc. The County also adopted road and bridge standards and a policy and procedures manual for improvements.

Action 1.3.4: Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/inadequate shelters for residents during storm events
Hazard(s) Addressed:	Severe Storm (Hail/Wind) and Tornado
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).
Action or Project Description:	Encourage investments in certified tornado safe rooms and storm shelters to be used during severe storms and tornado threats in areas with high population densities such as schools and large employers that do not currently have access to safe rooms.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown due to variables
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School districts, Osage County, city councils of all cities, EMDs
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	A community certified tornado safe room exists on the campus of Missouri State Technical College.

Action 1.3.5: Plan to identify standing pools of water and increase community awareness of the dangers of mosquito borne diseases such as the Zika virus.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Reducing risk of mosquito borne diseases
Hazard(s) Addressed:	Flooding, Severe Storm
Action or Project	
Action/Project Number:	1.3.5
Name of Action or Project:	Plan to identify standing pools of water and increase community awareness of the dangers of mosquito borne diseases such as the Zika virus.
Action or Project Description:	The Osage County Health Department will work to identify standing pools of water and increase community awareness of the dangers of mosquito borne diseases such as the Zika virus.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,500 - \$7,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Osage County Health Department
Action/Project Priority:	28 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	New
Report of Progress	New action item. No progress.

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

Action 2.1.2: Continue to evaluate and update emergency operation plans.

Action Worksheet	
Name of Jurisdiction:	Osage County, Chamois, Freeburg, Linn, Meta, Westphalia, Osage County R-I, Osage County R-II, Osage County R-III
Risk / Vulnerability	
Problem being Mitigated:	
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Continue to evaluate and update emergency operation plans.
Action or Project Description:	Jurisdictions will continue to work toward making sure that LEOPs and school crisis plans are evaluated regularly and updated as necessary.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDs
Action/Project Priority:	28 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, school crisis management plans
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	The county regularly reviews the county-wide LEOP. Schools are required to review and update emergency plans. Most cities rely on the county LEOP rather than maintaining plans of their own.

Action 2.1.8: Elevate County Road 725 due to flooding.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Road closures due to flooding and danger to people using the road.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.1.8
Name of Action or Project:	Elevate County Road 725
Action or Project Description:	Elevation of County Road 725 in order to mitigate the problem of the road being damaged and closed during flood events.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Osage County Commission and Road and Bridge Department
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	5 to 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plan
Progress Report	
Action Status	New
Report of Progress	New action item. No progress to date.

Action 2.1.9: Elevate structures to be compliant with flood ordinance.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.9
Name of Action or Project:	Elevate structures to be compliant with flood ordinance.
Action or Project Description:	Work with property owners to get all structures located in the flood plain in compliance with the county flood ordinance.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$5,500 - \$10,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County floodplain manager, County Commission
Action/Project Priority:	15 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services, Increased Cost of Compliance grants
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, county floodplain ordinance
Progress Report	
Action Status	New
Report of Progress	Osage County floodplain manager notifies those property owners who are required to elevate.

Action 2.1.10: Increase culvert size as replacements are installed.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Flooding and flood damage in areas where culverts are not large enough to handle water flow.
Hazard(s) Addressed:	Flooding, Severe Storm, Severe Winter Weather
Action or Project	
Action/Project Number:	2.1.10
Name of Action or Project:	Increase culvert size as replacements are installed.
Action or Project Description:	Increasing the size of culverts should become a routine activity as they are replaced by the county road and bridge department.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Departments, Osage County Commission
Action/Project Priority:	23 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Road and Bridge budget, capital improvements plan
Progress Report	
Action Status	New
Report of Progress	New action item. The County has replaced culverts with larger culverts in the past but this action item's intention is to make this practice a policy for the road and bridge department.

Action 2.1.11: Add culverts in areas as needed.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Flooding and flood damage in areas where culverts do not exist.
Hazard(s) Addressed:	Flooding, Severe Storm, Severe Winter Weather
Action or Project	
Action/Project Number:	2.1.11
Name of Action or Project:	Add culverts in areas as needed.
Action or Project Description:	The county road and bridge department will review areas of county roads that tend to flood, pool water or suffer flood damage and look for ways to install culverts to help improve drainage and reduce risk.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Departments, Osage County Commission
Action/Project Priority:	21 - High Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvements plan, road and bridge budget
Progress Report	
Action Status	New
Report of Progress	New action item. The County has installed culverts in drainage problem areas in the past but this action item's intention is to make this practice a policy for the road and bridge department.

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.

Action 3.2.3: Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Lack of communication between jurisdictions and related organizations for on-going mitigation planning.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.3
Name of Action or Project:	Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.
Action or Project Description:	Continue to encourage jurisdictions and related organizations to meet on at least an annual basis, or following a natural hazard disaster, to identify, assess and prioritize mitigation projects throughout the county.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Osage County Commission, Mayors of Argyle, Chamois, Freeburg, Linn, Meta, Westphalia, superintendents of Osage County R-I, R-II and R-III school districts
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, school crisis management plans, road and bridge capital improvement plans
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The county EMD regularly meets with jurisdictions and response agencies – routinely as well as following incidents. More focus will be placed on identifying, assessing and prioritizing mitigation actions.

Action 3.3.1: Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.
Action or Project Description:	Jurisdictions should schedule re-evaluations of the hazard mitigation plan and where applicable, merge hazard mitigation with other community planning activities.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Osage County Commission, city councils of Argyle, Chamois, Freeburg, Linn, Meta, Westphalia and superintendents of Osage County R-I, R-II and R-III school districts
Action/Project Priority:	16 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, comprehensive plans, capitol improvement plans, strategic plans
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	The Community Economic Development Strategy (CEDS) has incorporated hazard mitigation plans from the seven member counties. The Osage County Road and Bridge Department has incorporated mitigation activities into their regular maintenance program. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 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.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Community lack of knowledge regarding mitigation and mitigation activities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.2
Name of Action or Project:	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.
Action or Project Description:	Provide information on adopted mitigation measures to the public through press releases, brochures, website and FaceBook to help citizens stay current of changes and/or new developments and regulations – especially in regards to floodplain management.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, city EMDs
Action/Project Priority:	25 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, floodplain management ordinances
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	The county’s EMD currently maintains a website for emergency management and floodplain management. Information on projects within the jurisdictions is shared with local media to make residents aware. These include floodplain ordinance requirements and road and bridge upgrades.

Action 3.3.3: Dam safety and maintenance awareness including public announcements and reminders.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge and understanding by the general public of dam safety, maintenance and risks.
Hazard(s) Addressed:	Dam Failure
Action or Project	
Action/Project Number:	3.3.3
Name of Action or Project:	Dam safety and maintenance awareness
Action or Project Description:	Develop and disseminate information on dam safety, maintenance and the risks associated with dam failure to the general public.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD and Osage County Commission
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	New
Report of Progress	New action item. No progress.

Action 3.3.4: Awareness campaign for well testing/protection.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Awareness campaign for well testing/protection.
Hazard(s) Addressed:	Drought, Flooding
Action or Project	
Action/Project Number:	3.3.4
Name of Action or Project:	Awareness campaign for well testing/protection.
Action or Project Description:	The Osage County Health Department will develop and disseminate an awareness campaign for the general public on testing well water and wellhead protection.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts
Plan for Implementation	
Responsible Organization/Department:	Osage County Health Department
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	New
Report of Progress	New action item. No progress.

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

Action 4.2.1: Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge/information of officials in regards to mitigation planning, implementation, and budgeting for mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	4.2.1
Name of Action or Project:	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.
Action or Project Description:	Encourage meetings between EMDs, cities and county and SEMA representatives to familiarize local officials with mitigation planning, implementation and budgeting for mitigation projects.
Applicable Goal Statement:	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
Estimated Cost:	\$2,500 - \$3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, city EMDs, Local Elected Officials
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	The Region F SEMA area coordinator holds quarterly meetings in the region and discussions include a variety of topics, including mitigation. MRPC has provided information and presentations on mitigation at regular board meetings that included representatives from Osage County and its jurisdictions. Due to changes in elected officials, this is an ongoing activity.

Action 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.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into other planning tools such as comprehensive plans and capital improvement plans.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	4.2.2
Name of Action or Project:	Continue to encourage the incorporation of mitigation into other planning document and planning activities such as comprehensive plans and capital improvement plans.
Action or Project Description:	Merge mitigation plan and mitigation projects into other community planning and coordinate and integrate mitigation activities into other plans and planning tools – such as comprehensive plans, strategic plans and capital improvement plans.
Applicable Goal Statement:	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, City EMDs, Local Planners, City Administrators, MRPC
Action/Project Priority:	15 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, CEDS, comprehensive plans, strategic plans, capital improvement plans
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. The Osage County Road & Bridge Dept. has incorporated mitigation activities into their regular maintenance program. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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.

Action 5.1.1: Provide information to all communities on the benefits and costs of developing storm water management plans.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with non-existent stormwater management plans
Hazard(s) Addressed:	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Provide information to all communities on the benefits and costs of developing storm water management plans.
Action or Project Description:	Investigate and consider the benefits and costs of developing stormwater management plans.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local planners, economic developers
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain Ordinance, Comprehensive Plans, Hazard mitigation plan
Progress Report	
Action Status	Continuing Not Started
Report of Progress	No communities in Osage County currently have stormwater management plans.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.
Action or Project Description:	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.
Applicable Goal Statement:	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.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local Government, County and City EMDs, Floodplain Managers
Action/Project Priority:	14 –Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing Not Started
Report of Progress	No action has been taken to date.

Action 5.2.2: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with repetitive loss properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.2
Name of Action or Project:	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.
Action or Project Description:	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City Government, Local Planners, City EMDs, Floodplain Managers
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, Local Floodplain Management Ordinances
Progress Report	
Action Status	Continuing Not Started
Report of Progress	As this action is prioritized as medium, no action has been taken thus far.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.3: Work with state/local/federal agencies to include mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Lack of communication and coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with local/state/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Osage County Commission, Mayors of Argyle, Chamois, Freeburg, Linn, Meta, Westphalia, Local Planners, Local Economic Developers, Community Development Organizations, County and City EMDs
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, comprehensive plans, economic development plans, CEDS, capital improvement plans, land use plans, strategic plans
Progress Report	
Action Status	Continuing– in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, Osage County Commission, city councils of Argyle, Chamois, Freeburg, Linn, Meta and Westphalia, school boards of Osage County R-I, R-II, R-III school districts
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plans, strategic plans, comprehensive plans, CEDS, LEOP
Progress Report	
Action Status	Continuing in progress
Report of Progress	Road and bridge departments for the County and local communities generally try to incorporate larger culverts and other road improvements as repairs are made that further mitigation goals. As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners, and other funding for hazard mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Local mitigation cost-share programs.
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDs, Osage County Commission, city councils of Argyle, Chamois, Freeburg, Linn, Meta, Westphalia
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plans, comprehensive plans, strategic plans
Progress Report	
Action Status	Continuing - in progress
Report of Progress	Some of the communities will work with developers to cost-share projects that deal with storm water run-off. In some situations a community or the county will install a culvert if the individual pays for the culvert to insure that installation is done correctly and the culvert is sized appropriately. This is a program that could benefit from more organized guidelines and focused efforts if additional funding could be secured.

