



Maries County Multi-Jurisdiction Natural Hazard Mitigation Plan



Meramec Regional Planning Commission • May 3, 2019



CONTRIBUTORS

Maries County Hazard Mitigation Planning Committee

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

Jurisdictional Representatives

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Frankie Hicks	City Clerk	City Admin.	City of Belle

*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

Name	Title	Agency/Organization
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EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Maries County and participating cities and school districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses to the county and its communities and schools resulting from hazard events. The plan is an update of a plan that was approved on August 25, 2014. The original plan was approved in 2006. The plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 and to achieve eligibility for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant Programs.

The county Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the following 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 2006 with an update approved by FEMA on August 25, 2014. This current planning effort serves as an update (hereafter referred to as the 2019 Hazard Mitigation Plan.)

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

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

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

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

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

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

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

Goal 6: Secure resources for investment in hazard mitigation.

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

PREREQUISITES

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

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

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

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

WHEREAS, (Government/District) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the 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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1.1 Purpose

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.

Those jurisdictions within Maries County that do not adopt the 2019 plan will not be eligible for funding through these grant programs.

1.2 Background and Scope

The 2019 Maries Hazard Mitigation Plan is an update of the original plan developed and approved in 2006. The first update of the 2006 plan was approved by FEMA on August 25, 2014. The revised document will be valid for five years from approval by FEMA. It is a multi-jurisdictional plan that covers the participating jurisdictions within the County's borders, all of whom adopted both the 2006 and 2014 plan, including the following:

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

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

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, objectives and strategies identified through the planning process.

The plan is organized as follows:

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

To assist in the explanation of the above identified contents, there are several appendices included which provide more detail on specific subjects. This plan is intended to improve the

ability of 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

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 2018 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 insured that the final document met the DMA requirements established by federal regulations and the most current planning guidance.

In 2018, 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 insuring 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, the City of Vienna, Maries County R-I, and Maries County R-II, public agencies, non-profit organizations, the private sector as well as regional, state and federal agencies. MRPC contacted and asked for volunteers to serve on the planning committee from the county and local city governments, school districts, the county health department, local businesses and utility companies. The mailing list is included in **Appendix B: Planning Process**. This cross-section of local representatives was chosen for their experience and expertise in emergency planning and community planning in 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 of the jurisdictions provided information to develop the document, reviewed the plan and provided input. Interviews were conducted with stakeholders from the community and several planning meetings were conducted during the plan development.

The 2019 planning process began with a meeting held at the Maries County Courthouse on September 27, 2018. 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 December 11, 2018. The MPC reviewed the revised list of action items and applying the STAPLEE method (Social, Technical, Administrative, Political, Legal, Economic; Environmental) and applying cost benefit analysis to best determine priorities. A full description of the prioritization process is included in Chapter 4. The group agreed to review plan chapters as they were completed through email or postings on the MRPC website.

During the first meeting, staff met with Maries County Associate Commissioners who provided both a comprehensive list of projects to be included in the plan as well as a list of what had been accomplished since the last plan update. Staff incorporated these action items into the planning materials reviewed and prioritized by the MPC in December.

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

All planning committee members were provided drafts of sections of the plan as they became available. Members of the planning committee reviewed the draft chapters and provided valuable input to MRPC staff. Additionally, through public committee meetings, press releases and draft plan posting on MRPC's website, ample opportunity was provided for public participation. 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 County Courthouse in Vienna. 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:

Frankie Hick, Dwight Francis and Patrick Call all participated indirectly by providing information, completing the community survey, participating in phone calls and email discussions and assisting with adoption of the plan.

Table 1.2 Jurisdictional Representatives Maries County Mitigation Planning Committee

Name	Title	Department	Jurisdiction/Agency/ Organization	Direct Participation	Indirect Participation
Ed Fagre	Associate Commissioner	Admin.	Maries County	X	
Doug Drewel	Associate Commissioner	Admin.	Maries County	X	
Renee Kottwitz	Deputy Clerk	Admin.	Maries County	X	
Scott John	EMD	County Emergency Management	Maries County	X	
Chris Heitman	Sheriff	Sheriff's Office	Maries County	X	
Katie Strawbridge	RN	Health Dept.	Phelps/Maries Health Dept.	X	
Sherry James	City Clerk	Admin.	City of Vienna	X	
Shon Westart	Public Works Supt.	Public Works	City of Vienna	X	
Frankie Hick	City Clerk/Collector	Admin	City of Belle		X
Dwight Francis	Fire Chief/EMD	Emergency Management	City of Belle		X
Patrick Call	Superintendent	School	Maries County R-II		X
Mark Parker	Superintendent	School	Maries County R-I	X	
Ian Murray	Principal	School	Maries County R-I	X	
Linda Adkins	Reporter	Press	Maries Co. Gazette	X	
Mark Bushmann	Assistant Chief	Fire Dept.	Vienna Fire Prot. Dist.	X	
Shanda Snodgrass	Principal	School	Maries County R-I	X	

1.5 Multi-Jurisdictional Participation

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

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. Letters and/or emails were sent to each of the following:

- Maries County
- City of Belle
- City of Vienna
- Maries County R-I
- Maries County R-II
- Phelps/Maries Co. Health Dept.
- Intercounty Electric Co-Op, Inc.
- Gascosage Electric Co-Op, Inc.
- Three Rivers Electric Co-Op, Inc.
- American Red Cross
- Maries Manor
- Victorian Place of Vienna
- Dixon Rural Fire Prot. Dist.
- Rolla National Airport
- Missouri Dept. of Conservation
- MoDOT
- Missouri State Highway Patrol
- MO, SEMA
- FEMA Region VII
- USFWS
- USACE
- Century Link
- USDA, NRCS
- Belle Banner
- Maries County Advocate
- Maries County Gazette
- KKID Radio
- Results Radio
- Sunny 104.5
- KPLA
- Maries Medical Clinic

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

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

- Providing a representative to serve on the planning committee;
- Participating in at least one or more meetings of the planning committee;
- Providing data for plan development through surveys and/or interviews;
- Identify goals and mitigation actions for the plan;
- Prioritize mitigation actions/projects for the plan;
- Review and comment on the draft plan document;
- Informing the public, local officials and other interested parties about the planning process and providing opportunities for them to comment on the plan;
- Provide in-kind match documentation; and
- Formally adopt the plan prior to submittal of the final draft to SEMA and FEMA for final approval.

Not all jurisdictions were able to attend the MPC meetings. Most communities and school districts in Maries County are small and understaffed. It was not always feasible for representatives to travel to the meetings. However, all jurisdictions met at least one of the participation criteria. All jurisdictions were contacted by phone 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 1.3 Jurisdictional Participation in the Planning Process

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

1.6 The Planning Steps

Maries County and MRPC worked together to develop the plan and based the planning process in FEMA's *Local Mitigation Planning Guidance (March 2013)*, the *Local Mitigation Plan Review Guide (October 1, 2011)*, and *Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013)*. The planning process has included organizing the county's resources, assessing the risks to the county, developing the mitigation plan and implementing the plan and monitoring the progress of plan implementation.

The planning committee based their activities on the 10-step planning process adapted from FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. By following the 10-step planning process, the plan met funding eligibility requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System and Flood Mitigation Assistance Program.

Table 1.4 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

Community Rating System (CRS) Planning Steps (Activity 510)	Local Mitigation Planning Handbook Tasks (44 CFR Part 201)
Step 10: Implement, evaluate, revise	Task 7: Keep the Plan Current Task 9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)

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

The planning area was determined by the boundaries of 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. In addition, it was suggested that representatives of some of the local critical facilities be included on the planning committee, such as medical clinics and nursing homes. All meetings were also publicized to allow additional interested parties to attend and participate. Maries County Commission offered to host the meetings at the courthouse and two meeting dates were selected – September 27, 2018 and December 11, 2018.

At the first meeting on September 27, 2018, 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. Staff wrapped up the meeting by explaining the process that would be used to prioritize the action items at the next meeting – using both the STAPLEE method and analyzing the cost benefit.

At the second meeting on December 11, 2018, the group reviewed the complete list of action items developed at the September 27, 2018 meeting. MRPC staff shared the results of the public survey and provided an explanation of the prioritization process using both the STAPLEE and cost benefit scoring. The MCP 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. The group also reviewed the list of critical facilities in the plan and provided feedback on any changes or additions to that list. It was decided that staff would share plan chapters with the MPC as they were completed. If necessary the group would meet again but no date was set.

Table 1.5 Schedule of MPC Meetings outlines the dates that meetings were held and topics covered. Documentation of the planning process can be found in Appendix B: Planning Process.

Table 1.5 Schedule of MPC Meetings

Meeting	Topics	Date
Planning Meeting #1	Overview of 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	September 27, 2018
Planning Meeting #2	Overview of hazard mitigation planning and Maries Co. HMP; 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	December 11, 2018

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. All MPC meetings were held at the Maries County Courthouse. Public notices were placed at the courthouse 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 was presented for review and discussion. A public survey was conducted 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) where a copy of the draft plan could be viewed or downloaded. The document was made available on the website on March 5, 2019. Hard copies of the final draft were placed at the Maries County Courthouse and city hall buildings for Maries Co., Belle, and Vienna. A hard copy of the draft could be obtained directly from MRPC by request. Members of the local media, both radio, newspaper and online were invited to attend planning meetings. Information was shared by these media outlets with the public on the planning process and where to find draft copies of the plan. Copies of public notices and press release are included in Appendix 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. Which 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 Phelps/Maries County Health Dept., Maries County Sheriff's Department, Maries County Gazette, Vienna Fire Protection District. 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

Name	Title	Department	Jurisdiction/Agency/Organization
Ray Schwartze	Presiding Commissioner	County	Maries County
Doug Drewell	Associate Commissioner	County	Maries County
Ed Fagre	Associate Commissioner	County	Maries County
Rhonda Brewer	County Clerk	County	Maries County
Chris Heitman	Sherriff	Sherriff's Dept.	Maries County
Scott John	EMD	Emergency Management	Maries County
Ashley Wann	Admin.	Health Dept.	Phelps/Maries County Health Dept.
Josh Seaver	Mayor	City Admin.	City of Belle
Frankie Hicks	City Clerk	City Admin.	City of Belle
Jeanette Struempf	Alderman	City Admin.	City of Belle
Ken Stanfield	Alderman	City Admin.	City of Belle
Tony Gieck	Alderman	City Admin.	City of Belle
Courtney Abel	Alderman	City Admin.	City of Belle
Joseph Turnbough	Police Chief	Police Dept.	City of Belle
Dwight Francis	Fire Chief	Fire Dept.	Belle Volunteer Fire Dept.
Darryl Jenkins	Public Works Supt.	Public Works	City of Belle
T.C. James	Mayor	City Admin.	City of Vienna
Sherry James	City Clerk	City Admin.	City of Vienna
Brenda Davis	Alderman	City Admin.	City of Vienna
Carol Miller	Alderman	City Admin.	City of Vienna
Reva Hutchison	Alderman	City Admin.	City of Vienna

Name	Title	Department	Jurisdiction/Agency/Organization
Jeremy Smith	Alderman	City Admin.	City of Vienna
Shannon Thompson	Police Chief	Police Dept.	City of Vienna
Shon Westart	Public Works Supt.	Public Works	City of Vienna
Mike Smith	Fire Chief	Fire Dept.	Vienna Fire Prot. Dist.
Mike Prigge	Fire Chief	Fire Dept.	Vichy Vol. Fire Prot. Dist.
Mark Parker	Superintendent	School	Maries County R-I
Dr. Patrick Call	Superintendent	School	Maries County R-II

Stakeholder Invited to Participate in the Planning Process

Name	Title	Agency/Organization
Trina Gunter	Administrator	Maries Manor
Lorri Owens	Administrator	Victorian Place of Vienna
Heather Satterfield	Director of Communications	Intercounty Electric Coop.
Carmen Hartwell	General Manager	Gascosage Electric Coop
Dennis Lachowicz	Fire Chief	Dixon Rural Fire Prot. Dist.
Preston Kramer	Engineer	MoDOT
Darrin Bacon	Manager	Rolla National Airport
Roger Kloeppel	Manager of Operations	Three Rivers Electric Coop
Kath Mayne	Administrator	American Red Cross
Karen McHugh	Floodplain Manager	SEMA
Robert Gramke	District Engineer	USACE
Ken Sessa	Regional Environmental Officer	FEMA Region VII
Josh Hundley	Biologist	USFWS
Chris Newbold	Regional Supervisor	MDC
J.R. Flores	State Conservationist	USDA, NRCS
Steve Davis	Lieutenant	Missouri State Highway Patrol
Bill Fallin	General Manager	CenturyLink
-	Reporter	Belle Banner
-	Reporter	Maries County Advocate
-	Reporter	Maries County Gazette
-	-	KKID Radio
-	-	Results Radio
-	-	Sunny 104.5
-	-	KPLA
-	Administrator	Maries Medical Clinic

