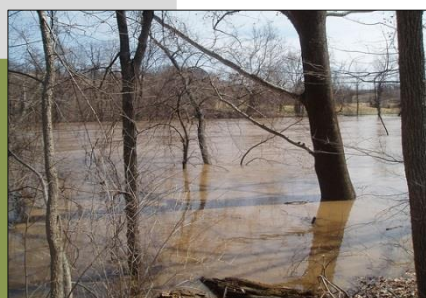




# ***Maries County Multi-Jurisdiction Natural Hazard Mitigation Plan***



Meramec Regional Planning Commission • July 2024



## CONTRIBUTORS

### Maries County Hazard Mitigation Planning Committee

The individuals who participated in the Maries County hazard mitigation planning committee are as follows:

#### **Jurisdictional Representatives**

<b>Name</b>	<b>Title</b>	<b>Department</b>	<b>Jurisdiction/Agency/Organization</b>
Vic Stratman	Presiding Commissioner	Administration	Maries County
Ed Fagre	District Commissioner	Administration	Maries County
Michael French	Supervisor	Road and Bridge	Maries County
Ashley Campbell	Administrator	Public Health	Maries County
Jordan Dillion	Environmental Specialist	Public Health	Maries County
Scott John	Director	Emergency Management	Maries County Sheriff
Brent Fulle	Road Worker	Road and Bridge	Maries County Road District 1
Tommie Roberds	Road Worker	Road and Bridge	Maries County Road District 1
Ryan Stumpe	Road Worker	Road and Bridge	Maries County Road District 1
Carla Butler	Director	EMS	Maries-Osage Ambulance District
Amanda Reichel	EMT	EMS	Maries-Osage Ambulance District
Clayton Bruno	EMT	EMS	Maries-Osage Ambulance District
Richie Hinz	EMT	EMS	Maries-Osage Ambulance District
Nakkita Johnson	EMT	EMS	Maries-Osage Ambulance District
Richard Reinkemeyer	EMT	EMS	Maries-Osage Ambulance District
Mike Smith	Chief	Fire	Vienna Fire Protection District
Shon Westart	Director	Public Works	City of Vienna
Shannon Thompson	Chief	Police Department	City of Vienna
Karen Dudenhoeffer	City Clerk	Administration	City of Vienna
Jim Sandbothe	Supervisor	Public Works	City of Vienna
Dwight Francis	Chief/Director	Fire/ Emergency Management	City of Belle
Teresa Messersmith	Superintendent	Administration	Maries County R-I
Joe Edwards	Principal	Administration	Maries County R-I

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

The individuals who represented stakeholders on the Maries County hazard mitigation planning committee are as follows:

## **Participating Stakeholder Representatives**

<b>Name</b>	<b>Title</b>	<b>Agency/Organization</b>
Brett Hendrix	Region I Coordinator	SEMA
Blake Rowden	Trooper	MO State Highway Patrol
Wendy Squires	Emergency Management Coordinator	Phelps Health
Michael Elliot		Public
Steve Vogt		Public

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## EXECUTIVE SUMMARY

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The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Maries County and participating cities and school districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses from hazard events to the county and its communities and school districts. The plan is an update of the original plan that was approved on September 5, 2019. The plan and the update were 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 5 jurisdictions that participated in the planning process:

- Maries County
- City of Belle
- City of Vienna
- Maries County R-I School District
- Maries County R-II School District

Maries County and the jurisdictions listed above have developed a multi-jurisdictional Hazard Mitigation Plan that was originally approved by FEMA in 2018. This current planning effort serves as an update (hereafter referred to as the 2024 Hazard Mitigation Plan.)

The plan update process followed a methodology in accordance with FEMA guidance, which began with the formation of a Mitigation Planning Committee (MPC) comprised of representative from Maries County and participating jurisdictions. The MPC updated the risk assessment that identified and profiled hazards that pose a risk to Maries County and analyzed the jurisdictional vulnerability to these hazards. The MPC also examined the capabilities in place to mitigate the hazard damages, 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/ lightning/high winds and tornadoes are among the hazards that historically have had a significant impact.

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

**Goal 1:** Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

**Goal 2:** Reduce the potential impact of natural disasters to [property, infrastructure, and the local economy.

**Goal 3:** Reduce the potential impact of natural disasters on the continuity of government and essential services.

To advance the identified goals, the MPC developed recommended mitigation actions, as summarized in the table on the following pages. 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. These additional details are provided in Chapter 4.

**Table I. Mitigation Action Matrix**

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.1	Local Fire Departments and Emergency Management Director will provide CERT training and distribute information on the benefits of the CERT and VOAD programs.	Belle, Maries County, Vienna	Medium	1	All	✓	✓	
1.2	Construct storm shelters or tornado safe rooms near schools and large employment centers as funding allows.	Belle, Maries County, Vienna, Maries Co. R-I, Maries Co. R-II	Medium	1	Tornado, Severe Thunderstorm		✓	
1.3	County health department will implement publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)	Belle, Maries County, Vienna	High	1	All			
1.4	Annually assess public and private locations as potential shelters from storms or extreme temperatures; designate suitable shelters, establish MOU's , and develop accessibility plans for the public during times of need.	Belle, Maries County, Vienna	High	1	Extreme Temperature, Severe Thunderstorm, Tornado, Severe Winter Weather	✓		
1.5	Distribute information on dam safety and self-inspection programs to all dam owners, explore funding opportunities for dam repair.	Belle, Maries County, Vienna	High	1	Dam Failure	✓	✓	
2.1	Upgrade roads and bridges that would improve drainage, reduce flooding, and reduce the risk to residents and property as funding allows.	Belle, Maries County, Vienna	High	2	Flooding	✓	✓	

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
2.2	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.	Maries County, Vienna	High	2	Flooding	✓	✓	✓
2.3	Update floodplain management ordinances to implement regulations to securely attach manufactured homes and fuel tanks to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.	Maries County, Vienna	Medium	2	Flooding	✓	✓	✓
2.4	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.	Maries County, Vienna	High	2	Flooding	✓	✓	✓
2.5	Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.	Belle, Maries County, Vienna, Maries Co. R-I, Maries Co. R-II	High	2	All	✓	✓	
2.6	Purchase properties in the floodplain to convert land into public space/recreation area as funding allows.	Maries County, Vienna	Medium	2	Flooding	✓		
2.7	Cities and counties will implement cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.	Belle, Maries County, Vienna	Medium	2	All	✓	✓	
2.8	Purchase appropriately sized generators for all critical facilities in the planning area as funding allows	Belle, Maries County, Vienna, Maries Co. R-I, Maries Co. R-II	High	2	All	✓	✓	
2.9	Assist in the formation and training of a prescribed burn association to reduce the incidence of wildfire.	Belle, Maries County, Vienna	High	2	Wildfire	✓		

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
3.1	Distribute materials to local businesses, governments, and schools to assist in the creation and update of emergency operations plans.	Belle, Maries County, Vienna	High	3	All	✓		
3.2	Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.	Belle, Maries County, Vienna	Medium	3	Earthquake, Tornado	✓	✓	
3.3	Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.	Belle, Maries County, Vienna, Maries Co. R-I, Maries Co. R-II	Medium	3	All			
3.4	City of Vienna will research options to reduce its wastewater facility's vulnerability to flood events.	Vienna	High	3	Flooding	✓		

## PREREQUISITES

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**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 school districts. The documentation of each adoption is included in Appendix D, and a model resolution is included on the following page.

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

- Maries County
- City of Belle
- City of Vienna
- Maries County R-I School District
- Maries County R-II School District

# Model Resolution

RESOLUTION NO. \_\_\_\_\_

## A RESOLUTION TO ADOPT THE MARIES 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**, (Government/District) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Maries 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 Maries 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 INTRODUCTION AND PLANNING PROCESS 1.1

1.1 Purpose.....	1.1
1.2 Background and Scope.....	1.2
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## 1.1 PURPOSE

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Maries County and four 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 Maries 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 Maries 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. Guidance for the development of this plan includes FEMA’s Local Mitigation Planning Handbook, May 2023 and FEMA’s Local Mitigation Plan Review Guide, October 1, 2011 and the Local Mitigation Planning Policy Guide April 19, 2023. Those jurisdictions within Maries

County that do not adopt the 2024 plan will not be eligible for funding through these grant programs.

Neither Maries County, nor any cities in Maries County participates in the NFIP Community Rating System (CRS).

## **1.2 Background and Scope**

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The 2024 Maries Hazard Mitigation Plan is an update of the original plan developed and approved in June 2006. The first update of the 2006 plan was approved by FEMA on August 25, 2014. The last update of the plan was approved by FEMA on September 5, 2019. 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 the 2019 plan, including the following:

- Maries County
- City of Belle
- City of Vienna
- Maries County R-I School District
- Maries County R-II 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. Maries 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**

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The plan contains a mitigation action listing, a discussion of the purpose and methodology used to develop the plan, a profile on Maries 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, as well as 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

Changes made to the 2024 plan are detailed in Table 1.1.

**Table 1.1 Changes Made in Plan Update**

<b>Plan Section</b>	<b>Summary of Updates</b>
<b>Chapter 1 – Introduction and Planning Process</b>	Updated members of the Mitigation Planning Committee (MPC) and participating jurisdictions formally adopted the MPC.
<b>Chapter 2 – Planning Area Profile and Capabilities</b>	Updated demographics and information provided in jurisdictional questionnaires, updated jurisdictional capabilities.
<b>Chapter 3 – Risk Assessment</b>	Combined extreme heat and extreme cold into one hazard: extreme temperatures. Updated data on hazards, updated demographic data.
<b>Chapter 4 – Mitigation Strategy</b>	The mitigation category of each action was added to the action worksheets. The action items were reviewed and updated, and progress made updated in the action worksheets.
<b>Chapter 5 – Plan Implementation and Maintenance</b>	Updated MPC meetings for evaluating and updating the plan quarterly.

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 Maries County and the jurisdictions within to handle disasters and will document valuable local knowledge on the most efficient and effective ways to reduce loss.

## **1.4 Planning Process**

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**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 Maries County Hazard Mitigation Planning Committee first organized in 2023 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.

MRPC's role in developing and updating the Maries County Hazard Mitigation plan included assisting in the formation of the mitigation planning committee (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 ensured that the final document met the DMA requirements established by federal regulations and the most current planning guidance.

In 2022, SEMA secured a grant to develop the Maries County Multi-Hazard Mitigation Plan and contracted with MRPC to facilitate the planning process for the plan development. MRPC staff has followed the most current planning guidance provided by FEMA for the purpose of ensuring that the plan meets all of the requirements of the Disaster Mitigation Act as established by federal regulations.

The Maries County Multi-Hazard Mitigation Plan was developed as the result of a collaborative effort among Maries County, the City of Belle, City of Vienna, Maries County R-I School District, Maries County R-II 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, community groups, 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 Maries County. Staff worked with the Maries 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 the jurisdictions provided information to develop the document, submitted questionnaires, reviewed the plan and provided input. Interviews were conducted with stakeholders from the community and several planning meetings were conducted during the plan development.

The 2024 planning process began with a meeting held at the Vienna Fire Protection District Training Room on February 07, 2023. MRPC staff provided an overview of the hazard mitigation 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 group made note of those action items that had been accomplished, those that were no longer applicable and added projects to the list. The second meeting was held on April 11, 2023. The MPC reviewed the revised list of action items and applied the STAPLEE method (Social, Technical, Administrative, Political, Legal, Economic; Environmental) and cost benefit analysis to best determine priorities. A full description of the prioritization process is included in Chapter 4. The group agreed to review plan chapters as they were completed through email or postings on the MRPC website. The third meeting of the MPC was held on January 16, 2024. The MPC reviewed the public survey results, participation requirements and status of participation of jurisdictions; reviewed and discussed draft chapters; reviewed plan maintenance and the adoption process.

The final list of prioritized action items was 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. An internet survey was provided for the public to provide input into the process. The results of that survey are included in the appendices. 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.

Maries County further assisted in the planning process by issuing public notice of the planning meetings as well as scheduling meeting times at the Vienna Fire Protection District training room. 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 hazard 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 of Maries County Mitigation Planning Committee**

<b>Name</b>	<b>Title</b>	<b>Department</b>	<b>Jurisdiction/Agency/ Organization</b>
Vic Stratman	Presiding Commissioner	Administration	Maries County
Michael French	Supervisor	Road and Bridge	Maries County
Scott John	Director	Emergency Management	Maries County
Ashley Campbell	Director	Health	Maries County
Jordan Dillan	Environmental Specialist	Health	Maries County
Dwight Francis	Director/Chief	Emergency Management/Fire	City of Belle
Steve Vogt			City of Belle
Shon Westart	Director	Public Works	City of Vienna
Shannon Thompson	Chief	Police	City of Vienna
Lenice Basham*	Superintendent	Administration	Maries R-II School District
Teresa Messersmith	Superintendent	Administration	Maries County R-I School District
Joe Edwards	Principal	Administration	Maries County R-I School District

Name	Title	Department	Jurisdiction/Agency/ Organization
Wendy Squires	Specialist	Emergency Management	Phelps Health Hospital System
Carla Butler	Administrator	Ambulance	Maries Osage Ambulance District
Amanda Reichel	EMT	Ambulance	Maries Osage Ambulance District
Clayton Bruno	EMT	Ambulance	Maries Osage Ambulance District
Richie Hinz	EMT	Ambulance	Maries Osage Ambulance District
Nakkita Johnson	EMT	Ambulance	Maries Osage Ambulance District
Mike Smith	Chief	Fire	Vienna Fire Protection District
Blake Rowden	Trooper	Police	Missouri State Highway Patrol
Brett Hendrix	Regional Coordinator	Emergency Management	State Emergency Management Agency
Michael Elliot			Maries County

\*Denotes indirect participation only

The expertise of MPC members in the six mitigation categories (Preventive Measures, Property Protection, Natural Resource Protection, Emergency Services, Structural Flood Control Projects and Public Information) is outlined in **Table 1.3 MPC Capability with Six Mitigation Categories**.

**Table 1.3 MPC Capability with Six Mitigation Categories**

Community Department/Office	Preventive Measures	Structure and Infrastructure Projects		Natural Resource Protection	Public Information	Emergency Services
		Property Protection	Structural Flood Control Projects			
Maries County Commission	✓	✓	✓	✓	✓	
Phelps-Maries County Health Center	✓			✓	✓	✓
Maries County Road and Bridge	✓	✓	✓	✓		
Maries County Emergency Management	✓	✓	✓	✓	✓	✓
City of Belle Emergency Management	✓	✓	✓	✓	✓	✓
Belle Fire Protection District	✓			✓	✓	✓
City of Vienna Police	✓			✓	✓	✓

Community Department/Office	Preventive Measures	Structure and Infrastructure Projects		Natural Resource Protection	Public Information	Emergency Services
		Property Protection	Structural Flood Control Projects			
City of Vienna Public Works	✓	✓	✓	✓		
Vienna Fire Protection District	✓			✓	✓	✓
Maries County R-I School District Administration	✓				✓	
Maries County R-II School District Administration	✓				✓	
Phelps Health Hospital System	✓				✓	✓
Maries Osage Ambulance District	✓				✓	✓
MO SEMA	✓	✓	✓	✓	✓	✓
MO SHP	✓				✓	✓

## 1.4.1 Multi-Jurisdictional Participation

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

Maries 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. Press releases were sent to the media. Letters and/or emails were sent to each of the following:

- Maries County
- City of Belle
- City of Vienna
- Maries County R-I School District
- Maries County R-II School District
- Phelps-Maries County Health Department
- Maries County Sheriff's Office
- Vienna Police Department
- Belle Fire Protection District
- Vichy Volunteer Fire Protection District
- Vienna Fire Protection District
- Dixon Rural Fire Protection District
- Dixon Ambulance District
- Maries/Osage Ambulance District
- Ozark Central Ambulance District
- Phelps Health Medical Group Vienna
- Family Medicine - Belle
- Intercounty Electric Cooperative
- Gascoage Electric Cooperative
- Three Rivers Electric Cooperative
- Fidelity Communications
- Rolla National Airport
- The Maries County Advocate
- KKID Radio
- Results Radio
- Sunny 104.5
- KPLA Radio

- Heartland Regional Library – Belle
- Heartland Regional Library - Vienna
- Maries County Senior Center
- Maries Manor
- Victorian Place of Vienna
- MO Highway Patrol Troop I
- MO Department of Conservation
- MO Dept. of Transportation
- MO Dept. of Natural Resources
- MO SEMA Floodplain Management
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture
- U.S. Fish and Wildlife Service
- U.S. FEMA
- American Red Cross
- Missouri Ozarks Community Action
- Missouri University Extension
- Lion's Club of Vienna
- Fraternal Order of Eagles
- Knights of Columbus Council 13178

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 were required to Complete the FEMA data collection questionnaire and formally adopt the plan. In addition participants were asked to do the following as they were able:

- Providing a representative to serve on the planning committee;
- Participating in at least one or more meetings of the planning committee;
- Report on progress toward completing action items from the current plan revision;
- 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

Not all jurisdictions were able to attend the MPC meetings. Most communities and school districts in Maries County are small and understaffed. It was not always feasible for representatives to travel to the meetings. However, all jurisdictions met the participation criteria. All jurisdictions were contacted by phone and email and asked to complete the data collection questionnaire. In some cases, staff assisted jurisdictions with completion of the questionnaire. All jurisdictions were also contacted via email and phone regarding completion of in-kind match forms and if there were any questions regarding the information on the data collection questionnaires. 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 1.4 Jurisdictional Participation in the Planning Process**

Jurisdiction	Meet- ing #1	Meet- ing #2	Meet- ing #3	Interviews	Data Collection Questionnaire/Call	Update/Develop/ Prioritize Mitigation Actions	Review/ Comment on Plan
Maries County	X	X	X	X	X	X	X
City of Belle	X	X	X	X	X	X	X



Jurisdiction	Meet- ing #1	Meet- ing #2	Meet- ing #3	Interviews	Data Collection Questionnaire/Call	Update/Develop/ Prioritize Mitigation Actions	Review/ Comment on Plan
City of Vienna		X	X	X	X	X	X
Maries County R-I		X	X	X	X	X	X
Maries County R-II				X	X		

## 1.4.2 The Planning Steps

Maries County and MRPC worked together to develop the plan and based the planning process in FEMA's *Local Mitigation Planning Policy Guide (April 19, 2023)*, *Local Mitigation Planning Handbook (May 2023)*, 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 process has included organizing the county's resources, assessing the risks to the county, developing the mitigation plan, 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, Building Resilient Infrastructure and Communities, Pre-Disaster Mitigation Program, Community Rating System, and Flood Mitigation Assistance Program.

**Table 1.5 Maries County Planning 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

Community Rating System (CRS) Planning Steps (Activity 510)	Local Mitigation Planning Handbook Tasks (44 CFR Part 201)
	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 Maries 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 via mail. 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. Non-profit organizations for underserved populations such as the regional community action agency, institutions of faith, etc. were also invited through a letter and email if one was listed in their contact information available on their website to serve on the planning committee. All meetings were also publicized to allow additional interested parties to attend and participate. The first meeting was held at the Vienna Fire Protection District training room on February 3, 2023. The second meeting was convened on April 11, 2023, and the third on January 16, 2024

At the first meeting on February 3, 2023, MRPC staff made introductions and provided an overview of the Maries 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 offered to help those jurisdictions present with completion of their data collection surveys.

At the second meeting on April 11, 2023, the group reviewed the complete list of action items; determined which had been completed; which should be combined; which were no longer a high or medium priority; and determined if any needed to be added. The MPC then provided input on prioritizing each 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 emailed 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. MRPC staff shared the results of the public survey. It was decided that staff would share plan chapters with the MPC as they were completed.

At the third meeting on January 16, 2024, the group reviewed participation requirements and the status of all jurisdictions; reviewed and discuss those draft chapters that were completed; discussed plan maintenance and the adoption process.

**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 1.6 Schedule of MPC Meetings**

Meeting	Topics	Date
Planning Meeting #1	Overview of hazard mitigation planning purpose and Maries County plan; grant programs linked to approved plan; participation requirements and public involvement; data collection questionnaires; discussion of hazards; critical facilities	February 3, 2023
Planning Meeting #2	Overview of hazard mitigation planning and Maries Co. HMP; discussion on the revision of plan goals, discussion of action items for the next 5 years; prioritization of action items; road and bridge projects; integration of other data, reports, studies, and plans	April 11, 2023
Planning Meeting #3	Review of participation requirements and status of jurisdictions, review and discussion of draft chapters, plan maintenance and adoption process and next steps for the planning process and completion of the plan.	January 16, 2024

## **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 suggested by SEMA and FEMA and as was followed during earlier planning processes. The first MPC meeting was held at the Vienna Fire Protection District training room. Public notices were placed at the courthouse, city halls, and MRPC office, and press releases were done 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 were presented for review and discussion. A public survey was conducted and advertised through press releases and on social media, and the results shared with the MPC. A sample of the survey and the results of the survey are included in Appendix C: Public Survey. MPC members and public officials within the county as

well as in surrounding counties were contacted, directed to the MRPC website ([www.meramecregion.org](http://www.meramecregion.org)) where a copy of the draft plan could be viewed or downloaded. The document was made available on the website on January 16, 2024. A hard copy of the draft could be obtained directly from MRPC by request. Members of the local media 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 releases are included in Appendix B. Results of the public survey are included in Appendix C: Public Survey.

No comments were received from the public other than what was found in the public survey. These are included in the Appendices.

### **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 Maries 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

Stakeholders involved in the hazard mitigation planning process included The Missouri State Highway Patrol and State Emergency Management Agency. No federal stakeholders were involved during the planning process. Lists of the people from the jurisdictions and stakeholders who were invited to participate in the planning process follows.

#### **Jurisdictional Representatives Invited to Participate in the Planning Process**

<b>Name</b>	<b>Title</b>	<b>Department</b>	<b>Jurisdiction/Agency/Organization</b>
Vic Stratman	Presiding Commissioner	Admin.	Maries County
Doug Drewell	Associate Commissioner	Admin.	Maries County
Ed Fagre	Associate Commissioner	Admin.	Maries County
Rhonda Rodgers	County Clerk	Admin.	Maries County
Carol Jo Schulte	Public Administrator	Admin.	Maries County
Chris Heitman	Sherriff	Sherriff's Dept.	Maries County
Scott John	EMD	Emergency Management	Maries County

Name	Title	Department	Jurisdiction/Agency/Organization
Ashley Campbell	Director	Public Health	Maries County
Darryl White Jr.	Mayor	Admin.	City of Belle
Frankie Horstman	City Clerk	Admin.	City of Belle
James Mitchell	Alder	Admin.	City of Belle
Emily Williams	Alder	Admin.	City of Belle
Adam Padgett	Alder	Admin.	City of Belle
Barb Howarth	Alder	Admin.	City of Belle
Dwight Francis	EMD/Fire chief	Emergency Management	City of Belle
Darin Guinn	Director	Public Works	City of Belle
Timothy Schell	Mayor	Admin.	City of Vienna
Karen Dudenhoeffer	City Clerk	Admin.	City of Vienna
Brenda Davis	Alder	Admin.	City of Vienna
Charles Davis	Alder	Admin.	City of Vienna
Reva Hutchison	Alder	Admin.	City of Vienna
Rita Juergens	Alder	Admin.	City of Vienna
Shannon Thompson	Chief	Police	City of Vienna
Shon Westart	Superintendent	Public Works	City of Vienna
Mike Smith	Fire Chief	Fire	Vienna Fire Protection District
Mike Prigge	Fire Chief	Fire	Vichy Rural Fire Department
Dennis Lachowicz	Fire Chief	Fire	Dixon Rural Fire Prot. District
Teresa Messersmith	Superintendent	Admin.	Maries County R-I School District
Lenice Basham	Superintendent	Admin.	Maries County R-II School District
	Administrator	Emergency Medical	Dixon Ambulance District
	Administrator	Emergency Medical	Maries Osage Ambulance District
	Administrator	Emergency Medical	Ozark Central Ambulance District

### Stakeholders Invited to Participate in the Planning Process

Name	Title	Agency/Organization
Fern Robertson	Administrator	Maries County Senior Center
	Administrator	Victorian Place of Vienna
	Administrator	Maries Manor
		Phelps Health Hospital System
		Family Medicine - Belle
Doug Lane		Intercounty Electric Cooperative
Carmen Harwell		Gascosage Electric Cooperative
Roger Kloeppe		Three Rivers Electric Cooperative
		Missouri Ozark Community Action Agency
Darrin Bacon	Manager	Rolla National Airport
Melissa Wilding		American Redcross
		Fidelity Communications
		Heartland Regional Library
		KKID Radio
		Results Radio
		Sunny 104.5 Radio
		KPLA Radio

Name	Title	Agency/Organization
		MU Extension
		Lion's Club of Vienna
		Fraternal Order of the Eagles
		Knights of Columbus
Capt. Eddie Blaylock	Commander of Troop I MSHP	MO State Highway Patrol
Ann Koenig	-	Missouri Department of Conservation
Preston Kramer	-	Missouri Department of Transportation
Karen McHugh	-	Missouri SEMA Floodplain Management
Travis Rayfield	Colonel	U.S. Army Corps of Engineers
Josh Hundley	Biologist	U.S. Fish and Wildlife Service
Ken Sessa	-	FEMA Region VII
Gary Applegate	-	U.S. Department of Agriculture NRCS
Amy Neir		Soil and Water Conservation District
Chris Brundick		Maries County Farm Bureau
Brett Hendrix	Regional Coordinator	MO SEMA

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 through letters and email.

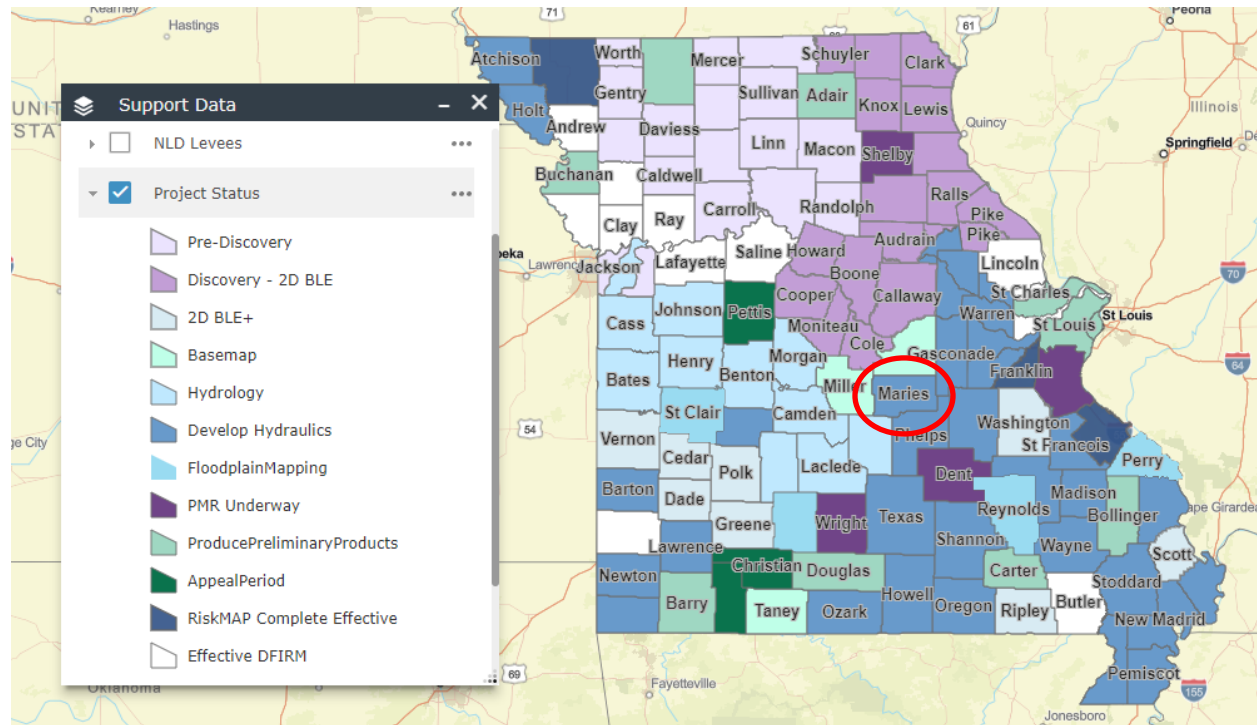
The questionnaire provided to every jurisdiction asked how mitigation actions were being incorporated into other planning documents. The county road and bridge department does a good job of incorporating mitigation projects into their regular maintenance program. Those projects have been incorporated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

### **Coordination with FEMA Risk MAP Project**

The Risk MAP project has begun in Maries County. As of January 2023, SEMA was working with WOOD E&IS to complete the Develop Hydraulics phases of the project to update the models used to develop the county's new flood risk data. Preliminary maps generated during the FSR3 phase are used in this plan as the current best source of data. Once completed, Risk MAP will provide 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 regard to RiskMap projects.

**Figure 1.1. Map of RiskMAP Projects**



Source: <http://bit.ly/MOSEMAOutreach>

## 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. Maries County is a rural area with the largest community's population at approximately 1,381. 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
- 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 (2023) 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 as indicated throughout the document.

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

The MPC reviewed the hazards that affected Maries County at the first planning meeting on February 3, 2023, including discussions of any hazard events that occurred during the last twenty 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 questionnaire completed by each jurisdiction. 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 questionnaire 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 and the Missouri State Hazard Mitigation plan data and the most recent U.S. census data available. Values reflected in the plan 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 questionnaire. The vulnerability assessment was completed using estimates from the 2023 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 February 22, 2022. At the second planning meeting on April 5, 2022, the MPC discussed revisions of the original goals to remove redundancies and improve coverage. The revised goals are as follows:

**Goal 1:** Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.



**Goal 2:** Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.

**Goal 3:** Reduce the potential impact of natural disasters on the continuity of government and essential services.

### **Step 7: Review Possible Mitigation Actions and Activities**

Mitigation strategy and specific action items were discussed at the first and second MPC meetings. At the first MPC meeting the group reviewed the list in the existing plan and decided which actions could be eliminated; what could be combined; what needed to remain on the list; and what needed to be added. It was emphasized that any mitigation actions in the 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 were 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 received proposed road and bridge mitigation projects that needed to be addressed from the County Road Crew Supervisor on August 28, 2023.

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.

Finally, action items were reviewed to determine if they met the SMART criteria as provided by SEMA and FEMA: **S**pecific, **M**easurable, **A**chievable, **R**elevant, **T**ime-bound.

### **Step 8: Draft an Action Plan**

The MPC reviewed the final list of action items and completed the prioritization process at the April 11, 2023 meeting. The final list was then emailed out to all jurisdictions and members of the MPC for review and approval as not everyone was able to attend the meeting. Staff were directed by the MPC to take the finalized list after allowing time for comments 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. 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 ensure 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 all three planning meetings (February 2, 2023, April 11, 2023 and January 16, 2024) 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 Maries County's strategy for implementation, evaluation and revising the plan.

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## 2 PLANNING AREA PROFILE AND CAPABILITIES

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<b>2 PLANNING AREA PROFILE AND CAPABILITIES.....</b>	<b>2.1</b>
<b>2.1</b> <i>Maries County Planning Area Profile.....</i>	<b>2.2</b>
2.1.2    Geography, Geology and Topography.....	2.3
2.1.3    Climate .....	2.7
2.1.4    Population/Demographics .....	2.8
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## 2.1 Maries County Planning Area Profile

Figure 2.1. Map of Maries County



Maries County has a population of approximately 8,432 according to the most recent census data<sup>1</sup>.

<sup>1</sup> U.S. Census Bureau, Census 2020 Redistricting Data

Error! Reference source not found. illustrates the percentage population growth since 2010 as compared to the statewide and national population growth. The median household income and percentage growth since 2010, as compared to statewide and national figures can be found in **Table 2.2**. Furthermore, median house value percentage growth for Maries County, Missouri, and the United States is provided in **Table 2.3**.

**Table 2.1. Percent Population Growth for County, State, and Nation 2010 - 2020**

Demographic Region	Total Population		Change Over Period	
	2010	2020	Change	Percent
Missouri	5,814,785	6,154,913	340,128	5.85
United States	300,758,215	331,449,281	30,691,066	10.2
Maries County	9,176	8,432	-744	-8.11

Source: U.S. Census Bureau, Census 2010 Summary File 1; U.S. Census Bureau, Census 2020 Redistricting Data

**Table 2.2. Median Household Income and Percentage Growth for County, State, and Nation 2010 - 2020**

Demographic Region	Median Household Income (USD)		Change Over Period	
	2010	2020	Change	Percent
United States	\$51,914	\$64,994	\$13,080	20.1
Missouri	\$46,262	\$57,290	\$20,972	19.2
Maries County	\$40,185	\$48,276	\$8,091	20.1

Source: U.S. Census Bureau, 2006-2010 and 2017-2021 5-Year American Community Survey

**Table 2.3. Median House Value Percentage Growth for County, State, and Nation 2010 - 2020**

Demographic Region	Median House Value (USD)		Change Over Period	
	2010	2020	Change	Percent
United States	\$188,400	\$229,800	\$41,400	18.02
Missouri	\$137,700	\$163,600	\$25,900	15.8
Maries County	\$112,500	\$145,400	\$32,900	29.2

Source: U.S. Census Bureau, 2006-2010 and 2017-2021 5-Year American Community Survey

## 2.1.1 Geography, Geology and Topography

Maries County has a total land area of 530 square miles. Approximately 43 percent of the land cover in the county is deciduous forest intermixed with 44 percent of grassland. Approximately one 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. Additionally, the county is comprised of 2.9 square miles of total water area. Incorporated jurisdictions within the county include the Cities of Belle and Vienna.

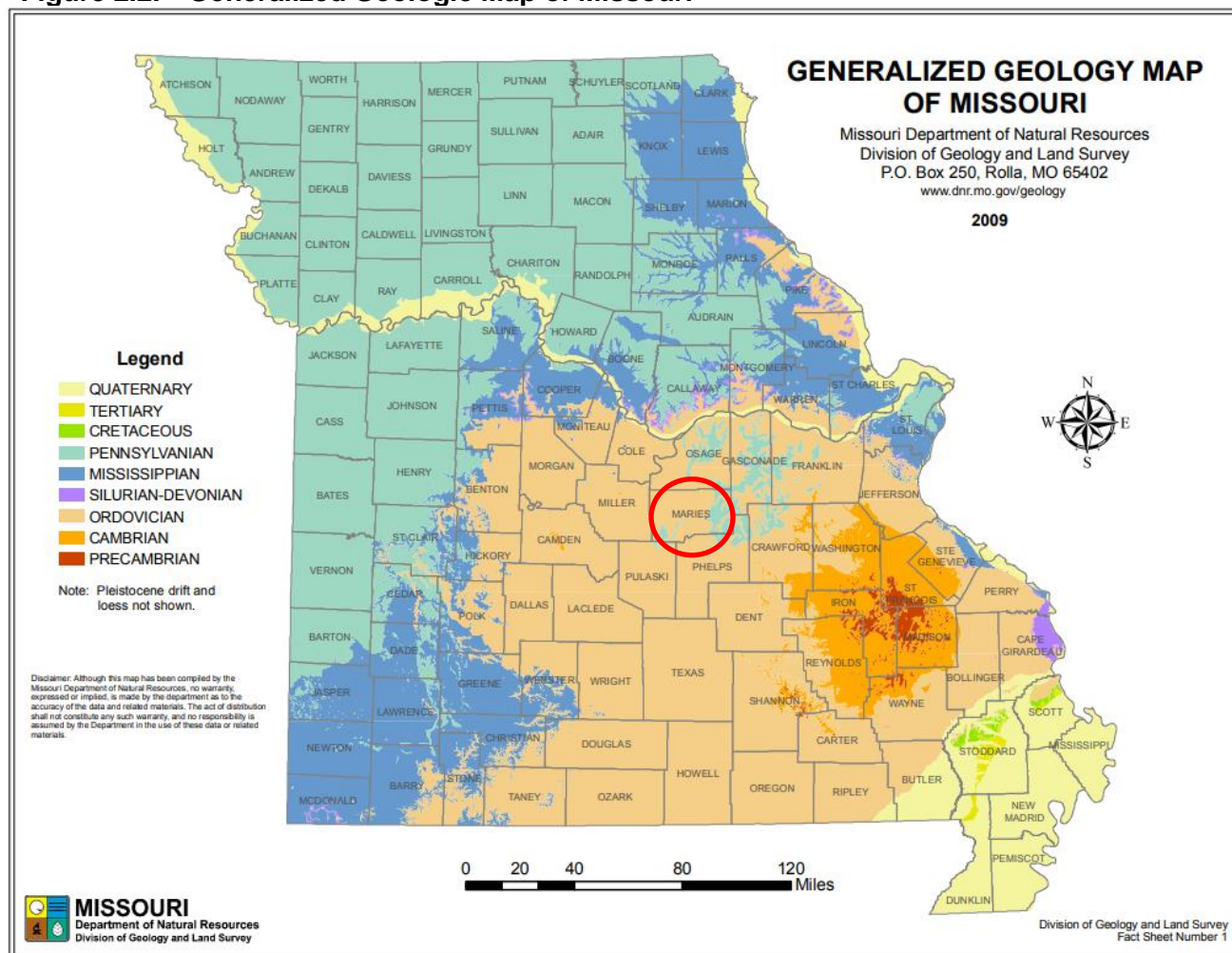
The county seat, Vienna, is located in central Missouri, approximately 29 miles south of the state capital of Jefferson City, approximately 100 miles northeast of Springfield, Mo. and approximately 99 miles southwest of St. Louis, Mo. The county is bordered on the north by Osage County, on the



east by Gasconade County, on the south by Phelps and Pulaski Counties, and on the west by Miller County.

Located within the Ozark Mountains, Maries County specifically resides within the Salem Plateau and the interior Ozark Highlands. The county is located in 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. **Figure 2.2** depicts a generalized geologic map of Missouri and its counties.

**Figure 2.2. Generalized Geologic Map of Missouri**



Source: <https://dnr.mo.gov/document-search/generalized-geologic-map-missouri-pub2514/pub2514> \*Red circle indicates Maries County

The topography in the eastern portion of the county is typical of the Bourbeuse Watershed, with gently rolling hills and prairie-like terrain. West of the Bourbeuse Watershed the terrain grows rough and hilly. The most rugged terrain is in the western portion of the county in the Maries River Watershed. The maximum relief in the county is approximately 500 feet.

**Figure 2.3. Maries County Watershed/Water Resources**





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Maries County is comprised of three HUC8 watersheds which include the Bourbeuse, Lower Osage, and Lower Gasconade. The Bourbeuse River lies on the eastern side of the county and includes the following tributaries: Little Bourbeuse Creek, Upper Bourbeuse River, and Dry Fork Creek. The Lower Osage River lies on the western side of the county and includes Tavern Creek, Sugar Creek, Little Maries River and Upper Maries River. The Lower Gasconade basin runs northward through the middle of the county and includes Spring Creek.

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.<sup>1</sup>

The East 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.<sup>2</sup>

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.<sup>3</sup>

During the last 100 years, stream channels in the Ozarks have become wider and shallower and

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<sup>1</sup> [https://mdc.mo.gov/sites/default/files/2021-12/050\\_2021\\_BourbeuseRiver.pdf](https://mdc.mo.gov/sites/default/files/2021-12/050_2021_BourbeuseRiver.pdf)

<sup>2</sup> [https://mdc.mo.gov/sites/default/files/2022-04/300\\_2022\\_EastOsageRiver.pdf](https://mdc.mo.gov/sites/default/files/2022-04/300_2022_EastOsageRiver.pdf)

<sup>3</sup> [https://mdc.mo.gov/sites/default/files/2021-12/130\\_2021\\_GasconadeRiver.pdf](https://mdc.mo.gov/sites/default/files/2021-12/130_2021_GasconadeRiver.pdf)

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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.<sup>1</sup>

There are nine different soil types found in Maries County. However, 82 percent of the county is dominated by three soil associations – the Union-Swiss Association, which makes up 20 percent of the county; Gatewood-Gravois Association, which makes up 34 percent of the survey area; and the Rueter-Union Association which makes up 28 percent of the county. Other soil associations present include the Jamesfin-Cedargap-Raccoon Association, which makes up 12 percent of the county; Beemont-Gravois Association which makes up five percent of the county and the Mariosa Association which makes up just one percent of the county. All three of the primary soil associations in the county are found mainly on ridges and side slopes and are made up of loess and residuum materials.<sup>2</sup>

## 2.1.2 Climate

Snowfall typically occurs from November to March and averages about 8 to 12 inches 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. Measurable precipitation occurs on the average of less than 100 days per year. About half of these will be days with thunderstorms. The average annual precipitation is 47.21 inches. Most of the precipitation is absorbed by the soil and plants; however, a portion of the precipitation forms runoff and is returned to streams and other bodies of water.<sup>3</sup>

Because of its inland location, Missouri and Maries County are subject to frequent changes in temperature. The average annual temperature is 57.35°F. The average annual high temperature is 68.7°F with the average annual low at 46°F. The average high and low in January is 44°F and 23°F, respectively. In August the average high and low are 90°F and 66°F, respectively.<sup>4</sup>

While winters are cold, and summers are hot, prolonged periods of very extreme 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. In the summer, temperatures rise to 90°F or higher on average 55 to 60 days. In winter, there is an average of about 100 days with temperatures below 32 degrees. Temperatures below 0°F are infrequent with only about three days per year

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<sup>1</sup> <https://pubs.usgs.gov/fs/FS-027-96/fs-027-96.pdf>

<sup>2</sup> <https://nrcs.app.box.com/s/ke8squ1ngtgemxb3qregccsbeg2c1bme/file/982750179096>

<sup>3</sup> Decker, W.L., 2017, Climate of Missouri, Missouri Climate Center, College of Agriculture, Food, and Natural Resources

<sup>4</sup> Ibid

reaching this low temperature. The first frost occurs in mid-October, and the last frost occurs about mid-April<sup>1</sup>.

Temperatures in Missouri have risen almost 1° since the beginning of the 20<sup>th</sup> century. Temperatures in the 2000's have been higher than in any other historical period with the exception of comparable temperatures in the early 1930s dust bowl era. This warming has been concentrated in the winter and spring. Winter warming is reflected in a below average occurrence of very cold nights since 1990. At the same time Missouri has experienced an increase in extreme precipitation events, a trend that is projected to continue. Future increases in winter precipitation will pose a continued risk of spring planting delays and increased flooding along rivers and streams.<sup>2</sup>

### 2.1.3 Population/Demographics

**Table 2.4** provides population/demographic data for Maries County between 2000 and 2020 by jurisdiction. The unincorporated area of Maries County was determined by subtracting the populations of the incorporated areas from the overall county population.

**Table 2.4. Maries County Population 2010-2020 by Jurisdiction**

Jurisdiction	2000 Population	2010 Population	2020 Population	2010-2020 # Change	2010-2020 % Change
<b>Unincorporated Maries County</b>	6,931	7,021	6,470	-551	-7.85%
<b>Belle</b>	1,344	1,545	1,381	-164	-10.6%
<b>Vienna</b>	628	610	581	-29	-4.75%

Source: U.S. Census Bureau, Census 2000 Summary File 2; Census 2010 Redistricting Data; Census 2020 Redistricting Data

**Table 2.5** provides information in regard to 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 **0** including figures for Maries County, Missouri, and the U.S. In 2021 there were an estimated 3,633 households within the county<sup>3</sup>.

**Table 2.5. Percent of Individuals Under the Age of 5, and Over 65 for County, State, and Nation (2021)**

Location	% Under Age of 5	% Over Age of 65
<b>Maries County</b>	4.5%	21.9%
<b>Missouri</b>	6.0%	16.9%
<b>United States</b>	5.9%	16.0%

Source: U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates

<sup>1</sup> Decker, W.L., 2017, Climate of Missouri, Missouri Climate Center, College of Agriculture, Food, and Natural Resources

<sup>2</sup> <https://statesummaries.ncics.org/chapter/mo/>

<sup>3</sup> U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates

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**Table 2.6. 2021 Average Household Size for County, State, and Nation**

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Location	Average Household Size
Maries County	2.30
Missouri	2.46
United States	2.60

Source: U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates

### Social Vulnerability Index (SoVI ®)

The University of South Carolina developed an index to evaluate and rank the ability to respond to, cope with, recover from, and adapt to disasters. The index synthesizes 30 socioeconomic variables, which research literature suggests contribute to a reduction in a community's ability to prepare for, respond to, and recover from hazards. SoVI ® data sources include primarily those from the United States Census Bureau.

**Table 2.7** depicts the Social Vulnerability Index for Maries County along with its national percentile.

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**Table 2.7. Social Vulnerability Index (SoVI ®)**

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State	County	SoVI Score (10 - 14)	National Percentile (10 - 14)
Missouri	Maries County	1.950000048	80.4%

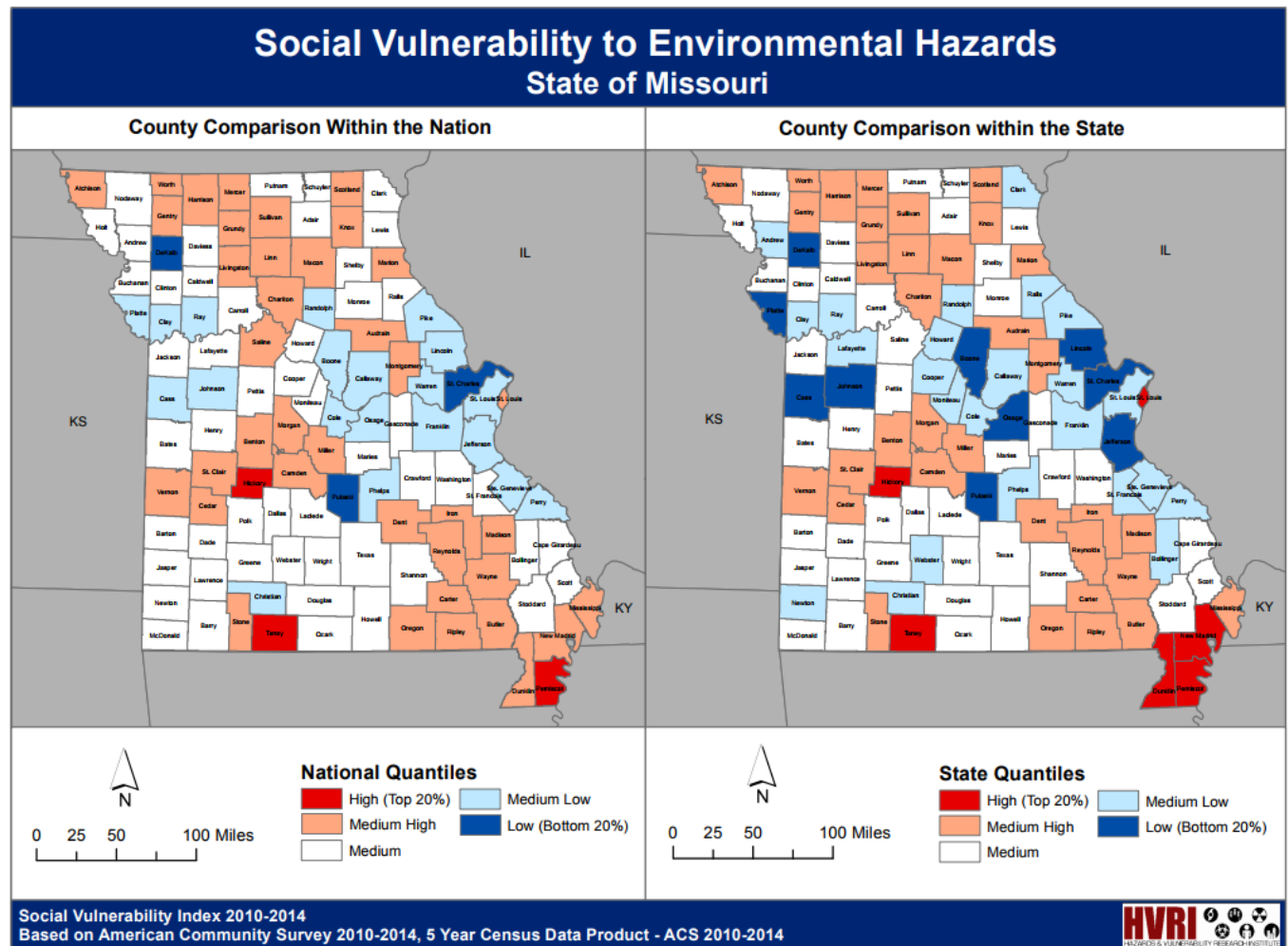
Source: <http://artsandsciences.sc.edu/geog/hvri/sovi%C2%AE-0>

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 resiliency<sup>1</sup>. Maries County's SoVI ® Score illustrates a diminished vulnerability to cope with natural disasters. Additionally, Maries County is ranked 80.4 percent nationally, for counties most vulnerable to environmental hazards. **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.

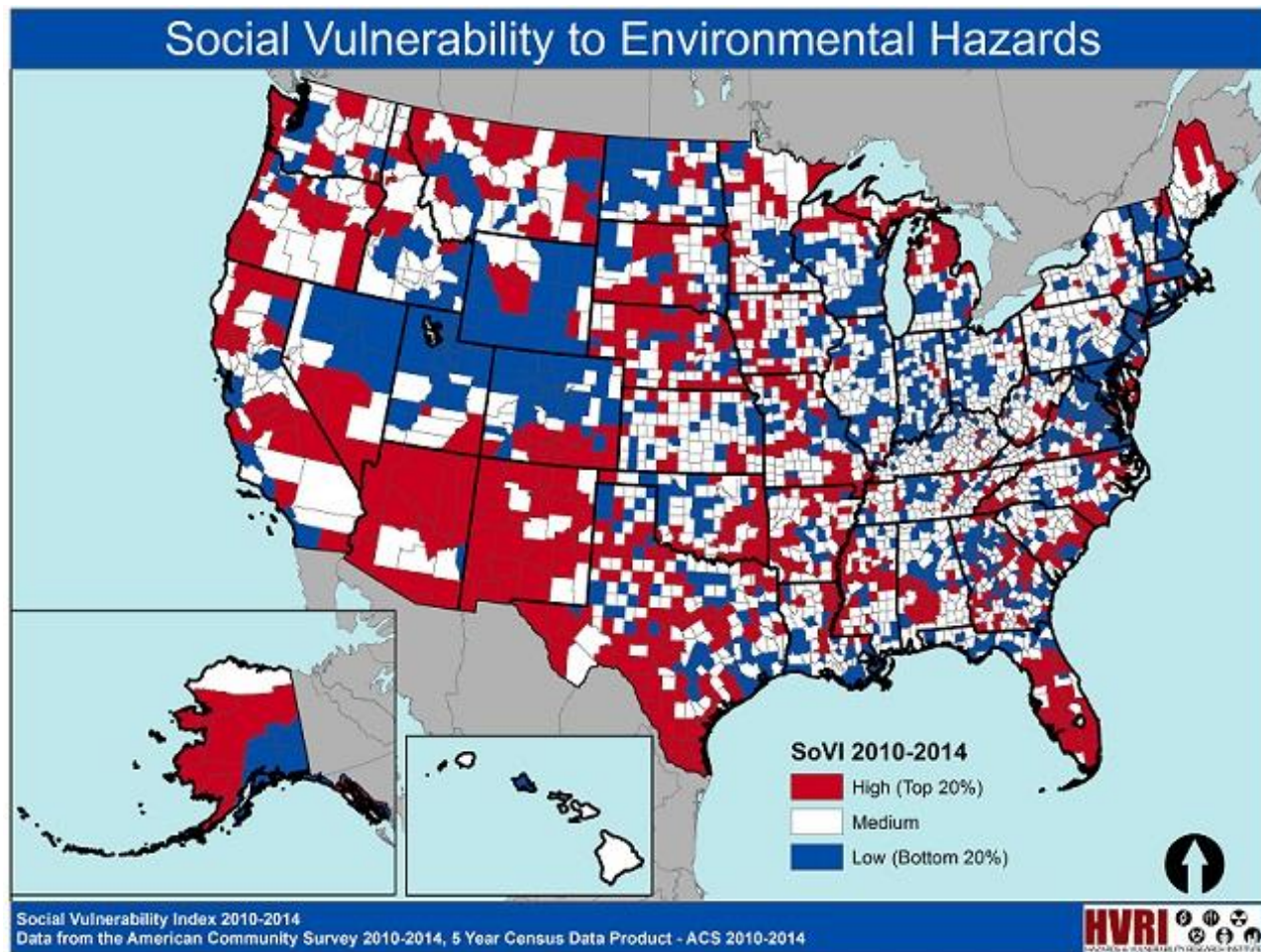
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<sup>1</sup> <http://webra.cas.sc.edu/hvri/products/sovifaq.aspx>

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



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



**Table 2.8** provides additional demographic and economic indicators for Maries County.

**Table 2.8. 2021 Unemployment, Poverty, Education, and Language Percentage Demographics, Maries 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
Unincorporated Maries County	55.2%	6.4%	9.5%	41.2%	17.5%	3.0%
Belle	62.3%	1.4%	4.8%	35.0%	13.9%	0.0%

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
Vienna	55.2%	1.4%	42.2%	29.5%	18.4%	0.8%

Source: U.S. Census Bureau, 2017-2021 American Community Survey, 5-Year American Community Survey

## 2.1.4 History

The first land entry within the present limits of Maries County was made on Jan. 11, 1826, at which time Charles Lane entered an 80-acre tract. In April of the following year, he entered the adjacent 80-acre tract giving him 160 acres of land known for a hundred years thereafter as the Old Pay Down Mills. Mill sites were in great demand by the early settlers, and Lane probably had such a use for the land in mind when he acquired it. The trace known as Boone's Lick Road was the site of the first three post offices to be established in the county. The first of these was established on the farm of Lunsford L. Lane in Lane's Ford in 1837. Mr. Lane was the postmaster. The second post office, also located on the road, was established in July 1842, in William Hawkins' store and lasted until June 1864. The third post office, located near the crossing of the Boone's Lick and Springfield roads, was established in February 1851, and was located in the home of William Pinnell. The first school district was organized in Maries County in 1843. Its boundaries were indefinitely described, but it included the northwestern portion of the present Maries County, and the southwestern part of the present Osage County. Davis Woody was the first president of the board of education of the new district. By the beginning of the 1850s, the population of the area now embraced by Maries County had grown large enough that agitation began for the formation of a separate county. A bill for the organization of the county was introduced into the legislature in December 1854 and was approved by the governor on March 2, 1855. The county was named for two streams, the Maries and the Little Maries. Maries is a derivative of a French word marais, which means marsh, lake or pond.

When originally formed, Maries County extended farther south than it does at present, taking in the city of Rolla and barely missing Newburg, both now in Phelps County. This situation existed only a short time, since Phelps County was formed shortly afterward. Maries County lost some territory to Phelps County but gained almost as much from Crawford County at the same time. On July 20, 1855, title to the 70 acres of land on which Vienna, the county seat, now stands was acquired from William Shockley, who donated the tract in consideration of the county seat being located there. The construction of the first courthouse was completed, and the building occupied in October of 1856. It was the most elevated building in the town, standing on the ridge between the Gasconade and Osage rivers and the roof divided the falling rain to flow into the Gasconade on the east and into the Osage to the west. The building was completely destroyed by fire on Nov. 6, 1868, and all court records were lost or destroyed. Work on a new building began in 1869 and was completed in 1870. This second courthouse was razed in 1939 to make way for the construction of the present courthouse.

The City of Belle was the location of a post office and train depot along the route of the Chicago, Rock Island and Pacific Railroad built across a portion of Maries County in 1904. The community is a fourth-class city with a four-member board of aldermen and a mayor. The city is located in the northeast corner of the county and straddles the Maries/Osage county line. The community lies at the convergence of Highways 28 and 89. Belle is the largest city in the county with a population of



1,723. The City of Vienna was formed in 1855 as the county seat. Initially the community had a population of about 250. It contained a brick schoolhouse, a newspaper – the Central Missourian, two churches, one hotel, four stores and a wagon shop.

Vienna is a fourth-class city with a four-member board of aldermen and a mayor. The city is located in central Maries County at the convergence of Highways 63 and 42. The current population for the city is 661.

## 2.1.5 Occupations

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

**Table 2.9. Occupation Statistics, Maries County, Missouri**

Place	% in Management, Business, Science, and Arts Occupations	% in Service Occupations	% in Sales and Office Occupations	% in Natural Resources, Construction, and Maintenance Occupations	% in Production, Transportation, and Material Moving Occupations
Unincorporated Maries County	30.4%	13.4%	17.3%	14.3%	24.7%
Belle	22.5%	13.1%	31.0%	11.4%	22.0%
Vienna	23.6%	24.2%	17.1%	16.5%	18.5%

Source: U.S. Census, 2017-2021 American Community Survey, 5-year Estimates.

## 2.1.6 Agriculture

Due to the rural nature of the area, agriculture and timber are significant factors in the local economy. According to the 2012 Census of Agriculture, the number of farms in the County was 836 encompassing 241,357 total acres<sup>1</sup>. In addition, the average farm was 289 acres. According to the 2017 Census of Agriculture, Maries County had increased to 879 farms encompassing 248,382 acres, with an average farm size of 283 acres<sup>2</sup>. Furthermore, there are approximately 27 farms with 1,000 or more acres in the County. In 2017, 46,130 acres of cropland were harvested, with corn for grain being the top crop in the County. Moreover, 57,257 cattle and calves were inventoried in the County. The average sale per farm was \$36,878. Lastly, the total number of hired workers in the County was 389<sup>3</sup> individuals comprising 9.96%<sup>4</sup> of the total workforce.

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.

<sup>1</sup> [https://agcensus.library.cornell.edu/wp-content/uploads/2012-Missouri-st29\\_2\\_001\\_001.pdf](https://agcensus.library.cornell.edu/wp-content/uploads/2012-Missouri-st29_2_001_001.pdf)

<sup>2</sup> [https://www.nass.usda.gov/Publications/AgCensus/2017/Full\\_Report/Volume\\_1\\_Chapter\\_2\\_County\\_Level/Missouri/st29\\_2\\_0001\\_0001.pdf](https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_2_County_Level/Missouri/st29_2_0001_0001.pdf)

<sup>3</sup> [https://www.nass.usda.gov/Publications/AgCensus/2017/Full\\_Report/Volume\\_1\\_Chapter\\_2\\_County\\_Level/Missouri/st29\\_2\\_0007\\_0007.pdf](https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_2_County_Level/Missouri/st29_2_0007_0007.pdf)

<sup>4</sup> U.S. Census Bureau, 2017-2021 American Community Survey



## 2.1.7 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 damages<sup>1</sup>. 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 1990-2022**

Project Type	Sub applicant	Declaration	Project Total (\$)
-	-	-	-
<b>Total</b>			\$0

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

## 2.1.8 FEMA Public Assistance (PA) Grants in Planning Area

The purpose of the Public Assistance (PA) Grant Program is to support communities' recovery from major disasters by providing them with grant assistance for debris removal, life-saving emergency protective measures, and restoring public infrastructure. Local governments, states, tribes, territories and certain private nonprofit organizations are eligible to apply. Public Assistance is FEMA's largest grant program. **Table 2.10** below gives information about all Public Assistance Grant for the Planning area. It gives the Declaration number, incident type, project type and size, and the project total. Total PA grants is \$2,408,222.46

**Table 2.11. FEMA PA Grants in Maries County from 2002 - 2022**

Disaster Declaration	Incident Type	Project Type	Project Size	Project Total
1412	Severe Storm	ROAD WASHOUTS	Small	\$7,393.25
1412	Severe Storm	WASHOUT OUT ROAD REPAIR	Small	\$9,552.45
1412	Severe Storm	ROAD WASHOUTS	Small	\$6,379.62
1412	Severe Storm	ROAD DAMAGE	Small	\$7,918.75
1412	Severe Storm	AGGREGATE SURFACES	Small	\$2,640.00
1412	Severe Storm	ROAD DAMAGE	Small	\$2,576.00
1412	Severe Storm	WATER CROSSING	Small	\$4,230.00
1412	Severe Storm	AGGREGATE SURFACE	Small	\$2,756.00
1412	Severe Storm	ROAD DAMAGE	Small	\$4,448.00
1412	Severe Storm	AGGREGATE SURFACE	Small	\$1,092.00
1412	Severe Storm	AGGREGATE SURFACES	Small	\$5,366.00
1412	Severe Storm	AGGREGATE SURFACES	Small	\$2,456.00
1412	Severe Storm	AGGREGATE SURFACE	Small	\$1,628.00
1412	Severe Storm	ROAD DAMAGE	Small	\$16,800.00
1412	Severe Storm	LOW WATER CROSSING REPAIR	Small	\$32,163.50
1412	Severe Storm	LOW WATER CROSSING DAMAGES	Small	\$29,500.00

<sup>1</sup> <https://www.fema.gov/grants/mitigation>

Disaster Declaration	Incident Type	Project Type	Project Size	Project Total
1463	Severe Storm	DEBRIS REMOVAL	Small	\$7,181.84
1463	Severe Storm	DONATED RESOURCES	Small	\$680.00
1676	Severe Ice Storm	EMERGENCY PROTECTIVE MEASURES	Small	\$1,255.24
1676	Severe Ice Storm	DEBRIS REMOVAL	Small	\$3,200.00
1676	Severe Ice Storm	EMERGENCY PROTECTIVE MEASURES	Small	\$3,029.60
1676	Severe Ice Storm	DEBRIS REMOVAL	Small	\$8,991.39
1676	Severe Ice Storm	PUBLIC BUILDINGS AND FACILITIES	Small	\$1,000.00
1676	Severe Ice Storm	EMERGENCY PROTECTIVE MEASURES	Small	\$14,042.36
1676	Severe Ice Storm	DONATED RESOURCES	Small	\$913.00
1676	Severe Ice Storm	EMERGENCY PROTECTIVE MEASURES	Small	\$5,578.24
1676	Severe Ice Storm	DEBRIS REMOVAL	Large	\$99,650.75
1742	Severe Storm	ROAD DAMAGES	Small	\$9,869.32
1742	Severe Storm	DONATED RESOURCES	Small	\$1,187.10
1742	Severe Storm	PA PILOT - DEBRIS REMOVAL	Small	\$7,588.14
1742	Severe Storm	EMERGENCY PROTECTIVE MEASURES	Small	\$1,745.35
1749	Severe Storm	PILOT PW - DEBRIS REMOVAL	Small	\$1,362.99
1749	Severe Storm	ROAD/CULVERT WASHOUT	Small	\$34,329.69
1749	Severe Storm	ROAD AND CULVERT WASHOUTS	Small	\$34,571.31
1749	Severe Storm	ROAD WASHOUT	Small	\$11,914.39
1749	Severe Storm	ROAD WASHOUT	Small	\$28,156.44
1749	Severe Storm	ROAD WASHOUT	Small	\$2,600.00
1749	Severe Storm	PA PILOT DEBRIS REMOVAL	Small	\$1,227.14
1749	Severe Storm	ROAD WASHOUTS	Small	\$1,019.92
1749	Severe Storm	ROAD WASHOUTS	Small	\$35,205.01
1749	Severe Storm	ROAD DAMAGES	Small	\$2,752.32
1809	Severe Storm	Low Water Crossings MCSKC2	Small	\$1,765.66
1809	Severe Storm	Road-MCSKC1	Small	\$1,413.16
1809	Severe Storm	Low Water Crossing-MCTSC1	Small	\$6,348.22
1809	Severe Storm	Roads-MCTSC2	Small	\$21,220.83
1809	Severe Storm	Roads-MCSKC5	Small	\$17,916.75
1809	Severe Storm	Road-MCSKC3	Small	\$1,557.44
1809	Severe Storm	Pilot Debris-MCSKA2	Small	\$32,595.76
1809	Severe Storm	Debris-Pilot-MCSKA1	Small	\$1,377.99
1809	Severe Storm	Road Washout MCSKC6	Small	\$31,020.06
1809	Severe Storm	County Roads MCSKC4	Small	\$23,639.88
1847	Severe Storm	DWC0002 / County Roads	Small	\$28,471.96
1847	Severe Storm	DWC0003 / County Roads Listed	Small	\$11,979.69
1847	Severe Storm	DWC0004 - County Roads	Small	\$13,951.83
1847	Severe Storm	DWC0006 - County Roads	Small	\$12,729.09
1847	Severe Storm	DWC0007 / County Roads	Small	\$14,524.71
1847	Severe Storm	DWC0001 / County Roads	Small	\$21,189.40
1847	Severe Storm	DWC0005 - County Roads Listed	Small	\$55,041.70

Disaster Declaration	Incident Type	Project Type	Project Size	Project Total
1847	Severe Storm	DWC0008 / County Roads	Small	\$11,808.06
1847	Severe Storm	DWC0010 / Culverts and Bridge Wing Wall	Small	\$6,800.00
1847	Severe Storm	DWC0012 - Gravel Roads	Small	\$34,768.95
1847	Severe Storm	DWC0009 /County Roads	Small	\$5,759.28
1847	Severe Storm	DWC0011 - Gravel Roads	Small	\$52,891.21
1847	Severe Storm	DWC0013 - Gravel Roads	Small	\$36,766.27
1961	Severe Storm	MRRH-05 - Roof/Gymnasium Floor Damage	Small	\$1,000.00
1961	Severe Storm	MRRB-06-Emergency Protective Measures-48 Hour Snow Rem	Small	\$19,088.86
1961	Severe Storm	MRGD-05-Emergency Protective Measures - DONATED RESOURC	Small	\$119.28
1961	Severe Storm	MRRB-07-Emergency Protective Measures-48 Hour Snow Remo	Small	\$1,659.08
1961	Severe Storm	MRRH-04- Emergency Protective Measures	Small	\$2,452.76
1961	Severe Storm	MRRH-16 - Emergency Protective Measures-48 Hour Snow Re	Small	\$2,830.32
1961	Severe Storm	MRRH-26 - Emergency Protective Measures-48 Hour Snow R	Small	\$6,110.26
4130	Severe Storm	MCMC01C Aggregate Roads Washouts 6 sites	Small	\$10,129.43
4130	Severe Storm	MCMC02C Aggregate Road Washouts	Small	\$12,625.87
4144	Severe Storm	MCMC05C- Roads and Culverts	Small	\$37,422.21
4144	Severe Storm	MCMC04C-LOW WATER CROSSING	Small	\$20,730.04
4144	Severe Storm	MCMC06C LOW WATER CROSSING	Small	\$23,850.77
4144	Severe Storm	MCMC02C-Roads and Ditches	Small	\$52,067.70
4144	Severe Storm	MCMC01C- Roads and Culverts	Large	\$67,643.67
4144	Severe Storm	CWVS01F - Fencing and pipe support	Small	\$12,411.50
4144	Severe Storm	MCMC03C- Roads and Culverts	Large	\$88,444.18
4238	Severe Storm	LMK007C - 10 Gravel Roads	Small	\$69,002.40
4238	Severe Storm	MCR001C- 5 Gravel Roads	Small	\$15,108.00
4238	Severe Storm	LMK005C - Road and Culvert Damage	Small	\$25,284.66
4238	Severe Storm	LMK006C- 10 Gravel Roads	Small	\$57,942.00
4238	Severe Storm	LMK004C - Road and Culvert Damage	Small	\$25,619.28
4238	Severe Storm	MCR002C- Road and Culvert Washout	Small	\$27,295.26
4317	Flood	ST02187 - Gravel Road Washouts	Small	\$24,362.81
4317	Flood	ST02186 - Gravel Roads and Low Water Crossing Washouts	Small	\$108,538.40
4317	Flood	ST02372 - Gravel Roads and Low Water Crossing Washouts	Large	\$106,033.73
4317	Flood	CP02380 - Gravel Road and Shoulder Washouts in Sector 6	Small	\$118,279.07
4317	Flood	ST02348 - Washouts at Sam Wilson Bridge CR 411 and Culvert	Small	\$34,018.60

Disaster Declaration	Incident Type	Project Type	Project Size	Project Total
4317	Flood	CP02378 - Gravel Road Washouts in Sector 500	Small	\$34,801.25
4317	Flood	CP02401 - Emergency Protective Measures	Small	\$7,932.63
4317	Flood	CP02375 - Gravel Road Washouts in Sector 200	Small	\$73,142.49
4317	Flood	ST02182 - Bridge Scouring on CR 409	Small	\$23,198.86
4317	Flood	CP02376 - Gravel Road Washouts in Sector 300	Small	\$23,258.33
4317	Flood	ST02360 - Gravel Road and Low Water Crossing Washouts i	Small	\$117,944.26
4317	Flood	ST02374 - Gravel Road and Low Water Crossing Washouts i	Large	\$148,519.20
4451	Severe Storm	112881 - County-Wide Roads (Work Completed)	Small	\$107,866.29
4451	Severe Storm	144989 - Management Costs	Small	\$0.00
				<b>\$2,408,222.46</b>

Source: Federal Emergency Management Agency, 01/24/2023

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## 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 Maries County

#### Overview

The jurisdiction of Maries County includes all unincorporated areas within the county boundaries. Maries County is governed by a three-member County Commission. The Commission is composed of a presiding commissioner, representing all of the county's population who is elected for a four-year term. Two associate commissioners representing roughly half the county's population each, are elected for four-year terms. The commission meets on Mondays and Thursdays of each week. According to the 2020 U.S. Decennial Census, the unincorporated area of the county has a population of 6,470.

Other elected county officials include the County Clerk, Prosecuting Attorney, Sheriff, Circuit Court Clerk/Recorder of Deeds, Collector of Revenue, Assessor, Treasurer, Coroner, and Public Administrator. Non-elected county officials include the County Surveyor, Emergency Management Director/911 Director, Floodplain Administrator, and Road and Bridge Supervisors. Maries County shares a county health department with Phelps County.

#### Technical and Fiscal Resources

Maries County operates as a third-class county. The county government has the authority to administer county structures, infrastructure, and finances. Third class counties do not have the authority to enforce building regulations. Maries County has staff resources emergency management and transportation. The county has a 9-1-1 central dispatch center located at the Maries County Sheriff's Office. Additionally, there are no outdoor warning sirens located in the unincorporated areas of the county. In September of 2023 the county established Code Red, a subscription-based mass notification system.

There are four fire departments located in Maries County. All four are volunteer departments. Those departments include Belle Fire Protection District, Vichy Volunteer Fire Protection Association, Vienna Fire Protection District and Dixon Rural Fire Protection District. The Belle and Vienna Fire Departments are tax supported, while the Vichy Volunteer Fire Department is dues supported. In addition, the county is served by Argyle Volunteer Fire Department, Iberia Volunteer Fire Department, Freeburg Volunteer Fire Department, Meta Fire & Rescue, and St. James Fire Protection District. The county is served by the Maries County Sheriff's Department. The county has a 911 Central Dispatch Center located at the Maries County Sheriff's Department, Maries County Courthouse, 211 Fourth Street, Vienna, Mo. The county is served by four ambulance districts – Maries-Osage Ambulance District, Osage Ambulance District, St. James Ambulance District, and Dixon Ambulance District. The county uses Code Red mass notification system and social media to provide alerts to residents. The county owns a fixed generator that serves the

Courthouse, Sheriff's department and dispatch/9-1-1. The county also owns two portable generators, mounted on trailers that can be dispatched around the county where needed.

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 an Emergency Operations Plan, Economic Development Plan, Regional Transportation Plan, and Critical Facilities Plan.

### Other Mitigation Activities

The Office of Emergency Management, local fire departments, Sheriff's Department and the Maries Phelps 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, Ready-in-3 emergency preparedness, Jr. Deputy Program, fire safety, storm preparedness, weather spotter training, heat wave preparedness, dissemination of SEMA brochures and general press releases/social media outreach regarding hazards, preparedness, and mitigation.

The county has several policies in place to remain proactive in responding to flooding hazards. The road and bridge department has a policy in place to size up culverts as replacement becomes necessary. They are also currently working to replace all low water crossings in the county with upgraded bridges or box culvert crossings.

The unincorporated county has a higher percentage of mobile homes at over 14 percent. A high percentage of mobile homes leads to an increased risk of damage during a natural disaster.

**Table 2.12. Demographic and Structure Risk Parameters For Unincorporated Maries County**

Jurisdiction	Total Population	People With a Disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Unincorporated Maries County	6,173	1,015	182	905	205	1,383	441	623

Source: U.S. Census Bureau, 2017-2021 5-Years American Community Survey

**Table 2.13. Unincorporated Maries County Mitigation Capabilities**

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
<b>Comprehensive Plan</b>	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	n/a

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
County Emergency Operations Plan	Yes -2022
Local Recovery Plan	n/a
County Recovery Plan	No
City Mitigation Plan	n/a
County Mitigation Plan	Yes - 2019
Debris Management Plan	No
<b>Economic Development Plan</b>	Yes – Regional CEDS 2023
Transportation Plan	Yes – Regional updated annually
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
<b>Watershed Plan</b>	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	Yes – Regional Hazardous Materials Emergency Response Plan 2023
<b>Policies/Ordinance</b>	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes - 1999
Subdivision Ordinance	N/A
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
<b>Program</b>	
Zoning/Land Use Restrictions	No
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 – In-Progress
FireWise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	9 (5 if 5 miles from a station)
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 (Local/County/Regional)	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (City)	N/A
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Vulnerable Population Inventory	No
Land Use Map	No
<b>Staff/Department</b>	
Building Code Official	N/A
Building Inspector	No
Mapping Specialist (GIS)	No
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	Yes – MOU Rolla HSRT
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – Regional - MLEPD
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	Yes
Economic Development Department	No
Housing Department	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC
Historic Preservation	Yes
<b>Non-Governmental Organizations (NGOs)</b>	
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
<b>Local Funding Availability</b>	
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	n/a
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	n/a
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2023



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## 2.2.2 City of Belle

### Overview

Belle is located in the northeast corner of Maries County at the junction of Highways 28 and 89. Part of the city is located in Osage County and part is located in Maries County. The city has been included in the Maries County Hazard Mitigation Plan since their first Plan. The community was incorporated in 1904. State highways 28 and 89 intersect the City of Belle. According to the 2020 U.S Decennial Census, the community has a population of 1,381. Belle is incorporated as a fourth-class city (1904) with a four-member board of aldermen and a mayor. The city employs a City Clerk/Collector, City Attorney/Prosecutor, Court Clerk, City Treasurer, Fire Chief, Marshall, Building Inspector, Municipal Court Judge and Public Works Director.

### Technical and Fiscal Resources

Belle does not participate in the National Flood Insurance Program and does not have a Flood Insurance Study. The city has one outdoor warning siren located in the High School parking lot. The sirens are controlled by the Osage County Emergency Operations Center and Belle Fire Protection District. Law enforcement for the city is provided by the Bell Police Department. The city Ambulance service is provided by the Osage Ambulance District. There is also a volunteer Fire Protection District within the community. The city is served by the Gasconade County E-911 dispatch service.

Belle does have building codes (2006 IBC) which the city enforces by requiring building permits and inspections for new builds as well as renovations.

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

### Existing Plans and Policies

Belle currently does not participate in the National Flood Insurance Program. The city has an Emergency Operations Plan and is a part of the County Emergency Operations Plan, County Hazard Mitigation Plan, Regional Transportation Plan (MRPC), and Regional Comprehensive Economic Development Strategy (MRPC).

### Other Mitigation Activities

Public education programs regarding preparations for weather events, water and energy conservation are provided locally through social media. Bicycle and car seat safety education is provided by the Coalition for Roadway Safety.

The city has higher percentages than the unincorporated county of population with disabilities and children under the age of 5. Higher percentages of vulnerable populations increase the chances of injury or death during hazard events. In addition, the city has a higher percentage of homes built prior to 1939 which increases the chance of damages during hazard events.

**Table 2.14** below shows the demographic and structure statistics, and **Table 2.15** describes the mitigation capabilities of the city.

**Table 2.14. Demographic and Structure Risk Parameters For Belle**

Jurisdiction	Total Population	With a disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Belle	1,446	361	0	153	115	236	72	50

Source: U.S. Census Bureau, 2017-2021 5-Years American Community Survey

**Table 2.15. City of Belle Mitigation Capabilities**

Capabilities	Status Including Date of Document or Policy
<b>Planning Capabilities</b>	
<b>Comprehensive Plan</b>	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes - 2018
County Emergency Operations Plan	Yes – 2022
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	No
County Mitigation Plan	Yes – 2019
Debris Management Plan	No
<b>Economic Development Plan</b>	Yes – Regional CEDS 2023
Transportation Plan	Yes – regional updated annually
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
<b>Watershed Plan</b>	No
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	Yes – 1990
Building Code	Yes – IBC, 2006
Floodplain Ordinance	No
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	Yes
<b>Program</b>	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	Yes
National Flood Insurance Program	No
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
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	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (City)	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	Yes
<b>Staff/Department</b>	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	No
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – regional MLEPD
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC
Historic Preservation	No
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No – Belle Betterment Community Association
Community Organizations (Lions, Kiwanis, etc.)	No
<b>Local Funding Availability</b>	
Ability to apply for Community Development Block Grants	Yes

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Capabilities	Status Including Date of Document or Policy
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	No
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2023

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## 2.2.3 City of Vienna

### Overview

Vienna is located in the central portion of Maries County. The community was named as the county seat in 1855. State highways 63 and 28 intersect the City of Vienna. According to the 2020 U.S. Decennial Census, the community has a population of 581. Vienna is incorporated as a fourth-class city with a four-member board of aldermen and a mayor. The city employs a City Clerk, City Attorney, Chief of Police and Public Works Superintendent.

### Technical and Fiscal Resources

Ambulance service is provided by the Maries-Osage Ambulance District in Vienna. There is also a Volunteer Fire Department within the community. The Maries County Sheriff's Department houses and operates the 9-1-1 system located in the courthouse in Vienna. The city has one warning siren which is activated by the Sheriff's Department. The city has one fixed generator and one portable generator.

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

### Existing Plans and Policies

Vienna currently participates in the National Flood Insurance Program, joined in November 1979. The only portion of the city that lies within the floodplain is the northwest corner that includes the city's sewage lagoons. There is no other development in the area, nor plans to develop the designated floodplain. Vienna has a floodplain ordinance and flood plain manager. The city does not have a flood insurance study. The city is included in a Regional Transportation Plan (MRPC), and a Regional Comprehensive Economic Development Strategy (MRPC).

### Other Mitigation Activities

Public education programs regarding preparations for weather events, water and energy conservation are provided locally through social media. Bicycle and car seat safety education is provided by the Coalition for Roadway Safety.

The city has higher percentages than the unincorporated county of population with disabilities, below the poverty line, under the age of 5, and people over the age of 65. Higher percentages of vulnerable populations increase the chances of injury or death during hazard events.

**Table 2.14** below shows the demographic and structure statistics, and **Table 2.15** describes the mitigation capabilities of the city.

**Table 2.16. Demographic and Structure Risk Parameters For Vienna**

Jurisdiction	Total Population	With a disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Vienna	838	169	6	271	64	227	28	30

Source: U.S. Census Bureau, 2017-2021 5-Years American Community Survey

**Table 2.17. City of Vienna Mitigation Capabilities**

Capabilities	Status Including Date of Document or Policy
<b>Planning Capabilities</b>	
<b>Comprehensive Plan</b>	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	No
County Emergency Operations Plan	Yes – 2022
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	No
County Mitigation Plan	Yes – 2019
Debris Management Plan	No
<b>Economic Development Plan</b>	Yes – Regional CEDS 2023
Transportation Plan	Yes – regional updated annually
Land-use Plan	Yes – 1987
Flood Mitigation Assistance (FMA) Plan	No
<b>Watershed Plan</b>	No
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	Yes – 1978
Building Code	No
Floodplain Ordinance	Yes – 1978
Subdivision Ordinance	No
Tree Trimming Ordinance	Yes – 2000
Nuisance Ordinance	Yes – 1992
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes – 1986
Historic Preservation Ordinance	No
Landscape Ordinance	No
<b>Program</b>	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
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	4

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
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	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2018) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2018) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	No
<b>Staff/Department</b>	
Building Code Official	No
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	Yes
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	No
Local Emergency Planning Committee	Yes – regional MLEPD
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC
Historic Preservation	No
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	Yes
Salvation Army	No
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes
<b>Local Funding Availability</b>	
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

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Fees for water, sewer, gas, or electric services	Yes
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, 2023

**Table 2.18** summarizes the mitigation capabilities of Maries County and its jurisdictions.

**Table 2.18. Mitigation Capabilities Summary Table**

<b>CAPABILITIES</b>	<b>Unincorporated Maries County</b>	<b>Belle</b>	<b>Vienna</b>
	<b>Planning Capabilities</b>		
Comprehensive Plan	No	No	No
Builder's Plan	No	No	No
Capital Improvement Plan	No	No	No
City Emergency Operations Plan	n/a	Yes - 2018	No
County Emergency Operations Plan	Yes -2022	Yes – 2022	Yes – 2022
Local Recovery Plan	n/a	No	No
County Recovery Plan	No	No	No
City Mitigation Plan	n/a	No	No
County Mitigation Plan	Yes - 2019	Yes – 2019	Yes – 2019
Debris Management Plan	No	No	No
Economic Development Plan	Yes – Regional CEDS 2023	Yes – Regional CEDS 2023	Yes – Regional CEDS 2023
Transportation Plan	Yes – Regional updated annually	Yes – regional updated annually	Yes – regional updated annually
Land-use Plan	No	No	Yes – 1987
Flood Mitigation Assistance (FMA) Plan	No	No	No
Watershed Plan	No	No	No
Firewise or other fire mitigation plan	No	No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	Yes – Regional Hazardous Materials Emergency Response Plan 2023	No	No
	<b>Policies/Ordinances</b>		
Zoning Ordinance	No	Yes – 1990	Yes – 1978
Building Code	No	Yes – IBC, 2006	No
Floodplain Ordinance	Yes - 1999	No	Yes – 1978
Subdivision Ordinance	N/A	Yes	No



<b>CAPABILITIES</b>	<b>Unincorporated Maries County</b>	<b>Belle</b>	<b>Vienna</b>
Tree Trimming Ordinance	No	No	Yes – 2000
Nuisance Ordinance	No	Yes	Yes – 1992
Storm Water Ordinance	No	Yes	No
Drainage Ordinance	No	Yes	No
Site Plan Review Requirements	No	No	Yes – 1986
Historic Preservation Ordinance	No	No	No
Landscape Ordinance	No	Yes	No
	<b>Program</b>		
Zoning/Land Use Restrictions	No	Yes	Yes
Codes Building Site/Design	No	Yes	Yes
Hazard Awareness Program	No	Yes	Yes
National Flood Insurance Program	Yes	No	Yes
NFIP Community Rating System (CRS) Participating Community	No	No	No
National Weather Service (NWS) Storm Ready	No – In-Progress	No	No
Firewise Community Certification	No	No	No
Building Code Effectiveness Grading (BCEGs)	No	No	No
ISO Fire Rating	9 (5 if 5 miles from station)	7	4
Economic Development Program	No	No	No
Land Use Program	No	No	No
Public Education/Awareness	No	No	No
Property Acquisition	No	No	No
Planning/Zoning Boards	No	Yes	No
Stream Maintenance Program	No	No	No
Tree Trimming Program	No	No	Yes
Engineering Studies for Streams (Local/County/Regional)	No	No	No
Mutual Aid Agreements	Yes	Yes	Yes
	<b>Studies/Reports/Maps</b>		
Hazard Analysis/Risk Assessment (City)	N/A	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans	Yes – Hazard Mitigation (2018) & Hazardous Materials (annual) Plans
Evacuation Route Map	Yes	No	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans	Yes – Hazard Mitigation (2019) & Hazardous Materials (annual) Plans	Yes – Hazard Mitigation (2018) & Hazardous Materials (annual) Plans

<b>CAPABILITIES</b>	<b>Unincorporated Maries County</b>	<b>Belle</b>	<b>Vienna</b>
Vulnerable Population Inventory	No	No	No
Land Use Map	No	Yes	No
	<b>Staff/Department</b>		
Building Code Official	N/A	Yes	No
Building Inspector	No	Yes	Yes
Mapping Specialist (GIS)	No	No	No
Engineer	No	No	Yes
Development Planner	No	No	No
Public Works Official	No	Yes	Yes
Emergency Management Director	Yes	Yes	Yes
NFIP Floodplain Administrator	Yes	No	Yes
Bomb and/or Arson Squad	No	No	No
Emergency Response Team	Yes – MOU Rolla HSRT	No	Yes
Hazardous Materials Expert	No	No	No
Local Emergency Planning Committee	Yes – Regional - MLEPD	Yes – regional MLEPD	Yes – regional MLEPD
County Emergency Management Commission	No	No	No
Sanitation Department	No	No	No
Transportation Department	Yes	No	No
Economic Development Department	No	No	No
Housing Department	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC	Yes - MRPC	Yes - MRPC
Historic Preservation	Yes	No	No
	<b>Non-Governmental Organizations (NGOs)</b>		
American Red Cross	No	No	Yes
Salvation Army	No	No	No
Veterans Groups	Yes	No	Yes
Environmental Organization	No	No	No
Homeowner Associations	No	No	No
Neighborhood Associations	No	No	No
Chamber of Commerce	No	No – Belle Betterment Community Association	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes	No	Yes
	<b>Financial Resources</b>		
Ability to apply for Community Development Block Grants	Yes	Yes	Yes
Ability to fund projects through Capital Improvements funding	Yes	Yes	Yes

<b>CAPABILITIES</b>	<b>Unincorporated Maries County</b>	<b>Belle</b>	<b>Vienna</b>
Authority to levy taxes for a specific purpose	Yes	Yes	Yes
Fees for water, sewer, gas, or electric services	n/a	Yes	Yes
Impact fees for new development	No	No	No
Ability to incur debt through general obligation bonds	Yes	No	Yes
Ability to incur debt through special tax bonds	Yes	No	Yes
Ability to incur debt through private activities	n/a	No	No
Ability to withhold spending in hazard prone areas	No	No	No

Source: Data Collection Questionnaires, 2023

## 2.2.4 Public School District Profiles and Mitigation Capabilities

The following school districts are participating jurisdictions in this plan: Maries County R-I School District and Maries County R-II School District. As public institutions responsible for the care and education of the county’s children, these school districts share an interest with Maries County in public safety and hazard mitigation planning. **Figure 2.6** provides the boundaries of the school districts participating in this planning process.