Action 6.2.2: Implement public awareness program about the program about the benefits of hazard mitigation projects, both public and private through press releases, brochures, EMD website and Facebook.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge among the general public on the importance / benefit of hazard mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.2.2
Name of Action or Project:	Public awareness program on hazard mitigation benefits
Action or Project Description:	Implement public awareness program about the program about the benefits of hazard mitigation projects, both public and private through press releases, brochures, EMD website and Facebook.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDs, Osage County Commission, mayors of Argyle, Chamois,
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, comprehensive plans, capital improvement plans, strategic plans
Progress Report	
Action Status	Continuing in progress
Report of Progress	There has been some progress on this activity. Press releases on the hazard mitigation plan raise awareness. Press releases and activities following disasters such as flooding raised awareness of mitigation and activities that local governments as well as private citizens can do to reduce their vulnerabilities to disasters. The county publicizes road and bridge improvements. This activity would benefit from the development and distribution or posting of brochures on hazard mitigation.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat of life, health, and property.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDS, County Commission, Local Governments, Local Planners, City/County Engineers, MPC
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	2 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Hazard mitigation projects are prioritized in the hazard mitigation plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

Action 6.3.2: Encourage businesses that provide essential services, such as pharmacies and medical services, to invest in generators.

Action Worksheet	
Name of Jurisdiction:	Osage County
Risk / Vulnerability	
Problem being Mitigated:	Loss of essential services during power outages
Hazard(s) Addressed:	Severe Storm, Tornado, Severe Winter Weather
Action or Project	
Action/Project Number:	6.3.7
Name of Action or Project:	Maintaining power to essential services businesses.
Action or Project Description:	Encourage businesses that provide essential services, such as pharmacies and medical services, to invest in generators.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	24 - High Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	New
Report of Progress	New action item. No progress.

Chamois

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

Action 1.3.1: Provide information on tree trimming and dead tree removal programs to utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Power outages due to dead trees/over-hanging limbs
Hazard(s) Addressed:	Severe Storm (Hail/Wind), Tornado, and Severe Winter Weather
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
Action or Project Description:	Jurisdictions will continue to trim dead trees and over hanging limbs to prevent power outages during severe weather.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$3,500 - \$7,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City water and street department, electric cooperative
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, utility budget
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The city's water and street dept., along with electrical co-op will continue to trim dead trees and over hanging limbs to protect electrical lines and property.

Action 1.3.2: Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and inadequate road/bridge structures and impacts on residents and their property.
Hazard(s) Addressed:	Flood, Earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Identify and prioritize mitigating road and bridge upgrades
Action or Project Description:	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City water and street department
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The city’s water and street dept. is working to do upgrades to roads and bridges within the community as funding allows.

Action 1.3.4: Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups
Hazard(s) Addressed:	Severe Storm (Hail/Wind) and Tornado
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of aldermen, school board
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing
Report of Progress	Due to the costs of building certified storm shelters, no progress has been made on this action item.

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

Action 2.1.2: Continue to evaluate and update emergency operation plans.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities to critical facilities and services during a disaster
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Maintaining an up-to-date emergency response plan.
Action or Project Description:	Continue to evaluate and update emergency operation plans on a regular basis.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD and emergency response services
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The local emergency planning committee provides an updated Annex H each year that can be inserted into the existing plan and used to update other sections of the plan.

Action 2.2.1: Educate and raise awareness of residents, contractors, and cities on the dangers of floodplain development and the benefits of the National Flood Insurance Program.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Lack of understanding by the general public on the dangers of floodplain development and benefits of the National Flood Insurance Program.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.2.1
Name of Action or Project:	Floodplain development awareness program
Action or Project Description:	Educate and raise awareness of residents, contractors, and cities on the dangers of floodplain development and the benefits of the National Flood Insurance Program.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$3,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, board of aldermen
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing– in progress
Report of Progress	Information on the floodplain is available through the county emergency management website. Chamois would benefit from a more aggressive program to educate the general public on floodplain development.

Action 2.2.2: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements in cities.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	The need to improve floodplain management enforcement procedures that will help reduce risk and vulnerability.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.2.2
Name of Action or Project:	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements in cities.
Action or Project Description:	The city floodplain manager, with the assistance of the board of aldermen, needs to establish enforcement procedures to make sure the city stays in compliance with the city floodplain management ordinance and NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$4,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City floodplain manager and board of aldermen
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Chamois floodplain management ordinance
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The city has a floodplain ordinance which it follows but would benefit from establishing procedures for enforcing the ordinance.

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.

Action 3.2.3: Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Need to identify, assess and prioritize hazard mitigation projects
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.3
Name of Action or Project:	Participating in efforts to identify, assess and prioritize hazard mitigation projects on a county-wide basis.
Action or Project Description:	Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of aldermen, floodplain manager, city EMD
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The county EMD regularly meets with jurisdictions and response agencies – routinely as well as following incidents. More focus will be placed on identifying, assessing and prioritizing mitigation actions.

Action 3.3.1: Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with not regularly reviewing updating the mitigation plan and incorporating mitigation activities into other planning documents such as strategic plans, comprehensive plans and emergency plans.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan and merge with other community plans.
Action or Project Description:	Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local planners, board of aldermen, MRPC
Action/Project Priority:	16 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Community Economic Development Strategy, LEOP
Progress Report	
Action Status	Continuing– in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. The Osage County Road & Bridge Dept. has incorporated mitigation activities into their regular maintenance program. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

Action 4.2.1: Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge/information of officials in regards to mitigation planning, implementation and budgeting for mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	4.2.1
Name of Action or Project:	Awareness/education program on mitigation for local officials
Action or Project Description:	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.
Applicable Goal Statement:	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local elected officials
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The Region F SEMA area coordinator holds quarterly meetings in the region and discussions include a variety of topics, including mitigation. MRPC has provided information and presentations on mitigation at regular board meetings that included representatives from Osage County and its jurisdictions.

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.

Action 5.1.1: Provide information to all communities on the benefits and costs of developing storm water management plans.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with non-existent stormwater management plans
Hazard(s) Addressed:	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Provide information to all communities on the benefits and costs of developing storm water management plans.
Action or Project Description:	Investigate and consider the benefits and costs of developing stormwater management plans.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$8,500
Benefits:	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local planners, economic developers
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain Management Ordinance, Comprehensive Plans
Progress Report	
Action Status	Continuing– not started
Report of Progress	Due to this action item being a medium priority, the small size of communities in Osage County and the lack of funding – no progress has been made on this action item.

Action 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.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	Acquisition of properties in the floodplain.
Action or Project Description:	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.
Applicable Goal Statement:	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.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager, board of aldermen
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to this action item having a medium priority and due to the cost of acquiring properties in the floodplain, this action item has not been started.

Action 5.2.2: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with repetitive loss properties.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.2
Name of Action or Project:	Discuss zoning repetitive loss properties as open space.
Action or Project Description:	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager, board of aldermen
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing – not started
Report of Progress	As this action has been prioritized as medium, no action has been taken to date.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.3: Work with state/local/federal agencies to include mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with local/state/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of aldermen, local planners, local economic developers and development organizations, city EMD
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of aldermen
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plan, comprehensive plan, CEDS, strategic plan, LEOP
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	Dam Failure, Earthquake, Flood, Landslide, Land Subsidence/Sinkholes, Levee Failure, Severe Storm (Hail/Wind), Tornado, Severe Winter Weather, and Wildfire
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Local mitigation cost-share programs.
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDs, County Commission, Local City Governments
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plans, comprehensive plans
Progress Report	
Action Status	Continuing – not started
Report of Progress	As this action item is medium priority, no action has been taken to date.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Chamois
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat of life, health, and property.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Board of Aldermen, Local Planners, MPC
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going – should be periodically reviewed and updated
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

Freeburg

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

Action 1.3.1: Provide information on tree trimming and dead tree removal programs to utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Power outages due to dead trees/over hanging limbs
Hazard(s) Addressed:	Severe Storm (Hail/Wind), Tornado, and Severe Winter Weather
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
Action or Project Description:	Jurisdictions will continue to trim dead trees and over hanging limbs to prevent power outages during severe weather.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$3,500 - \$9,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Departments, Electric Cooperative
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The county's road and bridge dept., along with electrical co-op will continue to trim dead trees and over hanging limbs to protect electrical lines and property.

Action 1.3.2: Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and inadequate road/bridge structures and impacts on residents and their property.
Hazard(s) Addressed:	Flood, Earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Reducing vulnerabilities of road and bridge infrastructure
Action or Project Description:	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown due to variables
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Department
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, capital improvements plan, city budget
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The city’s utility dept. is working to do upgrades to roads within the community as funding allows.

Action 1.3.4: Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups
Hazard(s) Addressed:	Severe Weather and Tornado
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown due to variables
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of trustees, city EMD, school boards
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	Due to this action item being medium priority and due to the cost of constructing certified tornado shelters, no progress has been made at this time in the Freeburg area. There is a certified tornado safe room located at the Missouri State Technical College just outside of Linn.

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

Action 2.1.2: Continue to evaluate and update emergency operation plans.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities to critical facilities and services during a disaster
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Maintaining an up-to-date emergency response plan.
Action or Project Description:	Continue to evaluate and update emergency operation plans.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD and emergency response services
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The local emergency planning committee provides an updated Annex H each year that can be inserted into the existing plan and used to update other sections of the plan.

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.

Action 3.2.3: Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.3
Name of Action or Project:	Identify, assess and prioritize hazard mitigation projects county-wide
Action or Project Description:	Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of aldermen, floodplain manager, city EMD
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	1 -5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	The county EMD regularly meets with jurisdictions and response agencies – routinely as well as following incidents. More focus will be placed on identifying, assessing and prioritizing mitigation actions.

Action 3.3.1: Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evalute hazard mitigation plans regularly and merge with other community planning
Action or Project Description:	Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of trustees, local planners, MRPC
Action/Project Priority:	16 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, CEDS,
Progress Report	
Action Status	Continuing– in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). Mitigation actions are part of the LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

Action 4.2.1: Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge/information of officials in regards to mitigation planning, implementation and budgeting for mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	4.2.1
Name of Action or Project:	Awareness/education program on mitigation for local officials.
Action or Project Description:	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.
Applicable Goal Statement:	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of trustees
Action/Project Priority:	19- Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	The Region F SEMA area coordinator holds quarterly meetings in the region and discussions include a variety of topics, including mitigation. MRPC has provided information and presentation on mitigation at regular board meetings that included representatives from Osage County and its jurisdictions.

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.