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

The 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

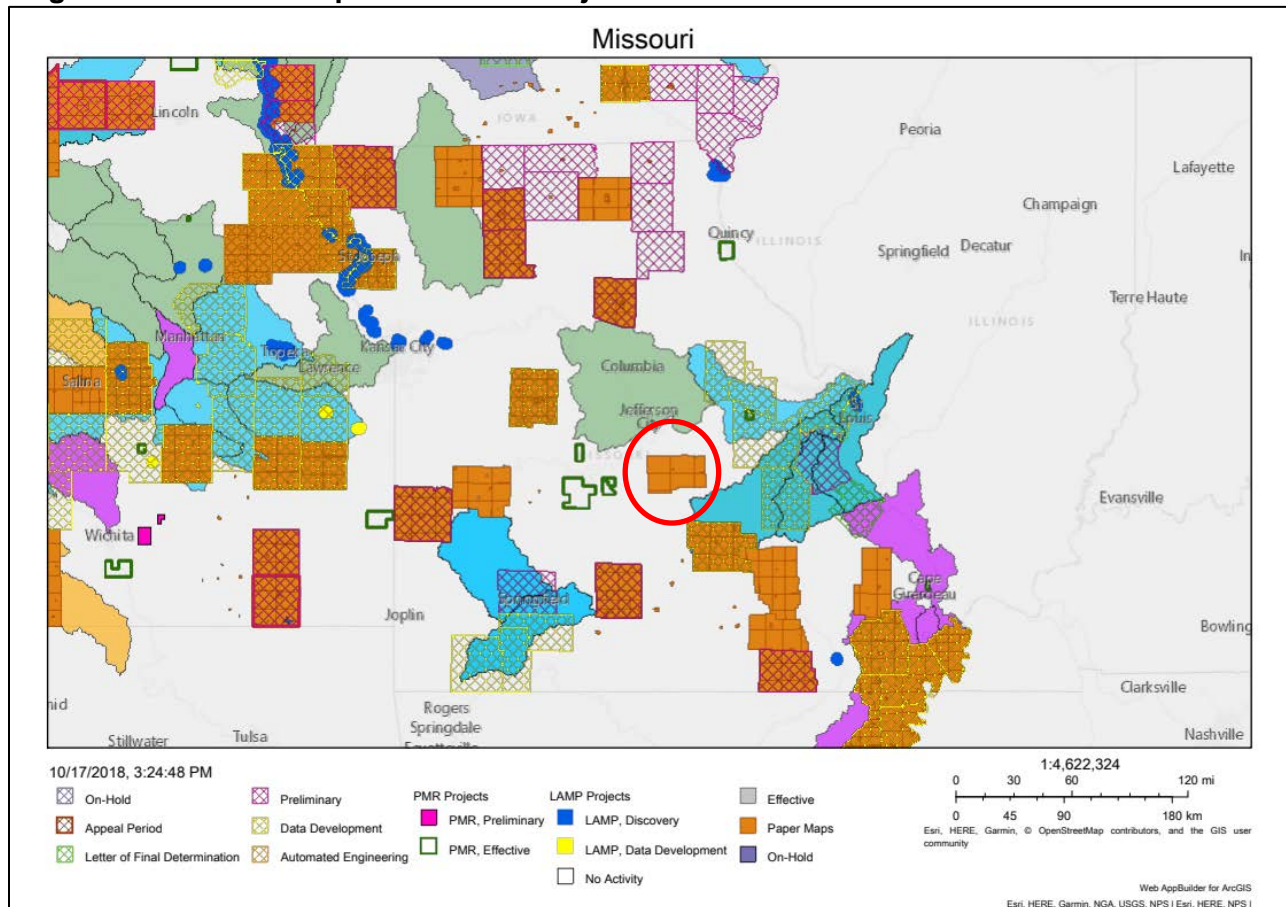
items have also be incorporated, where applicable, in the Community Economic Development Strategy (CEDS).

Coordination with FEMA Risk MAP Project

The Risk MAP project held its first kick-off data development meeting in Maries County on December 14, 2018. The county currently only has paper maps. 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 regards to RiskMap projects.

Figure 1.1. Map of RiskMAP Projects



Integration of Other Data, Reports, Studies and Plans

The MPC researched available plans, studies, reports and technical information during development of the Update. The intent was to identify existing data and information, shared objectives and past and ongoing activities that would add to the Update. The goal was to identify the existing capabilities and planning mechanisms to implement the mitigation strategy. Maries County is a rural area with the largest community's population at approximately 1,344. 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 (2018) 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 September 27, 2018 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 2018 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 September 27, 2018. Those goals are as follows:

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

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

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

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

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

Goal 6: Secure resources for investment in hazard mitigation.

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 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 was asked to provide information about mitigation activities that were needed as well as those that had been accomplished over the past five years. Meeting facilitators offered to share ideas for mitigation projects from the FEMA publication *Mitigation Ideas: As Resource for Reducing Risk to Natural Hazards* (January 2013) to help stimulate ideas and discussion.

Staff received proposed road and bridge mitigation projects that needed to be addressed from the County Associate Commissioners on September 27, 2018.

As RiskMAP is just beginning the Discovery and Topo Data Phase in Maries County, no projects have been identified through that process at this time.

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

STAPLEE stands for the following:

- **Social:** Will the action be acceptable to the community? Could it have an unfair effect on a particular segment of the population?
- **Technical:** is the action technically feasible? Are there secondary impacts? Does it offer a long-term solution?
- **Administrative:** Are there adequate staffing, funding and maintenance capabilities to implement the project?
- **Political:** Will there be adequate political and public support for the project?
- **Legal:** Does your jurisdiction have the legal authority to implement the action?
- **Economic:** is the action cost-beneficial? Is there funding available: Will the action contribute to the local economy?
- **Environmental:** Will there be negative environmental consequences from the action? Does it comply with environmental regulations? Is it consistent with community environmental goals?

Each question was scored based on a 0 to 3 point value system:

- 3 = Definitely YES
- 2 = Maybe YES
- 1 = Probably NO
- 0 = Definitely NO

For the Benefit/Cost Review portion of the prioritization process, these two aspects were scored as follows:

Benefit – two (2) points were added for each of the following avoided damages (8 points maximum = highest benefit)

- Injuries and/or casualties
- Property damages
- Loss-of-function/displacement impacts
- Emergency management costs/community costs

Cost – points were subtracted according to the following cost scale (-5 points maximum = highest cost)

- (-1) = Minimal – little cost to the jurisdiction involved
- (-3) = Moderate – definite cost involved but could likely be worked into operating budget
- (-5) = Significant – cost above and beyond most operating budgets; would require extra appropriations to finance or to meet matching funds for a grant

Note: For the Benefit/Cost Review, the benefit and cost of actions which used the word “encourage” were evaluated as if the action or strategy being encouraged was actually to be carried out.

Total Score – The scores for the STAPLEE Review and Benefit/Cost Review were added to determine a Total Score for each action.

Priority Scale – To achieve an understanding of how a Total Score might be translated into a Priority Rating, a sample matrix was filled out for the possible range of ratings an action might receive on both the STAPLEE and Benefit/Cost Review. The possible ratings tested ranged between:

- A hypothetical action with “Half probably NO and half maybe YES” answers on STAPLEE (i.e. poor STAPLEE score) and Low Benefit/High Cost: Total Score = 7
- A hypothetical action with “All definitely YES” on STAPLEE and High Benefit/Little Cost: Total Score = 28

An inspection of the possible scores within this range led to the development of the following Priority Scale based on the Total Score in the STAPLEE- Benefit/Cost Review process:

20 – 28 points = High Priority
14-19 points = Medium Priority
13 points and below = Low Priority

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

Step 8: Draft an Action Plan

The MPC reviewed the final list of action items at the December 11, 2018 meeting and completed the prioritization process. The final list was then mailed out to all jurisdictions and members of the MPC for review and approval as everyone was not able to attend the meeting. Staff was directed by the MPC to take the finalized list after allowing time for comments, remove all action items that scored a 13 or below, and drafts an action plan.

Step 9: Adopt the Plan (Handbook Task 8)

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

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

At both planning meetings (September 27, 2018 and December 11, 2018) 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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2.1 Maries County Planning Area Profile

Figure 2.1. Map of Maries County



Maries County has a population of approximately 8,959 according to the most recent census data¹. **Table 2.1** illustrates the percentage population growth since 2000 as compared to the statewide and national population growth. The median household income and percentage growth since 1999, 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 2000 - 2017

Demographic Region	Total Population		Change Over Period	
	2000	2017	Change	Percent
Maries County	8,903	8,959	56	.63
Missouri	5,595,211	6,075,300	480,089	8.6
United States	281,421,906	321,004,407	39,582,501	14.1

Source: U.S. Census Bureau, Census 2000 Summary File 1; U.S. Census Bureau, 2013-2017 5-Year American Community Survey

Table 2.2. Median Household Income and Percentage Growth for County, State, and Nation 2000 - 2017

Demographic Region	Median Household Income (USD)		Change Over Period	
	2000	2017	Change	Percent
United States	\$41,994	\$57,652	\$15,658	37.3
Missouri	\$37,934	\$51,542	\$13,608	35.9
Maries County	\$31,925	\$41,715	\$9,790	30.7

Source: U.S. Census Bureau, Census 2000 Summary File 3; U.S. Census Bureau, 2013-2017 5-Year American Community Survey

Table 2.3. Median House Value Percentage Growth for County, State, and Nation 2000 - 2017

Demographic Region	Median House Value (USD)		Change Over Period	
	2000	2017	Change	Percent
United States	\$111,800	\$193,500	\$81,700	73.1
Missouri	\$86,900	\$145,400	\$58,500	67.3
Maries County	\$71,900	\$122,800	\$50,900	70.8

Source: U.S. Census Bureau, Census 2000 Summary File 3; U.S. Census Bureau, 2013-2017 5-Year American Community Survey

2.1.2 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.

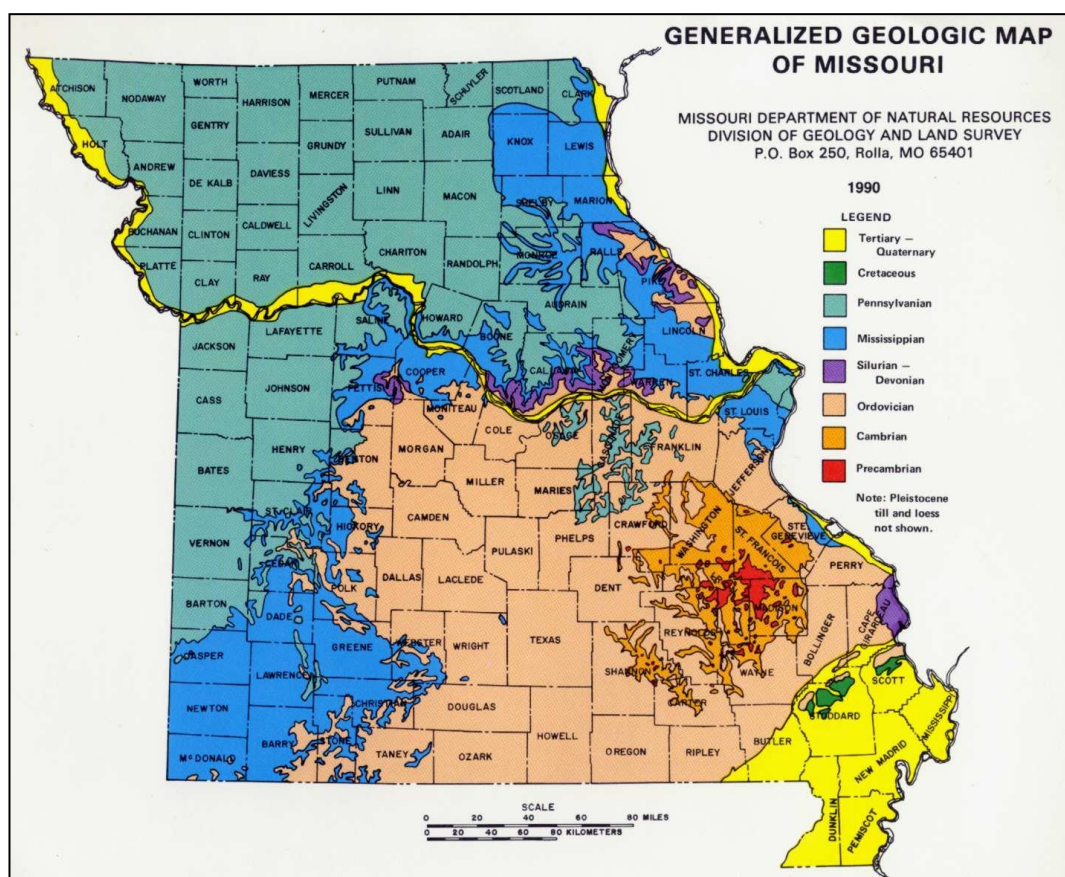
¹ U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

The county seat, Vienna, is located in central Missouri, approximately 29 miles south of the state capital of Jefferson City, approximately 121 miles northeast of Springfield, Mo. and approximately 121 miles southwest of St. Louis, Mo. The county is bordered on the north by Osage County. On the east side the county is bordered by Phelps and Gasconade Counties. To the south the county is bordered by Phelps and Pulaski Counties. Miller County shares a border with Maries to the west.