### Technical and Fiscal Resources

The Maries County R-II School District utilizes NOAA all hazard radios on site to provide early warning of hazard events. The Maries County R-I School District relies instead on internet and cell phone systems to provide early warning. In addition, each school district has fire alarms and intercom systems capable of providing specific instructions in the event of an emergency. Maries County R-I also uses hand-held radios to maintain constant contact with staff.

### Existing Plans and Policies

Both school districts in the planning area have only emergency management plans and weapons policies.

### Other Mitigation Activities

Both schools participating in the plan conduct regular fire, earthquake and tornado drills on a quarterly basis or semi-annual basis. All districts practice lock-down security training at least once a year. Neither of the schools have a designated safe area for tornados that meets FEMA standards.

### New Construction

In the last five years, Maries R-I School District has renovated to install man traps at the main entrances of the schools, replaced all exterior doors, improved lighting in the parking lots and installed new cameras throughout the schools. The district also replaced windows in the elementary and middle schools, paved the parking lots and added a new exterior concession stand. The district would like to remodel the restrooms and update the electrical system in the elementary school.

Maries R-II School District is in the process of replacing the HVAC system in the elementary school.

**Table 2.19. School District Buildings and Enrollment Data, 2023**

District Name	Building Name	Enrollment
Maries County R-I		
	Vienna Elementary	218
	Vienna Middle	93
	Vienna High	167
Maries County R-II		
	Belle Elementary	277
	Maries County Middle	211
	Belle High	245

Source: <https://dese.mo.gov/directory>

Figure 2.6. Maries County School Districts



**Table 2.20. Summary of Mitigation Capabilities for School Districts**

<b>Capability</b>	<b>Maries R-I</b>	<b>Maries R-II</b>
Master Plan/Date	No	Yes – 2016
Capital Improvement	No	No
School Emergency Plan/Date	Yes – 2022	Yes – 2020
Weapons Policy/Date	Yes – 2018	Yes – 2020
Full-Time Building Official (Principal)	Yes	Yes
Emergency Manager	No	Yes
Grant Writer	No	No
Public Information Officer	No	Yes
Capital Improvements Project Funding	Yes	No
Local Funds	Yes	Yes
General Obligation	No	No
Special Tax Bonds	No	No
Private Activities/Donations	Yes	No
State and Federal Funds/Grants	Yes	Yes
Privately or Self-Insured?	Private	Privately
Fire Evacuation Training	Quarterly	Semi-Quarterly
Tornado Sheltering Exercises	Quarterly	Semi-Quarterly
Public Address/Emergency Alert System	Intercom system & handheld radios	Intercom system
NOAA Weather Radios	No	Yes
Lock-Down Security Training	Bi-Annually	Annually
Mitigation Programs	No	No

Capability	Maries R-I	Maries R-II
Tornado Shelter/Safe-room	No	No
Campus Police	No	No

Source: Data Collection Questionnaires, 2023

There are no colleges or universities located in Maries County.

**Table 2.21. Maries County Colleges/Universities**

College/University	Location	Description
-	-	-

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## 3 RISK ASSESSMENT

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<b>3.1 Hazard Identification</b>	<b>3.4</b>
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	3.1



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**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 Land Use and Development** discusses development that has occurred since the last plan update and any increased or decreased risk that resulted. This section also discusses areas of planned future development and any implications on risk/vulnerability;
- **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.

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## 3.1 Hazard Identification

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**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 Maries County. These selected natural hazards are further profiled and analyzed in this plan.

### 3.1.1 Review of Existing Mitigation Plans

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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 Maries County Hazard Mitigation Plan:

- Dam Failure
- Drought
- Earthquake
- Extreme Temperatures
- Flooding (Riverine and Flash)
- Land Subsidence/Sinkholes
- Severe Thunderstorms Including High Winds, Hail, and Lightning
- Tornado
- Severe Winter Weather
- Wildfires

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 Maries County Plan to match the hazards listed in the Missouri State Hazard Mitigation Plan.

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**Table 3.1. Table 3.1 Hazards Not Profiled in the Plan**

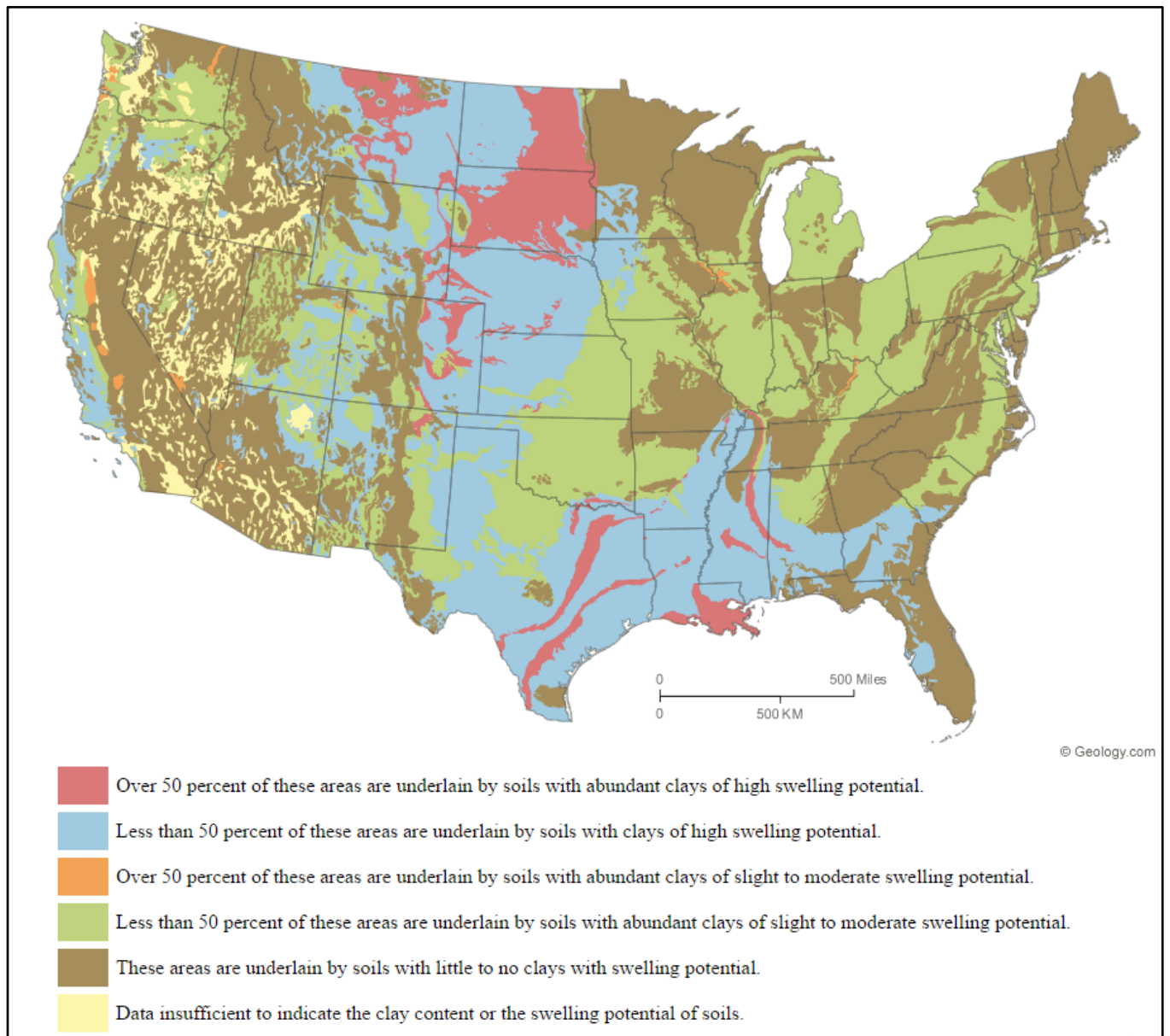
Hazard	Reason for Omission
<b>Avalanche</b>	No mountains in the planning area.
<b>Coastal Erosion</b>	Planning area is located in the Midwest, not on any coast.
<b>Coastal Storm</b>	Planning area is located in the Midwest, not on any coast.
<b>Debris Flow</b>	There are no mountainous areas in the planning area where this type of event occurs.

Hazard	Reason for Omission
<b>Expansive Soils</b>	No expansive soils exist within the planning area. According to the USGS National Geologic Map Database <sup>1</sup> , the planning area is underlain by soils with little to no clays with swelling potential ( <b>Figure 3.1</b> ).
<b>Hurricane</b>	Planning area is located in the Midwest, not on any coast.
<b>Levee Failure</b>	According to the US Army Corps of Engineers' National Levee Database <sup>2</sup> , and local officials, there are no levees located in the planning area. However, low-head agricultural levees could be present. Unfortunately, no data could be found indicating damages in the event of failure.
<b>Volcano</b>	There are no volcanic areas in the county.

<sup>1</sup> [http://ngmdb.usgs.gov/Prodesc/proddesc\\_10014.htm](http://ngmdb.usgs.gov/Prodesc/proddesc_10014.htm)

<sup>2</sup> <http://nld.usace.army.mil/egis/f?p=471:1:0::NO>

**Figure 3.1. Swelling clays map of the conterminous United States**



Source: [http://ngmdb.usgs.gov/Prodesc/proddesc\\_10014.htm](http://ngmdb.usgs.gov/Prodesc/proddesc_10014.htm)

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### 3.1.2 Review Disaster Declaration History

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In order to assess risk, it was logical to review the disaster declaration history for the State of Missouri and specifically for Maries 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 supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. If the disaster is so severe that both the local and state governments' capacities are exceeded; a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

FEMA also issues emergency declarations, which are more limited in scope and do not include the long-term federal recovery programs of major disaster declarations. Determinations for declaration type are based on scale and type of damages and institutions or industrial sectors affected.

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 77 federally declared disasters since 1953. Of those, 43 have occurred since 2003. Most of these disasters have been weather related – severe wind and rainstorms, tornadoes, flooding, hail, ice storms and winter storms. Table 3.2 lists the federal disaster declarations for Maries County from 2003 through 2022.

Missouri State of Emergencies are Executive Orders (E.O.) signed by the Governor. For disasters, a State of Emergency could lead to a Federal Disaster Declaration. Since the last plan update, no non-federally declared events resulted in a significant event impacting the planning area. If an Executive Order resulted in a Federal Disaster Declaration, the Federal Declaration will be listed in Table 3.2.

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**Table 3.2. FEMA Disaster Declarations that included Maries County, Missouri, 2003-2022**

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Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-1463	Severe Storms, Tornadoes, Flooding	Declaration Date: May 06, 2003 Incident Period: May 04, 2003 to May 30, 2003	PA

<b>Disaster Number</b>	<b>Description</b>	<b>Declaration Date Incident Period</b>	<b>Individual Assistance (IA) Public Assistance (PA)</b>
EM-3232	Hurricane Katrina Evacuation	Declaration Date: September 10, 2005 Incident Period: August 29, 2005 to October 01, 2005	PA
DR-1676	Severe Winter Storms, Flooding	Declaration Date: January 15, 2007 Incident Period: January 12, 2007 to January 22, 2007	PA
EM-3281	Severe Winter Storms	Declaration Date: December 12, 2007 Incident Period: December 08, 2007 to December 15, 2007	PA
DR-1742	Severe Storms, Tornadoes, and Flooding	Declaration Date: February 5, 2008 Incident Period: January 7, 2008 – January 10, 2008	PA
DR-1749	Severe Storms, Flooding	Declaration Date: March 19, 2008 Incident Period: March 17, 2008 to May 09, 2008	IA, PA
DR- 1809	Severe Storms, Flooding, and a Tornado	Declaration Date: November 13, 2008 Incident Period: September 11, 2008 – September 24, 2008	PA
EM-3303	Severe Winter Storm	Declaration Date: January 30, 2009 Incident Period: January 26, 2009 to January 28, 2009	PA
DR-1847	Severe Storms, Tornadoes, Flooding	Declaration Date: June 19, 2009 Incident Period: May 08, 2009 to May 16, 2009	PA
EM-3317	Severe Winter Storm	Declaration Date: February 03, 2011 Incident Period: January 31, 2011 to February 05, 2011	PA
DR-1961	Severe Winter Storm and Snowstorm	Declaration Date: March 23, 2011 Incident Period: January 31, 2011 – February 5, 2011	PA
DR-4130	Severe Storms, Straight-line Winds, Tornadoes, and Flooding	Declaration Date: July 18, 2013 Incident Period: May 29, 2013 to June 10, 2013	PA
DR-4144	Severe Storms, Straight-line Winds, Flooding	Declaration Date: September 6, 2013 Incident Period: August 2, 2013 to August 14, 2013	PA

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-4238	Severe Storms, Tornadoes, Straight-line Winds, Flooding	Declaration Date: August 7, 2015 Incident Period: May 15, 2015-July 27, 2015	PA
EM-3374	Severe Storms, Tornadoes, Straight-line Winds, Flooding	Declaration Date: January 2, 2016 Incident Period: December 22, 2015-January 9, 2016	PA
DR-4250	Severe Storms, Tornadoes, Straight-line Winds, Flooding	Declaration Date: January 21, 2016 Incident Period: December 23, 2015 – January 9, 2016	IA
DR-4317	Severe Storms, Tornadoes, Straight-line Winds, Flooding	Declaration Date: June 2, 2017 Incident Date: April 28, 2017, - May 11, 2017	IA, PA
DR-4451	Severe Storms, Tornadoes, and Flooding	Declaration Date: July 9, 2019 Incident Period: April 29, 2019 – July 6, 2019	PA
EM-3482	Missouri Covid-19	Declaration Date: March 13, 2020 Incident Period: January 20, 2020 and continuing	PA
DR-4490	COVID-19 Pandemic	Declaration Date: March 26, 2020 Incident Period: January 20, 2020 and continuing	IA, PA

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

### 3.1.3 Research Additional Sources

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

- Missouri Hazard Mitigation Plans (2013, 2018, 2023)
- Previously approved Maries County Hazard Mitigation Plan (2019)
- 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



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- 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 Centers for Environmental Information (NCEI);
  - 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 Centers for Environmental Information (NCEI). Although it is usually the best and most current source, there are limitations to the data which should be noted. The NCEI 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 NCEI 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 NCEI should be cautious as the NWS does not guarantee the accuracy or validity of the information.

The NCEI 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 January 2023, 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 NCEI 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. "X" indicates the jurisdiction is impacted by the hazard, and a "-" indicates the hazard is not applicable to that jurisdiction. As Maries 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 of damage from a tornado.

**Table 3.3. Hazards Identified for Each Jurisdiction**

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme Temperature	Flooding (River and Flash)	Land Subsidence/Sinkholes	Severe Winter Weather	Thunderstorms/High Winds/ Lightning/Hail	Tornado	Wildfire
Maries County	x	x	x	x	x	x	x	x	x	x
Belle	x	x	x	x	x	x	x	x	x	x
Vienna	x	x	x	x	x	x	x	x	x	x
School Districts										
Maries County R-I	x	x	x	x	-	x	x	x	x	x
Maries County R-II	x	x	x	x	-	x	x	x	x	x

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### 3.1.5 Multi-Jurisdictional Risk Assessment

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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. Maries 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 appear throughout the county and are localized in their effects. The areas of urbanization include the cities of Belle and Vienna. 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 damage. Differences among jurisdictions for each hazard will be discussed in greater detail in the vulnerability section of each hazard.

## 3.2 Assets at Risk

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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

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#### Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2020 Census Bureau data. Building counts values are based on parcel data developed by the State of Missouri Geographic Information Systems (GIS) database. Contents exposure values were calculated by factoring a multiplier to the building exposure values based on usage type. The multipliers were derived from the Hazus and are defined below in **Table 3.4**. Land values have been purposely excluded from consideration because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Another reason for excluding land values is that state and federal disaster assistance programs generally do not address loss of land (other than crop insurance). The total valuation of buildings is based on county assessors' data which may not be current. In addition, government-owned properties are usually taxed differently or not at all, and so may not be an accurate representation of true value. Public school district assets and special districts assets are included in the total exposure tables assets by community and county.

**Table 3.4** shows the total population, building count, estimated value of buildings, estimated value of contents and estimated total exposure to parcels for the unincorporated county and each incorporated city. For multi-county communities, the population and building data may include data on assets located outside the planning area. **Table 3.5** that follows provides the building value exposures for the county and each city in the planning area broken down by usage type. Finally, **Table 3.5** provides the building count total for the county and each city in the planning area broken out by building usage types (residential, commercial, industrial, and agricultural).

**Table 3.4. Maximum Population and Building Exposure by Jurisdiction**

Jurisdiction	2020 Population	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Unincorporated Maries County	6,470	8,732	\$478,321	\$261,237	\$739,558
Belle	1,381	639	\$84,110	\$45,985	\$130,095
Vienna	581	334	\$46,237	\$24,760	\$70,998
<b>Total</b>	<b>8,432</b>	<b>9,714</b>	<b>\$609,357</b>	<b>\$332,321</b>	<b>\$941,678</b>

Sources: U.S. Census Bureau Decennial Redistricting Data; Building Count and Building Exposure, Missouri GIS Database from SEMA Mitigation Management; Contents Exposure derived by applying multiplier to Building Exposure based on Hazus MH 2.1 standard contents multipliers per usage type as follows: Residential (50%), Commercial (100%), Industrial (150%), Agricultural (100%). For the purposes of these calculations, government, school, and utility were calculated at the commercial contents rate.

**Table 3.5. Building Value/Exposure by Usage Type**

Jurisdiction	Agriculture	Commercial	Education	Government	Industrial	Residential	Total
Maries County	\$13,909	\$12,956	\$0	\$517	\$22,294	\$428,646	\$478,321
Belle	\$23	\$10,576	\$3,986	\$1,294	\$0	\$68,231	\$84,110
Vienna	\$34	\$7,227	\$5,980	\$2,070	\$0	\$30,928	\$46,237
<b>Total</b>	<b>\$13,976</b>	<b>\$30,759</b>	<b>\$9,966</b>	<b>\$3,881</b>	<b>\$22,294</b>	<b>\$528,482</b>	<b>\$609,357</b>

Source: Missouri GIS Database, SEMA Mitigation Management Section

**Table 3.6. Building Counts by Usage Type**

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Other (Gov't/Edu)	Total
Maries County	8,732	147	45	5,378	2	8,732
Belle	503	120	0	9	7	639
Vienna	228	82	0	13	11	334
<b>Total</b>	<b>9,714</b>	<b>349</b>	<b>45</b>	<b>5,404</b>	<b>67</b>	<b>9,714</b>

Source: Missouri GIS Database, SEMA Mitigation Management Section

Even though school districts' total assets are included in the tables above, the data in **Table 3.7** below provides additional information based on the data that is available from the districts' completion of the Data Collection Questionnaire and from the Missouri Department of Elementary and Secondary Education (DESE). The additional information includes 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.

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**Table 3.7. Population and Building Exposure by Jurisdiction-Public School Districts**

Public School District	Enrollment	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Maries Country R-I	491	3	\$14,281,127	\$9,416,944	\$23,698,071
Maries Country R-II	730	3	\$14,582,374	\$4,000,000	\$18,582,374

Source: [https://apps.dese.mo.gov/MCDS/Reports/SSRS\\_Print.aspx?ReportId=152b1d45-e617-4184-acf3-82b9287ae2b4](https://apps.dese.mo.gov/MCDS/Reports/SSRS_Print.aspx?ReportId=152b1d45-e617-4184-acf3-82b9287ae2b4) ; 2023  
Data Collection Questionnaire

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### 3.2.2 Critical and Essential Facilities and Infrastructure

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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.

The table below (**Table 3.8**) provides information for critical and essential facilities and infrastructure in the planning area. The list was compiled from the Data Collection Questionnaire as well as

- the 2018 Missouri State Hazard Mitigation Plan and Hazard Mitigation Viewer;
- the Missouri Department of Elementary and Secondary Education (DESE);
- the Missouri Department of Health and Senior Services (DHSS), and;
- information provided by the Meramec Local Emergency Planning District.

**Table 3.8. Maries County Critical Facilities by Type and Jurisdiction**

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>Emergency Facilities</b>						
	Maries Co.	Dixon Ambulance District	305 S. Ellen Street	Dixon	MO	65456
	Maries Co.	Maries Osage Ambulance District	164 Ballpark Road	Vienna	MO	65582
	Maries Co.	Osage Ambulance District	119 S. Highway 89	Linn	MO	65051
	Maries Co.	St. James Ambulance District	103 N. Louise Avenue	St. James	MO	65559
<b>Fire Department Facilities</b>						
	Maries Co.	Belle Vol. Fire Dept.	PO Box 933, 98 Hwy 28 E.	Belle	MO	65013
	Maries Co.	Vichy Vol. Fire Prot. Assoc.	PO Box 486, 14812 Hwy 63	Vichy	MO	65580
	Maries Co.	Vienna Fire Prot. Dist.	PO Box 386, 308 N Mill St.	Vienna	MO	65582
<b>Law Enforcement Facilities</b>						
	Maries Co.	Maries County Sheriff's Office	211 4 <sup>th</sup> St., PO Box 23	Vienna	MO	65582
	Belle	Belle Police Department	106 East 3 <sup>rd</sup> St., PO Box 813	Belle	MO	65013
	Vienna	Vienna Police Department	PO Box 196, 424 8 <sup>th</sup> St.	Vienna	MO	65582
<b>Medical Facilities</b>						
	Maries Co.	Phelps Health Medical Group Vienna	606 S. Highway 63	Vienna	Mo	65582
	Maries Co.	SSM Health Group – Family Medicine	100 Highway 28	Belle	Mo	65013
<b>School Facilities</b>						
	Maries County R-I	Maries County R-I School District	300 Fourth Street	Vienna	MO	65582
	Maries County R-II	Maries County R-II School District	503 W. Third Street	Belle	MO	65013
	Visitation Inter-Parish	Visitation Inter-Parish Private School	105 N. Coffey Street	Vienna	MO	65582
<b>Childcare Facilities</b>						
	Maries Co.	MOCA Headstart	408 Oak St	Belle	MO	65013
	Maries Co.	Reeves, Rata Lynn	11361 Highway 63 S.	Vienna	MO	65582
	Maries Co.	Smith, Beth Ann	11309 Highway 63 S.	Vienna	MO	65582
	Maries Co.	Kiddie T Junction, LLC	30391 Highway T	Vienna	MO	65582
<b>Long Term Care Facilities</b>						
	Vienna	Maries Manor	174 Ballpark Road	Vienna	MO	65582
	Vienna	Victorian Place of Vienna	112 Parkway Drive	Vienna	MO	65582

Source: 2023 Data Collection Questionnaires, Meramec Local Emergency Planning District, Missouri DHSS  
<https://healthapps.dhss.mo.gov/childcaresearch/>, <https://healthapps.dhss.mo.gov/showmeltc/default.aspx>



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**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 2023 Data Collection Questionnaire, the Meramec Regional Hazardous Materials Emergency Response Plan and the National Bridge Inventory.

**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 Bridges	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 Maries County	1	0	3	0	0	1	1	5	0	0	70	0	0	0	0	1	0	0	0	0	0	1	0	83
City of Belle	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	1	1	0	8	1	16
City of Vienna	0	0	0	0	0	0	1	3	2	0	0	1	0	0	2	2	2	0	3	2	0	6	1	25
<b>Totals</b>	1	0	4	0	0	1	3	9	2	0	70	1	0	0	2	4	3	0	4	3	0	15	2	124

Source: 2023 Data Collection Questionnaires, National Bridge Inventory, 2022 MLEPD Hazardous Materials Emergency Response Plan

According to the National Bridge Inventory there are a total of 70 bridges in Maries County<sup>1</sup>. **Figure 3.2** shows the locations of State regulated bridges and non-State bridges in the planning area. Scour critical bridges were also examined. 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. There is one scour critical bridge within Maries County. The highway 63 bridge spanning the Gasconade River has a scour index of 3.<sup>2</sup>

<sup>1</sup> <http://www.fhwa.dot.gov/bridge/nbi/no10/county.cfm>

<sup>2</sup> <https://infobridge.fhwa.dot.gov/Data/SelectedBridges#!#OverviewTab>

Figure 3.2. Maries County Bridges



Source: MSDIS, MoDOT, MRPC

### 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 Maries County**

Common Name	Scientific Name	Status
<b>Amphibians</b>		
Eastern Hellbender	<i>Cryptobranchus alleganiensis</i>	Endangered (F)
Ozark Hellbender	<i>Cryptobranchnus alleganiensis bishopi</i>	Endangered (F)
<b>Fishes</b>		
Niangua Darter	<i>Etheostoma ninaguae</i>	Threatened (F) Endangered (S)
Topeka Shiner	<i>Notropis topeka</i>	Endangered (S)
<b>Birds</b>		
Bachman's Sparrow	<i>Peucaea aestivalis</i>	Endangered (S)
Piping Plover	<i>Charadrius melodus</i>	Endangered (F)
<b>Clams</b>		
Ebonyshell	<i>Fusconaia ebena</i>	Endangered (S)
Elephantear	<i>Elliptio crassidens</i>	Endangered (S)
Pink Mucket	<i>Lampsilis abrupta</i>	Endangered (F)
Scaleshell Mussel	<i>Leptodea Leptodon</i>	Endangered (F) (S)
Snuffbox Mussel	<i>Epioblasma triquetra</i>	Endangered (F)
Spectaclecase (Mussel)	<i>Cumberlandia monodonta</i>	Endangered (F)
<b>Flowering Plants</b>		
Eastern Prairie Fringed Orchid	<i>Platanthera leucophaea</i>	Threatened (F)
Running Buffalo Clover	<i>Trifolium stoloniferum</i>	Endangered (S)
Western Prairie Fringed Orchid	<i>Plantanthera praeclara</i>	Endangered (S)
<b>Mammal</b>		
Gray bat	<i>Myotis grisescens</i>	Endangered (F) (S)
Indiana bat	<i>Myotis sodalis</i>	Endangered (F)
Northern long-eared bat	<i>Myotis septentrionalis</i>	Threatened (F)
Eastern spotted skunk	<i>Spilogale putorius</i>	Endangered (S)

Note: S = State, F = Federal

Source: U.S. Fish and Wildlife Service, <https://ecos.fws.gov/ecp/>;  
MDC, <https://nature.mdc.mo.gov/status/endangered>

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 parks and conservation areas in Maries County.

**Table 3.11. Conservation Areas in Maries County**

Area Name	Address	Activities Offered
Bell Chute Access	From Vienna, take Highway 63 south 2.50 miles, then Highway 28 2 miles, then Route Y east 6 miles (the last 2 miles are on County Road 513)	Camping, Fishing
Clifty Creek Conservation Area	From Dixon, take Highway 28 northeast, then Route W east until the pavement ends and gravel leads to the area.	Hiking, Bird Watching, Camping, Hunting, Trapping, Archery and Firearms
Clifty Creek Natural Area	From Dixon, take Highway 28 northeast, then Route W east until the pavement ends and gravel leads to the area.	Hiking, Bird Watching, Camping, Hunting, Trapping, Archery and Firearms
Freeburg Towersite	From Vienna, take Highway 63 north 6 miles, then west 0.25 mile on County Road 209	
Paydown Access	From Vienna, take Highway 63 north 5.50 miles, then County Road 201 east (right) 8 miles to the access.	Camping, Fishing
Rinquelin Trail Lake Conservation Area	From Vienna, take Highway 42 west, then Highway 133 south to Route DD, then west to County Road 631, then south to County Road 630, then east to area entrance.	Bird Watching, Camping, Fishing, Hunting, Trapping, Archery and Firearms
Spring Creek Gap Conservation Area	From Vienna, take Highway 63 south approximately 10 miles, or north of Rolla on Highway 63 approximately 14 miles, take Old 63 north about 0.25 mile to the area.	Bird Watching, Camping, Hunting, Trapping, Archery and Firearms

Source: <https://mdc.mo.gov/discover-nature/places>

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

**Table 3.12. Community Owned Parks in Maries County**

Park Name	Address	City
Belle City Park	1507 Parkview Drive	Belle

Maries County Fairgrounds	242 Ballpark Road	Vienna
Vienna Park	132 Ballpark Road	Vienna
Vichy Community Park	US-63	Vichy

Source: Google Search

**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 regard to properties on the National Register of Historic Places in Maries County.

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

Property	Address	City	Date Listed
Maries County Jail and Sheriff's Residence	Fifth and Mill Street	Vienna	03/01/2002

Source: Missouri Department of Natural Resources – Missouri National Register Listings by County

<https://mostateparks.com/page/84436/missouri-national-register-listings>

**Economic Resources:** **Table 3.14** provides major non-government employers in the planning area. There are approximately 123 employer establishments within the county, employing on average about 8 individuals each<sup>1</sup>.

**Table 3.14. Major Non-Government Employers in Maries County**

Employer Name	Product or Service	Employees
Kingsford Manufacturing	Charcoal (whls)	100-249
Hippos	Farming	11-50
Maries County Bank	Commercial Banking	5-9
South Central Regional Sale Barn	Livestock Dealers	20-49
Maries Manor	Rehabilitation Services	50-99

Source: <https://meric.mo.gov/industry/business-locator>, 2023 Data Collection Questionnaires

Agriculture plays an important role in Maries County. The Agribusiness Employment Location Quotient for the Central Missouri non-metropolitan area is 6.33; meaning that there is a much higher share of agribusiness employment compared to its share of total national employment<sup>2</sup>. In addition, there were 929 individuals working in the agriculture industry, comprising 23.8% of the total workforce in 2022<sup>3</sup>. Furthermore, the market value of products sold in 2017 was \$32,416,000 million; 85% from livestock sales and 15% from crop sales.<sup>4</sup>

<sup>1</sup> <https://www.census.gov/quickfacts/fact/table/mariescountymissouri/HSG650221>

<sup>2</sup> <https://meric.mo.gov/data/industry/quarterly-census-employment-wages-qcew-in>

<sup>3</sup> [https://www.bls.gov/oes/current/area\\_lq\\_chart/area\\_lq\\_chart.htm](https://www.bls.gov/oes/current/area_lq_chart/area_lq_chart.htm)

<sup>4</sup> [https://www.nass.usda.gov/Quick\\_Stats/CDQT/chapter/2/table/1/state/MO/county/065/year/2017](https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/2/table/1/state/MO/county/065/year/2017)



**Table 3.15. Agriculture Related Jobs in Maries County**

Agribusiness Location Quotient (central region)	Agriculture Employment	Share of Workforce
6.33	929	23.8%

Source: Missouri Economic Research and Information Center

### 3.3 Land Use and Development

#### 3.3.1 Development Since Previous Plan Update

Jurisdictions reported on completed developments since the previous plan update in 2019. Maries county has replaced insufficient metal culverts/slabs with upgraded concrete box culverts at low water crossings on Maries Road 219 and Maries Road 621. The city of Belle had a new ambulance base constructed as well as two new restaurants. The city of Vienna reported the construction of a new commercial meat market as well as a new cultivation facility which was listed as a notable employer with 11-50 employees. The Maries County R-I school district has made several facility updates in the last five years and plans several more in the next five-year period. Recently they have added a new concession stand, all new exterior doors, new windows in the elementary and middle school sections of the building and added man traps at the main entrances to the building. Additionally, they paved the parking lots, added external lighting, and new cameras to improve security. **Table 3.16** provides population growth statistics for Maries County.

**Table 3.16. Maries County Population Growth, 2010-2020**

Jurisdiction	2010 Population	2020 Population	2010-2020 # Change	2010-2020 % Change
<b>Unincorporated Maries County</b>	7,021	6,470	-551	-7.85%
<b>Belle</b>	1,545	1,381	-164	-10.61
<b>Vienna</b>	610	581	-29	-4.75%

Source: U.S. Bureau of the Census 2020 Decennial Redistricting Data, Census 2010 Summary File 1

Typically, population growth or decline is generally accompanied by an increase or decrease in the number of housing units. **Table 3.17** provides the change in numbers of housing units in the planning area from 2010-2020.

**Table 3.17. Change in Housing Units, 2010-2020**

Jurisdiction	Housing Units 2010	Housing Units 2020	2010-2020 # Change	2010-2020 % Change
<b>Unincorporated Maries County</b>	3,536	3,251	-285	-8.06%
<b>Belle</b>	734	719	-15	-2.04%
<b>Vienna</b>	341	293	-48	-14.08%

Source: U.S. Census Bureau 2020 Decennial Redistricting Data, U.S. Bureau of the Census, Census 2010 Summary File 1

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### 3.3.2 Future Land Use and Development

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Jurisdictions reported anticipated future developments within the next five years (2023-2028). A new water tower serving the city of Belle is planned for construction. Additionally, a collaborative effort between two solar energy providers are planning the development of two solar energy farms within the county. The prospective sites are located in unincorporated areas of Maries county, one near Vichy and the other near Dixon.

Unincorporated Maries County is planning to replace multiple low water crossings on county roads throughout the jurisdiction. Additionally, the roads department has a standing policy of increasing the size of any culverts that are replaced throughout the county to manage stormwater and mitigate the risk of flooding.

The city of Vienna is planning a couple of upgrades to the public infrastructure within the next five years. They are hoping to complete some operational upgrades to the city's wastewater treatment facility. That facility is located within a special flood hazard area and the city would like to explore ways to help mitigate the facilities vulnerability to flooding. The city is also planning a renovation of the city hall facility.

The city of Belle did not report any anticipated future development within the next five years.

#### **School Districts' Future Development**

The Maries County R-I school district plans to complete a remodel project on the elementary restrooms and an update project on the electrical system in the elementary as well. The Maries County R-II school district reported plans to replace the HVAC system that serves the elementary building.

New developments 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 developments 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.

## 3.4 Hazard Profiles, Vulnerability, and Problem Statements

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Each hazard that has been determined to be a potential risk to Maries 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.



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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 that are affected by the hazard. Where available, maps are used 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. For hazards such as drought that may have gradual onset and extended duration, probability can be based on the number of months in drought in a given time-period and expressed as the probability for any given month to be in drought.

**Changing Future Conditions Considerations:** This section will consider the effects of long-term changes in weather patterns and climate on the identified hazard.

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## **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 of damage from natural hazards. The vulnerability assessments will be based on the best available county-level data, which is in the Missouri Hazard Mitigation Plan (2023). With the 2018 Hazard Mitigation Plan Update, SEMA was pleased to provide online access to the risk assessment data and associated mapping for the 114 counties in the State. Through the web-based Missouri hazard Mitigation Viewer, local planners or other interested parties can obtain all State Plan datasets. The Plan Viewer was updated for the 2023 State Hazard Mitigation Plan update. This effort removes from local mitigation planners a barrier to performing all the needed local risk assessments by providing the data developed during the 2023 State Plan Update. The Missouri Hazard Mitigation viewer can be found at this link: <http://bit.ly/MoHazardMitigationPlanViewer2023>

The county-level assessments in the State Plan were also based on the following additional sources:

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

The vulnerability assessments in the Maries 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:

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**Vulnerability Overview:** This section will provide an overall summary of each jurisdiction's vulnerability to the identified hazards. The summary identifies structures, systems, populations, or other community assets as defined by the community that are susceptible to damage and loss for hazard events.

**Potential Losses to Existing Development:** This section will describe the potential impacts of each hazard – the consequences of the effect of the hazard on the jurisdiction and its assets (including types and numbers, of buildings, critical facilities, etc.).

**Previous and Future Development:** This section will include information on how changes in development have impacted the community's vulnerability to this hazard. It will also describe any anticipated future development in the county, and how that would impact hazard risk in the planning area.

**Hazard Summary by Jurisdiction:** This section will provide an overview of any variation in hazard risk that vary by jurisdiction and provide a factual basis for that variation.

### **Problem Statements**

Each hazard analysis will conclude with a brief summary of the problems created by the hazard in the planning area, and possible ways to resolve those problems.

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### 3.4.1 Dam Failure

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Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.3, Page 3.148  
[https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO\\_Hazard\\_Mitigation\\_Plan2018.pdf](https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf)
- 2023 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.3
- Missouri Department of Natural Resources, Dam and Reservoir Safety, <https://dnr.mo.gov/land-geology/dam-reservoir-safety>
- Stanford University's National Performance of Dams Program; <http://npdp.stanford.edu/>
- National Inventory of Dams, <https://nid.sec.usace.army.mil/#/>
- National Resources Conservation Service <http://www.nrcs.usda.gov>
- DamSafetyAction.org, <https://damsafety.org/missouri>
- Missouri Spatial Data Information Service Structure Inventory and All Hazard Risk Dataset  
<https://drive.google.com/drive/folders/0Bzq99s866kWocFB5Y3hCRIRuWWM>
- Missouri Hazard Mitigation Viewer  
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<https://drive.google.com/file/d/1bPkc0JgF9ofwQLnTL9N0u-oPFWi9hkst/view> - User Guide
  - Total number of Missouri NID dams by County
  - Total number of High, Significant, and Low Hazard dams by County
  - Total number of State Regulated dams by County
  - Total number of Class 1, Class 2, and Class 3 dams by County
  - Total number of structures impacted by USACE dams by County
  - Total number of structures impacted by State dams by County
  - Total value of structures impacted by USACE dams by County
  - Total value of structures impacted by State dams by County
  - Total population impacted by USACE dams by County
  - Total population impacted by State dams by County

### **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 3.18** and **Table 3.19**, respectively.

**Table 3.18. 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, Missouri Geological Survey Rolla Office

**Table 3.19. 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 National Inventory of Dams there are 32 recorded dams in Maries County; including five high hazard dams; four significant hazard dams; and 23 low hazard dams. The Missouri Department of Natural Resources also tracks dams in the state and has Identified no Class 1 dams, six Class 2 dams, and 27 Class 3 dams. **Table 3.20** provides the name of the dam, DNR hazard class and NID hazard class for each of the Identified dams in Maries County. There are four state-regulated dams in Maries County. None of the dams are owned or operated by the United States Army Corps of Engineers (USACE). County dams are privately or commercially owned. **Table 3.21** provides the names, locations, and other pertinent information for all NID High Hazard Dams in the planning area.

**Table 3.20. Maries County Dams Hazard Risk**

<b>Name of Dam</b>	<b>DNR Hazard Class</b>	<b>NID Hazard Class</b>
Apex Lake Dame	3	Low
Blake Lake Dam	3	Low
Bowman Lake Dam	2	High
Cowan Lake Dam	3	Low
Danube Corporation Lower Dam	2	High
Danube Corporation Upper Dam	2	High
Dillon Lake Dam	3	Low
Dudenhoeffer Dam	2	High
Hayes Lake Dam	3	Significant
Hidden Lake Dam	3	Low
Hoban Lake Dame	3	Significant
Holmes Family Lake Dam	3	Significant
Kleffner Lake Dam	3	Low
Koch Lake Dam	3	Low
Kuhrts Lake Dam	3	Low
Lake Maxwell Dam	2	High
Larry Hendrix Dam	3	Low
Miller Lake Dam	3	Low
Murphy Lake Dam	2	High
Nepomuceno Lake Dam	3	Low
Norbert Sandbothe Pond	3	Low
Rinquelin Trail Dam	3	Significant
Share Lake Dam	3	Low
Sherrell Lake Dam	3	Low
Slinkman Lake Dam	3	Low
Swarthout Lake Dam	3	Low
Veasmann Lake Dam	3	Low
Vogt Dam	3	Low
Wensler Lake Dam	3	Low
Whippoorwill Lake Dam	3	Low
Wilson Lake Dam	3	Low
Wilson Lake Dam	3	Low

Source: Missouri Department of Natural Resources, Dam and Reservoir Safety Program; National Inventory of Dams

**Table 3.21. NID High Hazard Class Dams in the Maries County Planning Area**

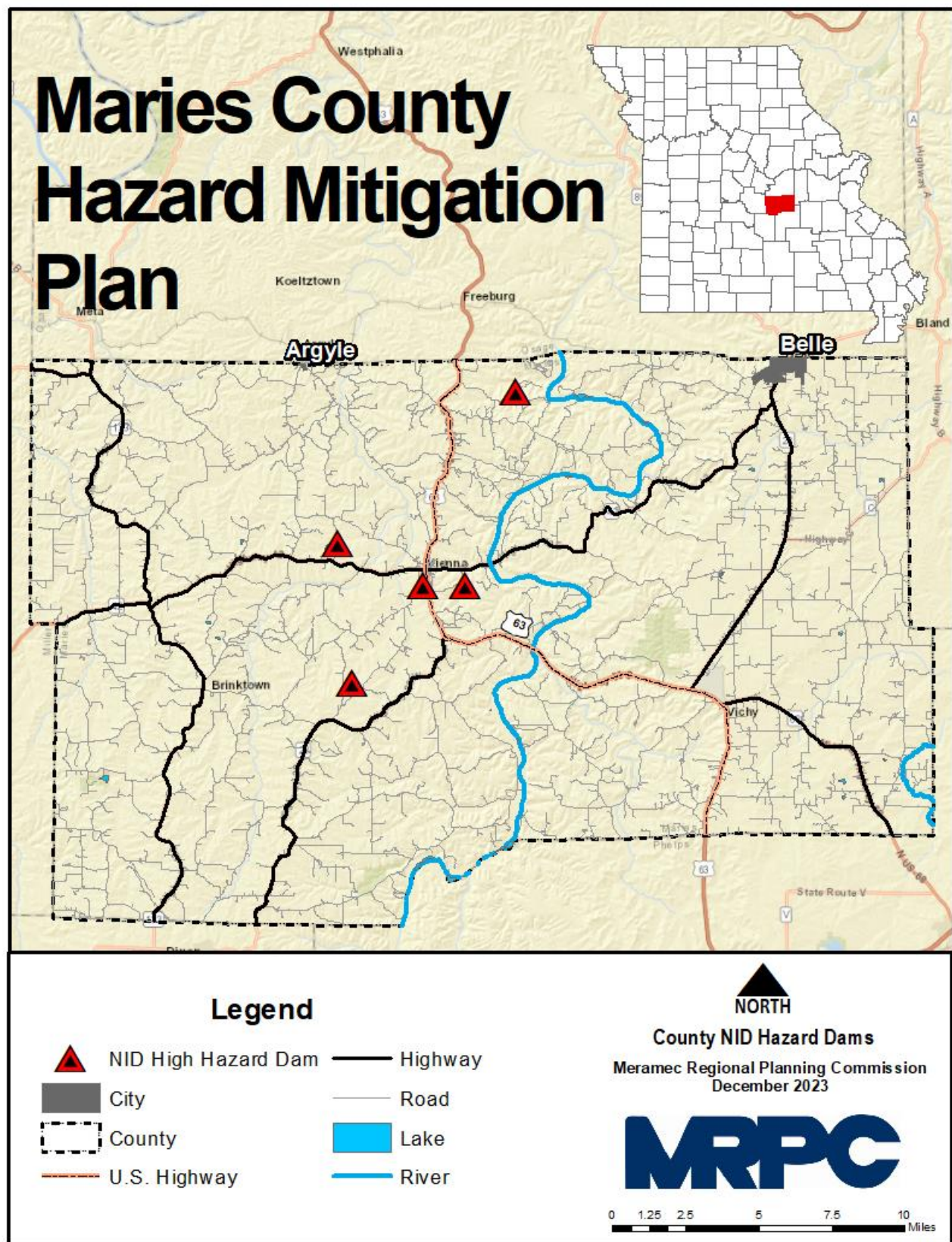
Dam Name	NID ID	Hazard Potential *	NID Height (Ft.)	NID Storage	River	Nearest City *	Distance To City (Mi.) *
Bowman Lake Dam	MO30180	High	23	111	TR to Fly Creek	Vienna	--
Danube Corporation Lower Dam	MO30061	High	32	633	Keiser Branch	Westphalia	28
Dudenhoeffer Dam	MO32065	High	55	853	--	Freeburg	--
Lake Maxwell Dam	MO32039	High	80	3,343	Indian Creek	Vienna	1
Murphey Lake Dam	MO30173	High	27	144	Little Fly Creek	Vienna	4

Sources: National Inventory of Dams, [http://nid.usace.army.mil/cm\\_apex/f?p=838:12.](http://nid.usace.army.mil/cm_apex/f?p=838:12.); Missouri Department of Natural Resources, Dam and Reservoir Safety Program

**Figure 3.4** depicts locations of NID high hazard dams located in the planning area. If a dam failure were to occur in Maries 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 commercial or industrial properties in dam inundation zones within the county. Two dam inundation maps were available from the Missouri Department of Natural Resources. These State regulated dams include Lake Maxwell Dam and Dudenhoeffer Dam (**Figure 3.4** and **Figure 3.6**). No other dam inundation maps were available for the remaining NID High Hazard Dams in the county. The Belle City Park Dam is not listed on MDNR or the National Inventory of Dams. The dam is located between the city park and the abandoned railroad. If the dam failed impact would be minimal as it would flow away from the park and follow the railroad into timber with no structures in the path.



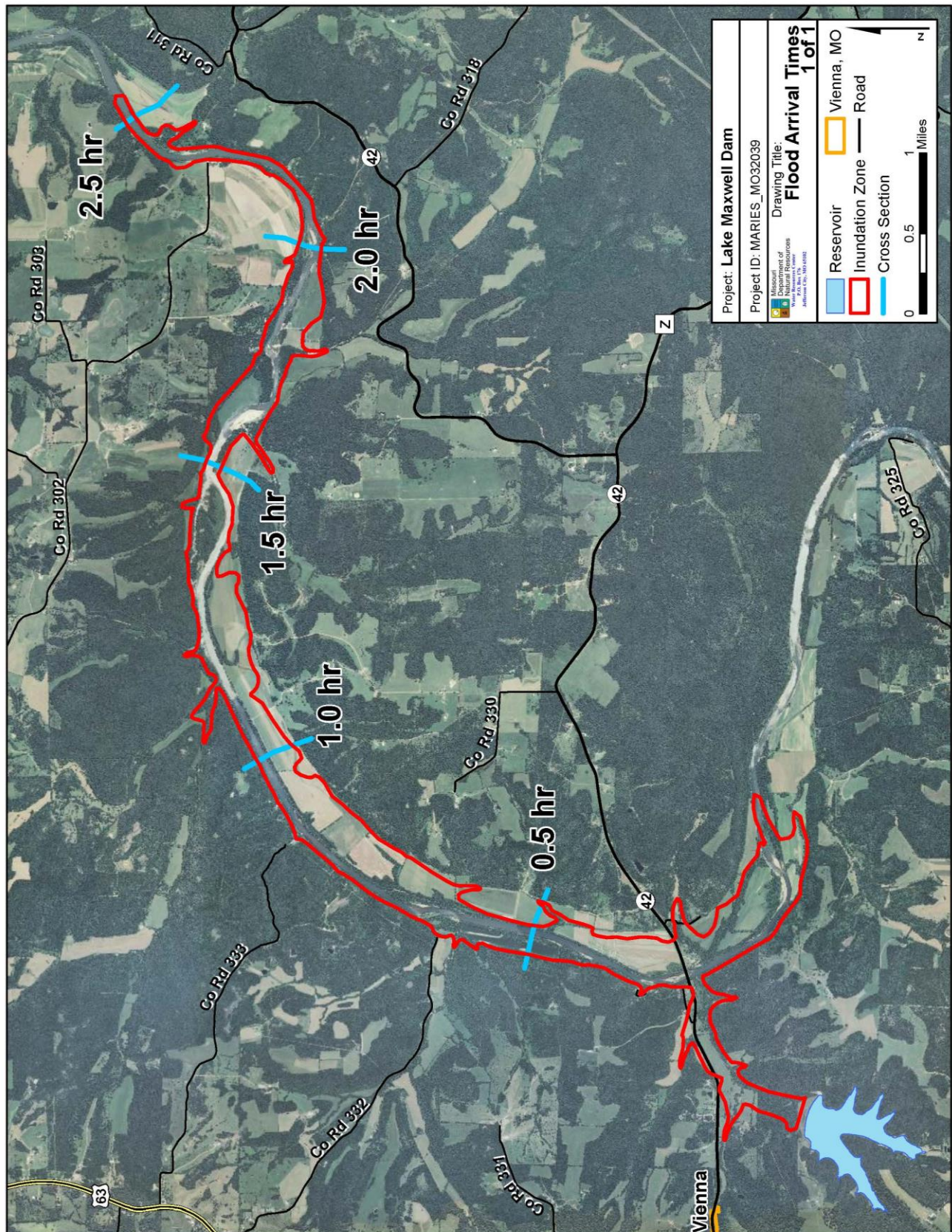
Figure 3.3. NID High Hazard Dam Locations in Maries County



Source: MSDIS, MRPC

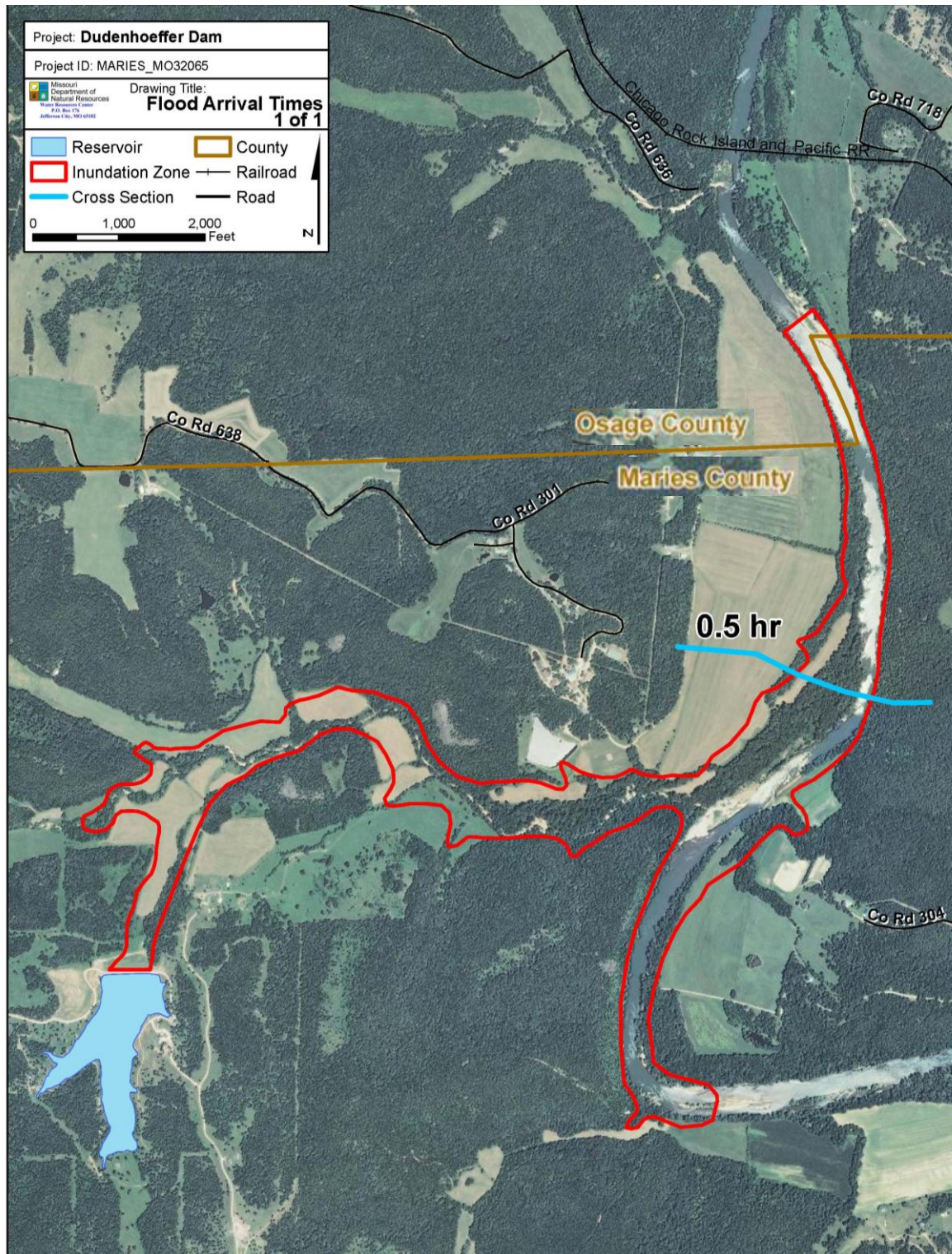


Figure 3.4. Lake Maxwell Dam Inundation Zone





**Figure 3.5. Dudenhoeffer Dam Inundation Zone**



Upstream Dams Outside the Planning Area

**Figure 3.6** depicts dams outside of Maries County that could impact the planning area in the event of failure. One unregulated High Hazard dam and three Low Hazard dams (1 regulated) are located within



a 1 mile buffer of the county. According to the Missouri Department of Natural Resources, Missouri Geological Survey, Water Resources Center, there are no high hazard dams that would flow into Maries County from surrounding counties during a failure event.

**Figure 3.6. Upstream Dams Outside Maries County**



Source: MSDIS, MRPC

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## ***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). The severity/magnitude/extent of dam failure is related to the volume of water behind the dam as well as the potential speed of onset, depth, and velocity. For this reason, dam failures could flood areas outside of mapped flood hazards.

Failure of any of the High Hazard/Class I 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. All four of the state regulated dams in Maries county were last inspected in 2017 and each received a satisfactory rating on its overall condition. A worst-case scenario in the planning area would be a failure of the Lake Maxwell dam located 1 mile southeast of the city of Vienna. This lake holds 3,343 acre-feet of water. An acre-foot is a unit of volume equal to the amount of water required to cover one acre of land to depth of one foot.

## ***Previous Occurrences***

According to Stanford University's National Performance of Dams Program, there were 92 recorded dam incidents in Missouri between 1917 and 2005. The Association of State Dam Safety Officials reports an additional 20 dam incidents from 2008 to 2017. 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 park<sup>1</sup>. The deluge destroyed Johnson's Shut-Ins State Park facilities, including the campground, and deposited sediment, boulders and debris into the park. The flood of debris diverted the East Fork of the Black River into an older channel and turned the river chocolate brown. Fortunately, the breach occurred in mid-winter. Five people were injured when the park superintendent's home was swept away by the flood, but all were rescued and eventually recovered. Had it been summer, and the campground filled with park visitors, the death toll could have been very high<sup>2</sup>. 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 was still being investigated. Even after the removal of thousands of dump truck loads of debris and mud, the river is still being affected by several feet of sediment left in the park. The local economy, heavily reliant upon the tourism from the park and Black River, has also been hit hard.

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<sup>1</sup> United States Geological Survey. Damage Evaluation of the Taum Sauk Reservoir Failure using LiDAR.

[https://www.researchgate.net/publication/268325451\\_Damage\\_Evaluation\\_of\\_the\\_Taum\\_Sauk\\_Reservoir\\_Failure\\_using\\_LiDAR](https://www.researchgate.net/publication/268325451_Damage_Evaluation_of_the_Taum_Sauk_Reservoir_Failure_using_LiDAR)

<sup>2</sup> The Alert. Spring 2006. After the Deluge...What's Ahead for Taum Sauk? By Dan Sherburne.

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### ***Event Description***

According to Stanford University's National Performance of Dams Program, only one dam incident has been recorded for Maries County. It occurred on July 16, 1993 at the Hidden Lake Dam located about 3 miles northeast of the unincorporated community of Vichy. The non-regulated dam experienced a failure of the spillway that resulted in a loss of most of the spillway and a part of the dam. No consequential losses were documented with this incident.<sup>1</sup>

### ***Probability of Future Occurrence***

As man-made structures, the probability of structural failure increase with age, however actions such as preventative maintenance can offset the degradation. It should also be noted that failures and incidents for regulated dams that have a higher inspection should be less probable. There has been 1 recorded dam incident in Maries County in 100 years resulting in a 1% yearly probability. Due to the number of confounding variables, this calculation is not robust.

### ***Changing Future Conditions Considerations***

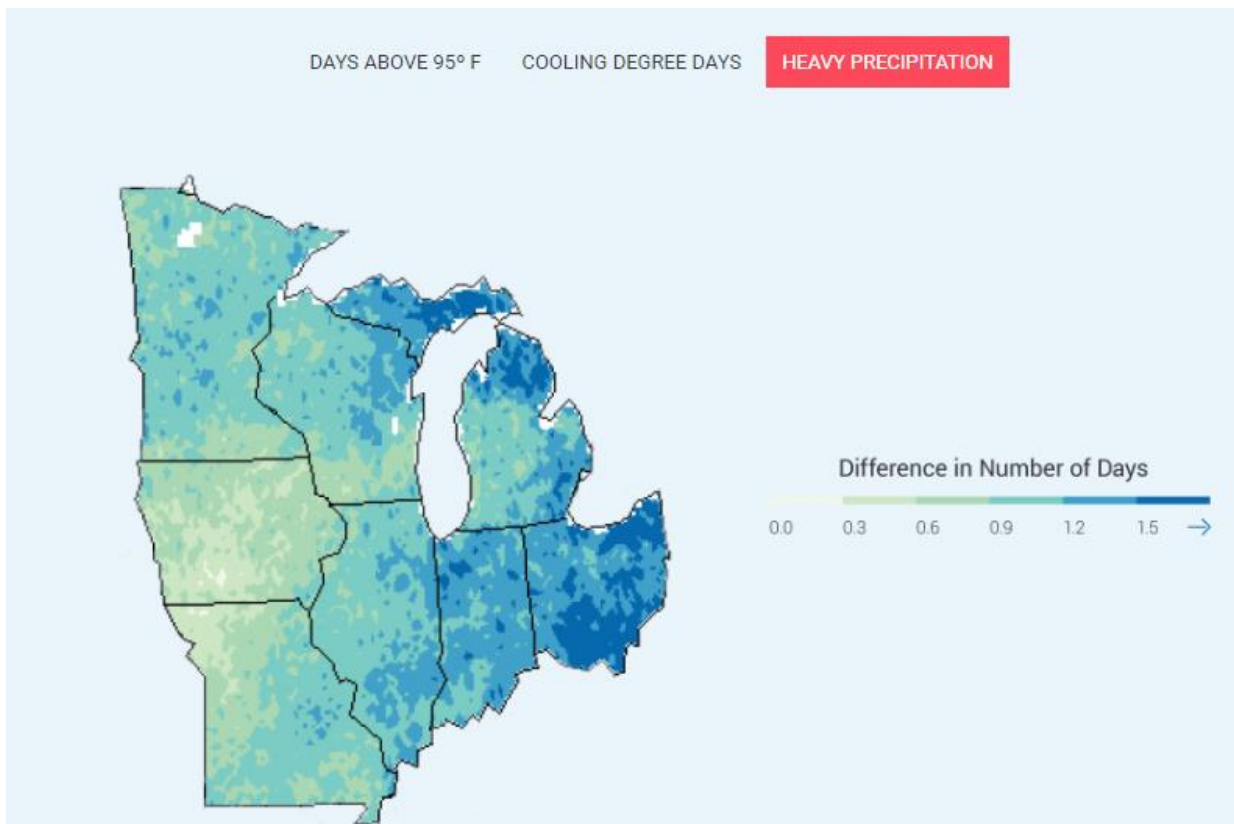
Dam failure is tied to flooding and the increased pressure flooding places on dams. The impacts of changing future conditions on dam failure will most likely be those related to changes in precipitation and flood likelihood. The planning area is already feeling the impacts of increased precipitation having witnessed four 100-year floods in the last ten years. **Figure 3.7** below from The National Climate Assessment<sup>2</sup> illustrate the projected increase in the number of days with very heavy precipitation in the Midwest region.

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<sup>1</sup> [http://npdp.stanford.edu/dam\\_incidents](http://npdp.stanford.edu/dam_incidents)

<sup>2</sup> <https://nca2014.globalchange.gov/highlights/regions/midwest>

**Figure 3.7. Increase in Frequency of Days with Very Heavy Precipitation**



Source: <https://nca2014.globalchange.gov/highlights/regions/midwest>

## **Vulnerability**

### ***Vulnerability Overview***

Data was obtained from the 2023 Missouri State Hazard Mitigation Plan for the vulnerability analysis of dam failure for Maries 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 3.22** provides vulnerability analysis data for the failure of State-regulated dams in Missouri.

**Table 3.22. Vulnerability Analysis for Failure of State-regulated Dams in Missouri**

County	Class 1	Class 2	Class 3	Total	Estimated # of Structures Vulnerable	Average Exposure Value per Structure (\$)	Estimated Total Potential Building Exposure (\$)	Estimated Total Population Exposure	Estimated Potential Losses (\$)
Maries	0	2	2	4	18	\$302,429	\$5,443,719	32	\$1,088,744

Source: 2023 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 or more permanent dwellings or any public building. Inspection of these dams must occur every two years.
- Class 2 dams: the area downstream from the dam that would be affected by inundation contains one to nine permanent dwellings, or one or more campgrounds with permanent water, sewer and electrical services or one or more industrial buildings. Inspection of these dams must occur once every three years.
- Class 3 dams: the area downstream from the dam that would be affected by inundation does not contain any of the structures Identified for Class 1 or Class 2 dams. Inspection of these dams must occur once every five years.

According to the 2023 Missouri State Hazard Mitigation Plan, there is an estimated 18 buildings vulnerable to failure of State-regulated dams (**Figure 3.8**) in Maries County. Furthermore, the state quantified potential loss estimates in terms of property damages. To execute the analysis, the following assumptions were utilized.

- For State-regulated Class 1 and Class 2 dams that have available inundation maps as well as USACE dams for which inundation maps were made available, GIS comparative analysis was accomplished against the building exposure data to determine the types, numbers and estimated values of buildings at risk to dam failure.
- The building exposure data was based on the structure inventory data layer available from the Missouri Spatial Data Inventory Service (MSDIS). The available dam inundation areas were compared against the structure inventory to determine the numbers and types of structures at risk to dam failure.
- To calculate estimated values of buildings at risk, buildings values available in the HAZUS census block data were used to determine an average value for each property type. This average value per property type was then applied to the number of structures in dam inundation areas by type to calculate an overall estimated value of buildings at risk by type.<sup>1</sup>

<sup>1</sup> 2023 Missouri State Hazard Mitigation Plan

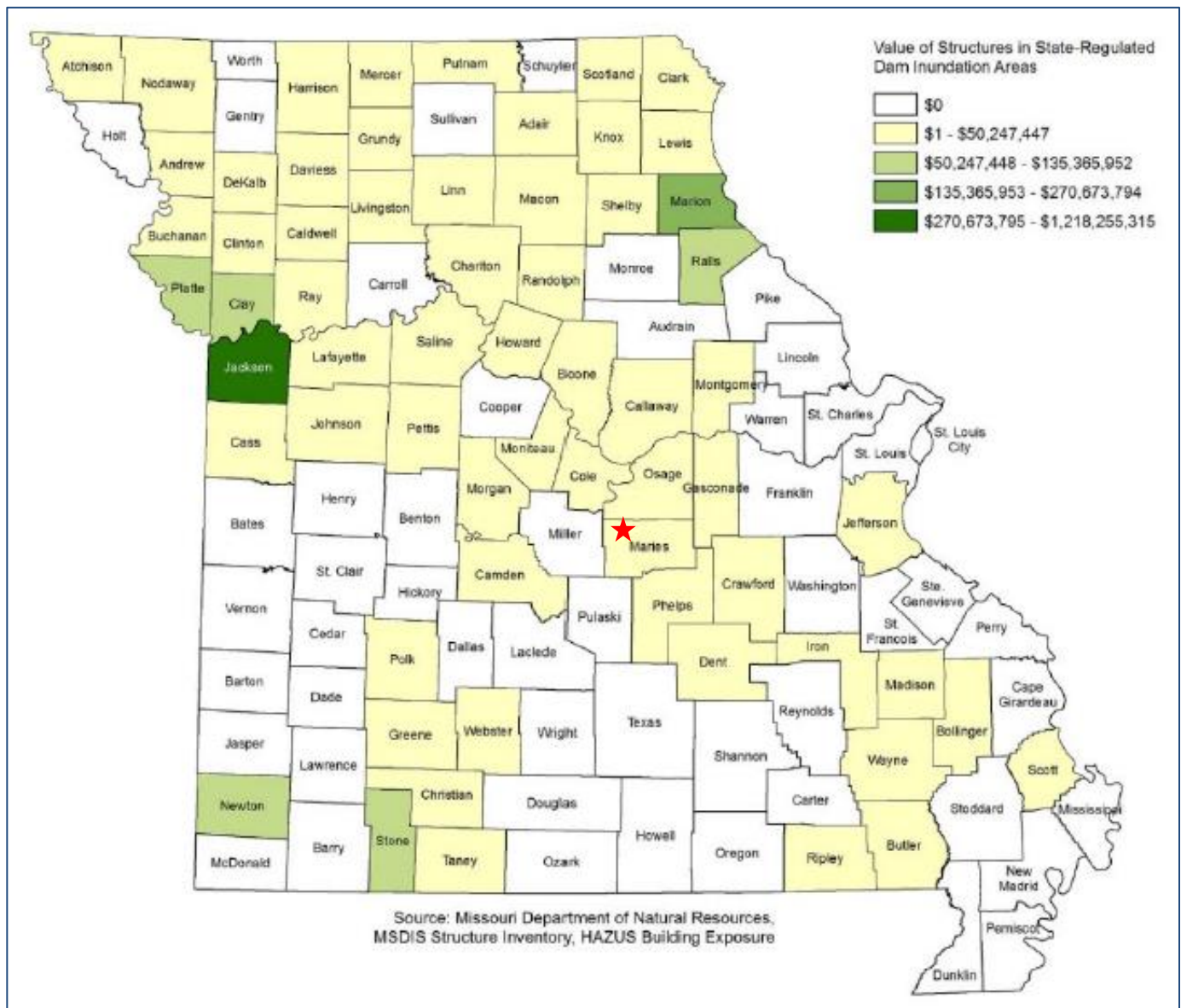


**Figure 3.8. Estimated Number of Buildings Vulnerable to Failure of State-regulated Dams**





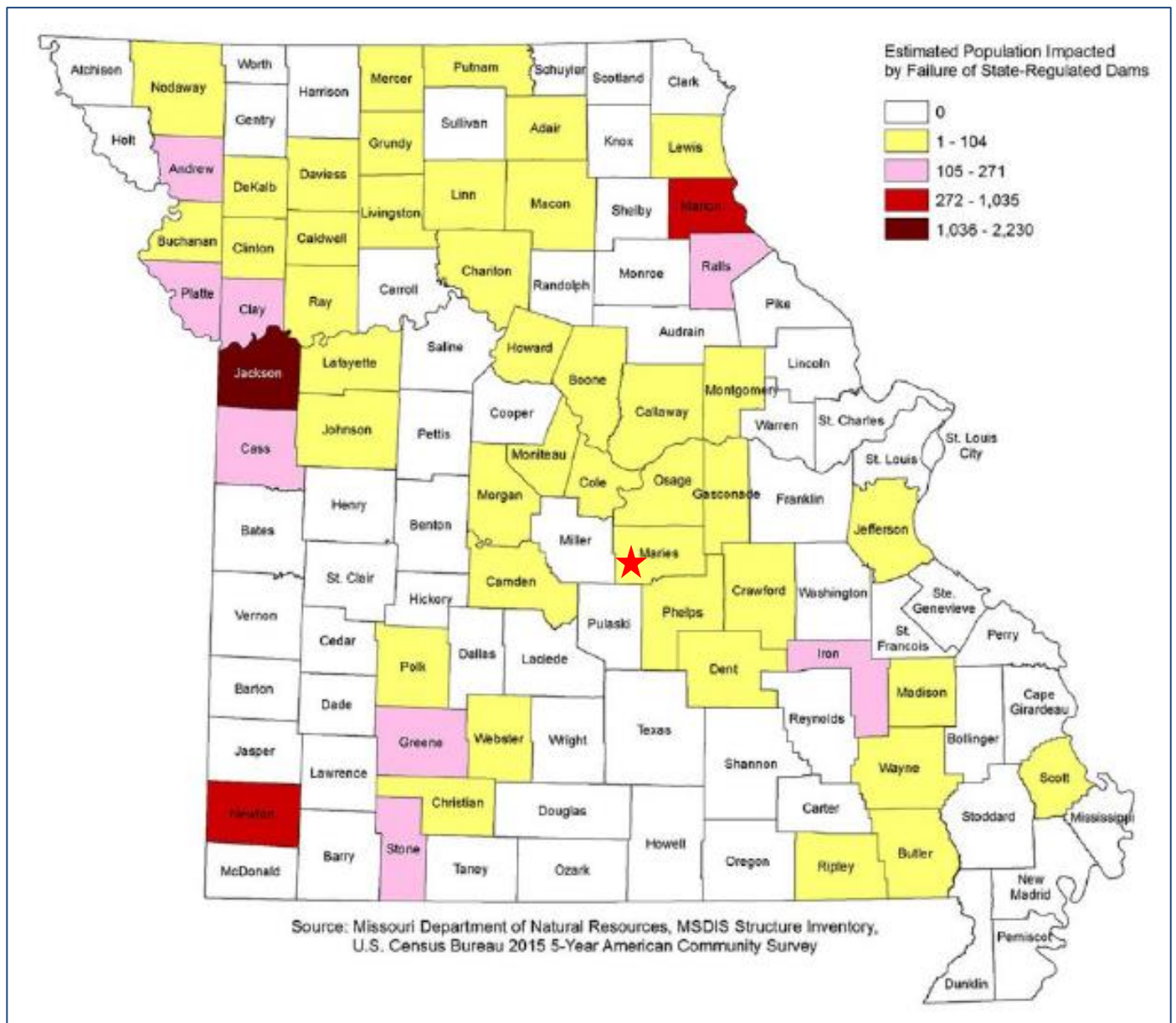
**Figure 3.9. Estimated Value of Structures in State-Regulated Dam Inundation Areas**



Source: 2023 Missouri State Hazard Mitigation Plan

\*Red star indicates Maries County

**Figure 3.10. Estimated Population Exposure to Failure of State-regulated Dams**



Source: 2023 Missouri State Hazard Mitigation Plan  
 \*Red star indicates Maries County

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

The majority of dams in Maries County are rural in nature and would have limited impacts upon failure. Of the four high hazard dams in the planning area, only two have inundation zone data available: Lake Maxwell dam and Dudenhoeffer dam. The downstream road crossings and assets affected for those dams are listed below:

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**Lake Maxwell Dam**

- Highway 42
- Maries County Rd 336
- 6 residential properties

**Dudenhoeffer Dam**

- 1 residential property

***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 inside documented inundation zones or within the 100 Year Floodplain. The county is an NFIP member and requires a floodplain permit for any development in the floodplain. No development is planned in any floodplain or areas downstream of dams in the county or cities.

***Hazard Summary by Jurisdiction***

Variations in vulnerability across the planning area depend mostly on geographic proximity to a dam. Of the five high hazard dams in the county only one is not state regulated, Bowman Lake Dam, which is located less than a quarter mile from the city limits of Vienna. It is also constructed in 1954 making it one of the oldest dams in the county. According to the National Inventory of Dams it was last inspected in 1981 and its condition is not rated. The remaining dams are located in the unincorporated areas of the county with less likelihood of damages. There are no DNR class 1 dams and only six class 2 dams in the county. Maries County school districts and special districts do not have assets located in known dam breach inundation areas.

**Problem Statement**

In summary, the hazard risk for dam failure in Maries County ranges between high and low, depending upon the dam. If a dam does fail, the expected impacts could vary from negligible to critical, and could potentially affect road/utility 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 landowners to properly inspect their dams and develop emergency action plans would be advantageous.

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### 3.4.2 Drought

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Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.6, Page 3.235
- 2023 Missouri State Hazard Mitigation Plan, Chapter 3. Section 3.3.6
- 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, <https://dnr.mo.gov/water/how-s-water/state-water/drought>
- Populations served by groundwater by county, USGS-NWIS, <http://maps.waterdata.usgs.gov/mapper/index.html>
- Census of Agriculture, [https://agcensus.library.cornell.edu/census\\_parts/2012-missouri/](https://agcensus.library.cornell.edu/census_parts/2012-missouri/)
- USDA Risk Management Agency, Insurance Claims, <https://www.rma.usda.gov/en/Information-Tools/Summary-of-Business/Cause-of-Loss>
- Natural Resources Defense Council, <http://www.nrdc.org/globalWarming/watersustainability/>
- Missouri Department of natural Resources (MDNR), Drought News, Conditions and Resources <https://dnr.mo.gov/drought.htm>
- MSDIS Structure Inventory and All Hazard Risk Dataset (available in both GIS and Excel format) <https://drive.google.com/drive/folders/0Bzq99s866kWocFB5Y3hCRIRuWWM>
- Missouri Hazard Mitigation Viewer <http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<https://drive.google.com/file/d/1bPkc0JgF9ofwQLnTL9N0u-oPFWi9hkst/view> - User Guide
  - Vulnerability to drought by County
  - Crop insurance claims due to drought by County

### **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 2018 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 people<sup>1</sup> - which impacts supply and demand of some economic commodity.

### **Geographic Location**

All areas and jurisdictions in Maries 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 majority of individuals living in Maries County rely on groundwater resources for drinking water. Approximately 74% of the land in the county is utilized for agricultural purposes. Furthermore, livestock sales comprise 85% of the market of agricultural products sold in Maries County. A drought would directly impact livestock production and the agricultural economy in Maries County<sup>2</sup>.

Data was collected from the Missouri Department of Natural Resources (2021 Census of Missouri Public Water Systems) to determine water source by jurisdiction. Maries County and the cities of Belle and Vienna utilize well water as their sole source of water (**Table 3.23**). Communities that exclusively depend upon ground water could experience hardship in the event of a long-term drought.

**Table 3.23. 2020 Water Source by Jurisdiction**

<b>Jurisdiction</b>	<b>% of source that is groundwater</b>
<b>Maries County</b>	100
<b>Belle</b>	100
<b>Vienna</b>	100

Source: Missouri Dept. of Natural Resources, 2020 Census of Missouri Public Water Systems

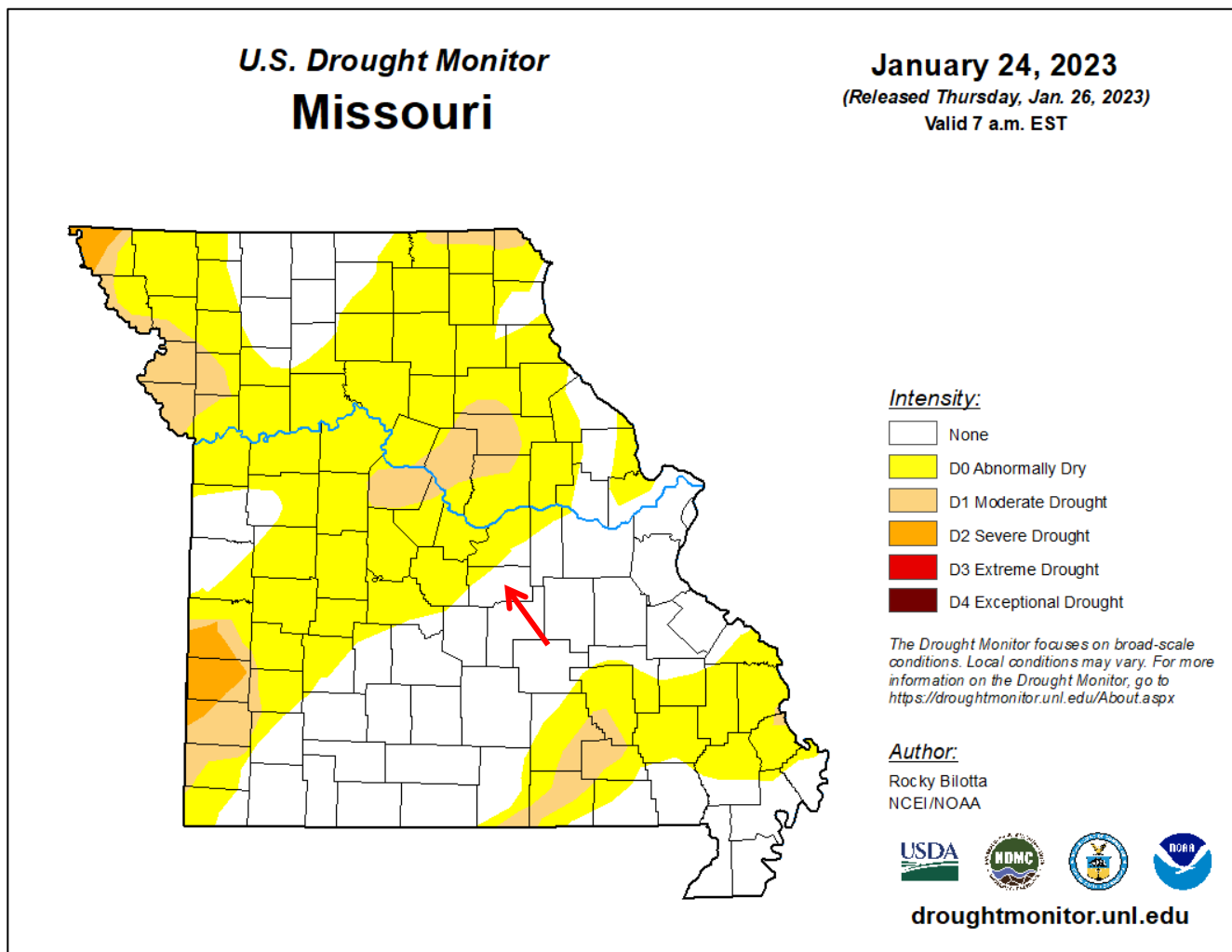
**Figure 3.11** depicts a U.S. Drought Monitor map of Missouri on January 24, 2023. This map illustrates the planning area, which could be in drought at any given moment in time. A red arrow indicates the location of the planning area (Maries County).

<sup>1</sup> <http://www.drought.unl.edu/> <http://droughtreporter.unl.edu/>

<sup>2</sup> [https://www.nass.usda.gov/Publications/AgCensus/2017/Online\\_Resources/County\\_Profiles/Missouri/cp29125.pdf](https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Missouri/cp29125.pdf)



Figure 3.11. U.S. Drought Monitor Map of Missouri on January 24, 2023



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

### 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 mortality<sup>1</sup>.

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

<sup>1</sup> Ibid

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.

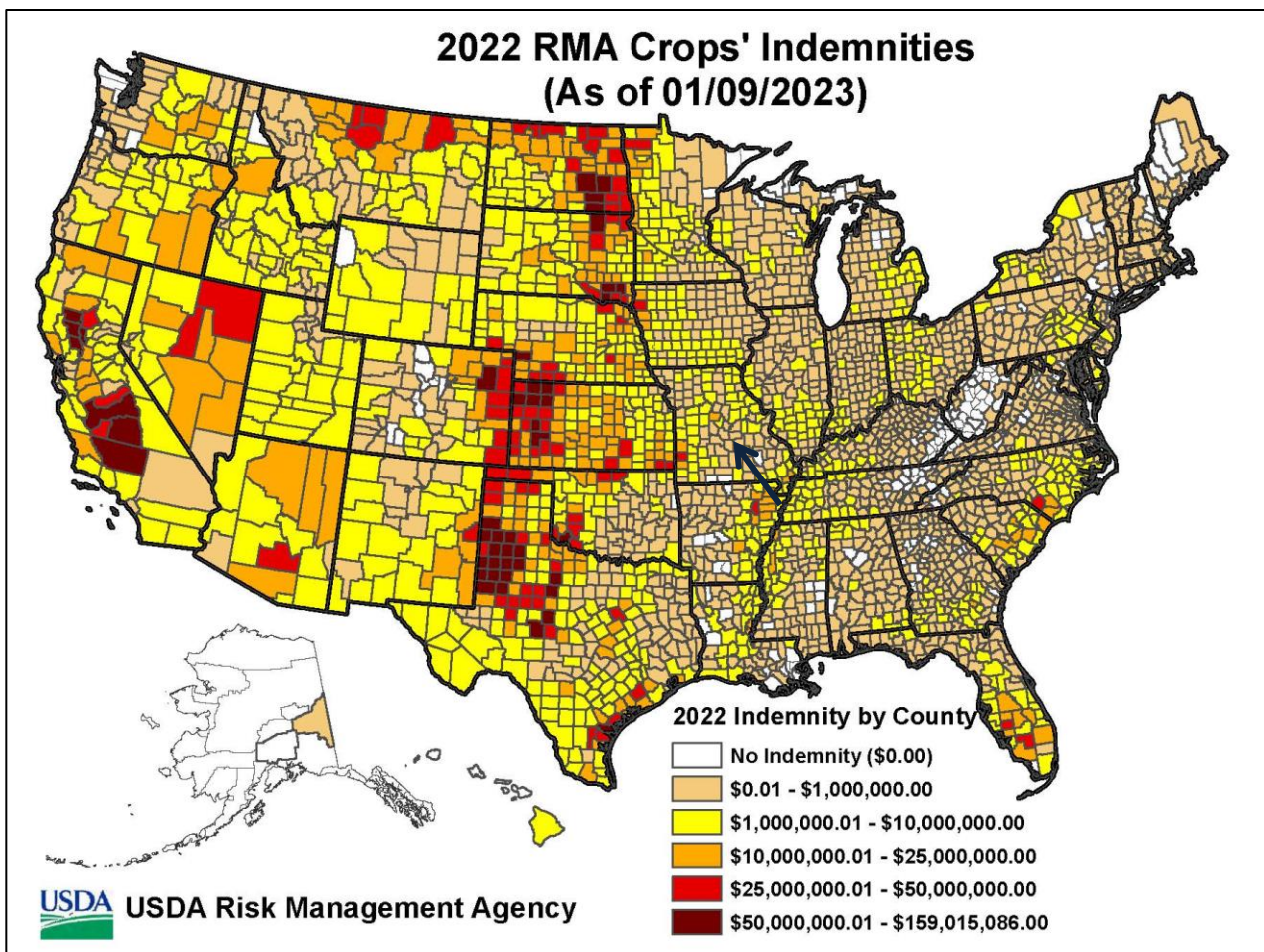
The Palmer Index has proven most effective in identifying long-term drought of more than several months. However, the Palmer Index has been less effective in determining conditions over a matter of weeks. It uses a “0” as normal, and drought is shown in terms of negative numbers; for example, negative 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.

### Previous Occurrences

**Figure 3.12** illustrates RMA crop indemnities for 2022 across the United States. Maries County fell in the \$0.01 to \$1,000,000 category for crop indemnities.

**Figure 3.12. 2021 RMA Crop Indemnities for the United States**



Source: <https://www.rma.usda.gov/-/media/RMA/Maps/Total-Crop-Indemnity-Maps/Crop-Year-2022/010923map.ashx?la=en> \*Black arrow indicates Maries County

According to the USDA's Risk Management Agency, there have been 75 crop insurance payments due to drought in Maries County since 2003, totaling \$840,454.49. **Table 3.24** illustrates the year, number of payments, and total amount of crop insurance payments.