Action 5.1.1: Provide information to all communities on the benefits and costs of developing storm water management plans.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with non-existent stormwater management plans
Hazard(s) Addressed:	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Provide information to all communities on the benefits and costs of developing storm water management plans.
Action or Project Description:	Investigate and consider the benefits and costs of developing stormwater management plans.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$8,500
Benefits:	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local planners, economic developers
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain Management Ordinance, Comprehensive Plans
Progress Report	
Action Status	Continuing - not started
Report of Progress	Due to this action item being a medium priority, the small size of communities in Osage County and the lack of funding – no progress has been made on this action item.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.3: Work with state/local/federal agencies to include mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with local/state/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of trustees, local planners, local economic developers and development organizations, city EMD
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of trustees
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plan, comprehensive plan, CEDS, strategic plan, LEOP
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	Dam Failure, Earthquake, Flood, Landslide, Land Subsidence/Sinkholes, Levee Failure, Sever Storm (Hail/Wind), Tornado, Severe Winter Weather, and Wildfire
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Local mitigation cost-share programs.
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDs, County Commission, Local City Governments
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plans, comprehensive plans
Progress Report	
Action Status	Continuing – not started
Report of Progress	As this action item is medium priority, no action has been taken to date.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Freeburg
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat of life, health, and property.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDS, County Commission, Local Governments, Local Planners, City/County Engineers, MPC
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the community.

Linn

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

Action 1.3.1: Provide information on tree trimming and dead tree removal programs to utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Power outages due to dead trees/over hanging limbs
Hazard(s) Addressed:	Severe Storm (Hail/Wind), Tornado, and Severe Winter Weather
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
Action or Project Description:	Jurisdictions will continue to trim dead trees and over hanging limbs to prevent power outages during severe weather.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$3,500 - \$7,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Departments
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, utility budget
Progress Report	
Action Status	Continuing in progress
Report of Progress	The city's water, street and utilities department, along with electrical co-op will continue to trim dead trees and over hanging limbs to protect electrical lines and property.

Action 1.3.2: Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and inadequate road/bridge structures and impacts on residents and their property.
Hazard(s) Addressed:	Flood, Earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Identify and prioritize mitigating road and bridge upgrades
Action or Project Description:	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Departments
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The city's water, street and utilities dept., is working to do upgrades to roads and bridges within the community as funding allows.

Action 1.3.4: Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups.
Hazard(s) Addressed:	Severe Storm (Hail/Wind) and Tornado
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of aldermen, school board
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	There is a certified tornado safe room on the campus of the Missouri State Technical College just outside of Linn.

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

Action 2.1.2: Continue to evaluate and update emergency operation plans.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities to critical facilities and services during a disaster.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Maintain a current emergency operations plan.
Action or Project Description:	Continue to evaluate and update emergency operation plans.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Departments
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The local emergency planning committee provides an updated Annex H each year that can be inserted into the existing plan and used to update other sections of the plan.

Action 2.2.1: Educate and raise awareness of residents, contractors, and cities on the dangers of floodplain development and the benefits of the National Flood Insurance Program.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Lack of understanding by the general public on the dangers of floodplain development and benefits of the National Flood Insurance Program.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.2.1
Name of Action or Project:	Floodplain development awareness program
Action or Project Description:	Educate and raise awareness of residents, contractors, and cities on the dangers of floodplain development and the benefits of the National Flood Insurance Program.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$3,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager, board of aldermen
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing in progress
Report of Progress	Information on the floodplain is available through the county emergency management website. Linn would benefit from a more aggressive program to educate the general public on floodplain development.

Action 2.2.2: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements in cities.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	The need to improve floodplain management enforcement procedures that will help reduce risk and vulnerability.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.2.2
Name of Action or Project:	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements in cities.
Action or Project Description:	The city floodplain manager, with the assistance of the board of aldermen, needs to establish enforcement procedures to make sure the city stays in compliance with the city floodplain management ordinance and NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$4,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City floodplain manager and board of aldermen
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Linn floodplain management ordinance
Progress Report	
Action Status	Continuing in progress
Report of Progress	The city has a floodplain ordinance which it follows but would benefit from establishing procedures for enforcing the ordinance.

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.

Action 3.2.3: Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Need to identify, assess and prioritize hazard mitigation projects
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.3
Name of Action or Project:	Participating in efforts to identify, assess and prioritize hazard mitigation projects on a county-wide basis.
Action or Project Description:	Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of aldermen, floodplain manager, city EMD
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The county EMD regularly meets with jurisdiction and response agencies – routinely as well as following incidents. More focus will be placed on identifying, assessing and prioritizing mitigation actions.

Action 3.3.1: Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with not regularly reviewing, updating the mitigation plan and incorporating mitigation activities into other planning documents such as strategic plans, comprehensive plans and emergency plans.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan and merge with other community plans.
Action or Project Description:	Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local planners, board of aldermen, MPC
Action/Project Priority:	16 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, CEDS
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

Action 4.2.1: Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge/information of officials in regards to mitigation planning, implementation and budgeting for mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	4.2.1
Name of Action or Project:	Awareness/education program on mitigation for local officials.
Action or Project Description:	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.
Applicable Goal Statement:	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local elected officials
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The Region F SEMA area coordinator holds quarterly meetings in the region and discussions include a variety of topics, including mitigation. MRPC has provided information and presentations on mitigation at regular board meetings that included representatives from Osage County and its jurisdictions.

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.

Action 5.1.1: Provide information to all communities on the benefits and costs of developing storm water management plans.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with non-existent stormwater management plans
Hazard(s) Addressed:	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Provide information to all communities on the benefits and costs of developing storm water management plans.
Action or Project Description:	Investigate and consider the benefits and costs of developing stormwater management plans.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$8,500
Benefits:	Losses avoided by implementing this action include damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local planners, economic developers
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	5 – 10 years 6
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain Ordinance, Comprehensive Plans
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to this item being a medium priority, the small size of communities in Osage County and the lack of funding – no progress has been made on this action item.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	Acquisition of properties in the floodplain.
Action or Project Description:	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.
Applicable Goal Statement:	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.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager, board of aldermen
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to this action item having a medium priority and due to the cost of acquiring properties in the floodplain, this action item has not been started.

Action 5.2.2: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with repetitive loss properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.2
Name of Action or Project:	Discuss zoning repetitive loss properties as open space.
Action or Project Description:	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager, board of aldermen
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing – not started
Report of Progress	As this action has been prioritized as medium, no action has been taken to date.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.3: Work with state/local/federal agencies to include mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with local/state/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of aldermen, local planners, local economic developers and development organizations, city EMD
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	1 -1 0 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plan, comprehensive plan, economic development plan, CEDS, strategic plan, land-use plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of aldermen
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, capital improvement plan, comprehensive plan, CEDS, strategic plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	Dam Failure, Earthquake, Flood, Landslide, Land Subsidence/Sinkholes, Levee Failure, Sever Storm (Hail/Wind), Tornado, Severe Winter Weather, and Wildfire
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Local mitigation cost-share programs.
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of aldermen
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plans, comprehensive plans
Progress Report	
Action Status	Continuing – not started
Report of Progress	As this action item is medium priority, no action has been taken to date.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Linn
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat of life, health, and property.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDS, County Commission, Local Governments, Local Planners, City/County Engineers, MPC
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going – should be periodically reviewed and updated
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the community.

Meta

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

Action 1.3.1: Provide information on tree trimming and dead tree removal programs to utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Power outages due to dead trees/over hanging limbs
Hazard(s) Addressed:	Severe Storm (Hail/Wind), Tornado, and Severe Winter Weather
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
Action or Project Description:	Jurisdictions will continue to trim dead trees and over hanging limbs to prevent power outages during severe weather.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$3,500 - \$7,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City water, street and utility department, electric cooperative
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, utility budget
Progress Report	
Action Status	Continuing in progress
Report of Progress	The city's street dept., along with electrical co-op will continue to trim dead trees and over hanging limbs to protect electrical lines and property.

Action 1.3.2: Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and inadequate road/bridge structures and impacts on residents and their property
Hazard(s) Addressed:	Flood, Earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Identify and prioritize mitigating road and bridge upgrades
Action or Project Description:	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Departments
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The city's water, street and utilities department is working to do upgrades to roads and bridges within the community as funding allows.

Action 1.3.4: Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups
Hazard(s) Addressed:	Severe Storm (Hail/Wind) and Tornado
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of aldermen, school board
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to the costs of building certified storm shelters, no progress has been made on this action item.

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

Action 2.1.2: Continue to evaluate and update emergency operation plans.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities to critical facilities and services during a disaster
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Maintaining an up-to-date emergency response plan.
Action or Project Description:	Continue to evaluate and update emergency operation plans.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD and emergency response agencies
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The local emergency planning committee provides an updated Annex H each year that can be inserted into the existing plan and used to update other sections of the plan.

Action 2.2.1: Educate and raise awareness of residents, contractors, and cities on the dangers of floodplain development and the benefits of the National Flood Insurance Program.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Lack of understanding by the general public on the dangers of floodplain development and benefits of the National Flood Insurance Program.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.2.1
Name of Action or Project:	Floodplain development awareness program
Action or Project Description:	Educate and raise awareness of residents, contractors, and cities on the dangers of floodplain development and the benefits of the National Flood Insurance Program.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$3,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager, board of aldermen
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing in progress
Report of Progress	Information on the floodplain is available through the county emergency management website and from the contracted floodplain management coordinator for the city of Meta. The floodplain coordinator has presented information at community information meetings and mailed information on floodplain management to residents who have property in the floodplain.

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.

Action 3.2.3: Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Need to identify, assess and prioritize hazard mitigation projects
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.3
Name of Action or Project:	Participating in efforts to identify, assess and prioritize hazard mitigation projects on a county-wide basis.
Action or Project Description:	Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of aldermen, floodplain manager, city EMD
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The county EMD regularly meets with jurisdictions and response agencies – routinely as well as following incidents. More focus will be placed on identifying, assessing and prioritizing mitigation actions.

Action 3.3.1: Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with not regularly reviewing updating the mitigation plan and incorporating mitigation activities into other planning documents such as strategic plans, comprehensive plans and emergency plans.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan and merge with other community plans.
Action or Project Description:	Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local planners, board of aldermen, MRPC
Action/Project Priority:	16 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, Community Economic Development Strategy, strategic plan, comprehensive plan, land-use plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

Action 4.2.1: Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge/information of officials in regards to mitigation planning, implementation and budgeting for mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	4.2.1
Name of Action or Project:	Awareness/education program on mitigation for local officials.
Action or Project Description:	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.
Applicable Goal Statement:	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local elected officials
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The Region F SEMA area coordinator holds quarterly meetings in the region and discussions include a variety of topics, including mitigation. MRPC has provided information and presentations on mitigation at regular board meetings that included representatives from Osage County and its jurisdictions.

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.