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.

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 2.2. Generalized Geologic Map of Missouri



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.

The Lower Osage River watershed is found in central Missouri in the Missouri counties of Osage, Maries, Cole, Pulaski, Miller, Camden, Morgan, Benton, and Hickory and encompasses 2,474 square miles. The Lake of the Ozarks was formed in 1931 in the western half of the East Osage River Basin. This basin lies within a dissected plateau known as the Salem Plateau and is represented by four of Missouri's natural divisions. Karst features are common and soils are generally acidic with moderate to low fertility. Erosion rates are generally low although new housing developments, road construction, intensive confinement of livestock and overgrazing have denuded land causing locally-increased erosion and sediment pollution. Truman Dam and Bagnell Dam on the Osage River have significantly impacted the hydrology of the region. Bagnell Dam has significantly changed the timing of water quantity discharged down the Osage River channel. This change in discharge rates and volume may have negatively affected the fish community found in the lower Osage River and its tributaries.

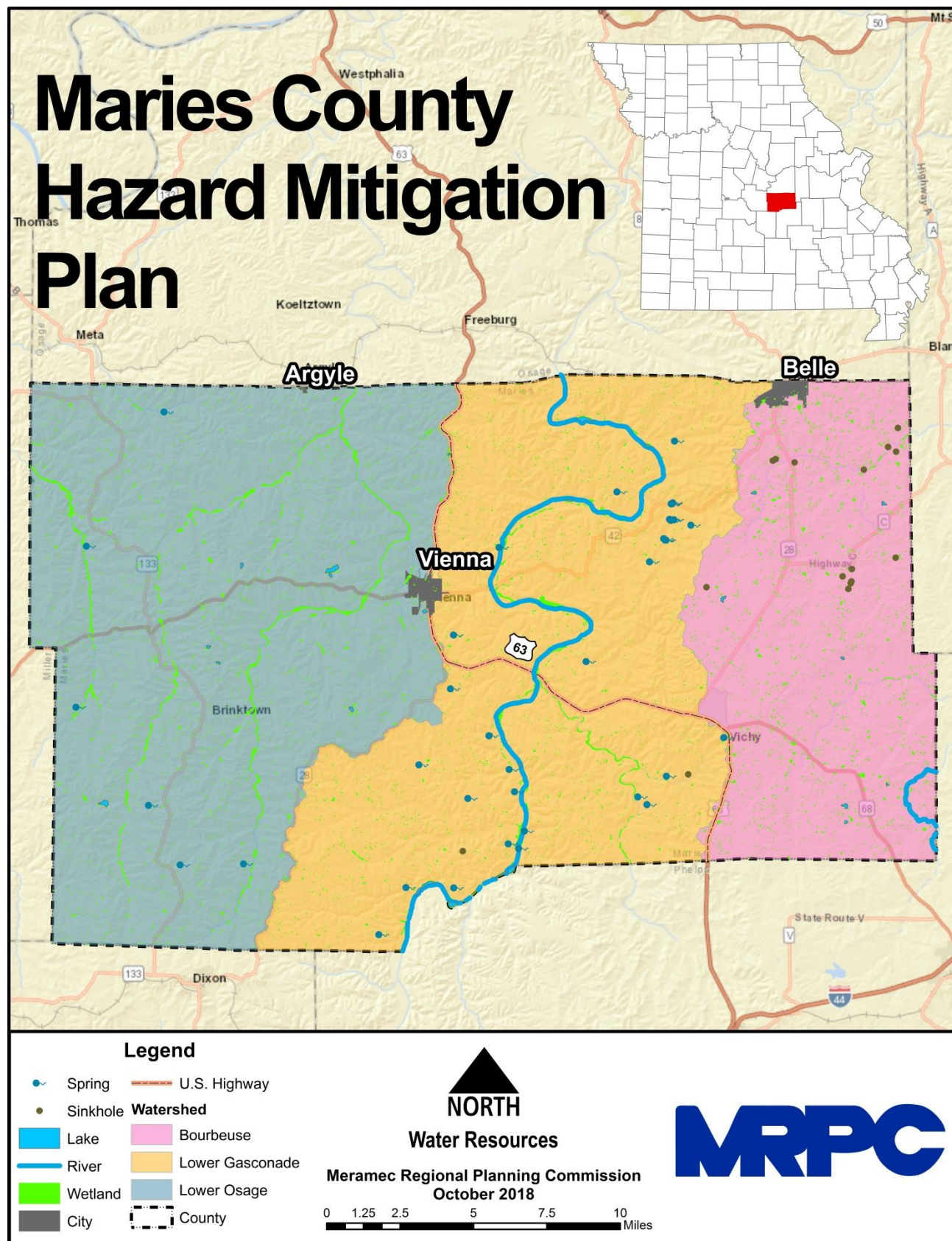
The Gasconade River watershed is located within the Ozark Plateau of the Interior Ozark Highlands. The river meanders north to northeast through Webster, Texas, Laclede, Pulaski, Dent, Maries, Osage, Phelps, and Gasconade counties to join the Missouri River. The Gasconade River is 271 miles long from 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.

During the last 100 years, stream channels in the Ozarks have become wider and shallower and deep-water fish habitat has been lost. Historical data indicate that channel disturbances have resulted most directly from clearing of vegetation along stream channels, which decreases bank

strength. Historical and stratigraphic data show that after 1830, Ozarks streams responded to land-use changes by depositing more gravel and less muddy sediment, compared to pre-settlement conditions. Because less muddy sediment is being deposited on flood plains, many stream banks now lack cohesive sediments, and, therefore, no longer support steep banks. Land use statistics indicate that the present trend in the rural Ozarks is toward increased populations of cattle and increased grazing density; this trend has the potential to continue the historical stream-channel disturbance by increasing storm-water runoff and sediment supply.

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

Figure 2.3. Maries County Watershed/Water Resources



2.1.3 Climate

Snow occurs between November and April, both inclusive, but most of the snow falls in December, January and February. An average of about 14 inches of snow occurs annually in the Meramec Region. It is unusual for snow to stay on the ground for more than a week or two before it melts. Winter precipitation usually is in the form of rain, snow or both. Conditions sometimes borderline between rain and snow, and in these situations freezing drizzle or freezing rain occurs. Spring, summer and early fall precipitation comes largely in the form of showers or thunderstorms. Thunderstorms are most frequent from April to July. The average annual precipitation is 45.82 inches, which occurs on the average of less than 100 days per year. About half of these will be days with thunderstorms.

Because of its inland location, Missouri and Maries County are subject to frequent changes in temperature. The average annual temperature is 53°F. The average annual high temperature is 67°F with the average annual low at 39°F. The average high and low in January is 41°F and 16°F, respectively. In July the average high and low are 89°F and 62°F, respectively. A heat index of 115 degrees has been observed in the county.

While winters are cold and summers are hot, prolonged periods of very hot weather are unusual. Occasional periods of mild, above freezing temperatures are noted almost every winter. Conversely, during the peak of the summer season occasional periods of dry, cool weather break up stretches of hot, humid weather. About half of the days in July and August will have temperatures of 90°F or above, but it is not unusual for the temperature to drop into the 50s by the evening. In winter, there is an average of about 100 days with temperatures below 32°F. Temperatures below 0°F are infrequent with only about three days per year reaching this low temperature. The first frost occurs in mid-October, and the last frost occurs about mid-April.

2.1.4 Population/Demographics

Table 2.4 provides population/demographic data for Maries County between 2000 and 2017 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 2000-2017 by Jurisdiction

Jurisdiction	2000 Population	2017 Population	2000-2017 # Change	2000-2017 % Change
Unincorporated Maries County	6,931	6,575	-356	-5.1
Belle	1,344	1,723	379	28.2
Vienna	628	661	33	5.3

Source: U.S. Census Bureau, Census 2000 Summary File 1; U.S. Bureau of the Census, 2013-2017 5-Year American Community Survey;

Table 2.5 provides information in regards 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 **Table 2.6** including figures for Maries County, Missouri, and the U.S. In 2017 there were an estimated 4,629 households within the county².

Table 2.5. Percent of Individuals Under the Age of 5, and Over 65 for County, State, and Nation (2017)

Location	% Under Age of 5	% Over Age of 65
Maries County	4.6%	20.1%
Missouri	6.1%	15.7%
United States	6.2%	14.9%

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Table 2.6. 2017 Average Household Size for County, State, and Nation

Location	Average Household Size
Maries County	2.42
Missouri	2.47
United States	2.63

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Social Vulnerability Index (SoVI ®)

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

Table 2.7. Social Vulnerability Index (SoVI ®)

State	County	SoVI Score (10 - 14)	National Percentile (10 - 14)
Missouri	Maries County	(-)0.300000012	44.8%

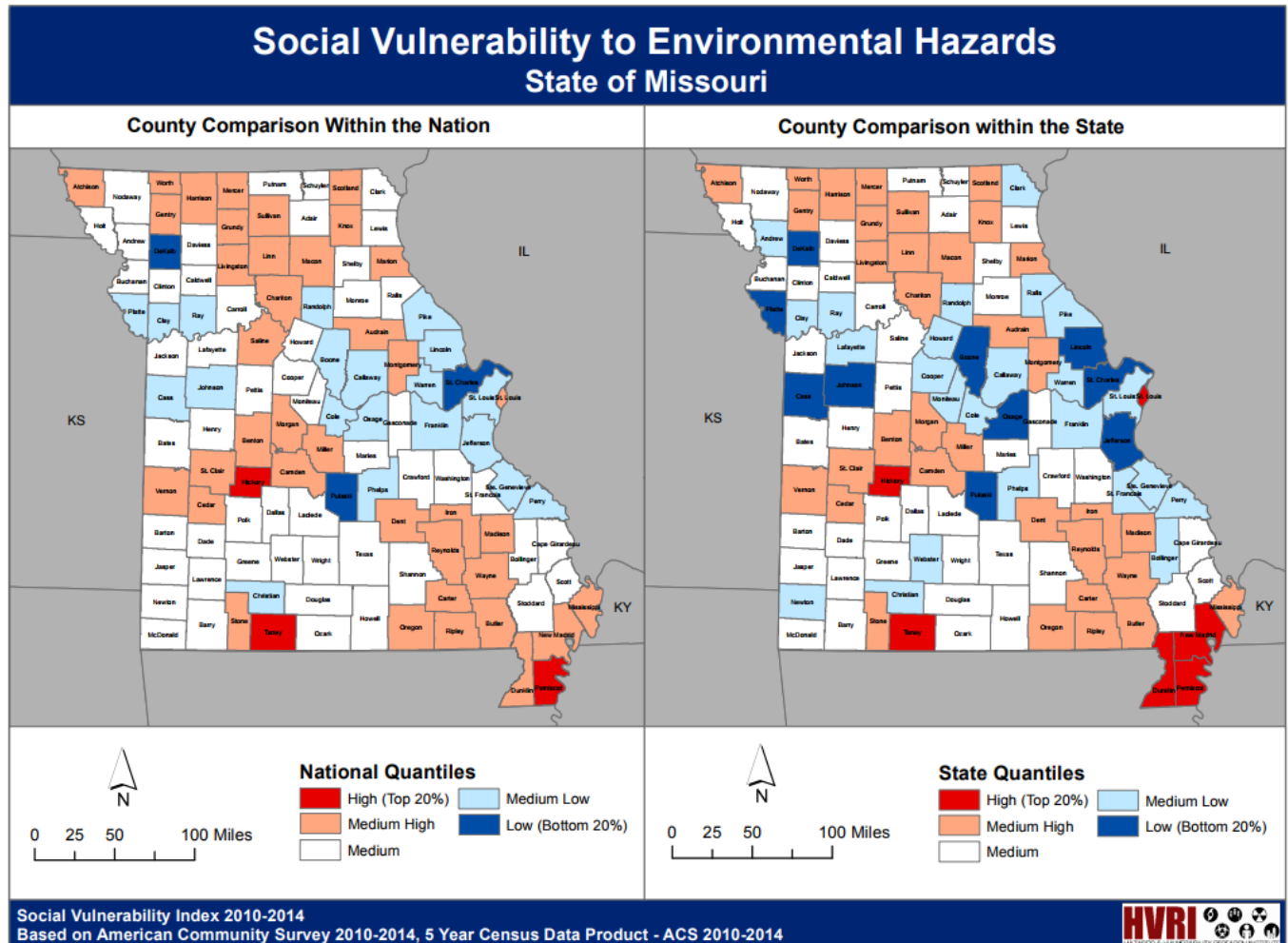
Source: <http://artsandsciences.sc.edu/geog/hvri/sovi-data>