**Table 3.24. Maries County Crop Indemnity Payments (2003-2022)**

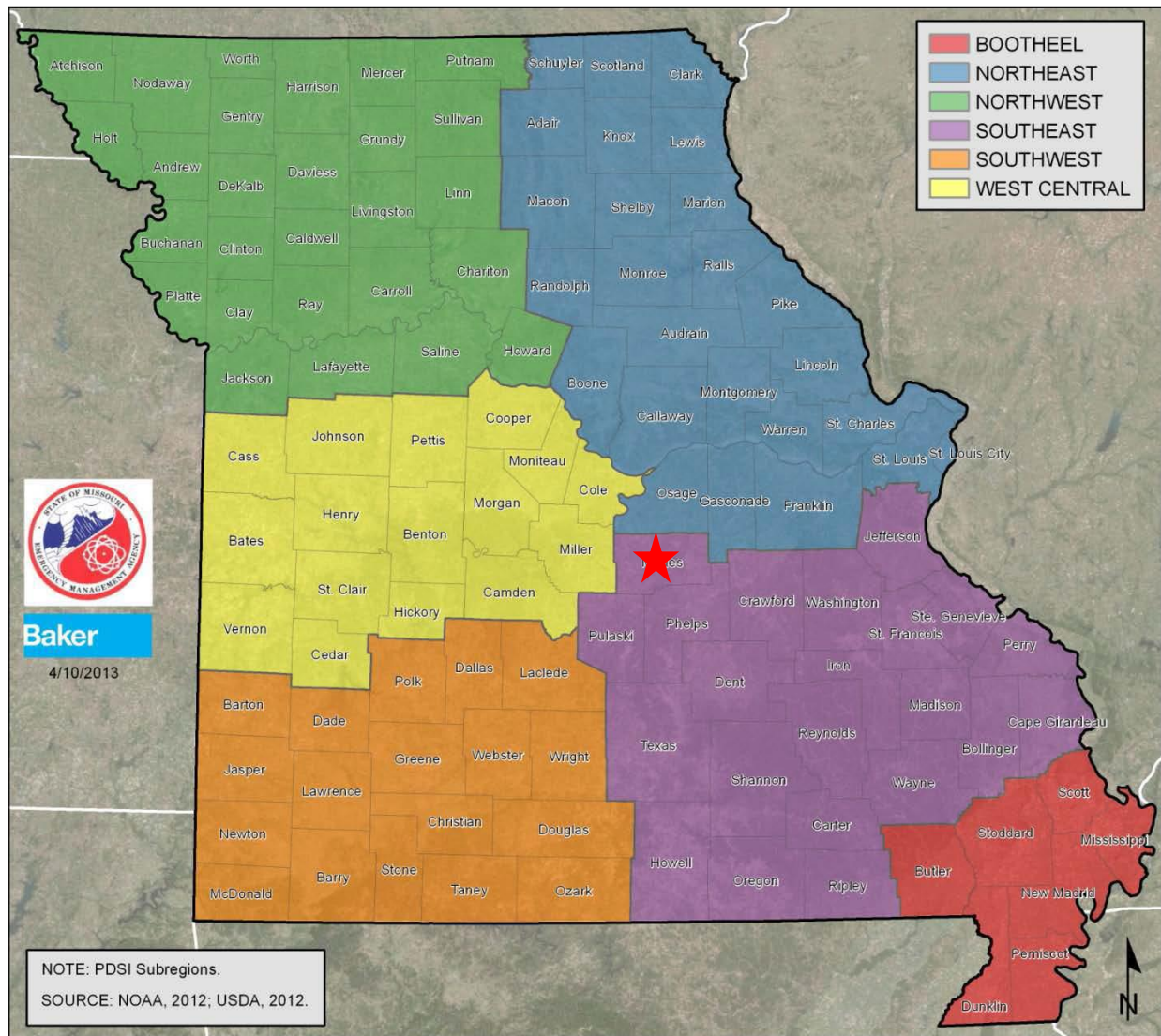
Year	Number of Payments	Total
2003	4	\$2,641.00
2004	0	0
2005	3	\$3,818.00
2006	7	\$7,203.00
2007	1	\$4,762.00
2008	0	0
2009	0	0
2010	0	0
2011	7	\$41,286.00
2012	19	\$427,833.99
2013	3	\$5,471.00
2014	2	\$3,825.00
2015	0	0
2016	0	0
2017	5	\$11,187.20
2018	15	\$162,593.90
2019	0	0
2020	1	\$6,687.10
2021	1	\$639.20
2022	7	\$162,507.10
<b>TOTAL</b>	<b>75</b>	<b>\$840,454.49</b>

Source: <https://www.rma.usda.gov/Information-Tools/Summary-of-Business/Cause-of-Loss>

Figure 3.13 illustrates the Palmer Drought Severity Index sub-regions of Missouri. Maries County is categorized under the Southeast sub-region.



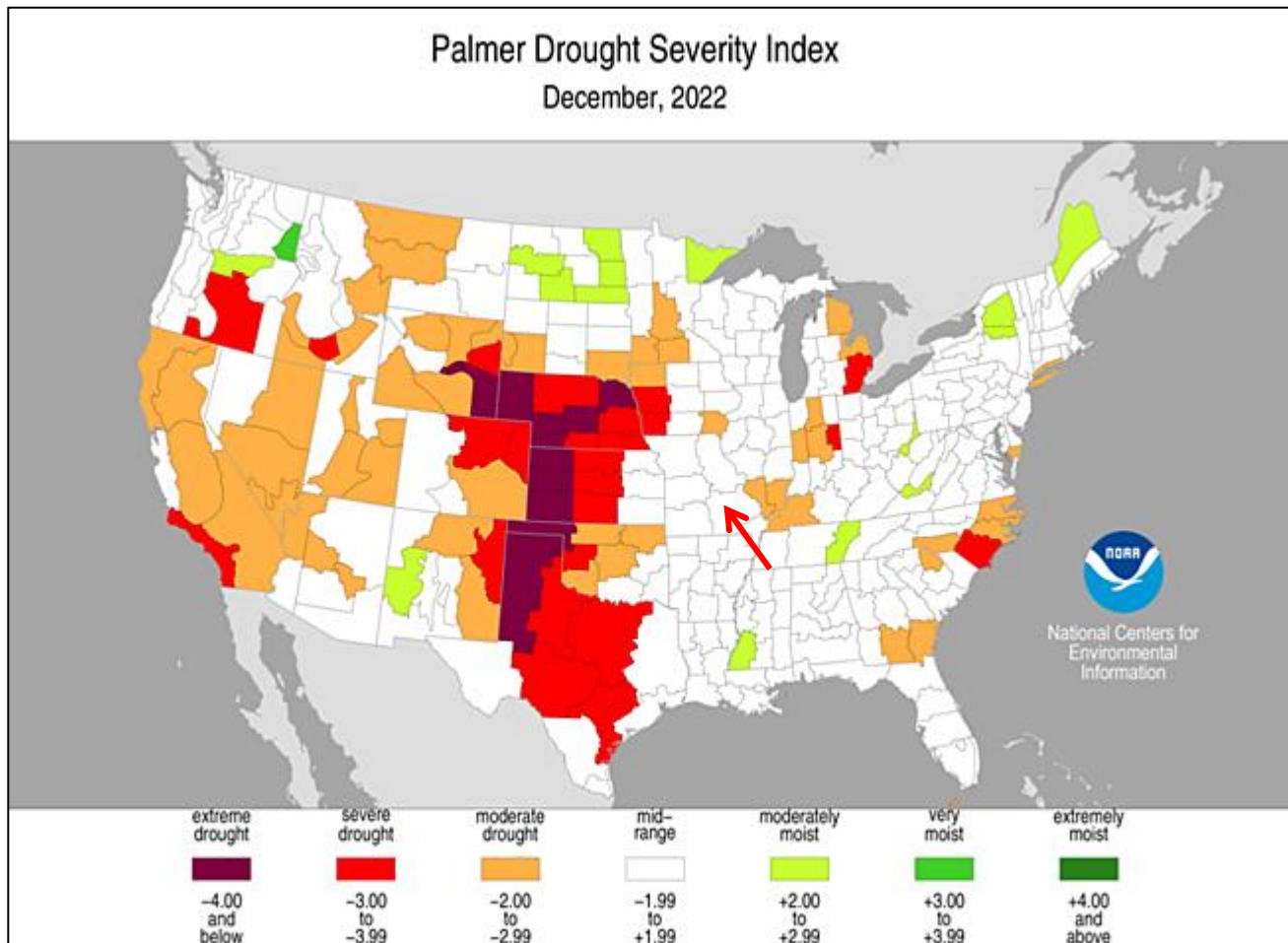
**Figure 3.13. Palmer Drought Severity Index: Missouri Sub-regions**



Source: 2018 Missouri State Hazard Mitigation Plan; \*Red star indicates Maries County

**Figure 3.14** is an example of the Palmer Modified Drought Index for the United States for December, 2022.

**Figure 3.14. Palmer Modified Drought Index National Map December, 2022**



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

**Table 3.25** offers Palmer Drought Severity Index data for Maries County between 2013 and 2022. This information exemplifies drought conditions on a monthly basis for Missouri's Southeast sub-region within the United States.

**Table 3.25. Palmer Drought Severity Index for Maries County, MO (2013 – 2022)**

	Year									
Year	2013	2014	2015	2016	2017	2018	2019	2020	2019	2022
<b>Jan.</b>	Mid-range	Moderately moist	Mid-range	Very moist	Mid-range	Severe drought	Moderately Moist	Extremely moist	Very Moist	Mid-range
<b>Feb.</b>	Mid-range	Mid-range	Mid-range	Very moist	Mid-range	Mid-range	Moderately Moist	Extremely moist	Moderately moist	Mid-range
<b>March</b>	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range	Mid-range	Moderately Moist	Extremely moist	Moderately moist	Mid-range
<b>April</b>	Mid-range	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range	Moderately Moist	Extremely moist	Moderately moist	Mid-range

<b>May</b>	Mid-range	Mid-range	Mid-range	Moderately moist	Very moist	Mid-range	Very moist	Extremely moist	Moderately moist	Mid-range
<b>June</b>	Mid-range	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range	Very moist	Very moist	Mid-range	Mid-range
<b>July</b>	Mid-range	Mid-range	Moderately moist	Moderate moist	Moderately moist	Mid-range	Very moist	Very moist	Moderately moist	Mid-range
<b>Aug.</b>	Moderately moist	Mid-range	Very moist	Very moist	Moderately moist	Mid-range	Extremely moist	Very moist	Mid-range	Mid-range
<b>Sept.</b>	Moderately moist	Mid-range	Moderately moist	Very moist	Mid-range	Mid-range	Very moist	Very moist	Mid-range	Mid-range
<b>Oct.</b>	Moderately moist	Mid-range	Mid-range	Very moist	Mid-range	Mid-range	Very moist	Very moist	Mid-range	Mid-range
<b>Nov.</b>	Moderately moist	Mid-range	Very moist	Very moist	Moderate drought	Mid-range	Extremely moist	Very moist	Mid-range	Mid-range
<b>Dec.</b>	Moderately moist	Mid-range	Extremely moist	Moderately moist	Severe Drought	Mid-range	Very moist	Moderately moist	Mid-range	Mid-range

Source: <https://www.ncei.noaa.gov/access/monitoring/historical-palmers/maps/psi/201101-202012>

### ***Probability of Future Occurrence***

To calculate the probability of future occurrence of drought in Maries County, historical climate data was analyzed. There were 14 months of recorded drought (**Table 3.26**) over a 20-year span (January, 2003 to December, 2022). The number of months in drought (14) 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 Maries County, MO (2003 – 2022)**

Month	Year											
	January	February	March	April	May	June	July	August	September	October	November	December
2003												
2004												
2005						X						
2006												
2007										X	X	
2008												
2009												
2010												
2011												
2012					X	X	X	X	X	X	X	X
2013												
2014												
2015												
2016												
2017											X	X
2018	X											
2019												
2020												
2021												
2022												

Source: <https://www.ncei.noaa.gov/access/monitoring/historical-palmers/maps/psi/200101-202012>

\*x indicates drought

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

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Location	Annual Avg. % P of Drought
Maries County	5.83%

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

\*P = probability; see page 3.44 for definition.

### ***Changing Future Conditions Considerations***

It is thought that human activity has not been a major component in historical droughts, although it is uncertain how droughts will behave in the future. Future projections predict that increases in spring precipitation will transition to insufficient levels in the summer<sup>1</sup>. Future increases in evaporation rates due to higher temperatures may increase the intensity of naturally occurring droughts<sup>2</sup>. Increases in drought frequency or severity could affect crop yields. Maries County is an agriculture-dependent county and decreases in yields would likely cause significant economic stress on the people of the planning area. 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. Maries County is predicted to experience moderate water shortages as a result of global warming (**Figure 3.1**) by the year 2050.

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<sup>1</sup> <https://nca2018.globalchange.gov/chapter/21/>

<sup>2</sup> 2023 Missouri State Hazard Mitigation Plan



**Water Supply Sustainability Index (2050)**  
 Number of Counties for each Category in Parentheses

Extreme (4)	Moderate (45)
High (26)	Low (15)

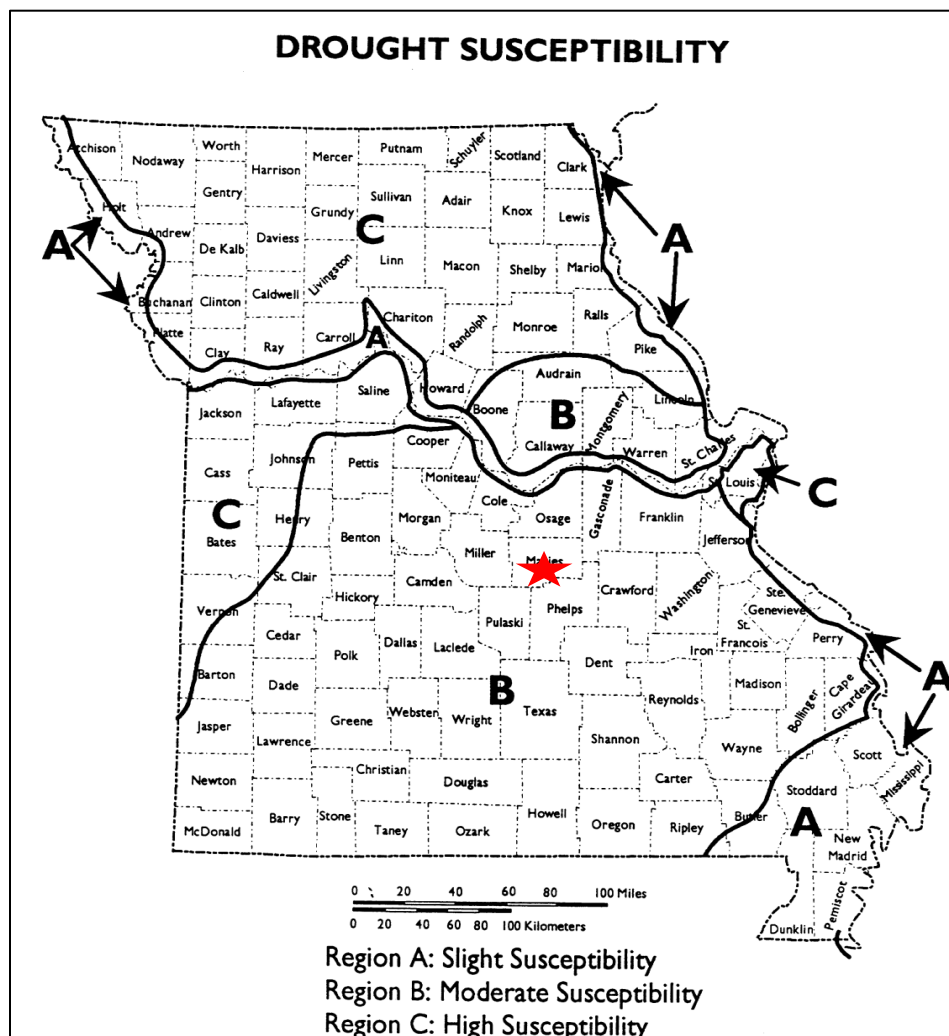
3.55

## Vulnerability

### Vulnerability Overview

Data was obtained from the 2023 Missouri State Hazard Mitigation Plan for the drought vulnerability analysis. **Table 3.27** depicts the ranges for drought vulnerability factor ratings created by SEMA. The array ranges between 1 (low) and 5 (high). The factors considered include social vulnerability, crop exposure ratio, annualized crop claims paid and likelihood of occurrence. Once the ranges were determined and applied to all factors considered in the analysis, the ratings were combined to determine an overall vulnerability rating for drought. Maries County is determined as having a low vulnerability to crop loss (**Table 3.28**) as a result of a drought. Additionally, SEMA has divided the State into 3 regions in regards to drought susceptibility (**Figure 3.2**). Maries 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 irrigation<sup>1</sup>.

**Figure 3.2. Drought Susceptibility in Missouri**



Source: 2023 Missouri State Hazard Mitigation Plan; \*Red star indicates Maries County

<sup>1</sup> 2023 Missouri State Hazard Mitigation Plan

**Table 3.28. Ranges for Drought Vulnerability Factor Ratings**

Factors Considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Social Vulnerability Index	1	2	3	4	5
Crop Exposure Ratio Rating	\$379,000 - \$22,460,000	\$23,369,000 - \$51,704,000	\$53,142,000 - \$84,855,000	\$84,855,000 - \$159,192,000	\$181,201,000 - \$239,334,000
Annualized USDA Crop Claims Paid	\$0	\$1 - \$2,170,363	\$2,170,364 - \$3,625,266	\$3,625,267 - \$6,069,160	\$6,096,161 - \$11,136,989
Likelihood of Occurrence of Severe or Extreme Drought	0.15 – 0.35	0.38 – 0.50	0.54 – 0.69	0.73 – 1.00	1.23 – 1.31
Total Drought Vulnerability Rating	4-7	8-10	11-13	14-16	17-20

Source: 2023 Missouri State Hazard Mitigation Plan

**Table 3.29. Vulnerability of Maries County to Drought**

SOVI index rating	USDA RMA Total Drought Crop Claims	Avg Annualized Crop Claims	USDA Claims Rating	2012 Crop Exposure	Crop Exposure Rating	Likelihood of severe drought %	Drought occurrence rating	Total Rating	Total rating (text) drought
3	\$1,669,551	\$166,955	1	\$4,731,000	1	0.31	1	6	Low

Source: 2023 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 hazards<sup>1</sup>.

### ***Impact of Previous and Future Development***

Impacts of drought on future development within Maries County would be negligible. Population projections as provided by the Missouri Office of Administration suggest that Maries County will increase by approximately 2000 individuals by 2030<sup>2</sup>. Moreover, with an increasing population, water use and demand would be expected to increase as well; potentially straining the water supply systems. Long term drought could expose vulnerabilities during construction/upgrades of water distribution and sewer infrastructures. Furthermore, any agriculture related development in terms of crop or livestock production would also be at risk.

<sup>1</sup> <https://drought.unl.edu/>

<sup>2</sup> Missouri Office of Administration <https://mcdc.missouri.edu/applications/MO-county-factsheets/?c=29065>



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### ***Hazard Summary by Jurisdiction***

The variations between jurisdictions are non-existent to minimal. All communities in Maries County utilize ground/well water as their water source. In all cities, 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.

### **Problem Statement**

In summary, drought within Maries County is considered a moderate risk. Maries County has a significant 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.

The county and city should develop water monitoring plans as an early warning system. Each sector should inventory and review their groundwater 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 both cities should continually look for and fund water system improvements, new systems, and new wells.

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### 3.4.3 Earthquakes

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Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.4, Page 3.192
- 2023 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.4
- U.S. Seismic Hazard Map, United States Geological Survey, <https://www.usgs.gov/programs/earthquake-hazards/maps>;
- Impact of Earthquakes on the Central USA [http://www.cusec.org/documents/aar/NMSZ\\_CAT\\_PLANNING\\_SCENARIO.pdf](http://www.cusec.org/documents/aar/NMSZ_CAT_PLANNING_SCENARIO.pdf)
- Missouri Hazard Mitigation Viewer <http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<https://drive.google.com/file/d/1bPkc0JgF9ofwQLnTL9N0u-oPFWi9hkst/view> - User Guide
  - Total population impacted by earthquakes by County
  - Total number of structures impacted by earthquakes by County
  - Total value of structures impacted by earthquakes by County
  - Property loss ratio to earthquakes by County
- 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone map, <https://iowageologicalsurvey.org/>;
- Facts about the New Madrid Seismic Zone, <https://dnr.mo.gov/land-geology/hazards/earthquakes/science/facts-new-madrid-seismic-zone>
- MSDIS Structure Inventory and All Hazard Risk Dataset (available in both GIS and Excel format) <https://drive.google.com/drive/folders/0Bzq99s866kWocFB5Y3hCRIRuWWM>

## **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. Stresses can build along these faults and tears in the crust, until one side of the fault slips, generating compressive and shear energy that produces shaking and damage to the built environment. The 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 energy to buildings and other structures on the earth's surface.

The closest fault to Maries County is the New Madrid Seismic Zone (NMSZ). The NMSZ extends 120 miles south from Charleston, Missouri, following Interstate 55 to near Marked Tree, Arkansas. These faults cross five state lines, the Mississippi River in three places, and the Ohio River in two places. It is the most active seismic area in the United States east of the Rocky Mountains and averages about 200 measured events per year. Tremors large enough to be felt occur annually. On average every 18 months, the fault releases a shock of magnitude 4.0 or greater, which is capable of localized damage. A magnitude 5.0 or greater occurs about once per decade, can cause significant damage, and be felt in several states. Unfortunately, the faults in the NMSZ are difficult to study due to concealment by alluvium soil deposits. However, improved monitoring techniques in recent years have led to great strides in understanding of this complex area<sup>1</sup>.

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<sup>1</sup> Missouri State Emergency Management Agency, Missouri Department of Natural Resources, About the New Madrid Seismic Zone

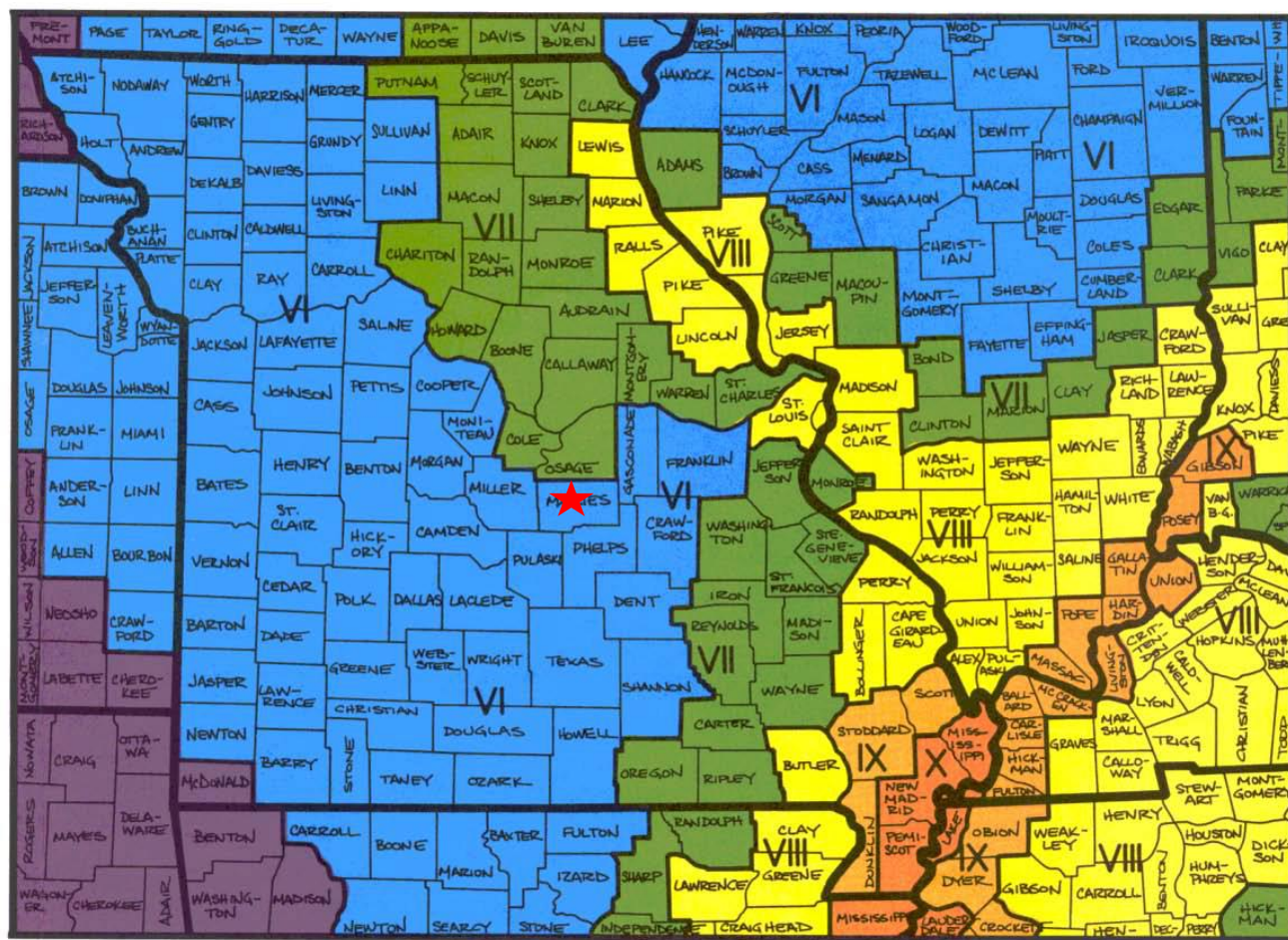
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### ***Geographic Location***

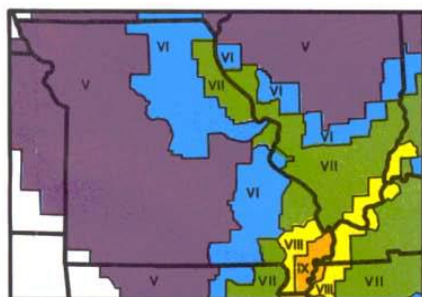
There are eight earthquake source zones in the Central United States, one of which is located within the state of Missouri—the New Madrid Seismic Zone. Other seismic zones, because of their close proximity, also affect Missourians. These are the Wabash Valley Fault, Illinois Basin, and the Nemaha Uplift. 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 3.3** depicts impact zones for a magnitude 7.6 earthquake along the New Madrid Fault along with associated Modified Mercalli Intensities. Maries 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, Maries County would experience a Modified Mercalli Intensity of V (**Figure 3.4**). This intensity is categorized as being almost felt by everyone. Most people are awakened. Doors swing open or closed. Dishes are broken. Pictures on the wall move. Windows crack in some cases. Small objects move or are turned over. Liquids might spill out of open containers. Additionally, in the occurrence of 7.6 and 8.6 magnitude earthquakes; the county would experience Modified Mercalli Intensities of VI and VII respectively. There will be a range in intensities within any small area such as a town or county, with the highest intensity generally occurring at only a few sites.

Figure 3.3. Impact Zones for Earthquake Along the New Madrid Fault

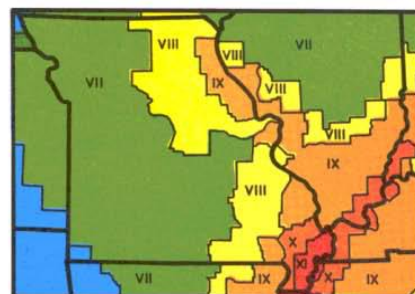


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.



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](http://sema.dps.mo.gov); \*Red star indicates Maries County



**Figure 3.4. Projected Earthquake Intensities**

<b>MODIFIED MERCALLI INTENSITY SCALE</b>	
I	People do not feel any Earth movement.
II	A few people might notice movement.
III	Many people indoors feel movement. Hanging objects swing.
IV	Most people indoors feel movement. Dishes, windows, and doors rattle. Walls and frames of structures creak. Liquids in open vessels are slightly disturbed. Parked cars rock.
V	Almost everyone feels movement. Most people are awakened. Doors swing open or closed. Dishes are broken. Pictures on the wall move. Windows crack in some cases. Small objects move or are turned over. Liquids might spill out of open containers.
VI	Everyone feels movement. Poorly built buildings are damaged slightly. Considerable quantities of dishes and glassware, and some windows are broken. People have trouble walking. Pictures fall off walls. Objects fall from shelves. Plaster in walls might crack. Some furniture is overturned. Small bells in churches, chapels and schools ring.
VII	People have difficulty standing. Considerable damage in poorly built or badly designed buildings, adobe houses, old walls, spires and others. Damage is slight to moderate in well-built buildings. Numerous windows are broken. Weak chimneys break at roof lines. Cornices from towers and high buildings fall. Loose bricks fall from buildings. Heavy furniture is overturned and damaged. Some sand and gravel stream banks cave in.
VIII	Drivers have trouble steering. Poorly built structures suffer severe damage. Ordinary substantial buildings partially collapse. Damage slight in structures especially built to withstand earthquakes. Tree branches break. Houses not bolted down might shift on their foundations. Tall structures such as towers and chimneys might twist and fall. Temporary or permanent changes in springs and wells. Sand and mud is ejected in small amounts.
IX	Most buildings suffer damage. Houses that are not bolted down move off their foundations. Some underground pipes are broken. The ground cracks conspicuously. Reservoirs suffer severe damage.
X	Well-built wooden structures are severely damaged and some destroyed. Most masonry and frame structures are destroyed, including their foundations. Some bridges are destroyed. Dams are seriously damaged. Large landslides occur. Water is thrown on the banks of canals, rivers, and lakes. Railroad tracks are bent slightly. Cracks are opened in cement pavements and asphalt road surfaces.
XI	Few if any masonry structures remain standing. Large, well-built bridges are destroyed. Wood frame structures are severely damaged, especially near epicenters. Buried pipelines are rendered completely useless. Railroad tracks are badly bent. Water mixed with sand, and mud is ejected in large amounts.
XII	Damage is total, and nearly all works of construction are damaged greatly or destroyed. Objects are thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move. Lakes are dammed, waterfalls formed and rivers are deflected.

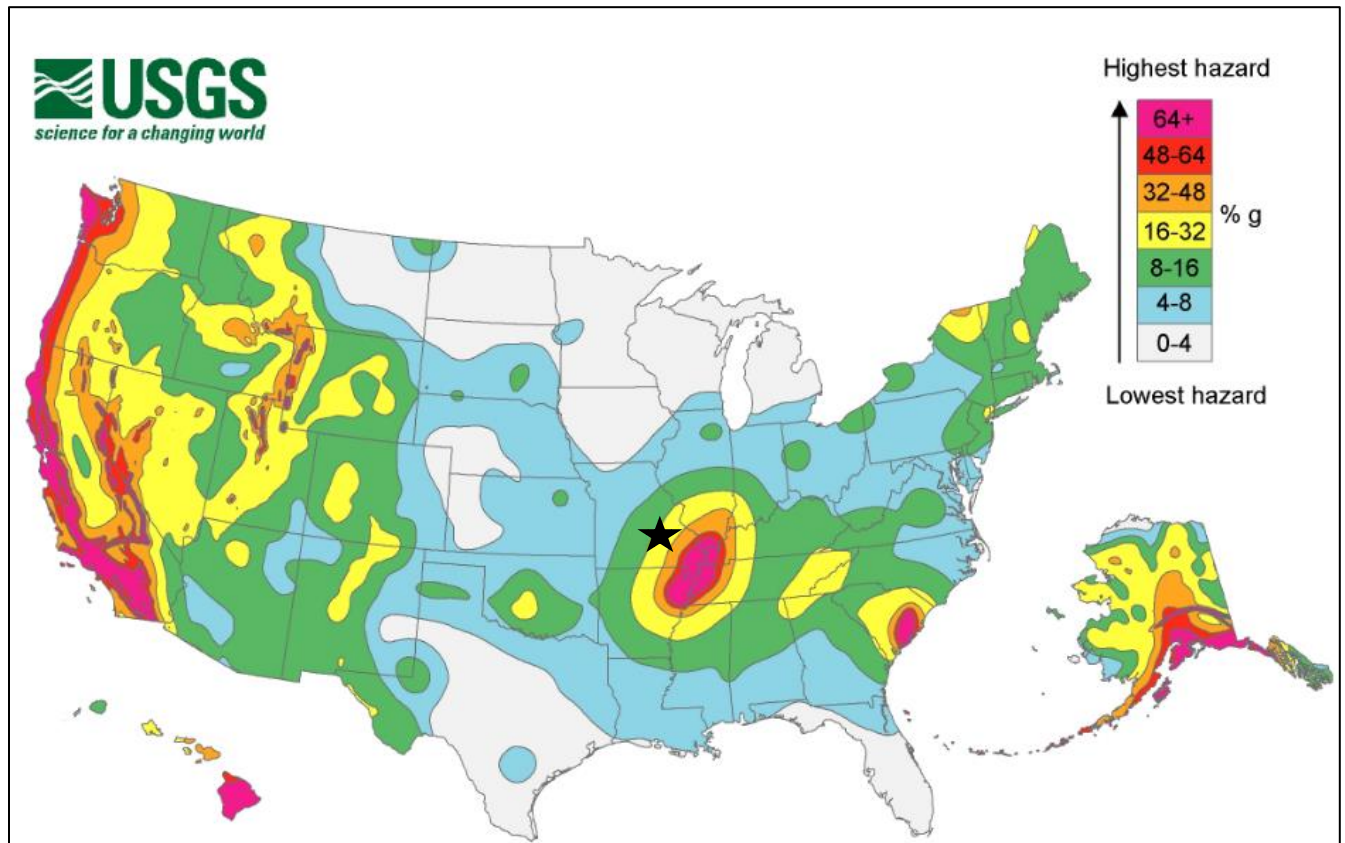
Intensity is a numerical index describing the effects of an earthquake on the surface of the Earth, on man, and on structures built by man. The intensities shown in these maps are the highest likely under the most adverse geologic conditions. There will actually be a range in intensities within any small area such as a town or county, with the highest intensity generally occurring at only a few sites. Earthquakes of all three magnitudes represented in these maps occurred during the 1811 - 1812 "New Madrid earthquakes." The isoseismal patterns shown here, however, were simulated based on actual patterns of somewhat smaller but damaging earthquakes that occurred in the New Madrid seismic zone in 1843 and 1895.

Prepared and distributed by  
**THE MISSOURI STATE  
 EMERGENCY MANAGEMENT AGENCY**  
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 JEFFERSON CITY, MO 65102  
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Source: [sema.dps.mo.gov](http://sema.dps.mo.gov)

**Figure 3.5** illustrates the seismicity in the United States. A black star indicates the location of Maries 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 16-32% g.

**Figure 3.5. United States Seismic Hazard Map**



Source: USGS, <http://earthquake.usgs.gov>; \*Black star indicates Maries 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)<sup>1</sup>. **Table 3.30** further define Richter Scale intensities.

<sup>1</sup> Measuring the Size of an Earthquake, <http://earthquake.usgs.gov/learn/topics/measure.php>

**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

### *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***

There have been no earthquakes documented in Maries County since 1931.

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 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 at the time of the earthquakes if 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 Marietta, 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.

Small earthquakes continue to occur frequently in Missouri. An average of 200 earthquakes are detected every year in the New Madrid Seismic Zone alone. Most are detectable only with sensitive instruments, but on an average of every 18 months, southeast Missouri experiences an earthquake strong enough to crack plaster in buildings<sup>1</sup>.

### ***Probability of Future Occurrence***

No earthquakes have been reported in Marion County since 1931. Additionally, the USGS database shows that there is a 0.44% chance of a major earthquake within 50 km of the county within the next 50 years.<sup>2</sup> The county, located in south central Missouri, is a good distance from the southeast corner of the state where the New Madrid Fault resides. Should a significant earthquake occur, it would have the potential to cause only limited damage within the county.

The 2018 Missouri Hazard Mitigation Plan states that there have been 31 recorded earthquake events greater than or equal to M 4.0 in the 43-year period from 1973 to 2018. According to this data, annual probability calculates to 72 percent. Additionally, the USGS estimated in 2006 that the probability of a repeat of the 1811-1812 earthquakes (magnitude 7.5 – 8.0) was seven to ten percent in a 50-year time period (Source: <http://pubs.usgs.gov/fs/2006/3125>). Given the historical frequency of earthquake events, this hazard is determined to have a high probability of occurrence within the State.

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<sup>1</sup> Missouri State Hazard Mitigation Plan 2018

<sup>2</sup> <https://www.usgs.gov/programs/earthquake-hazards/science/national-seismic-hazard-model#overview>



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## ***Changing Future Conditions Considerations***

Scientists are beginning to believe that there may be a correlation between changing climate conditions and earthquakes. Changing ice caps and sea-level redistribute weight over fault lines, which could potentially have an influence on earthquake occurrences. However, currently no studies quantify the relationship to a high level of detail, so recent earthquakes should not be linked with climate change. While not conclusive, early research suggests that more intense earthquakes and tsunamis may eventually be added to the adverse consequences that are caused by changing future conditions.<sup>1</sup>

## **Vulnerability**

### ***Vulnerability Overview***

As stated in the 2023 Missouri Hazard Mitigation Plan, the impacts and severity of earthquakes on Missouri can be significant. The New Madrid earthquakes of 1811-1812 are among the largest that have happened on the North American continent. Losses at the time were limited due to low population and little development. However, a similar quake at this time would result in devastating damage.

The most important direct earthquake hazard is ground shaking, which affects structures close to the earthquake epicenter. However, ground shaking can also affect structures located great distances from epicenters, particularly where thick clay-rich soils can amplify ground motions. Certain types of buildings are more vulnerable to ground shaking than others. Unreinforced masonry structures, tall structures without adequate lateral resistance and poorly maintained structures are specifically susceptible to large earthquakes.

According to MDNR's Missouri Geological Survey, damage from earthquakes in the New Madrid Seismic Zone will vary depending on the earthquake magnitude, the character of the land and the degree of urbanization. Maries County is rural with few clusters of population. Infrastructure in the region such as highways, bridges, pipelines, communication lines and railroads might suffer damage, which would adversely affect Maries County, even if the county itself did not suffer heavy damage. Infrastructure could take a significant time to repair.

An important tool for homeowners to address the risk of earthquake damage to property is the purchase of earthquake insurance coverage. The Missouri Department of Insurance, Financial Institutions and Professional Registration (DIFP) prepared a report in 2022 on the state of earthquake insurance coverage in Missouri. The report notes that earthquake coverage has become less available and less affordable. The cost of earthquake coverage has increased significantly, particularly in the high-risk New Madrid area. Insurers have increasingly pulled out of high-risk areas of the state or have subjected such areas to stricter underwriting standards. Policyholders are required to self-insure to a significant extent through higher deductibles and the application of separate deductibles to structure and contents. Some insurers will only sell policies with a deductible equal to 20 or 25% of policy limits. In 91 of Missouri's 115 counties, fewer than 20 percent of residences have earthquake coverage. Only in St. Charles County are at least half of residences insured from damage caused by earthquakes. In 2021 the percentage of residential policies with earthquake coverage in Maries County was 16.7 percent with the average cost of coverage at \$50 per year.<sup>2</sup>

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<sup>1</sup> Missouri State Hazard Mitigation Plan 2023

<sup>2</sup> The State of Earthquake Coverage Report <https://insurance.mo.gov/earthquake/>

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### ***Potential Losses to Existing Development***

SEMA utilized Hazus V 3.2 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. All Hazus analyses were run using Level 1 building inventory database comprised of updated demographic and aggregated data based on the 2010 census. An annualized loss scenario that enabled an “apples to apples” comparison of earthquake risk for each county was synthesized from a FEMA nationwide annualized loss study (FEMA 366 Hazus Estimated Annualized Earthquake Losses for the United States, April 2017). A second scenario, based on an event with a two percent probability of exceedance in 50 years, was done to model a worst case earthquake using a level of ground shaking recognized in earthquake-resistant design.

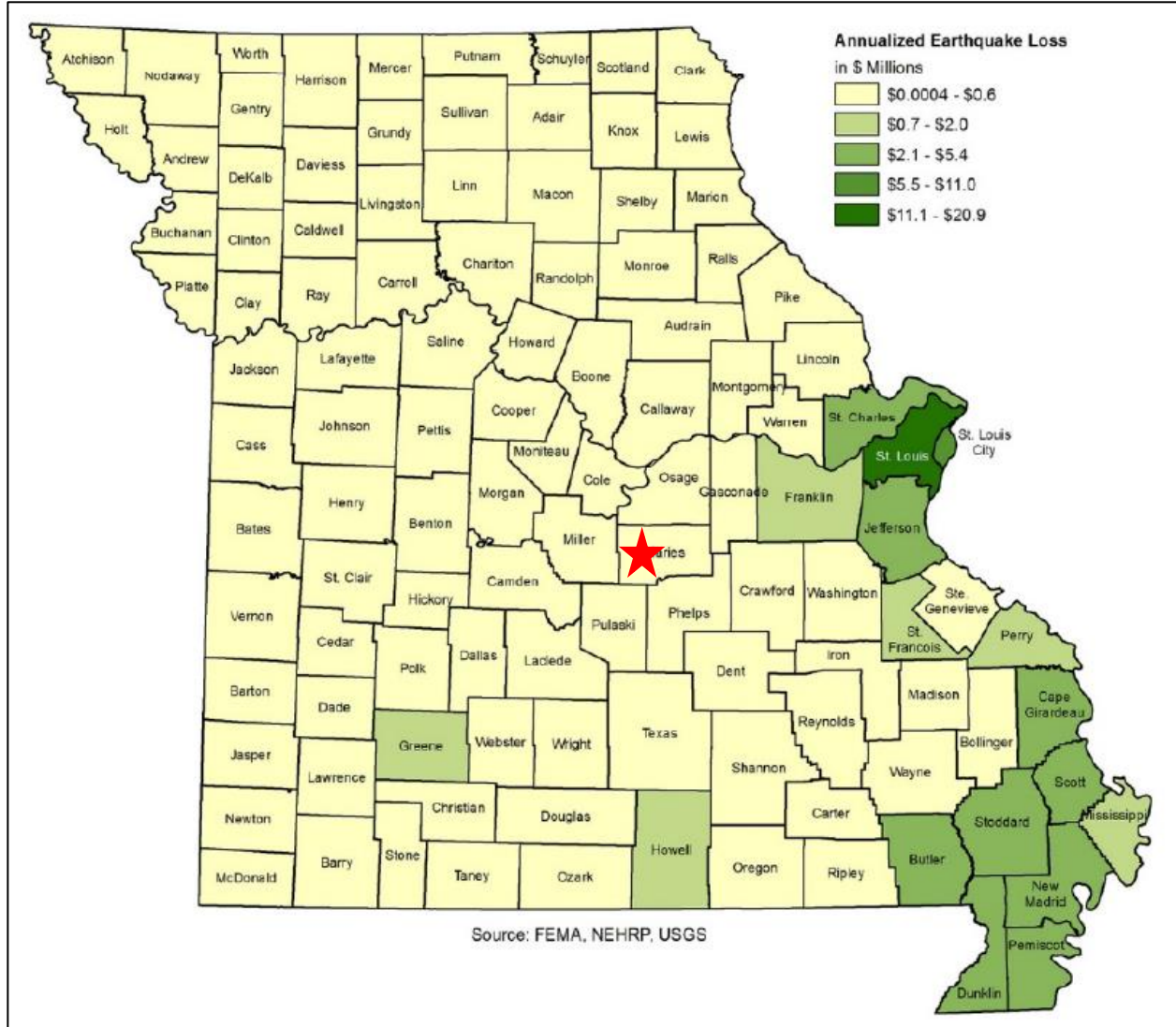
Annualized loss is the maximum potential annual dollar loss resulting from eight return periods (100, 200, 500, 750, 1,000, 1,500, 2,000, and 2,500 years) averaged on a ‘per year’ basis<sup>1</sup>. This is the scenario that FEMA uses to compare relative risk from earthquakes and other hazards at the county level nationwide. The Hazus earthquake loss estimation is depicted in **Figure 3.6** which shows annualized loss scenario direct economic losses to buildings. In this scenario, the annualized earthquake loss for buildings in Maries County in any one year is estimated to be \$400 to \$600,000. **Table 3.31** provides information on total estimated losses, estimated losses per capita and loss ratio. This results in the county being ranked 67<sup>th</sup> in the state for expected loss with low vulnerability for this hazard. This loss ratio indicates impacts on local economies in the event of an earthquake, and the difficulty for jurisdictions to recover from said event.<sup>2</sup>

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<sup>1</sup> 2023 Missouri State Hazard Mitigation Plan

<sup>2</sup> Ibid

**Figure 3.6. HAZUS-MH Earthquake Loss Estimation: Annualized Loss Scenario –Direct Economic Losses to Buildings.**



Source: 2023 Missouri State Hazard Mitigation Plan; \*Red star indicates Maries County

**Table 3.31. HAZUS-MH Earthquake Loss Estimation-Maries County: Annualized Loss Scenario**

Total Losses in \$ Thousands	Loss Per Capita, In \$ Thousands	Loss Ratio in \$ Per Million	Statewide Ranking for Expected Losses
\$48	\$0.0053	\$51	67th

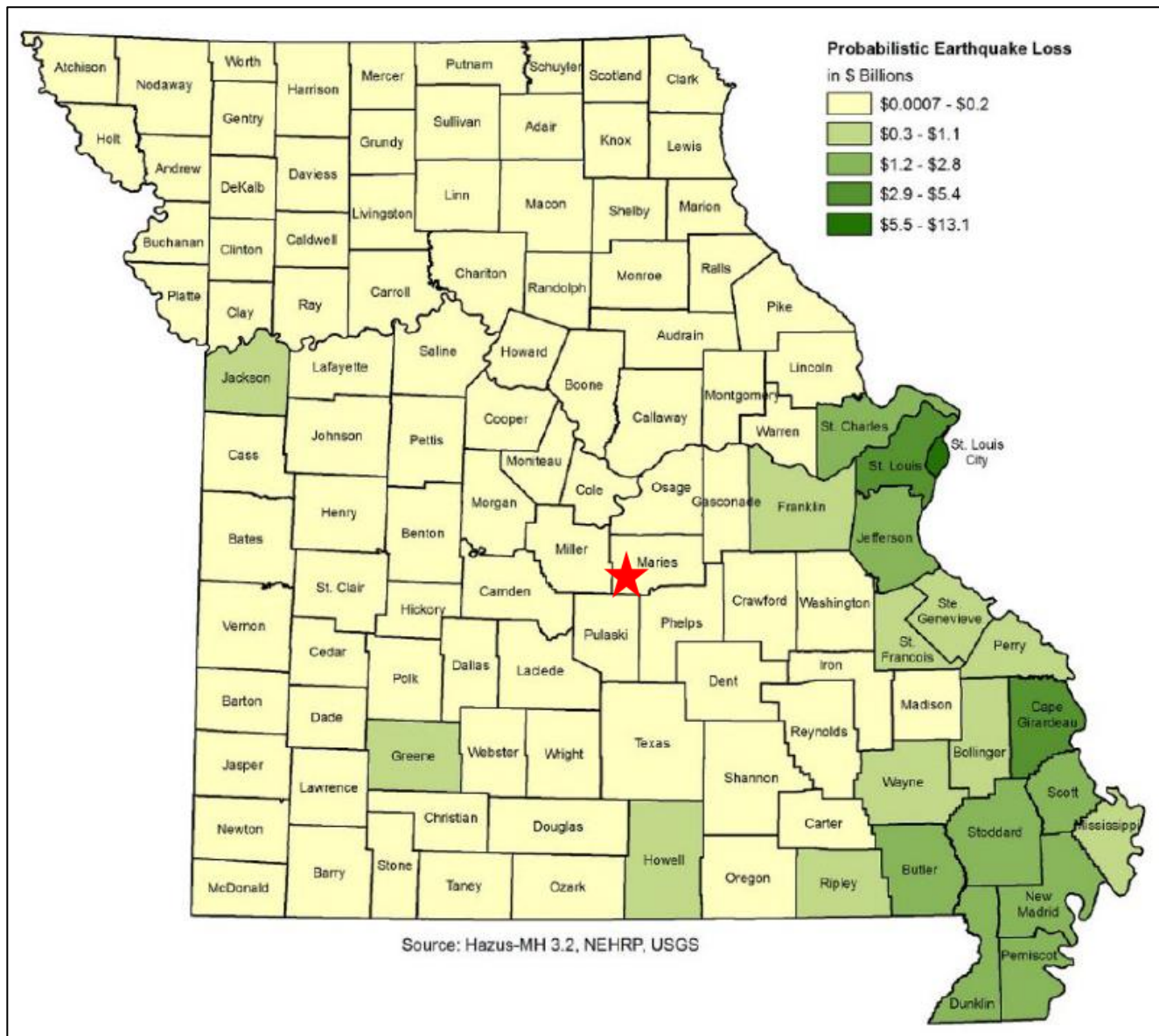
Source: Hazus 2.1

\*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. This scenario is equivalent to the 2,500 year earthquake scenario in HAZUS-MH. The methodology is based on probabilistic seismic hazard shaking grids developed by the U.S. Geological Survey (USGS) for the National Seismic

Hazard Maps that are included with HAZUS-MH. The USGS updated this mapping in 2014. **Figure 3.7** illustrates direct economic loss to buildings. Maries County is anticipated to lose between \$700,000 and \$200,000,000 in a 50 year scenario. **Figure 3.8** 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. Furthermore, this pattern of shaking can be seen in with corresponding potential for damage and areas with soils potentially susceptible to liquefaction. Maries County is estimated to have peak ground acceleration between 10 percent and 16 percent.

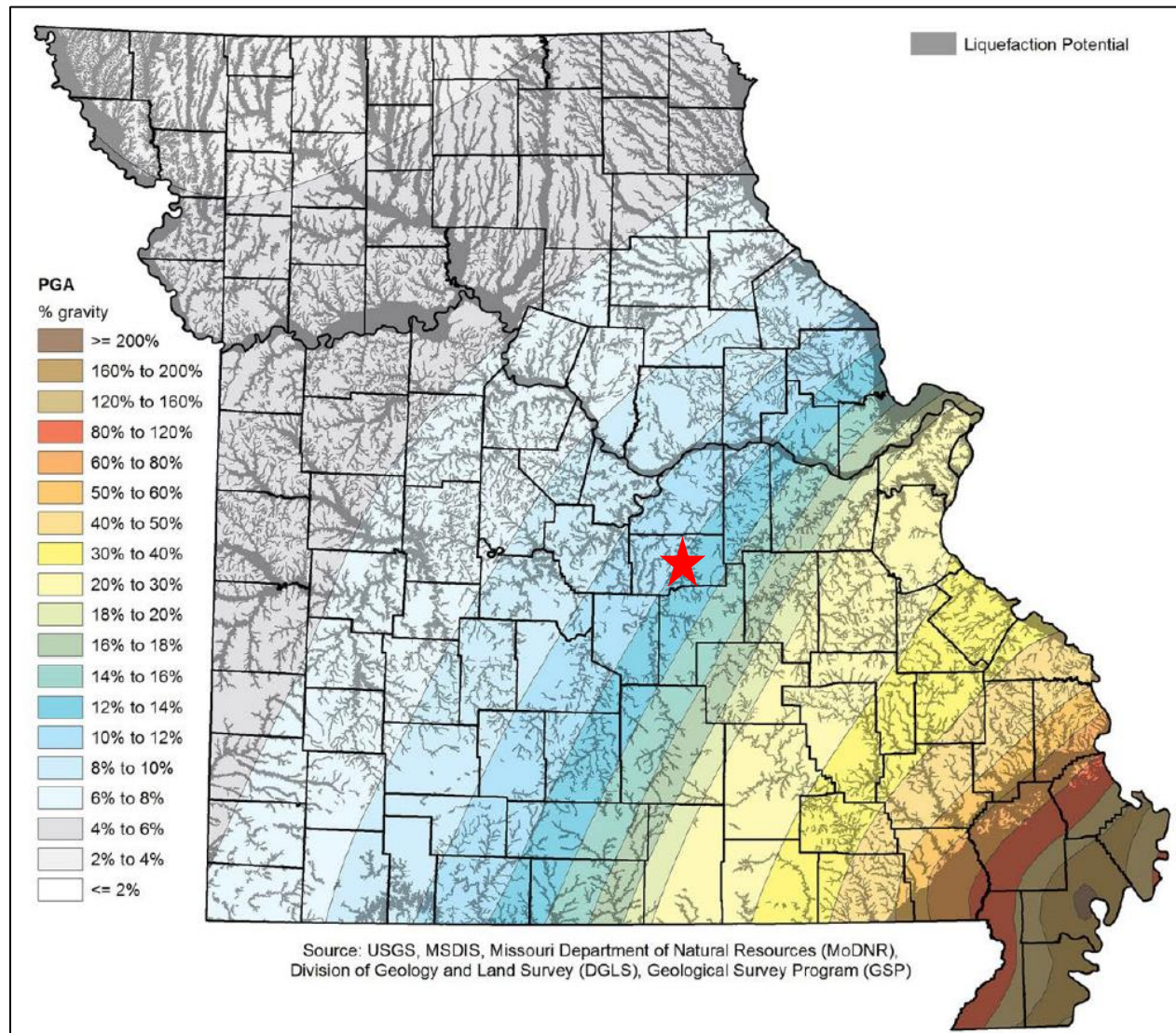
**Figure 3.7. HAZUS-MH Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Total Building Loss**



Source: 2023 Missouri State Hazard Mitigation Plan; \*Red star indicates Maries County



**Figure 3.8. Hazus Earthquake 2% Probability of Exceedance in 50 Years – Ground Shaking and Liquefaction Potential**



Source: 2023 Missouri State Hazard Mitigation Plan; \*Red star indicates Maries County

**Table 3.32** provides information on estimated direct economic losses for Maries County, including structural, nonstructural, inventory, contents, relocation costs, capital related loss, wages and rental income loss. According to the 2023 Missouri Hazard Mitigation Plan, Maries County's loss ratio is 2.15 percent. Maries County ranks 68<sup>st</sup> in the state for direct economic losses in this scenario. **Figure 3.9** depicts loss ratio by county, which is the ratio of the building structure and nonstructural damage to the value of the entire building inventory. The loss ratio is a measure of the disaster impact to community sustainability, which is generally considered at risk when losses exceed 10 percent of the built environment (FEMA).

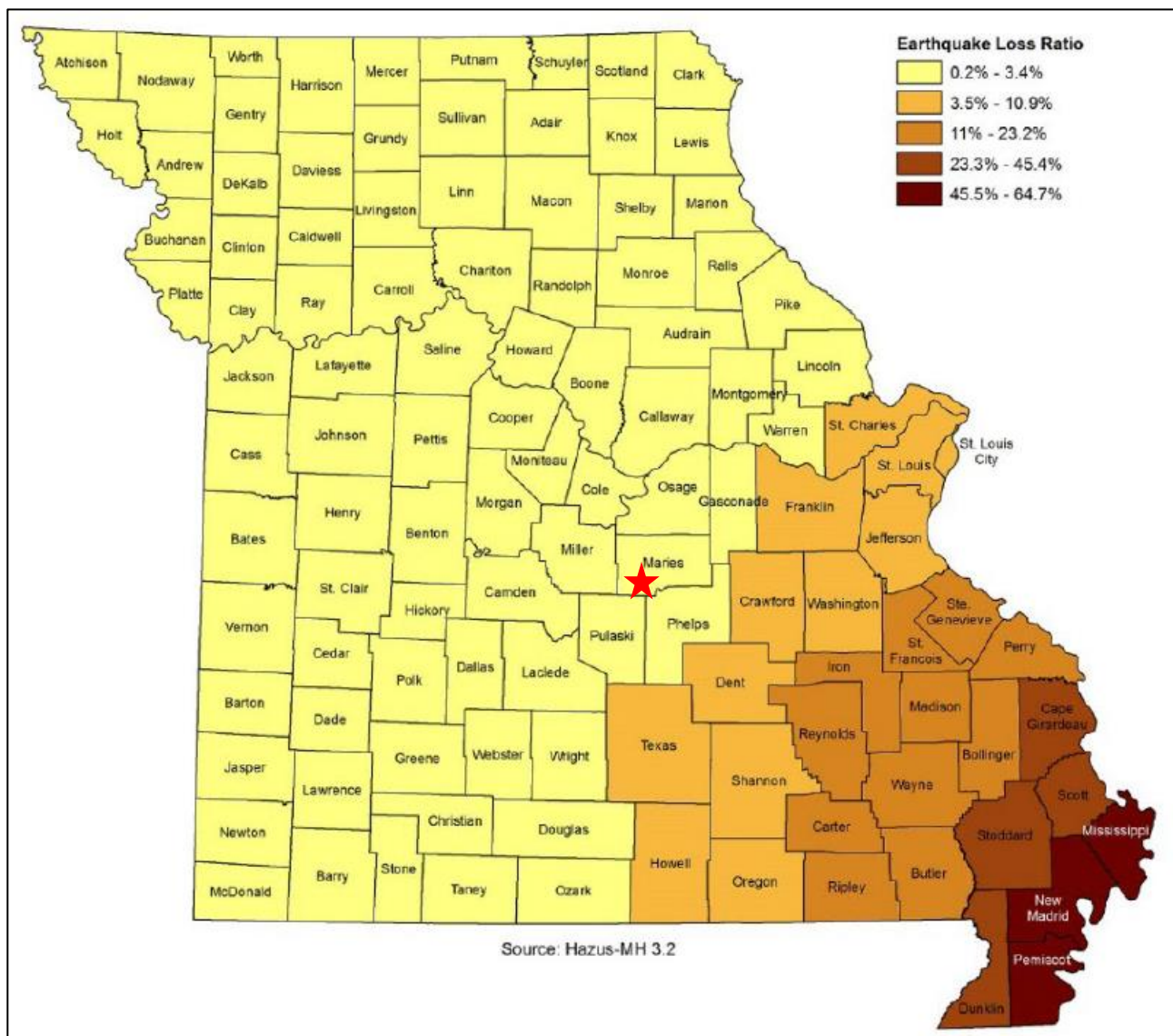
**Table 3.32. HAZUS-MH Earthquake Loss Estimation 2% Probability of Exceedance in 50 Years Scenario Direct Economic Losses Results Summary for Maries County\***

Cost Structural Damage	Cost Non-Structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
\$5,576	\$14,984	\$5,419	\$178	2.15	\$3,465	\$561	\$790	\$1,077	\$32,050

Source: 2023 Missouri Hazard Mitigation Plan

\*All values in thousands

**Figure 3.9. Hazus Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Loss Ratio**



Source: 2023 Missouri State Hazard Mitigation Plan; \*Red star indicates Maries County

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### ***Impact of Previous and Future Development***

Future development is not expected to increase the risk other than contributing to the overall exposure of what could be damaged as a result of an earthquake. Since the last update, there has been limited development in the City of Vienna to include development of 2 commercial properties and one new 4-plex residential rental property. The city of Belle reported the construction of a new ambulance facility. 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 jurisdiction<sup>1</sup>.

### ***Hazard Summary by Jurisdiction***

There will be a range in intensities within any small areas such as a town or county, with the highest intensity generally occurring at only a few sites. Maries County is not near the New Madrid Seismic 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 3.33** depicts the percent of residences built prior to 1939 in Maries County. In addition, if school districts have buildings built prior to 1939, those facilities may be at higher risk of damage should an earthquake occur. If a major earthquake should occur, Maries County would likely be impacted by the number of refugees traveling through the area seeking safety and assistance.

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**Table 3.33. Maries County Residences Built Prior to 1939**

Jurisdiction	Number of Residences Built Prior to 1939	% of Residences Built Prior to 1939
Unincorporated Maries County	441	13.7%
Belle	72	10.5%
Vienna	28	7.0%

Source: US Census Bureau 2017-2021 ACS Data

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<sup>1</sup> <https://revisor.mo.gov/main/OneSection.aspx?section=160.451>



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### **Problem Statement**

In a worst-case scenario, the county is expected to encounter \$32,050,000 in total economic losses to buildings. The unincorporated areas of the county have a higher risk of damage to buildings due to having a higher percentage of the homes having been built prior to 1939.

Jurisdictions should encourage the 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.

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### 3.4.4 Extreme Temperatures

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#### **Hazard Profile**

Some specific sources for this hazard are:

- 2018 Missouri State hazard Mitigation Plan, Chapter 3, Section 3.3.7, Page 3.253  
[https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO\\_Hazard\\_Mitigation\\_Plan2018.pdf](https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf)
- 2023 Missouri State hazard Mitigation Plan, Chapter 3, Section 3.3.7
- National Centers for Environmental Information, 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, <https://www.weather.gov/safety/heat-index>;
- Wind Chill chart, National Weather Service, [http://www.nws.noaa.gov/om/cold/wind\\_chill.shtml](http://www.nws.noaa.gov/om/cold/wind_chill.shtml) ;
- Daily temperatures averages and extremes, High Plains Regional Climate Summary, [https://hprcc.unl.edu/climate\\_extremes.php](https://hprcc.unl.edu/climate_extremes.php), <http://climod.unl.edu/>;
- 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>;
- MSDIS Structure Inventory and All Hazard Risk Dataset  
(available in both GIS and Excel format)  
<https://drive.google.com/drive/folders/0Bzq99s866kWocFB5Y3hCRIRuWWM>
- Missouri Hazard Mitigation Viewer  
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view> - User Guide
  - Average annual occurrence for extreme heat by County
  - Vulnerability to extreme heat by County
  - Average annual occurrence for extreme cold by County
  - Vulnerability to extreme cold by County

#### **Hazard Profile**

##### ***Hazard Description***

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. 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 days. 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 3.10** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions. Other factors that should be taken into account include duration of exposure to high temperatures, wind and activity.

The NWS has increased its efforts to more effectively alert the general public and local authorities on the hazards of heat waves. The Heat Index (HI) is an effective tool in helping people understand the dangers of high temperatures and how temperature and relative humidity together provide a more

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accurate gauge of heat intensity. The HI, provided in degrees Fahrenheit, is an accurate measure of how hot it actually feels when the relative humidity is added to the air temperature. Because HI values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15 degrees Fahrenheit. Also, strong winds, particularly with very hot, dry air, can be extremely dangerous.

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.

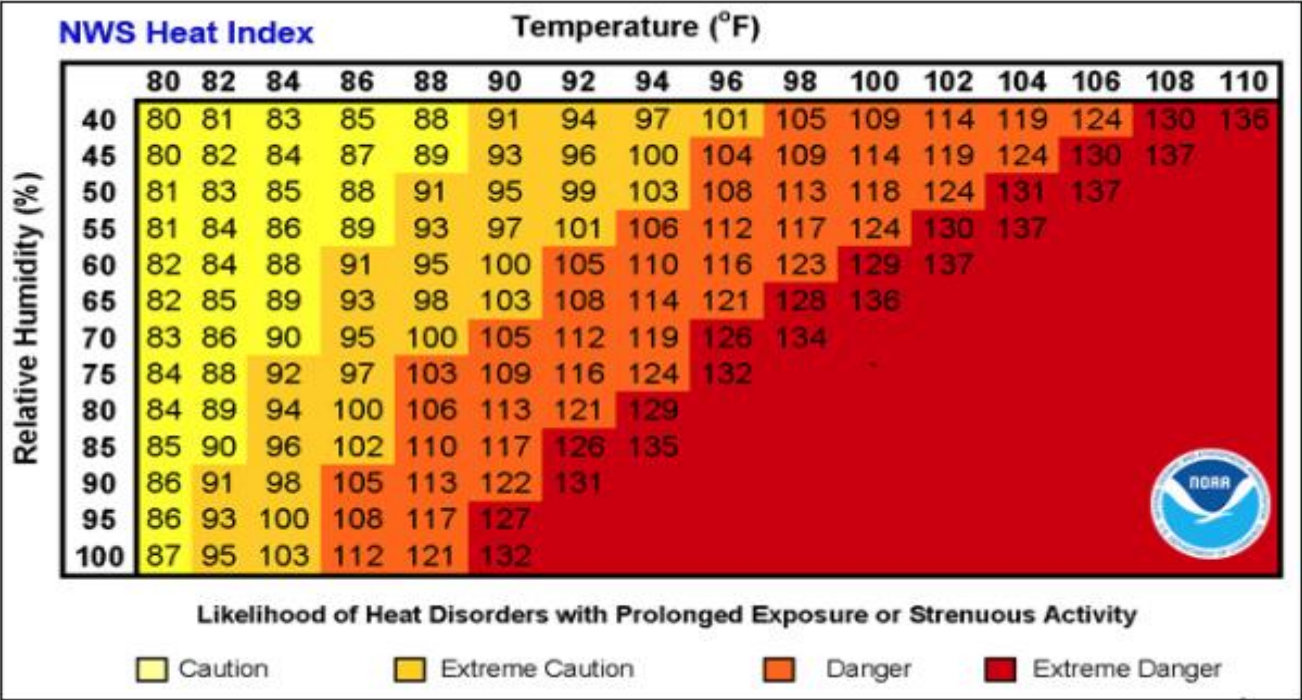
Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators and furnaces. Cold temperatures can also overpower a building's heating system and cause water and sewer lines to freeze and rupture. Extreme cold also increases the likelihood for ice jams on flat rivers and 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 those who are isolated being most at risk. About 10 percent of people over the age of 65 have some kind of bodily temperature-regulating defect, and three to four 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.

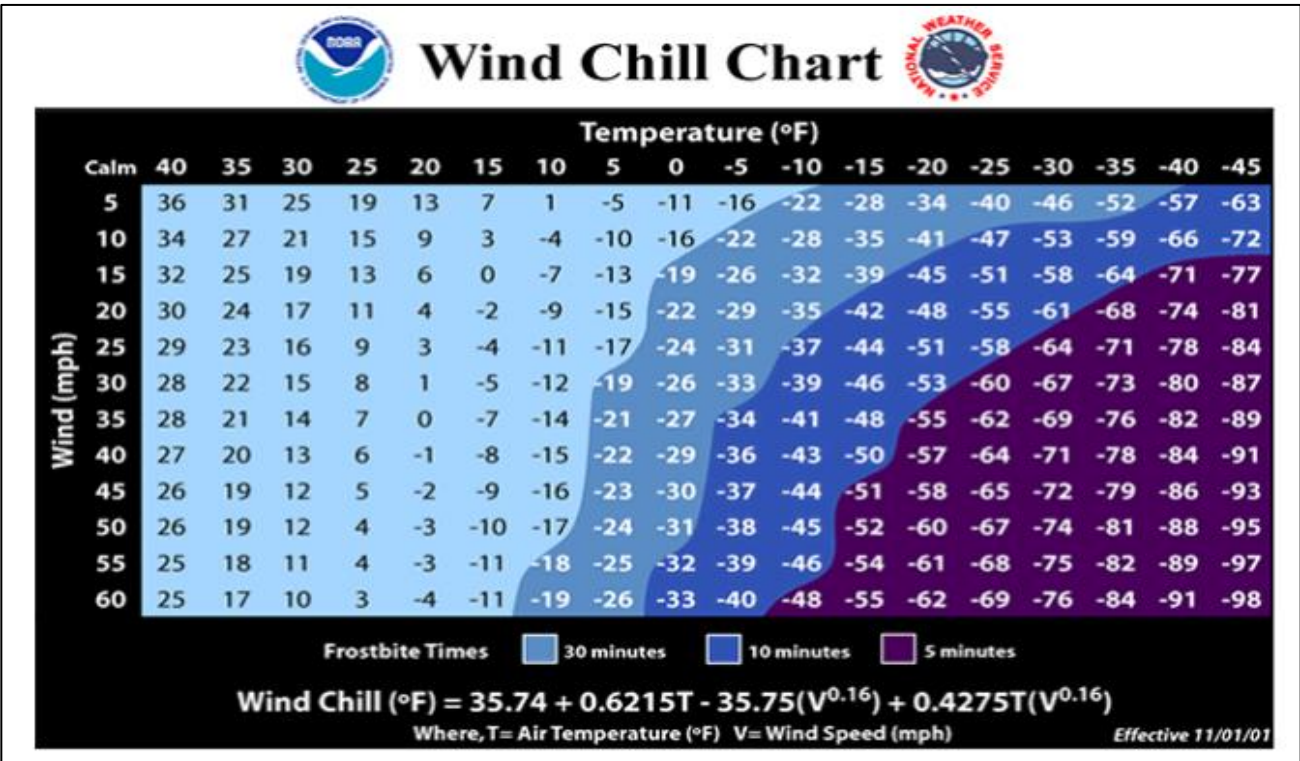
The NWS Wind Chill Temperature (WCT) index, shown in **Figure 3.11**, uses advances in science, technology and computer modeling to provide an accurate understandable and useful formula for calculating the dangers from winter winds and freezing temperatures. The Wind Chill Temperature index chart presents wind chill temperatures which are based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 3.10. Heat Index (HI) Chart



Source: National Weather Service (NWS); <https://www.weather.gov/safety/heat-index>  
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.

Figure 3.11. Wind Chill Chart



Source: <https://www.weather.gov/safety/cold-wind-chill-chart>

## Geographic Location

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

## Strength/Magnitude/Extent

The National Weather Service (NWS) has an alert system in place (advisories, watches, 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 nighttime 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.

The NWS also has an alert system in place (advisories, watches, or warnings) when a deadly combination of wind and cold air threatens. People in an area with a wind chill alert should avoid going outside during the coldest parts of the day. If going outside is unavoidable, it is important to dress in layers and cover exposed skin to protect against frostbite and hypothermia.

## Previous Occurrences

**Table 3.34** provides data in relation to record extreme temperature events between 2003 and 2022 in Maries County. Maximum heat index/wind chill values and temperatures are shown for each extreme temperature event. Fortunately, there were zero recorded injuries and fatalities during this time.

**Table 3.34. Maries County Recorded Extreme Temperature Events 2003 – 2022**

Month, Year	# of Event Days	Fatalities	Injuries	Temperature (F°)	Heat Index Values / Wind Chill (F°)
6/01/2012	30	0	0	>100	>100
7/01/2012	31	0	0	>100	>104
8/01/2012	31	0	0	103	106
2/14/2021	3	0	0	-6	-23
<b>Total</b>	<b>95</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>-</b>

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

Extreme temperature can cause stress to crops and animals. According to the NOAA Storm Events Data Base, there were no reported agricultural losses due to heat for Maries County from 2003 - 2022. However, USDA Risk management reports 21 crop indemnity payments for a total of

\$137,536.91 during the same period. **Table 3.33** below lists all USDA crop indemnity payments due to heat per year from 2013 to 2022. 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.

**Table 3.35. Crop Indemnity due to extreme temperature 2013 - 2022**

Year	Number of Payments	Total
2003	0	0
2004	0	0
2005	0	0
2006	1	\$1,448.00
2007	1	\$339.00
2008	0	0
2009	0	0
2010	0	0
2011	4	\$13,910.00
2012	10	\$56,997.01
2013	1	\$813.00
2014	1	\$834.00
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	1	\$28,394.00
2020	0	0
2021	0	0
2022	2	\$34,801.90
<b>TOTAL</b>	<b>21</b>	<b>\$137,539.91</b>

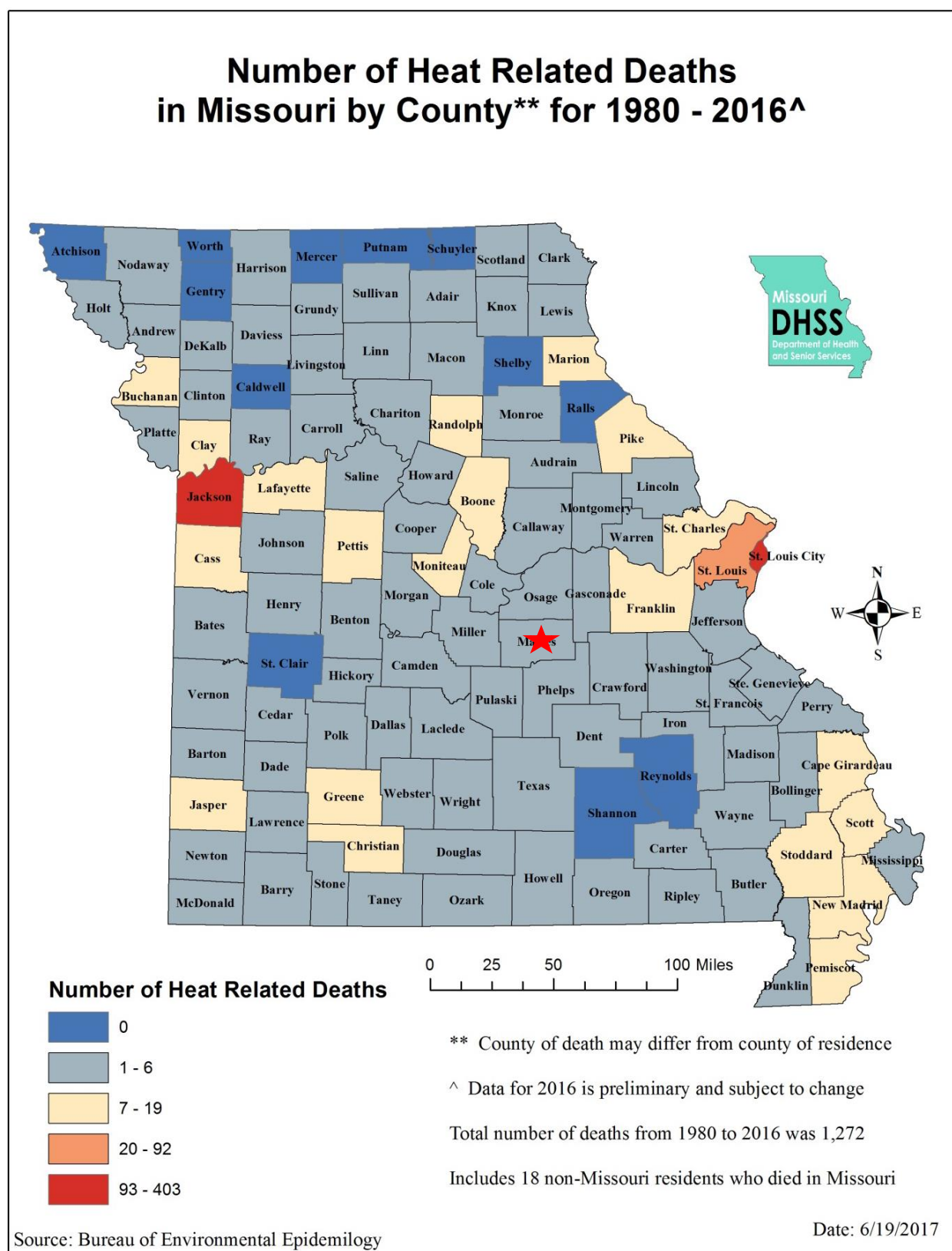
From 2004 through 2018, there were 10,527 fatalities in the U.S. attributed to summer heat<sup>1</sup>. This translates to an annual average of 702 deaths. During the same time period, zero deaths were recorded in Maries County, according to NOAA Storm Events Data Base. **Figure 3.12** illustrates heat related deaths by county in Missouri between 1980 and 2016. The national Weather Service stated that among natural hazards, no other natural disaster – not lightning, hurricanes, tornadoes, floods or earthquakes – causes more deaths than excessive heat.

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.

<sup>1</sup> MMWR Morb Mortal Wkly Rep, <http://dx.doi.org/10.15585/mmwr.mm6924a1>



**Figure 3.12. Heat Related Deaths in Missouri 1980 - 2016**



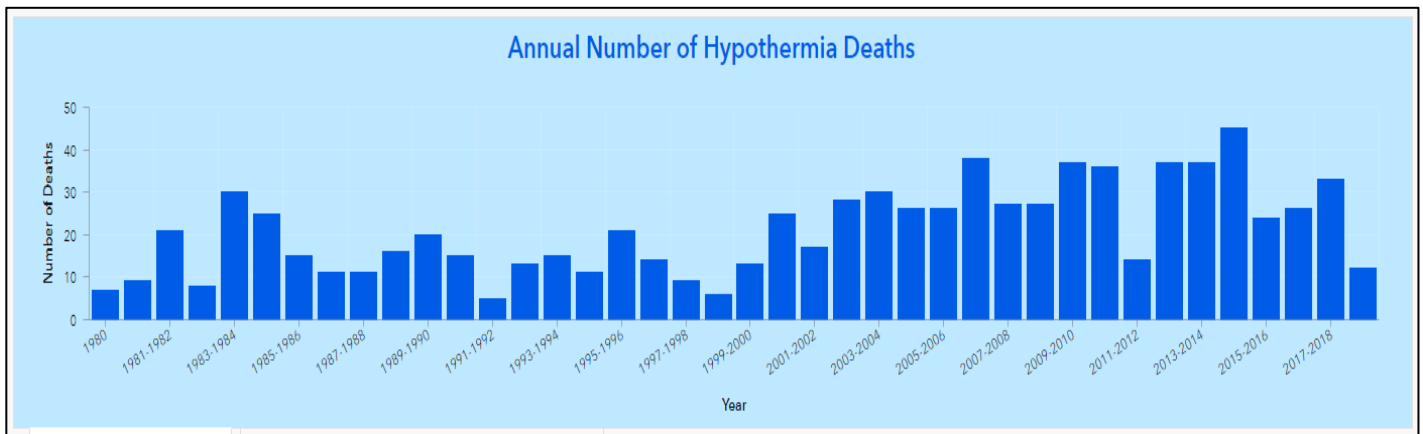
Source: <https://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/stat-report.pdf>  
 \*Red star indicates Maries County



According to the Missouri Department of Health and Senior Services, 840 people died in Missouri due to extreme cold conditions between 1980 and 2018, see **Figure 3.13**. As with extreme heat, the elderly are more vulnerable to cold-related deaths. Elderly or disabled individuals fall outside their homes and are not able to call for help or reach the safety of shelter during periods of extreme cold. According to the 2018 Missouri State Hazard Mitigation plan, during the winters of 1989-2012, a total of 414 hypothermia deaths occurred, with 186 (44.9%) being 65 years of age or older. As with extreme heat, substance abuse can be a contributing factor for hypothermia related fatalities for people between the ages of 25 and 64. Between 1989 and 2012, substance abuse factored into the hypothermia deaths of 107 of the 208 (51.4%) deaths in this age group. Fortunately, hypothermia deaths in people under the age of 25 are rare in Missouri, accounting for only 19 (4.6%) of the total extreme cold related deaths during this timeframe. There were two (0.5%) deaths of children under the age of five. Over 72 percent of hypothermia deaths are among males – 299 of the total 414. The remaining 115 (27.8%) were female.

In regards urban versus rural, hypothermia deaths tend to be higher in rural areas than in urban communities. There were 183 (44.2%) cold related deaths in the Kansas City and St. Louis metropolitan areas, while 231 (55.8%) occurred in other parts of the state.

**Figure 3.13. Hypothermia Deaths, Missouri: Winter Seasons 1980-2018**

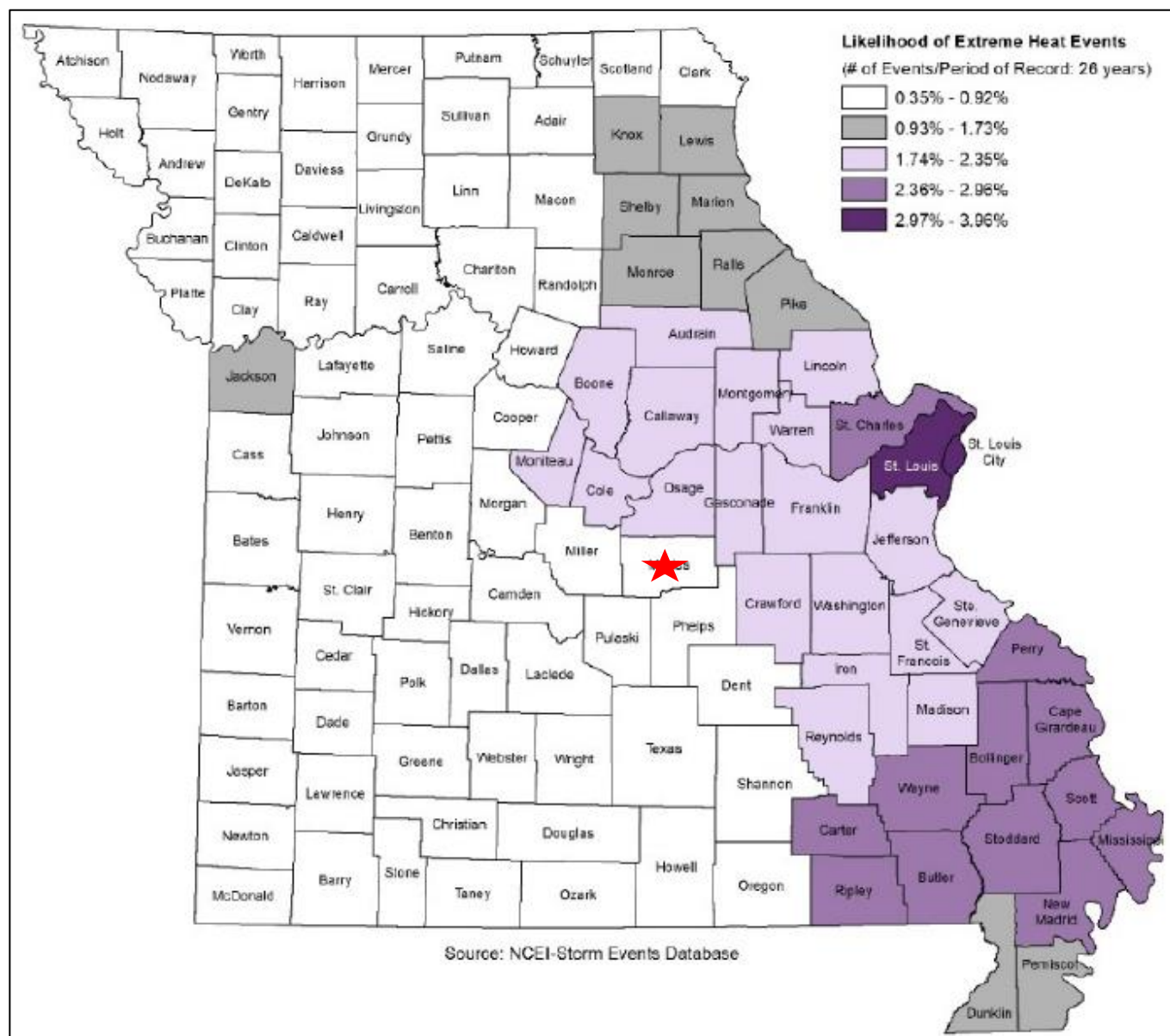


Source: Missouri DHSS, <http://health.mo.gov/living/healthcondiseases/hypothermia/pdf/hypo1.pdf>

### **Probability of Future Occurrence**

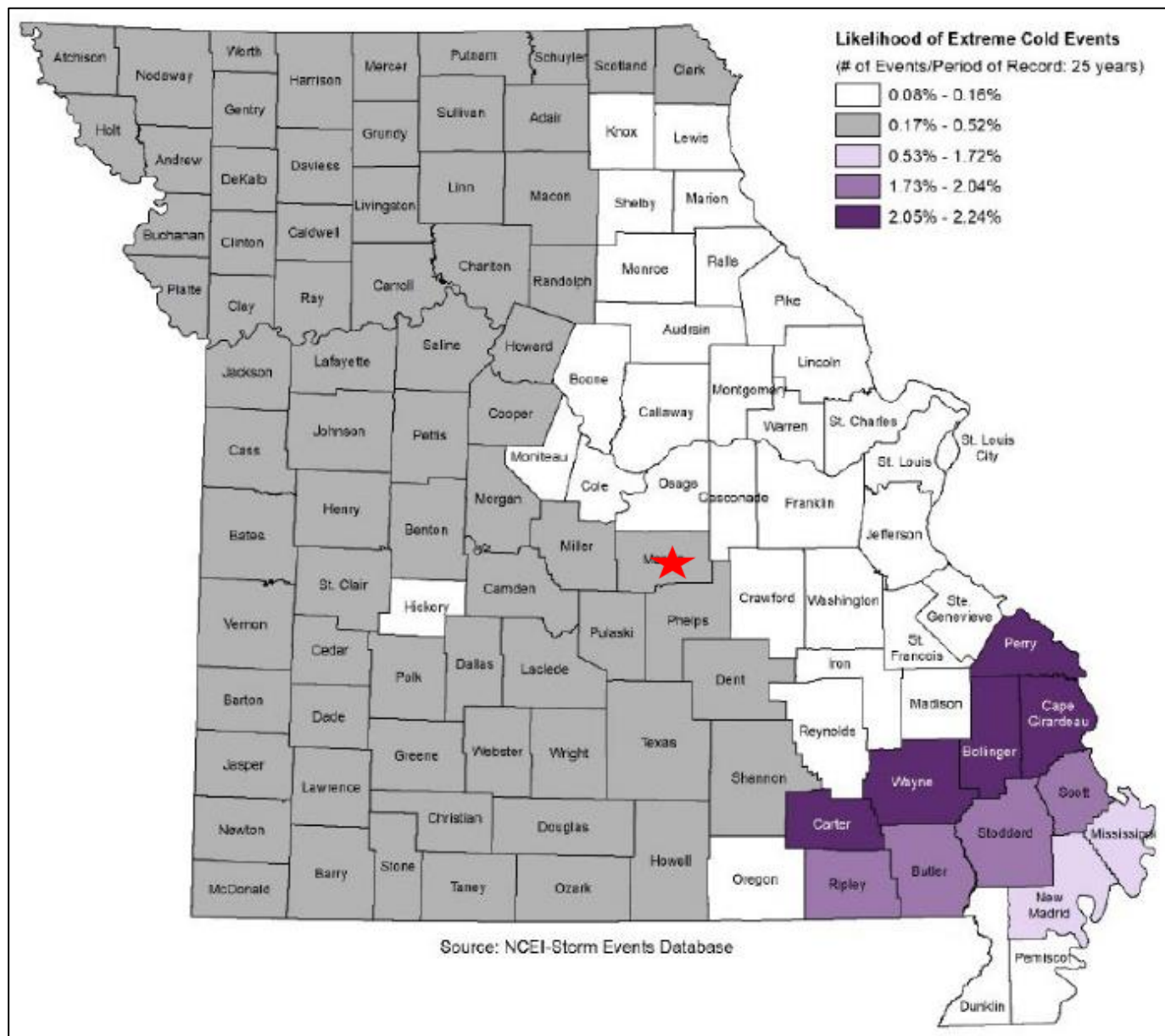
**Figure 3.14** illustrates the average annual occurrence for extreme heat statewide. Based on information provided in the 2023 Missouri State Hazard Mitigation Plan, Maries County has an average of .35 to .92 events per year based on data from 26 years. **Figure 3.15** illustrates the average annual occurrence for extreme cold statewide. Maries County has an average of 0.17 to 0.52 events per year based on data from 25 years. It should be noted that there are data limitations due to underreporting of extreme heat and cold events.