Action 5.1.1: Provide information to all communities on the benefits and costs of developing storm water management plans.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with non-existent stormwater management plans
Hazard(s) Addressed:	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Provide information to all communities on the benefits and costs of developing storm water management plans.
Action or Project Description:	Investigate and consider the benefits and costs of developing stormwater management plans.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$8,500
Benefits:	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local planners, economic developers
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain Ordinance, Comprehensive Plans
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to this action item being a medium priority, the small size of communities in Osage County and the lack of funding – no progress has been made on this action item.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	Acquisition of properties in the floodplain.
Action or Project Description:	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.
Applicable Goal Statement:	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.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager, board of aldermen
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to this action item having a medium priority and due to the cost of acquiring properties in the floodplain, this action item has not been started.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.3: Work with state/local/federal agencies to include mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with local/state/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of aldermen, local planners, local economic developers and development organizations, city EMD
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of aldermen
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, capital improvement plan, comprehensive plan, CEDS, strategic plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	Dam Failure, Earthquake, Flood, Landslide, Land Subsidence/Sinkholes, Levee Failure, Sever Storm (Hail/Wind), Tornado, Severe Winter Weather, and Wildfire
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Local mitigation cost-share programs.
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDs, County Commission, Local City Governments
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plans, comprehensive plans
Progress Report	
Action Status	Continuing – not started
Report of Progress	As this action item is a medium priority, no action has been taken to date.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Meta
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat of life, health, and property.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDS, County Commission, Local Governments, Local Planners, City/County Engineers, MPC
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an ongoing activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the community.

Westphalia

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

Action 1.3.1: Provide information on tree trimming and dead tree removal programs to utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Power outages due to dead trees/over hanging limbs
Hazard(s) Addressed:	Severe Storm (Hail/Wind), Tornado, and Severe Winter Weather
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
Action or Project Description:	Jurisdictions will continue to trim dead trees and over hanging limbs to prevent power outages during severe weather.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$3,500 - \$7,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City water, street and utility department, electric cooperative
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, utility budget
Progress Report	
Action Status	Continuing in progress
Report of Progress	The city's street dept., along with electrical co-op will continue to trim dead trees and over hanging limbs to protect electrical lines and property.

Action 1.3.2: Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and inadequate road/bridge structures and impacts on residents and their property
Hazard(s) Addressed:	Flood, Earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Identify and prioritize mitigating road and bridge upgrades
Action or Project Description:	Continue to identify and prioritize potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and Bridge/Utility Department
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The city's water, street and utilities department is working to do upgrades to roads and bridges within the community as funding allows.

Action 1.3.4: Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups
Hazard(s) Addressed:	Severe Storm (Hail/Wind) and Tornado
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of aldermen, school board
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to the costs of building certified storm shelters, no progress has been made on this action item.

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

Action 2.1.2: Continue to evaluate and update emergency operation plans.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities to critical facilities and services during a disaster
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Maintaining an up-to-date emergency response plan.
Action or Project Description:	Continue to evaluate and update emergency operation plans.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD and emergency response agencies
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The local emergency planning committee provides an updated Annex H each year that can be inserted into the existing plan and used to update other sections of the plan.

Action 2.2.1: Educate and raise awareness of residents, contractors, and cities on the dangers of floodplain development and the benefits of the National Flood Insurance Program.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Lack of understanding by the general public on the dangers of floodplain development and benefits of the National Flood Insurance Program.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.2.1
Name of Action or Project:	Floodplain development awareness program
Action or Project Description:	Educate and raise awareness of residents, contractors, and cities on the dangers of floodplain development and the benefits of the National Flood Insurance Program.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$3,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager, board of aldermen
Action/Project Priority:	22 - High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing in progress
Report of Progress	Information on the floodplain is available through the county emergency management website and from the contracted floodplain management coordinator for the city of Meta. The floodplain coordinator has presented information at community information meetings and mailed information on floodplain management to residents who have property in the floodplain.

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.

Action 3.2.3: Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Need to identify, assess and prioritize hazard mitigation projects
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.3
Name of Action or Project:	Participating in efforts to identify, assess and prioritize hazard mitigation projects on a county-wide basis.
Action or Project Description:	Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of aldermen, floodplain manager, city EMD
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The county EMD regularly meets with jurisdictions and response agencies – routinely as well as following incidents. More focus will be placed on identifying, assessing and prioritizing mitigation actions.

Action 3.3.1: Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with not regularly reviewing updating the mitigation plan and incorporating mitigation activities into other planning documents such as strategic plans, comprehensive plans and emergency plans.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan and merge with other community plans.
Action or Project Description:	Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local planners, board of aldermen, MRPC
Action/Project Priority:	16 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, Community Economic Development Strategy, strategic plan, comprehensive plan, land-use plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

Action 4.2.1: Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge/information of officials in regards to mitigation planning, implementation and budgeting for mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	4.2.1
Name of Action or Project:	Awareness/education program on mitigation for local officials.
Action or Project Description:	Encourage meetings between EMD, city/county, and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.
Applicable Goal Statement:	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local elected officials
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The Region F SEMA area coordinator holds quarterly meetings in the region and discussions include a variety of topics, including mitigation. MRPC has provided information and presentations on mitigation at regular board meetings that included representatives from Osage County and its jurisdictions.

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.

Action 5.1.1: Provide information to all communities on the benefits and costs of developing storm water management plans.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with non-existent stormwater management plans
Hazard(s) Addressed:	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Provide information to all communities on the benefits and costs of developing storm water management plans.
Action or Project Description:	Investigate and consider the benefits and costs of developing stormwater management plans.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$8,500
Benefits:	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local planners, economic developers
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain Ordinance, Comprehensive Plans
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to this action item being a medium priority, the small size of communities in Osage County and the lack of funding – no progress has been made on this action item.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	Acquisition of properties in the floodplain.
Action or Project Description:	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/retention area.
Applicable Goal Statement:	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.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager, board of aldermen
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, floodplain management ordinance
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to this action item having a medium priority and due to the cost of acquiring properties in the floodplain, this action item has not been started.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.3: Work with state/local/federal agencies to include mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with local/state/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Board of aldermen, local planners, local economic developers and development organizations, city EMD
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, board of aldermen
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, capital improvement plan, comprehensive plan, CEDS, strategic plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	Dam Failure, Earthquake, Flood, Landslide, Land Subsidences/Sinkholes, Levee Failure, Sever Storm (Hail/Wind), Tornado, Severe Winter Weather, and Wildfire
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Local mitigation cost-share programs.
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDs, County Commission, Local City Governments
Action/Project Priority:	18 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plans, comprehensive plans
Progress Report	
Action Status	Continuing – not started
Report of Progress	As this action item is a medium priority, no action has been taken to date.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Westphalia
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat of life, health, and property.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and City EMDS, County Commission, Local Governments, Local Planners, City/County Engineers, MPC
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an ongoing activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the community.

Osage County R-I:

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

Action 1.3.4: Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).

Action Worksheet	
Name of Jurisdiction:	Osage County R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups
Hazard(s) Addressed:	Severe Storm (Hail/Wind) and Tornado
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School board
Action/Project Priority:	17- Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to the cost of building certified storm shelters, no progress has been made on this action item.

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

Action 2.1.2: Continue to evaluate and update emergency operation plans.

Action Worksheet	
Name of Jurisdiction:	Osage County R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities to critical facilities and services during a disaster
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Maintaining an up-to-date school crisis/emergency plan
Action or Project Description:	Continue to evaluate and update emergency operation plans.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School superintendent, school board, local emergency response agencies
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, school crisis/emergency plan, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The school district is required to periodically review and update the school crisis/emergency plan.

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.

Action 3.2.3: Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.

Action Worksheet	
Name of Jurisdiction:	Osage County R-I
Risk / Vulnerability	
Problem being Mitigated:	Need to identify, assess and prioritize hazard mitigation projects
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.3
Name of Action or Project:	Participating in efforts to identify, assess and prioritize hazard mitigation projects on a county-wide basis.
Action or Project Description:	Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, school board
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	School crisis/emergency plan, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The county EMD regularly meets with jurisdictions and response agencies – routinely as well as following incidents. More focus will be placed on identifying, assessing and prioritizing mitigation actions.

Action 3.3.1: Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.

Action Worksheet	
Name of Jurisdiction:	Osage County R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with not regularly reviewing updating the mitigation plan and incorporating mitigation activities into other planning documents such as strategic plans, comprehensive plans and emergency plans.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan and merge with other community/school plans
Action or Project Description:	Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, school board, principals
Action/Project Priority:	16 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, Community Economic Development Strategy, school crisis/emergency plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.4: Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Osage County R-I
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, school board
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, capital improvement plan, school crisis/emergency plan,
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Osage County R-I
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat of life, health, and property.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, principals, school board, MPC
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going – should be periodically reviewed and updated
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the district.

Osage County R-II:

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

Action 1.3.4: Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).

Action Worksheet	
Name of Jurisdiction:	Osage County R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups
Hazard(s) Addressed:	Severe Storm (Hail/Wind) and Tornado
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School board
Action/Project Priority:	17- Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to the cost of building certified storm shelters, no progress has been made on this action item.

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

Action 2.1.2: Continue to evaluate and update emergency operation plans.

Action Worksheet	
Name of Jurisdiction:	Osage County R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities to critical facilities and services during a disaster
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Maintaining an up-to-date school crisis/emergency plan
Action or Project Description:	Continue to evaluate and update emergency operation plans.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School superintendent, school board, local emergency response agencies
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, school crisis/emergency plan, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The school district is required to periodically review and update the school crisis/emergency plan.

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.

Action 3.2.3: Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.

Action Worksheet	
Name of Jurisdiction:	Osage County R-II
Risk / Vulnerability	
Problem being Mitigated:	Need to identify, assess and prioritize hazard mitigation projects
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.3
Name of Action or Project:	Participating in efforts to identify, assess and prioritize hazard mitigation projects on a county-wide basis.
Action or Project Description:	Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, school board
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	School crisis/emergency plan, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The county EMD regularly meets with jurisdictions and response agencies – routinely as well as following incidents. More focus will be placed on identifying, assessing and prioritizing mitigation actions.

Action 3.3.1: Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.

Action Worksheet	
Name of Jurisdiction:	Osage County R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with not regularly reviewing updating the mitigation plan and incorporating mitigation activities into other planning documents such as strategic plans, comprehensive plans and emergency plans.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan and merge with other community/school plans
Action or Project Description:	Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, school board, principals
Action/Project Priority:	16 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, Community Economic Development Strategy, school crisis/emergency plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.4: Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects..

Action Worksheet	
Name of Jurisdiction:	Osage County R-II
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, school board
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, capital improvement plan, school crisis/emergency plan,
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Osage County R-II
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat of life, health, and property.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, principals, school board, MPC
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going – should be periodically reviewed and updated
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the district.

Osage County R-III:

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

Action 1.3.4: Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).

Action Worksheet	
Name of Jurisdiction:	Osage County R-III
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups
Hazard(s) Addressed:	Severe Storm (Hail/Wind) and Tornado
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School board
Action/Project Priority:	17- Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – not started
Report of Progress	Due to the cost of building certified storm shelters, no progress has been made on this action item.

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

Action 2.1.2: Continue to evaluate and update emergency operation plans.

Action Worksheet	
Name of Jurisdiction:	Osage County R-III
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities to critical facilities and services during a disaster
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Maintaining an up-to-date school crisis/emergency plan
Action or Project Description:	Continue to evaluate and update emergency operation plans.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School superintendent, school board, local emergency response agencies
Action/Project Priority:	22 - High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, school crisis/emergency plan, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The school district is required to periodically review and update the school crisis/emergency plan.