The analysis of 30 socioeconomic variables includes the standardization of data, and reduction of variables into a condensed set of statistically optimized components; positive component loadings (+) are linked with amplified vulnerability, and negative component loadings (-) are linked with diminished vulnerability. Scores are represented as a numeric value, but have no inherent mathematical properties. To simplify the metrics of the SoVI ® Score, a negative number illustrates a county's resiliency to hazard events, and a positive number illustrates a decrease in resiliency³. Maries County's SoVI ® Score illustrates a diminished vulnerability to cope with natural disasters. Additionally, Maries County is ranked 44.8 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.

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

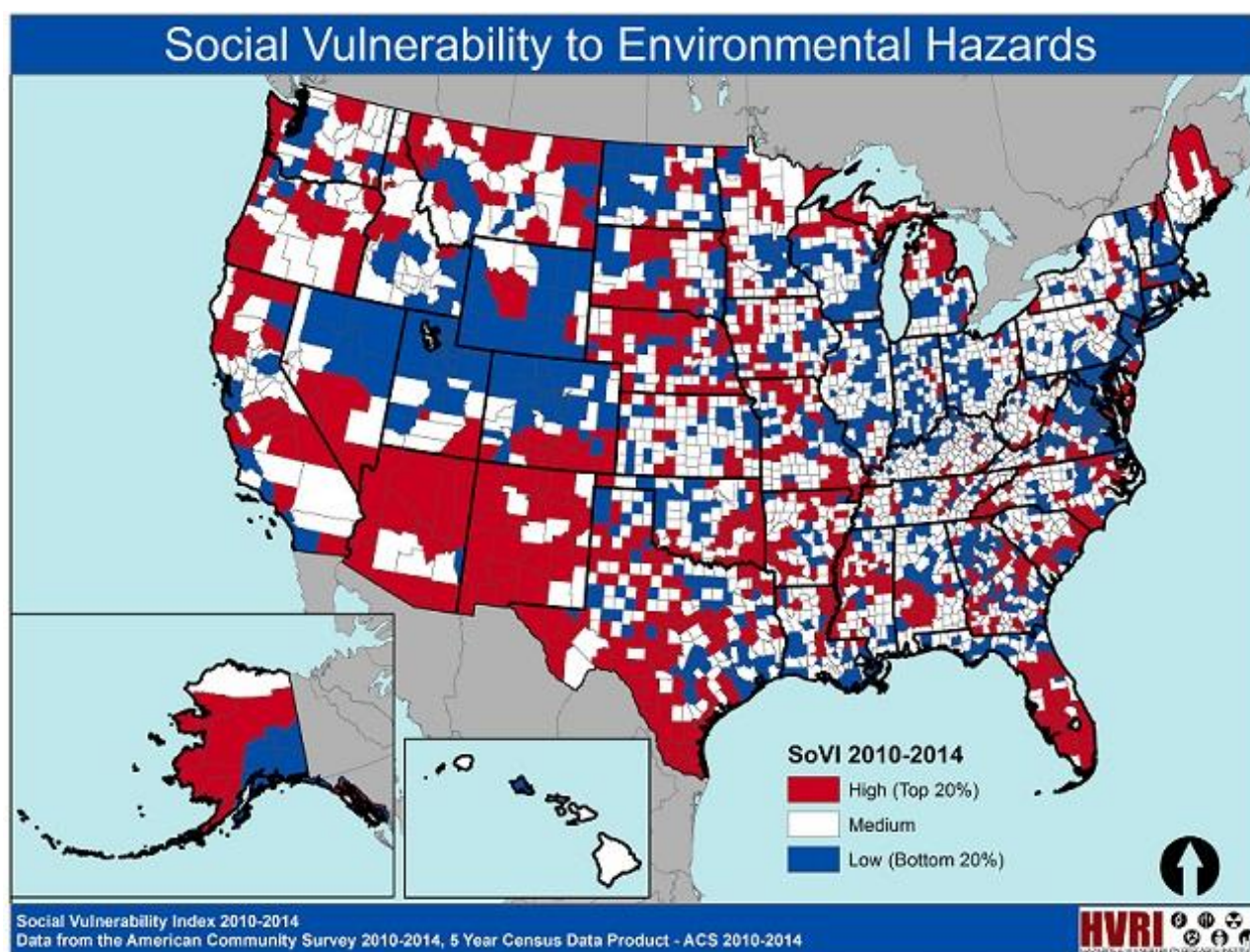
³ <http://webra.cas.sc.edu/hvri/products/sovifaq.aspx>

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



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

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



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

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

Table 2.8. 2017 Unemployment, Poverty, Education, and Language Percentage Demographics, Dent 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)
Maries County	55.6	7.7	18.9	41.6	15.1	3.7
Belle	51.7	5.6	21.8	36.8	10.2	4.2
Vienna	47.7	2.9	8.9	42.5	17.9	0.5

Source: U.S. Census Bureau, 2013-2017 American Community Survey, 5-Year American Community Survey

2.1.5 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 Current Maries County Courthouse 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 school house, 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.

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

Table 2.9. Occupation Statistics, Maries County, Missouri

Place	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Natural Resources, Construction, and Maintenance Occupations	Production, Transportation, and Material Moving Occupations
Maries County	911	633	727	502	932
Belle	103	151	174	73	175
Vienna	35	47	79	29	46

Source: U.S. Census, 2013-2017 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. In 2016, agriculture, forestry, and related industries contributed \$365 million in sales within the county. According to the 2007 Census of Agriculture, the number of farms in the county was 898 encompassing 240,376 total acres. In addition, the average farm was 268 acres. According to the 2012 Census of Agriculture, Maries County had fallen to 836 farms encompassing 241,357 acres, with an average farm size of 289 acres. Furthermore, there are only approximately 40 farms with 1,000 or more acres in the county. In 2012, the market value of products sold within the county for crop sales was 13 percent, with livestock sales at 87 percent. The average agricultural products sold per farm were \$42,176⁴.

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

2.1.7 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 damages⁵. Maries County has not previously received HMA grants⁶.

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

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

⁶ <https://www.fema.gov/openfema-dataset-hazard-mitigation-grants-v1>

2.2 Jurisdictional Profiles and Mitigation Capabilities

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

2.2.1 Unincorporated 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. Other elected county officials include the County Clerk, Prosecuting Attorney, Sheriff, Circuit Court Clerk, Recorder of Deeds, Collector of Revenue, Assessor, Treasurer, County Surveyor, Coroner, and Public Administrator.

Maries County operates as a third-class county. The county government has the authority to administer county structures, infrastructures, and finances as well as floodplain regulations. Third class counties do not have building regulations. Other county officials include the 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

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 in the county.

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. Belle and Dixon fire department are both tax supported. Vichy and Vienna are dues supported. 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 three ambulance districts – Maries Osage Ambulance District, St. James Ambulance District and Dixon Ambulance District. The county uses a text messaging program 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 a County Emergency Operations Plan, a Hazard Mitigation Plan, Regional Transportation Plan (MRPC), and a Regional Comprehensive Economic Development Strategy (MRPC). Maries County participates in the National Flood Insurance Program. The Meramec Regional Planning Commission serves as the floodplain coordinator for the county.

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, 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.

Table 2.10. Demographic and Structure Risk Parameters For Unincorporated Maries County

Jurisdiction	With a disability	Non-English Speaking Populations	People Below Poverty Level	% Population Under 5 Yrs.	% Population 65 Yrs. and Over	# of Residences Built Prior to 1939	% of Mobile Homes
Unincorporated Maries County	1,823	315	1,673	4.6	20.1	587	16.5

Source: Source: U.S. Census Bureau, 2013-2017 5-Years American Community Survey

Table 2.11. Unincorporated Maries County Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	n/a
Capital Improvement Plan	No
City Emergency Operations Plan	n/a
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	n/a
County Mitigation Plan	Yes
Debris Management Plan	No
Economic Development Plan	CEDS
Transportation Plan	Yes – Regional
Land-use Plan	No

Capabilities	Status Including Date of Document or Policy
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	03/29/1999
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
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
FireWise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	n/a
ISO Fire Rating	n/a
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	Yes - on county roads as necessary.
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	n/a
Hazard Analysis/Risk Assessment (County)	Yes – part of the Hazard Mitigation Plan
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
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

Capabilities	Status Including Date of Document or Policy
Emergency Response Team	Yes – Regional team in Rolla
Hazardous Materials Expert	Yes – Regional team in Rolla
Local Emergency Planning Committee	Yes – Regional - MREPC
County Emergency Management Commission	No
Sanitation Department	n/a
Transportation Department	Yes – Road and Bridge
Economic Development Department	No
Housing Department	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Unsure
Environmental Organization	No
Homeowner Associations	Yes
Neighborhood Associations	No
Chamber of Commerce	Yes – in Belle and Vienna
Community Organizations (Lions, Kiwanis, etc.)	Yes
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2018

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. The community was incorporated in 1904. State highways 28 and 89 intersect the City of Belle. According to the 2016 U.S. Census, the community has a population of 1,723. Salem 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, Chief of Police, 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 two outdoor warning sirens. The sirens are controlled by the Osage County Emergency Operations Center and Belle Volunteer Fire Department. Law enforcement for the city is provided by the city police chief. The city Ambulance service is provided by the Ozark Central Ambulance District. There is also a Volunteer Fire Department within the community. The city is served by the Maries County 90101 dispatch center in Vienna and the Osage County 9-1-1 Center located in Linn.

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 a Regional Transportation Plan (MRPC), and Regional Comprehensive Economic Development Strategy (MRPC).

Table 2.12. Demographic and Structure Risk Parameters For Belle

Jurisdiction	With a disability	Non-English Speaking Populations	People Below Poverty Level	% Population Under 5 Yrs.	% Population 65 Yrs. and Over	# of Residences Built Prior to 1939	% of Mobile Homes
Belle	582	68	373	5.8	15.3	95	8.7

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

Table 2.13. City of Belle Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	Part of county plan
County Mitigation Plan	Yes - 2014
Debris Management Plan	No
Economic Development Plan	Yes – regional CEDS 2018
Transportation Plan	Yes – regional 2018
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
FireWise or other fire mitigation plan	No

Capabilities	Status Including Date of Document or Policy
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
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
Program	
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
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	6 – inside the city and 10 outside city limits
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
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	Yes – in County Hazard Mitigation Plan
Hazard Analysis/Risk Assessment (County)	Yes – in County Hazard Mitigation Plan
Evacuation Route Map	No
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	No
Land Use Map	Yes
Staff/Department	
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	N/A
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – regional MREPC

Capabilities	Status Including Date of Document or Policy
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Yes, Phelps Co. PHA
Regional Planning Agencies	MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes
Local Funding Availability	
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 with voter approval
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, 2018

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 2017 U.S. Census, the community has a population of 661. 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 Ozark Central Ambulance District in Vienna. There is also a Volunteer Fire Department within the community. The Maries County Sherriff'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 has a Regional Transportation Plan (MRPC), Regional, and Comprehensive Economic Development Strategy (MRPC).