**Figure 3.14. Average Annual Occurrence for Extreme Heat**



Source: 2023 Missouri State Hazard Mitigation Plan; \*Red star indicates Maries County

**Figure 3.15. Average Annual Occurrence for Extreme Cold**



Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

### **Changing Future Conditions Considerations**

According to the 2023 Missouri Hazard Mitigation Plan, under a higher emissions pathway, historically unprecedented warming is projected by the end of the century. Even under a pathway of lower greenhouse gas emissions, average annual temperatures are projected to most likely exceed historical record levels by the middle of the 21<sup>st</sup> century. For example, in southern Missouri, the annual maximum number of consecutive days with temperatures exceeding 95 degrees F is projected to increase by up to 20 days. Temperature increases will cause future heat waves to be more intense, a concern for this region which already experiences hot and humid conditions. If the warming trend continues, future heat waves are likely to be more intense and cold spells are projected to decrease.

Furthermore, higher temperatures are experienced more acutely by vulnerable populations such as the elderly, the very young, the homeless, the ill and disabled, and those living in poverty. Higher demands and costs for electricity to run air conditioners can stress power systems. Higher temperatures can also cause harmful algal blooms in warmer water – resulting in poor water quality.

Mitigation against the impacts of future temperature increases may include increasing education on heat stress prevention, organizing cooling centers, allocating additional funding to repair and maintain roads damaged by buckling and potholes and reducing nutrient runoff that contributes to algal blooms. Local governments should also prepare for increased demand on utility systems. Improving energy efficiency in public buildings will also present an increasingly valuable savings potential.

## **Vulnerability**

### ***Vulnerability Overview***

Maries County, along with the rest of the state of Missouri is vulnerable to extreme heat and cold events. **Table 3.36** shows the typical health impacts of extreme temperature. Jurisdictions with higher percentages of individuals below the age of 5, and above the age of 65 tend to be more at risk for extreme temperature (**Table 3.39**). People who are overweight, ill or on certain medication can also be more vulnerable. However, even those without underlying risk factors are susceptible if they participate in outdoor activities during extreme temperatures. The exposure to extreme temperatures of farm workers and livestock is also a major concern.

**Table 3.36. Typical Health Impacts of Extreme Temperatures**

Heat Index (HI) or Wind Chill (WC)	Disorder
< -51°	Frostbite possible within 5 minutes
-32° - -50°	Frostbite possible within 10 minutes
-18° - -31°	Frostbite possible within 30 minutes
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, <https://www.weather.gov/safety/heat-index>, <https://www.weather.gov/bou/windchill>

The method used by state planners to determine vulnerability to extreme temperatures across Missouri was statistical analysis of data from several sources: National Centers for Environmental Information (NCEI) storm events data (1996- December 31, 2021), percentage of population over 65 data from the U.S. Census (2019) and the calculated Social Vulnerability Index for Missouri counties from the hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina. Four factors were considered in determining overall vulnerability to extreme temperatures – total population, percentage of population over 65, likelihood of occurrence and social vulnerability. Based on natural breaks in the data, a rating value of one through five was assigned with one being low, two being low-medium, three being medium, four being medium-high and five being high.

**Table 3.37** shows the population, percent of population over 65 and social vulnerability index data for Maries County overall.

**Table 3.37. Population, Percent of Population Over 65 and SOVI Data for Maries County**

County	Total Population Rating	Percentage of Population Over 65	Percent of Population Over 65 Rating	SOVI Ranking	SOVI Rating
Maries	1	27.3	4	Medium	3

Source: 2023 Missouri Hazard Mitigation Plan

Table 3.38 illustrates the likelihood of occurrence and overall vulnerability rating for extreme temperatures for Maries County. Figure 3.16 and Figure 3.17 provide a vulnerability summary for extreme heat and extreme cold, respectively. Maries County has medium vulnerability for extreme heat and medium high vulnerability for extreme cold.

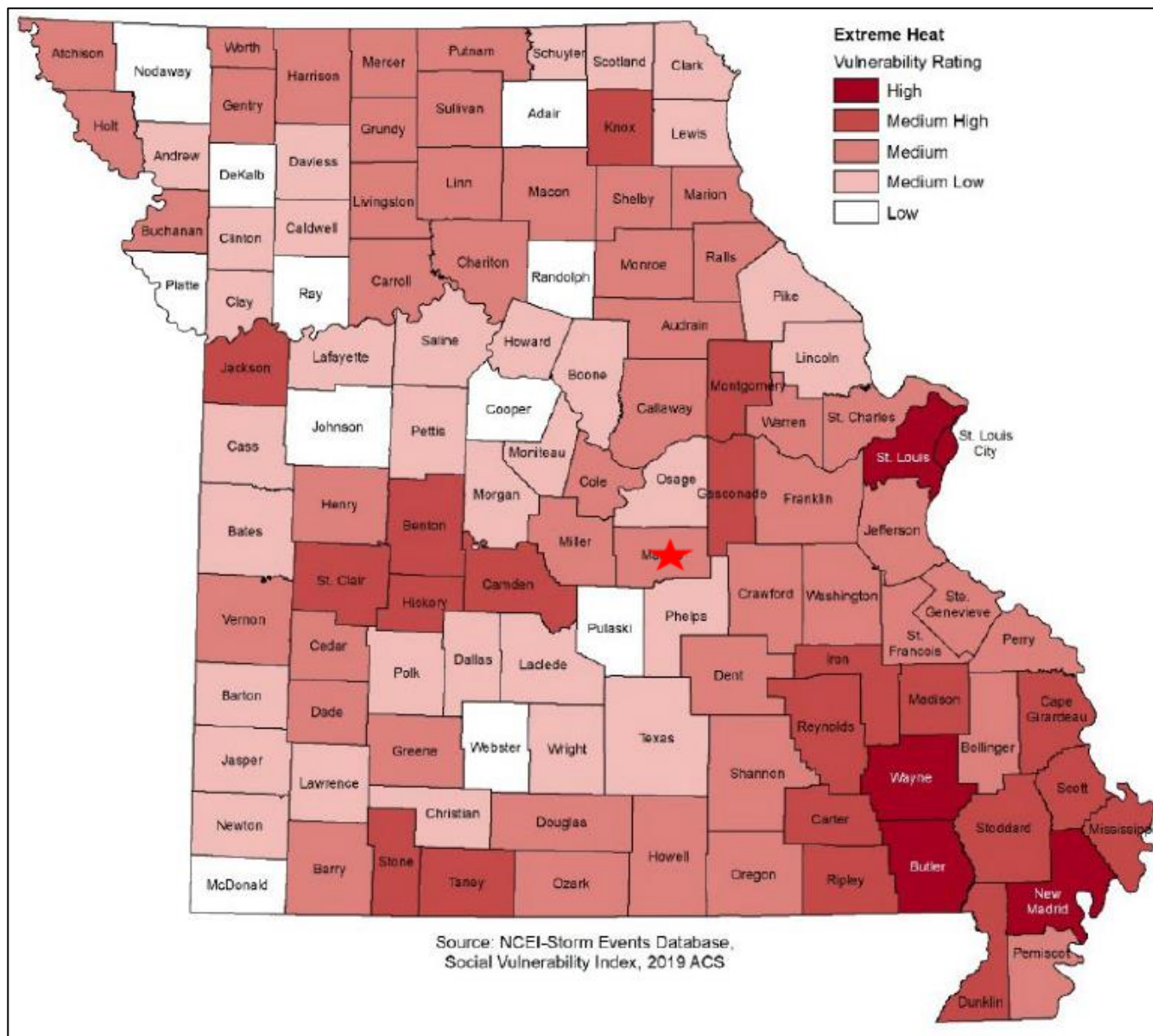
**Table 3.38. Maries County Likelihood of Occurrence and Overall Vulnerability Rating for Extreme Temperatures**

Heat					Cold				
Total Events	Likelihood of Occurrence	Likelihood Rating	Total Vulnerability	Total Vulnerability Description	Total Events	Likelihood of Occurrence	Likelihood Rating	Total Vulnerability	Total Vulnerability Description
11	0.42	1	9	Medium	5	0.2	2	10	Medium High

Source: 2023 Missouri Hazard Mitigation Plan

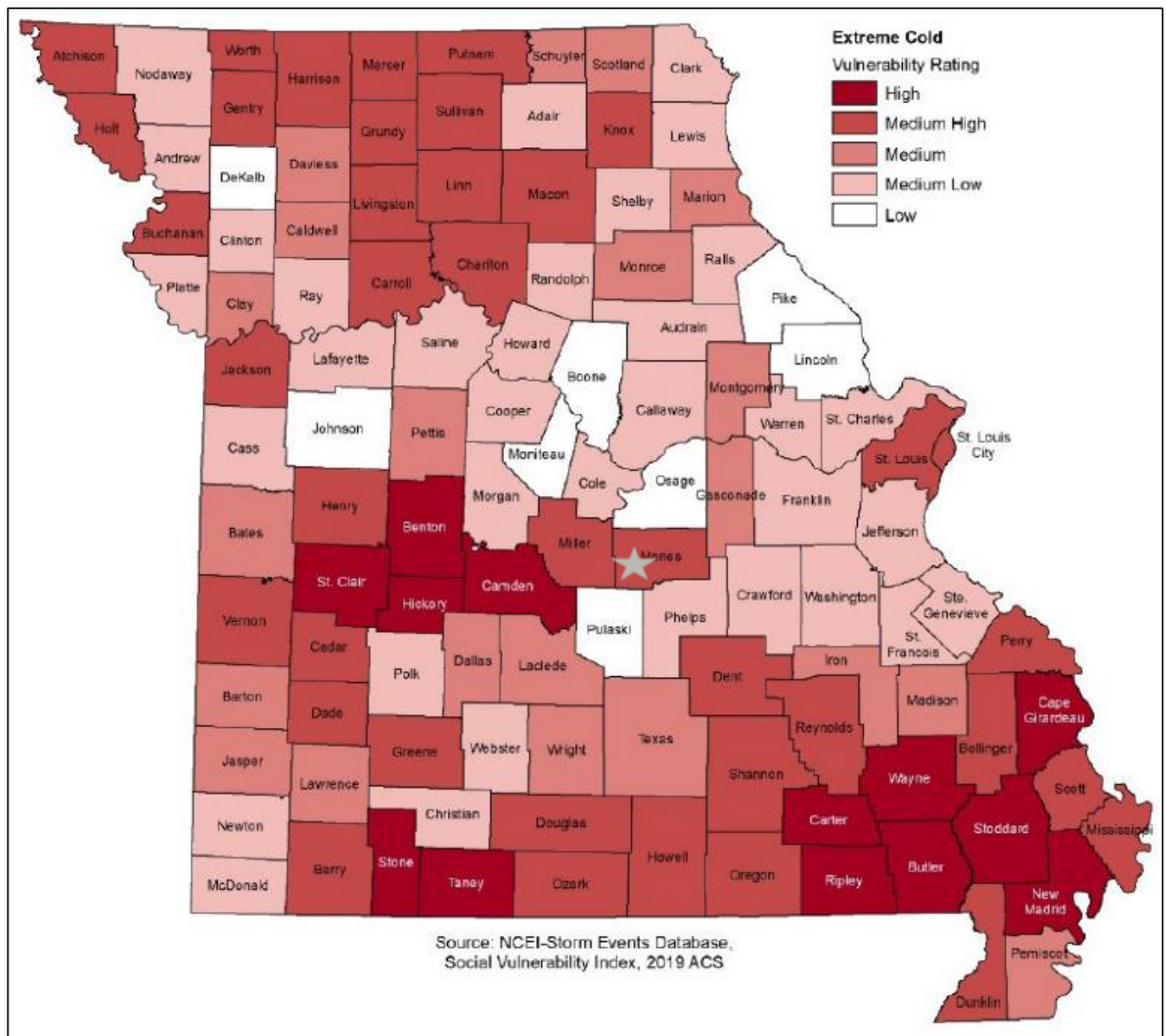


**Figure 3.16. Vulnerability Summary for Extreme Heat**



Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

**Figure 3.17. Vulnerability Summary for Extreme Cold**



Source: 2023 Missouri Hazard Mitigation Plan, \*Gray star indicates Maries County

## Potential Losses to Existing Development

### Extreme Heat/Heat Wave

Of greatest concern during extreme heat events are hyperthermia injuries and deaths. The 2023 Missouri Hazard Mitigation plan states that there were 1,272 heat-related deaths reported in Missouri from 1980 through 2016. Of those, 826 (64.9%) deaths occurred in the metropolitan areas of Kansas City and St. Louis while 428 (33.6%) deaths occurred in rural parts of the state. Over half of the deaths (62.3%) occurred in those age 65 or older. People in this demographic group are more vulnerable to this hazard for a number of reasons. Many live alone and have medical conditions that put them at higher risk. The lack of air conditioning or the refusal to use it for fear of higher utility bills



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further increases their risk. Deaths among children under the age of five are often linked to being left in vehicles during hot weather. Between 1980 and 2016 there were 29 (2.3%) heat-related deaths of children less than five years old. In the age group between 5 years and 65 years deaths are generally due to over exertion at work or in sports activities, complicating medical conditions or substance abuse.

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

### **Extreme Cold**

Of greatest concern during extreme cold events are hypothermia injuries and deaths. The 2023 Hazard Mitigation Plan states that a total of 840 hypothermia deaths have occurred between 1980 and 2018. Approximately half of those deaths were of people aged 65 years and older. Substance abuse is often a contributing cause of cold-related deaths in those aged 20 to 64 and was a factor in 48% of hypothermia related deaths in those of that age group. Fortunately, hypothermia related deaths in children are very rare with only 5 documented deaths in the reporting period. Hypothermia related deaths are more common in rural areas with only 39.9% occurring in metropolitan areas while 60% occurred in other areas of the state.

Extreme cold events can also put energy supplies at increased risk, damage water and wastewater systems, and cause natural gas pipelines to fracture and leak. Losses will vary based upon severity and duration of extreme cold temperature events.

### ***Impact of Previous and Future Development***

Population trends from 2010 to 2020 for Maries County indicate that the population in unincorporated areas has fallen by an estimated 7.85 percent. The city of Belle's population has decreased by 10.6 percent, while the city of Vienna's population fell by 4.75 percent. Overall, the county's population has shrunk by 7.9 percent. Population change can result in increased age groups that are more susceptible to extreme heat and cold. Additionally, population change can increase the strain on each jurisdiction's electricity and road infrastructure through increased use or decrease in maintenance revenue. Local government and local emergency management should take extreme temperature into consideration when upgrades occur to the local power grid.

### ***Hazard Summary by Jurisdiction***

Those at greatest risk for temperature-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 or have medical conditions that make them more vulnerable. To determine jurisdictions within the planning area with populations more vulnerable to extreme temperature, demographic data was obtained from the 2017-2021 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 temperature or with medical conditions that made them more vulnerable. **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 (2016-2020)**

Jurisdiction	Population Under 5 Years	Population 65 Years and over
Unincorporated Maries County	3.3%	16.6%
Belle	8.0%	16.4%
Vienna	7.6%	27.1%

Source: U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates

Due to lack of data, buildings that lack air-conditioning could not be analyzed for this report. Additionally, school policy data in regard to extreme heat or cold were not available.

In summary, the risks of extreme heat or cold can impact the health/lives of citizens within the county, specifically the young and elderly. The city of Vienna has the highest percentage of individuals 65 and over, with 27.1 percent and the second highest percentage of children under 5 years by only four tenths of a percent at 7.6 percent.

### **Problem Statement**

In summary, the risks of extreme heat and cold can impact the health/lives of citizens within the county, specifically the young and elderly. Based on the vulnerability analysis, the city of Vienna has the highest risk because it has a large populations of people aged 65 and over and a large population of children under the age of 5.(**Table 3.39**).

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 Phelps-Maries County Health Department and EMD, local governments should encourage residents to:

- Stay indoors as much as possible and limit exposure to the sun;
- Stay on the lowest floor out of the sunshine if air conditioning is not available;
- Consider spending the warmest part of the day in public buildings such as libraries or other public or community buildings. Circulating air can cool the body by increasing the evaporation rate of perspiration;
- Eat light, well-balanced meals at regular intervals and avoid using salt tablets unless directed by a physician;
- Hydrate by drinking plenty of water. Individuals with epilepsy or heart, kidney or liver disease who are on fluid restricted diets or have problems with fluid retention should consult their physicians on liquid intake;
- Limit consumption of alcoholic beverages;
- Dress in loose-fitting, lightweight and light-colored clothes that cover as much skin as possible;
- Protect your face and head by wearing a wide-brimmed hat. Wear sunscreen;
- Check on family, friends and neighbors who do not have air conditioning and are generally alone;
- Never leave children or pets in closed vehicles;
- Avoid strenuous work during the warmest part of the day and use the buddy system when working in extreme heat and take frequent breaks.

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. However, although fans are less expensive to operate than air

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conditioning, they may not be effective, and may even be harmful when temperatures are very high. As the air temperature rises, air flow is increasingly ineffective in cooling the body. At temperatures above 100° F, the fan may be delivering overheated air to the skin at a rate that exceeds the capacity of the body to get rid of this heat – even with perspiring – and the net effect is to add heat rather than to cool the body. An air conditioner is a much better option. Charitable organizations and the health department should work together to provide fans, when appropriate, to at-risk residents during times of critical heat. When temperatures are too high, however, these groups should work to get at-risk populations into cooling shelters.

Extreme cold can also be life-threatening, and the following precautions should be taken when someone is suffering from hypothermia:

- Call 9-1-1 for immediate medical assistance;
- Move the victim to a warm place;
- Monitor the victim's blood pressure and breathing;
- If necessary, provide rescue breathing and CPR;
- Remove wet clothing;
- Dry off the victim;
- Take the victim's temperature;
- Warm the body core first, NOT the extremities. Warming the extremities first can cause the victim to go into shock and can also drive cold blood toward the heart and lead to heart failure;
- Do not warm the victim too fast – rapid warming may cause heart arrhythmias

All jurisdictions should make sure they have plans in place to provide both cooling and warming shelters during times of extreme temperatures. School districts should have policies in place to minimize strenuous exercise outdoors during heat waves and to consider policies for delaying or cancelling school during times of extreme cold to reduce risk to students waiting for buses.

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### 3.4.5 Flooding (Riverine and Flash)

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Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.1, Page 3.80  
[https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO\\_Hazard\\_Mitigation\\_Plan2018.pdf](https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf)
- Watershed map, Environmental Protection Agency,  
[http://cfpub.epa.gov/surf/county.cfm?fips\\_code=19169](http://cfpub.epa.gov/surf/county.cfm?fips_code=19169)
- 2023 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.1,
- FEMA Map Service Center, Digital Flood Insurance Rate Maps (DFIRM) for all jurisdictions, if available, <https://msc.fema.gov/portal/home>
- 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 Centers for Environmental Information, Storm Events Database,  
<http://www.ncdc.noaa.gov/stormevents/>
- USDA Risk Management Agency, Insurance Claims, <https://www.rma.usda.gov/en/Information-Tools/Summary-of-Business/Cause-of-Loss>
- FEMA Data Visualization Tool, <https://www.fema.gov/data-visualization-floods-data-visualization>
- MSDIS Structure Inventory and All Hazard Risk Dataset  
(available in both GIS and Excel format)  
<https://drive.google.com/drive/folders/0Bzq99s866kWocFB5Y3hCRIRuWWM>
- Missouri Hazard Mitigation Viewer  
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view> - User Guide
  - Risk MAP, DFIRM, and Hazus based depth grids used in Hazus Analysis
  - Flood losses by County 1978-2018
  - Number of flood insurance claims by County
  - Total building exposure to flooding (1% annual chance) by County
  - Buildings impacted by flooding (1% annual chance) by County
  - Flood insurance coverage by County
  - Number of flood insurance policies by County
  - NFIP participation status by County
  - Number of state facilities impacted by flooding (1% annual chance) by County
  - Critical facilities impacted by flooding (1% annual chance) by County

#### **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

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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 3.4.1**. 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 Special Flood Hazard Areas (SFHA). Digital flood insurance risk maps are not yet available for Maries County. Risk mapping, assessment, and planning (RiskMap) 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 project kick-off meeting for RiskMAP in Maries County was held in December 2018 and a flood study review meetings were held in November 2019, January 2020, and March 2022. The maps below were generated using data gathered during the RiskMAP project and are currently the best source of data available. **Figure 3.31** is a map of Maries County showing the floodplain boundaries. Following the county-wide map is a city of Vienna map. Finally, **Figure 3.36** shows a map of the school districts in Maries County with an overlay of the SFHA. No school districts within the county have properties located in the floodplain. **Table 3.39** shows Maries County NCEI flood events by location between 2003 and 2022.

Figure 3.18. Map of Maries County with Special Flood Hazard Areas.

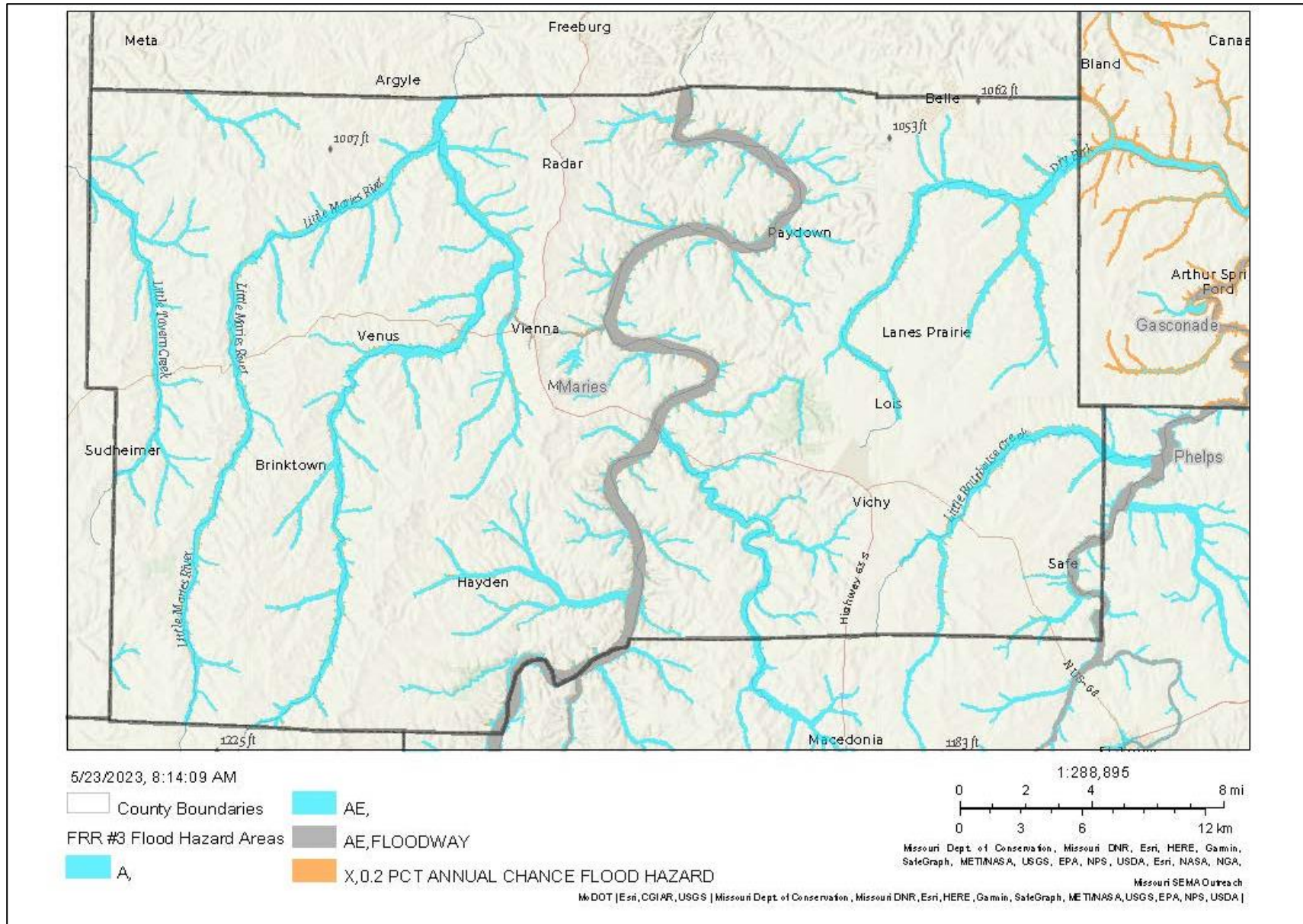
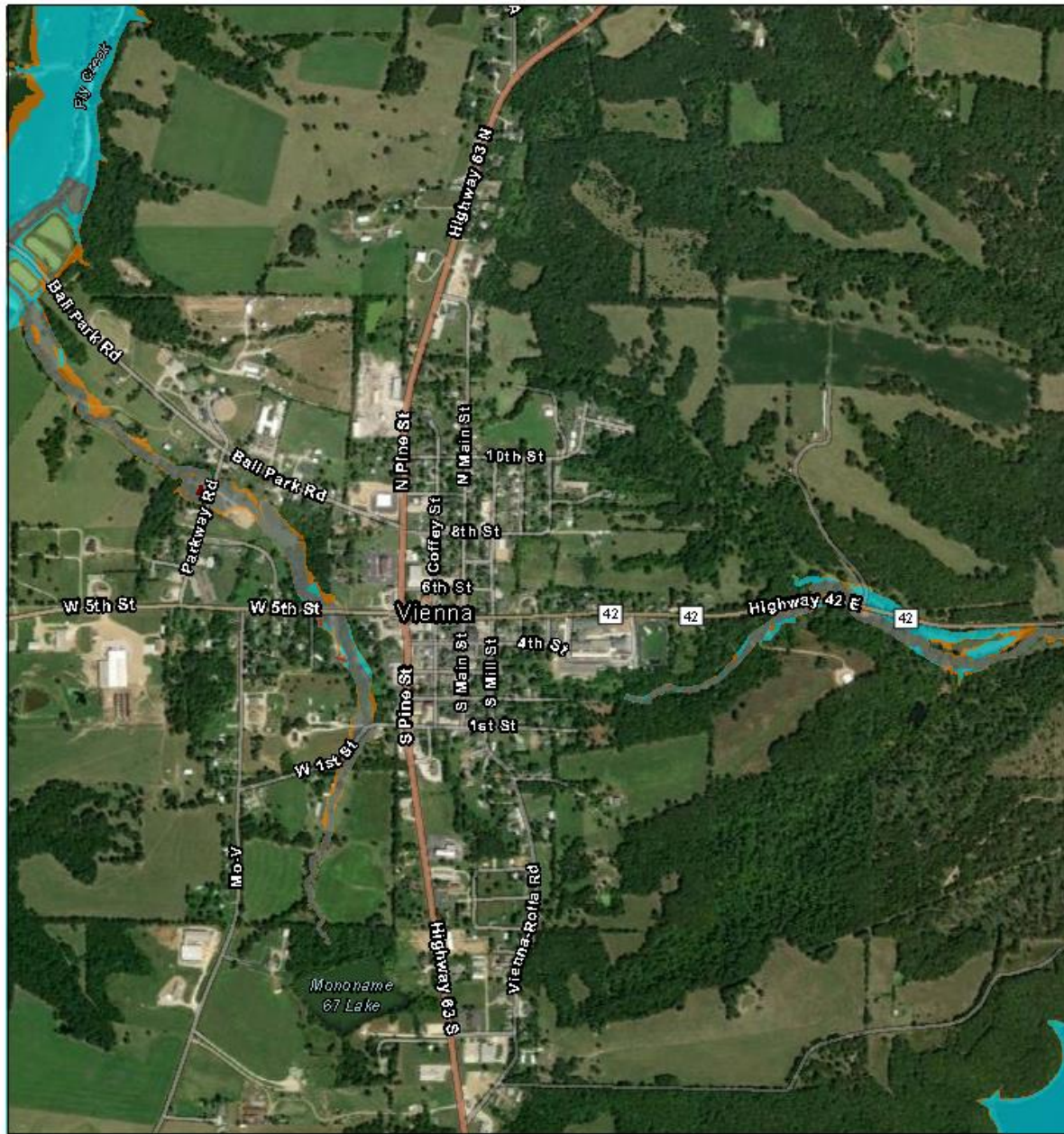




Figure 3.19. Vienna, Missouri Special Flood Hazard Areas (SFHAs)



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County Boundaries FRR #3 Flood Hazard Areas

Structures in SFHA

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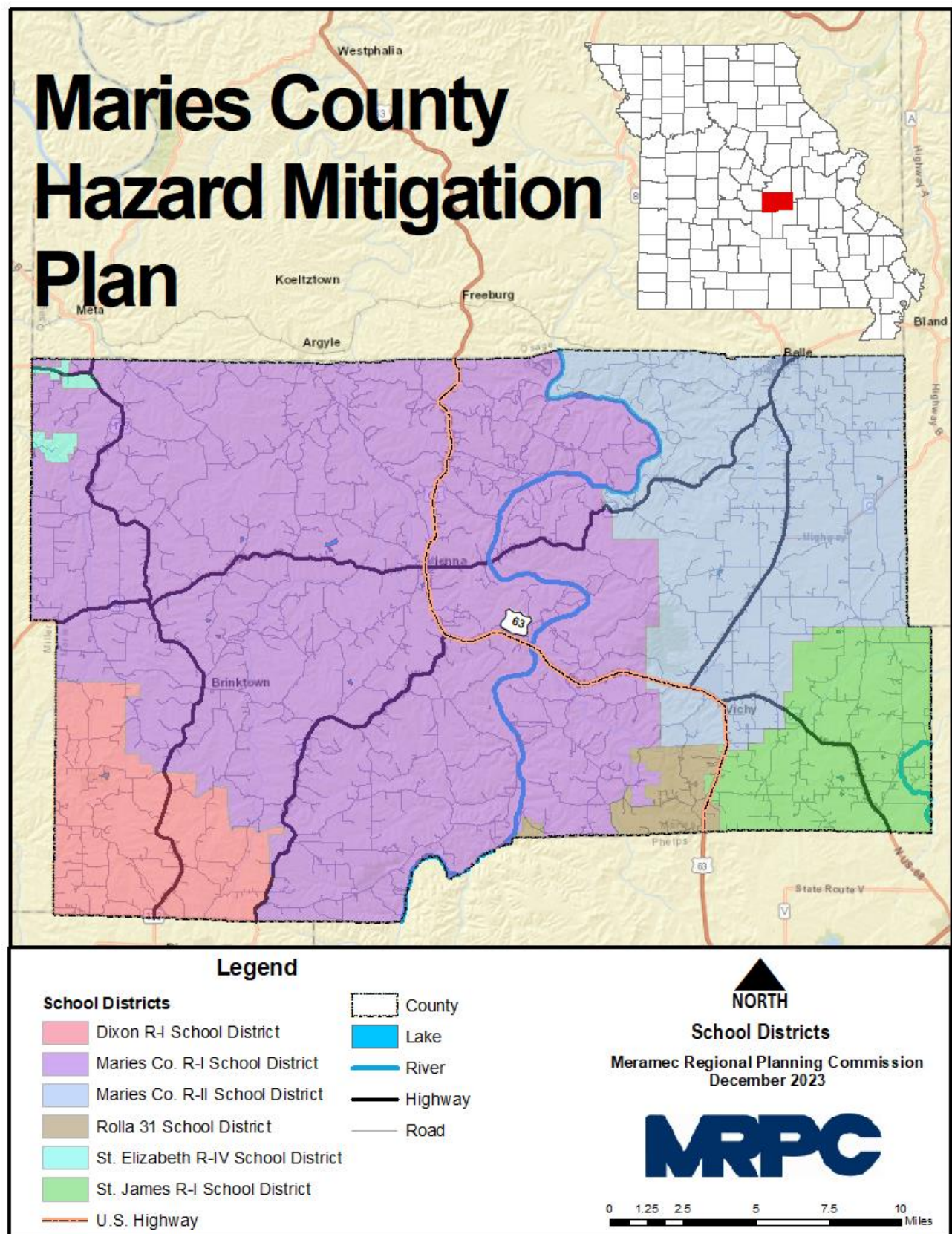
0 0.1 0.2 0.4 mi  
0 0.17 0.35 0.7 km

Maxar, Esri Community Maps Contributors, Missouri Dept. of Conservation, Missouri DNR, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METINASA, USGS, EPA, NPS, US Census Bureau, USDA

MoDOT | Maxar | Esri Community Maps Contributors, Missouri Dept. of Conservation, Missouri DNR, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METINASA, USGS, EPA, NPS, US Missouri SEMA Outreach



Figure 3.20. Maries County School Districts and Special Flood Hazard Areas (SFHAs)



**Table 3.40. Summary of Maries County NCEI Flood Events by Location, 2003-2022**

Location	# of Events
Maries County	1
Belle	2
Hayden	1
Shantytown	3
Veto	3
Vienna	4
(VIH) Rolla/Vichy Arp	1

Source: National Centers for Environmental Information Storm Events Database

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 NCEI data, Vienna is the community most prone to flash flooding events. Brinktown and Shantytown, unincorporated areas of the county, also have a high rate of flash flood events. **Table 3.41** provides information in regard to flash flood events between 2003 and 2022.

**Table 3.41. Maries County NCEI Flash Flood Events by Location, 2003-2022**

Location	# of Events
Maries County	1
Belle	5
Brinktown	6
High Gate	1
Safe	1
Shantytown	7
Summerfield	2
Van Cleve	3
Vichy	2
Vienna	9
(VIH) Rolla/Vichy Arp	3
Yarna	2

Source: National Centers for Environmental Information

### **Severity/Magnitude/Extent**

Missouri has a long and active history of flooding over the past century, according to the 2023 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.

According to the U.S. Geological Survey, two critical factors affect flooding due to rainfall: rainfall duration and rainfall intensity – the rate at which it rains. These factors contribute to a flood's height, water velocity and other properties that reveal its magnitude.

Flooding presents a danger to life and property, often resulting in injuries, and in some cases, fatalities. Floodwaters can interact with hazardous materials. Hazardous materials stored in large containers, like bulk propane tanks, could break loose or puncture as a result of flood activity. When this happens, evacuation of citizens could be 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 sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard.

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 roadbeds. In some instances, steep slopes that are saturated with water may cause mud or rockslides onto roadways. This damage can cause costly repairs for state, county, and city road and bridge maintenance departments. Further information regarding scour critical bridges can be found in **Section 3.2.2**.

### ***National Flood Insurance Program (NFIP) Participation***

**Table 3.42** depicts jurisdictions within the planning area that participate in NFIP. In addition, **Table 3.43** provides the number of policies in force, amount of insurance in force, number of closed losses, and total payments for Maries County.

Both Maries County and the city of Vienna follow the substantial improvement/substantial damage provisions of their floodplain management ordinances following a flood event. Maries County contracts with the Meramec Regional Planning Commission to provide technical assistance with floodplain management. Following a flood event, staff conducts damage assessments of affected properties in the floodplain to determine damage costs and compares those costs to the value of the property. If the property is determined to have more than 50 percent damage the property owner is notified that the structure must be brought into compliance with the current local floodplain management standards as described in the floodplain ordinance. The same conditions apply to properties that have been substantially improved. If a property has been renovated to the point that the value of the property has been increased by more than 50 percent, the property owner is notified that the property must be brought into compliance with the current local floodplain management standards as described in the floodplain ordinance. The city of Vienna also adheres to the city's floodplain ordinance. However, other than the sewage treatment lagoons and one or two outbuildings, the city does not currently have any structures located in the floodplain.

**Table 3.42. NFIP Participation in Maries County**

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	Regular-Emergency Program Entry Date	Responsible for Floodplain Regs in SFHAs and Floodplain Administration	Position Title
-	Belle, City of	N	-	-	-	-
290816	Maries County	Y	07/01/1987 (L)	07/01/1987	Victor Stratman	Presiding Commissioner
290647	Vienna, City of	Y	NONE	11/01/1979	Timothy Schell	Mayor

Source: NFIP Community Status Book,, <https://www.fema.gov/flood-insurance/work-with-nfip/community-status-book>

**Table 3.43. NFIP Policy and Claim Statistics as of 07/30/2023**

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Maries County	12	\$2,602,000	111	\$3,781,983.14

City of Vienna	0	0	2	3,310.16
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Source: NFIP Community Status Book, [08/08/2023]; SEMA

\*Closed Losses are those flood insurance claims that resulted in payment.

Of all the participating jurisdictions, Maries County has the most insurance payments totaling \$3,781,983.14.

### ***Repetitive Loss/Severe Repetitive Loss Properties***

Repetitive Loss Properties (RL) are those properties with at least two flood insurance payments of \$1,000 or more in a 10-year period. According to SEMA, there are 9 repetitive loss properties in Maries County that have had 26 losses with total payments of \$505,282.49. No repetitive loss properties have been mitigated with the planning area.

**Table 3.44. Repetitive Loss Properties in Maries County**

Jurisdiction	# of Properties	# Mitigated	Building Payments	Content Payments	Total Payments	# of Losses
Maries County	9	0	\$450,828.93	\$54,453.56	\$505,282.49	26

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 SEMA, there are 5 severe repetitive loss properties in Maries County that have had 19 losses with total payments equaling \$715,511.86. No severe repetitive loss properties have been mitigated in the planning area.

**Table 3.45. Severe Repetitive Loss Properties in Maries County**

Jurisdiction	# of Properties	# Mitigated	Building Payments	Content Payments	Total Payments	# of Losses
Maries County	5	0	\$652,709.79	\$62,802.07	\$715,511.86	19

### ***Previous Occurrences***

Between 2003 and 2022, there were 31 recorded flood-related crop insurance claims with total losses of \$391,311.90 due to flooding within Maries County<sup>1</sup>. **Table 3.43**Error! Reference source not found. shows crop losses for the period 2003 through 2022.

<sup>1</sup> <http://www.rma.usda.gov/data/cause.html>

**Table 3.46. Recorded USDA Crop Insurance Losses (Flood) for Maries County 2003 - 2022**

<b>Year</b>	<b>Number of Payments</b>	<b>Total</b>
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
2008	2	\$46,418.00
2009	5	\$40,658.00
2010	0	0
2011	0	0
2012	0	0
2013	15	\$179,638.50
2014	0	0
2015	4	\$90,752.40
2016	1	\$13,963.00
2017	4	\$19,882.00
2018	0	0
2019	0	0
2020	0	0
2021	0	0
2022	0	0
<b>TOTAL</b>	<b>31</b>	<b>\$391,311.90</b>

**Table 3.47** provides information regarding Presidential Flooding Disaster Declarations between 2003 and 2022 for Maries County.

**Table 3.47. Maries County Presidential Flooding Disaster Declarations 2001 to 2020**

<b>Declaration No.</b>	<b>Date</b>	<b>State</b>	<b>Incident Description</b>
DR-1463	05/06/2003	Missouri	Severe Storms, Tornadoes, Flooding
DR-1676	01/12/2007	Missouri	Severe Winter Storms and Flooding
DR-1742	01/07/2008	Missouri	Severe Storms, Tornadoes and Flooding
DR-1749	03/17/2008	Missouri	Severe Storms and Flooding
DR-1809	09/11/2008	Missouri	Severe Storms, Flooding, and a Tornado
DR-1847	05/08/2009	Missouri	Severe Storms, Tornadoes, and Flooding
DR-4130	09/06/2013	Missouri	Severe Storms, Straight-line Winds, Tornadoes, and Flooding
DR-4144	10/08/2013	Missouri	Severe Storms, Straight-line Winds, and Flooding
DR-4238	08/31/2015	Missouri	Severe Storms, Straight-line Winds, and Flooding
EM-3374	12/22/2015	Missouri	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding

DR-4250	01/21/2016	Missouri	Heavy Rains, Widespread Flash Flooding, and Flooding
DR-4317	06/02/2017	Missouri	Severe Storms, Tornadoes, Straight-line Winds and Flooding
DR-4451	07/09/2019	Missouri	Severe Storms, Tornadoes, and Flooding

Source: FEMA, Disaster Declarations for Missouri, Flooding

Data was obtained from the NCEI regarding flash and river flooding over the last 20 years. **Table 3.48** and **3.49** provide this information. Additionally, narratives available for each event are included.

**Table 3.48. NCEI Maries County Riverine Flood Events Summary, 2003 to 2022**

Year	# of Events	# of Deaths	# of Injuries	Property Damages (\$)	Crop Damages (\$)
2005	1	0	0	0	0
2008	2	0	0	0	0
2009	1	0	0	0	0
2010	2	0	0	15.00K	0
2011	3	0	0	200.00K	0
2013	1	0	0	0	0
2016	1	0	0	0	0
2017	1	1	0	500.00K	0
2018	2	0	0	0	0
2021	1	0	0	0	0
<b>Total</b>	<b>15</b>	<b>0</b>	<b>0</b>	<b>715.00K</b>	<b>0</b>

Source: NCEI, data accessed [2/3/23]

#### Narratives on flood events:

- 01/05/2005:** Several periods of heavy rain in conjunction with little vegetation over the winter months set the stage for widespread flooding across much of extreme southeast Kansas and southern and central Missouri. In Maries County, numerous roads and low lying areas were inundated and impassable by motorists countywide.
- 03/19/2008:** Excessive rainfall developed over southern Missouri during the evening of 17 March. A line of training convection assumed a position roughly along a line from Anderson to Ozark to Licking. This convection expanded with time, eventually covering nearly all of extreme southeast Kansas and the Missouri Ozarks. Moderate to heavy rain continued into the overnight period and did not stop until the morning of 19 March.
- 09/03/2009:** Following the landfall of Hurricane Gustav along the Louisiana coast, Gustav's extra-tropical circulation tracked directly into southern Missouri. The remnant moisture from Gustav created widespread rainfall amounts ranging from two to six inches across the region. Pre-existing dry soil conditions and thick summertime vegetation limited flooding from becoming widespread and significant. However, some localized flooding was observed.

Three to six inches of rain fell over maries County. Numerous low water crossings across the county flooded. A section of County Road 511 at its intersection with Clifty Creek had three feet of fast moving water over the road.

- 10/29/2009:** Showers and thunderstorms produced flooding across Southwest Missouri with

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isolated wind damage in Neosho. Several low water crossings were reported flooded across Maries County.

5. **01/24/2010:** A slow moving storm system brought an extended period of heavy rainfall which produced flooding across portions of the Missouri Ozarks. Numerous road closures were reported as streams and creeks swelled and low water crossings and roads became impassable. A low water crossing, on County Road 406 along a branch of the Dry Fork River was flooded and impassable.
6. **05/20/2010:** A slow moving upper level storm system, moved across the region, acting to transport significant amounts of moisture up and over a stalled frontal boundary laid out across the Ozarks. Isolated embedded thunderstorms produced small hail and locally heavy rainfall. Wide spread flooding and flash flooding occurred as a result of the duration of heavy rainfall in conjunction with isolated heavy rainfall from thunderstorms. A water rescue was performed along County Road 624. Excessive rainfall caused the Maries River to flood over a low water crossing which a motorist attempted to drive across.
7. **03/14/2011:** A vigorous shortwave moving across the Ozarks produced thunderstorms with heavy rain which caused several reports of flooding. Emergency manager reported numerous low water crossings were flooded across Maries County.
8. **04/25/2011:** Multiple rounds of thunderstorms produced very heavy rainfall across the Ozarks over the course of a week. A persistent trough over the central plains brought multiple upper level storm systems over the region which produced intense thunderstorms with very heavy rainfall. Some areas saw storm total rainfall amounts up to a foot or more. A housing area off State Highway E near the Gasconade River was cut off due to flooding of County Road 540. Several low water crossings and rural roads were flooded and impassable. The total cost estimate for flooding damages for Maries County for this entire episode has been included. This includes roads, bridges, and structures which were affected.
9. **06/01/2013:** Heavy rainfall led to flooding across the Missouri Ozarks. Numerous low water crossings in Maries County were flooded.
10. **07/02/2016:** Several rounds of thunderstorms over the holiday weekend produced severe weather across the Missouri Ozarks. There were reports of wind damage and large hail. Heavy rainfall led to flash flooding as well. Water flooded over County Road 624 at the low water crossing along the Maries River.
11. **04/30/2017:** Multiple rounds of severe thunderstorms and extremely heavy rainfall over several days led to historic and devastating flash floods, record breaking river levels, large hail, wind damage, and at least one tornado across the Missouri Ozarks region. Most counties across the Missouri Ozarks region were declared a federal disaster from the President and FEMA. Several homes and roads sustained flood damage across the county with damages to infrastructure, businesses and homes in Maries County estimated at \$500,000.
12. **03/29/2018:** Several rounds of thunderstorms caused heavy rainfall and minor flooding. Route E was closed due to flooding.
13. **03/12/2021:** Heavy rainfall affected the region from the late morning of the 12<sup>th</sup> to the evening of the 14<sup>th</sup> as a cold front stalled over northern Arkansas, moved back to the north as a warm front, and then moved east of the region again as a cold front during the 3 day period. Multiple rounds of heavy rainfall produced widespread rainfall amounts between two and three inches



with some local areas receiving in excess of 8 inches during the three-day period. A water rescue was performed successfully at a low water crossing on County Road 527 at the Spring Creek. No injuries occurred.

**Table 3.49. NCEI Maries County Flash Flood Events Summary, 2001 to 2020**

Year	# of Events	# of Deaths	# of Injuries	Property Damages (\$)	Crop Damages (\$)
2003	1	0	0	0	0
2004	1			0	0
2005	3	0	0	0	0
2006	1	0	0	0	0
2007	2			0	0
2008	7	0	0	1.00K	0
2009	3	0	0	25.00K	0
2011	3	0	0	0	0
2012	3			5.00K	0
2013	6	0	0	500.00K	0
2015	3	0	0	250.00K	0
2016	6	0	0	0	0
2018	2	0	0	0	0
2020	1	0	0	0	0
<b>Total</b>	<b>42</b>	<b>0</b>	<b>0</b>	<b>781.00K</b>	<b>0</b>

Source: NCEI, data accessed [2/3/23]

#### **Narratives on flash flood events:**

1. **07/18/2003:** Brief flooding was also observed on Highway Z east of Vienna.
2. **07/30/2004:** Flash flooding washed out a section of Highway 42 near the community of Belle.
3. **01/05/2005:** Several periods of heavy rain in conjunction with little vegetation over the winter months set the stage for widespread flooding across much of extreme southeast Kansas and southern and central Missouri. In Maries County, numerous roads and low lying areas were inundated and impassable by motorists countywide.
4. **04/20/2005:** Several low water crossings in far southwest Maries County became impassable after heavy thunderstorms affected the area. A section of County Road 628 near Highway BB had several inches of water flowing over the roadway.
5. **06/10/2005:** Thunderstorms caused flash flooding in a couple of areas across Maries County. Sections of County Roads 623 and 621 were inundated.
6. **08/27/2006:** A section of Highway AA near the Little Maries Creek became impassable to motorists from flash flooding.
7. **05/10/2007:** Heavy thunderstorms caused flash flooding in several areas. A few marginally severe hail was also observed. Numerous low water crossings along the Big Maries Creek became impassable to motorists due to flash flooding.
8. **09/25/2007:** A few thunderstorms developed over southwest and central Missouri. These storms produced minor flooding and marginally severe wind gusts. The Little Maries River

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flooded over a section of a county road in northwest Maries County.

9. **01/07/2008:** An unusual mid-winter tornado outbreak occurred over southwest and central Missouri. 31 tornadoes struck the region within a 15 hour timeframe on 7 January into early morning 8 January. Two tornadoes intensified to EF-3 status while five tornadoes caused EF-2 damage. All other tornadoes during this outbreak were surveyed and give EF-0 and EF-1 status. Multiple training supercells spawned most of these tornadoes that occurred along the Interstate 44 corridor. Toward the end of this episode, a broken squall line spawned numerous EF-) and EF-1 tornadoes across the southern Missouri Ozarks.

Excessive rainfall caused flash flooding in several areas of Maries County. A couple of specific locations along Highway FF that were impacted include low water crossings at Spring Creek and Mill Creek.

10. **02/17/2008:** Widespread excessive rainfall impacted almost all of extreme southeast Kansas and the Missouri Ozarks during the overnight period of 16 February into 17 February. Widespread rainfall amounts of one to three and a half inches fell. The heaviest amounts fell over the upper White River basin as three and a half inches were observed near Table Rock Lake. Meanwhile areas of the Osage Plains from southeast Kansas into west central Missouri measured around an inch. A section of County Road 827 five miles north of Dixon experienced flash flooding and was impassable to motorists.
11. **03/18/2008:** Excessive rainfall developed over southern Missouri during the evening of 17 March. A line of training convection assumed a position roughly along a line from Anderson to Ozark to Licking. This convection expanded with time, eventually covering nearly all of extreme southeast Kansas and the Missouri Ozarks. Moderate to heavy rain continued into the overnight period and did not stop until the morning of 19 March. Four to five inches of rain fell over Maries County. Major damage to county roads occurred, while all locations that typically experience flooding during periods of heavy rain were flooded. A few sections of Highway 63 became impassable to motorists.
12. **04/03/2008:** Marginally severe thunderstorms produced hail and flash flooding over several counties in southwest and central Missouri. Wet soil conditions from record breaking rainfall caused enhanced runoff leading to an unusual onset of flash flooding. One half of an inch to three quarters of an inch of rain fell over Maries County. Numerous roads and low water crossings within the county experienced flash flooding.
13. **04/10/2008:** Repeated development of storms along and north of an advancing warm front led to a large swath of greater than three inches of rain south of a line from Stockton to West Plains. This excessive rain occurred on wet soil conditions from record rainfall in February and March. One to two inches of rain fell over Maries County. All low areas that typically flood during periods of excessive rainfall were flooded. The Emergency Management Director stated that widespread flash flooding began after approximately one half of an inch of rain occurred.
14. **08/05/2008:** A cluster of severe thunderstorms developed along a west to east oriented cold front during the evening of 5 August. Several observations of large hail and damaging winds occurred from these storms. Nearly five inches of rain fell over a rural area along the Phelps and Maries county line. This excessive rain caused significant flash flooding in this area. Radar estimated rainfall exceeding five inches fell within this area of flash flooding. The Maries County Emergency Management Director surveyed the flooding and described it as major flash flooding. Sections of county roads 444, 442, 440, 521, 523, 527 and 450 were all impassable to motorists.

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15. **09/14/2008:** Storm total rainfall amounts ranged from one to six inches during the evening and overnight hours of 13 September into the morning of 14 September. Widespread flooding of small streams, creeks and main stem rivers resulted. Three to five inches of rain fell over Maries County resulting in widespread flooding of small creeks and streams. Numerous county roads were flooded and all low water crossings were impassable to motorists.
  16. **05/08/2009:** An intense squall line impacted extreme southeast Kansas and the Missouri Ozarks with mainly damaging winds. However, 19 tornadoes along with large hail was also observed. Due to the straight line nature of the winds, damage was widespread and intense. Two to four inches of rain fell over Maries County that resulted in widespread flooding of county roads. Several roads, low water crossings and culverts were washed out.
  17. **05/27/2009:** A marginally severe thunderstorm impacted Phelps County and Maries County with large hail and damaging winds. Flash flooding also resulted from two to five inches of rain. A small tributary of the Bourbeuse River flooded a section of Highway P just east of its intersection with Highway 63.
  18. **06/10/2009:** Widespread strong to severe thunderstorms impacted portions of southeast and central Missouri. The primary hazards with these storms were severe wind gusts that caused damage to trees, power poles and a few structures. Two weak tornadoes also occurred. Excessive rainfall caused flooding over a section of Highway 42, one half of a mile southwest of its intersection with Highway 28. This stream that flooded is a tributary of the Dry Fork Creek.
  19. **05/12/2011:** An upper level low over western Kansas combined with a cold front moved into the region and produced severe thunderstorms. Numerous severe storms and a few supercells produced very large hail and high wind gusts as the front moved through the region. Two to two and a half feet of water was flowing over County Road 624 in the vicinity of Maries Creek. Flooding was reported of low water crossings.
  20. **07/12/2011:** An upper level disturbance moving across the Ozarks and a stationary front positioned across the Ozarks caused a cluster of strong to severe storms to develop which caused wind damage and localized flash flooding. Excessive rainfall caused flooding to occur along the Little Maries River at the intersection with County Road 634. This low water crossing was impassable to motorists with two feet of swift water flowing over the bridge.
  21. **03/15/2012:** A stationary closed off low pressure system over the southern Plains developed several rounds of severe storms which produced large hail and heavy rainfall. A section of Highway 42 was impassable due to flash flooding.
  22. **03/17/2012:** The same weather system that began on 3/15/2012 caused a low water crossing to be washed out on County Road 454 making the road impassable. Several other low water crossings were reported to be flooded across Maries County.
  23. **04/14/2012:** A stalled out front combined with several upper level disturbances moving across the Ozarks produced several rounds of thunderstorms which produced heavy rainfall and caused flooding. Three feet of water was reported over Farm Road 624 along the Maries River.
  24. **05/31/2013:** A slow moving trough across the central portions of the country helped develop several rounds of severe thunderstorms and flash flooding across the Missouri Ozarks. Highway 42 was flooded one half mile west of Highway 28.

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25. **06/16/2013:** A weak frontal boundary along with several upper level impulses that moved over the Missouri Ozarks resulted in isolated severe thunderstorms that produced large hail, wind damage and flash flooding. Highway 68 near Highway H was flooded.
  26. **08/02/2013:** Multiple boundaries across the Ozarks region, combined with a very moist and unstable air mass, and an upper level shortwave produced significant rainfall across portions of the area. While some wind damage was reported, the primary impact from the storms was areas of significant flooding. Most locations received between one and three inches of rain. However, scattered reports in excess of six inches occurred over several days. The Maries River was reported out of its banks and flowing three to five feet deep over the low water crossing on County Roads 623 and 642.
  27. **08/07/2013:** A stalled frontal boundary led to multiple rounds of thunderstorms which rained over the same areas and produced intense rainfall rates and rainfall totals. Most areas received between one and five inches of rainfall with some localized areas receiving up to 20 inches of rainfall in several days. This caused devastating floods and flash floods with some rivers reaching all-time record levels. Joint agencies from the federal, state and local assessed over 18 million dollars in damages to property and infrastructure region-wide. Over 380 homes and over 130 businesses were damaged due to the floods. In Maries County, Highway 42 was impassable near the intersection of Highway T due to flood waters. Highway N was closed due to flooding. Numerous roads were under water and impassable throughout the county. One resident was evacuated from their home on County Road 213 on the northwest side of Vienna. Several high water rescues were performed. Several homes were flooded and low water crossings were damaged.
  28. **07/01/2015:** A slow moving front caused multiple rounds of thunderstorms which led to severe weather and flash flooding across the Missouri Ozarks. Numerous roads were closed including Highway 133, Highway DD, Highway BB, and Highway T due to flooding.
  29. **12/28/2015:** A slow moving and strong weather system caused several rounds of very heavy and record breaking rainfall to occur across the Missouri Ozarks which led to historic flooding. Numerous low water crossings were flooded. Several county roads and homes sustained flood damage.
  30. **08/03/2016:** Several rounds of severe thunderstorms affected the Missouri Ozarks. Heavy rainfall produced flash flooding. The low water crossing Highway 42 was flooded and impassable.
  31. **08/05/2016:** Several rounds of severe thunderstorms affected the Missouri Ozarks. Heavy rainfall produced flash flooding. Several inches of water was estimated flowing over Highway 63 north of Vichy and several other areas of Highway 63 between Vichy and Vienna had water over the roadway. Water over the roadway was also reported on Highway 42 west of Vienna. There were multiple county roads across the county that were flooded and impassable.
  32. **08/12/2016:** Several rounds of strong to severe thunderstorms caused minor flooding and wind damage reports. Flood water was over Highway 63 and Highway 42.
  33. **09/07/2018:** The remnants of Tropical Storm Gordon tracked from the Mississippi Coast into southwest Missouri. Widespread rainfall occurred over the Ozarks Region, with pockets of excessive rainfall leading to flash flooding. The Maries River rose out of its banks and flooded over the roadway at County Road 624, north of Dixon, closing the road.

34. **06/04/2020** A complex of strong to severe thunderstorms that developed over the Central Plains during the evening of the 3<sup>rd</sup> tracked southeastward into the Missouri Ozarks and southeast Kansas during the early and mid-morning hours of the 4<sup>th</sup>. The storms produced wind gusts over 60 mph and caused widespread damage to roofs, trees and power lines. County Road 624 was flooded and impassable due to flooding along the Maries River.

### ***Probability of Future Occurrence***

From the data obtained from the NCEI<sup>1</sup>, there were 15 riverine flood events (**Table 3.48**) over a period of 20 years. This information was utilized to determine the annual average percent probability of riverine flooding (**Table 3.50**). The probability of riverine flooding in Maries County per year is 75 percent (15 events/20 years x 100). Furthermore, data was obtained for flash flooding within the county. Maries County endured 42 flash flooding events (**0**) over a 20 year period. The probability of flash flooding in Maries County per year is 100% (42 events/20 years x 100) with an average of 2.1 events per year (**Table 3.51**).

**Table 3.50. Annual Average % Probability of Riverine Flooding in Maries County**

Location	Annual Avg. % P	Avg. Number of Events
Maries County	75%	.75

\*P = probability; see page 3.24 for definition.

**Table 3.51. Annual Average % Probability of Flash Flooding in Maries County**

Location	Annual Avg. % P	Avg. Number of Events
Maries County	100%	2.1

\*P = probability; see page 3.24 for definition.

### ***Changing Future Conditions Considerations***

Generally, annual precipitation increased in the Midwest during the past century (by up to 20% in some locations), with much of the increase driven by intensification of the heaviest rainfalls. This tendency towards more intense precipitation events is projected to continue into the future<sup>2</sup>. As the number of heavy rain events increases, more flooding and pooling water can be expected. The expected increases in rainfall frequency and intensity are likely to put additional stress on natural hydrological systems and community stormwater systems<sup>3</sup>.

## **Vulnerability**

### ***Vulnerability Overview***

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

<sup>1</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

<sup>2</sup> [https://nca2014.globalchange.gov/downloads/low/NCA3\\_Full\\_Report\\_18\\_Midwest\\_LowRes.pdf](https://nca2014.globalchange.gov/downloads/low/NCA3_Full_Report_18_Midwest_LowRes.pdf)

<sup>3</sup> 2018 MO State Hazard Mitigation Plan

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in large containers can break loose or sustain a puncture as a result of flooding. 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 flood 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. Additional information on scour bridges can be found on page 3.16. Floodwaters can also cause erosion undermining roadbeds. In some instances, steep slopes that are saturated with water may cause mud or rockslides 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.

For the vulnerability analysis of flooding for Maries County, data was obtained from the 2018 Missouri State Hazard Mitigation Plan. The 2018 Plan used the most recent release of Hazus, version 6.0, to model flood vulnerability and estimate flood losses due to the depth of flooding. Additional hazard data inputs were utilized, as available, to perform Hazus Level 2 analyses. This included the extensive use of the FEMA special flood hazard area data and RiskMAP flood risk datasets.

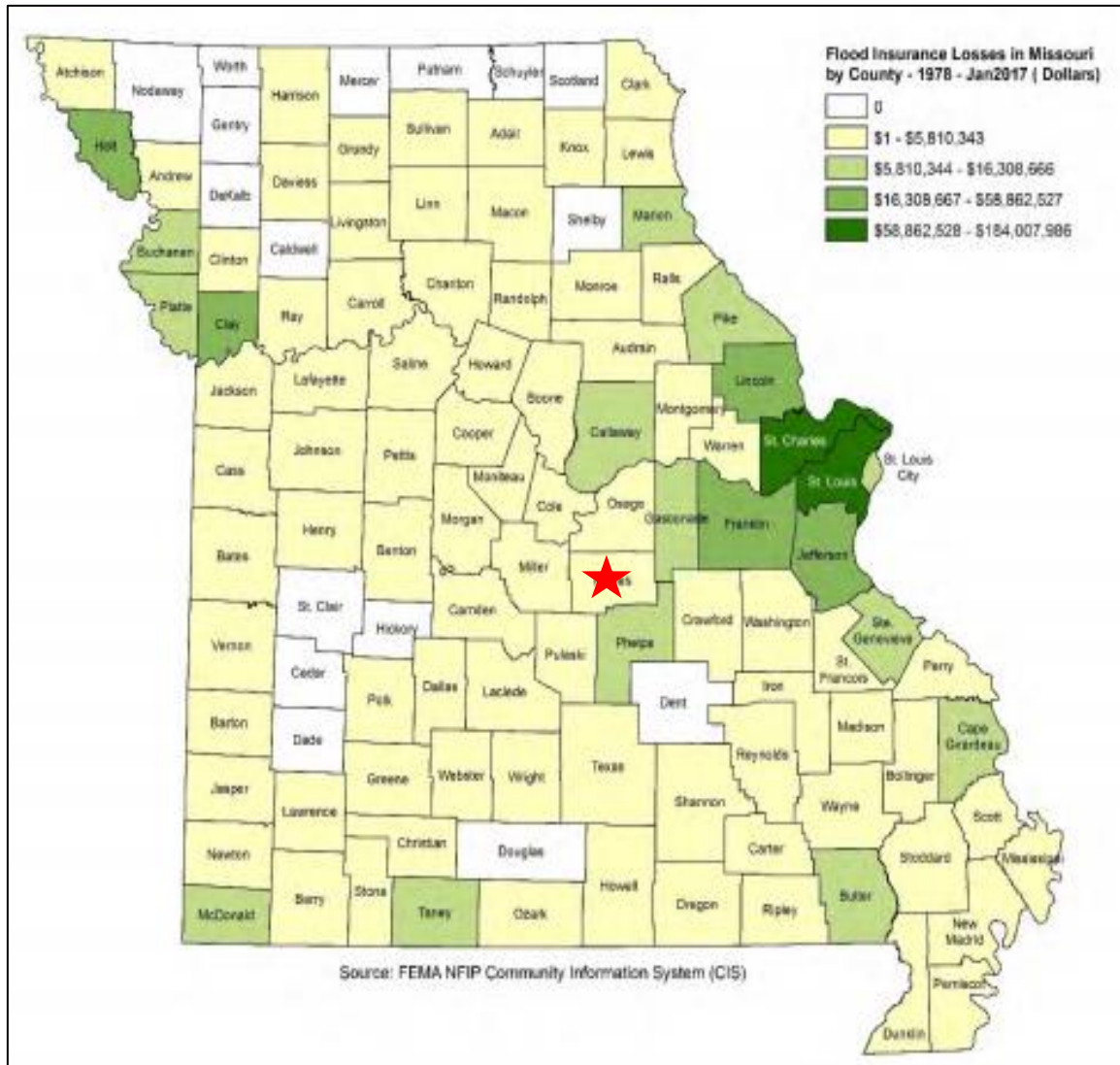
For the Hazus analysis, the flood hazard area and depth of flooding was determined for each county using one of three methods – depending on the data available for that county. Maries County does not have digital FIRMS, but does have RiskMAP flood datasets available. The regulatory special flood hazard area was utilized along with the 1-percent annual chance flood depth grid, a non-regulatory product. Flood depth grids are rasters where depth is calculated as the difference in feet between the water surface elevation and the ground surface elevation.

In addition to the RiskMap flood dataset, SEMA analyzed National Flood Insurance Program (NFIP) flood-loss data to determine areas of Missouri with the greatest flood risk. Missouri flood-loss information was obtained from PIVOT which FEMA's Federal Insurance and Mitigation Administration's new web-based processing system. With this flood-loss data there are limitations noted, including:

- Only losses to participating NFIP communities are represented
- Communities joined the NFIP at various times since 1978
- The number of flood insurance policies in effect may not include all structures at risk to flooding
- Some of the historic loss areas have been mitigated with property buyouts

**Figure 3.37** depicts the amount of flood insurance losses in Missouri by county for the period 1978-January 2017. Maries County falls in the \$1 - \$5,810,343 range of payments.

**Figure 3.21. Map of Funds Paid Historically for Flood Insurance Losses in Missouri by County 1978 - January 2017**

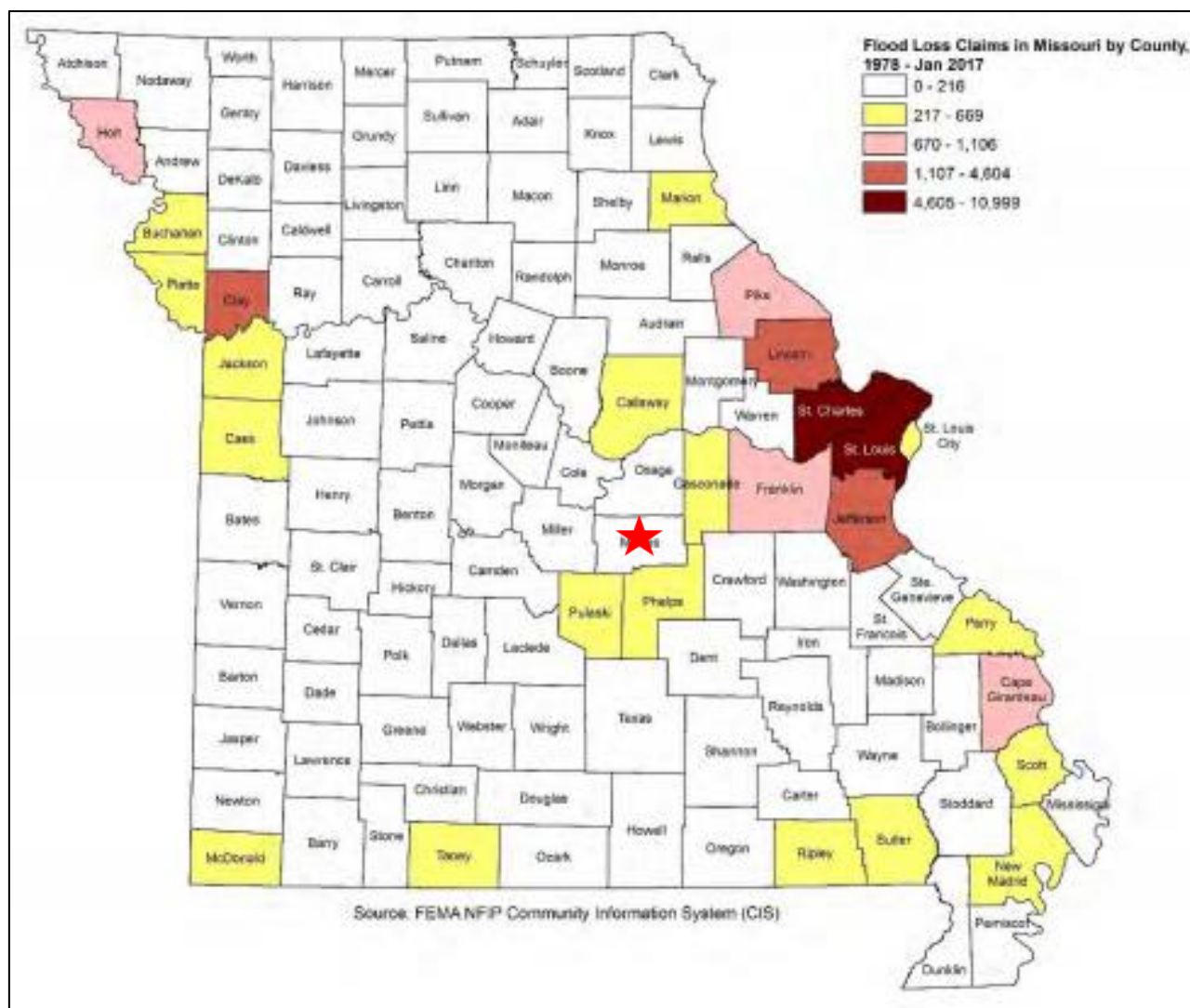


Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

**Figure 3.38** illustrates the number of flood loss claims made in Missouri during the same time period. Maries County had 0 - 216 claims during that timeframe.



**Figure 3.22. Flood Loss Claims in Missouri by County, 1978 – January 2017**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries 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 using consistent methodology. These results were generated from DFIRM data coupled with LiDAR derived building footprints. Additionally, a Hazus analysis provided the number of buildings impacted, estimates of the building repair costs, and the associated loss of building contents and business inventory. **Table 3.52** provides information regarding total direct building loss and income loss to Maries County. **Table 3.53** provides information on exposure of buildings. According to the Missouri Spatial Data Information Service (MSDIS) there are 141 Residential structures at risk of flood. Hazus shows the number of building exposed to flood damage at 180, with 112 potentially substantially damaged in a one percent annual chance of a flood.

**Table 3.52. Total Direct Building Loss and Income Loss to Maries County**

County-wide Building Loss	Structural Damage	Contents Loss	Inventory Loss	Total Direct Loss	Total Income Loss	Total Direct and Income Loss	Calc. Loss Ratio
\$980,656,500	\$13,085,600	\$7,409,300	\$130,000	\$20,624,900	\$12,415,100	\$33,040,000	1.33%

Source: 2023 Missouri State Hazard Mitigation Plan

**Table 3.53. Maries County Structures Exposure**

# MSDIS Residential Structures Exposed	# Hazus Buildings Exposed	# Substantially Damaged
141	180	112

Source: 2023 Missouri State Hazard Mitigation Plan

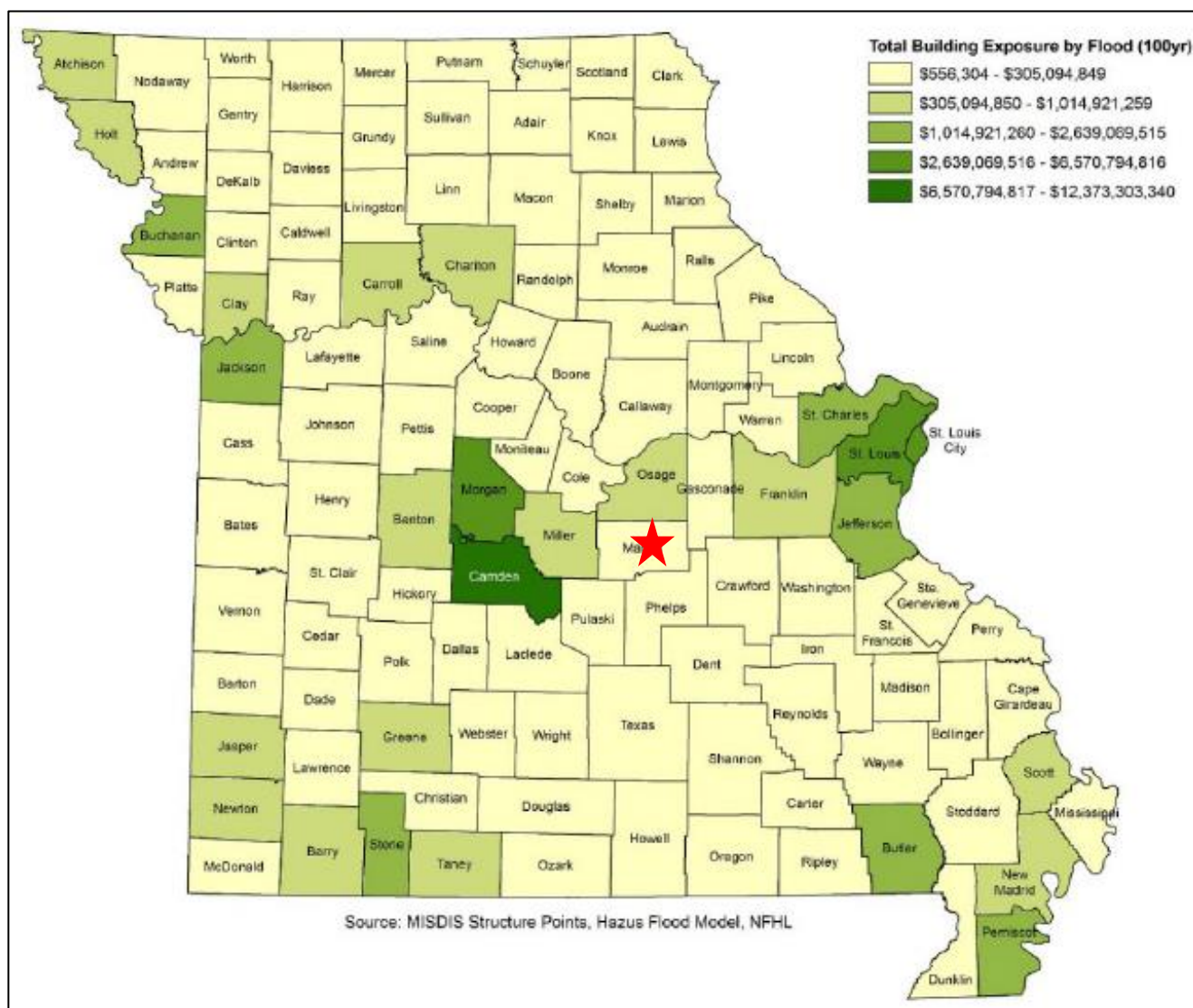
**Table 3.54** presents the results of the primary indicators for Maries County – Residential, agricultural, commercial, education, government and industrial. This table illustrates the number of affected structures and estimated losses. **Figure 3.23** shows the building exposure for the Hazus Base-Flood Scenario. **Figure 3.40** illustrates the building impacted ratio for a 100-year flood.

**Table 3.54. Maries County Total Building Loss and Income Loss**

# Residential Structures	Total \$\$ of Loss	# Agriculture Structures	Total \$\$ of Loss	# Commercial Structures	Total \$\$ of Loss	# of Education Structures	Total \$\$ of Loss	# of Government Structures	Total \$\$ of Loss	# of Industrial Structures	Total \$\$ of Loss	Total # Population Affected	Total Loss – Hazus Layer
141	\$22,837,804	32	\$657,636	7	\$3,059,460	0	\$0	0	\$0	0	\$0	524	\$26,554,900

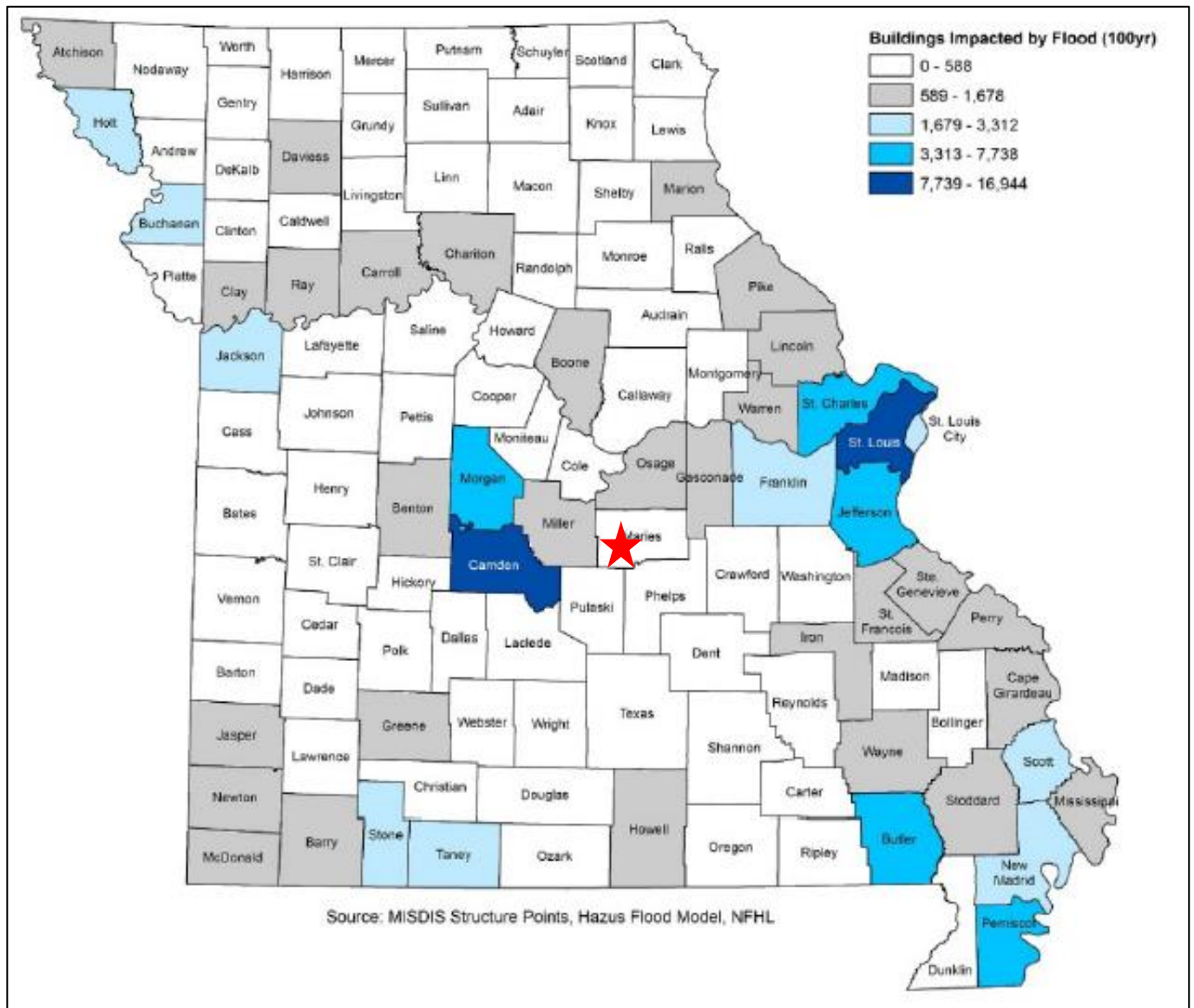
Source: 2023 Missouri State Hazard Mitigation Plan

**Figure 3.23. Hazus Countywide Base-Flood Scenarios: Building Exposure**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

**Figure 3.24. Hazus Countywide Base-Flood Scenarios: Building Impacted Ratio**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

Lastly, the State determined the estimated number of displaced households and need for shelters within Maries County in the event of a 100 year flood. **Table 3.55** and **Figure 3.25** illustrate this information.

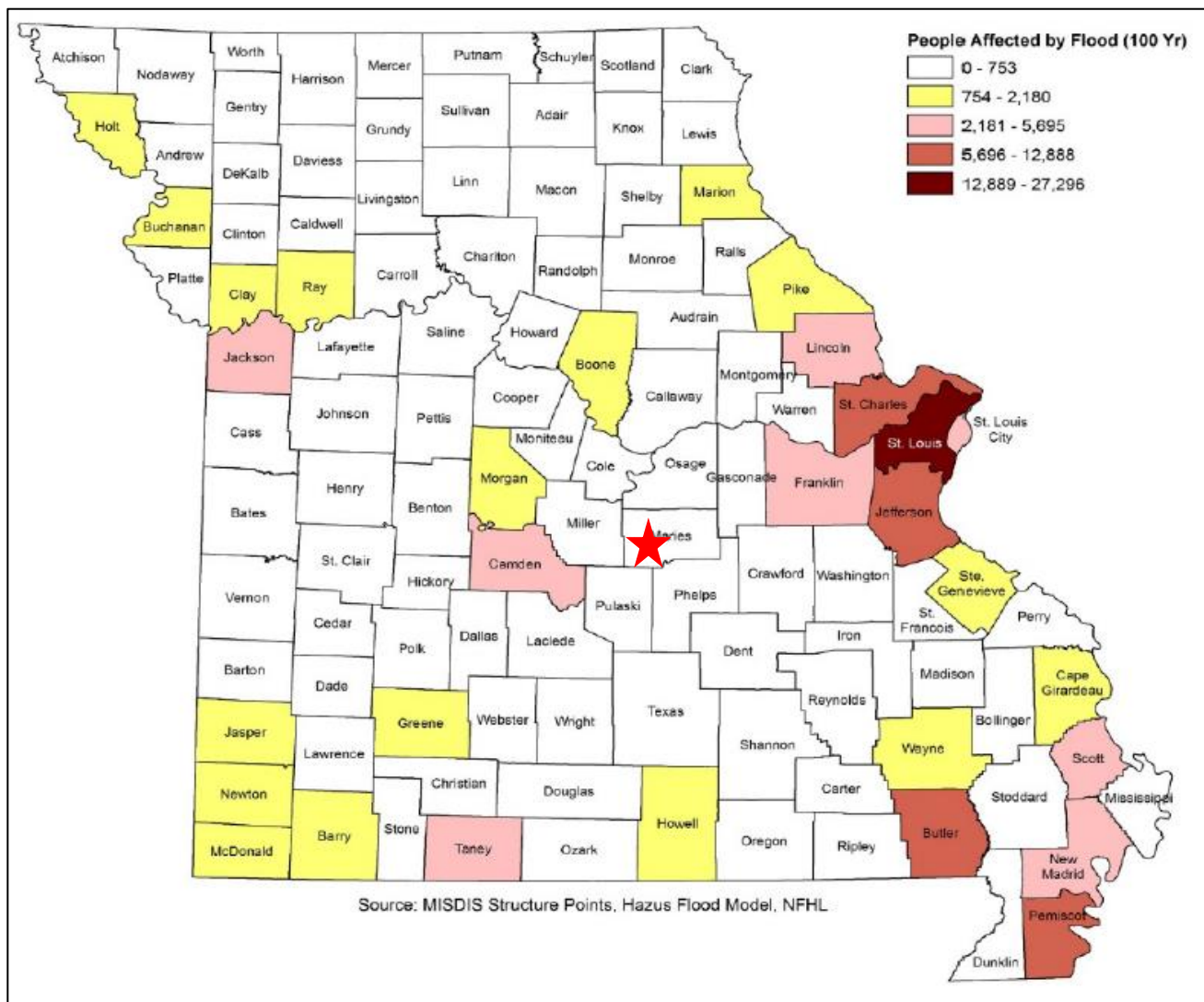
**Table 3.55. Estimated Displaced People and Shelter Needs for Maries County**

County	Displaced People	Displaced Population Requiring Shelter
Maries	524	111

Source: 2023 Missouri State Hazard Mitigation Plan



**Figure 3.25. Hazus Countywide Base-Flood Scenarios: Displaced People**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

### **Potential Losses to Existing Development**

According to the HAZUS model, Maries County has a building loss ratio of 1.33 percent for countywide base-flood scenarios. However, the unprecedented flooding in 2013 suggests that future flood events could cause significant disruption in the county. With the annual average probability for flooding and for flash floods at 100 percent, Maries County's existing development is vulnerable to flood. Developments located in low-lying areas, near rivers or streams, or where drainage systems are not adequate are prone to flooding.