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.

Action 3.2.3: Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.

Action Worksheet	
Name of Jurisdiction:	Osage County R-III
Risk / Vulnerability	
Problem being Mitigated:	Need to identify, assess and prioritize hazard mitigation projects
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.3
Name of Action or Project:	Participating in efforts to identify, assess and prioritize hazard mitigation projects on a county-wide basis.
Action or Project Description:	Encourage local jurisdictions to participate in efforts to identify, assess, and prioritize hazard mitigation projects throughout the county.
Applicable Goal Statement:	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.
Estimated Cost:	\$2,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, school board
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	School crisis/emergency plan, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The county EMD regularly meets with jurisdictions and response agencies – routinely as well as following incidents. More focus will be placed on identifying, assessing and prioritizing mitigation actions.

Action 3.3.1: Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.

Action Worksheet	
Name of Jurisdiction:	Osage County R-III
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with not regularly reviewing updating the mitigation plan and incorporating mitigation activities into other planning documents such as strategic plans, comprehensive plans and emergency plans.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan and merge with other community/school plans
Action or Project Description:	Participating jurisdictions should regularly re-evaluate hazard mitigation plans and merge with other community planning.
Applicable Goal Statement:	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.
Estimated Cost:	\$3,500 - \$6,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, school board, principals
Action/Project Priority:	16 - Medium Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, Community Economic Development Strategy, school crisis/emergency plan
Progress Report	
Action Status	Continuing– in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.4: Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Osage County R-III
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, school board
Action/Project Priority:	17 - Medium Priority
Timeline for Completion:	3 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, capital improvement plan, school crisis/emergency plan,
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Osage County R-III
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat of life, health, and property.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$1,500 - \$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, principals, school board, MPC
Action/Project Priority:	19 - Medium Priority
Timeline for Completion:	On-going – should be periodically reviewed and updated
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the district.

5 PLAN MAINTENANCE PROCESS

5 PLAN MAINTENANCE PROCESS	5.1
<i>5.1 Monitoring, Evaluating, and Updating the Plan.....</i>	<i>5.1</i>
5.1.1 Responsibility for Plan Maintenance	5.1
5.1.2 Plan Maintenance Schedule	5.2
5.1.3 Plan Maintenance Process.....	5.2
<i>5.2 Incorporation into Existing Planning Mechanisms</i>	<i>5.3</i>
<i>5.3 Continued Public Involvement</i>	<i>5.5</i>

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

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.

5.1.1 Responsibility for 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.

A key component of the ongoing plan monitoring, evaluating and updating will be the Osage County Hazard Mitigation Planning Committee (MPC). In order to carry out the activities necessary for maintaining the plan, the MPC 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 MPC are:

- Meet annually, and after a disaster event, to monitor and evaluate the implementation of the plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low or no-cost recommended actions;
- Maintain vigilant monitoring of multi-objective, cost-share, and other funding opportunities to help the community implement the plan’s recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;

- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Report on plan progress and recommended changes to the County Board of Supervisors and governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

The MPC (or other designated responsible entity) is an advisory body and can only make recommendations to county, city, town, or district elected officials. Its primary duty is to see the plan successfully carried out and to report to the community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information in areas accessible to the public.

5.1.2 Plan Maintenance Schedule

The MPC (or other designated responsible entity) agrees to meet annually and after a state or federally declared hazard event, as appropriate, to monitor progress and update the mitigation strategy. The Osage County Emergency Management Director will be responsible for initiating the plan reviews and will invite members of the MPC (or other designated responsible entity) to the meeting.

In coordination with all participating jurisdictions, a five-year written update of the plan will be submitted to the Missouri State Emergency Management Agency (SEMA) and FEMA Region VII per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule.

5.1.3 Plan Maintenance Process

Progress on the proposed actions can be monitored by evaluating changes in vulnerabilities identified in the plan. The MPC (or other designated responsible entity) during the annual meeting should review changes in vulnerability identified as follows:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions;
- Increased vulnerability due to hazard events; and/or
- Increased vulnerability as a result of new development (and/or annexation).

Future 5-year updates to this plan will include the following activities:

- Consideration of changes in vulnerability due to action implementation;
- Documentation of success stories where mitigation efforts have proven effective;
- Documentation of unsuccessful mitigation actions and why the actions were not effective;
- Documentation of previously overlooked hazard events that may have occurred since the previous plan approval;
- Incorporation of new data or studies with information on hazard risks;
- Incorporation of new capabilities or changes in capabilities;

- Incorporation of growth data and changes to inventories; and
- Incorporation of ideas for new actions and changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the participating jurisdictions will adopt the following process:

- Each proposed action in the plan identified an individual, office, or agency responsible for action implementation. This entity will track and report on an annual basis to the jurisdictional MPC (or designated responsible entity) member on action status. The entity will provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing risk.
- If the action does not meet identified objectives, the jurisdictional MPC (or designated responsible entity) member will determine necessary remedial action, making any required modifications to the plan.

Changes will be made to the plan to remedy actions that have failed or are not considered feasible. Feasibility will be determined after a review of action consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring of this plan. Updating of the plan will be accomplished by written changes and submissions, as the MPC (or designated responsible entity) deems appropriate and necessary. Changes will be approved by the Osage County Hazard Mitigation Planning Committee and the governing boards of the other participating jurisdictions.

5.2 Incorporation into Existing Planning Mechanisms

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.

Where possible, plan participants, including school and special districts, will use existing plans and/or programs to implement hazard mitigation actions. Additionally, as jurisdictions review and update existing planning mechanisms, relevant action items and data from the HMP will be integrated. Those existing plans and programs were described in **Section 2.2** of this plan. Based on the capability assessments of the participating jurisdictions, communities in Osage County will continue to plan and implement programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through the following plans:

- Regional Comprehensive Economic Development Strategy (CEDS) document
- General or master plans of participating jurisdictions;
- Ordinances of participating jurisdictions;
- Osage County Local Emergency Operations Plan (LEOP);
- Capital improvement plans and budgets;
- Other community plans within the County, such as water conservation plans, storm water management plans, and parks and recreation plans;
- School and Special District Plans and budgets; and
- Other plans and policies outlined in the capability assessment sections for each jurisdiction in Chapter 2 of this plan.

The MPC (or designated responsible entity) members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The MPC (or designated responsible entity) is also responsible for monitoring this integration and incorporation of the appropriate information into the five-year update of the multi-jurisdictional hazard mitigation plan.

Additionally, after the annual review of the Hazard Mitigation Plan, the Osage County Emergency Management Director (EMD) will provide the updated Mitigation Strategy with current status of each mitigation action to the County (Boards of Supervisors or Commissions) as well as all Mayors, City Clerks, and School District Superintendents. The EMD will request that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms.

Table 1.1 below lists the planning mechanisms by jurisdiction into which the Hazard Mitigation Plan will be integrated.

Table 1.1. Planning Mechanisms Identified for Integration of Hazard Mitigation Plan

Jurisdiction	Planning Mechanisms
Unincorporated Osage County	County Emergency Operations Plan County Mitigation Plan Debris Management Plan (In-Progress) Regional Transportation Plan Regional CEDS (Comprehensive Economic Development Strategy)
Chamois	County Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Regional CEDS (Comprehensive Economic Development Strategy)
Freeburg	County Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Regional CEDS (Comprehensive Economic Development Strategy)
Linn	County Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Regional CEDS (Comprehensive Economic Development Strategy)
Meta	City Emergency Operations Plan County Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Regional CEDS (Comprehensive Economic Development Strategy)
Westphalia	County Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Regional CEDS (Comprehensive Economic

Jurisdiction	Planning Mechanisms
	Development Strategy)
Osage Co. R-I	Master Plan Capital Improvement Plan School Emergency Plan Weapons Policy
Osage Co. R-II	Capital Improvements Plan School Emergency Plan Weapons Policy
Osage Co. R-III	Master Plan Capital Improvement Plan School Emergency Plan Weapons Policy

Source: Jurisdiction surveys 2017

Including hazard mitigation is now routine for any planning projects or plan updates carried out by the Meramec Regional Planning Commission (MRPC). Applicable goals and action items from hazard mitigation plans have been incorporated into the regional transportation plan as well as the Community Economic Development Strategy for the region. Both of these documents are resources for cities and counties within the eight county area and are updated on a regular basis with input from city and county representatives. This review and update process has helped city and county representatives better understand and appreciate the importance of including hazard mitigation in all applicable plans. In addition, MRPC and the hazard mitigation planning committee are also working to encourage the incorporation of hazard mitigation into the planning activities of all local governments, school districts and local entities through presentations and participation in planning activities.

5.3 Continued Public Involvement

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.

The hazard mitigation plan update process provides an opportunity to publicize success stories resulting from the plan’s implementation and seek additional public comment. Information about the annual reviews will be posted in the local newspaper as well as on the Meramec Regional Planning Commission’s website following each annual review of the mitigation plan. When the MPC reconvenes for the five-year update, it will coordinate with all stakeholders participating in the planning process. Included in this group will be those who joined the MPC after the initial effort to update and revise the plan. Public notice will be posted and public participation will be actively solicited, at a minimum, through available website postings and press releases to local media outlets, primarily newspapers.

6 Appendix

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B: Planning Process	6.6
C: Adoption Resolutions	6.27
D: Completed/Deleted Mitigation Actions.....	6.28
E: Critical/Essential Facilities	6.30

A: References

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B: Planning Process

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For Immediate Release

March 10, 2017

For more information contact

Ryan Dunwoody at (573) 265-2993

Public meeting scheduled for Osage County Hazard Mitigation Plan update

LINN – City and county officials, school leaders, emergency management agencies and interested residents are invited to attend a public meeting April 14 to discuss updates to the Osage County Hazard Mitigation Plan.

The meeting will be held at 10:00 a.m. in the Emergency Operations Center, Basement of Admin Building, located at 205 E Main Street, Linn, MO 65051.

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 sets goals and action items to reduce the impact of natural hazards in the future.

Meramec Regional Planning Commission (MRPC) is updating the plan in partnership with the Osage County Commission. Questions may be directed to MRPC Environmental Programs Specialist Ryan Dunwoody at rdunwoody@meramecregion.org or 573-265-2993.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. A professional staff of 25, directed by the MRPC board, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at www.meramecregion.org or on Facebook at www.facebook.com/meramecregion.

MEMORANDUM

TO: Osage County Hazard Mitigation Planning Committee

FROM: Ryan Dunwoody, MRPC Environmental Programs Specialist

DATE: March 13, 2017

SUBJECT: Hazard mitigation planning meeting April 14, 2017

MRPC has been contracted by Osage County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Osage County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Osage County. We need your help to successfully complete this project.