Table 2.14. Demographic and Structure Risk Parameters For Vienna

Jurisdiction	With a disability	Non-English Speaking Populations	People Below Poverty Level	% Population Under 5 Yrs.	% Population 65 Yrs. and Over	# of Residences Built Prior to 1939	% of Mobile Homes
Vienna	155	3	52	6.8	25.6	48	9.2

Source: Source: U.S. Census Bureau, 2013-2017 5-Years American Community Survey

Table 2.15. City of Vienna Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	No
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	No
County Mitigation Plan	Yes - 2014
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS - 2018
Transportation Plan	Yes - Regional
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	No
Floodplain Ordinance	Yes
Subdivision Ordinance	NO
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Storm Water Ordinance	No

Capabilities	Status Including Date of Document or Policy
Drainage Ordinance	Yes
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	Yes – Provided through local fire department and law enforcement
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	5
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes, Police and Fire
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	Yes
Hazard Analysis/Risk Assessment (County)	Yes
Evacuation Route Map	No
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	Yes
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 – covered by Rolla HSRT in Phelps County
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – member of regional MREPC
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Yes, Phelps Co. PHA
Regional Planning Agencies	MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	

Capabilities	Status Including Date of Document or Policy
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
Local Funding Availability	
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 with voter approval
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, 2018

Table 2.16 summarizes the mitigation capabilities of Maries County and its jurisdictions.

Table 2.16. Mitigation Capabilities Summary Table

CAPABILITIES	Unincorporated Maries County	Belle	Vienna
Planning Capabilities			
Comprehensive Plan	No	No	No
Builder's Plan	No	No	No
Capital Improvement Plan	No	No	No
City Emergency Operations Plan	n/a	Yes	No
County Emergency Operations Plan	Yes	Yes	Yes
Local Recovery Plan	No	No	No
County Recovery Plan	No	No	No
City Mitigation Plan	n/a	No	No
County Mitigation Plan	Yes	Yes	Yes
Debris Management Plan	No	No	No
Economic Development Plan	Yes - CEDS	Yes – CEDS	Yes - CEDS
Transportation Plan	Yes – Regional	Yes – Regional	Yes - Regional
Land-use Plan	No	No	No
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)	No	No	No
Policies/Ordinances			
Zoning Ordinance	No	Yes	Yes
Building Code	No	Yes, IBC 2006	No
Floodplain Ordinance	Yes	No	Yes
Subdivision Ordinance	n/a	Yes	No

CAPABILITIES	Unincorporated Maries County	Belle	Vienna
Tree Trimming Ordinance	No	Yes	No
Nuisance Ordinance	No	Yes	Yes
Storm Water Ordinance	No	Yes	No
Drainage Ordinance	No	Yes	Yes
Site Plan Review Requirements	No	No	Yes
Historic Preservation Ordinance	No	No	No
Landscape Ordinance	No	Yes	No
Program			
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	n/a	No
National Weather Service (NWS) Storm Ready	No	No	No
Firewise Community Certification	No	No	No
Building Code Effectiveness Grading (BCEGs)	No	No	No
ISO Fire Rating	n/a	6 in city – 10 outside city limits	5
Economic Development Program	No	No	No
Land Use Program	No	No	No
Public Education/Awareness	Yes	No	No
Property Acquisition	No	No	No
Planning/Zoning Boards	No	Yes	No

CAPABILITIES	Unincorporated Maries County	Belle	Vienna
Stream Maintenance Program	No	No	No
Tree Trimming Program	Yes	Yes	Yes
Engineering Studies for Streams (Local/County/Regional)	No	No	No
Mutual Aid Agreements	Yes	Yes, Police and Utilities	Yes, Police and Fire
Studies/Reports/Maps			
Hazard Analysis/Risk Assessment (City)	n/a	Yes	Yes
Hazard Analysis/Risk Assessment (County)	Yes	n/a	n/a
Evacuation Route Map	No	No	No
Critical Facilities Inventory	No	Yes	Yes
Vulnerable Population Inventory	No	No	No
Land Use Map	No	Yes	No
Staff/Department			
Building Code Official	n/a	Yes	Yes
Building Inspector	n/a	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	n/a	Yes
Bomb and/or Arson Squad	No	No	No
Emergency Response Team	Yes – Regional team (Rolla)	Yes – Regional team (Rolla)	Yes – Regional team (Rolla)
Hazardous Materials Expert	No	No	No

CAPABILITIES	Unincorporated Maries County	Belle	Vienna
Local Emergency Planning Committee	Yes – Regional - MREPC	Yes – Regional – MREPC	Yes – Regional - MREPC
County Emergency Management Commission	No	No	No
Sanitation Department	No	No	No
Transportation Department	Yes – Road and Bridge	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	No	No	No
Non-Governmental Organizations (NGOs)			
American Red Cross	Yes	No	Yes
Salvation Army	Yes	No	No
Veterans Groups	Unsure	No	Yes
Environmental Organization	No	No	No
Homeowner Associations	Yes	No	No
Neighborhood Associations	No	No	No
Chamber of Commerce	Yes – Vienna and Belle	Yes	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes	Yes
Financial Resources			
Ability to apply for Community Development Block Grants	Yes	Yes	Yes
Ability to fund projects through Capital Improvements funding	Yes	Yes	Yes
Authority to levy taxes for a specific purpose	Yes	Yes with voter approval	Yes with voter approval

CAPABILITIES	Unincorporated Maries County	Belle	Vienna
Fees for water, sewer, gas, or electric services	No	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	No	No	No
Ability to withhold spending in hazard prone areas	No	No	No

Source: Data Collection Questionnaires, 2018

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

Maries County R-I and R-II school districts both have NOAA all hazard radios on site to provide early warning of hazard events. In addition, each school district has fire alarms and intercom systems capable of providing specific instructions in the event of an emergency. Maries R-I utilizes Eagle Updates (TextCaster) for mass notifications via text, email and phone. Maries R-II utilizes Signal Kit for mass notifications via text, email and phone.

Existing Plans and Policies

Both school districts have an emergency management plan and weapons policy.

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

Neither school district anticipates a new building or major renovation project in the near future.

Table 2.17. School District Buildings and Enrollment Data, 2018

District Name	Building Name	Enrolment
Maries County R-I	Vienna Elem.	255
	Vienna Middle School	
	Vienna High	226
Maries County R-II	Belle Elem.	232
	Maries Co. Middle	242
	Belle High	223

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

Figure 2.6. Maries County School Districts

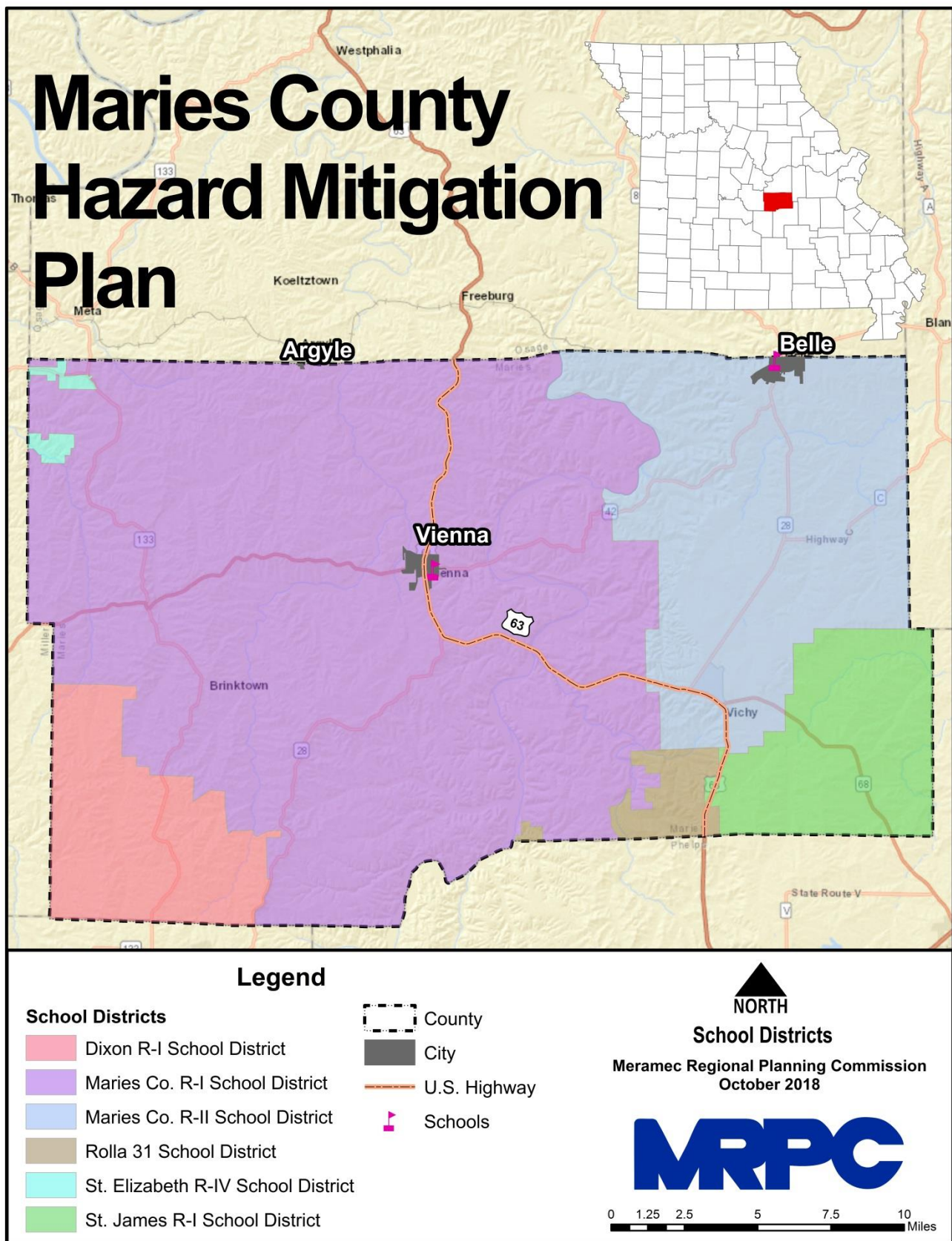


Table 2.18. Summary of Mitigation Capabilities for School Districts

Capability	Maries County R-I	Maries County R-II
Planning Elements		
Master Plan/Date	No	No
Capital Improvement	No	No
School Emergency Plan/Date	Yes - 2018	Yes - 2012
Weapons Policy/Date	Yes - 2018	Yes - 2004
Personnel Resources		
Full-Time Building Official (Principal)	Yes	Yes
Emergency Manager	No	Yes
Grant Writer	No	No
Public Information Officer	No	Yes
Financial Resources		
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
Other		
Public Education Programs	N/A	N/A
Privately or Self-Insured?	Private	-
Fire Evacuation Training	Quarterly	Monthly
Tornado Sheltering Exercises	Quarterly	Twice a year
Public Address/Emergency Alert System	PA system, hand-held radios, TextCaster for mass communication via email, text, phone	PA system and Signal Kit for mass communication via email, text and phone
NOAA Weather Radios	Yes	Yes
Lock-Down Security Training	Quarterly	Once per year
Mitigation Programs	No	No
Tornado Shelter/Safe-room	No – not FEMA certified	No – not FEMA certified
Campus Police	No – use Vienna PD	No – use Belle PD

Source: Data Collection Questionnaires, 2018

2.2.5 Critical Facilities

The table below (**Table 2.19**) provides information for critical facilities in the planning area. Specific information includes a Hazus ID if applicable, jurisdiction, building name/owner, and address. Facilities addressed include emergency, fire department, law enforcement, medical, and schools. Furthermore, (**Table 2.20**) provides information in regards to colleges/universities located in the planning area.