### **Impact of Previous and Future Development**

Impact of future development is correlated to floodplain management and regulations set forth by the county and jurisdictions. 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

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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 varies slightly across the planning area. The jurisdictions most vulnerable to flooding include the city of Vienna and the unincorporated community of Shantytown. Since 2003 there have been 57 Incidents of flooding or flash flooding in Maries County; 13 incidents in Vienna; and 10 incidents in and around Shantytown (**Table 3.48**). There have been no injuries or deaths associated with floods during this time period. The county has 16 repetitive loss and seven severe repetitive loss properties.

Those areas at greatest risk to riverine flooding are those populated areas along the Gasconade and Maries rivers and their tributaries. The Nagogami Resort development on the border with Phelps County is one area where there is a concentration of homes located in the floodplain and this area frequently floods. Although landowners are encouraged to elevate their homes, the area is not eligible for a floodplain buyout because the land is leased. A similar situation exists at the Moreland Resort that is located between Vichy and Vienna on the Gasconade River.

Due to the rural nature of Maries County and topography that includes a large number of rivers and tributaries, the county has a significant number of low water crossings and gravel roads that are vulnerable to flooding and flood damage. In regards to county infrastructure, there are a number of county roads and low water crossings that regularly flood – MR(Maries Road) 210, MR219, MR501, MR508, MR510, MR513, MR601, MR 614, MR625, MR628, MR634, MR636, and MR639 . In addition, there are a number of state highways in the county that are vulnerable to flooding and closure – highways 133, DD, BB, T, Z, N, AA, FF and P. Larger highways like 63, 68 and 42 also have areas that are vulnerable to flooding and damage from water running over the roadway.

A very small portion of the City of Vienna resides in a SFHA. The preliminary data developed by the RiskMAP project shows 5 structures within the city of Vienna located within a SFHA. Additionally, according to the jurisdictional questionnaires, school districts do not have assets located within an identified Special Flood Hazard Area.

The city of Belle is not a member of the NFIP and does not have any identified special flood hazard areas within the city boundaries. But the community is still vulnerable to flash floods and affected by closures to roads around the city.

### **Problem Statement**

Maries County and the city of Vienna has adopted a Floodplain Management Ordinance that regulates construction in the floodplain. Local governments should make a strong effort to further improve emergency warning systems to ensure 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.

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### 3.4.6 Land Subsidence/Sinkholes

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Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.5, Page 3.218  
[https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO\\_Hazard\\_Mitigation\\_Plan2018.pdf](https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf)
- <http://www.dnr.mo.gov/geology/geosrv/envgeo/sinkholes.htm>
- <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/>
- MSDIS Structure Inventory and All Hazard Risk Dataset  
(available in both GIS and Excel format)  
<https://drive.google.com/drive/folders/0Bzq99s866kWocFB5Y3hCRIRuWWM>
- Missouri hazard Mitigation Viewer  
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<http://drive.google.com/file/d/1bPkc0JgF9ofwQLnTL9NOu-oPFWi9hkst/view> - User Guide
  - Total number of sinkholes by County
  - Vulnerability to sinkholes by County
  - Total number of mines by County
  - Vulnerability to mines by County
  - Total value of structures impacted by sinkholes by County
  - Total population impacted by sinkholes by County

#### **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

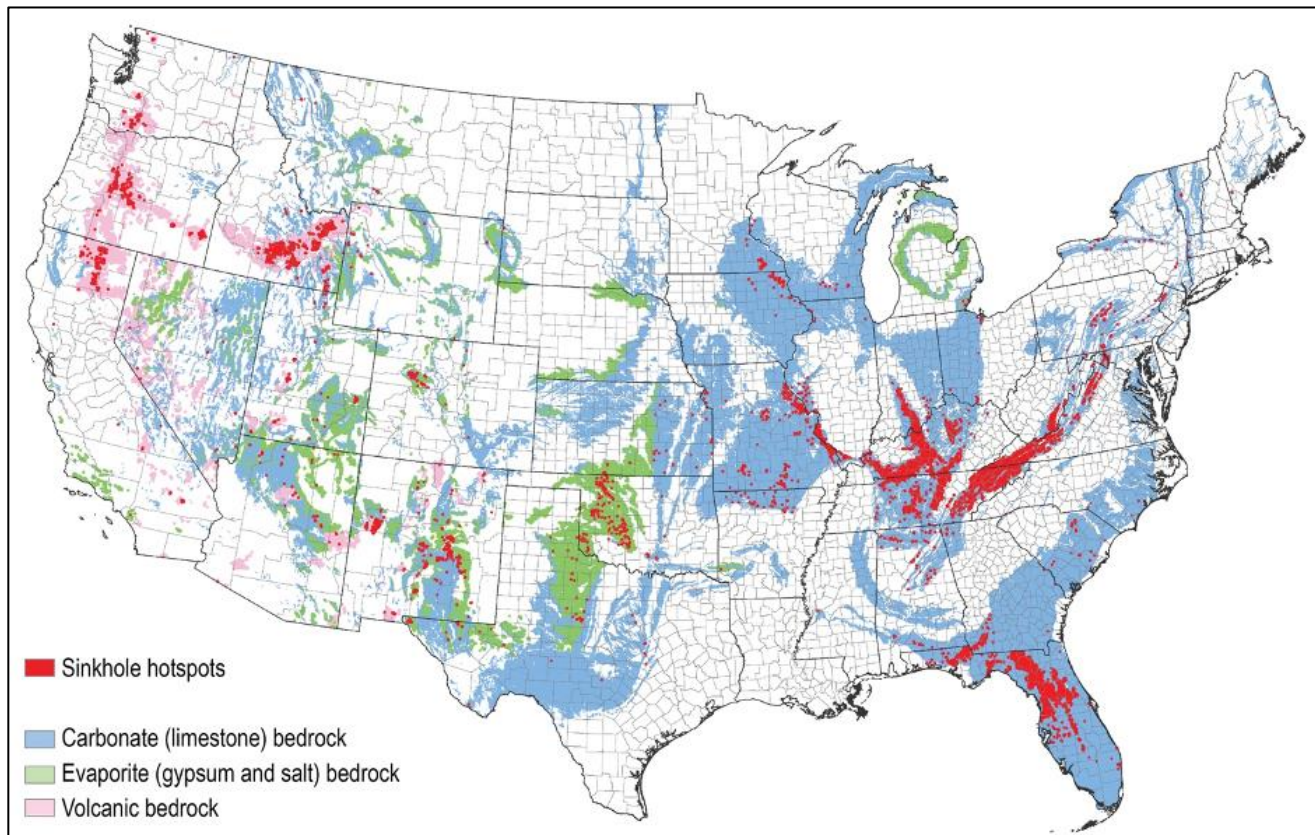


Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. Fifty-nine percent of Missouri is underlain by thick, carbonate rock that makes Missouri vulnerable to sinkholes. Sinkholes occur in Missouri on a fairly frequent basis. Most of Missouri's sinkholes occur naturally in the State's 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***

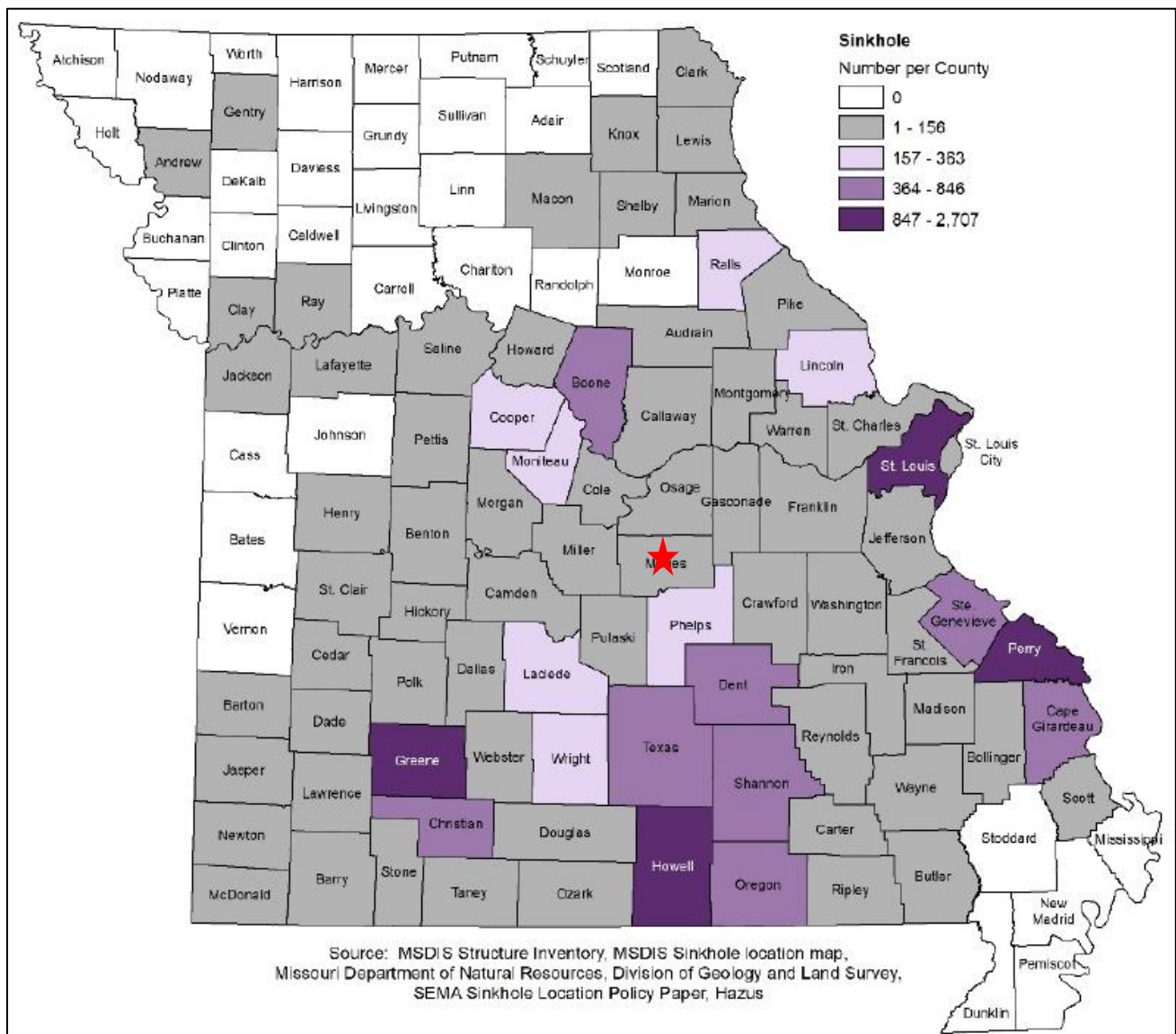
Error! Reference source not found. depicts karst topography across the United States. Missouri's karst topography is comprised of carbonate rocks such as limestone, dolomite, and marble. Variability in areas prone to sinkholes does not differ greatly across the county. According to the 2023 Missouri State Hazard Mitigation Plan there are 16 sinkholes that have been recorded within Maries County (**Figure 3.27**). In addition, the Plan states that there are 286 mines in Maries County - as shown in **Figure 3.28**. According to the Missouri Department of Natural Resources, Maries County primarily produces refractory clay but has deposits of barite with lead, sedimentary limonite and hematite. Activities such as mining or drilling are known to be responsible for the formation of sinkholes.

**Figure 3.26. Karst Map of the Conterminous United States - 2020**



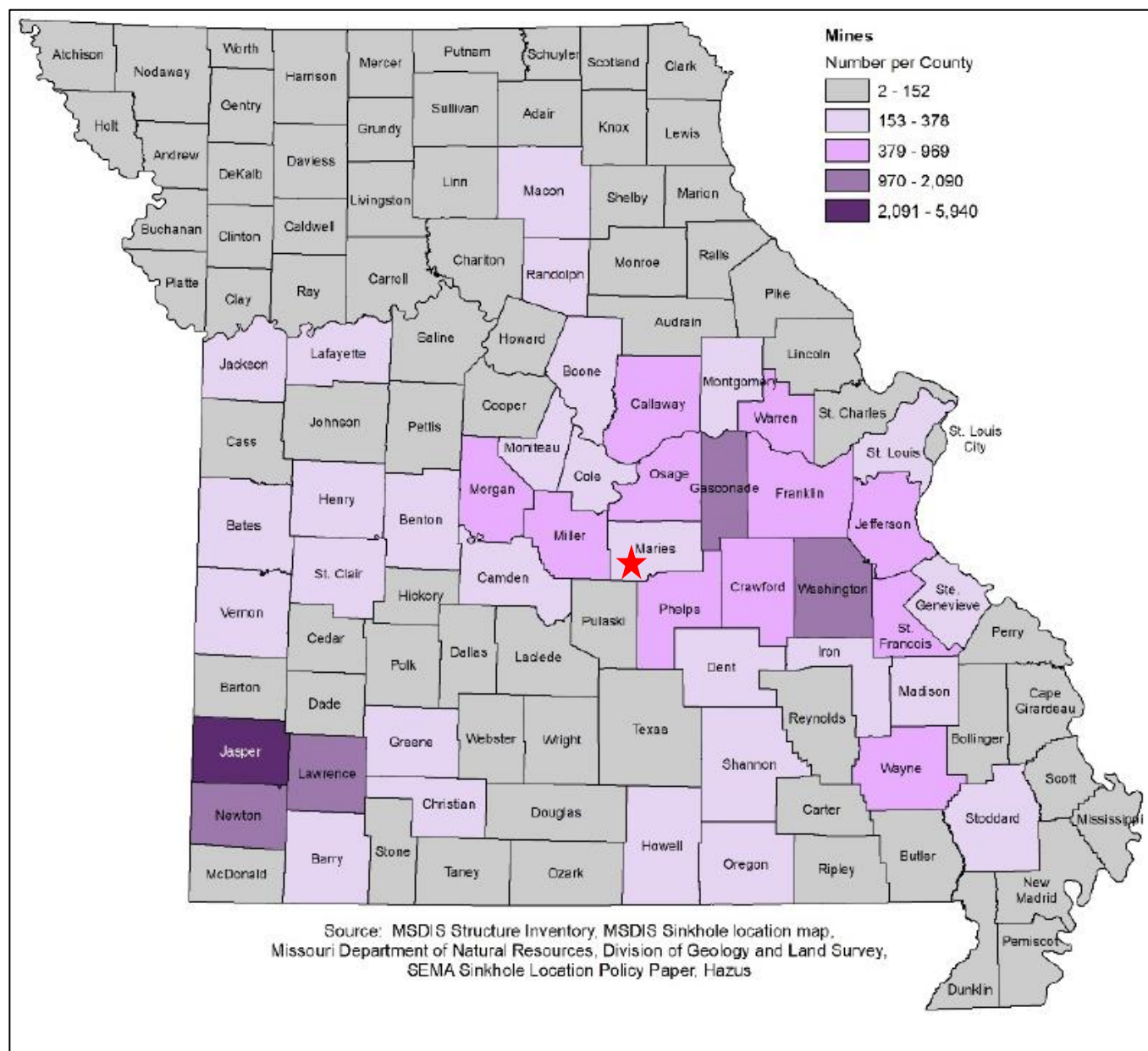
Source: <https://www.usgs.gov/media/images/karst-map-conterminous-united-states-2020>

**Figure 3.27. Sinkholes Counts per County**



Source: 2023 Missouri Hazard Mitigation Plan; \*Red star indicates Maries County

**Figure 3.28. Mines Counts Per County**



Source: 2023 Missouri Hazard Mitigation Plan; \*Red star indicates Maries County

### Severity/Magnitude/Extent

Unlike earthquakes or other geologic hazards, there currently is no scale for measuring or determining the severity of sinkholes. However, geological and mining parameters can affect the magnitude and extent of sinkhole subsidence. As previously noted, natural sinkholes develop in areas where the rock below the surface is limestone, carbonate rock, salt beds or any type of rock that can naturally be dissolved by groundwater circulating through it. Artificial sinkholes form due to groundwater pumping, water main and sewer collapses and mine collapses.<sup>1</sup>

<sup>1</sup> 2018 Missouri Hazard Mitigation Plan

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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.

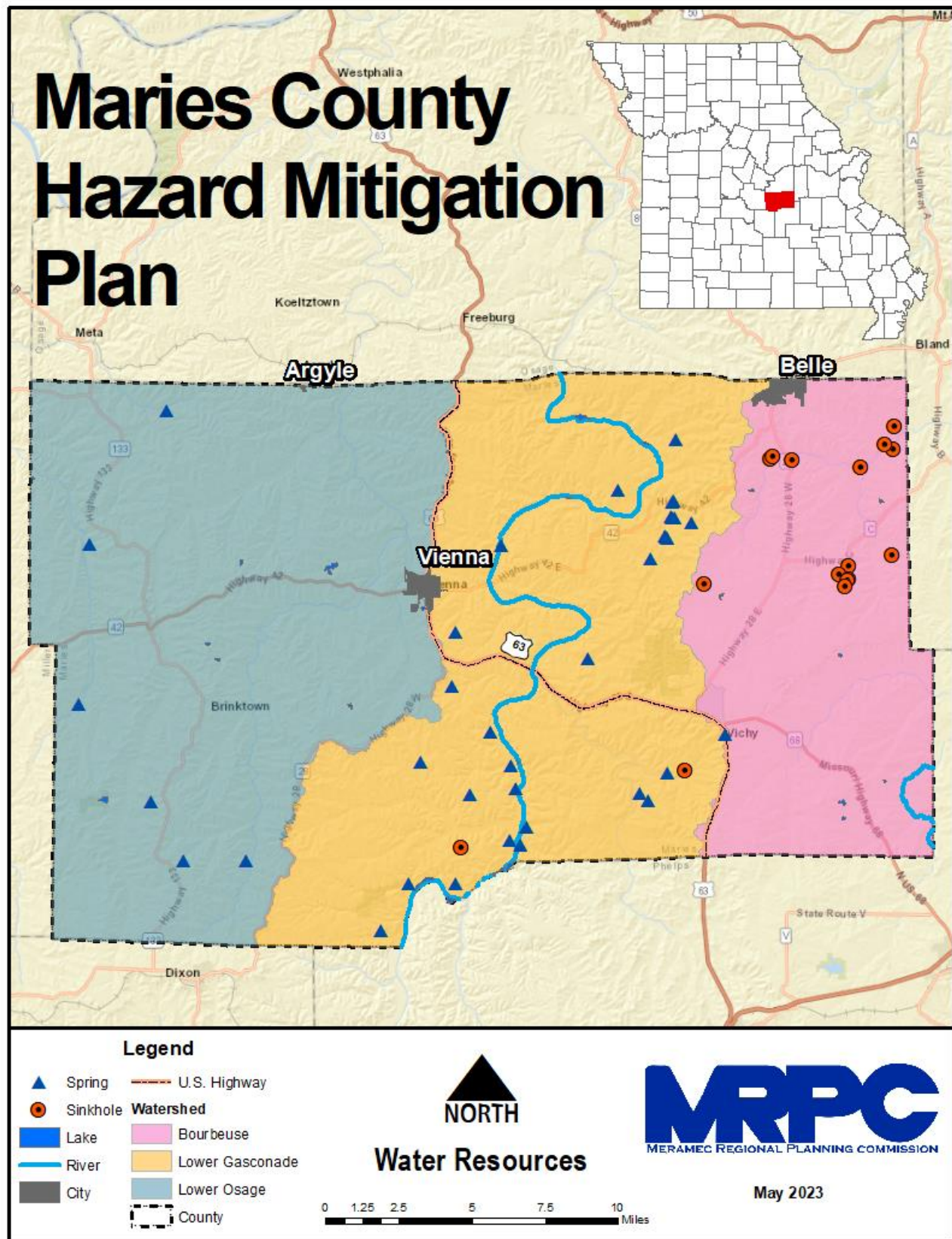
The 2023 State Plan mentions 15 documented sinkhole "notable events" that have occurred since 2004. The plan stated that sinkholes are common to Missouri and the probability is high that they will occur in the future. To date, Missouri sinkholes have rarely had major impacts on development, nor have they caused serious damage.

### ***Previous Occurrences***

Sinkhole formation is a regular occurrence in Missouri, but rarely are events of any significance. However, they have been occasional damages related to sinkholes. There are sinkholes and sinkhole areas in Maries County however, there have been no recorded incidents of death or damage. There are no recorded sinkholes in either the city of Vienna or the city of Belle. The majority of recorded sinkholes are located in rural, unincorporated areas in the northeast part of the county.



Figure 3.29. Maries County Watershed/Water Resources



## ***Probability of Future Occurrence***

Due to the lack of data for previous sinkhole events in Maries County, the probability of future occurrence could not be calculated.

## ***Changing Future Conditions Considerations***

Climate models predict both an increase in the length of dry periods as well as an increase in the severity of the heaviest rainfall events. This leads to the prime conditions for sinkhole formation: low levels of groundwater due to extended drought combined with a heavy influx of rainfall.

## **Vulnerability**

### ***Vulnerability Overview***

Unfortunately, no statistics are available for the number of subsurface locations that may potentially collapse in the future, forming a sinkhole. Sinkholes vary in size and location. These factors will determine the impact of the hazard, which could manifest as the loss of a personal vehicle, a building collapse or damage to infrastructure such as roads, water or sewer lines. Groundwater contamination is also a possible impact of a sinkhole. Because of the relationship of sinkholes to groundwater, pollutants captured in sinkholes (or dumped) can affect a community's groundwater system.

A statewide sinkhole inventory has been created by MoDNR's Missouri Geological Survey that will be used in addition to new data being developed for some newly mapped floodplain areas. The new data is being developed using the methods outlined in the Missouri Sinkhole Analysis Policy paper "Analysis and Communication of Flood Risk for Sinkholes in Missouri" funded in 2016 by SEMA. These inventories are polygon features which will be used for count analysis within ArcGIS.

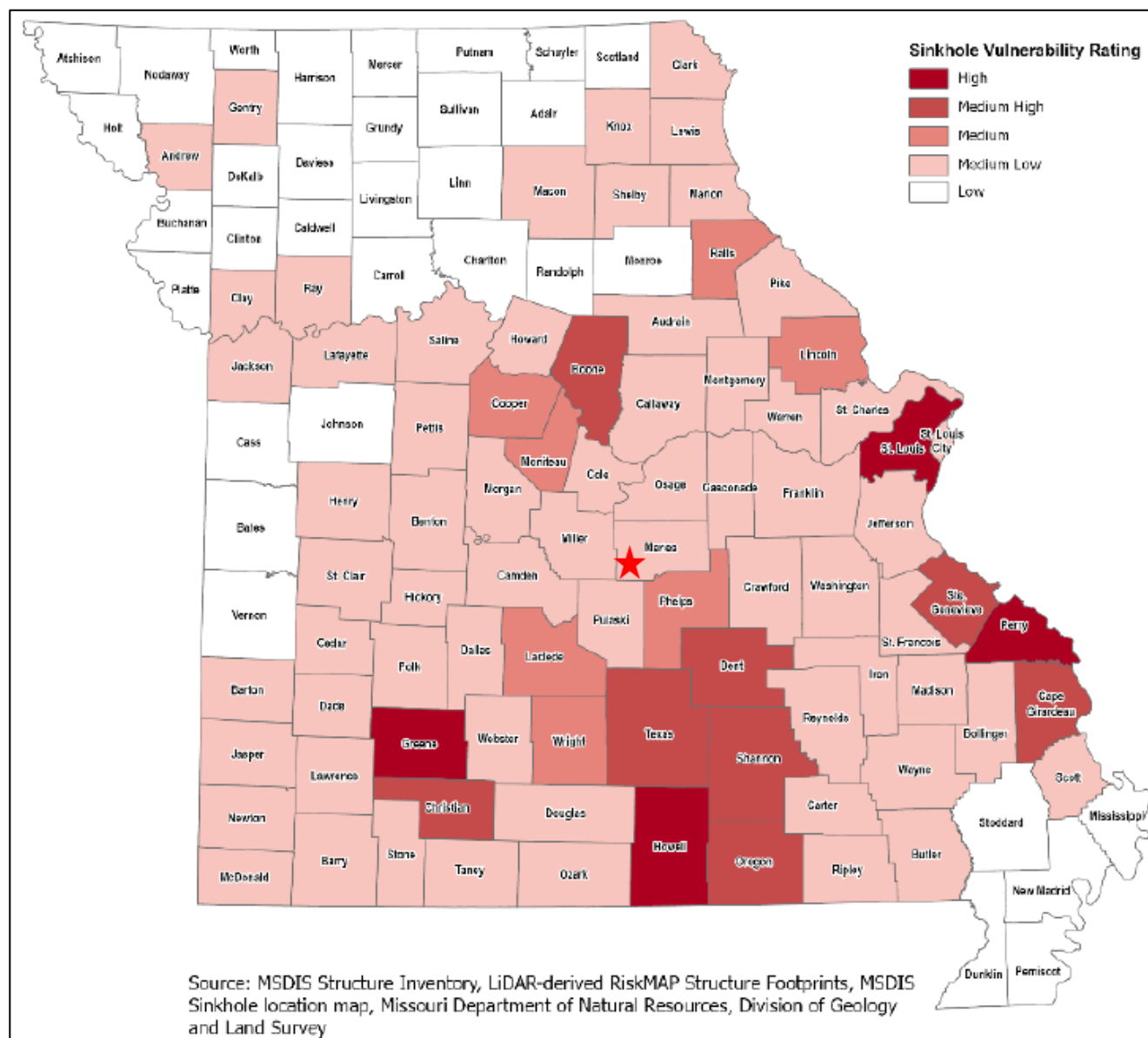
The sinkhole hazard layer was used in conjunction with the MSDIS structure file and LiDAR-derived RiskMAP structure footprints to determine structures that fall within sinkhole areas as well as structures that are within a buffered distance of 50 feet of sinkholes. Based on natural breaks in the data, a rating value of 5 categories from low to high was assigned. According to the state plan, if a county has 1-156 sinkholes, the risk is considered 2 – medium-low. See **Table 3.56.** and **Figure 3.30** further illustrate the sinkhole values.

**Table 3.56. Sinkhole/Mine Rating Values for Maries County**

<b>Factor</b>	<b>1 (Low)</b>	<b>2 (Medium-low)</b>	<b>3(Medium)</b>	<b>4 (Medium-high)</b>	<b>5 (High)</b>
Sinkholes per county	0	1-156	157-363	364-846	847-2707

*Source: 2023 Missouri Hazard Mitigation Plan*

**Figure 3.30. Sinkhole Rating Value by County**



Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

### **Potential Losses to Existing Development**

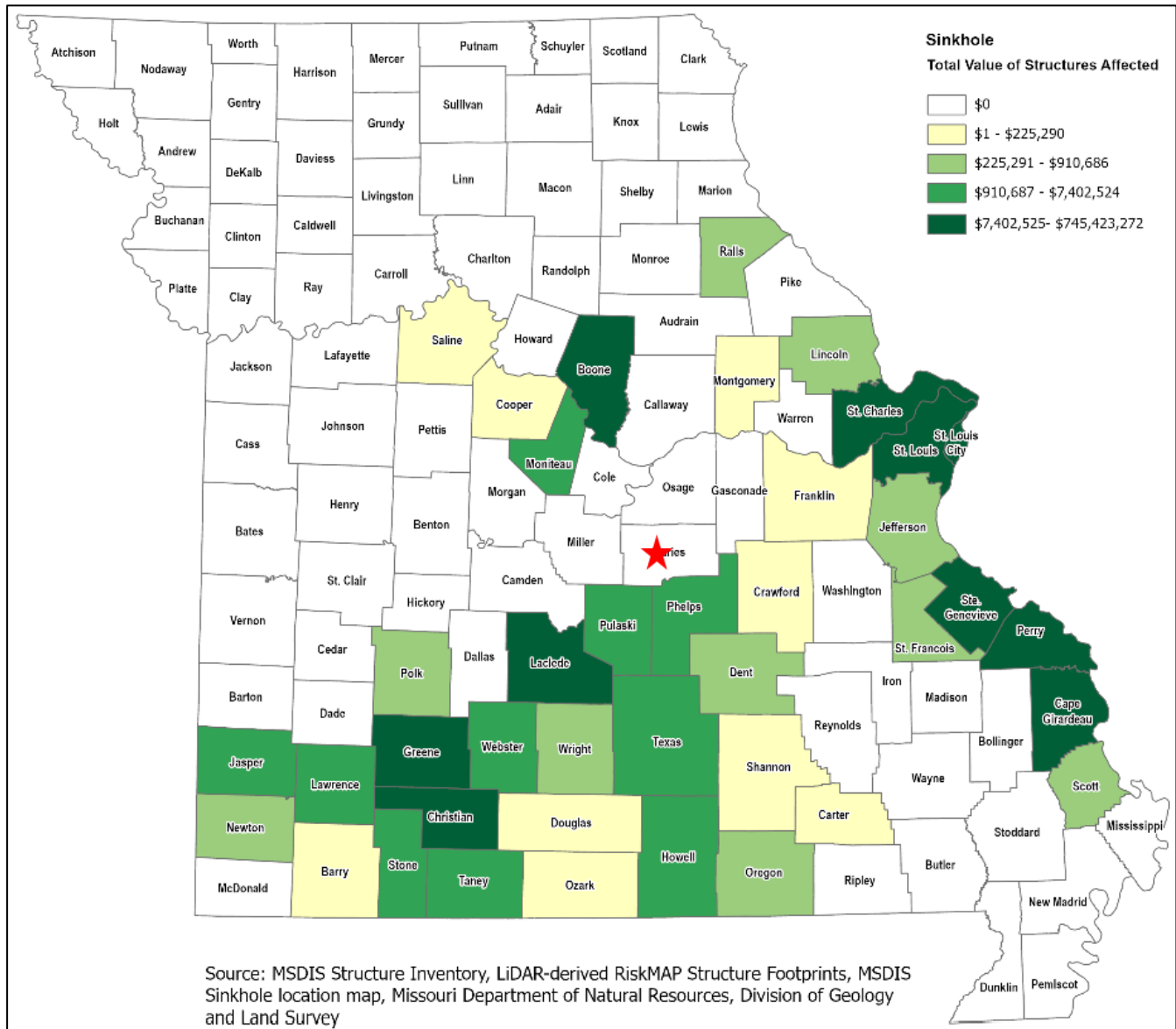
The most likely type of damage to occur in conjunction with a sinkhole collapse is property damage related to foundation disturbance. Signs include cracks in interior and exterior walls; doors and windows that no longer sit square or open and close properly; depressions forming in the yard; cracks in 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 vicinity<sup>1</sup>. In the event of a sudden collapse, an open sinkhole can form in a matter of minutes and swallow lawns, 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 Maries County.

<sup>1</sup> <http://sinkhole.org/commonsigns.php>



The 2023 Missouri Hazard Mitigation Plan devised a method of estimating potential losses using GIS data. **Figure 3.31** shows the ranking of structures that could potentially be impacted by sinkholes by county. This map shows that Maries County has \$0 value of structures affected.

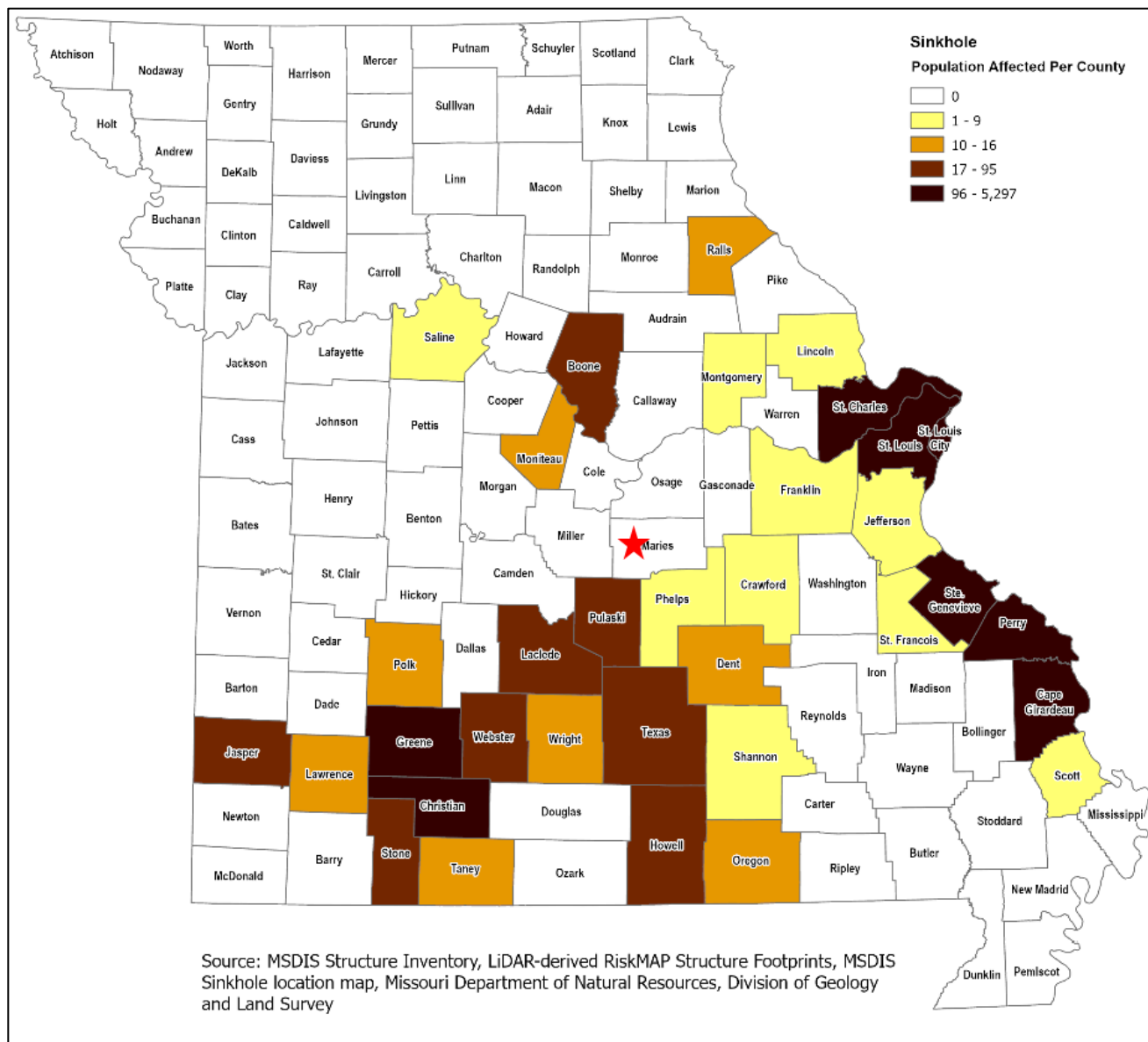
**Figure 3.31. Ranking of Structures Potentially Impacted by Sinkholes by County**



Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

**Figure 3.32** shows the population potentially impacted by sinkholes and again, Maries County shows that one to 0 people are expected to be affected by sinkholes.

**Figure 3.32. Ranking of Population Potentially Impacted by Sinkholes by County**



Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

### **Impact of Previous and 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. According to the state plan, Maries County's risk in regards to these hazards is low.

### **Hazard Summary by Jurisdiction**

According to the state plan, Maries County's sinkhole rating is medium low. Based on the location of known sinkholes, the communities and school districts have less vulnerability than the unincorporated areas of the county. As there are no documented sinkholes within the two communities, the jurisdiction most likely to be impacted by sinkholes is unincorporated Maries County. All school

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district facilities are located within the two communities and so are also at lower risk than some areas of the county. Information provided by the Missouri Department of Natural Resources indicates that most documented sinkholes are located in rural areas in the northeast quarter of the county.

### **Problem Statement**

Sinkholes and sinkhole/mining 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 mines and advised to avoid placing themselves and their property in danger by building in sinkhole/mining areas. Communities with building codes should include prohibitions on building in known sinkhole/mining areas.

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### 3.4.7 Severe Thunderstorms Including High Winds, Hail, and Lightning

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Some Specific Sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.8, Page 3.280  
[https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO\\_Hazard\\_Mitigation\\_Plan2018.pdf](https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf)
- FEMA 320, Taking Shelter from the Storm, 3rd edition, [http://www.weather.gov/media/bis/FEMA\\_SafeRoom.pdf](http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf)
- Lightning Map, National Weather Service, <https://www.vaisala.com/sites/default/files/documents/WEA-MET-Annual-Lightning-Report-2020-B212260EN-A.pdf>
- Death and injury statistics from lightning strikes, National Weather Service.
- Wind Zones in the U.S. map, FEMA, [https://www.fema.gov/pdf/library/ism2\\_s1.pdf](https://www.fema.gov/pdf/library/ism2_s1.pdf);
- Annual Windstorm Probability (65+knots) map U.S. 1980-1994, NSSL, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bigwind.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif)
- Hailstorm intensity scale, The Tornado and Storm Research Organization (TORRO), <https://www.torro.org.uk/research/hail/hscale>;
- NCEI data;
- USDA Risk Management Agency, Insurance Claims, <https://www.rma.usda.gov/Information-Tools/Summary-of-Business/Cause-of-Loss>;
- National Severe Storms Laboratory – hail map, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bighail.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif)
- MSDIS Structure Inventory and All Hazard Risk Dataset (available in both GIS and Excel format) <https://drive.google.com/drive/folders/0Bzq99s866kWocFB5Y3hCRIRuWWM>
- Missouri Hazard Mitigation Viewer  
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<http://drive.google.com/file/d/1bPkc0jqF9ofwQLnTL9N0u-oPFWi9hkst/view> - User Guide
  - Average annual high wind events by County
  - Average annual hail events by County
  - Average annual lightning events by County
  - Vulnerability to severe thunderstorm event by County
  - Annualized property loss for high wind events by County
  - Annualized property loss for lightning events by County
  - Annualized property loss ratio for high wind events by County
  - Annualized property loss ratio for hail events by County
  - Annualized property loss ratio for lightning events by County

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## **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 3.4.5**) 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.

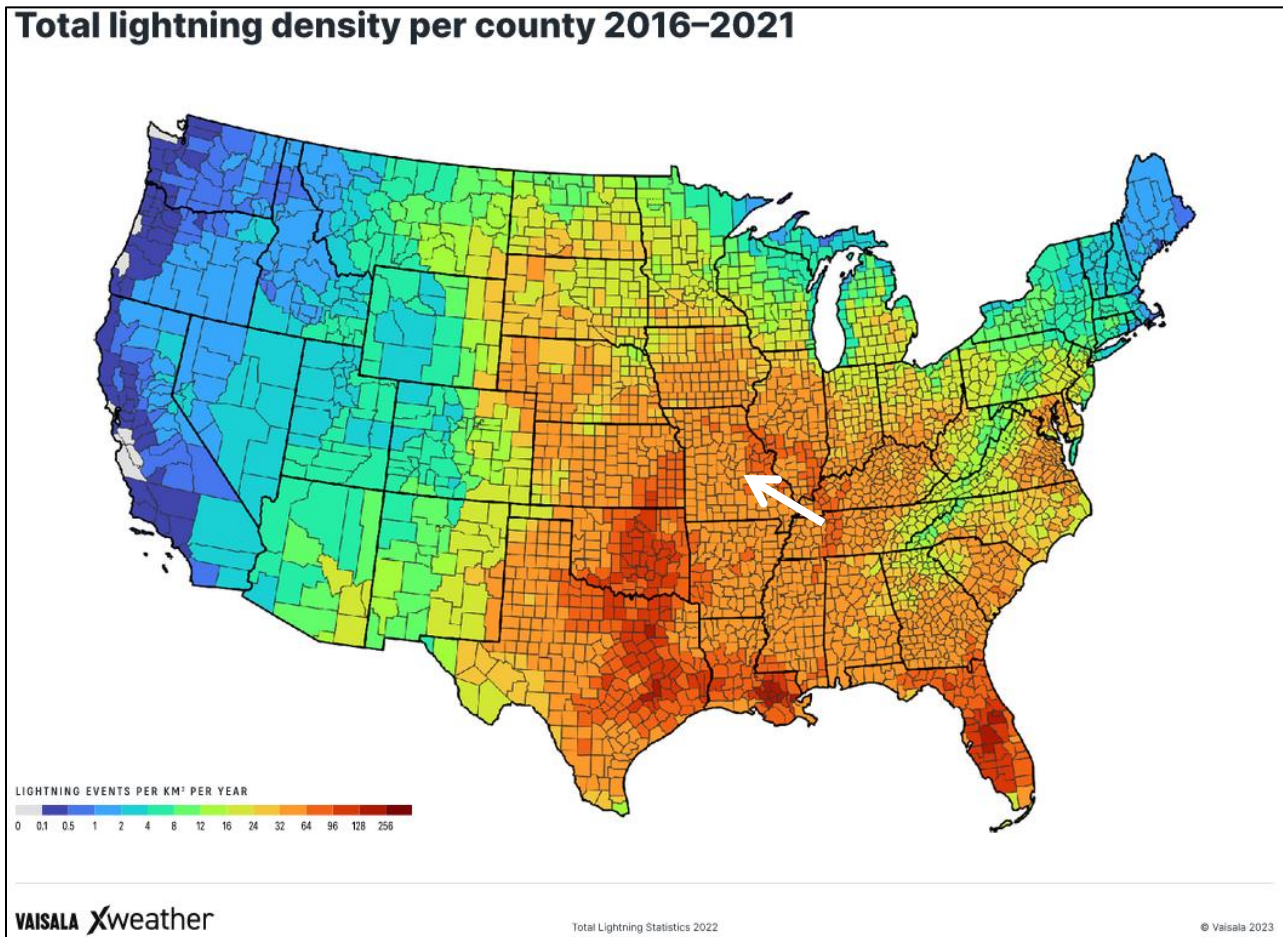
### ***Geographic Location***

Thunderstorms, high winds, hail, and lightning events are an area-wide hazard that can take place

anywhere across the county. Furthermore, while 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 3.33** depicts the location and frequency of lightning in Missouri. Additionally, the map indicates that the flash density of Maries County ranges between 32 and 64 flashes per square kilometer per year.

**Figure 3.33. Location and Frequency of Lightning in Missouri**

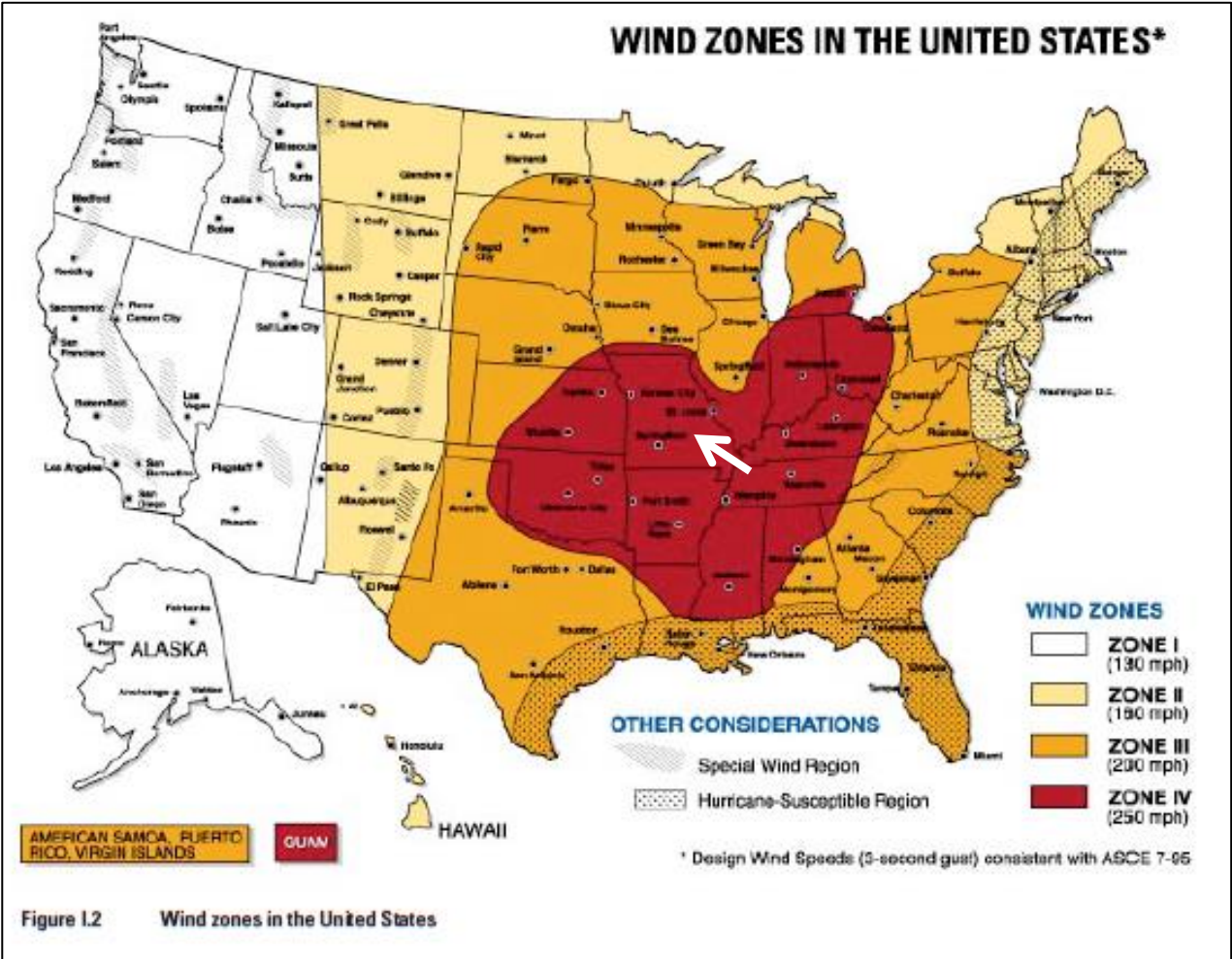


Source: National Weather Service, <https://indd.adobe.com/view/d0591066-471e-41b9-83e1-4dc937aaeb96> \* Maries County is indicated by a white arrow.

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 3.34**).



Figure 3.34. Wind Zones in the United States



Source: FEMA 320, Taking Shelter from the Storm, 3<sup>rd</sup> edition, [https://www.fema.gov/pdf/library/ism2\\_s1.pdf](https://www.fema.gov/pdf/library/ism2_s1.pdf)

\*Maries County is indicated by a white arrow.

### Severity/Magnitude/Extent

Based on information provided by the Tornado and Storm Research Organization (TORRO), Table 3.57 below describes typical damage impacts of the various sizes of hail.

Table 3.57. Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	DiameterSize (inches)	Description	Typical Damage Impacts
Hard Hail	5	0.2	Pea	No damage
Potentially Damaging	5 - 15	0.2 - 0.6	Mothball	Slight general damage to plants, crops
Significant	10 - 20	0.4 - 0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	20 - 30	0.8 - 1.2	Walnut	Severe damage to fruit and crops, damage to glass, plastic structures, paint and wood scored



Severe	25 - 40	1.0 – 1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	30 – 50	1.2 – 2.0	Golf ball > pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	40 - 60	1.6 - 2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	50 – 75	2.0 – 3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	60 – 90	2.4 – 3.5	Large orange > soft ball	Severe damage to aircraft bodywork
Super Hailstorms	75 – 100	3.0 – 3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.
Super Hailstorms	>100	3.9+	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. <https://www.torro.org.uk/research/hail/hscale>

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.

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.

### **Previous Occurrences**

Due to the lack of available parameters, heavy rain is utilized in the place of thunderstorms in **0**. Moreover, thunderstorm wind and strong wind was included with high winds. NCEI data was obtained for lightning, and hail events between 2003 and 2022 as well (**Table 3.59**, **Table 3.60**, and **Table 3.59**). However, limitations to the use of NCEI reported lightning events include the fact that only lightning events that result in fatality, injury and/or property and crop damage are in the NCEI.

**Table 3.58. NCEI Maries County Heavy Rain Events Summary, 2003 to 2022**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Rainfall (Inch)
2018	2	0	0	0	4.28
2019	2	0	0	0	5.33
<b>Total</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>

Source: NCEI, data accessed [2/7/2023]

**Table 3.59. NCEI Maries County High Wind Events Summary, 2003 to 2022 (Thunderstorm)**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
2003	5	0	0	0	65
2004	2	0	0	0	55
2005	5	0	0	2K	60
2006	1	0	0	0	50
2007	2	0	0	20K	54
2008	3	0	0	4K	55
2009	2	0	0	12K	50
2010	2	0	0	35K	61
2011	4	0	0	3K	52
2012	2	0	0	0	52
2013	2	0	0	0	52
2014	2	0	0	0	52
2015	4	0	0	10K	52
2016	2	0	0	0	53
2017	3	0	0	5K	52
2019	2	0	0	0	52
2020	1	0	0	50K	52
2021	5	0	0	0	57
2022	1	0	0	10K	52
<b>Total</b>	<b>55</b>	<b>0</b>	<b>0</b>	<b>151K</b>	<b>-</b>

Source: NCEI, data accessed [2/7/2023]

**Table 3.60. NCEI Maries County Lightning Events Summary, 2003 to 2022**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damage
-	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Source: NCEI, data accessed [2/7/2023]

**Table 3.61. NCEI Maries County Hail Events Summary, 2003 to 2022**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
2003	6	0	0	0	1.00
2004	7	0	0	0	4.50
2005	5	0	0	0	1.25
2006	6	0	0	0	1.00
2007	1	0	0	0	0.75
2008	5	0	0	0	1.75
2011	5	0	0	0	1.25
2012	8	0	0	0	1.75
2013	4	0	0	0	1.75
2016	3	0	0	0	1.50
2017	1	0	0	0	1.00
2019	1	0	0	0	1.00
2020	1	0	0	0	0.88
2022	1	0	0	0	0.88
<b>Total</b>	<b>54</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>

Source: NCEI, data accessed [2/7/2023]

Agriculture is an important piece of the economy for Maries County. The table below (0) summarize past crop damages as indicated by crop insurance claims. The table illustrates the magnitude of the impact on the planning area's agricultural economy. It should be noted that the USDA Risk Management Agency data does not align directly with the breakdown of hazards listed here. The claims database only listed "Hail", "Excessive Moisture/Precipitation/ Rain", and "Wind/Excessive Wind" as causes of loss categories that align with this hazard. Between 2003 and 2022 a total of 94 insurance claims were paid out for damages due to excessive moisture, precipitation. The total claims paid for this cause were \$643,518.20.

For the time period 2003-2022, there was one crop insurance claim made for wind and excessive wind damage for \$4,678.00.

**Table 3.62. Crop Insurance Claims Paid In Maries County from Severe Thunderstorms 2003-2022**

Crop Year	Number of Claims	Cause of Loss Description	Insurance Paid
2004	1	Excessive Moisture/Precipitation/Rain	\$3,643.00
2008	1	Excessive Moisture/Precipitation/Rain	\$1,668.00
2009	3	Excessive Moisture/Precipitation/Rain	\$3,120.00
2010	4	Excessive Moisture/Precipitation/Rain	\$1,487.00
2011	1	Excessive Moisture/Precipitation/Rain	\$1,181.00
2012	1	Excessive Moisture/Precipitation/Rain	\$645.00
2013	16	Excessive Moisture/Precipitation/Rain	\$101,868.50
2014	2	Excessive Moisture/Precipitation/Rain	\$3,614.00
2015	25	Excessive Moisture/Precipitation/Rain	\$272,552.60
2016	2	Excessive Moisture/Precipitation/Rain	\$40,170.00
2017	9	Excessive Moisture/Precipitation/Rain	\$24,800.00
2018	3	Excessive Moisture/Precipitation/Rain	\$14,723.00
2019	10	Excessive Moisture/Precipitation/Rain	\$30,341.80
	1	Wind/Excess Wind	\$4,678.00
2020	4	Excessive Moisture/Precipitation/Rain	\$9,266.90
2021	8	Excessive Moisture/Precipitation/Rain	\$85,477.40
2022	4	Excessive Moisture/Precipitation/Rain	\$48,960.00
<b>Total</b>	<b>95</b>	-	<b>\$648,196.20</b>

Source: USDA Risk Management Agency, Insurance Claims, <https://www.rma.usda.gov/Information-Tools/Summary-of-Business/Cause-of-Loss>

### **Probability of Future Occurrence**

From the data obtained from the NCEI <sup>1</sup>, annual average percent probabilities were calculated for heavy rainfall, high winds, lightning, and hail. Heavy rainfall has a 20 percent annual average percent probability of occurrence (4 events/20 years x 100) (**Table 3.63**). Heavy rainfall events can be found in **0**.

The annual average percent probability for high winds within the county is 100 percent (55 event/20 years \* 100) with an average 2.75 events per year (**Table 3.64**). High wind events can be found in **Table 3.59**.

Lightning events have a 0 percent annual average percent probability of occurrence (0 events/20

<sup>1</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

years x 100) (**Table 3.61**) Lightning events can be found in **Table 3.60**.

Lastly, the annual average percent probability of hail occurrence is 100 percent (54 events/20 years x 100) with an average of 2.70 events per year (**Table 3.66**). Hail events can be found in **0**.

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**Table 3.63. Annual Average % Probability of Heavy Rain in Maries County**

Location	Annual Avg. % P
Maries County	20%

\*P = probability; see page 3.24 for definition.

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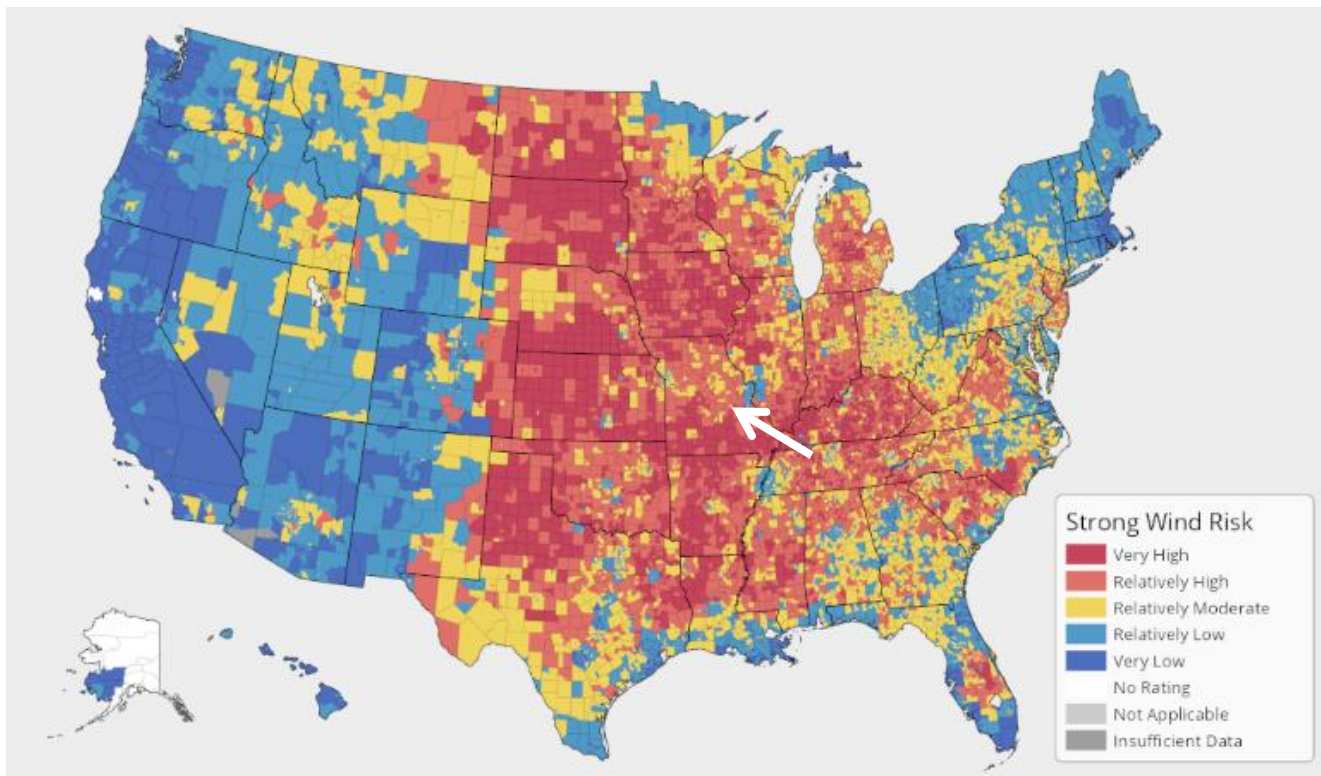
**Table 3.64. Annual Average % Probability of High Winds in Maries County**

Location	Annual Avg. % P	Avg. # of Events
Maries County	100%	2.75

\*P = probability; see page 3.24 for definition.

**0** depicts a map illustrating the risk of losses due to high wind events. In the National Risk Index, a Strong Wind Risk Index score and rating represent a community's relative risk for Strong Wind when compared to the rest of the United States. A Strong Wind Expected Annual Loss score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to Strong Wind when compared to the rest of the United States.

**Figure 3.35. National Risk Index for High Winds Events**



Source: FEMA, <https://hazards.fema.gov/nri/strong-wind>, White arrow points to Maries County

**Table 3.65. Annual Average % Probability of Lightning in Maries County**

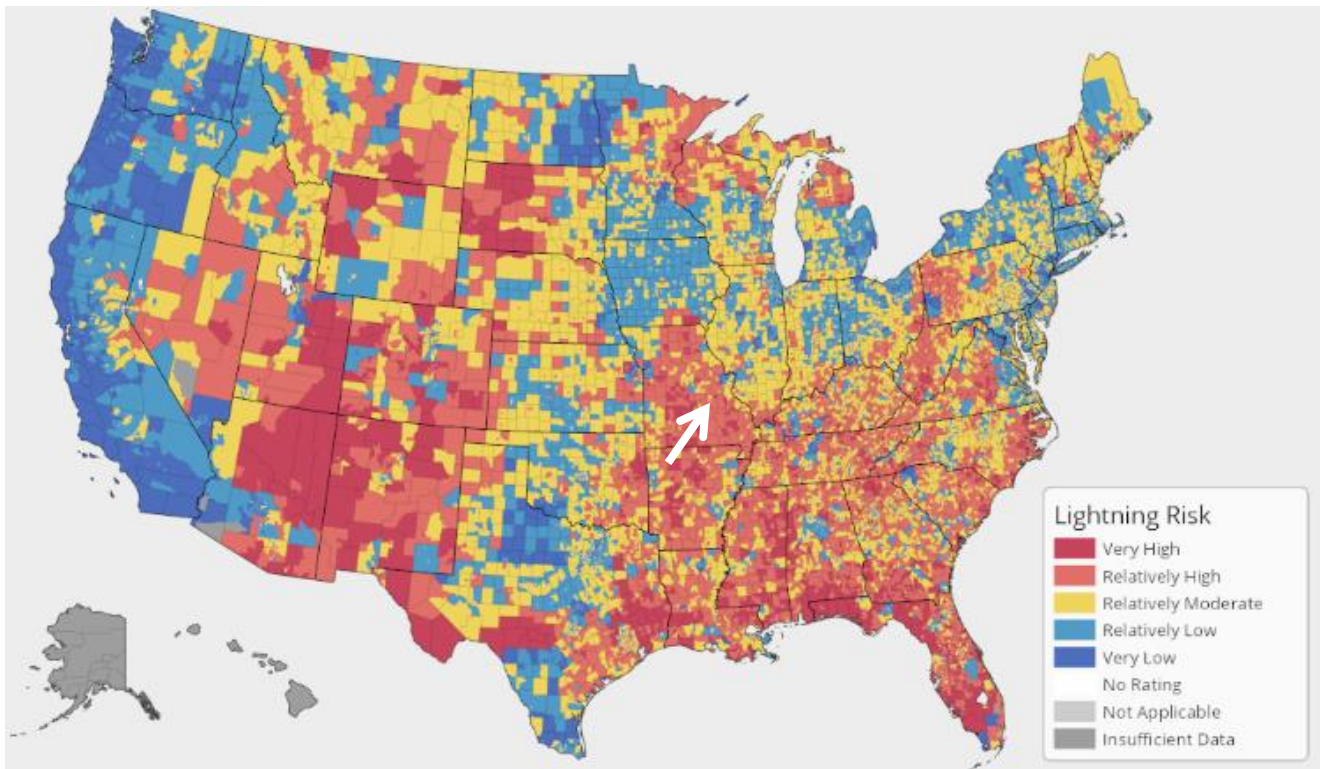
Location	Annual Avg. % P
Maries County	0%

\*P = probability; see page 3.24 for definition.

**Figure 3.36** depicts a map illustrating the risk of losses due to lightning events in the United States. In the National Risk Index, a Lightning Risk Index score and rating represent a community's relative risk for Lightning when compared to the rest of the United States. A Lightning Expected Annual Loss score and rating represent a community's relative level of expected building and population loss each year due to Lightning when compared to the rest of the United States.



**Figure 3.36. National Risk Index for Lightning Events**



Source: FEMA, <https://hazards.fema.gov/nri/lightning>, White arrow points to Maries County

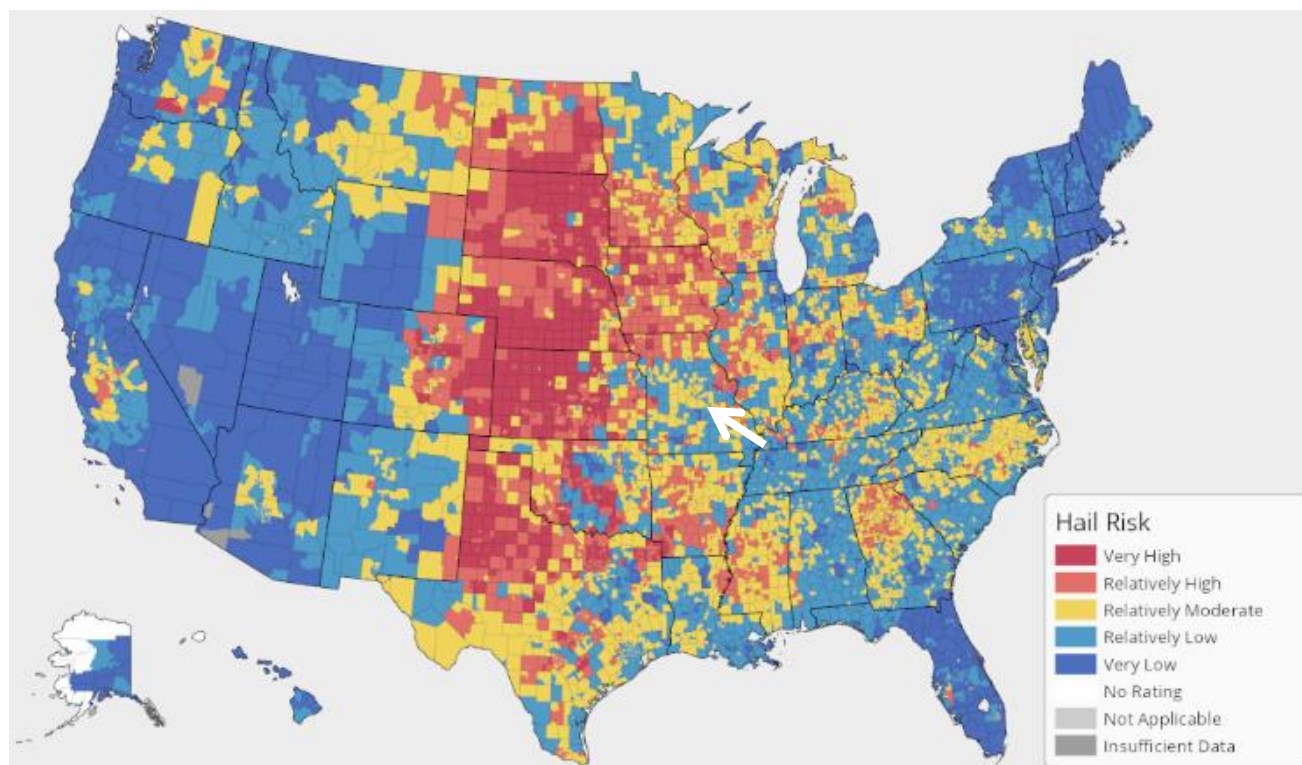
**Table 3.66. Annual Average % Probability of Hail in Maries County**

Location	Annual Avg. % P	Avg. # of Events
Maries County	100%	2.70

\*P = probability; see page 3.24 for definition.

**Figure 3.37** depicts a map illustrating the risk of losses due to hail events. In the National Risk Index, a Hail Risk Index score and rating represent a community's relative risk for Hail when compared to the rest of the United States. A Hail Expected Annual Loss score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to Hail when compared to the rest of the United States.

**Figure 3.37. National Risk Index for Hail Events**



Source: FEMA, <https://hazards.fema.gov/nri/hail>, White arrow points to Maries County

### ***Changing Future Conditions Considerations***

Extreme events such as tornadoes and severe thunderstorms occur in shorter time periods and smaller areas than other extreme phenomena. This makes it difficult to detect trends and develop future projections. Compared to damages from other types of extreme weather, those occurring due to thunderstorm-related weather hazards have increased the most since 1980. There is some indication that in a warmer world an increase in the number of days with conditions conducive to severe thunderstorms is possible<sup>1</sup>.

## **Vulnerability**

### ***Vulnerability Overview***

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

<sup>1</sup> <https://nca2018.globalchange.gov/chapter/2/>

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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.<sup>1</sup>

Data was obtained from the 2018 Missouri State Hazard Mitigation Plan for vulnerability overview and analysis. Since severe thunderstorms occur frequently throughout Missouri, the method used to determine vulnerability to severe thunderstorms was statistical analysis of data from several sources including: National Centers for Environmental Information (NCEI) storm events data (1996 to December 31, 2016 – which will differ slightly from data collected for the Maries County plan which is 1999-2019), HAZUS Building Exposure Value data, housing density and mobile home data from the U.S. Census (2015 ACS), and the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina.<sup>2</sup>

From the data collected, six factors were considered in determining vulnerability to lightning as follows: housing density, building exposure, percentage of mobile homes, social vulnerability, likelihood of occurrence, and average annual property loss. A rating value of one through five was assigned to each factor. Rating values are as follows:

- 1) Low
- 2) Low-medium
- 3) Medium
- 4) Medium-high
- 5) High

**Table 3.67** illustrates the factors considered and ranges for the rating values assigned.

Once the ranges were determined and applied to all factors considered in the analysis for wind, hail and lightning, they were rated individually and factored together to determine an overall vulnerability rating for thunderstorms. **Table 3.68** provides the calculated ranges applied to determine overall vulnerability of Missouri counties to severe thunderstorms.

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<sup>1</sup> <http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx>

<sup>2</sup> 2018 Missouri Hazard Mitigation Plan

**Table 3.67. Ranges for Severe Thunderstorm Vulnerability Factor Ratings**

Factors Considered	Low (1)	Medium Low (2)	Medium (3)	Medium High (4)	High (5)
<b>Common Factors</b>					
Housing Density (# per sq. mile)	4-46	47-140	141-283	284-871	872-2,865
Building Exposure (\$1,000)	\$286,351- \$3,053,773	\$3,381,480- \$9,044,465	\$11,043,270- \$24,814,360	\$30,225,497- \$50,440,776	\$96,532,305- \$153,542,314
Percent Mobile Homes	0.23-4.38	4.39-8.24	8.25-13	13.01-23.77	23.78-34.58
Social Vulnerability	1	2	3	4	5
<b>Wind</b>					
Likelihood of Occurrence (# of events/ yrs. of data)	0.83-3.27	3.28-5.31	5.32-8.77	8.78-15.23	15.24-23.5
Average Annual Property Loss (annual property loss/ yrs of data)	\$0	\$1- \$144,538	\$144,539- \$315,712	\$315,713- \$724,312	\$724,313- \$2,006,385
<b>Hail</b>					
Likelihood of Occurrence (# of events/ yrs. of data)	1.12-3.12	3.13-4.92	4.93-7.23	7.24-11.42	11.43-17.23
Average Annual Property Loss (annual property loss/ yrs. of data)	\$0	\$1- \$138,907	\$139,908- \$377,884	\$377,885- \$7,846,346	\$7,846,347- \$32,787,692
<b>Lightning</b>					
Likelihood of Occurrence (# of events/ yrs. of data)	0	0.01-0.12	0.13-0.23	0.24-0.35	0.36-0.65
Average Annual Property Loss (annual property loss/ yrs. Of data)	\$0	\$1- \$6,038	\$6,039- \$15,192	\$15,193- \$30,846	\$30,847- \$48,000

Source: 2023 Missouri Hazard Mitigation Plan

**Table 3.68. Ranges for Severe Thunderstorm Combined Vulnerability Rating**

	Low (1)	Medium Low (2)	Medium (3)	Medium High (4)	High (5)
Severe Thunderstorm Combined Vulnerability	11-16	17-19	20-23	24-29	30-36

Source: 2023 Missouri Hazard Mitigation Plan

According to the Hazus data included in the 2023 state plan, Maries County has total building exposure to severe thunderstorms of \$995,884,000. **Table 3.69** shows housing density, building exposure, SOVI and mobile home data for Maries County. The county's building exposure and housing density rating is low, while the SOVI ranking and the percent of mobile homes in the county, at 20.1 percent of the housing stock, are both rated as medium. **Table 3.70**, also pulled from the state plan, provides data on the number of events and likelihood of occurrence and occurrence rating for high wind, hail and lightning.

**Table 3.69. Maries County Housing Density, Building Exposure, SOVI and Mobile Home Data**

Total Building Exposure (Hazus)	Building Exposure Rating	Housing Density	Housing Density Rating	SOVI Ranking	SOVI Ranking Rating	Percent Mobile Homes	Percent Mobile Homes Rating
\$995,884,000	1	8.75	1	Medium	3	9.7	3

Source: 2023 Missouri Hazard Mitigation Plan

**Table 3.70. Number of High Wind, Hail and Lightning Events, Likelihood of Occurrence and Associated Ratings for Maries County**

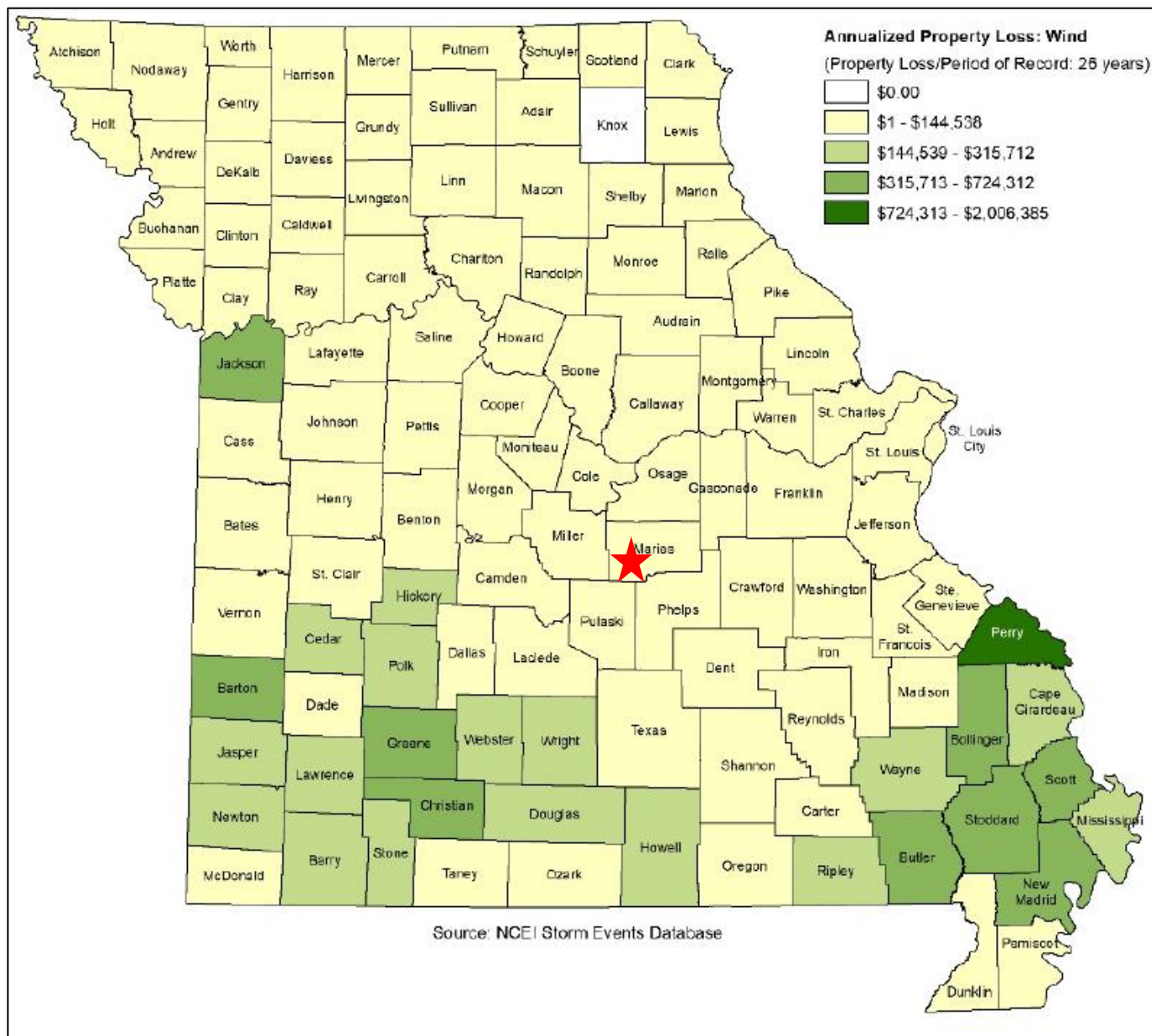
High Wind			Hail			Lightning		
Total Number of Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total Number of Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total Number of Events	Likelihood of Occurrence	Likelihood of Occurrence Rating
62	2.38	1	69	2.65	1	0	0.000	1

Source: 2023 Missouri Hazard Mitigation Plan

**Figure 3.38** through **Figure 3.40** have been pulled from the 2023 Missouri Hazard Mitigation Plan and further depict the annualized damages caused by high winds, hail, and lightning events in Missouri.



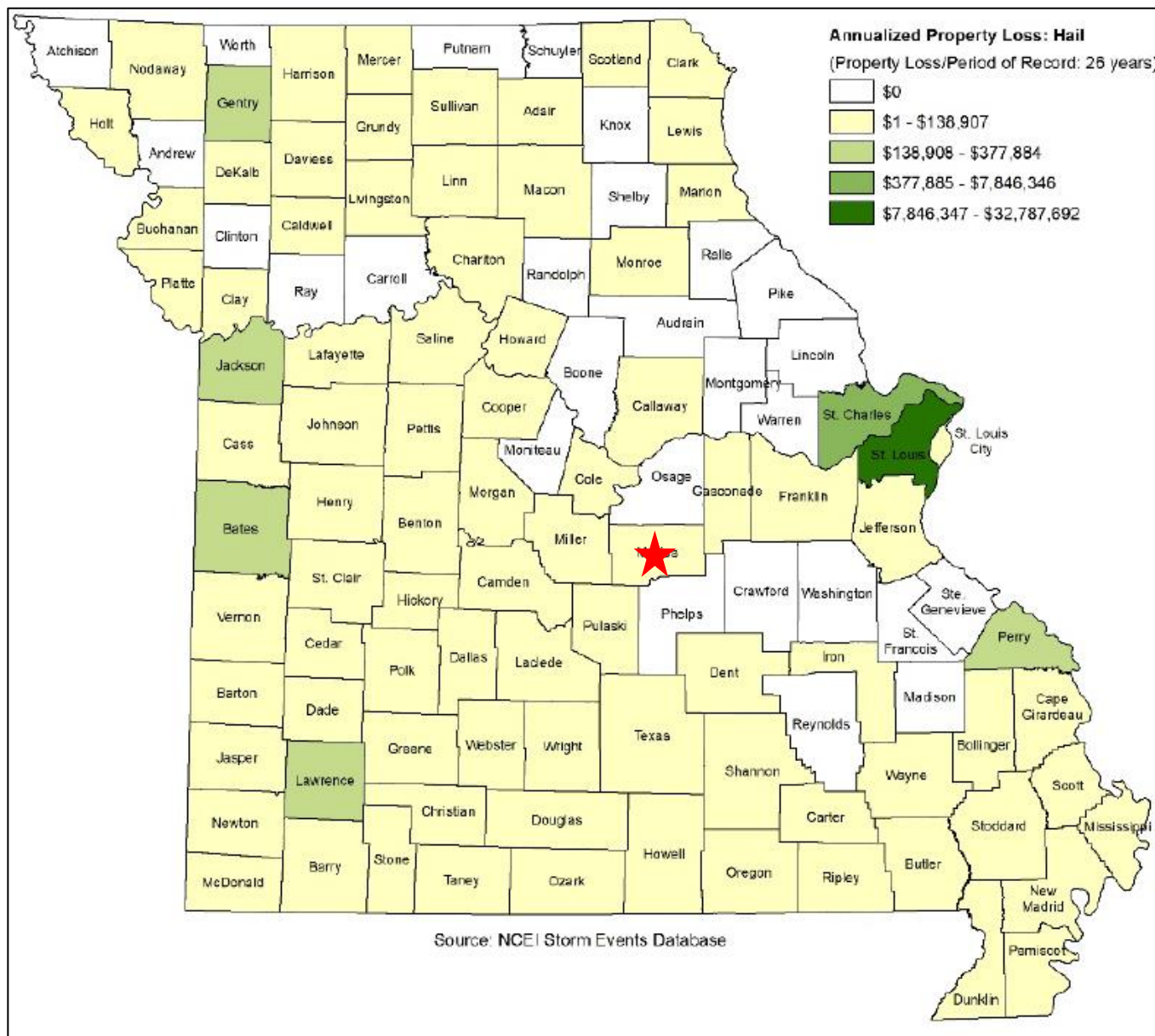
**Figure 3.38. Annualized High Wind Damages (40 MPH and Higher)**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

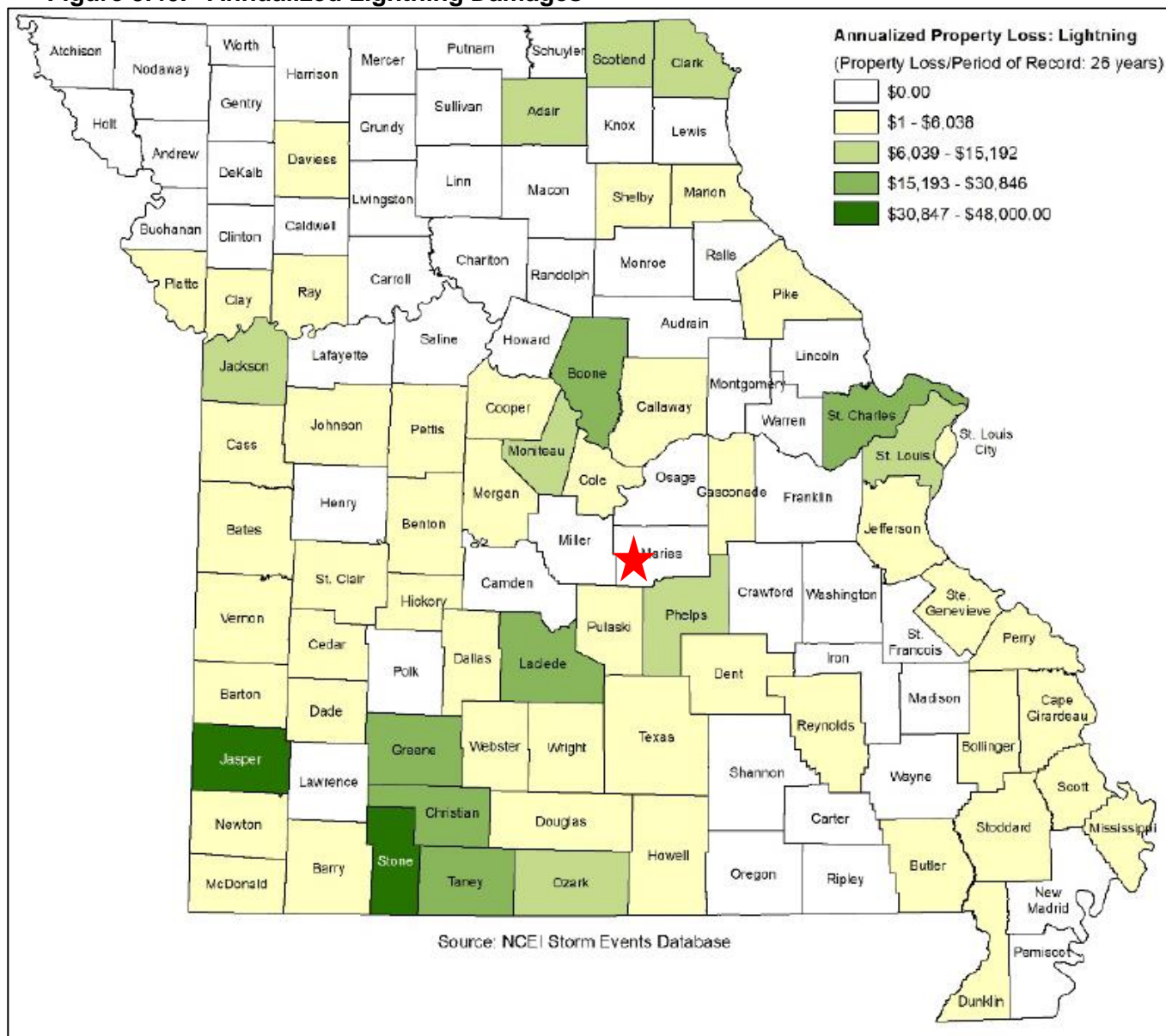


**Figure 3.39. Annualized Hail Damages**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

**Figure 3.40. Annualized Lightning Damages**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

**Table 3.67** provides additional data obtained from the National Centers for Environmental Information for property loss to complete the overall vulnerability analysis.

**Table 3.71. Annualized Property Loss and Associated Ratings for Maries County**

High Wind		Hail		Lightning	
Total Annualized Property Loss	Total Annualized Property Loss Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating
\$11,038	1	\$192	1	\$0	1

Source: 2023 Missouri State Hazard Mitigation Plan

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 calculated ranges applied to determine overall vulnerability of Missouri counties to severe thunderstorms can be found in **Table 3.68**. **Table 3.72** provides the calculated vulnerability rating for the severe thunderstorm hazard. **Figure 3.41** that follows provides the mapped results of this analysis by county<sup>1</sup>.

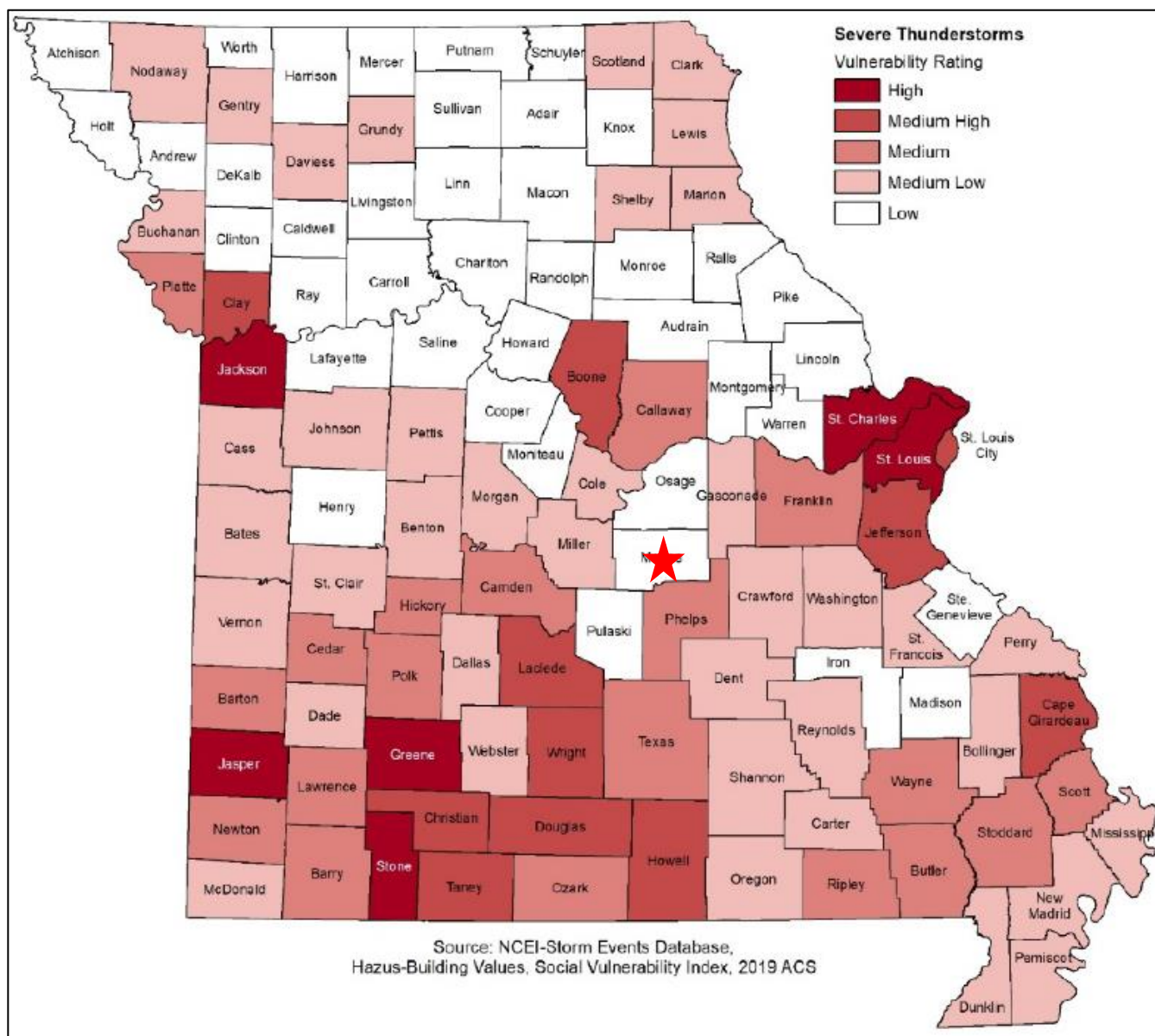
**Table 3.72. Severe Thunderstorm Vulnerability Rating for Maries County**

Total Sum of All Factor Ratings	Overall Vulnerability Rating for Thunderstorms	Overall Vulnerability Rating for Thunderstorms Description
15	1	Low

Source: 2023 Missouri State Hazard Mitigation Plan

<sup>1</sup> 2018 Missouri State Hazard Mitigation Plan

**Figure 3.41. Vulnerability Summary for Severe Thunderstorms**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

### **Potential Losses to Existing Development**

According to the NCEI Maries County experienced approximately \$151,000 in property damages from severe thunderstorms between 2003 and 2022. The USDA reports a total of \$648,196.20 in crop insurance payouts in the same time period. This is a combined average of \$39,959.81 in losses due to this hazard per year. 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 area.