The county must submit an approved, updated hazard mitigation plan to SEMA and FEMA by March, 2018 in order to continue to be eligible for hazard mitigation grant funds and certain recovery funds after a natural disaster occurs. It is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

A meeting of the **Osage County Hazard Mitigation Planning Committee** is scheduled for **Friday, April 14 at 10:00 a.m.** at the **Emergency Operations Center, Basement of Admin Building in Linn, MO**. The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. This can include activities such as improvements to roads and bridges that were prone to flooding, new programs that have reduced risk to residents and/or businesses and new tornado shelters that have been constructed in the past five years. Additionally, we request that **each jurisdiction and school district bring a filled out Hazard Mitigation Plan Questionnaire** (included). After the meeting we will answer questions and assist with filling out the questionnaire.

As the county, each city and school district will be asked to formally approve and adopt the Osage County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from emergency management offices, law enforcement, city/county officials, fire protection, road and bridge departments, utilities and public works, local health services, disaster relief volunteer services and other appropriate groups. If you are not able to attend, please send a representative from your organization. It is very important that we have good participation from all stakeholders in Osage County.

Thank you for your assistance in addressing hazard mitigation for Osage County. If you have any questions, contact me at (573) 265-2993, or via e-mail: rdunwoody@merameregion.org. I look forward to seeing you at the meeting.

RD
Enclosures

**Advisory Committee Meeting
Osage County Hazard Mitigation Plan Update**

AGENDA

10:00 a.m. ~ April 14, 2017

**Emergency Operations Center, Basement of Admin Building
205 E Main Street, Linn, MO 65051**

- I. Welcome and Introductions – Tammy Snodgrass**
- II. Overview of Hazard Mitigation Planning and Osage County Hazard Mitigation Plan**
Staff will provide an overview of the planning process and a brief review of the existing hazard mitigation plan
- III. Discussion of Goals and Objectives and Progress Made in Five Years**
Staff will lead the review of existing goals and a group discussion on what progress has been made in addressing hazard mitigation over the past five years.
- IV. Discussion of Possible Changes to Goals and Action Items for Next Five Years**
After reviewing the plan document and looking at what has been accomplished, the group will be asked to discuss if needs have changed and what, if any changes need to be made to goals and action items for the revised plan.
- V. Integration of Other Data, Reports, Studies, Plans**
What other information is available locally that could be included in the hazard mitigation plan? What other plans need to incorporate aspects of the hazard mitigation plan?
- VI. Review of Disasters/Deaths/Injuries over the Past Five Years**
Staff will provide data on disaster declarations for the past five years. Participants are asked to share any additional information on specific damage that occurred to infrastructure, critical infrastructure, neighborhoods, etc. Of particular interest is any information on deaths or injuries attributed to natural disasters.
- VII. Setting of Date and Time for Next Meeting**
- VIII. Adjourn**

NOTICE OF PUBLIC MEETING

Date and time of posting: **March 15, 4:00 p.m.**

Notice is hereby given that the **Osage County Hazard Mitigation Planning Committee** will meet at 10:00 a.m. on **Friday, April 14, 2017** at the Emergency Operations Center, Basement of Admin Building located at 205 E Main Street, Linn, MO 65051.

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Overview of Hazard Mitigation Planning and Osage County Hazard Mitigation Plan
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Discussion of Possible Changes to Goals and Action Items for Next Five Years
- Integration of Other Data, Reports, Studies, Plans
- Review of Disasters/Deaths/Injuries over the Past Five Years
- Setting of Date and Time for Next Meeting
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

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rdunwoody@meramecregion.org

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.

**Osage County Hazard Mitigation Plan Review Meeting
April 14, 2017 ~ 10:00 a.m.**

Name	Representing	Email Address	Phone #	Address
Edward Fowler	OCSD	efowler@osagecounty sheriff.ks.us	573-897-3927 Ext 802	106 E MAIN ST LINN, MO 65051
Susan Long	OCND	Susan.Long@ lpha.mo.gov	573-897-3113	205 E MAIN LINN, MO 65051
Dave Dudenhueffer	OC Commissioner	on file	on file	on file
Randy Atkins	ROAD & BRIDGE	on file	on file	on file
Andrea Ricci	all/EMA	on file	on file	on file
Larry Klitzhermes	Osage Co Commissioner	on file	ON FILE	ON FILE
John Gilman	COMMISSIONER	NH	ON FILE	ON FILE



For Immediate Release

May 18, 2017

For more information contact

Ryan Dunwoody at (573) 265-2993

Second public meeting planned June 9 for Osage County Hazard Mitigation Plan update

LINN – City and county officials, school leaders, emergency management agencies and interested residents are invited to attend a public meeting June 9 to discuss updates to the Osage County Hazard Mitigation Plan.

The meeting will be held at 10:00 a.m. in the Emergency Operations Center, in the basement of county administration building, located at 205 E Main Street, Linn, MO 65051.

The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago.

The county must have an approved hazard mitigation plan in order for Osage County schools, local governments, agencies and others to access state hazard mitigation grant funds. The plan includes an assessment of natural hazards, showcases past accomplishments and sets goals and action items to reduce the impact of natural hazards in the future.

Meramec Regional Planning Commission (MRPC) is updating the plan in partnership with the Osage County Commission. Questions may be directed to MRPC Environmental Programs Specialist Ryan Dunwoody at rdunwoody@meramecregion.org or 573-265-2993.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. A professional staff of 25, directed by the MRPC board, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at www.meramecregion.org or on Facebook at www.facebook.com/meramecregion.

MEMORANDUM

TO: Osage County Hazard Mitigation Planning Committee

FROM: Ryan Dunwoody, MRPC Environmental Programs Specialist

DATE: May 11, 2017

SUBJECT: Second Hazard Mitigation Planning Meeting June 09, 2017

MRPC has been contracted by Osage County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Osage County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Osage County. We need your help to successfully complete this project.

The county must submit an approved, updated hazard mitigation plan to SEMA and FEMA by the end of this year in order to continue to be eligible for some hazard mitigation grants, so it is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

A **second meeting** of the **Osage County Hazard Mitigation Planning Committee** is **scheduled** for **Friday, June 09 at 10:00 a.m.** at the **Emergency Operations Center, Basement of Admin Building** located at **205 E Main Street, Linn, MO 65051**. The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. This can include activities such as improvements to roads and bridges that were prone to flooding, new programs that have reduced risk to residents and/or businesses and new tornado shelters that have been constructed in the past five years.

As the county, each city and school district will be asked to formally approve and adopt the Osage County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from emergency management offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups. If you are not able to attend, please send a representative from your organization. It is very important that we have good participation from all stakeholders in Osage County.

Reminder: Hazard Mitigation Questionnaires are due by **May 30, 2017**. If a jurisdiction **does not submit** a filled out **questionnaire**, it will be **ineligible** to **receive hazard mitigation funds**.

Thank you for your assistance in addressing hazard mitigation for Osage County. If you have any questions, contact me at (573) 265-2993, or via e-mail: rdunwoody@merameregion.org. I look forward to seeing you at the meeting.

RD

Enclosures

**Advisory Committee Meeting
Osage County Hazard Mitigation Plan Update**

AGENDA

10:00 a.m. ~ June 09, 2017

**Emergency Operations Center, Basement of Admin Building
205 E Main Street, Linn, MO 65051.**

- I. Welcome and Introductions – Tammy Snodgrass**
- II. Overview of Hazard Mitigation Planning and Osage County Hazard Mitigation Plan**
Staff will provide an overview of the planning process and a brief review of the existing hazard mitigation plan
- III. Discussion of Action Items and Progress Made in Five Years**
Staff will lead the review of existing action items from the plan and ask the attendees to provide information on any progress that has been made on each action item. A list of action items was distributed at the last meeting and is attached to this email.
- IV. Discussion of Possible Changes to Action Items for Next Five Years**
After reviewing action items and looking at what has been accomplished, the group will be asked to discuss if needs have changed and what, if any changes need to be made to goals and action items for the revised plan.
- V. Prioritization of Action Items**
Attendees will be asked to provide input on the prioritization of action items in the plan.
- VI. Review of Disasters/Deaths/Injuries over the Past Five Years**
Staff will provide data on disaster declarations for the past five years. Participants are asked to share any additional information on specific damage that occurred to infrastructure, critical infrastructure, neighborhoods, etc. Of particular interest is any information on deaths or injuries attributed to natural disasters.
- VII. Setting of Date and Time for Next Meeting**
- VIII. Adjourn**

NOTICE OF PUBLIC MEETING

Date and time of posting: **May 11, 2017 ~ 4:00 p.m.**

Notice is hereby given that the **Osage Co. Hazard Mitigation Planning Committee** will meet at 10:00 a.m. on **Friday, June 09, 2017** at the Emergency Operations Center, Basement of Admin Building located at 205 E Main Street, Linn, MO 65051.

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Integration of Other Data, Reports, Studies, Plans
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Review and Prioritize Action Items
- Jurisdiction and School District Questionnaire Assistance
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

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rdunwoody@meramecregion.org

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.

**Osage County Hazard Mitigation Plan Review Meeting
June 09, 2017 ~ 10:00 a.m.**

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Justin GLAVIN	OSAGE CO	NA	763-5547	
Tom Wansing	Freeburg Fire & City	NA	573/680-3285	Freeburg Amm. Fire Box 10 - Freeburg, Mo.
KENDA BAPE	META	cityofmeta@radiance.net	573-229-4439 cell 573-690630	101 S Locust St Meta, mo 65058
Harold Libbert	Meta	—	229-4248	303 N Linn Meta, MO
Lyle Best	Osage B-I	best12@osage1.com	573-763-5666	614 S Poplar Chamois, Mo 65024
RANDY ATKIN	OSAGE COUNTY Pond & Bridge	rd.bridge@YAHOO.COM	573-897-3917	

Name	Representing	Email Address	Phone #	Address
Susan Long	OC Health Dept	Susan.Long@pha.mo.gov	573-897-3103	205 E Main St Linn, MO 65051
Dorcas Ruff	City Clerk Chamais, Mo	cityofchamais@centurytel.net	573-763-5541	200 S. Main St. Chamais, Mo 65024
JEFFREY BROWN	CITY OF CHAMMOIS	jlbrown.roadie@gmail.com	816.728.7389	207 S MARKET ST CHAMMOIS, MO 65024

Action No.	Mitigation Action Item	Hazards											Jurisdictions											
		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	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 <i>have this in place</i>	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											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

*Rich
Shaw
Done
on*

Executive Summary

*Co does it -
Ameren/Three Rivers*

Action No.	Mitigation Action Item	Hazards												Jurisdictions										
		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	Chamolis	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III	Priority
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											H

Handwritten notes:
 need to do
 Postcard of the
 city flood
 Go thru it review
 make a case
 to city

Handwritten notes:
 yes - down wind -
 significant by case

Action No.	Mitigation Action Item	Hazards													Jurisdictions									
		Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Landslide	Land Subsidence/Sinkholes	Lavee Failure	Severe Storm (Hail/Wind)	Tornado	Severe Winter Weather	Wildfire	Osage County	Argyle	Chamolis	Freeburg	Linn	Meta	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III	Priority
3.2.2	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											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											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						H

*Make sure
when to city
jurisdictions & schools
notify*

Action No.	Mitigation Action Item	Hazards												Jurisdictions										
		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	Chamolis	Freeburg	Linn	Meia	Westphalia	Osage County R-I	Osage County R-II	Osage County R-III	Priority
	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											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	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					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											H
5.1.1	Encourage all communities to develop stormwater				X				X		X		X	X	X	X	X	X	X					L

Handwritten notes:
 In 2024
 eliminate
 3.4.2
 3.4.3
 4.1.1
 4.1.2
 4.1.3

Handwritten notes:
 4.2.1
 4.2.2

Executive Summary

Cost collection - list of approach in regards to funding

Action No.	Mitigation Action Item	Hazards													Jurisdictions										
		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	Chambers	Freeburg	Linn	Meda	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	X	H

→ meet closer furniture to the walls, don't store shelves overhead, flood plain,
 - resilient for drinking water contain. of the flooding
 - James Child Plumbing Co - contract
 - get people to build home storm shelter
 "Encourage more individual mitigation"

- 1) want 8 more storm shelters
- 2) want to expand CERT teams
- 3)

Executive Summary

Get sample action items for next mtg -

C: Adoption Resolutions

Adoption resolutions have been mailed out to the jurisdictions and will be included in the final draft submitted to FEMA.