Table 2.19. Maries County Critical Facilities by Type and Jurisdiction

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Emergency Facilities						
	Maries County	Maries Osage Ambulance District	164 Ballpark Rd.	Vienna	MO	65582
	Maries County	EOC	211 4 th St.	Vienna	MO	65582
Fire Department Facilities						
MO000082	Belle	Belle Volunteer Fire Department	106 W Third St.	Belle	MO	65013
MO000437	Vienna	Vienna Fire Protection Dist.	308 N Mill St.	Vienna	MO	65582
MO000439	Vichy	Vichy Volunteer Fire Prot. Dist.	14812 Hwy 63 South	Vichy	MO	65580
Law Enforcement Facilities						
MO000077	Belle	Belle Police Dept.	106 E 3 rd St.	Belle	MO	65013
MO000298	Maries County	Maries County Sheriff	211 4 th St.	Vienna	MO	65582
	Vienna	Vienna Police Department	424 8 th St.	Vienna	MO	65582
Medical Facilities						
	Maries County	Phelps-Maries County Health Dept.	200 N Main St.	Rolla	MO	65401
School Districts						
	Vienna	Vienna Elem.	300 4 th St.	Vienna	MO	65582
	Vienna	Vienna High	300 4 th St.	Vienna	MO	65582
	Vienna	Visitation Inter-Parish School	105 N Coffey St.	Vienna	MO	65582
	Belle	Belle Elem.	402 W Third	Belle	MO	65013
	Belle/Bland	Maries Co. Middle	300 S Main	Bland	MO	65401
	Belle	Bell High	504 W Third	Belle	MO	65013

Source: Meramec Region Community Data Mining for Hazard Mitigation Planning (2014)

Although there are no post-secondary schools in Maries County, there are numerous colleges located within the region. These campuses and their locations are shown in **Table 2.200**.

Table 2.20. Maries County Colleges/Universities

College/University	Location	Description
State Technical College of Missouri	One Technology Drive, Linn, MO 65051	Associates Degree and Certificates
East Central College	1964 Prairie Dell Road, Union, MO 63084	Associate Degree
Missouri University of Science and Technology	Parker Hall Rolla, MO 65401	Main campus in Rolla, MO Bachelor, Masters, and Doctoral degrees
Drury University	Forum Plaza Rolla, MO 65401	Main campus in Springfield, MO Bachelor degrees
Webster University	1103 Kingshighway Rolla, MO 65401	Main campus in St. Louis, MO Bachelor and Masters degrees
Metro Business College	Hwy 72 Rolla, MO 65401	Main campus in Jefferson City, Mo Associate degrees
Columbia College	Hwy 63 N. Rolla, MO 65401	Main campus in Columbia, MO Bachelor degrees

3 RISK ASSESSMENT

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

3.1 Hazard Identification

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

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

3.1.1 Review of Existing Mitigation Plans

Within the State of Missouri, local hazard mitigation plans customarily include only natural hazards, as only natural hazards are required by federal regulations. Nevertheless, there is an opportunity to include man made or technical hazards within the plan. However, it was decided that only natural hazards were appropriate for the purpose of this plan. Based on past history and future probability, the Hazard Mitigation Planning Committee (HMPC) determined that the following potential hazards would be included in the Maries County Hazard Mitigation Plan:

- Dam Failure
- Drought
- Earthquake
- Extreme Temperatures
- Fires (Urban/Structural and Wild)
- Flooding
- Land Subsidence/Sinkholes
- Thunderstorm/High Winds/Lightning/Hail
- Tornado
- Severe Winter Weather

Hazards not occurring in the planning area, or considered insignificant were eliminated from this plan. **Table 3.1** outlines the hazards eliminated from the plan and the reasons for doing so. Additionally, some hazards were combined in the Maries County Plan to match the hazards listed in the Missouri State Hazard Mitigation Plan.

Table 3.1. Table 3.1 Hazards Not Profiled in the Plan

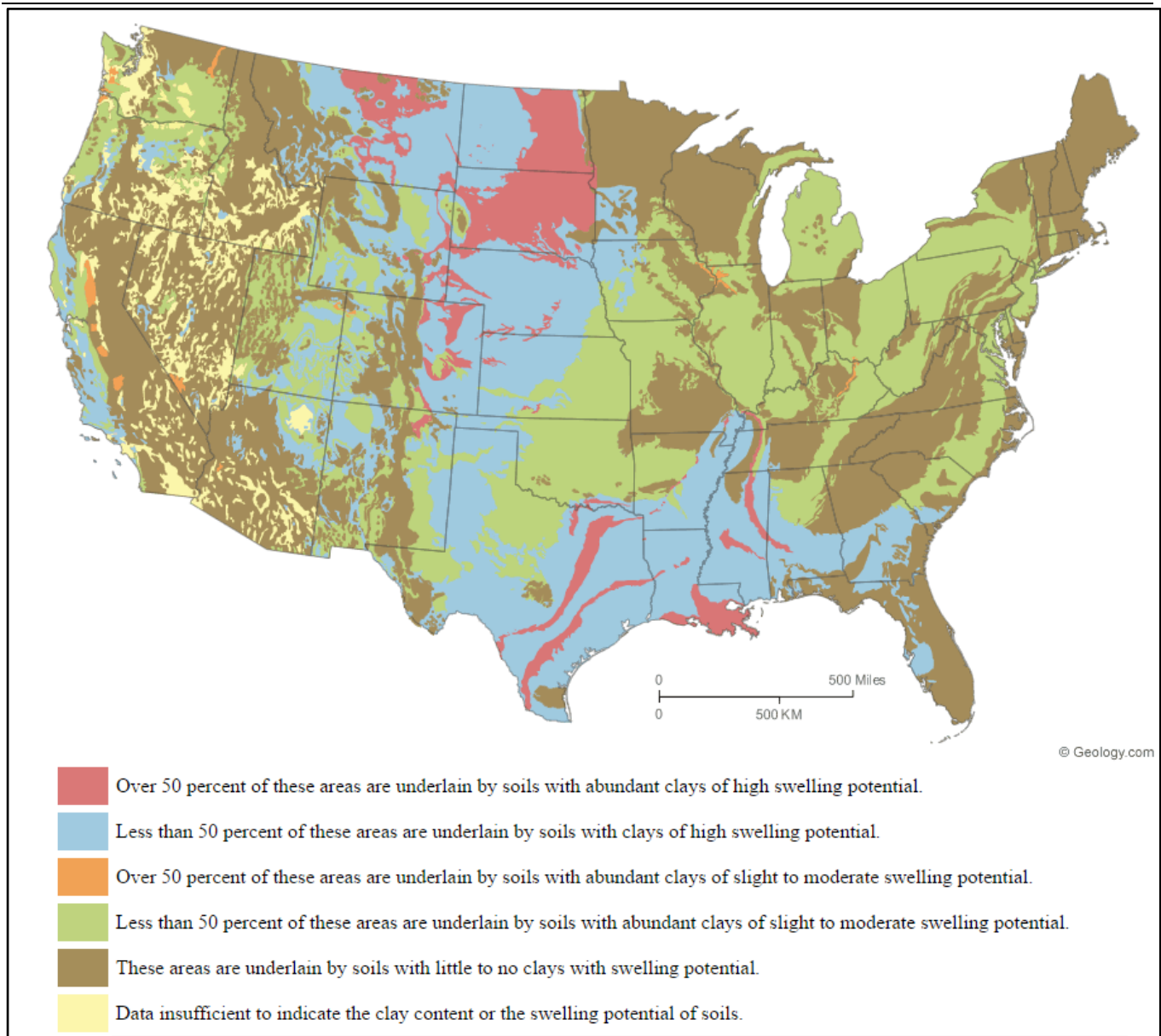
Hazard	Reason for Omission
Avalanche	No mountains in the planning area.
Coastal Erosion	Planning area is located in the Midwest, not on any coast.
Coastal Storm	Planning area is located in the Midwest, not on any coast.

Hazard	Reason for Omission
Debris Flow	There are no mountainous areas in the planning area where this type of event occurs.
Expansive Soils	No expansive soils exist within the planning area. According to the USGS National Geologic Map Database ¹ , the planning area is underlain by soils with little to no clays with swelling potential (Figure 3.1).
Hurricane	Planning area is located in the Midwest, not on any coast.
Levee Failure	According to the US Army Corps of Engineers' National Levee Database ² , 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.
Volcano	There are no volcanic areas in the county.

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

² <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

3.1.2 Review Disaster Declaration History

In order to assess risk, it was logical to review the disaster declaration history for the State of Missouri and specifically for 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 69 federally declared disasters since 1953. Of those, 39 have occurred between 2000 and 2017. All of these disasters have been weather related – severe wind and rain storms, tornadoes, flooding, hail, ice storms and winter storms. **Table 3.2** lists the federal disaster declarations for Maries County from 1990 through 2017.

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

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-1006	Missouri Flooding, Severe Storm	Incident Period: June 10, 1993 – October 25, 1993 Declaration Date: July 09, 1993	-
DR-1054	Missouri Severe Storm, Tornadoes, Hail, Flooding	Incident Period: May 13, 1995 – June 23, 1995 Declaration Date: June 02, 1995	-
DR-1412	Missouri Severe Storms & Tornadoes	Incident Period: April 24, 2002 – June 10, 2002 Declaration Date: May 06, 2002	PA

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-1463	Missouri Severe Storms, Tornadoes & Flooding	Incident Period: May 04, 2003 – May 30, 2003 Declaration Date: May 06, 2003	IA, PA
EM-3232	Missouri Hurricane Katrina Evacuation	Incident Period: August 29, 2005 – October 01, 2005 Declaration Date: September 10, 2005	PA
EM-3281	Missouri Severe Winter Storms	Incident Period: December 08, 2007 – December 15, 2007 Declaration Date: December 12, 2007	-
DR-1676	Missouri Severe Winter Storms & Flooding	Incident Period: January 12, 2007 – January 22, 2007 Declaration Date: January 15, 2007	PA
DR-1809	Missouri Severe Storms, Flooding, and a Tornado	Incident Period: September 11, 2008 – September 24, 2008 Declaration Date: November 13, 2008	PA
DR-1749	Missouri Severe Storms & Flooding	Incident Period: March 17, 2008 – May 09, 2008 Declaration Date: March 19, 2008	IA, PA
DR-1742	Missouri Severe Storms, Tornadoes, & Flooding	Incident Period: January 07, 2008 – January 10, 2008 Declaration Date: February 05, 2008	PA
DR-1847	Missouri Severe Storms, Tornadoes, & Flooding	Incident Period: May 08, 2009 – May 16, 2009 Declaration Date: June 19, 2009	IA, PA
EM-3303	Missouri Severe Winter Storm	Incident Period: January 26, 2009 – January 28, 2009 Declaration Date: January 30, 2009	-
EM-3317	Missouri Severe Winter Storm	Incident Period: January 31, 2011 – February 05, 2011 Declaration Date: February 03, 2011	-
DR-1961	Missouri Severe Winter Storm & Snowstorm	Incident Period: January 31, 2011 – February 05, 2011 Declaration Date: March 23, 2011	PA

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-4144	Missouri Severe Storms, Straight-line Winds, & Flooding	Incident Period: August 02, 2013 – August 14, 2013 Declaration Date: September 06, 2013	PA
DR-4130	Missouri Severe Storms, Straight-line Winds, Tornadoes, & Flooding	Incident Period: May 29, 2013 – June 10, 2013 Declaration Date: July 18, 2013	PA
DR-4238	Missouri Severe Storms, Tornadoes, Straight-line Winds, & Flooding	Incident Period: May 15, 2015 – July 27, 2015 Declaration Date: August 07, 2015	PA
EM-3374	Missouri Severe Storms, Tornadoes, Straight-line Winds, & Flooding	Incident Period: December 22, 2015 – January 09, 2016 Declaration Date: January 02, 2016	-
DR-4250	Missouri Severe Storms, Tornadoes, Straight-line Winds, & Flooding	Incident Period: December 23, 2015 – January 09, 2016 Declaration Date: January 21, 2016	IA
DR-4317	Missouri Severe Storms, Tornadoes, Straight-line Winds, & Flooding	Incident Period: April 28, 2017 – May 11, 2017 Declaration Date: June 02, 2017	IA, PA

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

3.1.3 Research Additional Sources

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

- Missouri Hazard Mitigation Plans (2013, 2018)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources (MDNR)
- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- National Agricultural Statistics Service (Agriculture production/losses)
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Environmental Protection Agency
- Flood Insurance Administration

-
- Hazards US (HAZUS)
 - Missouri Department of Transportation
 - Missouri Division of Fire Marshal Safety
 - Missouri Public Service Commission
 - National Fire Incident Reporting System (NFIRS)
 - National Oceanic and Atmospheric Administration's (NOAA) National 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 March 2014, as entered by the NWS. Due to changes in the data collection and processing procedures over time, there are unique periods of record available depending on the event type. The following timelines show the different time spans for each period of unique data collection and processing procedures.