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### ***Impact of Previous and Future Development***

Population trends from 2010 to 2020 for Maries County indicate that the population in unincorporated areas has fallen by an estimated 7.85 percent. The city of Belle's population has decreased by 10.6 percent. The city of Vienna's population has decreased by 4.75 percent. Overall, the county has decreased its population by 8.11 percent. It is difficult to determine future impacts. However, anticipated development in each jurisdiction will result in increased exposure. 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 damage from severe thunderstorms. Unincorporated Maries County has both a higher percentage of housing built before 1939 at 13.7 percent and a higher percentage of mobile homes at 19.4 percent, which are also more prone to damage.

### **Problem Statement**

The NCEI Storm Events Database notes over 113 thunderstorm and wind events in Maries County from 2003 - 2022, with about \$151,000.00 in property and crop damages reported. Early warnings are possibly the best hope for residents when severe weather strikes. Cities that do not already possess warning systems – whether that is storm sirens or automated email/text/phone call systems - should plan to invest in such 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.



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### 3.4.8 Severe Winter Weather

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Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.9, Page 3.321  
[https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO\\_Hazard\\_Mitigation\\_Plan2018.pdf](https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf)
- 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, <https://www.rma.usda.gov/Information-Tools/Summary-of-Business/Cause-of-Loss>;
- Any local Road Department data on the cost of winter storm response efforts.
- National Centers for Environmental Information, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>
- MSDIS Structure Inventory and All Hazard Risk Dataset (available in both GIS and Excel format)  
<https://drive.google.com/drive/folders/0Bzq99s866kWocFB5Y3hCRIRuWWM>
- Missouri Hazard Mitigation Viewer  
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view> - User Guide
  - o Average annual severe winter weather events by County
  - o Vulnerability to severe winter weather events by County
  - o Annualized property loss for severe winter weather events by County
  - o Annualized property loss for severe winter weather events by County

#### **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.

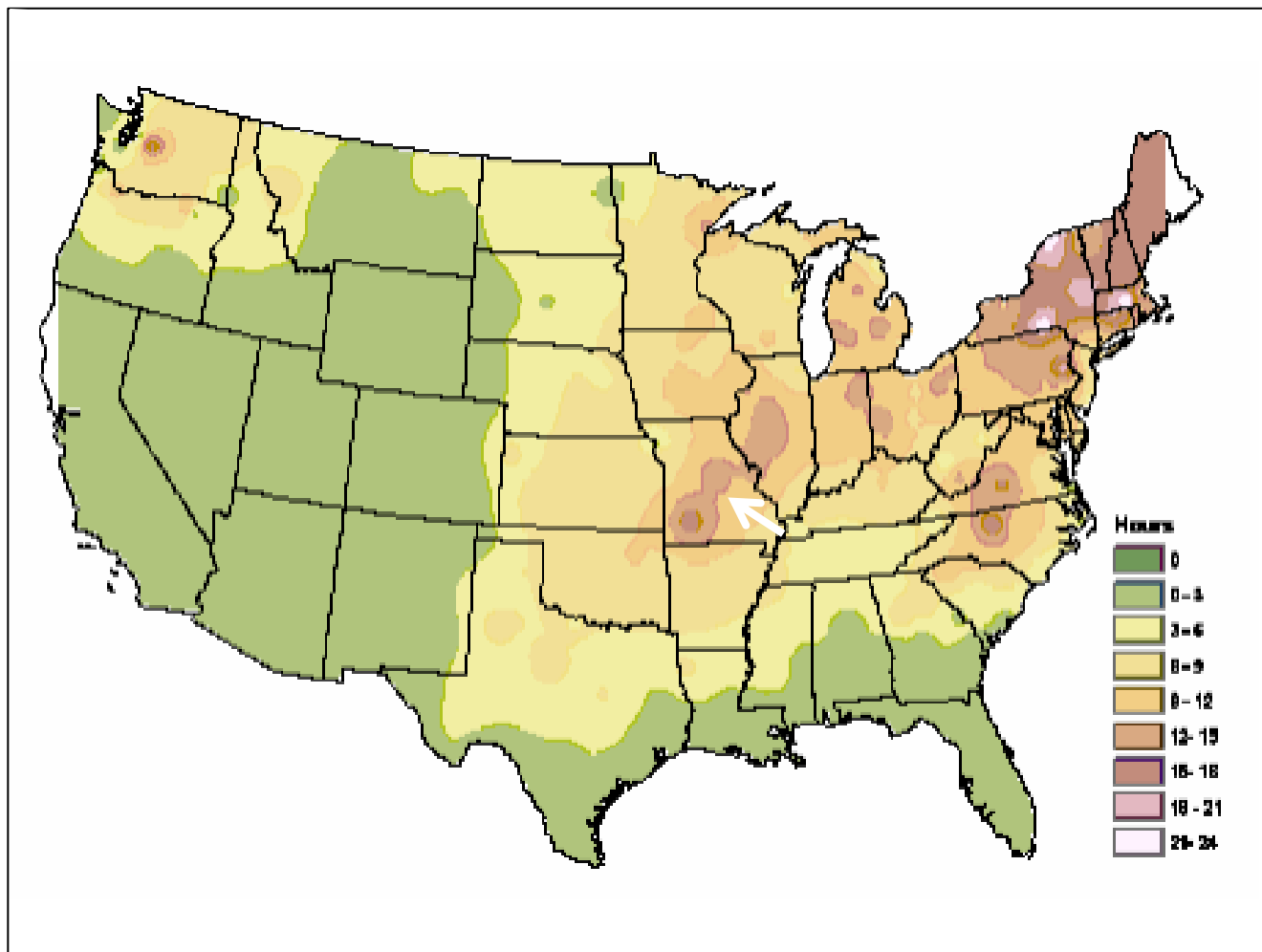
##### ***Geographic Location***

Severe winter weather typically strikes Missouri more than once every year. Maries County receives



winter weather events from heavy snow to freezing rain annually. Major snowstorms typically occur once each year, causing multiple school closings, as well as suspending business and government activity. All of Maries County is vulnerable to heavy snow, ice, and freezing rain. **Figure 3.42** illustrates statewide average number of hours per year with freezing rain. Maries County receives approximately 9 to 12 hours.

**Figure 3.42. NWS Statewide Average Number of Hours per Year with Freezing Rain**



Source: American Meteorological Society. "Freezing Rain Events in the United States."  
<http://ams.confex.com/ams/pdfpapers/71872.pdf>

### **Strength/Magnitude/Extent**

Severe winter storms include heavy snowfall, ice, and strong winds which can push the wind chill well below zero degrees in the planning area.

For severe weather conditions, the National Weather Service issues some or all of the following products as conditions warrant across the State of Missouri. NWS local offices in Missouri may collaborate with local partners to determine when an alert should be issued for a local area.

- Winter Weather Advisory — Winter weather conditions are expected to cause significant inconveniences and may be hazardous. If caution is exercised, these situations should not

- become life threatening. Often the greatest hazard is to motorists.
- Winter Storm Watch — Severe winter conditions, such as heavy snow and/or ice are possible within the next day or two.
  - Winter Storm Warning — Severe winter conditions have begun or are about to begin.
  - Blizzard Warning — Snow and strong winds will combine to produce a blinding snow (near zero visibility), deep drifts, and life-threatening wind chill.
  - Ice Storm Warning -- Dangerous accumulations of ice are expected with generally over one quarter inch of ice on exposed surfaces. Travel is impacted, and widespread downed trees and power lines often result.

### ***Previous Occurrences***

Data was obtained from the NCEI for winter weather reported events and damages between 2003 and 2022 (**Table 3.73**). This data includes variables such as blizzard, freezing fog, frost/freeze, heavy snow, ice storm, sleet, winter storm, and winter weather. Additionally, narratives for specific events are listed below.

**Table 3.73. NCEI County A Winter Weather Events Summary, 2003 - 2022**

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Winter Storm	02/23/2003	0	0	0
Winter Storm	03/05/2003	0	0	0
Ice Storm	01/25/2004	0	0	0
Winter Storm	11/30/2006	0	500.00K	0
Ice Storm	01/12/2007	0	3.300M	0
Winter Storm	01/20/2007	0	0	0
Frost/Freeze	04/07/2007	0	0	4.860M
Ice Storm	12/09/2007	0	50.00K	0
Ice Storm	02/11/2008	0	0	0
Ice Storm	02/21/2008	0	0	0
Winter Storm	01/26/2009	0	0	0
Winter Storm	02/28/2009	0	0	0
Blizzard	02/01/2011	0	0	0
Winter Storm	02/21/2013	0	0	0
Winter Storm	01/05/2014	0	0	0
Winter Storm	03/02/2014	0	0	0
Ice Storm	01/13/2017	0	0	0
Winter Storm	01/11/2019	0	0	0
Winter Weather	02/15/2019	0	0	0
Winter Weather	01/17/2020	0	0	0
Winter Weather	02/05/2020	0	0	0

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Winter Weather	12/31/2020	0	0	0
Winter Storm	01/01/2021	0	25.00K	0
Winter Weather	01/27/2021	0	0	0
Winter Weather	02/08/2021	0	0	0
Winter Weather	02/10/2021	0	0	0
Winter Weather	02/14/2021	0	0	0
Winter Weather	02/17/2021	0	0	0
Frost/Freeze	04/20/2021	0	0	0
Winter Storm	02/02/2022	0	0	0
Winter Weather	02/17/2022	0	0	0
Winter Weather	02/23/2022	0	0	0
Winter Weather	03/11/2022	0	0	0
<b>Total</b>	<b>33</b>	<b>0</b>	<b>3.875M</b>	<b>4.860M</b>

Source: NCEI, data accessed [2/10/2023]

#### Notable Winter Narratives:

- 11/30/2006:** A major winter storm caused a combination of freezing rain, sleet, and heavy snow to fall over sections of southwest and central Missouri. The frozen precipitation began on the 30th, the precipitation type was freezing rain and sleet, with ice accumulations up to four inches in some areas. The second wave of precipitation occurred overnight causing large amount of snow to accumulate over the ice. Storm total accumulations ranging from 13 to 17 inches occurred from the Lake of the Ozarks Region, over to Vernon and Cedar counties. The combination of the ice and snow weighted down all exposed objects. As a matter of fact, some areas experienced disaster as many roofs on businesses, barns, outbuildings, and schools collapsed due to the weight of the accumulated precipitation.
- 01/12/2007 – 01/14/2007:** One of the greatest disasters to ever impact southwest Missouri, including the Springfield metro area, occurred in the form of an ice storm. Several counties, mainly along and north of the interstate 44 corridor, experienced ice accumulations up to two and a half inches. Power outages and catastrophic tree damage were the main impacts resulting from this historic event. Power outages occurred for over three weeks in many areas. Several indirect fatalities due to the extreme elements were documented. In Maries County there was significant damage to trees and power lines due to one and one-half inches of ice over the entire county.
- 04/07/2007 – 04/09/2007:** Unusually warm conditions during the month of March caused early season growth in vegetation across the Missouri Ozarks. Hay along with the wheat crop had begun to mature. During the nights of April 7th through the 9th, temperatures dropped into the upper teens to mid-20s, causing a hard freeze on matured vegetation. The wheat crop suffered approximately 90% damage. Hay crops along with fescue seed also sustained major damage. Total crop losses for 34 counties across the southwestern quadrant of Missouri were estimated at \$147,905,541.
- 12/09/2007:** A major ice storm impacted southwest Missouri and the Ozarks. Areas

experienced accumulation ranging from one quarter of an inch to one and one quarter inches of ice. Intermittent periods of light freezing rain occurred through the morning of 10 December. Maries County had ice accumulations ranging from one quarter of an inch to three quarters of an inch. Power outages were common as several trees and power lines were damaged.

5. **01/01/2021:** A storm system lifted northward through Arkansas and into Missouri from New Year's Eve into New Year's Day. Freezing rain spread into southeast Kansas and southern and central Missouri during the evening hours of Thursday, December 31. The freezing rain continued into January 1, 2021, before transitioning over to minor accumulations of snow. Ice accumulations overnight and into January 1, 2021, resulted in tree damage and scattered power outages. Once the freezing rain changes to snow with a dusting to 1.5 inches of accumulation was reported. The ASOS unit 1 mile north northwest of Vichy Missouri reported a flat ice accumulation of 0.68 inches.

Maries County has been included in five federal disaster declarations for winter weather since 2003.<sup>1</sup>

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 3 claims paid in Maries County between 2003 and 2022 for severe winter weather with a total payout of \$29,546.00.

**Table 3.74. Crop Insurance Claims Paid in Maries County from Winter Weather 2003-2022**

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2007	All Other Crops	Cold wet weather	\$339.00
2013	Soybeans	Cold wet weather	\$813.00
2019	Wheat	Cold wet weather	\$28,394.00
<b>Total</b>	<b>3</b>	<b>-</b>	<b>\$29,546.00</b>

Source: USDA Risk Management Agency, Insurance Claims, <https://www.rma.usda.gov/data/cause>

### **Probability of Future Occurrence**

From the data obtained from the NCEI<sup>2</sup>, annual average percent probabilities were calculated for winter weather within Maries County (**Table 3.73**). There were 33 recorded events (**Table 3.73**) over a 20-year period. There is 100 percent annual average probability of winter weather occurrence (33 events/20 years), with an average of 1.65 events per year.

**Table 3.75. Annual Average % Probability of Winter Weather in Maries County**

Location	Annual Avg. % P	Avg. # of Events
<b>Maries County</b>	100%	1.65

\*P = probability; see page 3.24 for definition.

<sup>1</sup> <https://www.fema.gov/data-visualization-summary-disaster-declarations-and-grants>

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

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## ***Changing Future Conditions Considerations***

Increasing temperatures could lead to an overall shorter winter season with fewer days of extreme cold. While this could reduce the number of severe winter storms, it could also lead to an increase in the frequency of severe thunderstorms, flooding, and drought. Snowmelt results in less surface runoff than rainfall events. This allows water to infiltrate to replenish groundwater supplies. Additionally, we could be trading snow for ice, which would result in increased traffic complications and damage to utility infrastructure.

## **Vulnerability**

### ***Vulnerability Overview***

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.

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 storm events damage to power lines due to the ice weight on the 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.

Data was obtained from the 2023 Missouri State Hazard Mitigation Plan for vulnerability information regarding Maries County. Various data sources were utilized for statistical analysis including the following:

- National Centers for Environmental Information (NCEI) storm event data (1996 to December 31, 2021)
- HAZUS Building Exposure Value data
- Housing density data from the U.S. Census 2019
- Calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina

From the statistical data collected, five factors were considered in determining overall vulnerability to

severe winter weather as follows: housing density, building exposure, social vulnerability, likelihood of occurrence and average annual property loss. A rating value of one through five was assigned to each factor:

- 1) Low
- 2) Low-medium
- 3) Medium
- 4) Medium-high
- 5) High

**Table 3.76** provides the factors considered and the ranges for the rating values assigned. After the individual ratings were determined for the common factors, a combined vulnerability rating was computed for severe winter weather. Those can be seen in **Table 3.77**. The housing density, building exposure and SOVI data for Maries County can be found in **Table 3.78**.

**Table 3.76. Ranges for Severe Winter Weather Vulnerability Factor Ratings**

Factors Considered	Low (1)	Medium-Low (2)	Medium (3)	Medium-High (4)	High (5)
<b>Common Factors</b>					
Housing Density (# per sq. mile)	4-46	47-140	141-283	284-871	872-2,865
Building Exposure (\$1,000)	\$286,351- \$3,053,773	\$3,381,480- \$9,044,465	\$11,043,270- \$24,814,360	\$30,225,497- \$50,440,776	\$96,532,305- \$153,542,314
Social Vulnerability	1	2	3	4	5
Likelihood of Occurrence (# of events/ yrs. of data)	1-1.5	1.6-1.8	1.9-2.2	2.3-2.7	2.8-4
Average Annual Property Loss (annual property loss/ yrs. of data)	0	\$1- \$329,423	\$329,424- \$961,962	\$961,963- \$2,572,692	\$2,572,693- \$4,738,269

Source: 2023 Missouri Hazard Mitigation Plan

**Table 3.77. Ranges for Severe Winter Weather Combined Vulnerability Rating**

	Low (1)	Medium-Low (2)	Medium (3)	Medium-High (4)	High (5)
Severe Winter Weather Combined Vulnerability	6-8	9-10	11-12	13-15	16-21

Source: 2023 Missouri Hazard Mitigation Plan

**Table 3.78. Housing Density, Building Exposure and SOVI Data for Maries County**

Total Building Exposure (Hazus)	Building Exposure Rating	Housing Density	Housing Density Rating	SOVI Ranking	SOVI Rating
\$995,884,000	1	8.75	1	Medium	3

Source: 2023 Missouri Hazard Mitigation Plan



**Table 3.79** provides the last piece of the data gathered from NCEI to complete the overall vulnerability analysis and the total overall vulnerability rating for severe winter weather. The total number of winter weather events includes blizzard, heavy snow, ice storm winter storm and winter weather events. The likelihood of occurrence is 1.38 or 100 percent per year. The total annualized property loss is \$151,154, which provides a total annualized property loss rating of two and an overall vulnerability rating of eight – which translates to an overall Low vulnerability rating for the county for severe winter weather.

**Table 3.79. Additional Statistical Data Compiled for Vulnerability Analysis for Maries County**

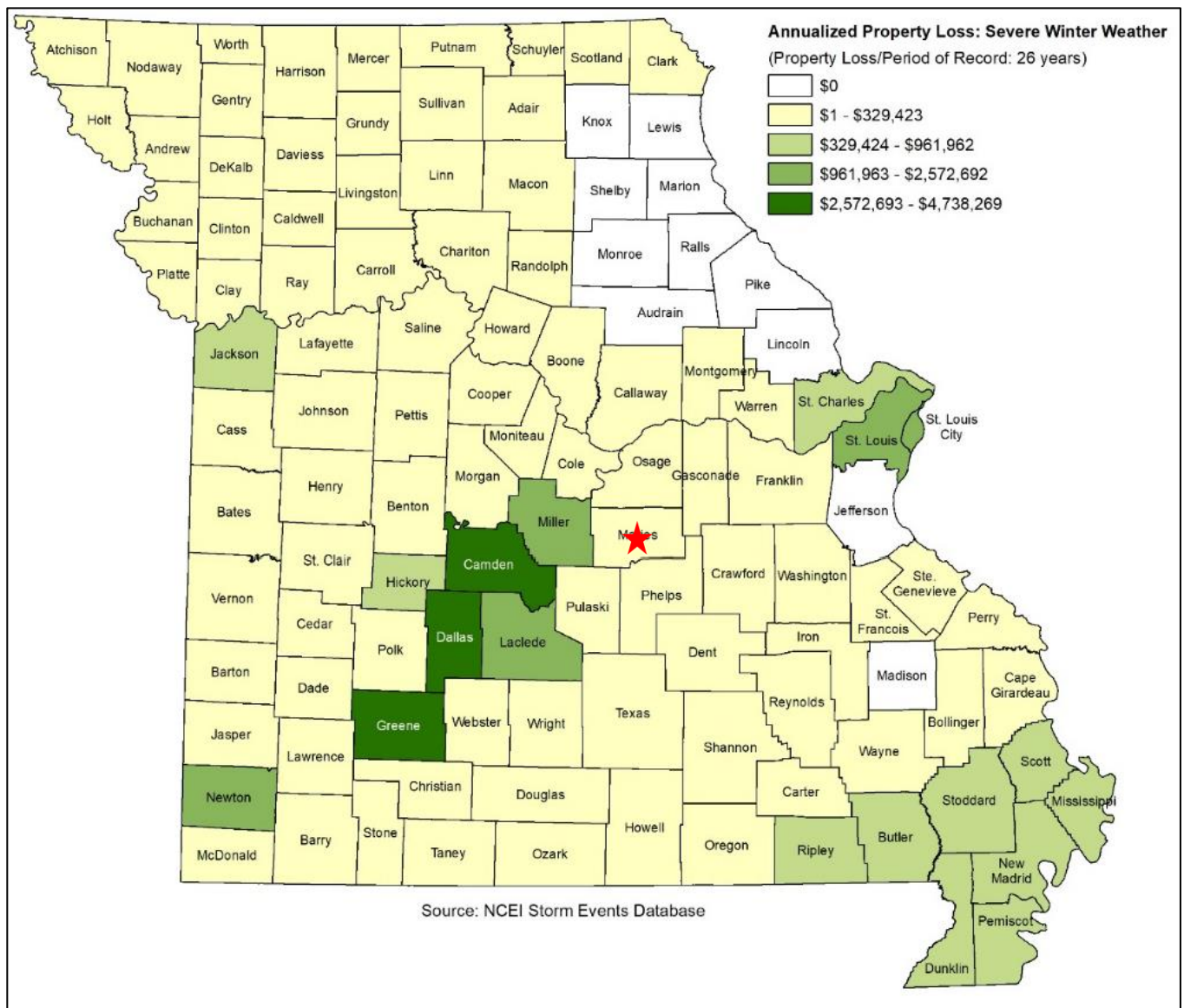
Total number of Winter Weather Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating	Overall Vulnerability Rating	Overall Vulnerability Rating Description
38	1.38	1	\$151,154	2	8	Low

Source: 2023 Missouri Hazard Mitigation Plan

Error! Reference source not found. illustrates the annualized winter weather damages. Maries County falls into the \$1 - \$329,423 category.

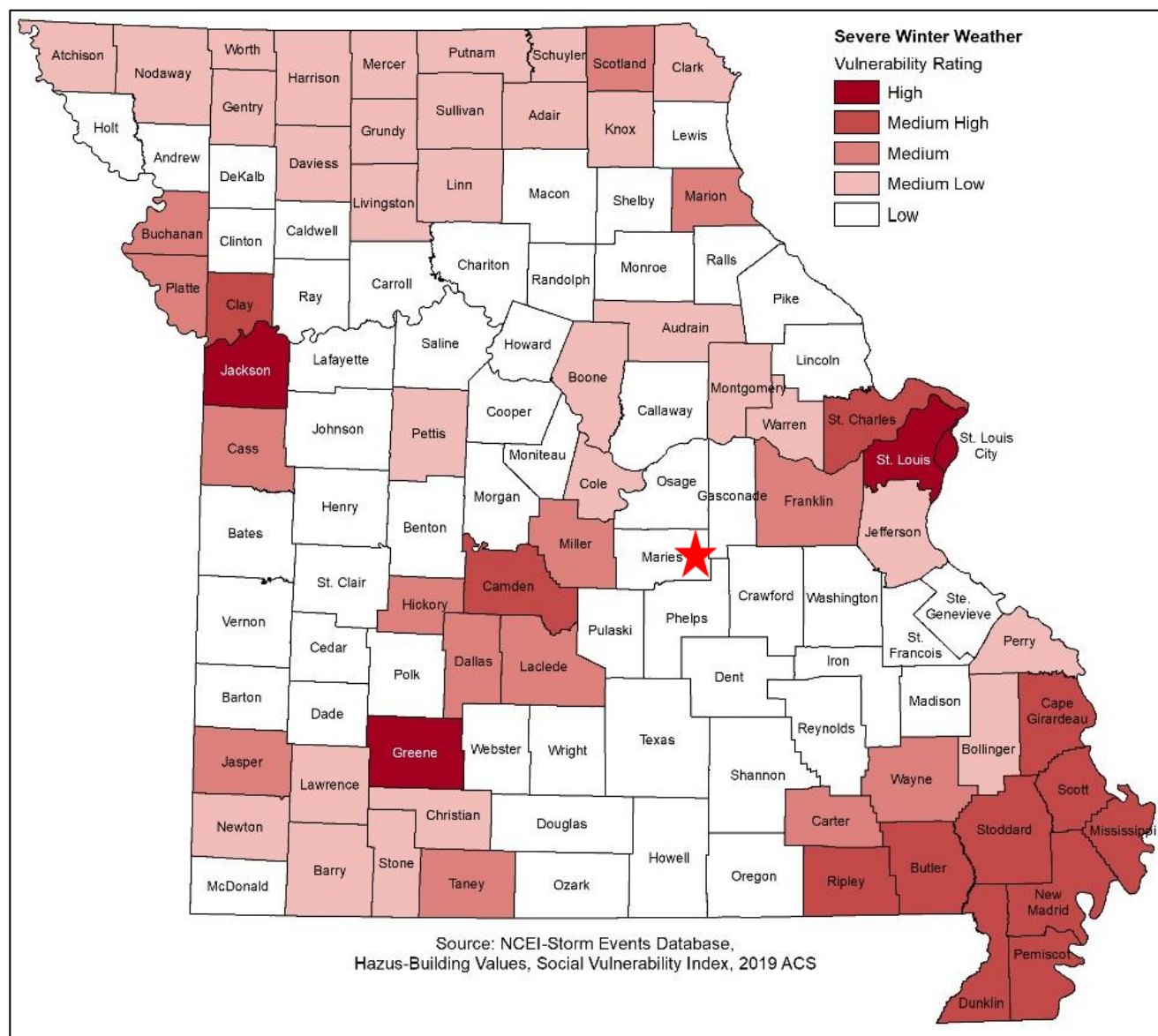
**Figure 3.44** provides an illustration of the vulnerability summary of all Missouri counties for severe winter weather. Again, Maries County falls into the Low rating for overall vulnerability.

**Figure 3.43. Annualized Winter Weather Damages**



Source: 2023 Hazard Mitigation Plan, \*Red star indicates Maries County

**Figure 3.44. Vulnerability Summary for Severe Winter Weather**



Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

### **Potential Losses to Existing Development**

Severe winter storms can often 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. According to the 2018 state plan, Maries County can expect annual property losses of \$7,381 due to severe winter storms.

### **Impact of Previous and 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. In

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addition, the county's population within the cities is anticipated to increase, which would increase the number of individuals at risk during a winter weather event.

### ***Hazard Summary by Jurisdiction***

Variations in impacts are not anticipated for severe winter weather across the planning area. Yet, areas with a higher number of mobile homes and higher number of homes built before 1939 tend to experience increased damage. Unincorporated Maries County has both the highest abundance of mobile homes at 19.4% of residences, and the highest percentage of homes built before 1939 at 13.7% making the unincorporated area more prone to increased exposure to damage than the incorporated cities. In addition, rural areas of the county may be more susceptible to power outages due to more power infrastructure being exposed to the risk of damage from winter storms.

### **Problem Statement**

In summary, Maries County is expected to experience at least one severe winter weather event 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 as preparing for power outages.

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### 3.4.9 Tornado

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Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.10, Page 3.355  
[https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO\\_Hazard\\_Mitigation\\_Plan2018.pdf](https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf)
- NWS Enhanced F Scale for Tornado Damage including damage indicators and degrees of damage [www.spc.noaa.gov/faq/tornado/ef-scale.html](http://www.spc.noaa.gov/faq/tornado/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://tornadochaser.com/education/tornado-alley/>
- National Centers for Environmental Information, <https://www.ncdc.noaa.gov/stormevents/>;
- Midwest Regional Climate Center, <https://mrcc.purdue.edu/gismaps/cntytnrn.htm>;
- MSDIS Structure Inventory and All Hazard Risk Dataset (available in both GIS and Excel format)  
<https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRIRuWWM>
- Missouri Hazard Mitigation Viewer  
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view> - User Guide
  - Number of Tornadoes by County
  - Percentage of Mobile Homes in 2015 by County
  - Average annual tornado events by County
  - Vulnerability to tornado events by County
  - Annualized property loss for tornado events by County
  - Annualized property loss for tornado events by County

## **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 3.4.7, Severe Thunderstorms Including High Winds, Hail, and 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

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Missouri, causing the large thunderstorms that breed tornadoes.

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

A typical tornado can be described as a funnel-shaped cloud 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 and do occur anywhere across the state of Missouri, including Maries 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 Enhanced Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (0) 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 3.80. Enhanced F Scale for Tornado Damage**

Fujita Scale			Derived EF Scale		Operational EF 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](http://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 3.81**. 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 3.81. 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.

<b>EF5</b>	<b>&gt;200</b>	<b>&lt;0.1%</b>	<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.
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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 3.82** illustrates NCEI data reported for tornado events and damages from 2003 to 2022 in the planning area.

There are limitations to the use of NCEI 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 NCEI. 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.

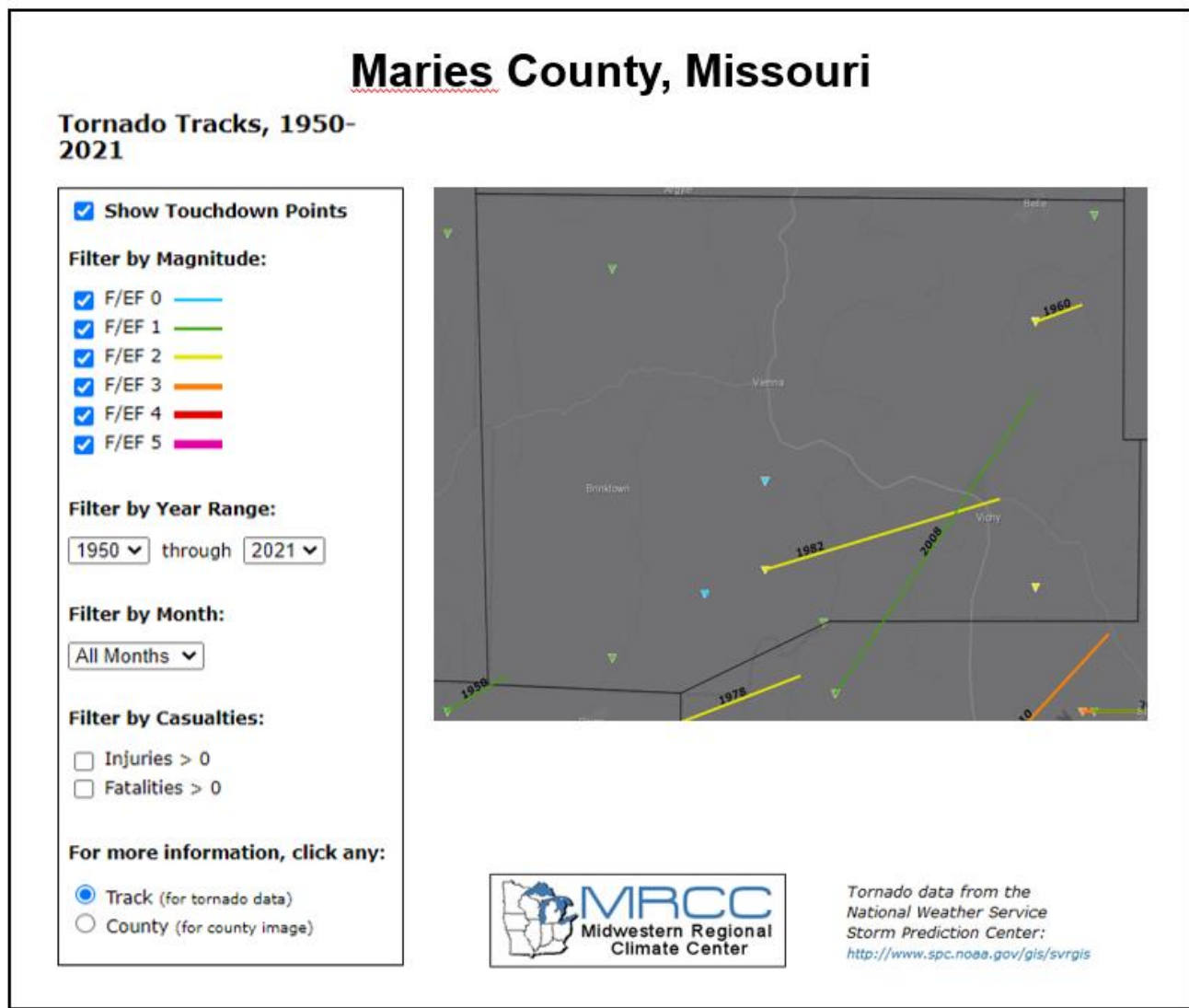
**Table 3.82. Recorded Tornadoes in Maries County, 2003 – 2022**

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
5/4/2003	4S Vienna	4S Vienna	0.2	20	F0	0	0	0	0
1/7/2008	2SSW Veto	0ESE Lanes Prairie	11.29	100	EF0	0	1	5.00M	0
7/1/2015	2WSW Hayden	2WSW Hayden	.2	50	EF0	0	0	0	0
<b>Total</b>	<b>-</b>	<b>-</b>	<b>11.69</b>	<b>170</b>	<b>-</b>	<b>0</b>	<b>1</b>	<b>\$5.00M</b>	<b>0</b>

Source: National Centers for Environmental Information, <http://www.ncdc.noaa.gov/stormevents/>

**Figure 3.45** depicts historic tornado paths across Maries County.

**Figure 3.45. Maries County Map of Historic Tornado Paths (1950 – 2021)**



Source: <https://mrcc.purdue.edu/gismaps/cntytnr.htm>

According to the USDA Risk Management Agency's record, there were no insurance payments in Maries County for crop damages as a result of tornadoes between 2003 and 2022.

### ***Probability of Future Occurrence***

From the data obtained from the NCEI<sup>1</sup>, an annual average percent probability was calculated for tornadoes within Maries County (**Table 3.79**). There is a 15.0 percent annual average probability of a tornado occurrence (3 events/20 years x 100). Tornado events can be found in **Table 3.82**. In addition, **Figure 3.46**, obtained from the National Oceanic and Atmospheric Administration, illustrates the number of recorded tornados per county across the United States and shows the total number of documented tornados in Maries County as 1 – 20 in 72 years resulting in an annual average probability of 1.4% - 27.8%

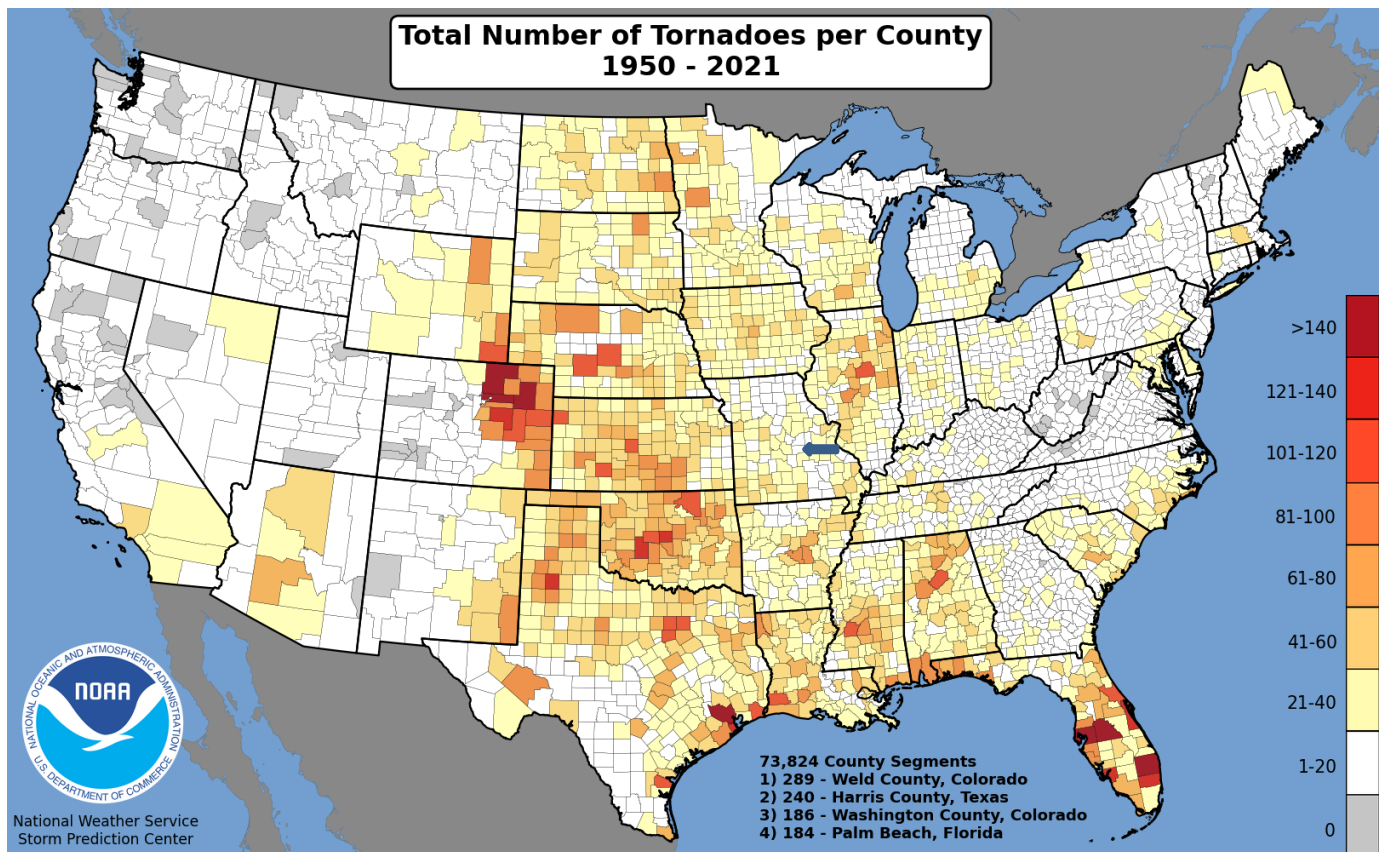
<sup>1</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

**Table 3.83. Annual Average % Probability of Tornadoes in Maries County**

Location	Annual Avg. % P
Maries County	15.0%

\*P = probability; see page 3.24 for definition.

**Figure 3.46. Tornado Activity in the United States**



Source: <https://www.spc.noaa.gov/wcm/ustormaps/tornadoes-by-county.png> \*Blue arrow indicates Maries County

### **Changing Future Conditions Considerations**

While the growing intensity and frequency of severe weather events can be directly attributed to climate change, a link between tornadoes and changing climate conditions is not well understood. Studies have shown that over the last 20 years the number of days with tornadoes has fallen although other trends such as the number of outbreaks with 30+ tornadoes, the density of tornado clusters, and the strength of tornadoes are increasing. The distribution of tornadoes has also shifted slightly eastward. At this time the cause of these trends remains unclear<sup>1</sup>.

<sup>1</sup> <https://www.c2es.org/content/tornadoes-and-climate-change/>

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## **Vulnerability**

### ***Vulnerability Overview***

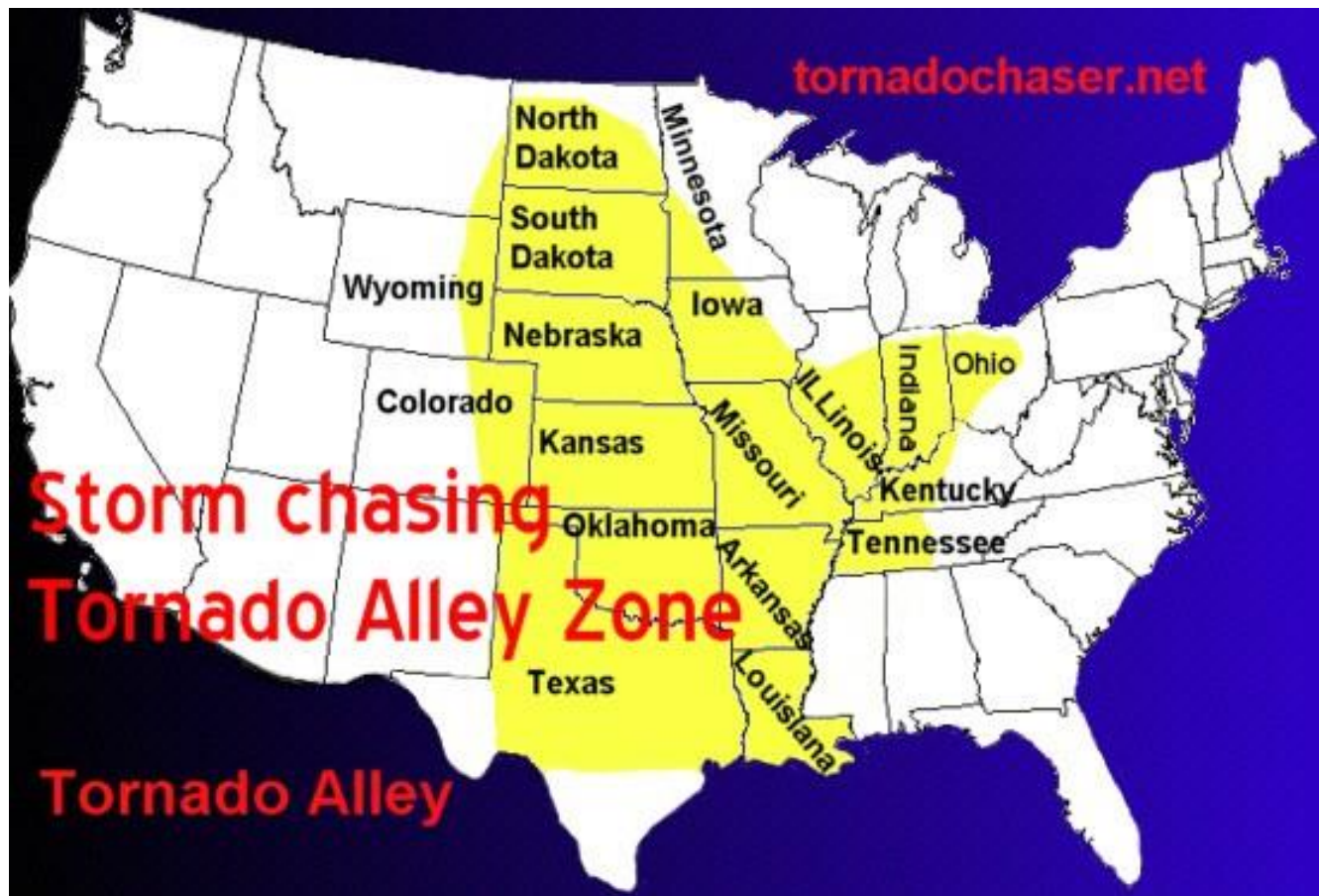
Many tornadoes are capable of great destruction and every tornado is a potential killer. Tornadoes can topple buildings, destroy mobile homes, uproot trees, hurl people and animals through the air for hundreds of yards and fill the air with lethal, windblown debris. Sticks, glass, roofing material and lawn furniture all become deadly missiles when driven by tornado winds.<sup>1</sup> Maries County resides in a region of the United States that has a high frequency of dangerous and destructive tornadoes. This region seen in **Figure 3.47** is referred to as “Tornado Alley”.

The 2023 Missouri Hazard Mitigation Plan used statistical analysis of data from several sources to determine vulnerability to tornadoes across the state. HAZUS building exposure value data, population density and mobile home data from the U.S. Census 2019 the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina, and storm events data (1950 to December 31, 2021) from the National Centers for Environmental Information (NCEI). One limitation to the NCEI data is that many tornadoes that may have occurred in uninhabited areas and some in inhabited areas, may not have been reported. In addition, NOAA data cannot show a realistic frequency distribution of different Fujita scale tornado events, except for recent years. For these reasons a parametric model based on a combination of many physical aspects of the tornado to predict future expected losses was not used. The statistical model used for this analysis was probabilistic based purely on tornado frequency and historic losses.

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<sup>1</sup> 2018 Missouri Hazard Mitigation Plan

Figure 3.47. Tornado Alley in the U.S.



Source: <http://tornadochaser.net/>

Six factors were considered in determining overall vulnerability to tornadoes as follows: building exposure, population density, social vulnerability, percentage of mobile homes, likelihood of occurrence and annual property loss. Based on natural breaks in the statistical data, a rating value of one through five was assigned to each factor. These rating values correspond to the following descriptive terms:

- 1) Low
- 2) Low-medium
- 3) Medium
- 4) Medium-high
- 5) High

0 provides the factors used and ranges for the rating values assigned. Once the ranges were established and applied to all factors, the ratings were combined to determine overall vulnerability.

**Table 3.85** illustrates the ranges for tornado combined vulnerability rating.



**Table 3.84. Ranges for Tornado Vulnerability Factor Ratings**

Factors Considered	Low (1)	Medium-Low (2)	Medium (3)	Medium-High (4)	High (5)
<b>Common Factors</b>					
Building Exposure (\$1,000)	\$286,351- \$3,053,773	\$3,381,480- \$9,044,465	\$11,043,270- \$24,814,360	\$30,225,497- \$50,440,776	\$96,532,305- \$153,542,314
Population Density (#per sq. mile)	8-113	114-434	435-1,163	1,164-1,958	1,959-4,855
Social Vulnerability	1	2	3	4	5
Percent Mobile Homes	0.23-4.38	4.39-8.24	8.25-13	13.01-23.77	23.78-34.58
Likelihood of Occurrence (# of events/ yrs. of data)	0-19	20-29	30-40	41-53	54-74
Total Annualized Property Loss (\$ / yrs. of data)	\$906- \$268,132	\$268,133- \$1,010,663	\$1,010,664- \$2,400,000	\$2,400,001- \$4,499,038	\$4,499,039- \$39,592,934

Source: 2023 Missouri Hazard Mitigation Plan

**Table 3.85. Ranges for Tornado Combined vulnerability Rating**

	Low (1)	Medium-Low (2)	Medium (3)	Medium-High (4)	High (5)
Tornado Combined Vulnerability	7-10	11-12	13-14	15-16	17-21

Source: 2023 Missouri Hazard Mitigation Plan

**Table 3.86** provides data on building exposure, population density, SOVI and mobile home data for Maries County that is used to determine overall vulnerability.

**Table 3.86. Building Exposure, Population Density, SOVI and Mobile Home Data for Maries County**

Total Building Exposure (Hazus)	Exposure Rating	Population Density	Population Rating	SOVI Ranking	SOVI Rating	Percent Mobile Homes	Mobile Home Rating
\$995,884,000	1	16.50	1	Medium	3	9.7	3

Source: 2023 Missouri Hazard Mitigation Plan

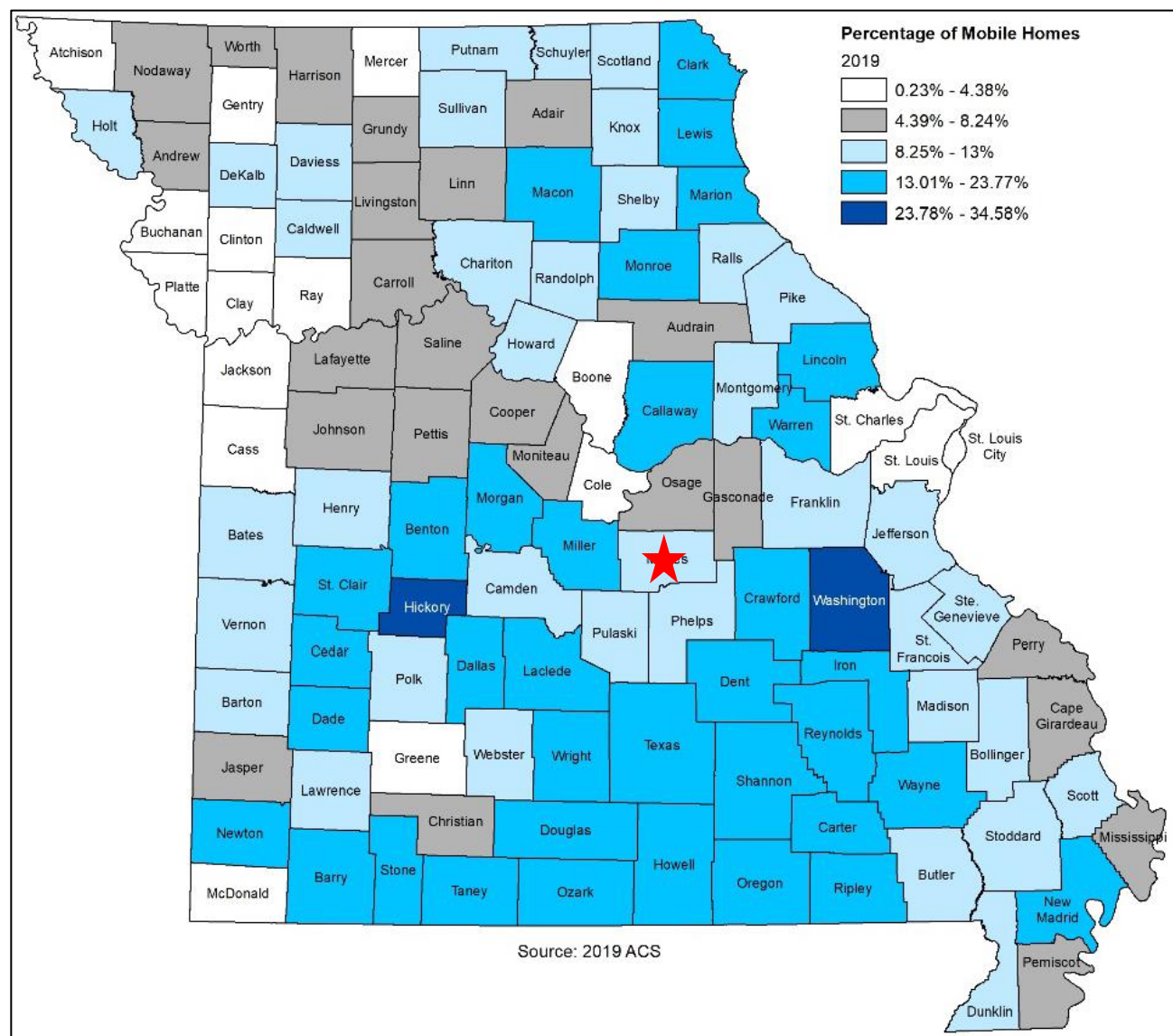
**0** provides additional data, obtained from the National Centers for Environmental Information to complete the overall vulnerability analysis and the total overall vulnerability rating for tornadoes. **Figure 3.48** shows the percent of mobile homes per county throughout the state with Maries County determined to have medium mobile home density at 8.25 percent to 13 percent. Error! Reference source not found. provides the annualized property loss for tornadoes in Missouri and illustrates that Maries County falls into the lowest category at \$906 - \$268,132. Finally, **Figure 3.50** shows the county's overall vulnerability to tornadoes – Medium Low.

**Table 3.87. Likelihood of Occurrence, Annual Property Loss and Overall Vulnerability Rating for Tornadoes for Maries County**

Total Number of Tornadoes	Likelihood of Occurrence	Likelihood of occurrence Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating	Overall Vulnerability Rating	Overall Vulnerability Rating Description
8	0.111	1	\$74,656	1	10	Medium Low

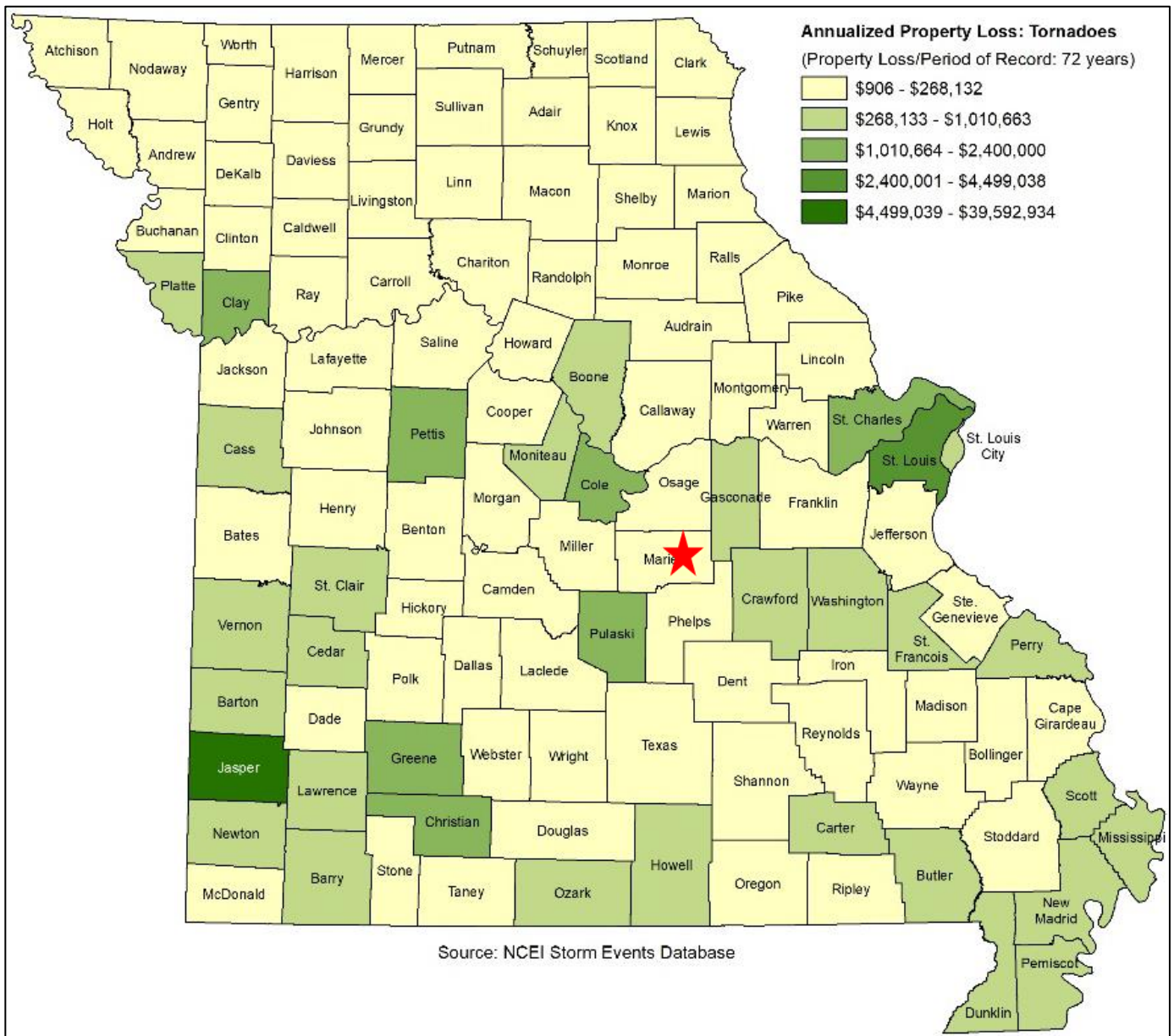
Source: 2023 Missouri Hazard Mitigation Plan

**Figure 3.48. Missouri – Percent of Mobile Homes Per County**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

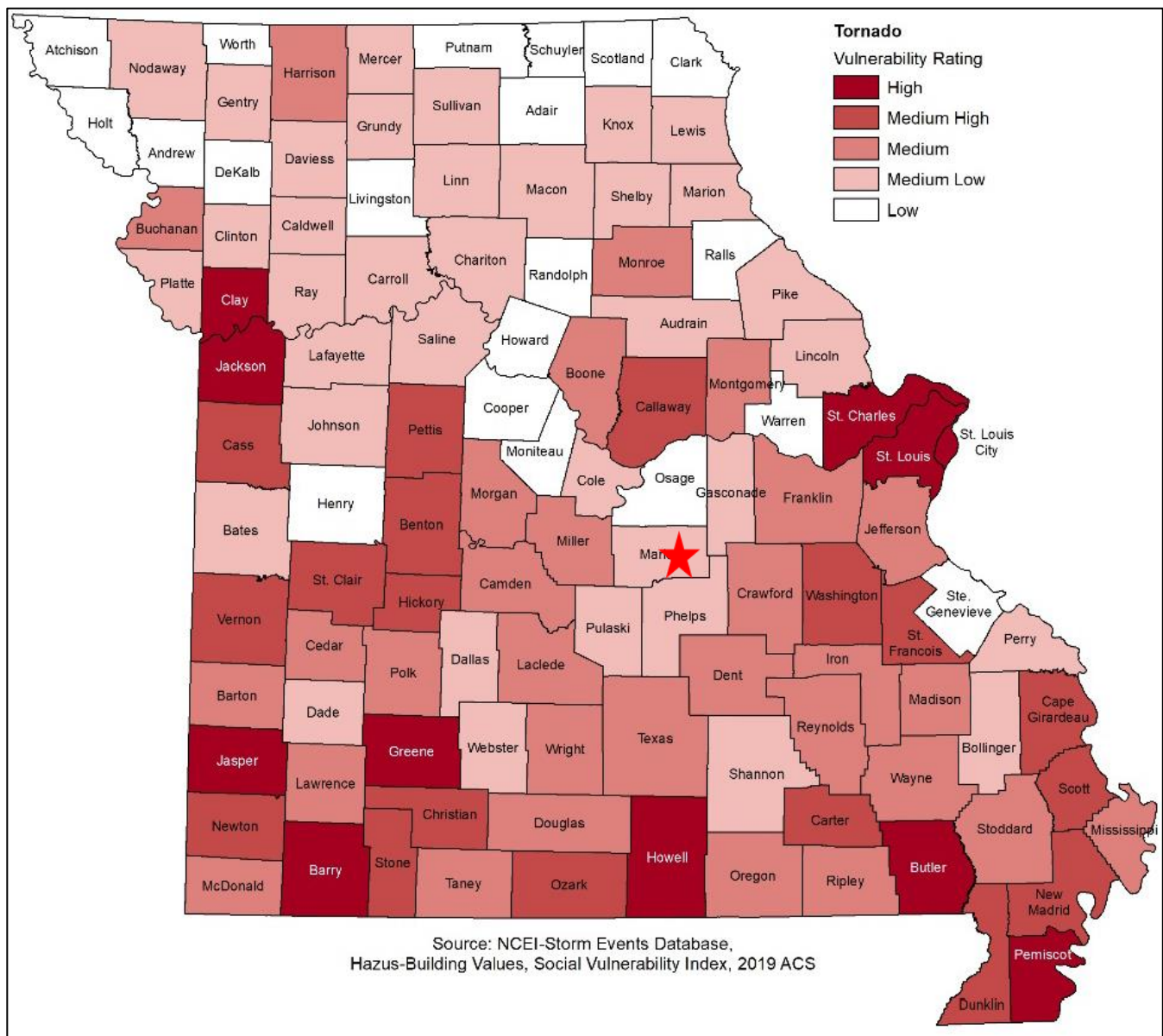
**Figure 3.49. Annualized Property Loss for Tornadoes**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County



**Figure 3.50. Overall Vulnerability to Tornadoes**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

### **Potential Losses to Existing Development**

There has been a total of \$5,000,000 in property damage and 1 injury within Maries County due to tornadoes between 2003 and 2022. With this information we can estimate that each year there will be approximately \$250,000 in loss to existing development. Additionally, the largest recorded tornado in the planning area was an F2 tornado occurring on April 16, 1982. Utilizing this information, we can infer that there is potential for another tornado of equivalence.

### **Impact of Previous and Future Development**

As populations and development increases across the county, the vulnerability will increase as 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.

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### ***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 3.33** for jurisdictions most vulnerable to damage due to the age of the structure. Based on structure age, the unincorporated Maries County would have higher vulnerability due to 13.7 percent of its housing stock being built prior to 1939. Furthermore, data was obtained from the U.S. Census Bureau for the number of mobile homes in Maries County and its jurisdictions. From the information provided in **Table 3.88**, unincorporated Maries County, with 623 mobile homes – 19.4 percent of housing, is most vulnerable to losses due to the number of mobile homes located within the jurisdiction.

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**Table 3.88. Percentage of Mobile Homes in Maries County, 2017-2021**

<b>Jurisdiction</b>	<b>Number of Mobile Homes</b>	<b>Percentage of Mobile Homes*</b>
Unincorporated Maries County	623	19.4%
Belle	50	7.3%
Vienna	30	7.5%

Source: U.S. Census Bureau, 2016-2020 5-Year American Community Survey

\*Number of mobile homes per jurisdiction/total occupied housing units per jurisdiction

\*\*Total housing units for all jurisdictions = 4,294

### **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 tornadoes, 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 tornadoes. 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 develop home emergency action plans and build their own storm shelters to prepare for emergencies.

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### 3.4.10 Wildfires

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The specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.11, Page 3.390  
[https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO\\_Hazard\\_Mitigation\\_Plan2018.pdf](https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf)
- Missouri Department of Conservation Wildfire Data Search at  
<http://mdc4.mdc.mo.gov/applications/FireReporting/Report.aspx>
- Statistics, Missouri Division of Fire Safety at <https://dfs.dps.mo.gov/>;
- National Statistics, US Fire Administration at <https://www.usfa.fema.gov/statistics/>;
- Fire/Rescue Mutual Aid Regions in Missouri at  
<https://dfs.dps.mo.gov/programs/resources/mutual-aid.php>;
- Forestry Division of the Missouri Dept. of Conservation at <https://mdc.mo.gov/your-property/fire-management>;
- National Fire Incident Reporting System (NFIRS),  
<http://www.dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.php>
- Firewise, [www.firewise.org](http://www.firewise.org)
- University of Wisconsin Slivis Lab, [http://silvis.forest.wisc.edu/maps/wui\\_main](http://silvis.forest.wisc.edu/maps/wui_main)
- MSDIS Structure Inventory and All Hazard Risk Dataset  
(available in both GIS and Excel format)  
<https://drive.google.com/drive/folders/0Bzq99s866kWocFB5Y3hCRIRuWWM>
- Missouri Hazard Mitigation Viewer  
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website  
<https://drive.google.com/file/d/1bPkcojgF9ofwQLnTL9N0u-oPFWi9hkst/view> - User Guide
  - Likelihood of Occurrence of wildfire by County
  - Average annual land burned (acres) by County
  - Number of structures within the WUI Interface/Intermix Area
  - Potential loss, average annual land burned by County

#### **Hazard Profile**

##### ***Hazard Description***

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 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, approximately 900 rural fire departments in Missouri have mutual aid agreements with the Forestry Division to obtain assistance in wildfire protection if needed. Over 300 have mutual aid agreements with the State to obtain assistance in wildfire protection if needed. A cooperative agreement with the Mark Twain National Forest is renewed annually.



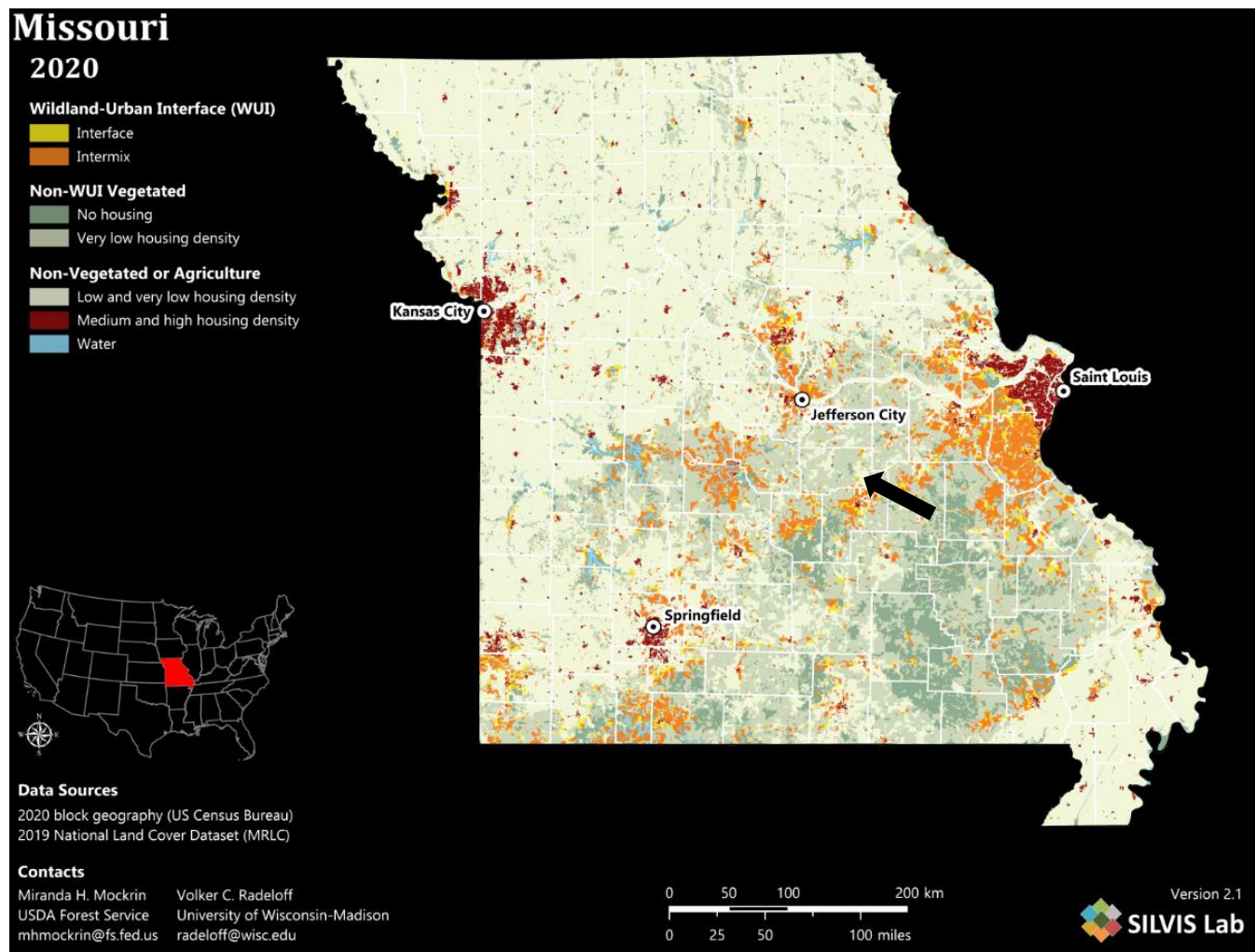
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Most Missouri fires occur during the spring season between February and May. The length and severity of both structural and wildland fires depend largely on weather conditions. Each year, an average of about 3,200 wildfires burn more than 52,000 acres of forest and grassland in Missouri. Spring in Missouri is usually characterized by low humidity and high winds. These conditions result in higher fire danger. Drought conditions can also hamper firefighting efforts, as decreasing water supplies may not prove adequate for firefighting. It is common for rural residents to 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***

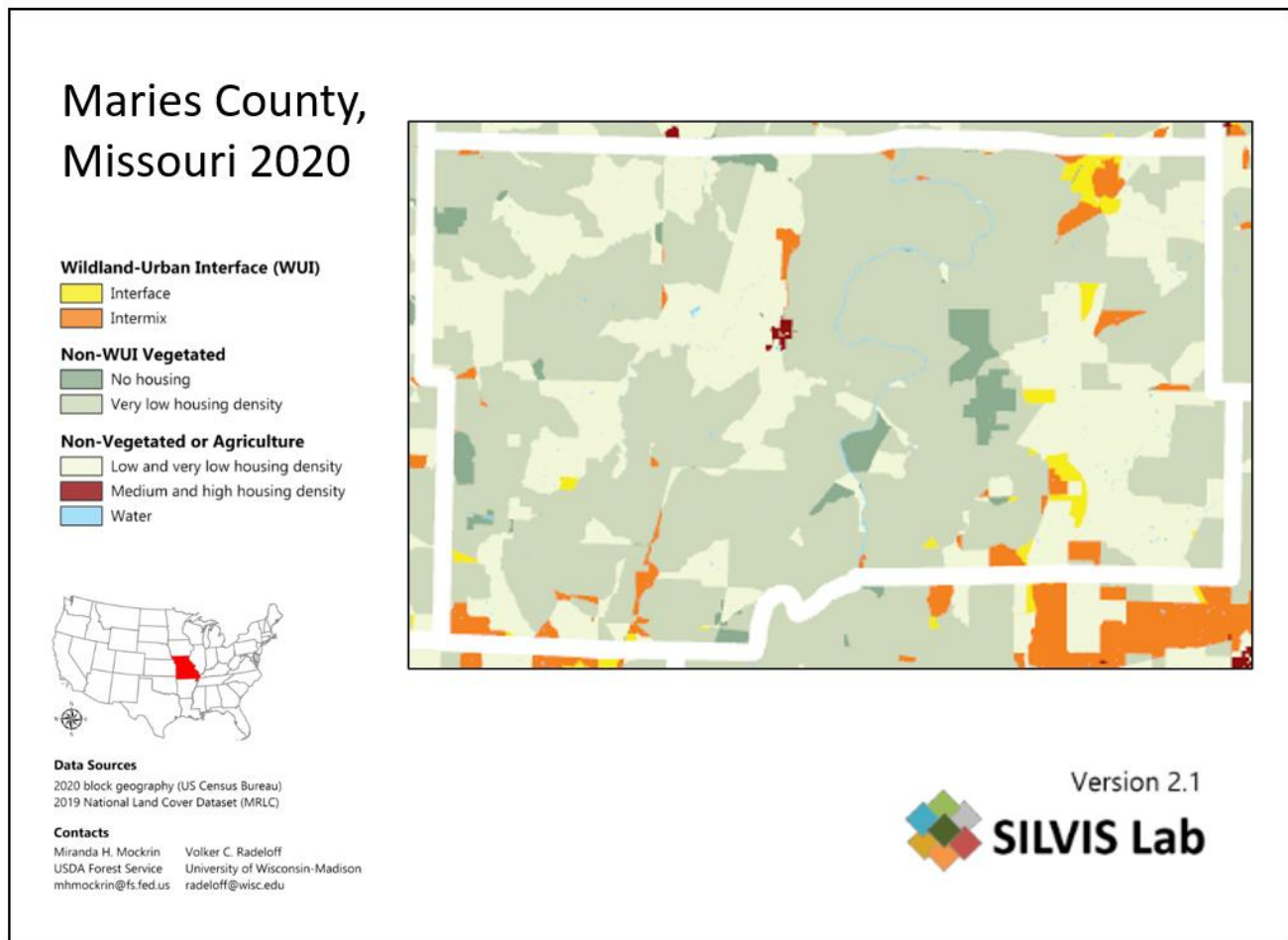
The risk of wildfire does not vary widely across the planning area. However, damages due to wildfires are expected to be higher in communities with more wildland–urban interface (WUI) areas. WUI refers to the zone of transition between unoccupied land and human development. Within the WUI, there are 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 3.51**). To determine specific WUI areas and variations, data was obtained from ArcGIS, Streets and SILVIS (**Figure 3.52**). According to the WUI area map of Maries County many unincorporated communities across the county and the City of Belle partially reside in a WUI area.

Figure 3.51. 2020 Missouri Wildland Urban Interface (WUI)



Source: <http://silvis.forest.wisc.edu/maps/wui/>; black arrow points to Maries County

**Figure 3.52. Maries County Wildlife Urban Interface**



Source: [https://geoserver.silvis.forest.wisc.edu/geodata/wui\\_change\\_2020/maps/gifs/white/MO\\_WUI\\_v21\\_white\\_2020.gif](https://geoserver.silvis.forest.wisc.edu/geodata/wui_change_2020/maps/gifs/white/MO_WUI_v21_white_2020.gif)

### ***Strength/Magnitude/Extent***

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 to suppress fires safely.

The severity of wildfires in Missouri is considered low to moderate, and wildfires in Missouri often 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. Large fires have the potential to kill people, livestock, fish and wildlife as well as destroy crops and pastures. Wildfires can destroy not only natural areas, but homes, businesses and other facilities. Loss of life due to wildfires is not common in Missouri, but injuries to residents and firefighters can include falls, sprains, abrasions or heat-related injuries such as dehydration.

### ***Previous Occurrences***

Between 2003 and 2022 there were 303 wildfires reported in Maries County, according to wildfire reporting to the Missouri Department of Conservation<sup>1</sup>. This is an average of 15.15 wildfires per year. The size of the fires varied from as small as .01 acre to as large as 500 acres. **Table 3.89** shows the cause of wildfires, number of wildfires and acres burned for the period 2003-2022. Debris fires account for both the largest number of fires and the greatest number of acres burned.

**Table 3.89. 2003-2022 Maries County Wildfires by Cause**

Cause	Number	Acres	% Number	% Acres
Arson	4	7	1.32%	0.15%
Debris	129	2,327	42.57%	48.89%
Equipment	18	65	5.94%	1.37%
Miscellaneous	103	1,912.82	33.99%	40.19%
Not Reported	3	231	0.99%	4.85%
Unknown	46	216.59	15.18%	4.55%
Totals	303	4759.41	100.00%	100.00%

### ***Probability of Future Occurrence***

From the data obtained from the Missouri Department of Conservation<sup>2</sup> (Appendix: F), 303 wildfire events occurred in Maries County between 2003 and 2022. This information was utilized to determine the annual average percent probabilities of wildfires. Since multiple occurrences are anticipated per year (303 events/20 years), the probability of wildfires per year is 100% with an average of 15.15 events per year Table 3.91.

**Table 3.90. Annual Average Percentage Probability of Wildfires in Maries County**

Location	Annual Avg. % P	Avg. Number of Events
Maries County	100%	15.15

\*P = probability; see page 3.24 for definition.

<sup>1</sup> <http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx>

<sup>2</sup> <http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx>

## Changing Future Conditions Considerations

Higher temperatures and changes in rainfall are unlikely to substantially reduce forest cover in Missouri, although the composition of trees in the forests may change. More droughts would reduce forest productivity and changing future conditions are also likely to increase the damage from insects and diseases. But longer growing seasons and increased carbon dioxide concentrations could offset the losses from those factors. Forests cover about one-third of the state, dominated by oak and hickory trees. As the climate changes, the abundance of pines in Missouri's forests are likely to increase, while the population of hickory trees is likely to decrease.<sup>1</sup>

Higher temperatures will also reduce the number of days prescribed burning can be performed. Reduction of prescribed burning will allow for growth of understory vegetation – providing fuel for destructive wildfires. Drought is also anticipated to increase in frequency and intensity during summer months under projected future scenarios. Drought can lead to dead or dying vegetation and landscaping material close to structures which creates fodder for wildfires.<sup>2</sup>

## Vulnerability

### Vulnerability Overview

According to the 2023 Missouri State Hazard Mitigation Plan, the Department of Conservation historical wildfire data was the best resource for data on wildfires. The Missouri State Hazard Mitigation Plan used data from 2004-2016 and determined that Maries County should expect to have 15.2 wildfires per year, impacting 251.3 acres (**Table 3.91**).

The state plan also indicates that Maries County is at a higher possible likelihood for building damage from wildfires due to 2,040 buildings valued at \$248,747,397 and 3,366 individuals vulnerable. **Figure 3.53** illustrates the likelihood of wildfire events based on data from 2004-2016. **Figure 3.53** provides a map that illustrates the average annual acreage burned.

**Table 3.91. Statistical Data for Wildfire Vulnerability in Maries County**

Number of Wildfires 2004-2016	Likelihood of Occurrence (#/year)	Total Acres Burned	Average Annual Acreage Burned
273	15.2	4,522.85	251.3

Source: 2023 Missouri State Hazard Mitigation Plan

The method used to determine vulnerability to wildfires in the 2018 Missouri Hazard Mitigation plan was a GIS comparative analysis of wildland urban interface and intermix (WUI) areas against building exposure data to determine the types, numbers and estimated values of buildings at risk to wildfire. This GIS-based analysis utilized data from several sources: the Missouri Spatial Data Inventory Service (MSDIS), LiDAR-derived RiskMAP Footprints, HAZUS building exposure value data and wildland urban interface and intermix area data from the University of Wisconsin-Madison SILVIS Lab.

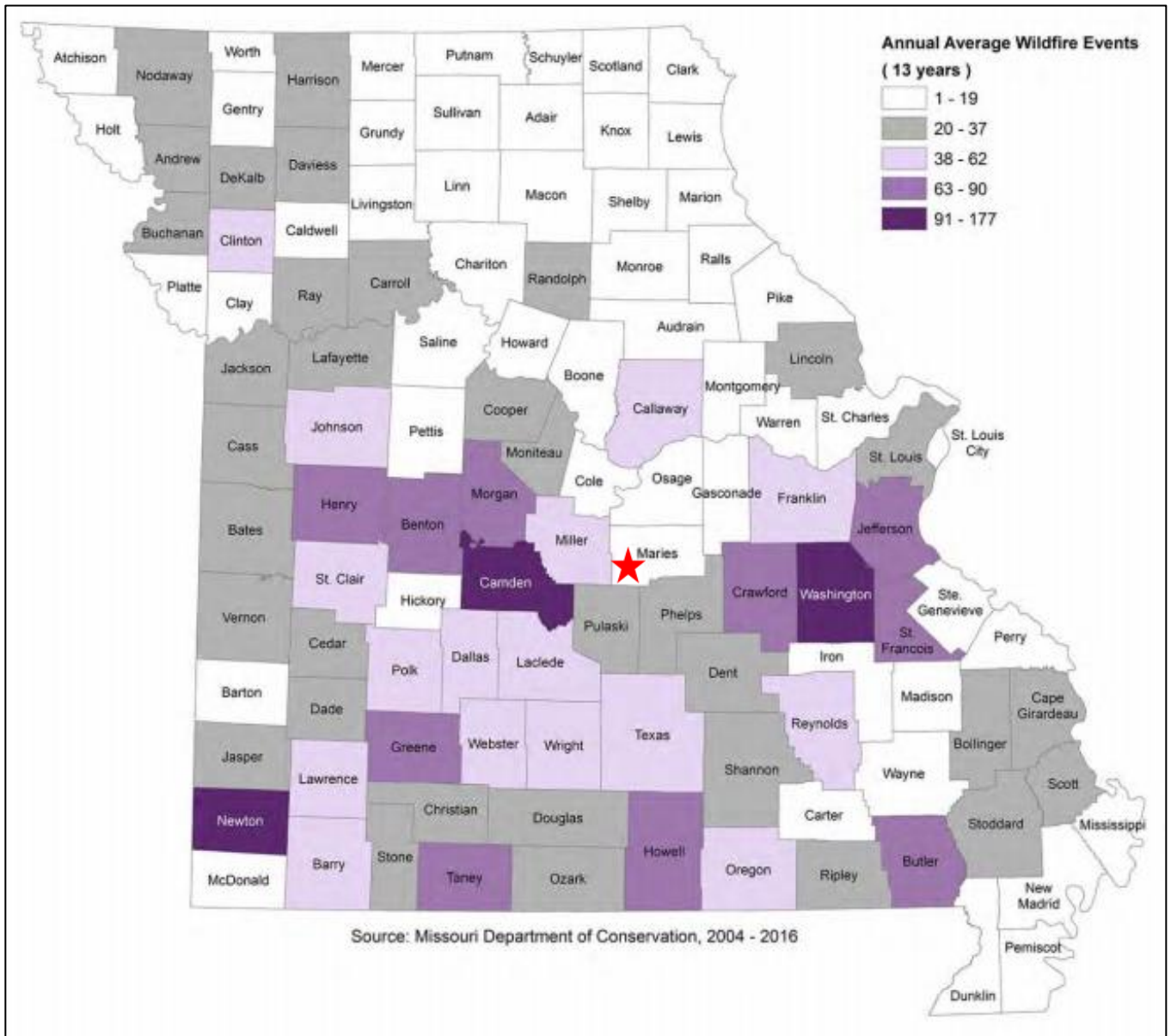
The results of that analysis, including estimated number of structures, value of structures and

<sup>1</sup> 2018 Missouri Hazard Mitigation Plan

<sup>2</sup> Ibid

population are illustrated in **Table 3.92**. The total estimated number of structures vulnerable to wildfires is 2,040. The overall value of structures vulnerable to wildfire in Maries County is estimated at \$248,747,397. To further illustrate vulnerability in Maries County, maps from the 2023 Missouri Hazard Mitigation plan illustrating these numbers and comparing them statewide are included. The number of structures in the WUI interface and intermix areas statewide are shown in **Figure 3.55**. **Figure 3.56** shows the estimated value of structures in the WUI interface and intermix areas. **Figure 3.57** illustrates the number of people at risk to wildfire in the WUI interface and intermix areas.