D: Critical/Essential Facilities

The table below (**Table 6.1**) provides information for critical facilities in the planning area. Specific information includes a Hazus ID if applicable, jurisdiction, building name/owner, and address.

Table 6.1 Osage County Critical Facilities by Type and Jurisdiction

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Emergency Facilities						
	Osage Co.	Osage Co. E-911	205 E. Main St.	Linn	MO	65051
	Osage Co.	Emergency Management Director	205 E. Main St.	Linn	MO	65051
Fire Department Facilities						
	Argyle	Argyle Volun. Fire Dept. #1	223 3 rd St.	Argyle	MO	65001
	Chamois	Chamois Volunteer Fire Dept.	200 S Main St.	Chamois	MO	65024
	Chamois	Chamois Volunteer Fire Dept.	338 E Missouri Ave.	Chamois	MO	65024
	Freeburg	Freeburg Comm. Fire Assoc. #1	600 Hwy. 63	Freeburg	MO	65035
	Freeburg	Freeburg Comm. Fire Assoc. #2	4339 HWY U	Rich Fountain	MO	65035
	Linn	Linn Fire Prot. Dist. #1	210 W. Main St.	Linn	MO	65051
MO000400	Linn	Linn Fire Prot. Dist. #2	1986 HWY A	Bonnots Mill	MO	65051
MO000679	Linn	Linn Fire Prot. Dist. #3	633 HWY 89 N	Linn	MO	65051
MO000401	Linn	Linn Fire Prot. Dist. #4	119 HWY 89 S	Linn	MO	65051
	Linn	Linn Fire Prot. Dist. #5	100 S. Clay St.	Linn	MO	65051
MO000402	Meta	Meta Fire & Rescue	112 E Third St.	Meta	MO	65058
	Westphalia	Westphalia Fire Prot. Dist.	3388 County Road 503	Westphalia	MO	65085
	Westphalia	Westphalia Fire Prot. Dist.	1926 HWY 63	Westphalia	MO	65085
Law Enforcement Facilities						
MO000165	Linn	Linn Police Dept.	1200 E Main St.	Linn	MO	65051
MO000015	Osage Co.	Osage County Sheriff's Office	106 Main St.	Linn	MO	65051
School Facilities						
MO001582	Bonnots Mill	St. Mary's School	1641 HWY C	Bonnots Mill	MO	65016
MO002940	Chamois	Chamois Elem.	614 S Poplar St.	Chamois	MO	65024

MO002941	Chamois	Chamois High	614 S Poplar St.	Chamois	MO	65024
MO001256	Freeburg	Holy Family School	110 W Oliver St.	Freeburg	MO	65035
MO002942	Linn	Linn Elem.	141 Wildcat Dr.	Linn	MO	65051
HazusID	Jurisdiction	Building Name	Address	City	State	Zip
MO000710	Linn	Linn High	141 Wildcat Dr.	Linn	MO	65051
MO001253	Linn	St. George Elem. School	601 E Main St.	Linn	MO	65051
MO001581	Loose Creek	Immaculate Conception School	147 County Road 402	Loose Creek	MO	65054
MO001255	Rich Fountain	Sacred Heart School	4309 HWY U	Rich Fountain	MO	65035
MO001093	Westphalia	Fatima Elem.	143 E Main	Westphalia	MO	65085
MO001796	Westphalia	Fatima High	143 E Main	Westphalia	MO	65085
MO001254	Westphalia	St. Joseph Catholic School	123 E Main St.	Westphalia	MO	65085

Source: Meramec Region Community Data Mining for Hazard Mitigation Planning (2014); Facilities, Missouri_SEMA, ArcGIS Online.

E: MDC Wildfire Data Search

Discovered Date	County	Station	Cause	Acres Burned
3/17/2003	Osage	Argyle Volunteer Fire Dept	Debris	0.5
2/26/2004	Osage	Westphalia Fire Protection District	Debris	1
3/8/2004	Osage	MDC REPORTING REGION - CENTRAL	Debris	1
3/14/2004	Osage	Argyle Volunteer Fire Dept	Debris	0.5
3/20/2004	Osage	Meta Fire & Rescue Fpd	Equipment	3
4/3/2004	Osage	Meta Fire & Rescue Fpd	Miscellaneous	2
10/25/2004	Osage	Meta Fire & Rescue Fpd	Miscellaneous	1
2/22/2005	Osage	Meta Fire & Rescue Fpd	Debris	1
3/2/2005	Osage	Meta Fire & Rescue Fpd	Miscellaneous	4
3/5/2005	Osage	Meta Fire & Rescue Fpd	Miscellaneous	10
3/12/2005	Osage	Linn Fire Protection District	Debris	1
7/9/2005	Osage	Linn Fire Protection District	Miscellaneous	0.1
1/8/2006	Osage	Westphalia Fire Protection District	Unknown	1
1/24/2006	Osage	Meta Fire & Rescue Fpd	Debris	0.75
2/26/2006	Osage	Freeburg Community Fire Association	Debris	1
2/27/2006	Osage	Freeburg Community Fire Association	Debris	1
3/17/2006	Osage	Meta Fire & Rescue Fpd	Unknown	1
3/18/2006	Osage	Meta Fire & Rescue Fpd	Debris	10
1/10/2007	Osage	Linn Fire Protection District	Miscellaneous	0.5
2/11/2007	Osage	Meta Fire & Rescue Fpd	Debris	1
2/11/2007	Osage	Linn Fire Protection District	Debris	1
3/4/2007	Osage	Linn Fire Protection District	Debris	0.5
3/5/2007	Osage	Linn Fire Protection District	Debris	10
3/6/2007	Osage	Linn Fire Protection District	Debris	0.25
3/6/2007	Osage	Linn Fire Protection District	Debris	100
3/7/2007	Osage	Freeburg Community Fire Association	Debris	5

3/8/2007	Osage	Freeburg Community Fire Association	Debris	15
3/8/2007	Osage	Linn Fire Protection District	Equipment	85
3/8/2007	Osage	Freeburg Community Fire Association	Debris	5
3/14/2007	Osage	Linn Fire Protection District	Debris	1
3/16/2007	Osage	Linn Fire Protection District	Debris	2
3/16/2007	Osage	Freeburg Community Fire Association	Debris	5
3/20/2007	Osage	Linn Fire Protection District	Debris	0.5
3/25/2007	Osage	Linn Fire Protection District	Debris	0.5
4/1/2007	Osage	Linn Fire Protection District	Debris	2
4/21/2007	Osage	Linn Fire Protection District	Debris	1
4/22/2007	Osage	Linn Fire Protection District	Debris	1
4/23/2007	Osage	Linn Fire Protection District	Debris	0.5
8/12/2007	Osage	Westphalia Fire Protection District	Unknown	1
8/15/2007	Osage	Linn Fire Protection District	Debris	8
8/16/2007	Osage	Westphalia Fire Protection District	Miscellaneous	0.25
11/11/2007	Osage	Westphalia Fire Protection District	Miscellaneous	0.1
1/3/2008	Osage	Meta Fire & Rescue Fpd	Debris	1
1/5/2008	Osage	Linn Fire Protection District	Debris	0.75
1/25/2008	Osage	Linn Fire Protection District	Debris	3
1/26/2008	Osage	Linn Fire Protection District	Debris	6
1/26/2008	Osage	Linn Fire Protection District	Debris	0.5
1/27/2008	Osage	Linn Fire Protection District	Unknown	0.1
1/28/2008	Osage	Linn Fire Protection District	Unknown	0.1
2/14/2008	Osage	Linn Fire Protection District	Miscellaneous	0.5
3/1/2008	Osage	Linn Fire Protection District	Miscellaneous	30
3/1/2008	Osage	Linn Fire Protection District	Debris	2
3/2/2008	Osage	Linn Fire Protection District	Miscellaneous	2
3/5/2008	Osage	Linn Fire Protection District	Debris	0.5
3/10/2008	Osage	Linn Fire Protection District	Miscellaneous	0.1
3/10/2008	Osage	Linn Fire Protection District	Miscellaneous	0.5

3/11/2008	Osage	Linn Fire Protection District	Miscellaneous	75
3/12/2008	Osage	Linn Fire Protection District	Miscellaneous	3.5
3/12/2008	Osage	Linn Fire Protection District	Miscellaneous	25
3/26/2008	Osage	Linn Fire Protection District	Miscellaneous	0.1
4/5/2008	Osage	Linn Fire Protection District	Miscellaneous	0.1
5/29/2008	Osage	Linn Fire Protection District	Debris	0.5
6/19/2008	Osage	Linn Fire Protection District	Miscellaneous	5
11/23/2008	Osage	Linn Fire Protection District	Miscellaneous	0.1
11/26/2008	Osage	Meta Fire & Rescue Fpd	Debris	1
12/30/2008	Osage	Linn Fire Protection District	Unknown	1
1/22/2009	Osage	Linn Fire Protection District	Unknown	1
1/22/2009	Osage	Linn Fire Protection District	Debris	4
1/22/2009	Osage	Linn Fire Protection District	Unknown	1
1/22/2009	Osage	Linn Fire Protection District	Debris	2
2/6/2009	Osage	Linn Fire Protection District	Debris	4
2/6/2009	Osage	Linn Fire Protection District	Debris	1
2/7/2009	Osage	Meta Fire & Rescue Fpd	Unknown	1
2/7/2009	Osage	Westphalia Fire Protection District	Debris	2
2/20/2009	Osage	Linn Fire Protection District	Debris	25
2/22/2009	Osage	Linn Fire Protection District	Miscellaneous	1
2/22/2009	Osage	Linn Fire Protection District	Miscellaneous	5
2/25/2009	Osage	Freeburg Community Fire Association	Debris	15
3/3/2009	Osage	Owensville Volunteer Fire Department	Debris	1
3/4/2009	Osage	Linn Fire Protection District	Debris	2
3/4/2009	Osage	Owensville Volunteer Fire Department	Debris	2
3/5/2009	Osage	Owensville Volunteer Fire Department	Debris	2
3/6/2009	Osage	Meta Fire & Rescue Fpd	Miscellaneous	15
3/12/2009	Osage	Linn Fire Protection District	Miscellaneous	1
3/15/2009	Osage	Linn Fire Protection District	Miscellaneous	1.5
3/15/2009	Osage	Linn Fire Protection District	Unknown	1