1. Tornado: From 1950 through 1954, only tornado events were recorded.
2. Tornado, Thunderstorm Wind and Hail: From 1955 through 1992, only tornado,

thunderstorm wind and hail events were keyed from the paper publications into digital data. From 1993 to 1995, only tornado, thunderstorm wind and hail events have been extracted from the Unformatted Text Files.

3. All Event Types (48 from Directive 10-1605): From 1996 to present, 48 event types are recorded as defined in NWS Directive 10-1605.

Injuries and deaths caused by a storm event are reported on an area-wide basis. When reviewing a table resulting from an 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. However, not all hazards impact every jurisdiction such as dam failure. "X" indicates the jurisdiction is impacted by the hazard, and a "-" indicates the hazard is not applicable to that jurisdiction. As 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 to damages from a tornado. Although neither of the school districts nor the city of Belle have facilities that would be directly impacted by a dam failure, a dam failure could impact bus routes and school transportation and cause transportation issues for the city. **Table 3.4** depicts a summary of natural hazard profiles and severity ratings by participating jurisdictions.

Table 3.3. Hazards Identified for Each Jurisdiction

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

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

		Maries County	Belle	Vienna	Maries Co. R-I	Maries Co. R-II
Dam Failure	P	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA
Drought	P	13.09%	13.09%	13.09%	13.09%	13.09%
	V	L-M	L-M	L-M	L-M	L-M
Earthquake	P	1%	1%	1%	1%	1%
	V	L	L	L	L	L
Extreme Heat	P	100%	100%	100%	100%	100%
	V	M-H	M-H	M-H	M-H	M-H
Wildfires	P	100%	100%	100%	100%	100%
	V	M	M	M	M	M
*Flood/Flash Flood	P	100%	100%	100%	100%	100%
	V	M	M	M	M	M
Land Subsidence/Sinkholes	P	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA
Thunderstorm: *Heavy Rain/High Winds/Lightning/Hail	P	100%	100%	100%	100%	100%
	V	L	L	L	L	L
Tornado	P	20%	20%	20%	20%	20%
	V	L	L	L	L	L
Severe Winter Weather/Snow/Ice/Severe Cold	P	100%	100%	100%	100%	100%
	V	L	L	L	L	L
Vulnerability Rating Key: L = Low, L-M = Low-Medium, M = Medium, M-H = Medium-High, H = High, NDA = No Data Avail.						
*Indicates hazard utilized for probability.						

3.1.5 Multi-Jurisdictional Risk Assessment

For this multi-jurisdictional hazard mitigation plan, each hazard is profiled in which the risks are assessed on a planning area wide basis. Some hazards, such as dam failure, vary in risk across the county. If variations exist within the planning area, discussion is included in each profile. 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 in the north eastern portion of the county, and are localized in their effects. The focal area of urbanization includes 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 damages. Differences among jurisdictions for each hazard will be discussed in greater detail in the vulnerability section of each hazard.

3.2 Assets at Risk

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

3.2.1 Total Exposure of Population and Structures

Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2017 Census Bureau data. Building counts values are based on parcel data provided by the 2018 Missouri State Hazard Mitigation Plan, which can be found at the following website,

https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf.

Table 3.5. Maximum Population and Building Exposure by Jurisdiction

Jurisdiction	2017 Population	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Unincorporated Maries County	6,575	-	-	-	-
Belle	1,723	-	-	-	-
Vienna	661	-	-	-	-
Total	8,959	9,706	-	-	955,863,000

Sources: U.S. Census Bureau, 2013-2017 5-Year American Community Survey; 2018 Missouri State Hazard Mitigation Plan

Table 3.6. Building Counts by Usage Type

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Other	Total
Maries County	3,892	349	45	5,400	20	9,706

Source: 2018 MO State Hazard Mitigation Plan

Table 3.7 below, provides additional information for school districts, including the number of buildings, building values (building exposure) and contents value (contents exposure). These numbers will represent the total enrollment and building count for the public school districts regardless of the county in which they are located.

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

Public School District	Enrollment	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Maries County R-I	481	6	11,334,459.43	4,514,938.05	15,849,397.48
Maries County R-II	697	6	10,297,948	1,787,273	12,085,221

Source: <https://ogi.oa.mo.gov/DESE/schoolSearch/index.html>; 2018 Data Collection Questionnaire

3.2.2 Critical and Essential Facilities and Infrastructure

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

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

Table 3.8 includes a summary of the inventory of critical and essential facilities and infrastructure in the planning area. The list was compiled from the 2018 Data Collection Questionnaire, the Meramec Regional Hazardous Materials Emergency Response Plan and the National Bridge Inventory.

Table 3.8. 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	State & Non-State Structures (Bridge)	Hospital/Health Care	Military	Pipeline/Pump Station	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	2	-	0	1	2	3	1	-	70	0	0	2	0	1	0	0	0	0	0	3	0	86
City of Belle	0	0	2	1	0	0	1	1	1	1	0	0	0	0	0	1	1	0	1	6	0	6	1	23
City of Vienna	0	0	1	-	0	0	1	1	1	1	0	2	0	0	2	1	1	0	2	3	0	5	1	22
Totals	1	0	5	-	0	1	4	5	3	2	70	0	0	1	2	3	2	0	3	9	0	14	2	131

Source: 2018 Data Collection Questionnaires, National Bridge Inventory, 2018 MREPC Hazardous Materials Emergency Response Plan

According to the National Bridge Inventory there are a total of 70 bridges in Maries County³. **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.

³ <http://www.fhwa.dot.gov/bridge/nbi/no10/county.cfm>

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 3.9** depicts Federally Threatened, Endangered, Proposed and Candidate Species in the county.

Table 3.9. Threatened and Endangered Species in Maries County

Common Name	Scientific Name	Status
Amphibians		
Eastern Hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>	Endangered (S)
Clams		
Pink Mucket	<i>Lampsilis abrupta</i>	Endangered (F) (S)
Scaleshell Mussel	<i>Leptodea leptodon</i>	Endangered (F) (S)
Snuffbox Mussel	<i>Epioblasma triquetra</i>	Endangered (F)
Spectaclecase	<i>Cumberlandia monodonta</i>	Endangered (F) (S)
Elephantear	<i>Elliptio crassidens</i>	Endangered (S)
Ebonyshell	<i>Reginaia ebenus</i>	Endangered (S)
Fishes		
Niangua Darter	<i>Etheostoma nianguae</i>	Threatened (F) Endangered (S)
Crystal Darter	<i>Crystallaria asprella</i>	Endangered (S)
Flowering Plants		
Running Buffalo Clover	<i>Trifolium stoloniferum</i>	Endangered (S)
Mammal		
Gray bat	<i>Myotis grisescens</i>	Endangered (F) (S)
Indiana bat	<i>Myotis sodalis</i>	Endangered (F) (S)
Northern long-eared bat	<i>Myotis septentrionalis</i>	Threatened (F) Endangered (S)

Note: S = State, F = Federal

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

MDC Missouri Natural Heritage Program Search

Natural Resources: The Missouri Department of Conservation (MDC) provides a database of lands owned, leased, or managed for public use. **Table 3.10** provides the names and locations of parks and conservation areas in Maries County.

Table 3.10. Conservation Areas in Maries County

Area Name	Address	City
Bell Chute Access	From Vienna, take Highway 63 south 2.50 miles, then Highway 28 south 2 miles, then Route Y east 6 miles (the last 2 miles are on County Road 513).	Vienna
Clifty Creek CA	From Dixon, take Highway 28 northeast, then Route W east until the pavement ends and gravel leads to area.	Dixon
Freeburg Towersite	From Vienna, take Highway 63 north 6 miles, then west 0.25 mile on County Road 209.	Vienna
Paydown Access	From Vienna, take Highway 63 north 5.50 miles, then County Road 201 east (right) 8 miles to the access.	Vienna
Rinquelin Trail Lake CA	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.	Vienna
Spring Creek Gap CA	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.	Vienna

Source: <http://mdc4.mdc.mo.gov/applications/moatlas/AreaList.aspx?txtUserID=guest&txtAreaNm=s>

Table 3.11 provides information pertaining to community owned/operated parks within Maries County.

Table 3.11. Community Owned Parks in Maries County

Park Name	Address	City
Belle City Park	City Park Road	Belle
Flag Park	Belle Avenue	Belle
Maries County Memorial Park	Ball Park Road	Vienna

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 3.12** provides information in regards to properties on the National Register of Historic Places in Maries County.

Table 3.12. 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 Streets	Vienna	3/1/2002

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

Economic Resources: **Table 3.13** provides major non-government employers in the planning area. There are approximately 131 employer establishments within the county, employing on average 8 individuals each⁴.

Table 3.13. Major Non-Government Employers in Maries County

Employer Name	Product or Service	Employees
Kingsford Manufacturing Company	Charcoal briquettes	100-249
Brewer Science	High tech manufacturing	50-99
Quaker Window Products	Window Manufacturer	100-249
Maries County R-I School District	Education/School	50-99
Maries County R-II School District	Education/School	50-99

Source: <https://missourieconomy.org/Employers/default.aspx>, 2018 Data Collection Questionnaires

Agriculture plays an important role in Maries County. However, the Agribusiness Employment Location Quotient for the county is greater than 1.5; meaning that there is a relatively high share of agribusiness employment to its share of total national employment⁵. In addition, there were 87

⁴ <https://www.census.gov/quickfacts/fact/table/mariescountymissouri/HSG650216>

⁵ http://www.missourieconomy.org/pdfs/missouri_farms_and_agribusiness.pdf;

individuals working in the agriculture industry, comprising 1.5% of the total workforce in 2017⁶. Furthermore, the market value of products sold in 2012 was \$35.2 million; 87% from livestock sales and 13% from crop sales.

3.3 Future Land Use and Development

Table 3.14 provides population growth statistics for Maries County.

Table 3.14. Maries County Population Growth, 2000-2017

Jurisdiction	2000 Population	2017 Population	2000-2017 # Change	2000-2017 % Change
Unincorporated Maries County	6,931	6,575	-356	-5.1
Belle	1,344	1,723	379	28.2
Vienna	628	661	33	5.3

Source: U.S. Bureau of the Census, 2013-2017 5 Year American Community Survey; Census 2000 Summary File 1

Typically population growth or decline is generally accompanied by an increase or decrease in the number of housing units. **Table 3.15** provides the change in numbers of housing units in the planning area from 2000-2017.

Table 3.15. Change in Housing Units, 2000-2017

Jurisdiction	Housing Units 2000	Housing Units 2017	2000-2017 # Change	2000-2017 % change
Unincorporated Maries County	3,200	3,415	215	6.7
Belle	652	899	247	37.9
Vienna	297	315	18	6.0

Source: U.S. Census Bureau, 2013-2017 5 Year American Community Survey; U.S. Bureau of the Census, Census 2000 Summary File 1

Jurisdictions reported anticipated future developments within the next five years (2018-2023). Maries County and the cities of Belle and Vienna did not anticipate any major future developments within the next five years.

Maries County R-I School District reported that they did not anticipate any developments within the next five years other than a possible remodel that would include replacing windows in the school buildings. Maries County R-II did not anticipate any major future developments within the next five years.

New development can impact a jurisdiction's vulnerability to natural hazards. As the number of buildings, critical facilities, and assets increase, vulnerability increases as well. For example, real

⁶ https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_S2405&prodType=table

estate development can increase storm water runoff, which often increases localized flooding. However, some development such as infrastructure improvements can help reduce vulnerability risks. Unfortunately, quantitative data is not available to further examine each jurisdiction's new development and its correlation to natural hazard vulnerabilities.

Socioeconomic Profile

The University of Missouri Extension developed a Social and Economic Profile for Maries County. Population trend data suggests that Maries County will decrease slightly by 1 to 2 percent within the next 2 to 12 years⁷. Furthermore, business incentives are available in the County including Missouri Works, a program for qualified job creators which enables the retention of withholding tax or tax credits that can be transferrable, refundable and/or saleable; BUILD, a financial incentive for the location or expansion of large business projects; sales tax exemptions exist for qualified manufacturers; and, industrial infrastructure grants are available up to \$2 million or \$20,000 per job created⁸.

3.4 Hazard Profiles, Vulnerability, and Problem Statements

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

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

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

Severity/Magnitude/Extent: This includes information about the severity, magnitude, and extent of a hazard. For some hazards, this is accomplished with description of a value on an established scientific scale or measurement system, such as an EF2 tornado on the Enhanced Fujita Scale. Severity, magnitude, and extent can also include the speed of onset and the duration of hazard

⁷ UM Extension Social and Economic Profile <http://mcdc.missouri.edu/cgi-bin/broker? PROGRAM=websas.cntypage.sas&county=29065>

⁸ <https://ded.mo.gov/programs/business/missouri-works>

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.