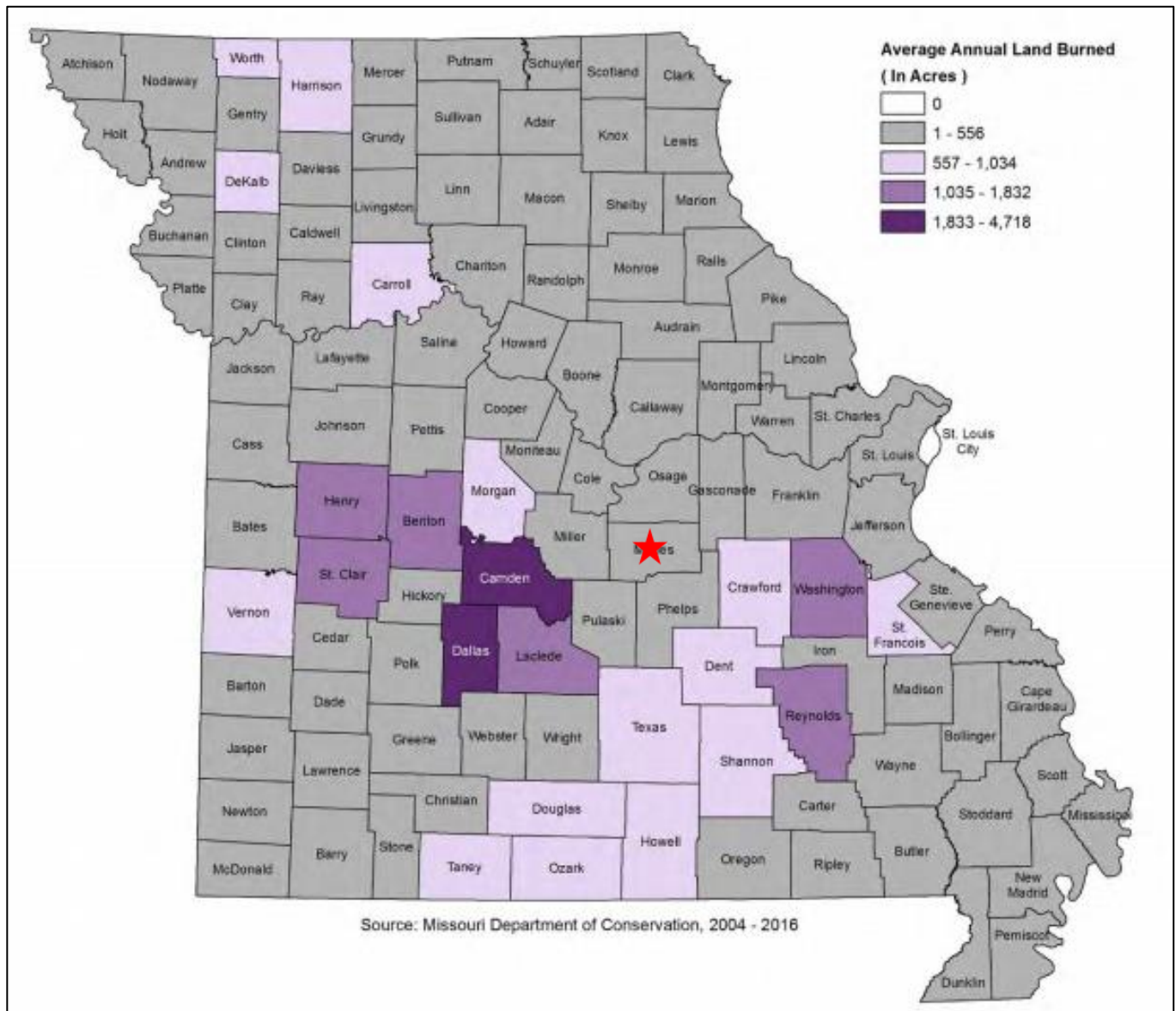
**Figure 3.53. Likelihood of Wildfire Events, 2004-2016**



Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County



**Figure 3.54. Average Annual Acreage Burned**



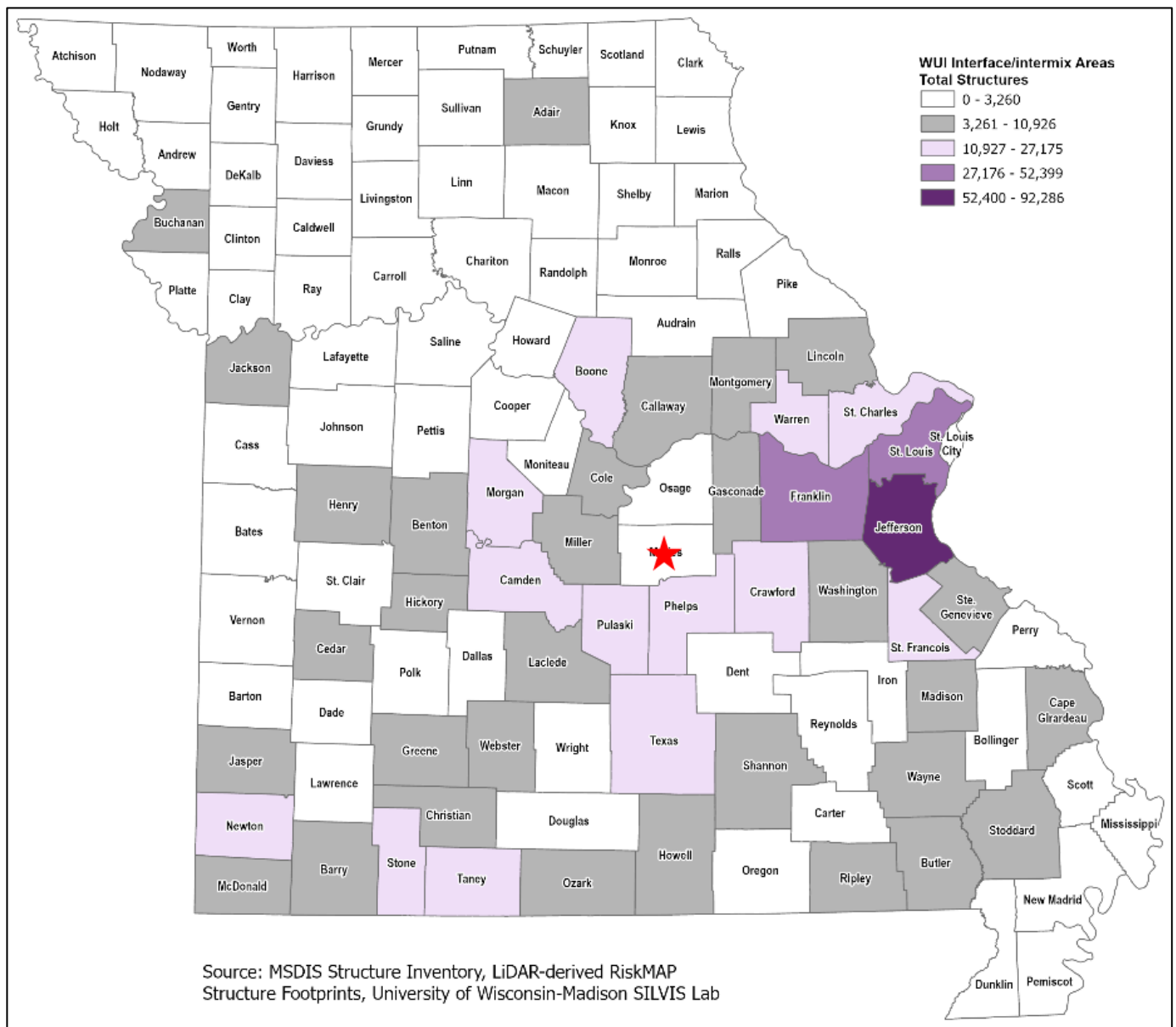
Source: 2023 Missouri State Hazard Mitigation Plan, \*Red star indicates Maries County

**Table 3.92. Estimated Numbers and Values of Structures and Population Vulnerable to Wildfire in Maries County**

Maries County	Number of Structures	Value of Structures	Population
<b>Agriculture</b>	435	\$1,281,656	
<b>Commercial</b>	141	\$26,085,404	
<b>Education</b>	2	\$4,670,800	
<b>Government</b>	3	\$1,707,600	
<b>Industrial</b>	2	\$2,316,933	
<b>Residential</b>	1457	\$212,685,003	
<b>Totals</b>	<b>2040</b>	<b>\$248,747,397</b>	<b>3366</b>

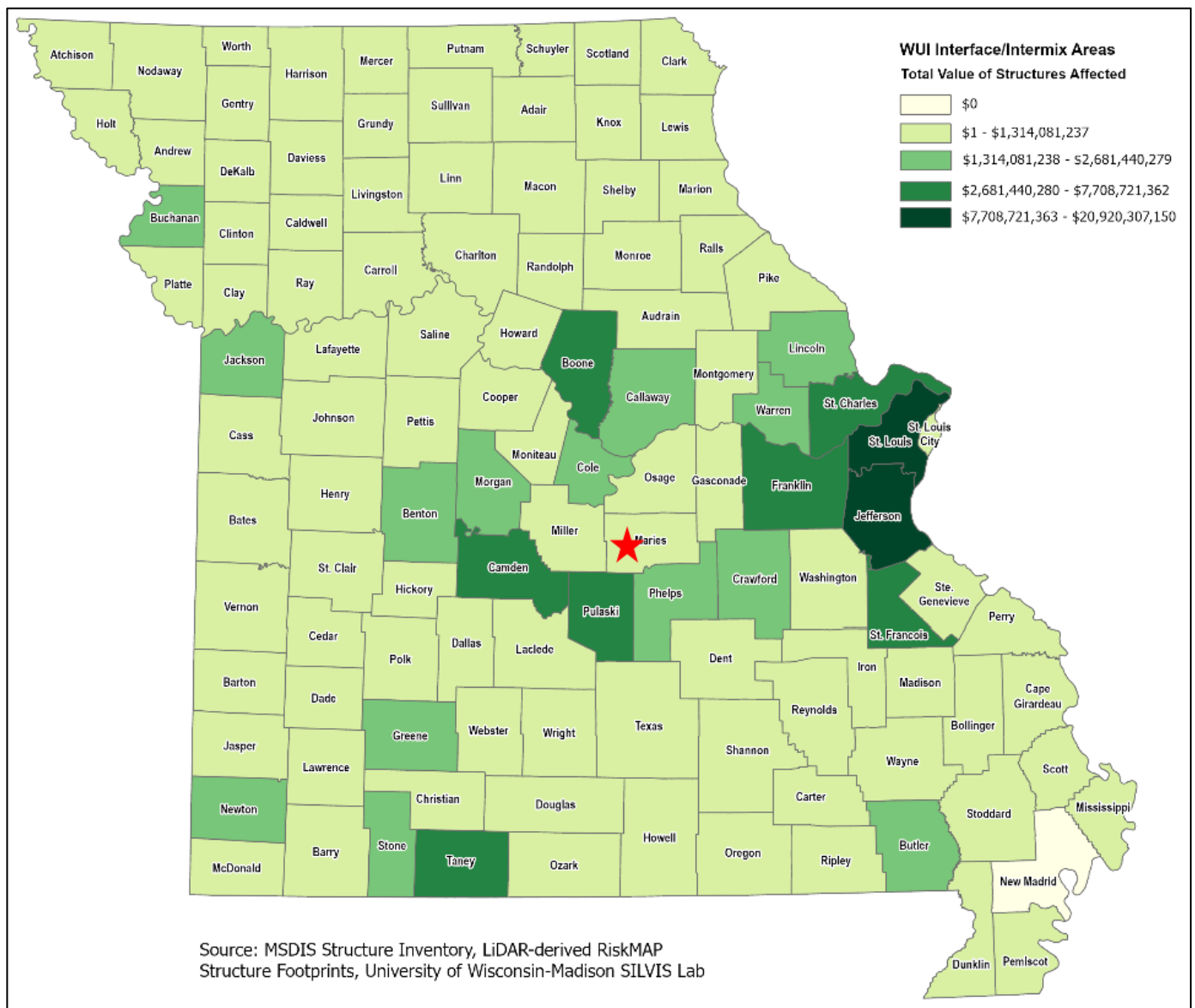
Source: 2023 Missouri State Hazard Mitigation Plan

**Figure 3.55. Number of Structures in WUI Interface and Intermix Areas**



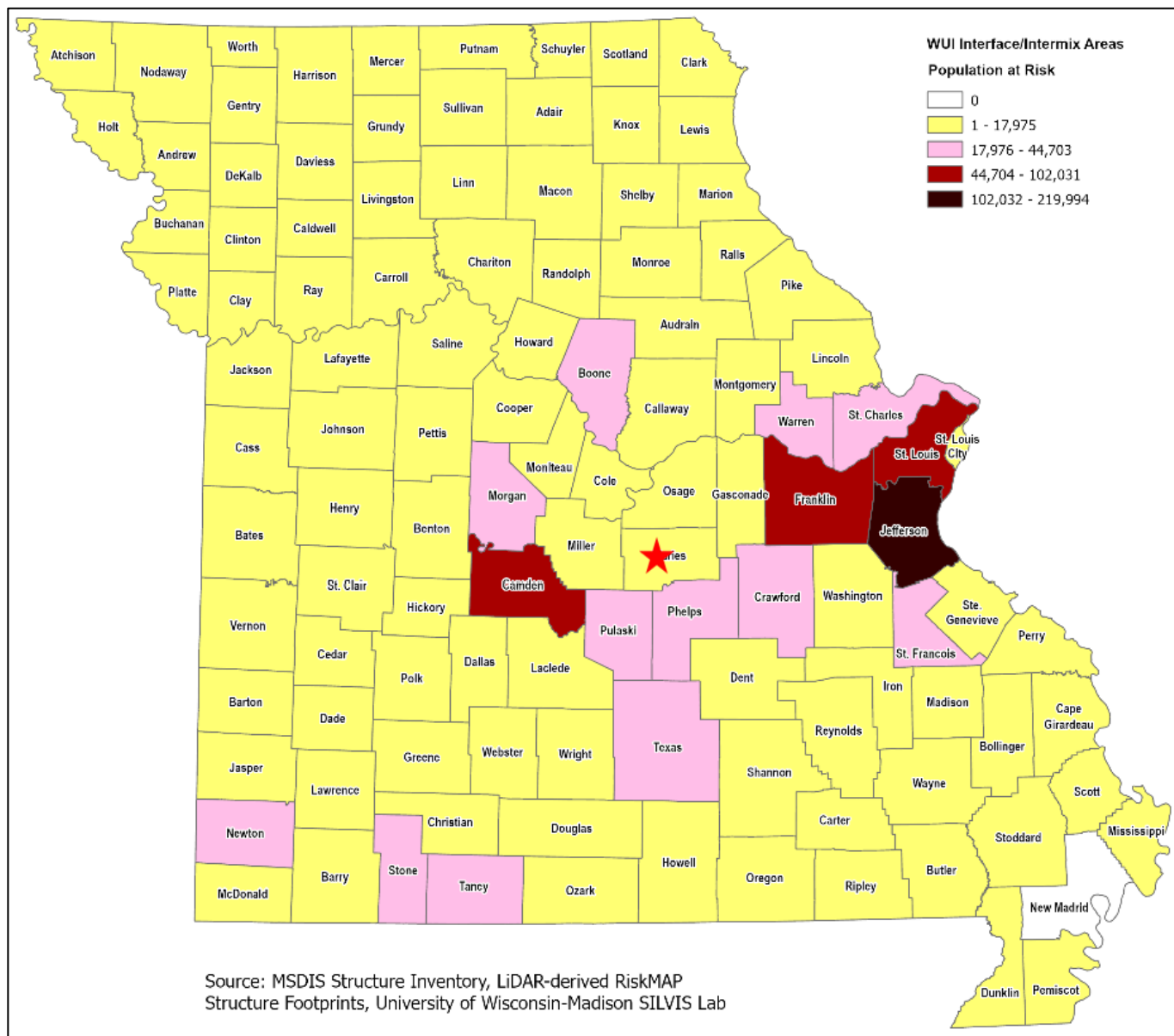
Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

**Figure 3.56. Value of Structures in the WUI Interface and Intermix Areas**



Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

**Figure 3.57. Population at Risk to Wildfire in WUI Interface and Intermix Areas**



Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

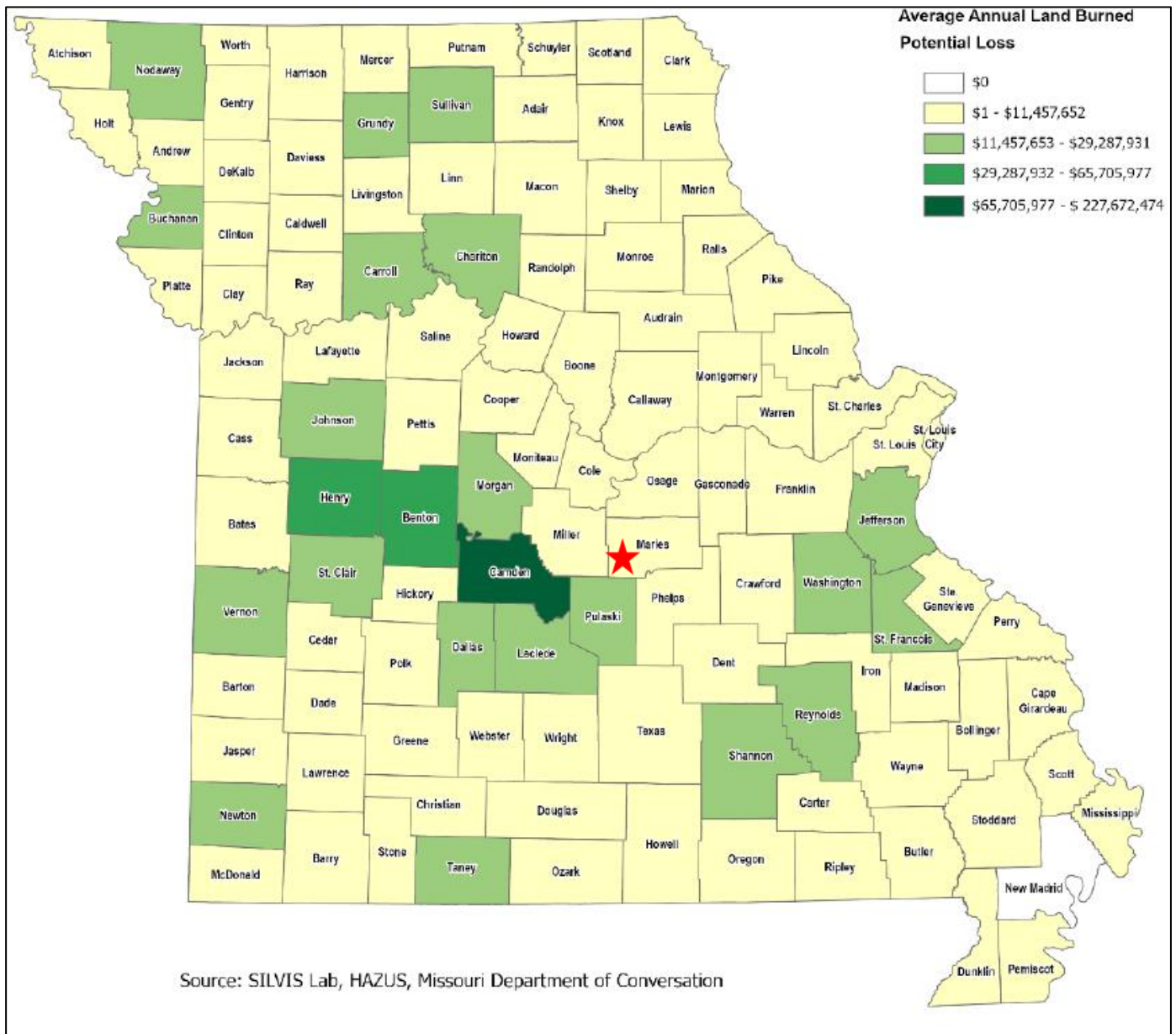
### **Potential Losses to Existing Development**

As there was no data available on Maries County specific losses, data was used from the 2023 Missouri State Hazard Mitigation Plan. The factors considered for estimating potential losses due to wildfires were average acreage burned each year per county and the average value of structures per acre in the WU-Interface/Intermix areas. **Table 3.93** and **Figure 3.58** that follows provide the potential loss figures for Maries County based on this methodology.

**Table 3.93. Wildfire Potential Loss Estimates for Maries County**

Total WUI Acreage	Total Structure Value Within WUI	Average Value/Acre within WUI	Average Annual Acreage Burned	Potential Loss
18,145.40	\$248,747,397	\$13,709	251.27	\$3,444,544

Source: 2023 Missouri Hazard Mitigation Plan

**Figure 3.58. Annualized Wildfire Damages**

Source: 2023 Missouri Hazard Mitigation Plan, \*Red star indicates Maries County

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### ***Impact of Previous and 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, many unincorporated communities within the county and the city of Belle reside 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 severe, future wildfires in Maries County should have a low-medium adverse impact on the community, depending on the proximity to population centers. Nonetheless, homes, businesses, and schools located in unincorporated areas are at higher risk from wildfires due to proximity to woodland and more importantly, distance from fire services. All cities and school districts are in WUI areas but are closer to fire services.

### **Problem Statement**

An estimated 2,040 structures and 3,366 people are vulnerable to wildfires in Maries County. 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. Residents should be educated on the dangers of wildfires and what steps they can take to mitigate their vulnerability. This could include landscaping and water supply.



## 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 .....	4.4

**44 CFR Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.**

This section presents the mitigation strategy developed by the Mitigation Planning Committee (MPC). 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 (2023)*.

- **Goals** are broad, long-term policy and vision statements that explain what is to be achieved by implementing the mitigation strategy.
- A **mitigation action** is a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment.

### 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 Maries County’s existing hazard mitigation plan approved by FEMA on September 5, 2019. Therefore, the goals from the updated 2018 Maries 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 second meeting to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the 2023 State Hazard Mitigation Plan goals were reviewed. The MPC also reviewed the goals from current surrounding county plans. The MPC then reviewed the existing goals from the current plan and decided on revisions to consolidate from six goals down to three to remove redundancy and improve coverage in the Action Plan. The following goals were established for the 2024 Maries County plan update:

- Goal 1:** Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
- Goal 2:** Reduce the potential impact of natural disasters on property, infrastructure, and the local economy.
- Goal 3:** Reduce the potential impact of natural disasters on the continuity of government and essential services.

## 4.2 Identification and Analysis of Mitigation Actions

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**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 been no 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. The problem statements summarize the risk to the planning area presented by each hazard and include possible methods to reduce that risk. Use of the problem statements allowed the MPC to recognize new and innovative strategies to mitigate risks in the planning area.

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 six completed actions, five deleted actions, four actions that were combined with other similar actions, and fifteen continuing actions.

**Table 4.1** provides a summary of the action statuses for each jurisdiction:

**Table 4.1. Action Status Summary**

<b>Jurisdiction</b>	<b>Completed Actions</b>	<b>Continuing Actions (ongoing or modify)</b>	<b>Deleted Actions</b>
Maries County	6	15	6
Belle	6	10	6
Vienna	6	15	6
Maries County R-I School District	6	4	0
Maries County R-II School District	6	4	0

**Table 4.2** provides a summary of the completed and deleted actions from the previous plan.

**Table 4.2. Summary of Completed and Deleted Actions from the Previous Plan**

<b>Completed Actions</b>	<b>Completion Details (date, amount, funding source)</b>
1.1.6 Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.	All school districts agree that this is currently implemented and is embedded in district's policy and procedures and requirements from the Missouri Department of Elementary and Secondary Education.
1.2.1 Continue to encourage local governments to budget for and obtain enhanced early warning systems and improved communications systems.	Maries County started operating Code Red mass notification system in September of 2023. Both local school districts have texting/phone/email systems in place to contact parents.
1.2.2 Continue to promote weather radios to local residents through press releases and brochures to ensure advanced warning about threatening weather.	All participating jurisdictions agreed that this is accomplished by the National Weather Service. Citizens in the planning area are aware or and have had opportunities to receive emergency weather radio at little or no cost.
1.2.4 Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence, and wildfire upon Maries County and all jurisdictions through local, state, and federal agencies for use in hazard mitigation planning.	All jurisdictions agree that this is regularly achieved through the plan update process. In addition, SEMA has indicated that this action item can be removed from plans.
3.3.1 Re-evaluate the hazard mitigation plan, merge with other community planning and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations, plans, and procedures.	All jurisdictions agree that this is regularly achieved through the plan update and maintenance process.
6.1.3 Work with state/local/federal agencies to include mitigation in all economic and community development projects.	All jurisdictions agree that this is regularly achieved through the plan update and maintenance process.
6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.	All jurisdictions agree that this is regularly achieved through the plan update process.
<b>Deleted Actions</b>	<b>Reason for Deletion</b>
2.1.2 Encourage the development and implementation of minimum building codes in all communities.	Removed due to not meeting SMART criteria and MPC rating the priority as low.

2.1.6 Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.	Removed due to not meeting SMART criteria and MPC rating the priority as low.
2.2.2 Encourage the development of storm water management plans.	Duplicate of 2.1.6 Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.
2.3.4 Encourage the City of Belle to become a member of NFIP	Removed due to not meeting SMART criteria and being a low priority.
3.4.2 Publicize local, regional, and/or statewide drills.	Removed due to no longer being a high priority.
<b>Combined Actions</b>	<b>Explanation</b>
1.3.3 Continue to maintain a list of locations that can serve as shelters for storm, cooling/warming shelters, and establish MOUs with the appropriate organizations responsible for those facilities.	Combined with 5.2.2 Encourage the assessment of public buildings as potential storm shelters; designate those that are suitable as safe shelters; and develop accessibility plans for the public during times of need.
4.1.1 Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.	Combined with 3.2.2. Encourage meetings between EMB, city/county officials, and SEMA to familiarized officials with mitigation planning, implementation, and budgeting for mitigation projects.
4.1.3 Whenever possible pool different agency resources to achieve widespread mitigation results.	Combined with 3.2.2. Encourage meetings between EMB, city/county officials, and SEMA to familiarized officials with mitigation planning, implementation, and budgeting for mitigation projects.
6.2.2 Implement public awareness program about the benefits of hazard mitigation projects, both public and private, through press releases and brochures.	Combined with 3.3.2 Implement a public awareness program on the benefits of hazard mitigation – both public and private – by distributing press releases and brochures (by local governments and school districts) on adopted mitigation measures to help the public stay abreast of changes and/or new regulations.

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

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. A spreadsheet with the action items and final scores is illustrated in **Figure 4.1**.

### Jurisdictional Floodplain Management Programs

Maries County and the City of Vienna are members of the NFIP and regulate 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 the city hall and the county's flood maps can be obtained from the floodplain coordinator - MRPC. Furthermore, floodplain maps can be found online through FEMA's website <https://msc.fema.gov/portal>.

**Table 4.1. Jurisdictional Floodplain Ordinance Adoption Date**

Community Name	Ordinance Adoption Date
Maries County	07/01/1987
Vienna	11/01/1979

Source: FEMA's Community Status Book Report<sup>1</sup>; NSFHA (SEMA)

Funding source abbreviations on worksheets:

- HMGP = Hazard Mitigation Assistance Program
- BRIC = Building Resilient Infrastructure and Communities
- FMA = Flood Mitigation Assistance
- PDM = Pre-Disaster Mitigation

<sup>1</sup> [www.fema.gov/cis/mo.html](https://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
1.1.5 1.1	Local Fire Departments and Emergency Management Director will provide CERT training and distribute information on the benefits of the CERT and VOAD programs.	2	2	2	2	3	2	2	15	IC, PD,	4	-1	3	18	M
1.3.4 1.2	Construct storm shelters or tornado safe rooms near schools and large employment centers as funding allows.	3	3	2	3	3	1	3	18	IC, LF, EMCC	6	-5	1	19	M
3.4.1 1.3	County health department will implement publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
5.2.2 1.4	Annually assess public and private locations as potential shelters from storms or extreme temperatures; designate suitable shelters, establish MOU's , and develop accessibility plans for the public during times of need.	3	3	2	2	3	3	3	19	IC, EMCC	4	-1	3	22	H
1.5	Distribute information on dam safety and self-inspection programs to all dam owners, explore funding opportunities for dam repair.	3	2	2	1	3	3	2	16	IC, PD, EMCC	6	-1	5	21	H
1.3.2 2.1	Upgrade roads and bridges that would improve drainage, reduce flooding, and reduce the risk to residents and property as funding allows.	3	3	2	3	3	2	2	18	IC, PD, LF, EMCC	8	-1	7	25	H
2.2.1 2.2	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
2.3.2 2.3	Update floodplain management ordinances to implement regulations to securely attach manufactured homes and fuel tanks to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.	2	2	2	1	2	2	2	13	IC, PD, EMCC	8	-3	5	18	M
2.3.3 2.4	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.	3	2	2	2	3	3	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
3.3.2 2.5	Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
5.3.1 2.6	Purchase properties in the floodplain to convert land into public space/recreation area as funding allows.	2	2	2	2	3	1	3	15	IC, PD, LF, EMCC	8	-5	3	18	M

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
6.2.1 2.7	Cities and counties will implement cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.	2	1	1	1	2	2	2	11	IC, PD, LF, EMCC	8	-5	3	14	M
2.8	Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.	3	3	3	3	3	2	3	20	LF, EMCC	4	-3	1	21	H
2.9	Assist in the formation and training of a prescribed burn association to reduce the incidence of wildfire.	3	2	2	3	3	3	2	18	IC, PD, LF, EMCC	8	-2	6	24	H
1.1.4 3.1	Distribute materials to local businesses, governments, and schools to assist in the creation and update of emergency operations plans.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
2.1.1 3.2	Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.	2	2	2	2	2	1	3	14	IC, PD, LF, EMCC	8	-5	3	17	M
3.2.2 3.3	Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.	2	2	2	2	2	2	2	14	IC, PD, LF, EMCC	8	-3	5	19	M
3.4	City of Vienna will research options to reduce its wastewater facility's vulnerability to flood events.	3	2	3	3	3	2	3	19	PD, LF, EMCC	6	-5	1	20	H

During this plan update, the goals were revised to remove redundancies and better represent the objectives of the planning area. This required us to revise the numbering conventions for action items included in the previous plan update. In the table above, action numbers in red denote the revised action number for continuing actions.

## **Maries County**

**Goal 1:** Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

**Action 1.1:** Local Fire Departments and Emergency Management Director will provide CERT training and distribute information on the benefits of the CERT and VOAD programs.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with the lack of CERT or VOAD programs in the county
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1
<b>Name of Action or Project:</b>	CERT training and awareness program for CERT and VOADs.
<b>Action or Project Description:</b>	Local Fire Departments and Emergency Management Director will provide CERT training and distribute information on the benefits of the CERT and VOAD programs.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	\$1,000 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD and Local Fire Departments
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - revised
<b>Report of Progress</b>	There was a CERT program in Maries County in the past. However, the pandemic resulted in the discontinuation of training and meetings of this group. Recently seven individuals have completed CERT training. The program would benefit from holding additional CERT trainings to form a team and an

	organized approach to distributing information about CERT and VOAD.
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**Action 1.2:** Construct storm shelters or tornado safe rooms near schools and large employment centers as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff, and employees in the event of high winds/tornadoes.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Encourage construction of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	Disseminate information on the importance of and funding sources for constructing storm shelters, especially certified tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission and EMD
<b>Action/Project Priority:</b>	19 – Medium Priority
<b>Timeline for Completion:</b>	On-going until facilities are constructed
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs, School Emergency Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised – no progress
<b>Report of Progress</b>	No progress at this time. The cost of constructing certified tornado shelters is an obstacle and neither school district nor any large manufacturers currently has plans to expand/build which would provide an opportunity to incorporate a certified tornado safe room into the plans.

**Action 1.3:** County health department will implement publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave, extreme cold).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge by the general public of proper measures to take during times of threatening conditions.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.4
<b>Name of Action or Project:</b>	Public education
<b>Action or Project Description:</b>	County health department will implement publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave, extreme cold).
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	\$500 - \$2,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Phelps-Maries County Health Department
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – on-going
<b>Report of Progress</b>	The health department currently works to increase awareness of the proper measures to take during times of threatening conditions such as heat waves and extreme cold through the distribution of brochures and social media postings. This is an on-going activity.

**Action 1.4:** Annually assess public and private locations as potential shelters from storms, or extreme temperatures, designate suitable shelters, establish MOU's, and develop accessibility plans for the public during times of need.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack of adequate natural hazard shelters.
<b>Hazard(s) Addressed:</b>	Tornadoes, severe storms, extreme weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.5
<b>Name of Action or Project:</b>	Assessment of locations as potential public shelters, designation of suitable facilities and development of accessibility plans
<b>Action or Project Description:</b>	Encourage the assessment of locations as potential emergency shelters; designate those that are suitable as safe shelters; and develop accessibility plans for the public during times of need.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD
<b>Action/Project Priority:</b>	22 – High Priority
<b>Timeline for Completion:</b>	Annually
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – in progress
<b>Report of Progress</b>	The county EMD has made some progress on this action item. Two shelters have been designated – the county courthouse in Vienna and the Masonic Lodge in Belle. Accessibility plans are in place for these two locations, and both have shelter supplies. The county would benefit from having more detailed assessments done and additional shelters designated.



**Action 1.5:** Distribute information on dam safety and self-inspection programs to all dam owners, explore funding opportunities for dam repair.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Aging dams that could be in need of repair or replacement
<b>Hazard(s) Addressed:</b>	Dam Failure
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.6
<b>Name of Action or Project:</b>	Dam Safety Outreach.
<b>Action or Project Description:</b>	Distribute information on dam safety and self-inspection programs to all dam owners, explore funding opportunities for dam repair.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	\$1,000 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD and Local Fire Departments
<b>Action/Project Priority:</b>	21– High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP, Dam Emergency Action Plans
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	N/A

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

**Action 2.1:** Upgrade roads and bridges that would improve drainage, reduce flooding, and reduce the risk to residents and property as funding allows.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquake events.
<b>Hazard(s) Addressed:</b>	Floods and Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1
<b>Name of Action or Project:</b>	Review road and bridge upgrades for potential mitigation actions
<b>Action or Project Description:</b>	Examine potential road and bridge upgrades and seek out sources of funding that would improve drainage, reduce flooding, and the risk to residents and property.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$1,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission, Road & Bridge Dept., Local Planners
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Revised and in progress
<b>Report of Progress</b>	The county has a policy to upgrade and improve all road and bridge projects where possible. Improvements since the last update include the replacement of metal culverts on Maries Road 619 and Maries Road 621 with new concrete box culverts.

**Action 2.2:** Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities of properties in the floodplain during a flood event.
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2
<b>Name of Action or Project:</b>	Flood insurance education/awareness
<b>Action or Project Description:</b>	Educate residents about the dangers of floodplain development and the benefits of the NFIP
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$250 - \$500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Floodplain Manager, Floodplain Coordinator, Maries County Commission
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain management ordinances, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised - in Progress
<b>Report of Progress</b>	Information, brochures, etc. on floodplain development and the NFIP is available through the floodplain manager and floodplain coordinator for the county. Brochures have been made available at the courthouse. Press releases are done annually. This is a program that requires on-going activity as people move in and out of the county.

**Action 2.3:** Update floodplain management ordinances to implement regulations to securely attach mobile homes and fuel tanks to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with unsecured hazardous materials tanks, and mobile homes during flood, severe weather, or tornado events.
<b>Hazard(s) Addressed:</b>	Flood, Severe Weather, Tornado
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3
<b>Name of Action or Project:</b>	Update floodplain management ordinances to implement regulations to securely attach mobile homes and fuel tanks to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.
<b>Action or Project Description:</b>	Encourage local governments to develop and implement regulations and/or ordinances for securing hazardous materials, tanks, and mobile homes to reduce hazards during storms, flooding, and high winds.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$100
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Floodplain Manager, County Commission
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	1 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	County ordinances, builder's plans, LEOP, floodplain ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Not Started
<b>Report of Progress</b>	N/A

**Action 2.4:** Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with flooding and unregulated floodplain development.
<b>Hazard(s) Addressed:</b>	Flood, Severe Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.4
<b>Name of Action or Project:</b>	Floodplain management compliance enforcement.
<b>Action or Project Description:</b>	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$4,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Floodplain Manager, Floodplain Coordinator, Maries County Commission
<b>Action/Project Priority:</b>	23 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Maries County continues to ensure compliance with its floodplain ordinance by requiring floodplain development permits, carrying out inspections of floodplain properties, distributing press releases on NFIP and floodplain ordinance requirements annually and distributing brochures.

**Action 2.5:** Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of what hazard mitigation is, what local jurisdictions are doing on hazard mitigation and how individuals can benefit from hazard mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.5
<b>Name of Action or Project:</b>	Hazard Mitigation Awareness Program
<b>Action or Project Description:</b>	Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies, MPC
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – on-going
<b>Report of Progress</b>	Local media outlets report on county road and bridge projects and the benefits of the improvements made. The county health department provides information on how to mitigate potential health problems during periods of extreme temperatures. Progress is being made but this is an on-going program.



**Action 2.6:** Purchase properties in the floodplain to convert land into public space/recreation area as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with floodplain properties
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.6
<b>Name of Action or Project:</b>	Government purchase of properties in the floodplain
<b>Action or Project Description:</b>	Purchase properties in the floodplain to convert land into public space/recreation area as funding allows.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission, County EMD, Floodplain Manager/Coordinator
<b>Action/Project Priority:</b>	18 - M
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain ordinances, Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised – no progress
<b>Report of Progress</b>	N/A

**Action 2.7:** Cities and counties will implement cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects for individuals
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.7
<b>Name of Action or Project:</b>	Cities and counties will implement cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.
<b>Action or Project Description:</b>	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
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Progress is being made in this area. Maries County Road and Bridge works with landowners and cost-shares the installation of culverts on private driveways.

**Action 2.8:** Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.8
<b>Name of Action or Project:</b>	Acquisition and installation of backup generators for critical infrastructure.
<b>Action or Project Description:</b>	Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$25,500 – \$100,000
<b>Benefits:</b>	Losses avoided by implementing this action include loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission
<b>Action/Project Priority:</b>	21 –High Priority
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
<b>Progress Report</b>	
<b>Action Status</b>	Revised – in progress
<b>Report of Progress</b>	The county has two portable generators available. There is a generator for the Sheriff's department and one for the courthouse as well.

**Action 2.9:** Assist in the formation and training of a prescribed burn association to reduce the incidence of wildfire.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities of properties during a wildfire event
<b>Hazard(s) Addressed:</b>	Wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.9
<b>Name of Action or Project:</b>	Formation of a Prescribe Burn Association
<b>Action or Project Description:</b>	Assist in the formation and training of a prescribed burn association to reduce the incidence of wildfire.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$250 - \$500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Emergency Management Directors, Fire Departments
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	County Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	The Greater Maries Prescribed Burn Association is in development and currently seeking members.

**Goal 3:** Reduce the potential impact of natural disasters on the continuity of government and essential services.

**Action 3.1:** Distribute materials to businesses, local governments, and schools to assist in the creation and update of emergency operations plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of emergency plans by businesses, local government units and schools.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1
<b>Name of Action or Project:</b>	Development of emergency plans by businesses, local government units and schools.
<b>Action or Project Description:</b>	Promote development of emergency plans by businesses and public entities by providing information on business continuity and emergency planning through local chambers of commerce and emergency management offices.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD,
<b>Action/Project Priority:</b>	23 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Continuing

<b>Report of Progress</b>	The planning area has a county-wide LEOP. Maries Manor, a local nursing home; Phelps Health Clinic; Hippos, LLC, a cultivation facility; and the Maries County Bank have all developed emergency operation plans.
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**Action 3.2:** Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
<b>Hazard(s) Addressed:</b>	Earthquakes and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.2
<b>Name of Action or Project:</b>	Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.
<b>Action or Project Description:</b>	Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the continuity of government and essential services.
<b>Estimated Cost:</b>	\$1,500 – \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – no progress
<b>Report of Progress</b>	The county EMD periodically does safety walk-throughs of facilities in the county upon request. Those inspections have not typically included structural resistance to earthquake or tornado in the past. EMD will begin distributing information about the NOAA

	ambassador program that evaluates tornado safety at no cost to the facility.
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**Action 3.3:** Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge/information of officials in regard to mitigation planning, implementation, and budgeting for mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.3
<b>Name of Action or Project:</b>	Mitigation awareness/education meetings with local officials and SEMA
<b>Action or Project Description:</b>	Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the continuity of government and essential services.
<b>Estimated Cost:</b>	\$100
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission, SEMA Area Coordinator
<b>Action/Project Priority:</b>	19 - M
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - Ongoing
<b>Report of Progress</b>	The Region I 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 Maries County and its jurisdictions. Due to changes in elected officials, this is an ongoing activity.

## **Belle**

**Goal 1:** Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

**Action 1.1:** Local Fire Departments and Emergency Management Director will provide CERT training and distribute information on the benefits of the CERT and VOAD programs.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with the lack of CERT or VOAD programs in the county
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1
<b>Name of Action or Project:</b>	CERT training and awareness program for CERT and VOADs.
<b>Action or Project Description:</b>	Local Fire Departments and Emergency Management Director will provide CERT training and distribute information on the benefits of the CERT and VOAD programs.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	\$1,000 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD and Local Fire Departments
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - revised
<b>Report of Progress</b>	There was a CERT program in Maries County in the past. However, the pandemic resulted in the discontinuation of training and meetings of this group. The program would benefit from

	holding additional CERT trainings and an organized approach to distributing information on CERT and VOAD.
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**Action 1.2:** Obtain/upgrade early warning systems and improved communication systems as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with lack of early warning systems and communications systems in unincorporated areas.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Improving early warning and communications capabilities.
<b>Action or Project Description:</b>	Belle City Council needs to budget for enhanced warning and communications systems to improve early warning capabilities for residents in the city of Belle.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Local Planners, Local Emergency Response Agencies
<b>Action/Project Priority:</b>	23 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing and revised – in progress
<b>Report of Progress</b>	Belle has one warning siren operated by the EMD and the Belle Fire Protection District.

**Action 1.3:** Construct storm shelters or tornado safe rooms near schools and large employment centers as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff, and employees in the event of high winds/tornadoes.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Encourage construction of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	Disseminate information on the importance of and funding sources for constructing storm shelters, especially certified tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission and EMD
<b>Action/Project Priority:</b>	19 – Medium Priority
<b>Timeline for Completion:</b>	On-going until facilities are constructed
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs, School Emergency Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised – no progress
<b>Report of Progress</b>	No progress at this time. The cost of constructing certified tornado shelters is an obstacle. The city is unaware of any large manufacturers currently that has plans to expand/build which would provide an opportunity to incorporate a certified tornado safe room into the plans.

**Action 1.4:** County health department will implement publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave, extreme cold).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge by the general public of proper measures to take during times of threatening conditions.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.4
<b>Name of Action or Project:</b>	Public education
<b>Action or Project Description:</b>	County health department will implement publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave, extreme cold).
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	\$500 - \$2,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Phelps-Maries County Health Department
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – on-going
<b>Report of Progress</b>	The health department currently works to increase awareness of the proper measures to take during times of threatening conditions such as heat waves and extreme cold through the distribution of brochures and social media postings. This is an on-going activity.

**Action 1.5:** Annually assess public and private locations as potential shelters from storms, or extreme temperatures, designate suitable shelters, establish MOU's, and develop accessibility plans for the public during times of need.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack of adequate natural hazard shelters.
<b>Hazard(s) Addressed:</b>	Tornadoes, severe thunderstorms, extreme temperature, severe winter weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.5
<b>Name of Action or Project:</b>	Assessment of locations as potential public shelters, designation of suitable facilities and development of accessibility plans
<b>Action or Project Description:</b>	Encourage the assessment of locations as potential emergency shelters; designate those that are suitable as safe shelters; and develop accessibility plans for the public during times of need.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD
<b>Action/Project Priority:</b>	22 – High Priority
<b>Timeline for Completion:</b>	Annually
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – in progress
<b>Report of Progress</b>	The county EMD has established shelters at the Masonic Lodge in Belle. The shelter is opened each time the tornado sirens are activated and is stocked with supplies. It also serves as an evacuation shelter. The Belle Fire Protection District Station is utilized as a warming/cooling shelter as needed.

**Action 1.6:** Distribute information on dam safety and self-inspection programs to all dam owners, explore funding opportunities for dam repair.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Aging dams that could be in need of repair or replacement
<b>Hazard(s) Addressed:</b>	Dam Failure
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.6
<b>Name of Action or Project:</b>	Dam Safety Outreach.
<b>Action or Project Description:</b>	Distribute information on dam safety and self-inspection programs to all dam owners, explore funding opportunities for dam repair.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	\$1,000 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD and Local Fire Departments
<b>Action/Project Priority:</b>	21– High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP, Dam Emergency Action Plans
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	N/A



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

**Action 2.1:** Upgrade roads and bridges that would improve drainage, reduce flooding, and reduce the risk to residents and property as funding allows.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquake events.
<b>Hazard(s) Addressed:</b>	Floods and Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1
<b>Name of Action or Project:</b>	Review road and bridge upgrades for potential mitigation actions
<b>Action or Project Description:</b>	Examine potential road and bridge upgrades and seek out sources of funding that would improve drainage, reduce flooding, and the risk to residents and property.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$1,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission, Road & Bridge Dept., Local Planners
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Revised and in progress
<b>Report of Progress</b>	The city reviews each street project to determine if it would benefit from enlarging culverts to improve drainage.

**Action 2.5:** Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of what hazard mitigation is, what local jurisdictions are doing on hazard mitigation and how individuals can benefit from hazard mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.5
<b>Name of Action or Project:</b>	Hazard Mitigation Awareness Program
<b>Action or Project Description:</b>	Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies, MPC
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – on-going
<b>Report of Progress</b>	Local media outlets report on county road and bridge projects and the benefits of the improvements made. The county health department provides information on how to mitigate potential health problems during periods of extreme temperatures. Progress is being made but this is an on-going program.

**Action 2.7:** Cities and counties will implement cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects for individuals
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.7
<b>Name of Action or Project:</b>	Cities and counties will implement cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.
<b>Action or Project Description:</b>	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
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	No progress

**Action 2.8:** Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.8
<b>Name of Action or Project:</b>	Acquisition and installation of backup generators for critical infrastructure.
<b>Action or Project Description:</b>	Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$25,500 – \$100,000
<b>Benefits:</b>	Losses avoided by implementing this action include loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission
<b>Action/Project Priority:</b>	21 –High Priority
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
<b>Progress Report</b>	
<b>Action Status</b>	Revised – in progress
<b>Report of Progress</b>	The city of Belle has two fixed generators: one servicing the Fire Station and the other at the wastewater treatment facility.

**Action 2.9:** Assist in the formation and training of a prescribed burn association to reduce the incidence of wildfire.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities of properties during a wildfire event
<b>Hazard(s) Addressed:</b>	Wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.9
<b>Name of Action or Project:</b>	Formation of a Prescribe Burn Association
<b>Action or Project Description:</b>	Assist in the formation and training of a prescribed burn association to reduce the incidence of wildfire.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$250 - \$500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Emergency Management Directors, Fire Departments
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	County Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	N/A

**Goal 3:** Reduce the potential impact of natural disasters on the continuity of government and essential services.

**Action 3.1:** Distribute materials to businesses, local governments, and schools to assist in the creation and update of emergency operations plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of emergency plans by businesses, local government units and schools.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1
<b>Name of Action or Project:</b>	Development of emergency plans by businesses, local government units and schools.
<b>Action or Project Description:</b>	Promote development of emergency plans by businesses and public entities by providing information on business continuity and emergency planning through local chambers of commerce and emergency management offices.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD,
<b>Action/Project Priority:</b>	23 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Continuing
<b>Report of Progress</b>	The planning area has a county-wide LEOP. Maries Manor, a local nursing home; Phelps Health Clinic; Hippos, LLC, a cultivation facility; and the Maries County Bank have all developed emergency operation plans.

**Action 3.2:** Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
<b>Hazard(s) Addressed:</b>	Earthquakes and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.2
<b>Name of Action or Project:</b>	Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.
<b>Action or Project Description:</b>	Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the continuity of government and essential services.
<b>Estimated Cost:</b>	\$1,500 – \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – no progress
<b>Report of Progress</b>	The county EMD periodically does safety walk-throughs of facilities in the county upon request. Those inspections have not typically included structural resistance to earthquake or tornado in the past. EMD will begin distributing information about the NOAA ambassador program that evaluates tornado safety at no cost to the facility.



**Action 3.3:** Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Belle
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge/information of officials in regard to mitigation planning, implementation, and budgeting for mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.3
<b>Name of Action or Project:</b>	Mitigation awareness/education meetings with local officials and SEMA
<b>Action or Project Description:</b>	Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the continuity of government and essential services.
<b>Estimated Cost:</b>	\$100
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission, SEMA Area Coordinator
<b>Action/Project Priority:</b>	19 - M
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - Ongoing
<b>Report of Progress</b>	The Region I 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 the city of Belle. Due to changes in elected officials, this is an ongoing activity.

## Vienna

**Goal 1:** Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

**Action 1.1:** Local Fire Departments and Emergency Management Director will provide CERT training and distribute information on the benefits of the CERT and VOAD programs.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with the lack of CERT or VOAD programs in the county
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1
<b>Name of Action or Project:</b>	CERT training and awareness program for CERT and VOADs.
<b>Action or Project Description:</b>	Local Fire Departments and Emergency Management Director will provide CERT training and distribute information on the benefits of the CERT and VOAD programs.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	\$1,000 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD and Local Fire Departments
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - revised
<b>Report of Progress</b>	There was a CERT program in Maries County in the past. However, the pandemic resulted in the discontinuation of training and meetings of this group. The program would benefit from

	holding additional CERT trainings and an organized approach to distributing information CERT and VOAD.
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**Action 1.2:** Obtain/upgrade early warning systems and improved communication systems as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with lack of early warning systems and communications systems in unincorporated areas.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Improving early warning and communications capabilities.
<b>Action or Project Description:</b>	Maries County Commission needs to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Maries County.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Local Planners, Local Emergency Response Agencies
<b>Action/Project Priority:</b>	23 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing and revised – in progress
<b>Report of Progress</b>	Vienna has one warning siren.

**Action 1.3:** Construct storm shelters or tornado safe rooms near schools and large employment centers as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff, and employees in the event of high winds/tornadoes.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Encourage construction of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	Disseminate information on the importance of and funding sources for constructing storm shelters, especially certified tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission and EMD
<b>Action/Project Priority:</b>	19 – Medium Priority
<b>Timeline for Completion:</b>	On-going until facilities are constructed
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs, School Emergency Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised – no progress
<b>Report of Progress</b>	No progress at this time. The cost of constructing certified tornado shelters is an obstacle and neither school district nor any large manufacturers currently has plans to expand/build which would provide an opportunity to incorporate a certified tornado safe room into the plans.

**Action 1.4:** County health department will implement publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave, extreme cold).

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge by the general public of proper measures to take during times of threatening conditions.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.4
<b>Name of Action or Project:</b>	Public education
<b>Action or Project Description:</b>	County health department will implement publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave, extreme cold).
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	\$500 - \$2,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Phelps-Maries County Health Department
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – on-going
<b>Report of Progress</b>	The health department currently works to increase awareness of the proper measures to take during times of threatening conditions such as heat waves and extreme cold through the distribution of brochures and social media postings. This is an on-going activity.

**Action 1.5:** Annually assess public and private locations as potential shelters from storms, or extreme temperatures, designate suitable shelters, establish MOU's, and develop accessibility plans for the public during times of need.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack of adequate natural hazard shelters.
<b>Hazard(s) Addressed:</b>	Tornadoes, severe storms, extreme weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.5
<b>Name of Action or Project:</b>	Assessment of locations as potential public shelters, designation of suitable facilities and development of accessibility plans
<b>Action or Project Description:</b>	Encourage the assessment of locations as potential emergency shelters; designate those that are suitable as safe shelters; and develop accessibility plans for the public during times of need.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD
<b>Action/Project Priority:</b>	22 – High Priority
<b>Timeline for Completion:</b>	Annually
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – in progress
<b>Report of Progress</b>	The county EMD has made some progress on this action item. Two shelters have been designated – the county courthouse in Vienna and the Masonic Lodge in Belle. Accessibility plans are in place for these two locations, and both have shelter supplies. The county would benefit from having more detailed assessments done and additional shelters designated.

**Action 1.6:** Distribute information on dam safety and self-inspection programs to all dam owners, explore funding opportunities for dam repair.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Aging dams that could be in need of repair or replacement
<b>Hazard(s) Addressed:</b>	Dam Failure
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.6
<b>Name of Action or Project:</b>	Dam Safety Outreach.
<b>Action or Project Description:</b>	Distribute information on dam safety and self-inspection programs to all dam owners, explore funding opportunities for dam repair.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	\$1,000 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD and Local Fire Departments
<b>Action/Project Priority:</b>	21– High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP, Dam Emergency Action Plans
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	N/A



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

**Action 2.1:** Upgrade roads and bridges that would improve drainage, reduce flooding, and reduce the risk to residents and property as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquake events.
<b>Hazard(s) Addressed:</b>	Floods and Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1
<b>Name of Action or Project:</b>	Review road and bridge upgrades for potential mitigation actions
<b>Action or Project Description:</b>	Examine potential road and bridge upgrades and seek out sources of funding that would improve drainage, reduce flooding, and the risk to residents and property.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$1,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission, Road & Bridge Dept., Local Planners
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Revised and in progress
<b>Report of Progress</b>	The city reviews each road and bridge project and determines if it will benefit from an upgrade of culvert size to improve drainage.

**Action 2.2:** Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities of properties in the floodplain during a flood event.
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2
<b>Name of Action or Project:</b>	Flood insurance education/awareness
<b>Action or Project Description:</b>	Educate residents about the dangers of floodplain development and the benefits of the NFIP
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$250 - \$500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Floodplain Manager, Floodplain Coordinator, Maries County Commission
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain management ordinances, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised - in Progress
<b>Report of Progress</b>	Information, brochures, etc. on floodplain development and the NFIP is available through the floodplain manager and floodplain coordinator for the city. Press releases are done annually. This is a program that requires on-going activity as people move in and out of the city.

**Action 2.3:** Update floodplain management ordinances to implement regulations to securely attach mobile homes and fuel tanks to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with unsecured hazardous materials tanks, and mobile homes during flood, severe weather, or tornado events.
<b>Hazard(s) Addressed:</b>	Flood, Severe Weather, Tornado
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3
<b>Name of Action or Project:</b>	Update floodplain management ordinances to implement regulations to securely attach mobile homes and fuel tanks to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.
<b>Action or Project Description:</b>	Encourage local governments to develop and implement regulations and/or ordinances for securing hazardous materials, tanks, and mobile homes to reduce hazards during storms, flooding, and high winds.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$100
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Floodplain Manager, County Commission
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	1 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	County ordinances, builder's plans, LEOP, floodplain ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Not Started
<b>Report of Progress</b>	N/A

**Action 2.4:** Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with flooding and unregulated floodplain development.
<b>Hazard(s) Addressed:</b>	Flood, Severe Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.4
<b>Name of Action or Project:</b>	Floodplain management compliance enforcement.
<b>Action or Project Description:</b>	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$4,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Floodplain Manager, Floodplain Coordinator, Maries County Commission
<b>Action/Project Priority:</b>	23 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The city benefits from the public information campaign done by Maries County on requiring floodplain development permits, carrying out inspections of floodplain properties, distributing press releases on NFIP annually and distributing brochures. Because the city has such a small floodplain area, there is no development activity in the floodplain.

**Action 2.5:** Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of what hazard mitigation is, what local jurisdictions are doing on hazard mitigation and how individuals can benefit from hazard mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.5
<b>Name of Action or Project:</b>	Hazard Mitigation Awareness Program
<b>Action or Project Description:</b>	Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies, MPC
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – on-going
<b>Report of Progress</b>	Local media outlets report on county road and bridge projects and the benefits of the improvements made. The county health department provides information on how to mitigate potential

	health problems during periods of extreme temperatures. Progress is being made but this is an on-going program.
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**Action 2.6:** Purchase properties in the floodplain to convert land into public space/recreation area as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with floodplain properties
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.6
<b>Name of Action or Project:</b>	Government purchase of properties in the floodplain
<b>Action or Project Description:</b>	Purchase properties in the floodplain to convert land into public space/recreation area as funding allows.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission, County EMD, Floodplain Manager/Coordinator
<b>Action/Project Priority:</b>	18 - M
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain ordinances, Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised – no progress
<b>Report of Progress</b>	N/A

**Action 2.7:** Cities and counties will implement cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects for individuals
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.7
<b>Name of Action or Project:</b>	Cities and counties will implement cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.
<b>Action or Project Description:</b>	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
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	No progress has been made in this area.



**Action 2.8:** Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.8
<b>Name of Action or Project:</b>	Acquisition and installation of backup generators for critical infrastructure.
<b>Action or Project Description:</b>	Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$25,500 – \$100,000
<b>Benefits:</b>	Losses avoided by implementing this action include loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission
<b>Action/Project Priority:</b>	21 –High Priority
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
<b>Progress Report</b>	
<b>Action Status</b>	Revised – in progress
<b>Report of Progress</b>	The city of Vienna has one fixed generator located at the city water plant and one portable generator kept at the city hall building.

**Action 2.9:** Assist in the formation and training of a prescribed burn association to reduce the incidence of wildfire.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities of properties during a wildfire event
<b>Hazard(s) Addressed:</b>	Wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.9
<b>Name of Action or Project:</b>	Formation of a Prescribe Burn Association
<b>Action or Project Description:</b>	Assist in the formation and training of a prescribed burn association to reduce the incidence of wildfire.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties, infrastructure, and the local economy.
<b>Estimated Cost:</b>	\$250 - \$500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Emergency Management Directors, Fire Departments
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	County Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	N/A

**Goal 3:** Reduce the potential impact of natural disasters on the continuity of government and essential services.

**Action 3.1:** Distribute materials to businesses, local governments, and schools to assist in the creation and update of emergency operations plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of emergency plans by businesses, local government units and schools.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1
<b>Name of Action or Project:</b>	Development of emergency plans by businesses, local government units and schools.
<b>Action or Project Description:</b>	Promote development of emergency plans by businesses and public entities by providing information on business continuity and emergency planning through local chambers of commerce and emergency management offices.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD,
<b>Action/Project Priority:</b>	23 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Continuing
<b>Report of Progress</b>	The planning area has a county-wide LEOP. Maries Manor, a local nursing home, has an emergency plan. The Maries County Bank has also developed an emergency plan.

**Action 3.2:** Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
<b>Hazard(s) Addressed:</b>	Earthquakes and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.2
<b>Name of Action or Project:</b>	Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.
<b>Action or Project Description:</b>	Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the continuity of government and essential services.
<b>Estimated Cost:</b>	\$1,500 – \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – no progress
<b>Report of Progress</b>	The county EMD periodically does safety walk-throughs of facilities in the county upon request. Those inspections have not typically included structural resistance to earthquake or tornado in the past. EMD will begin distributing information about the NOAA ambassador program that evaluates tornado safety at no cost to the facility.

**Action 3.3:** Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge/information of officials in regard to mitigation planning, implementation, and budgeting for mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.3
<b>Name of Action or Project:</b>	Mitigation awareness/education meetings with local officials and SEMA
<b>Action or Project Description:</b>	Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the continuity of government and essential services.
<b>Estimated Cost:</b>	\$100
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission, SEMA Area Coordinator
<b>Action/Project Priority:</b>	19 - M
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - Ongoing
<b>Report of Progress</b>	The Region I 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 the city of Vienna. Due to changes in elected officials, this is an ongoing activity.

**Action 3.4:** City of Vienna will research options to reduce its wastewater facility's vulnerability to flood events.

Action Worksheet	
<b>Name of Jurisdiction:</b>	City of Vienna
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Wastewater facility's vulnerability to flood
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4
<b>Name of Action or Project:</b>	City of Vienna will research options to reduce its wastewater facility's vulnerability to flood events.
<b>Action or Project Description:</b>	The city's wastewater facility is comprised of 4 wastewater retention ponds that are located in the floodway fringe. The city will research avenues to reduce the facility's vulnerability to flood waters.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the continuity of government and essential services.
<b>Estimated Cost:</b>	\$4,500 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Mayor, Board of Aldermen
<b>Action/Project Priority:</b>	20 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	N/A

## **Maries County R-I**

**Goal 1:** Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

**Action 1.2:** Obtain/upgrade early warning systems and improved communication systems as funding allows.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County R-I
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with lack of early warning systems and communications systems in unincorporated areas.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Improving early warning and communications capabilities.
<b>Action or Project Description:</b>	Maries County Commission needs to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Maries County.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Local Planners, Local Emergency Response Agencies
<b>Action/Project Priority:</b>	23 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing and revised – in progress
<b>Report of Progress</b>	One warning siren serves the school district located within the city limits of Vienna. The district has an intercom system in their buildings and also utilize handheld radios to maintain constant contact with staff to allow for notification in the event of impending



	disaster events. The district also has email/text notification systems in place for contacting parents.
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**Action 1.3:** Construct storm shelters or tornado safe rooms near schools and large employment centers as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County R-I
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff, and employees in the event of high winds/tornadoes.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Encourage construction of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	Disseminate information on the importance of and funding sources for constructing storm shelters, especially certified tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission and EMD
<b>Action/Project Priority:</b>	19 – Medium Priority
<b>Timeline for Completion:</b>	On-going until facilities are constructed
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs, School Emergency Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised – no progress
<b>Report of Progress</b>	No progress at this time. The cost of constructing certified tornado shelters is an obstacle. The school district does not currently have plans to expand/build in a way which would provide an opportunity to incorporate a certified tornado safe room into the plans.

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

**Action 2.5:** Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County R-I
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of what hazard mitigation is, what local jurisdictions are doing on hazard mitigation and how individuals can benefit from hazard mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.5
<b>Name of Action or Project:</b>	Hazard Mitigation Awareness Program
<b>Action or Project Description:</b>	Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies, MPC
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – on-going

<b>Report of Progress</b>	The school district uses social media and email/text based notification systems to relay important information on general health and wellness to the families of students in the district including challenging weather events, bus route closures, vaccination events, etc.
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**Action 2.8:** Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County R-I
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.8
<b>Name of Action or Project:</b>	Acquisition and installation of backup generators for critical infrastructure.
<b>Action or Project Description:</b>	Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$25,500 – \$100,000
<b>Benefits:</b>	Losses avoided by implementing this action include loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission
<b>Action/Project Priority:</b>	21 –High Priority
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
<b>Progress Report</b>	
<b>Action Status</b>	Revised – in progress
<b>Report of Progress</b>	The district does not own any generators at this time.

**Goal 3:** Reduce the potential impact of natural disasters on the continuity of government and essential services.

**Action 3.3:** Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County R-I
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge/information of officials in regard to mitigation planning, implementation, and budgeting for mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.3
<b>Name of Action or Project:</b>	Mitigation awareness/education meetings with local officials and SEMA
<b>Action or Project Description:</b>	Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the continuity of government and essential services.
<b>Estimated Cost:</b>	\$100
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission, SEMA Area Coordinator
<b>Action/Project Priority:</b>	19 - M
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - Ongoing
<b>Report of Progress</b>	The Region I 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. Due to changes in elected officials, this is an ongoing activity.
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## **Maries County R-II**

**Goal 1:** Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

**Action 1.2:** Obtain/upgrade early warning systems and improved communication systems as funding allows.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County R-II
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with lack of early warning systems and communications systems in unincorporated areas.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Improving early warning and communications capabilities.
<b>Action or Project Description:</b>	Maries County Commission needs to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Maries County.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Local Planners, Local Emergency Response Agencies
<b>Action/Project Priority:</b>	23 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs, County Budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing and revised – in progress

<b>Report of Progress</b>	One warning siren serves the Elementary and High School buildings. Both buildings have public address systems and the district utilizes email/text notification systems for parent communication.
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**Action 1.3:** Construct storm shelters or tornado safe rooms near schools and large employment centers as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County R-II
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff, and employees in the event of high winds/tornadoes.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Encourage construction of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	Disseminate information on the importance of and funding sources for constructing storm shelters, especially certified tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission and EMD
<b>Action/Project Priority:</b>	19 – Medium Priority
<b>Timeline for Completion:</b>	On-going until facilities are constructed
<b>Potential Fund Sources:</b>	HMGP, BRIC, and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs, School Emergency Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised – no progress
<b>Report of Progress</b>	No progress at this time. The cost of constructing certified tornado shelters is an obstacle. The school district does not currently have plans to expand/build which would provide an opportunity to incorporate a certified tornado safe room into the plans.

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

**Action 2.5:** Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County R-II
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of what hazard mitigation is, what local jurisdictions are doing on hazard mitigation and how individuals can benefit from hazard mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.5
<b>Name of Action or Project:</b>	Hazard Mitigation Awareness Program
<b>Action or Project Description:</b>	Local governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies, MPC
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Revised – on-going
<b>Report of Progress</b>	The school district uses social media and email/text based notification systems to relay important information on general



	health and wellness to the families of students in the district including challenging weather events, bus route closures, vaccination events, etc.
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**Action 2.8:** Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.

Action Worksheet	
<b>Name of Jurisdiction:</b>	Maries County R-II
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.8
<b>Name of Action or Project:</b>	Acquisition and installation of backup generators for critical infrastructure.
<b>Action or Project Description:</b>	Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$25,500 – \$100,000
<b>Benefits:</b>	Losses avoided by implementing this action include loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission
<b>Action/Project Priority:</b>	21 –High Priority
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	HMGP, BRIC, FMA, HMGP Post-Fire Assistance and PDM Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
<b>Progress Report</b>	
<b>Action Status</b>	Revised – in progress
<b>Report of Progress</b>	The school district does not own any generators at this time.

**Goal 3:** Reduce the potential impact of natural disasters on the continuity of government and essential services.

**Action 3.3:** Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Maries County R-II
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge/information of officials in regard to mitigation planning, implementation, and budgeting for mitigation projects.
<b>Hazard(s) Addressed:</b>	Dam Failure, Drought, Earthquakes, Extreme Temperatures, Flooding, Land Subsidence/Sinkholes, Severe Thunderstorms Including High Winds, Hail, and Lightning, Severe Winter Weather, Tornado, Wildfires
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.3
<b>Name of Action or Project:</b>	Mitigation awareness/education meetings with local officials and SEMA
<b>Action or Project Description:</b>	Organize an annual meeting between EMD's, city/county/school officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on the continuity of government and essential services.
<b>Estimated Cost:</b>	\$100
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission, SEMA Area Coordinator
<b>Action/Project Priority:</b>	19 - M
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - Ongoing
<b>Report of Progress</b>	The Region I 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. Due to changes in elected officials, this is an ongoing activity.

# 5 PLAN MAINTENANCE PROCESS

5 PLAN MAINTENANCE PROCESS .....5.1

5.1 Monitoring, Evaluating, and Updating the Plan..... 5.1

5.1.1 Responsibility for Plan Maintenance ..... 5.1

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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 Maries 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 Maries 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 Maries 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**

The plan must identify how, when and by whom the plan will be assessed for effectiveness at achieving its stated purpose and goals (evaluating). 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;
- Incorporation of ideas for new action 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.
- Criteria used to evaluate effectiveness will be the same STAPLEE categories initially used to assign priority. If upon implementation a project is found to not be socially, technically, administratively, politically, legally, economically, or environmentally feasible it will be declared to not meet identified objectives.
- 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 Maries County Hazard Mitigation Planning Committee and the governing boards of the other participating jurisdictions.

## 5.2 Incorporation into Existing Planning Mechanisms

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**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 Maries 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;
- Maries 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 Maries 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 5.1** below lists the planning mechanisms by jurisdiction into which the Hazard Mitigation Plan will be integrated.

**Table 5.1 Planning Mechanisms Identified for Integration of Hazard Mitigation Plan**

<b>Jurisdiction</b>	<b>Planning Mechanisms</b>	<b>Integration Process for Previous Plan</b>	<b>Integration Process for Current Plan</b>
Unincorporated Maries County	County Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Comprehensive Economic Development Strategy Construction/Road & Bridge Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	County Commission and road and bridge supervisors incorporating hazard mitigation projects into budgets and future road and bridge improvements. EMD will review LEOP again and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Belle	City Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Comprehensive Economic Development Strategy Public Works	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. EMD was encouraged to incorporate hazard mitigation into LEOP	City will work toward incorporating hazard mitigation projects into city budget where possible and will incorporate hazard mitigation into other plans upon revision. EMD will review LEOP again and incorporate hazard

<b>Jurisdiction</b>	<b>Planning Mechanisms</b>	<b>Integration Process for Previous Plan</b>	<b>Integration Process for Current Plan</b>
	Construction Budget	where applicable.	mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Vienna	County Mitigation Plan Regional Transportation Plan Comprehensive Economic Development Strategy Public Works Construction Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	City will work toward incorporating hazard mitigation projects into city budget where possible and will incorporate hazard mitigation into other plans upon revision. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Maries County R-I	School Emergency Plan Weapons Policy District Budget	School board and superintendent reviewed district emergency plan and district budget to see where hazard mitigation actions could be incorporated.	School board and superintendent will review School Emergency Plan, Weapons Policy, and district budget to update applicable areas with revised action items list. Superintendent will work toward including the certified tornado safe room(s) into the district budget.
Maries County R-II	Master Plan School Emergency Plan Weapons Policy District Budget	School board and superintendent reviewed district emergency plan and district budget to see where hazard mitigation actions could be incorporated.	School board and superintendent will review Master Plan, , School Emergency Plan, Weapons Policy, and district budget to update applicable areas with revised action items list. Superintendent will work toward including the certified tornado safe room(s) into the district budget.

Source: Jurisdiction surveys 2023

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

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**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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A: References .....	6.2
B: Planning Process .....	6.7
C: Public Survey .....	6.35
D: Adoption Resolutions.....	6.51
E: Critical/Essential Facilities .....	6.56
F: MDC Wildfire Data Search .....	6.58

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## B: Planning Process

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### HMPC Mailing list

Presiding Com. Vic Stratman  
Maries County Courthouse  
P. O. Box 205  
Vienna, MO 65582

Associate Com. Doug Drewell  
Maries County Courthouse  
P. O. Box 205  
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Associate Com. Ed Fagre  
Maries County Courthouse  
P. O. Box 205  
Vienna, MO 65582

Rhonda Rodgers, County Clerk  
Maries County Courthouse  
P. O. Box 205  
Vienna, MO 65582

Carol Jo Schulte  
Maries County Courthouse  
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Vienna, MO 65582

Ashley Wann  
Phelps/Maries County Health  
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City of Belle  
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City of Belle  
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Belle, MO 65013

James Mitchell, Alderman  
City of Belle  
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Emily Williams, Alderman  
City of Belle  
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Adam Padgett, Alderman  
City of Belle  
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Barb Howarth, Alderman  
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City of Belle  
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Belle, MO 65013

Dwight Francis, Fire Chief  
Belle Fire Protection District  
P. O. Box 903  
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Darin Guinn, Public Works  
City of Belle  
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Karen Dudenhoeffer, City Clerk  
City of Vienna  
P. O. Box 196  
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City of Vienna  
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Vienna Fire Prot. Dist.  
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Vichy Volunteer Fire Prot. Assoc.  
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Vichy, MO 65580

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Maries Co. Senior Center  
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Vienna, MO 65582

Missouri Ozarks Community Action  
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Richland, MO 65556

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Maries Manor  
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Administrator  
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Gascosage Electric Cooperative  
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Administrator  
Dixon Ambulance District  
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Dixon, MO 65459

Administrator  
Maries/Osage Ambulance District  
P. O. Box 515  
Vienna, MO 65582

Administrator  
Ozark Central Ambulance District  
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Melissa Wilding  
American Red Cross  
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Karen McHugh, MO SEMA  
Floodplain Management Officer  
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Colonel Travis Rayfield, USACE  
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FEMA Region VII  
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U.S. Fish & Wildlife Service  
Ecological Services Field Office  
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Eddie Blaylock, Captain  
MSHP, Troop I  
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Rolla, MO 65401

Fidelity Communications  
1304 MO-72,  
Rolla, MO 65401

Heartland Regional Library  
206-B South Alvarado  
Belle, MO 65013

Maries County Advocate  
1110 Highway 28, Suite B  
Belle, MO 65013

Heartland Regional Library  
PO Box 231  
Vienna, MO 65582

KKID Radio  
1401A Forum Drive  
Rolla, MO 65401

Results Radio  
P.O. Box 727  
Rolla, MO 65402

Sunny 104.5  
1051 Kingshighway, Suite 5  
Rolla, MO 65401

KPLA  
1002 Diamond Ridge, Suite 400  
Jefferson City, MO 65109

Phelps Health Medical Group  
Vienna  
606 Highway 63 S  
Vienna, MO 65582

Family Medicine – Belle  
100 Highway 28  
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PO Box 263  
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Amy Neir  
Soil and Water Conservation District  
105 Parkway  
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Christy Metzger  
MU Extension - Maries County  
211 4<sup>th</sup> Street  
Vienna, MO 65582

Lion's Club of Vienna  
P.O. Box 448  
Vienna, MO 65582

Fraternal Order of Eagles  
10686 Highway V  
Vienna, MO 65582

Knights of Columbus  
Council 13178 - Vienna  
206 6th Street  
Vienna, MO 65582

## MEMORANDUM

TO: Maries County Hazard Mitigation Planning Committee

FROM: Tammy Snodgrass, MRPC Environmental Programs Manager  
Patrick Stites, MRPC Environmental Programs Specialist  
Kathryn Hawes, MRPC Environmental Program Specialist

DATE: January 6, 2023

SUBJECT: Hazard mitigation planning meeting February 07, 2023

The Meramec Regional Planning Commission (MRPC) has been contracted by Maries County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Maries County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Maries County. We need your help to successfully complete this project.

The county, as well as both cities and both school districts in it, must submit an adopted updated hazard mitigation plan to SEMA and FEMA by March 05, 2024, in order to continue to be eligible for hazard mitigation grants 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, tornado shelters for schools, road/bridge improvements, early warning sirens, generator purchases, etc.

A **meeting** of the **Maries County Hazard Mitigation Planning Committee** is **scheduled** for **Tuesday, February 7<sup>th</sup> at 1:00 p.m.** at the **Vienna Fire Protection District's training room** located at **308 N. Mill St., Vienna, MO**. The focus of this meeting will be to provide background information about hazard mitigation and discuss how we will be upgrading the Plan. These plans are required to be revised every 5 years. This will be the fourth update of the Plan that was originally developed and approved in 2006. We will then review and discuss parts of the existing plan to discover what, if any, changes need to be made. In addition, the group will be asked to report on what mitigation accomplishments and activities have occurred since the last plan update. 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. FEMA requires that the county, both cities, and both school districts included in this plan submit a **Hazard Mitigation Plan Questionnaire**. We just need one fully completed questionnaire from each of the five jurisdictions and these were included in some of these mailers. If you did not receive one you may still be contacted by your jurisdiction to provide information for it. We ask that each jurisdiction bring their completed questionnaire to the meeting. Afterwards we will answer questions and assist with finishing those up. If you believe that your jurisdiction did not receive a questionnaire in error, please contact me and we will get one sent out.

As the county, each city and each school district are required to participate in the planning process and will be asked to formally adopt the Maries County Hazard Mitigation Plan, we strongly encourage you to participate in this committee. If you are unavailable, please 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 community groups. If you have any suggestions for an organization who should be invited to this meeting to ensure that all populations within the county are represented let us know and we will make sure to send them an invite. It is very important that we have good participation from all stakeholders in Maries County.

Thank you for your assistance in addressing hazard mitigation for Maries County. If you have any questions, contact me at (573) 265-2993, or via e-mail: [pstites@meramecregion.org](mailto:pstites@meramecregion.org) . I look forward to seeing you at the meeting.

PS  
Enclosures  
For immediate release  
Jan. 6, 2023

For more information, contact  
Tammy Snodgrass at (573) 265-2993

### **MRPC to hold public meeting for Maries County hazard mitigation plan**

Maries COUNTY—Meramec Regional Planning Commission (MRPC) will be meeting with the Maries County hazard mitigation planning committee at 1:00 p.m. on Feb. 7, 2023, at the Vienna Fire Protection District training room, 308 N Mill St., Vienna, MO, to update the county's hazard mitigation plan. The meeting is open to the public.

Hazard mitigation planning is focused on reducing risk before disasters strike. Activities such as burying electric lines, reduces damage during tornadoes and elevating homes in the floodplain help reduce damage and loss of life during natural disasters. Public input is necessary to truly understand the risks that could be facing the county. Additionally, the county must have a current, updated plan to be eligible for some hazard mitigation grants.

The first draft of the revised plan must be submitted to SEMA by March 5, 2024. Jurisdictions within the county, such as cities, the county itself, schools, fire departments and others, are asked to participate in the planning process. Jurisdictions such as local governments and the school districts are required to complete questionnaires, review the revised plan and adopt the new plan. For those members of the public interested in providing input, a public survey can be found and completed at <https://www.meramecregion.org/surveys/>.

County-level hazard mitigation plans cover a five-year timeframe. Maries County's last plan was approved in May 2019 and can be found at <https://www.meramecregion.org/publications/>.

If you have questions, please contact Tammy Snodgrass at MRPC at 573-265-2993 or by email at [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org).

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. Steve Vogt, representing the city of Belle, serves as MRPC chairman. A professional staff of 34, led by Executive Director Bonnie Prigge, 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](http://www.meramecregion.org) or on Facebook at [www.facebook.com/meramecregion/](https://www.facebook.com/meramecregion/).

**Maries County**  
**Multi-Jurisdictional Hazard Mitigation Plan Update**  
**Planning Meeting**

Tuesday, February 07, 2023 ~ 1:00 p.m.  
Vienna Fire Protection District Training Room

**AGENDA**

- I. Welcome/Introductions – Tammy Snodgrass, Assistant Director, Meramec Regional Planning Commission
- II. Hazard Mitigation Planning Purpose
- III. Grant Programs Linked to Approved Plan
- IV. Planning Tasks / Multi-jurisdictional Approach
- V. Participation Requirements
- VI. Public Involvement
- VII. Data Collection Questionnaires
- VIII. Discussion of Hazards
- IX. Critical Facilities
- X. Next Steps in the Planning Process
- XI. Set Next Meeting Date(s)

## NOTICE OF PUBLIC MEETING

Date and time of posting: 2/3/2023 @11:45 a.m. fS

Notice is hereby given that the **Maries County Hazard Mitigation Planning Committee** will meet at 1:00 p.m. on **Tuesday, February 7, 2022** at the Vienna Fire Protection District Training Room, located at 308 N. Mill St., Vienna, MO 65582

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Hazard Mitigation Planning Purpose
- Grant Programs Linked to Approved Plan
- Planning Tasks/Multi-Jurisdictional Approach
- Participation Requirements
- Public Involvement
- Data Collection Questionnaires
- Discussion of Hazards
- Critical Facilities
- Next Steps in the Planning Process
- Setting of Date and Time for Next Meeting
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Tamara Snodgrass  
#4 Industrial Drive  
St. James, MO 65559  
(573) 265-2993  
[tsnodgrass@meramecregion.org](mailto:tsnodgrass@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.



**Maries County Hazard Mitigation Plan Review Meeting**  
**February 7, 2023 ~ 1:00 p.m.**

Name	Representing	Email Address	Phone #	Address
Wendy Squires	Phelps Health	wsquires@phelpshealth.org	573-458-7720	
BRETT HENDRIX	SEMA	brett.hendrix@sema.dps.mo.gov	573-680-9215	
VIC STRATMAN	Maries County	vustratman@yahoo.com	573-690-9917	
BLAKE ROWDEN	MSHP	BLAKE.Rowden@mshp.dps.mogov	573-368-2345	
Jordan Dillion	Phelps/Maries County Health Dept.	Jordan.Dillion@phelpscounty.org	(573)458-6022	
Carla Butler	Maries Osage Ambulance District	moad800@yahoo.com	(573)422-6123	
MIKE SMITH	VIERNA FIRE PROT. DIST.	mbsmith@socket.net	(573)221-3487	
Michael Elliott	Public	KJFAWB@gmail.com	(573)937-1090	
Tammy Snodgrass	MRPC			

Name	Representing	Email Address	Phone #	Address
Patrick Stiles	MRPC			

\*Steve Vogt, representing the City of Belle attended the meeting by Zoom.

For immediate release  
Mar. 31, 2023

For more information, contact  
Patrick Stites at (573) 265-2993

### **Second public meeting for Maries County hazard mitigation plan April 11**

MARIES COUNTY—Meramec Regional Planning Commission (MRPC) to hold the second meeting of the Maries County hazard mitigation planning committee at 1:00 p.m. on April 11, 2023, at the Vienna Fire Protection District training room, 308 N Mill St., Vienna, MO, to update the county's hazard mitigation plan. The meeting is open to the public.

During the first meeting of the Maries County hazard mitigation planning committee, MRPC provided an overview of hazard mitigation planning, discussed grant programs requiring an approved hazard mitigation plan and discussed the steps required to update the plan. Representatives from Maries County, Phelps Health, the Missouri State Highway Patrol, the Phelps/Maries County Health Department, Maries Osage Ambulance District, Vienna Fire Protection District, SEMA and the public provided input on the types of natural hazards prevalent in the planning area as well as the types of projects that have been completed in the last five years to help lessen the impact of those hazards.

Hazard mitigation planning is focused on reducing risk before disasters strike. Activities such as burying electric lines, reduces damage during tornadoes and elevating homes in the floodplain help reduce damage and loss of life during natural disasters. Public input is necessary to truly understand the risks that could be facing the county. Residents of Maries County can participate in the update process by visiting <https://www.meramecregion.org/surveys/> and completing our public survey.

County-level hazard mitigation plans cover a five-year timeframe. Maries County's last plan was approved in May 2019 and can be found at <https://www.meramecregion.org/publications/>. The first draft of the revised plan must be submitted to SEMA by March 5, 2024.

If you have questions, please contact Patrick Stites at MRPC at 573-265-2993 or by email at [pstites@meramecregion.org](mailto:pstites@meramecregion.org).

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. Steve Vogt, representing the city of Belle, serves as MRPC chairman. A professional staff of 33, led by Executive Director Bonnie Prigge, 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](http://www.meramecregion.org) or on Facebook at [www.facebook.com/meramecregion/](https://www.facebook.com/meramecregion/).

## MEMORANDUM

TO: Maries County Hazard Mitigation Planning Committee

FROM: Patrick Stites, MRPC Environmental Programs Specialist  
Kathryn Hawes, MRPC Environmental Programs Specialist

DATE: March 21, 2022

SUBJECT: Second Hazard Mitigation Planning Meeting April 11, 2023

You are invited to the second meeting of the Maries County Hazard Mitigation Planning Committee. The Meramec Regional Planning Commission (MRPC) has been contracted by Maries County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Maries County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Maries County. Jurisdictions within the county, such as cities, the county itself, schools, emergency response agencies and other community organizations, are asked to participate in the planning process. Public input is necessary to truly understand the risks that could be facing the county. We need your help to successfully complete this project.

The second **meeting** of the **Maries County Hazard Mitigation Planning Committee** is **scheduled** for **Tuesday, April 11<sup>th</sup>, 2023, at 1:00 p.m.** at the **Vienna Fire Protection District's training room** located at **308 N. Mill St., Vienna, MO.** The primary focus of this meeting will be to review existing goals and action items to determine if any changes or additions need to be made. 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. In addition, the group will be asked to look ahead to identify any mitigations projects that they would like to get funded in the next five years.

The county, each city, and school district must submit an adopted updated hazard mitigation plan to SEMA and FEMA by March 05, 2024, in order to continue to be eligible for hazard mitigation grants and certain recovery funds after a natural disaster occurs. As you will be asked to formally approve and adopt the Maries 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. Hazard mitigation funds are used for such projects as floodplain buyouts, tornado shelters for schools, road/bridge improvements, early warning sirens, generator purchases, etc. 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 Maries County.

Thank you for your assistance in addressing hazard mitigation for Maries County. If you have any questions, contact me at (573) 265-2993, or via e-mail: [pstites@meramecregion.org](mailto:pstites@meramecregion.org). I look forward to seeing you at the meeting.

PS

**Reminder:** The planning area is obligated to document \$3000.00 (approximately 110 hours calculated using the federal volunteer rate) worth of in-kind match. In-kind match is any time spent contributing to the update of the hazard mitigation plan. Any time spent researching and providing information on the FEMA data collection questionnaire, attending meetings, reviewing draft chapters of the plan, or discussing the plan update with others can be documented and submitted. Any shortage of in-kind match will have to be made up in cash by the county, so please take a second to document your time on an in-kind match form.

# Goals and Action Item Revisions

- **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.

## Current Goals:

**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.

## Revised Goals:

**Goal 1:** Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

**Goal 2:** Reduce the potential impact of natural disaster to property, infrastructure, and the local economy.

**Goal 3:** Reduce the potential impact of natural disaster on the continuity of government and essential services.

## S.M.A.R.T.

- Specific
- Measurable
- Achievable
- Relevant
- Timebound

Mitigation Actions	
From Current Plan	Revision Suggestions
Promote the development and/or update of emergency plans by businesses, local governments and schools.	Distribute materials to local businesses, governments, and schools to assist in the creation and update of emergency operations plans.
Continue to provide CERT training and encourage the development of CERTs throughout the county through training opportunities and public awareness.	Local Fire Departments and Emergency Management Director will provide CERT training and distribute information on the benefits of the CERT and VOAD programs.
Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.	Remove. Routine in policy.
Continue to encourage local governments to budget for and obtain enhanced early warning systems and improved communications systems.	Obtain/upgrade early warning systems and improved communication systems as funding allows.
Continue to promote weather radios to local residents through press releases and brochures to ensure advanced warning about threatening weather.	Remove. Lowered priority. Accomplished by National Weather Service.
Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence and wildfire upon Maries County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	Remove. Complete. Achieved through plan update process.
Continue to review and consider road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property and structure grant proposals for these upgrades so that hazard mitigation concerns are also met.	Upgrade roads and bridges that would improve drainage, reduce flooding, and reduce the risk to residents and property as funding allows.
Continue to maintain a list of locations that can serve as shelters for storm, cooling/warming shelters and establish MOUs with the appropriate organizations responsible for those facilities.	Redundant. Combine below.
Encourage the designation of storm shelters and the construction of tornado safe rooms in or near schools and large employment centers that currently do not have access to safe rooms.	Construct storm shelters or tornado safe rooms near schools and large employment centers as funding allows.
Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.	Distribute information to critical facilities on the benefits of building infrastructure improvements to lessen the potential impacts of natural disasters.
Encourage the development and implementation of minimum building codes in all communities.	Remove. Lowered Priority.