3/17/2009	Osage	Linn Fire Protection District	Miscellaneous	50
3/17/2009	Osage	Linn Fire Protection District	Unknown	1
3/19/2009	Osage	Linn Fire Protection District	Miscellaneous	0.1
3/20/2009	Osage	Linn Fire Protection District	Unknown	0.1
4/17/2009	Osage	Linn Fire Protection District	Miscellaneous	1
4/22/2009	Osage	Meta Fire & Rescue Fpd	Debris	1
4/26/2009	Osage	Linn Fire Protection District	Unknown	2
5/20/2009	Osage	Linn Fire Protection District	Unknown	0.1
7/2/2009	Osage	Linn Fire Protection District	Miscellaneous	0.25
11/7/2009	Osage	Linn Fire Protection District	Debris	0.25
11/7/2009	Osage	Linn Fire Protection District	Equipment	1.5
11/23/2009	Osage	Linn Fire Protection District	Miscellaneous	1
11/27/2009	Osage	Linn Fire Protection District	Miscellaneous	1
3/4/2010	Osage	Meta Fire & Rescue Fpd	Miscellaneous	1
3/5/2010	Osage	Westphalia Fire Protection District	Unknown	1
3/5/2010	Osage	Linn Fire Protection District	Debris	1
3/6/2010	Osage	Linn Fire Protection District	Debris	2.5
3/7/2010	Osage	Westphalia Fire Protection District	Miscellaneous	1
3/8/2010	Osage	Westphalia Fire Protection District	Unknown	0.25
3/12/2010	Osage	Linn Fire Protection District	Unknown	18
3/23/2010	Osage	Westphalia Fire Protection District	Debris	0.2
3/29/2010	Osage	Westphalia Fire Protection District	Unknown	1
4/1/2010	Osage	Linn Fire Protection District	Debris	0.25
5/12/2010	Osage	Linn Fire Protection District	Lightning	0.25
11/8/2010	Osage	Westphalia Fire Protection District	Unknown	0.5
11/10/2010	Osage	Linn Fire Protection District	Campfire	1
11/11/2010	Osage	Linn Fire Protection District	Miscellaneous	0.25
11/15/2010	Osage	Westphalia Fire Protection District	Debris	1
1/5/2011	Osage	Westphalia Fire Protection District	Debris	5
3/12/2011	Osage	Linn Fire Protection District	Unknown	20

3/19/2011	Osage	Thayer Rural Fire Department	Debris	1
3/23/2011	Osage	Thayer Rural Fire Department	Debris	1
4/2/2011	Osage	Westphalia Fire Protection District	Unknown	0.5
4/3/2011	Osage	Meta Fire & Rescue Fpd	Miscellaneous	1
4/3/2011	Osage	Linn Fire Protection District	Unknown	1
4/3/2011	Osage	Linn Fire Protection District	Unknown	1
4/13/2011	Osage	Linn Fire Protection District	Debris	3
4/22/2011	Osage	Linn Fire Protection District	Debris	1
7/21/2011	Osage	Linn Fire Protection District	Unknown	1
8/1/2011	Osage	MDC Test Station	Equipment	234
8/2/2011	Osage	MDC Test Station	Smoking	9
9/12/2011	Osage	Linn Fire Protection District	Unknown	1
11/1/2011	Osage	Meta Fire & Rescue Fpd	Equipment	1
11/2/2011	Osage	TAOS VFD	Debris	5
11/13/2011	Osage	Linn Fire Protection District	Unknown	50
11/13/2011	Osage	Linn Fire Protection District	Unknown	3
11/15/2011	Osage	Linn Fire Protection District	Unknown	3
11/19/2011	Osage	Linn Fire Protection District	Unknown	1
12/2/2011	Osage	Westphalia Fire Protection District	Debris	0.5
2/28/2012	Osage	Freeburg Community Fire Association	Debris	3
3/6/2012	Osage	Freeburg Community Fire Association	Debris	60
3/6/2012	Osage	Freeburg Community Fire Association	Unknown	20
3/7/2012	Osage	Freeburg Community Fire Association	Unknown	2
6/5/2012	Osage	Linn Fire Protection District	Equipment	15
6/29/2012	Osage	Westphalia Fire Protection District	Unknown	0.1
7/7/2012	Osage	Freeburg Community Fire Association	Lightning	1
7/9/2012	Osage	Freeburg Community Fire Association	Debris	10
7/9/2012	Osage	Linn Fire Protection District	Lightning	2
7/22/2012	Osage	Freeburg Community Fire Association	Debris	1
8/10/2012	Osage	Westphalia Fire Protection District	Debris	

8/10/2012	Osage	Westphalia Fire Protection District	Debris	
8/19/2012	Osage	Freeburg Community Fire Association	Debris	2
6/22/2013	Osage	Meta Fire & Rescue Fpd	Miscellaneous	1
10/23/2013	Osage	Westphalia Fire Protection District	Unknown	0.1
1/7/2014	Osage	Linn Fire Protection District	Debris	0.1
1/12/2014	Osage	Linn Fire Protection District	Equipment	0.1
1/12/2014	Osage	Meta Fire & Rescue Fpd	Debris	1
1/16/2014	Osage	Meta Fire & Rescue Fpd	Miscellaneous	1
1/25/2014	Osage	Vichy Volunteer Fire Protection Assoc	Miscellaneous	175
1/26/2014	Osage	Freeburg Community Fire Association	Equipment	10
1/26/2014	Osage	Freeburg Community Fire Association	Miscellaneous	5
1/26/2014	Osage	Meta Fire & Rescue Fpd	Debris	2
1/27/2014	Osage	Linn Fire Protection District	Miscellaneous	7
1/27/2014	Osage	Linn Fire Protection District	Miscellaneous	0.1
1/27/2014	Osage	Linn Fire Protection District	Debris	0.1
1/29/2014	Osage	Linn Fire Protection District	Debris	3
1/30/2014	Osage	Westphalia Fire Protection District	Equipment	0.5
2/19/2014	Osage	Linn Fire Protection District	Miscellaneous	0.5
2/20/2014	Osage	Westphalia Fire Protection District	Unknown	0.5
2/21/2014	Osage	Linn Fire Protection District	Not Reported	0.1
2/21/2014	Osage	Meta Fire & Rescue Fpd	Debris	2
2/22/2014	Osage	Linn Fire Protection District	Not Reported	3
2/22/2014	Osage	Westphalia Fire Protection District	Miscellaneous	2
2/27/2014	Osage	Linn Fire Protection District	Debris	0.5
2/28/2014	Osage	Westphalia Fire Protection District	Smoking	3
2/28/2014	Osage	Linn Fire Protection District	Debris	1
3/1/2014	Osage	Linn Fire Protection District	Miscellaneous	2
3/9/2014	Osage	Westphalia Fire Protection District	Unknown	1
3/9/2014	Osage	Linn Fire Protection District	Unknown	1
3/9/2014	Osage	Freeburg Community Fire Association	Miscellaneous	10

3/10/2014	Osage	Linn Fire Protection District	Debris	3
3/10/2014	Osage	Freeburg Community Fire Association	Debris	10
3/10/2014	Osage	Linn Fire Protection District	Miscellaneous	1.5
3/10/2014	Osage	Linn Fire Protection District	Debris	2
3/15/2014	Osage	Westphalia Fire Protection District	Unknown	4
3/15/2014	Osage	Linn Fire Protection District	Debris	2
3/18/2014	Osage	Freeburg Community Fire Association	Debris	6
3/18/2014	Osage	Linn Fire Protection District	Lightning	0.1
3/18/2014	Osage	Freeburg Community Fire Association	Debris	1
3/22/2014	Osage	Meta Fire & Rescue Fpd	Miscellaneous	2
3/24/2014	Osage	Linn Fire Protection District	Debris	0.25
3/25/2014	Osage	Linn Fire Protection District	Debris	1
4/9/2014	Osage	Linn Fire Protection District	Debris	2
4/10/2014	Osage	Linn Fire Protection District	Debris	1.5
4/22/2014	Osage	Westphalia Fire Protection District	Unknown	2
7/2/2014	Osage	Linn Fire Protection District	Equipment	2
7/30/2014	Osage	Linn Fire Protection District	Children	2
1/18/2015	Osage	Westphalia Fire Protection District	Debris	3
2/8/2015	Osage	Belle Volunteer Fire Department	Unknown	5
3/7/2015	Osage	Westphalia Fire Protection District	Unknown	1
3/7/2015	Osage	Westphalia Fire Protection District	Unknown	1
7/16/2015	Osage	Belle Volunteer Fire Department	Unknown	0.2
9/14/2015	Osage	Belle Volunteer Fire Department	Unknown	0.02
9/30/2015	Osage	MDC Test Station	Campfire	2
10/8/2015	Osage	MDC Test Station	Children	1
10/8/2015	Osage	MDC Test Station	Campfire	3
10/12/2015	Osage	Belle Volunteer Fire Department	Campfire	
10/17/2015	Osage	Belle Volunteer Fire Department	Unknown	0.01
10/18/2015	Osage	Belle Volunteer Fire Department	Miscellaneous	25
10/19/2015	Osage	Belle Volunteer Fire Department	Equipment	50

10/19/2015	Osage	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
10/19/2015	Osage	Gerald-Rosebud Fire Prot. Dist.	Equipment	50
10/20/2015	Osage	Belle Volunteer Fire Department	Unknown	
10/22/2015	Osage	Vichy Volunteer Fire Protection Assoc	Miscellaneous	0.1
2/7/2016	Osage	Belle Volunteer Fire Department	Debris	1
2/29/2016	Osage	Belle Volunteer Fire Department	Debris	0.2
3/6/2016	Osage	Belle Volunteer Fire Department	Unknown	0.2
3/26/2016	Osage	Belle Volunteer Fire Department	Unknown	0.5
4/3/2016	Osage	Belle Volunteer Fire Department	Unknown	3
5/6/2016	Osage	Westphalia Fire Protection District	Debris	1
6/18/2016	Osage	Belle Volunteer Fire Department	Unknown	1
10/27/2016	Osage	Westphalia Fire Protection District	Unknown	2
11/15/2016	Osage	Belle Volunteer Fire Department	Unknown	2
11/18/2016	Osage	Westphalia Fire Protection District	Unknown	1
11/21/2016	Osage	Belle Volunteer Fire Department	Unknown	1
12/10/2016	Osage	Westphalia Fire Protection District	Unknown	0.1
2/12/2017	Osage	Owensville Volunteer Fire Department	Unknown	1
3/8/2017	Osage	Westphalia Fire Protection District	Unknown	0.5
3/18/2017	Osage	Owensville Volunteer Fire Department	Debris	5