Mitigation Actions	
Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.	Remove. Lowered Priority.
Educate residents on the dangers of floodplain development and the benefits of the National Flood Insurance Program and enforce restrictions on development in the floodplain.	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.
Encourage the development of storm water management plans.	Redundant. Removed. Lowered priority.
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 and raise awareness of the need to secure propane tanks to reduce the risk of dislodged tanks during these disasters.	Update floodplain ordinances to implement regulations to securely attach manufactured homes and fuel tanks to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.
Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.	Keep. State requested.
Encourage the City of Belle to become a member of the NFIP.	Lowered priority.
Encourage meetings between EMD, city/county officials and SEMA to familiarize officials with mitigation planning, implementation and budgeting for mitigation projects.	Organize an annual meeting between EMD's, city/county officials, and SEMA to familiarize officials with mitigation planning, implementation, budgeting, and to facilitate coordination of mitigation efforts in the planning area.
Re-evaluate the hazard mitigation plan, merge with other community planning and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	Complete. This is part of the plan maintenance policy.
Implement a public awareness program on the benefits of hazard mitigation – both public and private - by distributing press releases and brochures (by local governments and school districts) on adopted mitigation measures to help the public stay abreast of changes and/or new regulations.	Local Governments and school districts will distribute press releases, brochures, and digital content on the benefits of hazard mitigation projects and adopted mitigation efforts to help the public stay abreast of changes and/or new regulations.
Encourage county health department to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)	County health department will implement publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave).
Publicize local, regional and/or statewide drills/exercises.	Remove. Lowered Priority. Few exercises to report.



Mitigation Actions	
Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.	Redundant. Combine.
Whenever possible pool different agency resources to achieve widespread mitigation results.	Redundant. Combine.
Encourage the assessment of public buildings as potential storm shelters; designate those that are suitable as safe shelters; and develop accessibility plans for the public during times of need.	Annually assess public and private locations as potential shelters from storms or extreme temperatures; designate suitable shelters, establish MOU's, and develop accessibility plans for the public during times of need.
Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.	Purchase properties in the floodplain to convert land into public space/recreation areas as funding allows.
Work with state/local/federal agencies to include mitigation in all economic and community development projects.	Complete. This is part of the plan maintenance policy.
Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.	Cities and counties will develop cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.
Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.	Redundant. Combine.
Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.	Completed during the planning process.
	Purchase appropriately sized generators for all critical facilities in the planning area as funding allows.
City of Vienna will research options to reduce its wastewater facility vulnerability to flood events.	

**Maries County**  
**Multi-Jurisdictional Hazard Mitigation Plan Update**  
**Planning Meeting**

Tuesday, April 11<sup>th</sup>, 2023 ~ 1:00 p.m.  
Vienna Fire Protection District Training Room

**AGENDA**

- I. Welcome/Introductions – Patrick Stites & Kathryn Hawes, Environmental Program Specialists, Meramec Regional Planning Commission
- II. Brief Review
- III. Public Survey Update
- IV. Participation Requirements/Status
- V. Discuss Mitigation Action Updates – *(Which have been accomplished or had progress made; which are no longer high priority; which can be combined or eliminated)*
- VI. Review and Prioritize Action Items
- VII. Next Steps
- VIII. Adjourn

## NOTICE OF PUBLIC MEETING

Date and time of posting: 04/06/2023 @ 2:30 p.m. PS

Notice is hereby given that the **Maries County Hazard Mitigation Planning Committee** will meet at 1:00 p.m. on **Tuesday, April 11<sup>th</sup>, 2023** at the Vienna Fire Protection District Training Room, located at 308 N. Mill St., Vienna, MO 65582

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Brief Review of Hazard Mitigation
- Public Survey Update
- Participation Requirement/Status
- Discuss Mitigation Action Updates
- Review and Prioritize Action Items
- Next Steps
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Patrick Stites  
#4 Industrial Drive  
St. James, MO 65559  
(573) 265-2993  
[pstites@meramecregion.org](mailto:pstites@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.

**Maries County Hazard Mitigation Plan Review Meeting**  
**April 11, 2023 ~ 1:00 p.m.**

Name	Representing	Email Address	Phone #	Address
Vic STRATMAN	Maries Co. Belle	VICSTRATMAN@yahoo.com	577-690-9917	ARGYLE, MO 33342 Hwy AA 65001
Wendy Squires	Phelps Health	wsquires@phelpshlth.org	573-458-7700	1000 W Rolla MO
Michael French	Maries County Road #1 city of Belle	mfrench@mariescountymo.gov	573-280-2670	P.O. Box 205 Vienna, MO 65582
Dwight Francis		bellefire1@yahoo.com	573-578-1814	200 East Third St. Belle MO. 65013
Joe Edwards	Maries R-1/ Vienna Fire	jedwards@viennaeagles.org	314-971-1459	31339 Hwy AA Argyle, MO 65001
Teresa Messersmith	Maries R-1 Vienna School	tmessersmith@viennaeagles.org	573-578-8893	300 4th St. Vienna, MO 65582
Carla Butler	Maries Osage Ambulance	moad800@yahoo.com	573-422-6123	PO Box 515 Vienna, MO 65582
Amanda Reichel	" "	" "	" "	" "
Clayton Bruno	" "	" "	" "	" "

Name	Representing	Email Address	Phone #	Address
Richie Hinz	maries OSAP Ambulance	" "	" "	" "
Nakita Johnson	" "	" "	" "	" "
Jordan Dillon	Phelps/Maries County Health Dept	Jordan.Dillon@ PhelpsCounty.org	573 458 6010	200 N Main St Suite 6-51 Rolla, MO 65401
Ashley Campbell	" "	ashley.campbell@ phelpscounty.org	" "	" "
John Westart	City of Vienna	JWestart@yahoo	573 578-3549	P.O. Box 196 Vienna
Scott John	MARIES County Em MGT	STON@MARIESCOUNTYMO.GOV	573-422-3381	P.O. Box 23 VIENNA, MO 65582
Shannon Thompson	CITY OF VIENNA POLICE	sthompson@viennamissouri.org	573-422-3384	P.O. Box 196 VIENNA, MO 65582
Steve Vogt	City of Belle			
Kathryn Hawes	MRPC	Khawes@meramecregion.org	573-265-2993	4 Industrial Dr. St. James, MO 65559
Patrick Stites	"	pstites@meramecregion.org	"	"

For immediate release  
Jan. 30, 2024

For more information, contact  
Kathryn Hawes or Tammy Snodgrass at (573) 265-2993

**Public comment being accepted on Maries County Hazard Mitigation Plan until Feb. 20**

MARIES COUNTY—Public comment is being accepted until Feb. 20, 2024, on the Maries County Hazard Mitigation Plan. The plan update is available for review on Meramec Regional Planning Commission's website, <http://www.meramecregion.org/publications/>. The 2024 plan update is located under the Hazard Mitigation Plans by county along with the county's approved 2019 plan. A hard copy of the plan is also available at the Maries County Courthouse in the county clerk's office.

The purpose of the plan is to reduce or eliminate long-term risk to people and property from natural hazards. It is required that the county have this plan in place in order to be eligible for several Federal Emergency Management Agency grant programs.

Several entities participated in the planning process to update the plan, including Maries County, the cities of Belle and Vienna, as well as the Maries County Sheriff, Maries-Osage Ambulance District, Vienna Fire Protection District and Maries County R-1 and R-2 school districts.

The Meramec Regional Planning Commission (MRPC) facilitated focus group meetings and assisted these entities in developing the plan. Following a public comment period, a final draft will be created and sent to FEMA and SEMA for review and approval.

If you need assistance locating the plan or have questions, please contact Tammy Snodgrass or Kathryn Hawes at MRPC at 573-265-2993 or by email at [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org) or [khawes@meramecregion.org](mailto:khawes@meramecregion.org), respectively.

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. Mary Heywood, representing the unemployed, serves as MRPC chair. A professional staff of 34, led by Executive Director Bonnie Prigge, 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](http://www.meramecregion.org) or on Facebook at [www.facebook.com/meramecregion/](http://www.facebook.com/meramecregion/).

## MEMORANDUM

TO: Maries County Hazard Mitigation Planning Committee  
FROM: Tammy Snodgrass, MRPC Environmental Programs Manager/Assistant Director  
Kathryn Hawes, MRPC Environmental Programs Specialist  
DATE: January 5, 2024  
SUBJECT: Hazard mitigation planning meeting January 16, 2024

**The next meeting of the Maries County hazard mitigation planning committee is scheduled for Tuesday, January 16th, at 1:00 p.m.** at the **Vienna Youth Building (Ball Park) located near 210 Ball Park Road, Vienna, MO 65582.** The focus of this meeting will be to review and discuss all completed draft chapters of the hazard mitigation plan and discuss the formal adoption process for each jurisdiction. We will be sending the draft chapters one at a time next week. As you spend time reviewing these drafts it is very important that you document those hours spent and submit in-kind match forms so that we can get those hours counted. If you have comments or corrections, please feel free to send those over to me via email and I will get those addressed.

The Meramec Regional Planning Commission (MRPC) has been contracted by Maries County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Maries County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Maries County. A significant number of in-kind hours are still needed from non-elected officials. We need your help to successfully complete this project.

All jurisdictions must formally adopt the plan document prior to submittal to be included in the plan. The first draft of the updated hazard mitigation plan must be submitted to SEMA and FEMA by March 5, 2024, 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.

As the county, each city and school district are required to participate in the planning process and will be asked to formally approve and adopt the Maries 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 road and bridge, local planners, emergency management offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups.

Thank you for your assistance in addressing hazard mitigation for Maries County. If you have any questions, contact me at (573) 265-2993, extension 104 or via e-mail: [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org). I look forward to seeing you at the meeting.

TS

**Maries County**  
**Multi-Jurisdictional Hazard Mitigation Plan Update**  
**Planning Meeting**

Tuesday, January 16, 2024, ~ 1:00 p.m.  
Vienna Youth Building

**AGENDA**

- I. Welcome/Introductions – Tammy Snodgrass, Assistant Director, Meramec Regional Planning Commission
- II. Brief Review
- III. Participation Requirements/Status
- IV. Review and Discussion on Draft Chapters
- V. Plan Maintenance
- VI. Adoption Process
- VII. Next Steps
- VIII. Adjourn



## NOTICE OF PUBLIC MEETING

Date and time of posting: 1/5/2024 12:00 p.m.

Notice is hereby given that the **Maries County Hazard Mitigation Planning Committee** will meet at **1:00 p.m.** on **Tuesday, January 16, 2024**, at the **Vienna Youth Building (Ball Park)**, near **210 Ball Park Road, Vienna, MO 65582**

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Brief Review
- Participation Requirements
- Review and Discussion on Draft Chapters
- Plan Maintenance
- Adoption Process
- Next Steps
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Tamara Snodgrass  
#4 Industrial Drive  
St. James, MO 65559  
(573) 265-2993

[tsnodgrass@meramecregion.org](mailto:tsnodgrass@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.

**Maries County Hazard Mitigation Plan Review Meeting**  
**January 16, 2024 ~ 1:00 p.m.**

Name	Representing	Email Address	Phone #	Address
Karen Dudenheffer	City of Vienna	Koludenheffer@viennamissouri.org	573-422-3519	
James "Jim" Sandbothe	City of Vienna	cityofvienna@outlook.com	573-422-3550	
Brent Fulle	Maries Co Road 1		573-694-4478	
Tommiel Roberts	Munie Co Road 1		573 694 0514	
Ryan Stupe	Maries Co Road 1		573-291-9187	
Michael French	Maries county Road 1	mfrench@mariescounty.mo.gov	573-280-2670	
Ed Fable	Maries County		573-619-4770	
Vic STRATMAN	MARIES Co			
Mike Elliott		KJ7AWB@gmail	573-937-1090	

Name	Representing	Email Address	Phone #	Address
Wendy Squires	Phelps Health	wsquires@phelpshealth.org	458-7720	
Joe Edwards	Vienna Fire/ Maries R-1	jedwards@viennaeagles.org	314-971-1459	
Teresa Messersmith	Maries R-1	tmessersmith@viennaeagles.org	573-422-3304	
Steve Vogt	City of Belle	steve65013@yahoo.com	573-680-9968	
Richard Hillz	MOAD	delldrop29@gmail.com	573-691-3887	
Leonard Reinkeneyer	moad		573-257-1015	
Carla Butler	maries OSAP Ambulance	moad@osapmariesage.com	573-422-6123	
Jordan Dillon	Phelps/Maries County Health Dept	Jordan.Dillon@phelpscounty.org	573-458-6022	
John John	Maries Co Em M&S	JOHN@MARIESCOUNTYMO.GOV	573-422-3381	

Mailing list for surrounding jurisdictions:

Mayor Debby Green  
City of Gasconade  
493 Oak St.  
Gasconade, MO 65061-3005

Mayor Bruce Cox  
City of Hermann  
1902 Jefferson St.  
Hermann, MO 65041

Mayor Melissa Strobe  
City of Morrison  
632 Hwy. 100  
Morrison, MO 65061-1005

Mayor John Kamler  
City of Owensville  
107 W. Sears  
Owensville, MO 65066

Mayor Shannon Grus  
City of Rosebud  
P.O. Box 199  
Rosebud, MO 63091

Dr. Jeri Hardy, Supt.  
Gasconade County R-II  
P.O. Box 536  
Owensville, MO 65066

Mayor Pro-Tem Merrilee Spurgeon  
City of Bland  
P.O. Box 40  
Bland, MO 65014

Pres. Commissioner Tim Schulte  
Gasconade County Commission  
119 E. First St.  
Hermann, MO 65041

Geoff Neill, Supt.  
Gasconade County R-I  
170 Blue Pride Drive  
Hermann, MO 65041

Mr. Whittle, Supt.  
Iberia R-V School District  
201 Pemberton Drive  
Iberia, MO 65486

Dr. Laura Nelson, Supt.  
School of the Osage School District  
P.O. Box 1960  
Lake Ozark, MO 65049

Tina Spencer, Supt.  
Miller County R-III School District  
526 School Road  
Tuscumbia, MO 65082

Charley Bunch, Supt.  
Cole County R-V School District  
14803 Hwy 17  
Eugene, MO 65032

Matt Davis, Supt.  
Eldon R-I School District  
112 S Pine Street  
Eldon, MO 65026

Doug Kemper, Supt.  
St. Elizabeth R-IV School District  
240 Church Street  
St. Elizabeth, MO 65075

Fred Wilde, Chairman  
Town of St. Elizabeth  
160 S Walnut St  
St. Elizabeth, MO 63841

Jim Schlupp, Mayor  
City of Iberia  
803 Hwy 42  
Iberia, MO 65486

Kevin Cardwell, Presiding Commissioner  
Miller County  
P.O. Box 12  
Tuscumbia, MO 65082

Mayor Michael Harmison  
City of Osage Beach  
6378 Osage Beach Parkway  
Osage Beach, MO 65056

Mayor Dennis Newberry  
City of Lake Ozark  
3162 Bagnall Dam Blvd  
Lake Ozark, MO 65049

Mayor Trevor Vernon  
City of Eldon  
101 S Oak  
Eldon, MO 65026

Presiding Commissioner Darryl Griffin  
Osage County  
205 East Main St.  
Linn, MO 65051

Chairperson Ryan Davis  
City of Argyle  
PO BOX 22  
Argyle, MO 65001

Mayor Mike Edwards  
Chamois City Hall  
200 S. Main St.  
Chamois, MO 65024

Chairperson Scott Knoll  
City of Freeburg  
PO BOX 121  
Freeburg, MO 65035

Mayor Dwight Massey  
City of Linn  
1200 E Main St, PO Box 498  
Linn, MO 65051

Mayor Emily Sommerer  
City of Meta  
101 S. Locust St., PO BOX 65  
Meta, MO 65058

Mayor Tammy Massman  
City of Westphalia  
PO BOX 36  
Westphalia, MO 65085

Superintendent Lyle Best  
Osage Co. R-I  
614 S. Poplar St.  
Chamois, MO 65024

Superintendent Bob James  
Osage Co. R-II  
1212 E Main St.  
Linn, MO 65051

Pres. Commissioner Gene Newkirk  
Pulaski County Commission  
301 Historic 66 East  
Waynesville, MO 65583

Mayor Glen Smith  
City of Crocker  
P.O. Box 116  
Crocker, MO 65452

Mayor Mike Null  
City of Dixon  
P.O. Box 177  
Dixon, MO 65459

Mayor Eldon Haun  
City of Richland  
P.O. Box 798  
Richland, MO 65556

Mayor Dr. George Lauritson  
City of St. Robert  
194 Eastlawn Ave. #A  
St. Robert, MO 65584

Mayor Shawn Wilson  
City of Waynesville  
100 Tremont Center  
Waynesville, MO 65583

Dr. Jim Bogle, Supt.  
Swedeberg R-III  
17507 Hwy T  
Richland, MO 65556

Tina Turner, Supt.  
Richland R-IV  
714 E. Jefferson  
Richland, MO 65556

Kent Stoumbaugh, Supt.  
Laquey R-V  
P.O. Box 130  
Laquey, MO 65534

Hilary Bales, Supt.  
Waynesville R-VI  
200 Fleetwood Dr.  
Waynesville, MO 65583

Travis Bohrer, Supt.  
Dixon R-I  
106 W. Fourth St.  
Dixon, MO 65459

Ashley Burton, Supt.  
Crocker R-II  
P.O. Box 488  
Crocker, MO 65452

Presiding Commissioner Joey Auxier  
Phelp County Courthouse  
200 N. Main Street  
Rolla, MO 65401

Mayor Doug Smith  
City of Doolittle  
380 Eisenhower  
Doolittle, MO 65401

Mayor Albert Hamlet  
City of Edgar Springs  
555 Broadway Street  
Edgar Springs, MO 65462

Mayor James Poucher  
City of Newburg  
P.O. Drawer K  
Newburg, MO 65550

Mayor Louis J. Magdits, IV  
City of Rolla  
901 N. Elm  
Rolla, MO 65402

Mayor Rick Krawiecki  
City of St. James  
100 S. Jefferson  
St. James, MO 65559

Superintendent Tracy Kinglsey  
Newburg R-II School District  
701 Wolf Pride  
Newburg, MO 65550

Superintendent Bob Cottengim  
Phelps County R-III  
17790 State Route M  
Edgar Springs, MO 65462

Superintendent Tim Webster  
St. James R-I School District  
122 East Scioto Street  
St. James, MO 65559

Superintendent Dr. Kyle Dare  
Rolla 31 School District  
500A Forum Drive  
Rolla, MO 65401

Superintendent Chuck Woody  
Osage Co. R-III  
143 E. Main  
Westphalia, MO 65085

**Meramec Regional Planning Commission**  
#4 Industrial Drive  
St. James, MO 65559

Maries County  
Hazard  
Mitigation Plan is  
Ready for Review!

01/16/2024

**Attention Members of the Maries County Hazard Mitigation Planning Committee and neighboring jurisdictions:**

The first draft of the Maries County Hazard Mitigation Plan is now available for review on the MRPC website – <http://www.meramecregion.org/publications/>. A hard copy of the draft document is being made available at the Maries County Clerk's Office for public viewing as well. Please take some time to review the planning document, especially sections that have specifics regarding your jurisdiction. The public comment period will be open until February 16, 2024. Please notify us no later than **February 16, 2024** with any recommended changes or corrections. Contact Kathryn Hawes at (573) 265-2993 or via email at [khawes@meramecregion.org](mailto:khawes@meramecregion.org)

## C: Public Survey

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### Public Survey: Maries County

### Multi-jurisdictional Hazard Mitigation Plan

The federal government requires all states and local governments to have hazard mitigation plans approved by FEMA that are consistent with the Disaster Mitigation Act of 2000. Approved mitigation plans are required to maintain eligibility for certain types of federal Hazard Mitigation Assistance Grants.

A planning committee comprised of representatives from Maries County, the incorporated cities, and the public school districts is currently developing an update to the comprehensive Maries County Multi-jurisdictional Hazard Mitigation Plan with a strategy to reduce the vulnerability of people and property in the planning area to the impacts of hazards and to remain eligible for mitigation funding programs from FEMA.

One of the key components of a hazard mitigation plan is public input during the planning process. The planning committee will be evaluating information on the hazards that impact each jurisdiction within Maries County. The committee is seeking your input on the hazards that will be evaluated as well as your opinions on the types of activities that should be considered to reduce future impacts. Your comments will be considered by your community's representatives on the planning committee as the plan is developed. Please take a few moments to answer the following questions. Thank you for your participation.

1. Please select your jurisdiction from the list. You may only select one jurisdiction for each survey completed. If you belong to more than one jurisdiction in this list, please complete multiple surveys.

- |   |   |
|---|---|
| <input type="checkbox"/> Unincorporated Maries County | <input type="checkbox"/> Maries County R-I School District  |
| <input type="checkbox"/> City of Belle                | <input type="checkbox"/> Maries County R-II School District |
| <input type="checkbox"/> City of Vienna               |   |

2. The hazards addressed in the Multi-jurisdictional Hazard Mitigation Plan Update are listed below. Please indicate your opinion on the likelihood for each hazard to impact YOUR JURISDICTION (identified above). **Please rate EACH hazard 1 through 4 as follows:**

**1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely**

____ Flooding (Flash and River)	____ Earthquake	____ Severe Thunderstorms
____ Tornadoes	____ Land Subsidence / Sinkholes	____ Severe Winter Weather
____ Dam Failure	____ Drought	
____ Wildfire	____ Extreme Temperatures	

3. Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). **Please rate EACH hazard 1 through 4 as follows:**

**1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic**

____ Flooding (Flash and River)	____ Earthquake	____ Severe Thunderstorms
____ Tornadoes	____ Land Subsidence / Sinkholes	____ Severe Winter Weather
____ Dam Failure	____ Drought	
____ Wildfire	____ Extreme Temperatures	



4. FEMA Hazard Mitigation Assistance Grants are administered by the State Emergency Management Agency. Listed below are some types of projects considered.

**Please check all those that could benefit your jurisdiction, in your opinion:**

- |  |   |
|--|---|
| <input type="checkbox"/> Flood-prone Property Acquisition & Structure Demolition /Relocation                                   | <input type="checkbox"/> Retrofitting of Existing Buildings, and Facilities from Wind Damage. |
| <input type="checkbox"/> Flood-Prone Structure Elevation   | <input type="checkbox"/> New Tornado Safe Room Construction                                   |
| <input type="checkbox"/> Dry Floodproofing of Historical Residential Structures and/or Non-residential Structures              | <input type="checkbox"/> Electrical Utilities Infrastructure Retrofit                         |
| <input type="checkbox"/> Minor Localized Flood Reduction Projects (storm water management or localized flood control projects) | <input type="checkbox"/> Soil Erosion Stabilization   |
| <input type="checkbox"/> Structural Retrofitting of Existing Buildings to Add a Tornado Safe Room                              | <input type="checkbox"/> Wildfire Mitigation  |
| <input type="checkbox"/> Storm Sirens  | <input type="checkbox"/> Other (please specify)   |
| <input type="checkbox"/> Early Warning Systems such as phone/text alerts   |   |
- 

5. Please comment on any other issues that the Maries County Hazard Mitigation Planning Committee should consider in developing a strategy to reduce future losses caused by hazard events.

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**Please return your completed survey to:**

Patrick Stites

Meramec Regional Planning Commission

4 Industrial Drive ~ St. James, MO 65559

Phone: 573-265-2993, ext. 135 ~ FAX: 573-265-3550

[pstites@meramecregion.org](mailto:pstites@meramecregion.org)

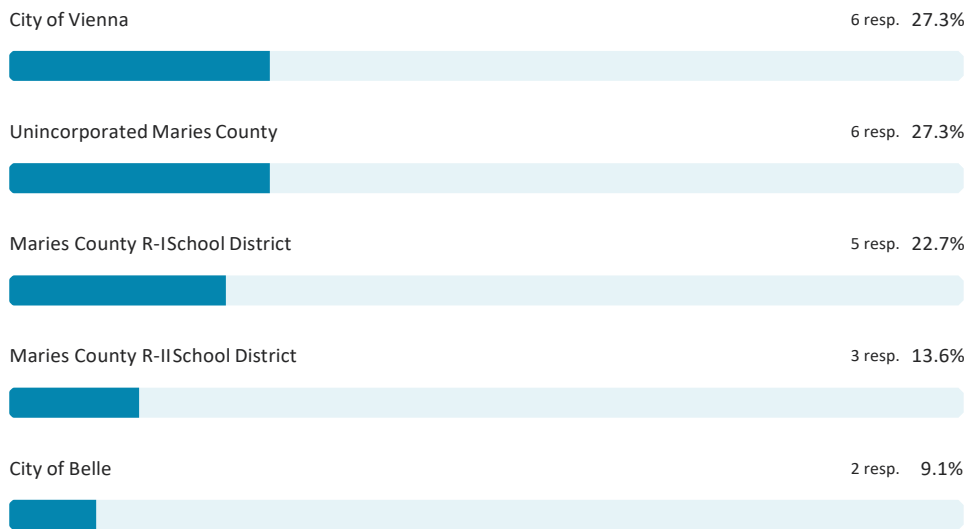
Online surveys will be automatically sent.

# Public Survey: Maries County Multi-jurisdictional Hazard Mitigation Plan

22 responses

Please select your jurisdiction from the list. You may only select one jurisdiction for each survey completed. If you belong to more than one jurisdiction in this list, please complete multiple surveys.

22 out of 22 answered



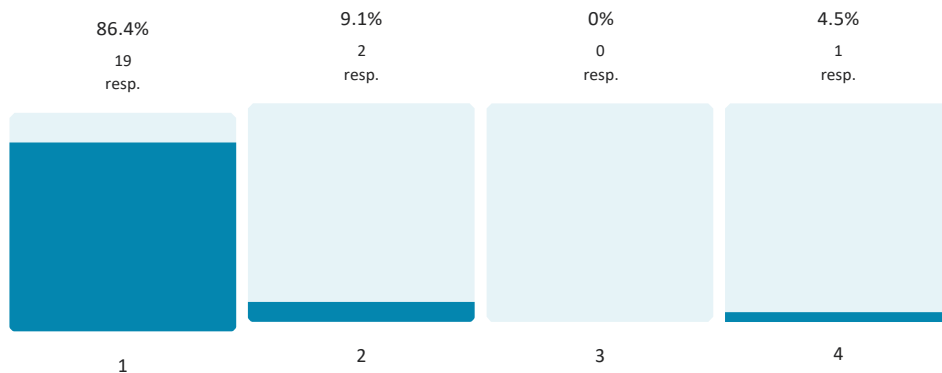
Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

#### Dam Failure

22 out of 22 answered

##### 1.2 Average rating

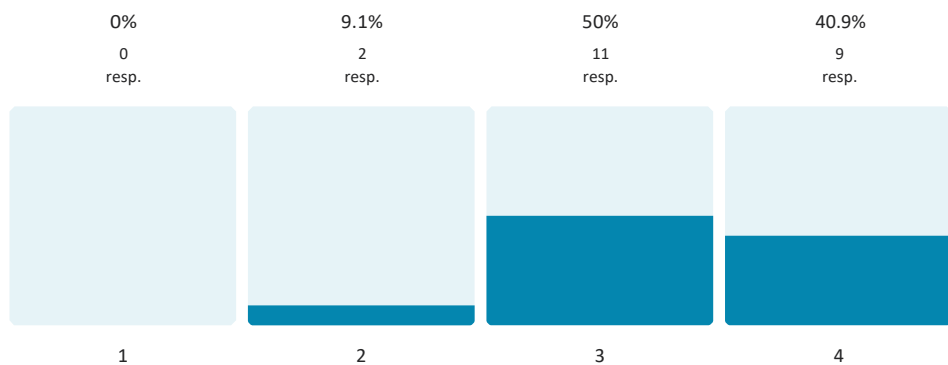


#### Drought

22 out of 22 answered

##### 3.3 Average rating

##### 3.3 Average rating



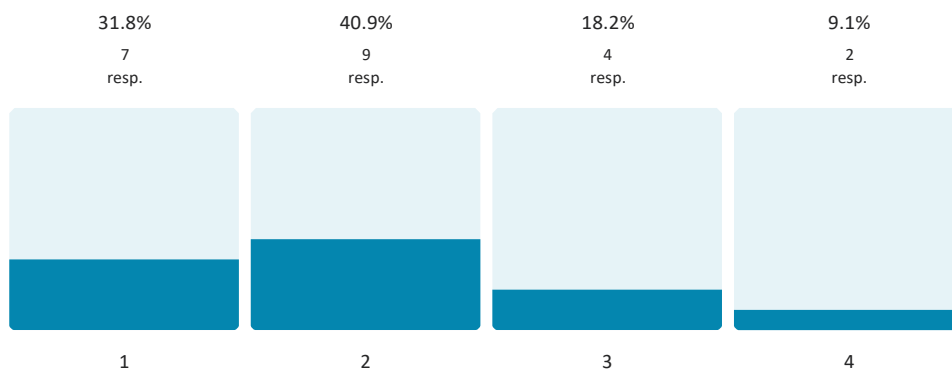
Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

### Earthquake

22 out of 22 answered

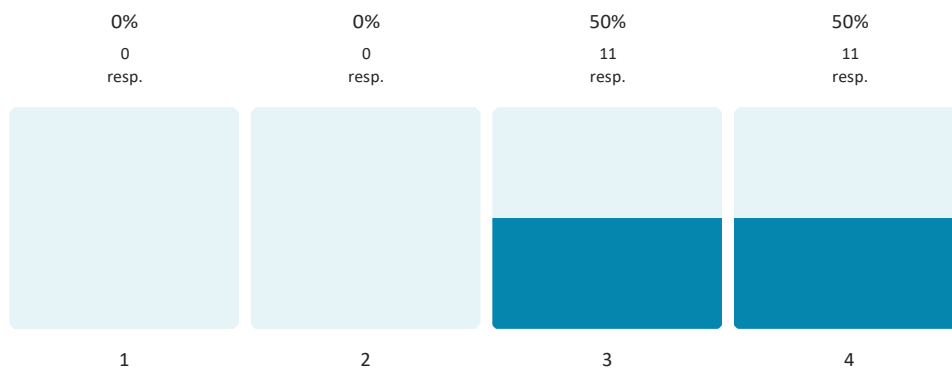
2.0 Average rating



### Extreme Temperatures

22 out of 22 answered

3.5 Average rating



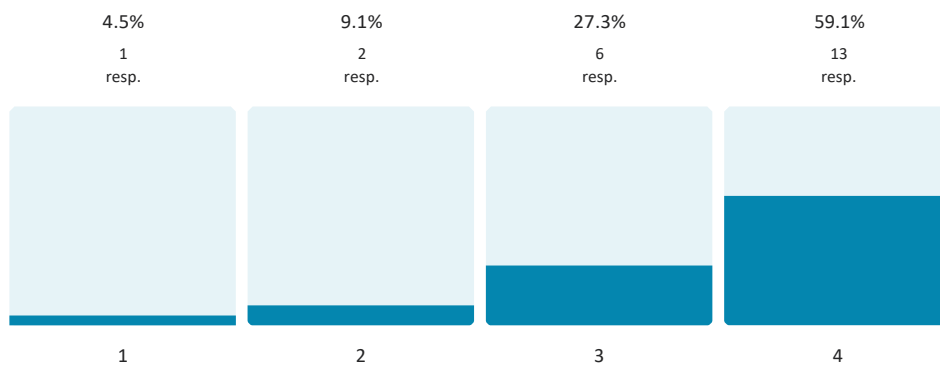
Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

#### Flooding (Flash and River)

22 out of 22 answered

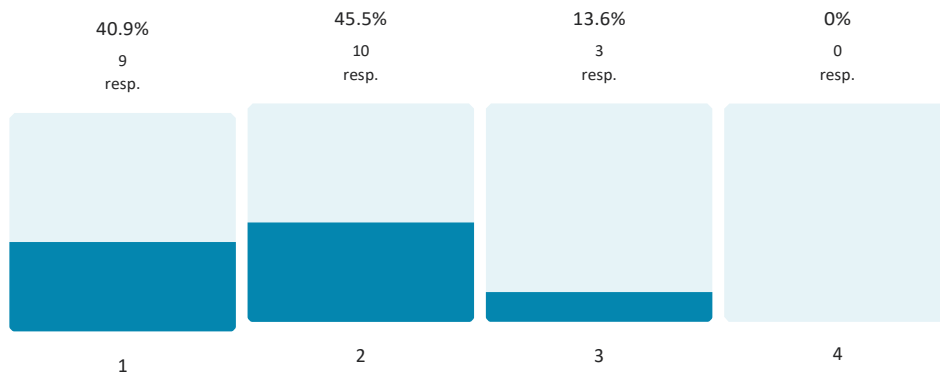
3.4 Average rating



#### Land Subsidence/Sinkholes

22 out of 22 answered

1.7 Average rating



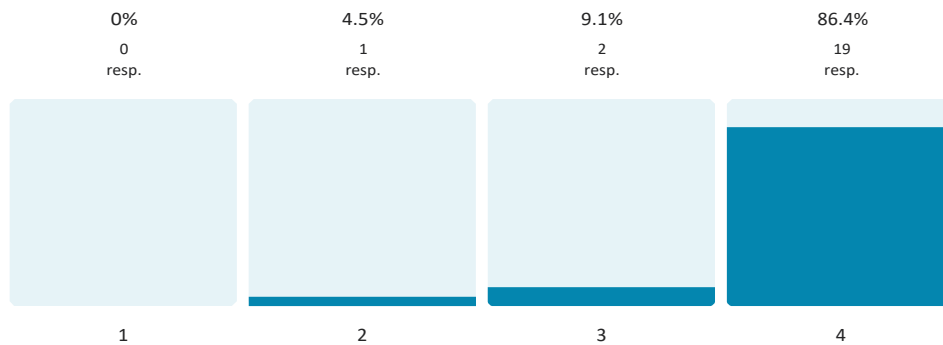
Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

#### Severe Thunderstorms - Including high winds, hail, & lightning

22 out of 22 answered

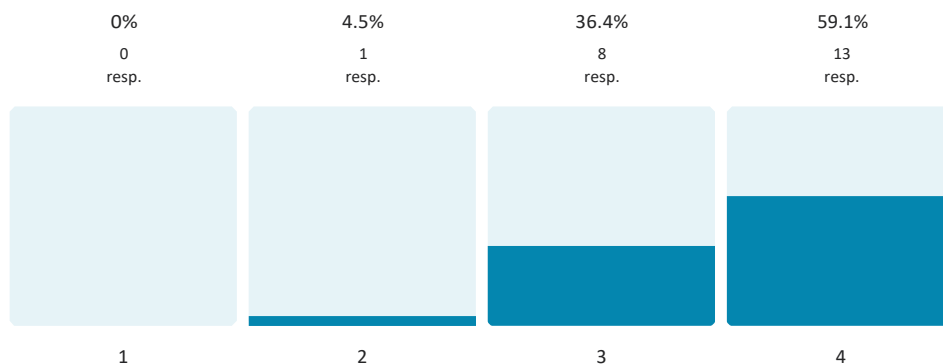
3.8 Average rating



#### Severe Winter Weather

22 out of 22 answered

3.5 Average rating



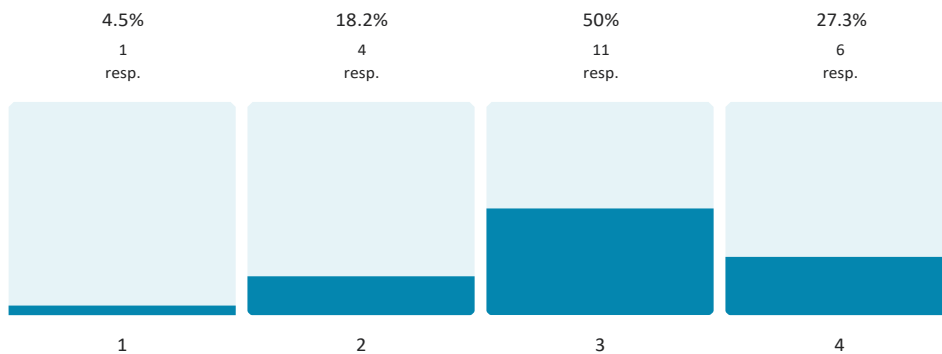
Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

#### Tornadoes

22 out of 22 answered

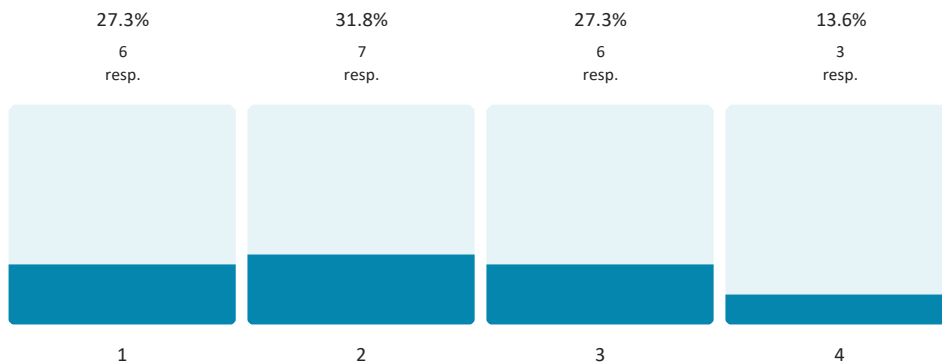
3.0 Average rating



#### Wildfire

22 out of 22 answered

2.3 Average rating



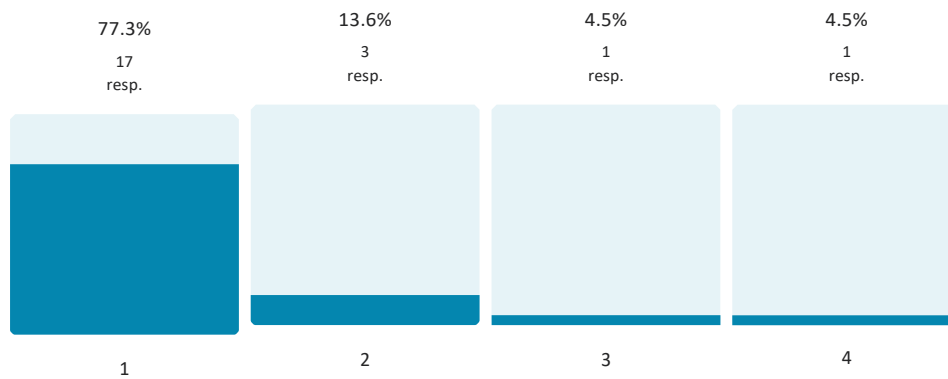
Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

### Dam Failure

22 out of 22 answered

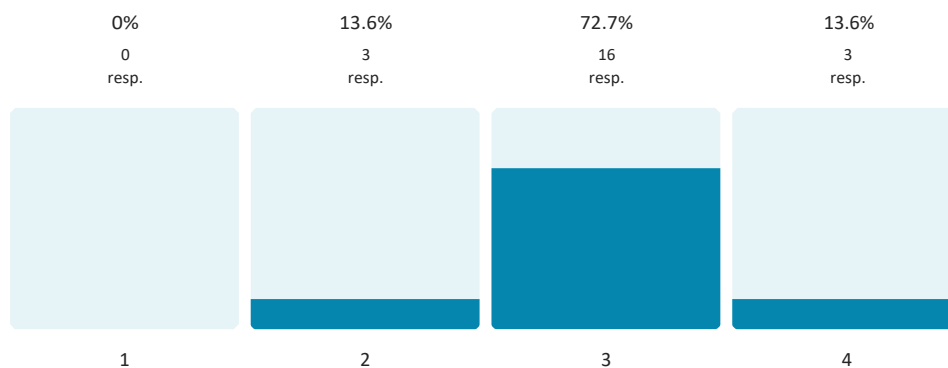
1.4 Average rating



### Drought

22 out of 22 answered

3.0 Average rating





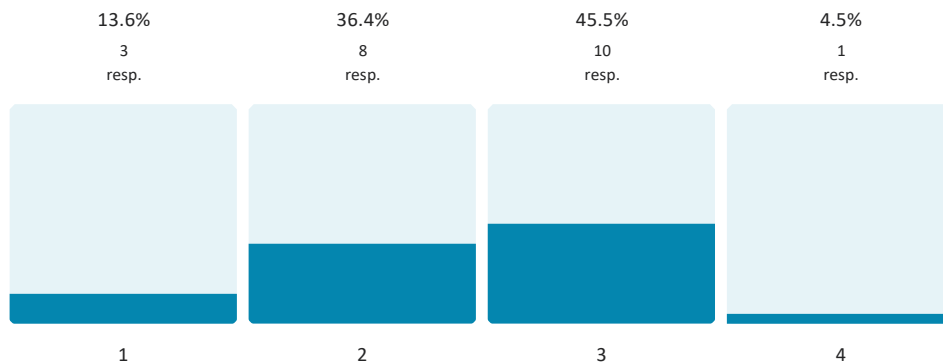
Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

### Earthquake

22 out of 22 answered

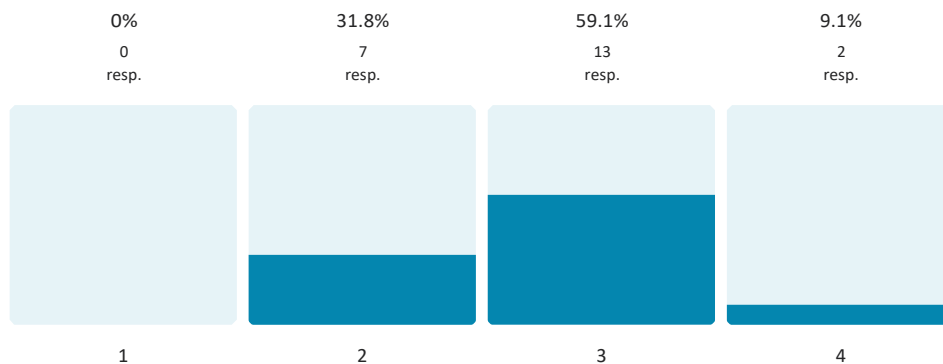
2.4 Average rating



### Extreme Temperatures

22 out of 22 answered

2.8 Average rating



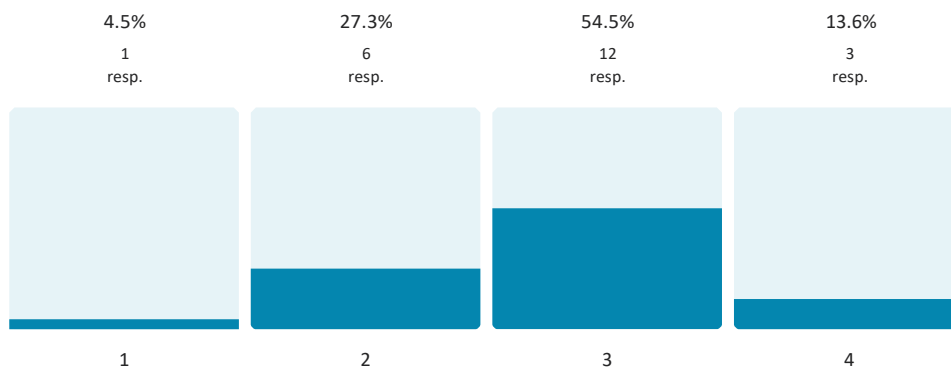
Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

### Flooding (Flash and River)

22 out of 22 answered

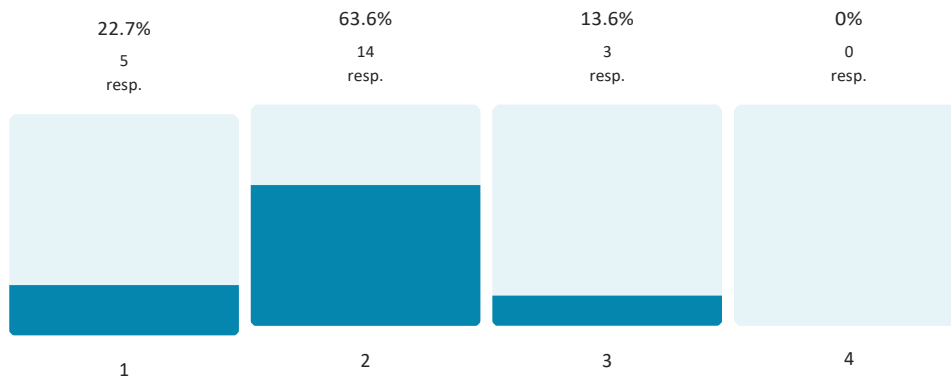
2.8 Average rating



### Land Subsidence/Sinkholes

22 out of 22 answered

1.9 Average rating



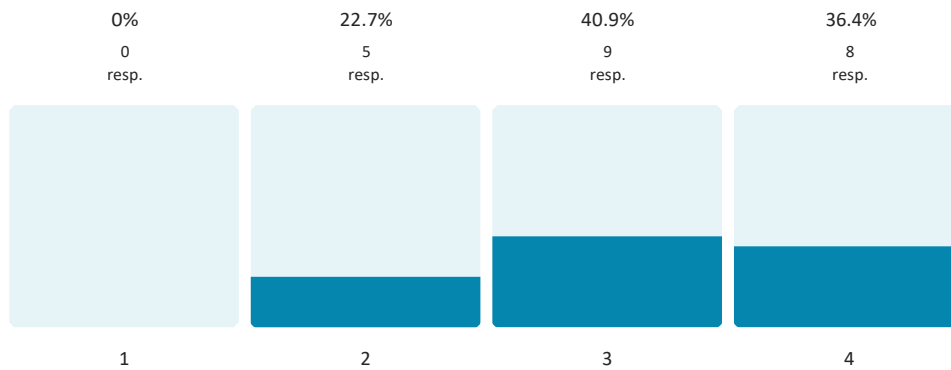
Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

### Severe Thunderstorms - Including high winds, hail, & lightning

22 out of 22 answered

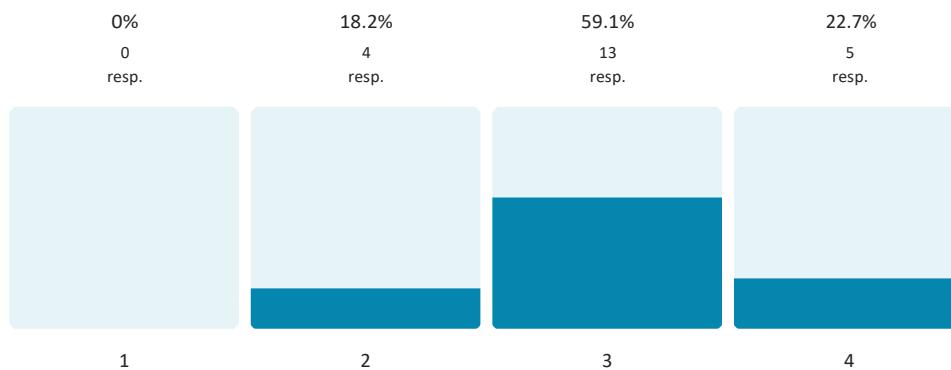
#### 3.1 Average rating



### Severe Winter Weather

22 out of 22 answered

#### 3.0 Average rating



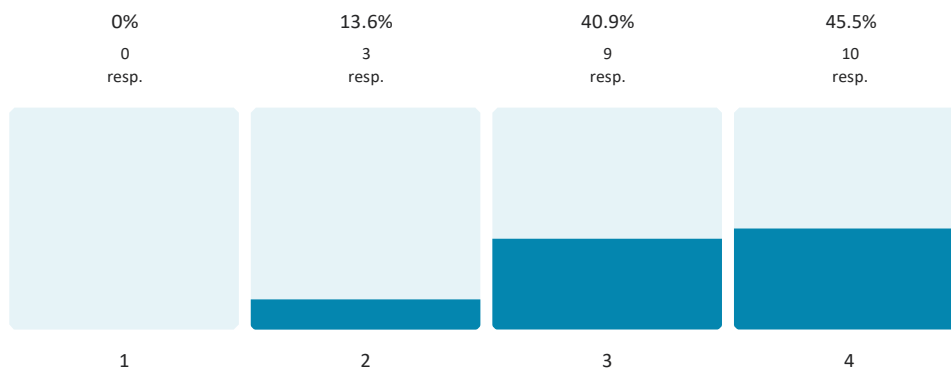
Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:

1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

### Tornadoes

22 out of 22 answered

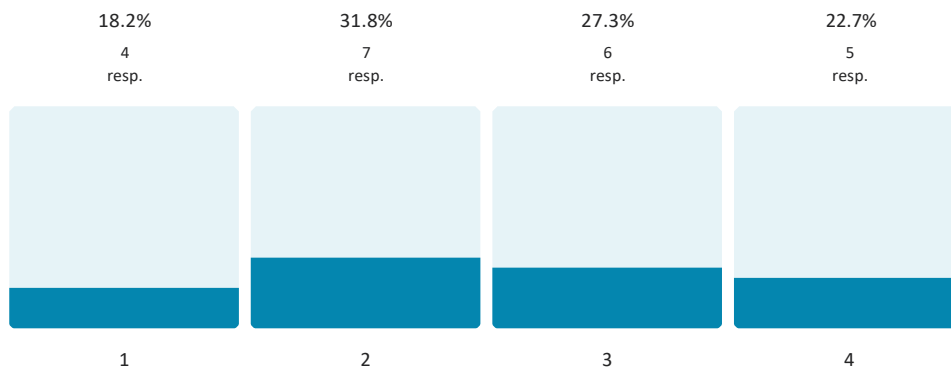
3.3 Average rating



### Wildfire

22 out of 22 answered

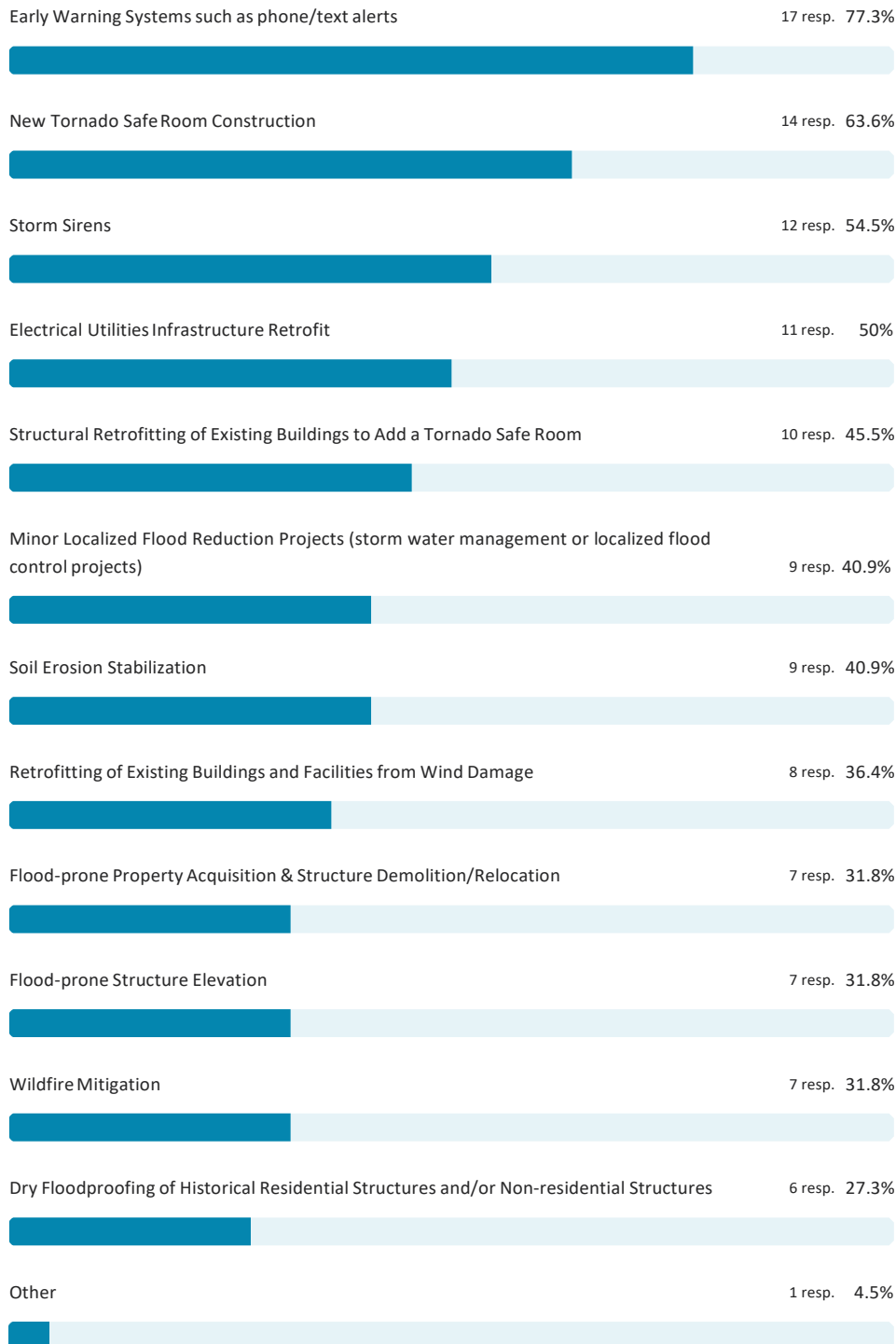
2.5 Average rating



FEMA Hazard Mitigation Assistance Grants are administered by the State Emergency Management Agency. Listed below are some types of projects considered.

Please select all those that could benefit your jurisdiction, in your opinion:

22 out of 22 answered



Please comment on any other issues that the Maries County Hazard Mitigation Planning Committee should consider in developing a strategy to reduce future losses caused by hazard events.

- Hwy 28 is too narrow to deal with increase traffic and large vehicles for evacuation and rescue.
- Damage to wildlife from solar panels.
- Nothing I can think of.
- No other.
- Education of the public on insurance programs available for recovery of hazard events. Much needed development of basic building codes, especially in populated areas such as incorporated areas of Vienna and Belle.
- No comment.
- No other issue.
- Raising awareness is probably the best way to reduce future losses caused by hazard events.
- I think extreme weather conditions affect us the most, but I can't think of any other issues
- Hat Factory soil issues.
- Road and bridge repair, along with tornado preparedness would be the best things to consider in the county. Siren/alert systems for severe weather would be great in the county. Drought relief and pumping options would assist the agriculture areas also.
- Talk more with the public, then the city/county employees.
- Emergency response routes when roadways are flooded and the only option is travel miles around the flooded areas.

## D: Adoption Resolutions

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RESOLUTION NO. 011824

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

**WHEREAS**, Maries County 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**, Maries County fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

**WHEREAS**, Maries County desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Maries County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

**WHEREAS**, adoption by the governing body of Maries County 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 Maries County adopts the Maries County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri State Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

  
\_\_\_\_\_  
Presiding Commissioner

1-18-24  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Associate Commission

1-18-24  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Associate Commission

2/13/24  
\_\_\_\_\_  
Date

RESOLUTION NO. 24-1

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

**WHEREAS**, the City of Belle 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**, the City of Belle fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

**WHEREAS**, the City of Belle desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Maries County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

**WHEREAS**, adoption by the governing body of the City of Belle 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 the City of Belle Board of Alders adopts the Maries County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri State Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

  
\_\_\_\_\_  
Mayor

1-22-2024  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Witness

1/22/2024  
\_\_\_\_\_  
Date



**RESOLUTION NO. 24-01**

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

**WHEREAS**, the City of Vienna 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

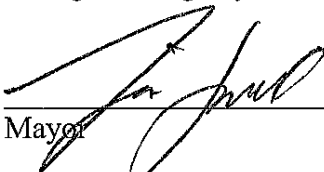
**WHEREAS**, the City of Vienna fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

**WHEREAS**, the City of Vienna desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Maries County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

**WHEREAS**, adoption by the governing body of the City of Vienna 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 the City of Vienna Board of Alders adopts the Maries County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri State Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

  
\_\_\_\_\_  
Mayor

2-5-2024  
Date

  
\_\_\_\_\_  
Witness

2-5-2024  
Date

RESOLUTION NO. \_\_\_\_\_

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

**WHEREAS**, the Maries County R-I School 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**, the Maries County R-I School District fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

**WHEREAS**, the Maries County R-I School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Maries County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

**WHEREAS**, adoption by the governing body of the Maries County R-I School 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 the Maries County R-I School District Board of Education adopts the Maries County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri State Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

Kacie James  
School Board President

1-23-2024  
Date

Teresa Messumitt  
Witness

1/23/2024  
Date

RESOLUTION NO. \_\_\_\_\_

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

**WHEREAS**, the Maries County R-II School 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

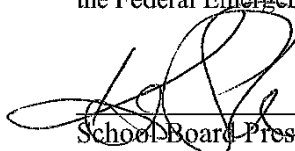
**WHEREAS**, the Maries County R-II School District fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

**WHEREAS**, the Maries County R-II School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Maries County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

**WHEREAS**, adoption by the governing body of the Maries County R-II School 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 the Maries County R-II School District Board of Education adopts the Maries County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri State Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

  
\_\_\_\_\_  
School Board President

2/1/24  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Witness

1-30-2024  
\_\_\_\_\_  
Date

## E: 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 Maries County Critical Facilities by Type and Jurisdiction**

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>Emergency Facilities</b>						
	Maries Co.	Dixon Ambulance District	305 S. Ellen Street	Dixon	MO	65456
	Maries Co.	Maries Osage Ambulance District	164 Ballpark Road	Vienna	MO	65582
	Maries Co.	Osage Ambulance District	119 S. Highway 89	Linn	MO	65051
	Maries Co.	St. James Ambulance District	103 N. Louise Avenue	St. James	MO	65559
<b>Fire Department Facilities</b>						
	Maries Co.	Belle Vol. Fire Dept.	PO Box 933, 98 Hwy 28 E.	Belle	MO	65013
	Maries Co.	Vichy Vol. Fire Prot. Assoc.	PO Box 486, 14812 Hwy 63	Vichy	MO	65580
	Maries Co.	Vienna Fire Prot. Dist.	PO Box 386, 308 N Mill St.	Vienna	MO	65582
<b>Law Enforcement Facilities</b>						
	Maries Co.	Maries County Sheriff's Office	211 4 <sup>th</sup> St., PO Box 23	Vienna	MO	65582
	Belle	Belle Police Department		Belle	MO	65013
	Vienna	Vienna Police Department	PO Box 196, 424 8 <sup>th</sup> St.	Vienna	MO	65582
<b>Medical Facilities</b>						
	Maries Co.	Phelps Health Medical Group Vienna	606 S. Highway 63	Vienna	Mo	65582
	Maries Co.	SSM Health Group – Family Medicine	100 Highway 28	Belle	Mo	65013
<b>School Facilities</b>						
	Maries County R-I	Maries County R-I School District	300 Fourth Street	Vienna	MO	65582
	Maries County R-II	Maries County R-II School District	503 W. Third Street	Belle	MO	65013
	Visitation Inter-Parish	Visitation Inter-Parish Private School	105 N. Coffey Street	Vienna	MO	65582
<b>Childcare Facilities</b>						

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
	Maries Co.	MOCA Headstart	408 Oak St	Belle	MO	65013
	Maries Co.	Reeves, Rata Lynn	11361 Highway 63 S.	Vienna	MO	65582
	Maries Co.	Smith, Beth Ann	11309 Highway 63 S.	Vienna	MO	65582
	Maries Co.	Kiddie T Junction, LLC	30391 Highway T	Vienna	MO	65582
<b>Long Term Care Facilities</b>						
	Vienna	Maries Manor	174 Ballpark Road	Vienna	MO	65582
	Vienna	Victorian Place of Vienna	112 Parkway Drive	Vienna	MO	65582

Source: 2023 Data Collection Questionnaires, Missouri DHSS

<https://healthapps.dhss.mo.gov/childcaresearch/>, <https://healthapps.dhss.mo.gov/showmeltc/default.aspx>

## F: MDC Wildfire Data Search

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View	Discovered Date	County	Station	Cause	Acres Burned
2003-00001-003069	04/14/2003	Maries	MDC REPORTING REGION - CENTRAL	Debris	6
2003-06305-001137	01/27/2003	Maries	Vienna Fire Prot. Dist.	Debris	1
2003-06305-001138	02/12/2003	Maries	Vienna Fire Prot. Dist.	Debris	1
2003-06305-001140	03/22/2003	Maries	Vienna Fire Prot. Dist.	Debris	2
2003-06305-001141	04/05/2003	Maries	Vienna Fire Prot. Dist.	Debris	30
2003-06305-001142	04/13/2003	Maries	Vienna Fire Prot. Dist.	Debris	0.25
2003-06305-001144	04/15/2003	Maries	Vienna Fire Prot. Dist.	Debris	10
2003-06313-001130	02/05/2003	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1.5
2003-06313-001131	03/08/2003	Maries	Vichy Volunteer Fire Protection Assoc	Debris	20
2003-06313-001132	03/09/2003	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1.5
2003-06313-001133	04/13/2003	Maries	Vichy Volunteer Fire Protection Assoc	Debris	2
2004-00001-005808	02/29/2004	Maries	MDC REPORTING REGION - CENTRAL	Miscellaneous	0.2
2004-00001-005809	02/28/2004	Maries	MDC REPORTING REGION - CENTRAL	Debris	35
2004-06305-004634	03/21/2004	Maries	Vienna Fire Prot. Dist.	Debris	18
2004-06305-004635	03/22/2004	Maries	Vienna Fire Prot. Dist.	Debris	3
2004-06305-004636	02/28/2004	Maries	Vienna Fire Prot. Dist.	Debris	40
2004-06305-004637	03/08/2004	Maries	Vienna Fire Prot. Dist.	Debris	6
2004-06305-004638	02/28/2004	Maries	Vienna Fire Prot. Dist.	Debris	0.25
2004-06305-004639	02/28/2004	Maries	Vienna Fire Prot. Dist.	Debris	40
2004-06305-004640	04/02/2004	Maries	Vienna Fire Prot. Dist.	Debris	0.25
2004-06305-004641	04/04/2004	Maries	Vienna Fire Prot. Dist.	Debris	3
2004-06313-003781	02/19/2004	Maries	Vichy Volunteer Fire Protection Assoc	Debris	0.25
2004-06313-003782	02/21/2004	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	0.5
2004-06313-003783	02/27/2004	Maries	Vichy Volunteer Fire Protection Assoc	Debris	2.5
2004-08518-004538	02/19/2004	Maries	Dixon Rural Fire Protection District	Arson	2

View	Discovered Date	County	Station	Cause	Acres Burned
2004-08518-004539	02/19/2004	Maries	Dixon Rural Fire Protection District	Arson	2
2004-08518-004545	03/01/2004	Maries	Dixon Rural Fire Protection District	Debris	4
2004-08518-004546	03/01/2004	Maries	Dixon Rural Fire Protection District	Debris	
2004-08518-004547	02/29/2004	Maries	Dixon Rural Fire Protection District	Debris	170
2004-08518-004548	03/01/2004	Maries	Dixon Rural Fire Protection District	Debris	200
2005-06305-006734	02/11/2005	Maries	Vienna Fire Prot. Dist.	Debris	2
2005-06632-007150	03/06/2005	Maries	Iberia Rural Fire Protection District	Debris	2
2005-08110-008115	03/09/2005	Maries	St. James Fire Protection District	Debris	2
2005-08110-008122	03/15/2005	Maries	St. James Fire Protection District	Debris	2
2005-08518-008143	03/05/2005	Maries	Dixon Rural Fire Protection District	Debris	3
2005-08518-008146	03/05/2005	Maries	Dixon Rural Fire Protection District	Debris	3.5
2005-08518-008148	03/06/2005	Maries	Dixon Rural Fire Protection District	Debris	12
2005-08518-008150	03/06/2005	Maries	Dixon Rural Fire Protection District	Debris	7.5
2005-08518-008165	03/20/2005	Maries	Dixon Rural Fire Protection District	Debris	10
2006-06313-011771	02/28/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	6
2006-06313-011772	02/12/2006	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1.5
2006-06313-011774	02/20/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	2.3
2006-06313-011778	02/15/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
2006-06313-011780	02/14/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	0.2
2006-06313-011783	02/14/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	2
2006-06313-011785	01/27/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	0.5
2006-06313-011787	01/27/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	5
2006-06313-011790	01/24/2006	Maries	Vichy Volunteer Fire Protection Assoc	Equipment	2
2006-06313-011792	01/14/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	5
2006-06313-025457	03/19/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	5
2006-06313-025458	03/28/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	0.75
2006-06313-025460	04/07/2006	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	0.05
2006-06313-025461	04/21/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3

View	Discovered Date	County	Station	Cause	Acres Burned
2006-06313-025462	07/22/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
2006-06313-025465	08/23/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	35
2006-06313-025466	09/05/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	0.1
2006-07614-012635	02/28/2006	Maries	Meta Fire & Rescue Fpd	Debris	10
2006-07614-012636	03/03/2006	Maries	Meta Fire & Rescue Fpd	Debris	15
2006-08110-023855	02/14/2006	Maries	St. James Fire Protection District	Debris	3
2006-08110-023861	03/25/2006	Maries	St. James Fire Protection District	Debris	1
2007-00102-029979	03/11/2007	Maries	ADAIR CO RFD #3	Arson	3
2007-07614-029792	05/23/2007	Maries	Meta Fire & Rescue Fpd	Equipment	3
2007-08518-034234	08/15/2007	Maries	Dixon Rural Fire Protection District	Equipment	0.2
2007-08518-034241	04/30/2007	Maries	Dixon Rural Fire Protection District	Unknown	2.5
2007-08518-034242	04/30/2007	Maries	Dixon Rural Fire Protection District	Unknown	2.5
2008-07614-033733	03/13/2008	Maries	Meta Fire & Rescue Fpd	Debris	5
2009-07614-037626	02/19/2009	Maries	Meta Fire & Rescue Fpd	Miscellaneous	40
2009-07614-037772	02/21/2009	Maries	Meta Fire & Rescue Fpd	Miscellaneous	500
2009-07614-037774	02/22/2009	Maries	Meta Fire & Rescue Fpd	Debris	7
2009-07614-037775	02/22/2009	Maries	Meta Fire & Rescue Fpd	Miscellaneous	10
2009-07614-038741	03/17/2009	Maries	Meta Fire & Rescue Fpd	Debris	5
2010-08518-052684	11/07/2010	Maries	Dixon Rural Fire Protection District	Debris	0.5
2010-08518-052740	10/20/2010	Maries	Dixon Rural Fire Protection District	Debris	50
2010-08518-052769	10/04/2010	Maries	Dixon Rural Fire Protection District	Debris	0.1
2010-08518-052771	10/22/2010	Maries	Dixon Rural Fire Protection District	Debris	15
2010-08518-052801	10/29/2010	Maries	Dixon Rural Fire Protection District	Debris	0.5
2010-08518-052804	10/29/2010	Maries	Dixon Rural Fire Protection District	Debris	0.1
2011-06305-054806	03/12/2011	Maries	Vienna Fire Prot. Dist.	Debris	3
2011-07614-052658	01/03/2011	Maries	Meta Fire & Rescue Fpd	Debris	1
2011-07614-054422	02/20/2011	Maries	Meta Fire & Rescue Fpd	Unknown	1
2011-07614-054552	03/02/2011	Maries	Meta Fire & Rescue Fpd	Miscellaneous	400



View	Discovered Date	County	Station	Cause	Acres Burned
2011-07614-061421	10/08/2011	Maries	Meta Fire & Rescue Fpd	Equipment	1
2011-08518-054430	02/18/2011	Maries	Dixon Rural Fire Protection District	Debris	3
2011-08518-054461	02/18/2011	Maries	Dixon Rural Fire Protection District	Debris	2
2011-08518-056116	04/01/2011	Maries	Dixon Rural Fire Protection District	Debris	2
2011-08518-056118	04/03/2011	Maries	Dixon Rural Fire Protection District	Debris	2
2011-08518-056143	04/05/2011	Maries	Dixon Rural Fire Protection District	Debris	25
2011-08518-056303	04/08/2011	Maries	Dixon Rural Fire Protection District	Debris	1
2011-08518-056324	04/09/2011	Maries	Dixon Rural Fire Protection District	Debris	30
2011-08518-056325	04/09/2011	Maries	Dixon Rural Fire Protection District	Debris	30
2011-08518-056565	04/09/2011	Maries	Dixon Rural Fire Protection District	Not Reported	1
2011-08518-056566	04/13/2011	Maries	Dixon Rural Fire Protection District	Unknown	1
2011-08518-058999	07/28/2011	Maries	Dixon Rural Fire Protection District	Debris	4
2011-08518-059000	07/30/2011	Maries	Dixon Rural Fire Protection District	Miscellaneous	1
2011-08518-059013	07/18/2011	Maries	Dixon Rural Fire Protection District	Miscellaneous	1
2011-08518-060609	09/12/2011	Maries	Dixon Rural Fire Protection District	Debris	2
2011-08518-061351	10/16/2011	Maries	Dixon Rural Fire Protection District	Debris	5
2011-08519-078421	02/18/2011	Maries	Crocker Rural Fire Protection District	Unknown	15
2012-06305-067678	03/04/2012	Maries	Vienna Fire Prot. Dist.	Not Reported	200
2012-06305-072241	06/14/2012	Maries	Vienna Fire Prot. Dist.	Equipment	12
2012-06305-072261	06/08/2012	Maries	Vienna Fire Prot. Dist.	Equipment	15
2012-06305-073827	07/15/2012	Maries	Vienna Fire Prot. Dist.	Miscellaneous	0.25
2012-06313-068486	01/03/2012	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
2012-06313-068487	02/01/2012	Maries	Vichy Volunteer Fire Protection Assoc	Debris	1
2012-06313-068529	02/02/2012	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
2012-06313-068549	02/17/2012	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
2012-06313-068550	02/23/2012	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
2012-06632-099024	01/06/2012	Maries	Iberia Rural Fire Protection District	Debris	1
2012-07609-077965	07/29/2012	Maries	Freeburg Community Fire Association	Debris	25

View	Discovered Date	County	Station	Cause	Acres Burned
2012-07614-065458	01/04/2012	Maries	Meta Fire & Rescue Fpd	Miscellaneous	1
2012-07614-069068	03/04/2012	Maries	Meta Fire & Rescue Fpd	Debris	200
2012-07614-069081	02/12/2012	Maries	Meta Fire & Rescue Fpd	Debris	450
2012-07614-074859	07/18/2012	Maries	Meta Fire & Rescue Fpd	Equipment	5
2012-08518-065981	01/06/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	1.5
2012-08518-067062	01/22/2012	Maries	Dixon Rural Fire Protection District	Debris	10
2012-08518-068871	03/13/2012	Maries	Dixon Rural Fire Protection District	Debris	1.5
2012-08518-068889	03/05/2012	Maries	Dixon Rural Fire Protection District	Debris	20
2012-08518-071023	02/26/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	1
2012-08518-071024	02/26/2012	Maries	Dixon Rural Fire Protection District	Debris	1
2012-08518-071029	03/03/2012	Maries	Dixon Rural Fire Protection District	Debris	25
2012-08518-071030	03/04/2012	Maries	Dixon Rural Fire Protection District	Debris	200
2012-08518-071067	04/01/2012	Maries	Dixon Rural Fire Protection District	Debris	1
2012-08518-071069	04/09/2012	Maries	Dixon Rural Fire Protection District	Debris	2
2012-08518-074200	06/21/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	6
2012-08518-074263	06/26/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	1
2012-08518-074290	07/18/2012	Maries	Dixon Rural Fire Protection District	Unknown	4
2012-08518-076872	08/05/2012	Maries	Dixon Rural Fire Protection District	Debris	0.1
2012-08518-076878	08/22/2012	Maries	Dixon Rural Fire Protection District	Debris	70
2012-08518-076879	08/23/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	5
2012-08518-076880	08/28/2012	Maries	Dixon Rural Fire Protection District	Unknown	4
2012-08518-076881	06/26/2012	Maries	Dixon Rural Fire Protection District	Debris	1
2013-07614-112431	03/15/2013	Maries	Meta Fire & Rescue Fpd	Miscellaneous	1
2013-08518-084845	01/25/2013	Maries	Dixon Rural Fire Protection District	Miscellaneous	0.1
2013-08518-087244	04/07/2013	Maries	Dixon Rural Fire Protection District	Debris	12
2013-08518-092053	11/10/2013	Maries	Dixon Rural Fire Protection District	Arson	0.1
2013-08518-092055	11/11/2013	Maries	Dixon Rural Fire Protection District	Debris	3
2013-08518-092056	11/17/2013	Maries	Dixon Rural Fire Protection District	Debris	3

View	Discovered Date	County	Station	Cause	Acres Burned
2013-08518-092059	11/29/2013	Maries	Dixon Rural Fire Protection District	Equipment	0.1
2013-08518-092060	09/15/2013	Maries	Dixon Rural Fire Protection District	Debris	1
2013-08518-092061	07/06/2013	Maries	Dixon Rural Fire Protection District	Debris	0.1
2014-06305-093552	01/19/2014	Maries	Vienna Fire Prot. Dist.	Equipment	7
2014-06305-093553	01/25/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	15
2014-06305-093708	01/27/2014	Maries	Vienna Fire Prot. Dist.	Debris	2
2014-06305-094478	02/23/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	5
2014-06305-094485	02/23/2014	Maries	Vienna Fire Prot. Dist.	Equipment	2
2014-06305-095466	03/15/2014	Maries	Vienna Fire Prot. Dist.	Debris	2
2014-06305-095502	03/15/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	40
2014-06305-095503	03/15/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	50
2014-06305-095504	03/15/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	3
2014-06305-099573	04/06/2014	Maries	Vienna Fire Prot. Dist.	Not Reported	30
2014-06305-100462	04/12/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	20
2014-06313-111290	01/19/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	22
2014-06313-111291	01/15/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
2014-06313-111292	01/20/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
2014-06313-111293	01/20/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	15
2014-06313-111294	01/25/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	80
2014-06313-111571	01/26/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	25
2014-06313-111572	01/26/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	7
2014-06313-111573	01/29/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	8
2014-06313-111574	01/29/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	20
2014-06313-111575	01/29/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	21
2014-06313-111576	02/19/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	8
2014-06313-111577	02/21/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
2014-06313-111578	02/23/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
2014-06313-111579	02/24/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	18

View	Discovered Date	County	Station	Cause	Acres Burned
2014-06313-111580	02/24/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	12
2014-06313-111581	02/25/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2
2014-06313-111582	03/10/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	80
2014-06313-111583	03/11/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
2014-06313-111585	03/13/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	8
2014-06313-111586	03/16/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
2014-06313-111587	03/15/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
2014-06313-111588	03/16/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	12
2014-06313-111589	03/20/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	15
2014-06313-111590	03/24/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	9
2014-06313-111591	03/26/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	9
2014-06313-111593	04/16/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	6
2014-06313-111594	06/11/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	14
2014-06313-111595	07/27/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
2014-06313-111596	08/28/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
2014-06632-096144	03/07/2014	Maries	Iberia Rural Fire Protection District	Unknown	2
2014-07614-112434	01/14/2014	Maries	Meta Fire & Rescue Fpd	Miscellaneous	1
2014-07614-112439	03/01/2014	Maries	Meta Fire & Rescue Fpd	Debris	2
2014-07614-112441	03/22/2014	Maries	Meta Fire & Rescue Fpd	Miscellaneous	5
2014-08518-093327	01/19/2014	Maries	Dixon Rural Fire Protection District	Unknown	0.1
2014-08518-093328	01/14/2014	Maries	Dixon Rural Fire Protection District	Debris	100
2014-08518-093962	01/27/2014	Maries	Dixon Rural Fire Protection District	Debris	1
2014-08518-093963	01/30/2014	Maries	Dixon Rural Fire Protection District	Debris	2.5
2014-08518-095054	02/23/2014	Maries	Dixon Rural Fire Protection District	Debris	12
2014-08518-095056	02/18/2014	Maries	Dixon Rural Fire Protection District	Unknown	0.1
2014-08518-095057	02/22/2014	Maries	Dixon Rural Fire Protection District	Debris	5
2014-08518-095228	03/10/2014	Maries	Dixon Rural Fire Protection District	Unknown	10
2014-08518-095229	03/10/2014	Maries	Dixon Rural Fire Protection District	Debris	75

View	Discovered Date	County	Station	Cause	Acres Burned
2014-08518-095230	03/10/2014	Maries	Dixon Rural Fire Protection District	Debris	25
2014-08518-095976	03/13/2014	Maries	Dixon Rural Fire Protection District	Debris	1
2014-08518-096502	03/15/2014	Maries	Dixon Rural Fire Protection District	Debris	25
2014-08518-096503	03/15/2014	Maries	Dixon Rural Fire Protection District	Debris	65
2014-08518-096802	03/21/2014	Maries	Dixon Rural Fire Protection District	Debris	45
2014-08518-096804	03/25/2014	Maries	Dixon Rural Fire Protection District	Equipment	1
2014-08518-097843	03/30/2014	Maries	Dixon Rural Fire Protection District	Debris	1
2014-08518-097844	03/30/2014	Maries	Dixon Rural Fire Protection District	Debris	1
2014-08518-097845	04/01/2014	Maries	Dixon Rural Fire Protection District	Unknown	2
2014-08518-107423	05/05/2014	Maries	Dixon Rural Fire Protection District	Equipment	0.5
2014-08518-107424	05/08/2014	Maries	Dixon Rural Fire Protection District	Equipment	1
2015-06303-129672	02/14/2015	Maries	Belle Fire Protection District	Unknown	0.5
2015-06303-129673	03/23/2015	Maries	Belle Fire Protection District	Unknown	3
2015-06303-129674	03/31/2015	Maries	Belle Fire Protection District	Unknown	1
2015-06303-129675	05/02/2015	Maries	Belle Fire Protection District	Unknown	4
2015-06303-129677	07/30/2015	Maries	Belle Fire Protection District	Unknown	0.1
2015-06303-129681	03/23/2015	Maries	Belle Fire Protection District	Unknown	2
2015-06303-129683	07/25/2015	Maries	Belle Fire Protection District	Equipment	0.01
2015-06303-130449	10/24/2015	Maries	Belle Fire Protection District	Equipment	1
2015-06305-129852	10/12/2015	Maries	Vienna Fire Prot. Dist.	Unknown	18
2015-06313-129830	01/12/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	0.5
2015-06313-129831	01/19/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2.5
2015-06313-129832	02/08/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1.5
2015-06313-129833	02/12/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
2015-06313-129834	03/23/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	20
2015-06313-129835	04/18/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	7
2015-06313-129836	05/18/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
2015-06313-129837	09/01/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	0.1

View	Discovered Date	County	Station	Cause	Acres Burned
2015-06313-129838	09/13/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	0.75
2015-06313-129839	09/25/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
2015-06313-129840	09/25/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	15
2015-06313-129842	10/20/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	0.75
2015-08518-117914	01/18/2015	Maries	Dixon Rural Fire Protection District	Debris	1
2015-08518-125193	03/08/2015	Maries	Dixon Rural Fire Protection District	Unknown	20
2015-08518-129500	09/03/2015	Maries	Dixon Rural Fire Protection District	Unknown	5
2015-08518-129501	09/13/2015	Maries	Dixon Rural Fire Protection District	Unknown	0.5
2015-08518-129508	10/07/2015	Maries	Dixon Rural Fire Protection District	Debris	2
2015-08518-129512	10/15/2015	Maries	Dixon Rural Fire Protection District	Unknown	0.1
2015-08518-129514	10/16/2015	Maries	Dixon Rural Fire Protection District	Unknown	1
2015-08518-130633	11/14/2015	Maries	Dixon Rural Fire Protection District	Debris	1
2015-08518-130636	10/30/2015	Maries	Dixon Rural Fire Protection District	Debris	2
2016-06303-132691	11/08/2015	Maries	Belle Fire Protection District	Debris	0.01
2016-06303-132693	12/25/2015	Maries	Belle Fire Protection District	Debris	0.01
2016-06303-140873	05/22/2016	Maries	Belle Fire Protection District	Debris	0.5
2016-06303-141959	09/02/2016	Maries	Belle Fire Protection District	Unknown	0.1
2016-06303-141961	11/16/2016	Maries	Belle Fire Protection District	Unknown	10
2016-06313-141132	03/25/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	5
2016-06313-141133	03/26/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1.5
2016-06313-141134	03/28/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	2
2016-06313-141135	04/01/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1
2016-06313-141136	04/08/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	0.5
2016-06313-141137	04/06/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	5
2016-07614-142359	01/21/2016	Maries	Meta Fire & Rescue Fpd	Equipment	4
2017-06313-158111	02/03/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
2017-06313-158112	02/03/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
2017-06313-158113	02/10/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	7

View	Discovered Date	County	Station	Cause	Acres Burned
2017-06313-158114	02/13/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1.5
2017-06313-158116	02/17/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
2017-06313-158117	02/19/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
2017-06313-158118	02/19/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
2017-06313-158119	03/05/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
2017-06313-158120	03/06/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1.5
2017-06313-158121	03/15/2017	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	4
2017-06313-158122	05/22/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2
2017-06313-158123	07/02/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	8
2017-06313-159171	09/15/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2
2017-06313-159351	10/02/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2
2017-06313-164918	12/06/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	12
2017-06313-164919	12/02/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
2017-06313-164920	11/30/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
2017-06313-164924	11/25/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
2017-06313-165071	12/19/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	9
2017-08518-145637	03/25/2016	Maries	Dixon Rural Fire Protection District	Debris	5
2017-08518-145640	03/05/2016	Maries	Dixon Rural Fire Protection District	Debris	1.5
2017-08518-145641	03/05/2016	Maries	Dixon Rural Fire Protection District	Unknown	2
2017-08518-145646	02/18/2016	Maries	Dixon Rural Fire Protection District	Debris	2
2017-08518-145648	02/07/2016	Maries	Dixon Rural Fire Protection District	Unknown	20
2017-08518-145650	02/06/2016	Maries	Dixon Rural Fire Protection District	Unknown	5
2017-08518-145653	01/30/2016	Maries	Dixon Rural Fire Protection District	Debris	6
2017-08518-145654	02/13/2017	Maries	Dixon Rural Fire Protection District	Unknown	2
2018-06305-166038	02/03/2018	Maries	Vienna Fire Prot. Dist.	Debris	5.24
2018-06305-176064	03/14/2018	Maries	Vienna Fire Prot. Dist.	Debris	3.99
2018-07614-177916	03/24/2018	Maries	Meta Fire & Rescue Fpd	Debris	0.35

View	Discovered Date	County	Station	Cause	Acres Burned
2018-07614-177917	04/16/2018	Maries	Meta Fire & Rescue Fpd	Equipment	7.83
2019-03731-179118	04/10/2019	Maries	Bland Fire Protection District	Miscellaneous	1.42
2019-06305-178358	03/21/2019	Maries	Vienna Fire Prot. Dist.	Unknown	0.45
2019-06632-179201	02/05/2017	Maries	Iberia Rural Fire Protection District	Debris	4.92
2019-08102-178705	03/02/2018	Maries	Rolla Rural Fire Protection District	Miscellaneous	0.22
2019-08102-178808	04/07/2017	Maries	Rolla Rural Fire Protection District	Debris	0.02
2020-06313-230796	01/08/2020	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	
2020-06313-230797	03/07/2020	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	15.28
2020-06313-251193	11/19/2020	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	9.18
2020-08110-190182	03/07/2020	Maries	St. James Fire Protection District	Unknown	0.75
2021-03731-281881	03/09/2021	Maries	Bland Fire Protection District	Unknown	39.75
2021-06305-261640	02/23/2021	Maries	Vienna Fire Prot. Dist.	Debris	1.17
2021-06305-271749	03/07/2021	Maries	Vienna Fire Prot. Dist.	Miscellaneous	1.64
2021-06305-271751	03/07/2021	Maries	Vienna Fire Prot. Dist.	Miscellaneous	1.58
2021-06313-282106	01/13/2021	Maries	Vichy Volunteer Fire Protection Assoc	Debris	5.05
2021-06313-282109	01/12/2021	Maries	Vichy Volunteer Fire Protection Assoc	Debris	0.49
2021-06313-282111	03/07/2021	Maries	Vichy Volunteer Fire Protection Assoc	Debris	5.02
2021-06313-282112	03/09/2021	Maries	Vichy Volunteer Fire Protection Assoc	Debris	0.03
2021-06313-282113	03/10/2021	Maries	Vichy Volunteer Fire Protection Assoc	Debris	2.05
2022-06305-374025	03/04/2022	Maries	Vienna Fire Prot. Dist.	Debris	0.82
2022-06305-374026	03/02/2022	Maries	Vienna Fire Prot. Dist.	Unknown	0.64
2022-06305-425046	08/14/2022	Maries	Vienna Fire Prot. Dist.	Equipment	2.4
2022-06305-425047	08/14/2022	Maries	Vienna Fire Prot. Dist.	Debris	0.27
2022-06305-436188	11/09/2022	Maries	Vienna Fire Prot. Dist.	Unknown	12.95
2022-06632-373817	02/15/2022	Maries	Iberia Rural Fire Protection District	Debris	6.63
2022-06632-424938	02/27/2022	Maries	Iberia Rural Fire Protection District	Debris	0.2
2022-08110-435984	10/21/2022	Maries	St. James Fire Protection District	Debris	0.71

Source: Missouri Department of Conservation, Fire Report Search, <https://mdc12.mdc.mo.gov/Applications/MDCFireReporting/Home/FireReportSearch>