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

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

Vulnerability Assessments

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

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

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

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

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

Following the hazard profile for each hazard will be the vulnerability assessment. The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to damages from natural hazards. The vulnerability assessments will be

based on the best available county-level data, which is in the Missouri Hazard Mitigation Plan (2018). With the 2018 Hazard Mitigation Plan Update, SEMA is 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. This effort removes from local mitigation planners a barrier to performing all the needed local risk assessments by providing the data developed during the 2018 State Plan Update. The Missouri Hazard Mitigation viewer can be found at this link: <http://bit.ly/MoHazardMitigationPlanViewer2018>.

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:

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

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

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

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

Problem Statements

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

3.4.1 Dam Failure

Some specific sources for this hazard are:

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

3.16 and Table 3.17, respectively.

Table 3.16. MDNR Dam Hazard Classification Definitions

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

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

Table 3.17. 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 31 recorded dams in Maries County; including six high hazard dams; three significant hazard dams; and 22 low hazard dams. The Missouri Department of Natural Resources also tracks dams in the state and has identified five Class 2 dams and 26 Class 3 dams. **Table 3.18** 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 3.19** provides the names, locations, and other pertinent information for all NID High Hazard Dams in the planning area.

Table 3.18. Maries County Dams Hazard Risk

Name of Dam	DNR Hazard Class	NID Hazard Class
SHARE LAKE DAM	3	Low
DANUBE CORPORATION LOWER DAM	2	High
DILLON LAKE DAM	3	Low
RINQUELIN TRAIL DAM	3	Significant
WHIPPOORWILL LAKE DAM	3	Low
BLAKE LAKE DAM	3	Low
MURPHEY LAKE DAM	2	High
BOWMAN LAKE DAM	2	High
HOBAN LAKE DAM	3	Low
COWAN LAKE DAM	3	Low
SLINKMAN LAKE DAM	3	Low
WILSON LAKE DAM	3	Low
KLEFFNER LAKE DAM	3	Low
VOGT DAM	3	Low
HIDDEN LAKE DAM	3	Low
WENSLER LAKE DAM	3	Low
NEPOMUCENO LAKE DAM	3	Low
VEASMANN LAKE DAM	3	Low
SHERRELL LAKE DAM	3	Low
KOCH LAKE DAM	3	Low
WILSON LAKE DAM	3	Low
MILLER LAKE DAM	3	Low
APEX LAKE DAM	3	Low
SWARTHOUT LAKE DAM	3	Low
DANUBE CORPORATION UPPER DAM	3	Low
HAYES LAKE DAM	3	Significant
KUHRTS LAKE DAM	3	Low
LAKE MAXWELL DAM	2	High
NORBERT SANDBOTHE POND	3	Low
DUDENHOEFFER DAM (Osage County)	2	High
HOLMES FAMILY LAKE DAM	3	Significant

Source: Missouri Department of Natural Resources, Dam and Reservoir Safety Program; 2018 State Hazard Mitigation Plan, National Inventory of Dams

Table 3.19. NID High Hazard Class Dams in the Maries County Planning Area

Dam Name	NIDID	Hazard Potential *	NID Height (Ft.)	NID Storage	River	Nearest City *	Distance To City (Mi.) *
DANUBE CORPORATION LOWER DAM	MO31754	High	25	67	TRIB TO KEISER BRANCH	WESTPHALIA	28
MURPHEY LAKE DAM	MO30173	High	27	144	LITTLE FLY CREEK	VIENNA	4
BOWMAN LAKE DAM	MO30180	High	23	111	TRIB TO FLY CREEK	VIENNA	0
LAKE MAXWELL DAM	MO32039	High	80	3343	INDIAN CREEK	VIENNA	1
DUDENHOEFFER DAM (Osage County)	MO32065	High	55	853	-	FREEBURG	0

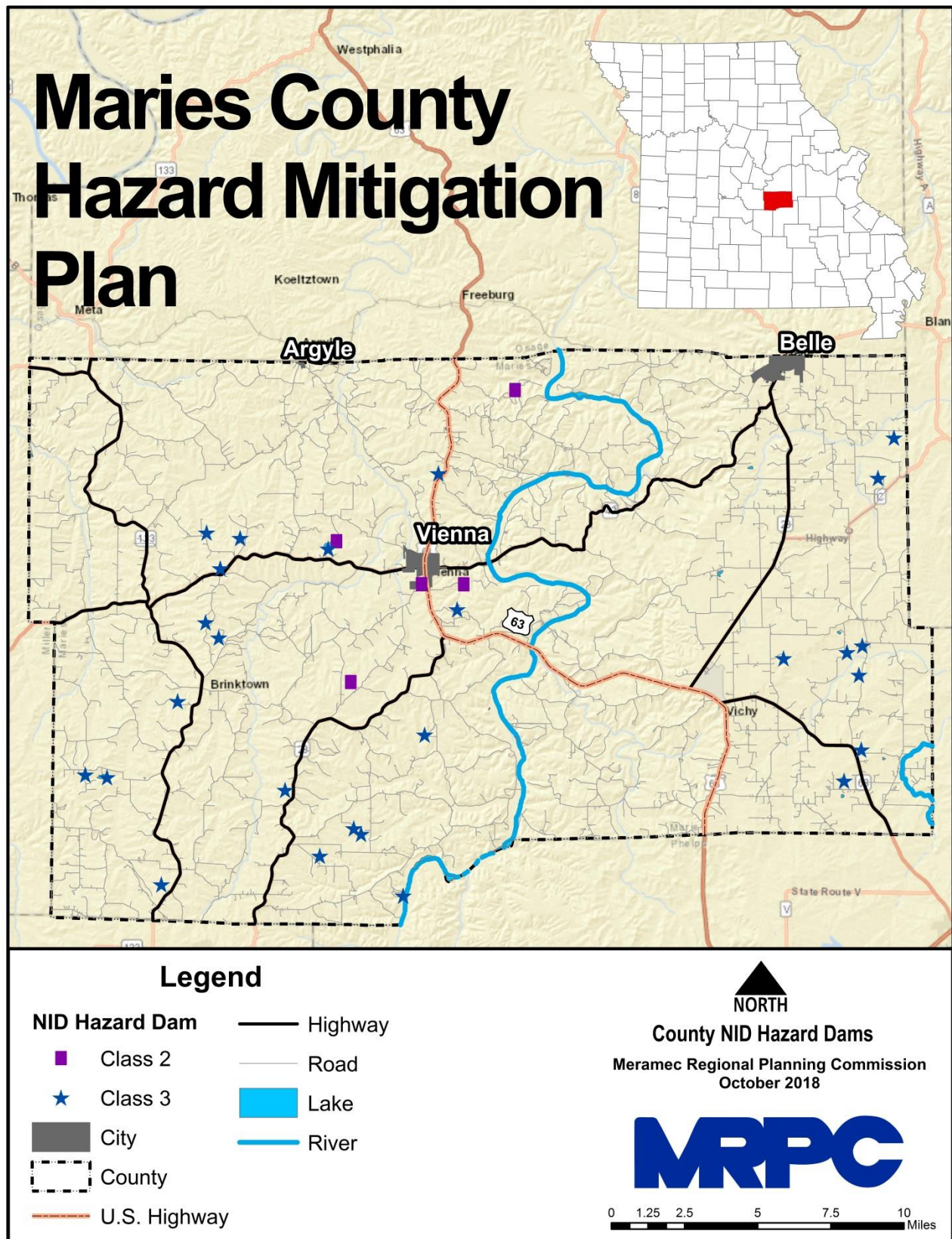
Sources: National Inventory of Dams, http://nid.usace.army.mil/cm_apex/f?p=838:12.: Missouri Department of Natural Resources, Dam and Reservoir Safety Program

Figure 3.3 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 no areas of assembly 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 Maxwell Lake Dam and Dudenhoeffer Lake Dam (**Figure 3.4** and **Figure 3.5**). No other dam inundation maps were available for the remaining NID High Hazard Dams in the county.

A failure of Maxwell Lake Dam would likely affect some county roads and Highway 42. There is also a bridge on Highway 42 that crosses the Gasconade River that would likely be adversely affected by a breach of this dam. There are few if any structures included in the inundation maps provided by MDNR.

A failure of Dudenhoeffer Lake Dam would likely result in damage to agricultural areas. There are few if any structures included in the inundation maps provided by MDNR.

Figure 3.3. NID High Hazard Dam Locations in Maries County



Source: MSDIS, MRPC

Figure 3.4. Maxwell Lake Dam Inundation Zone

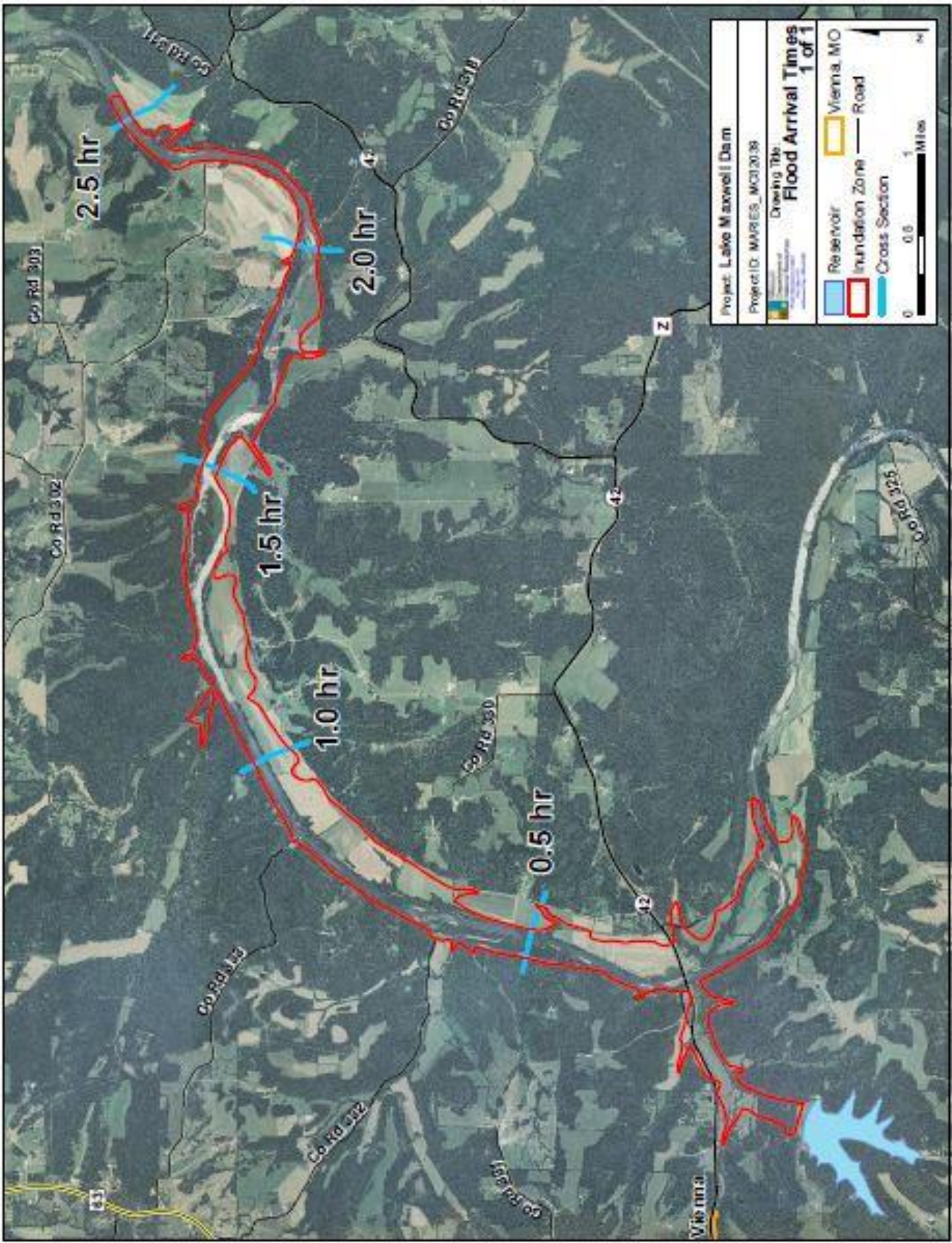
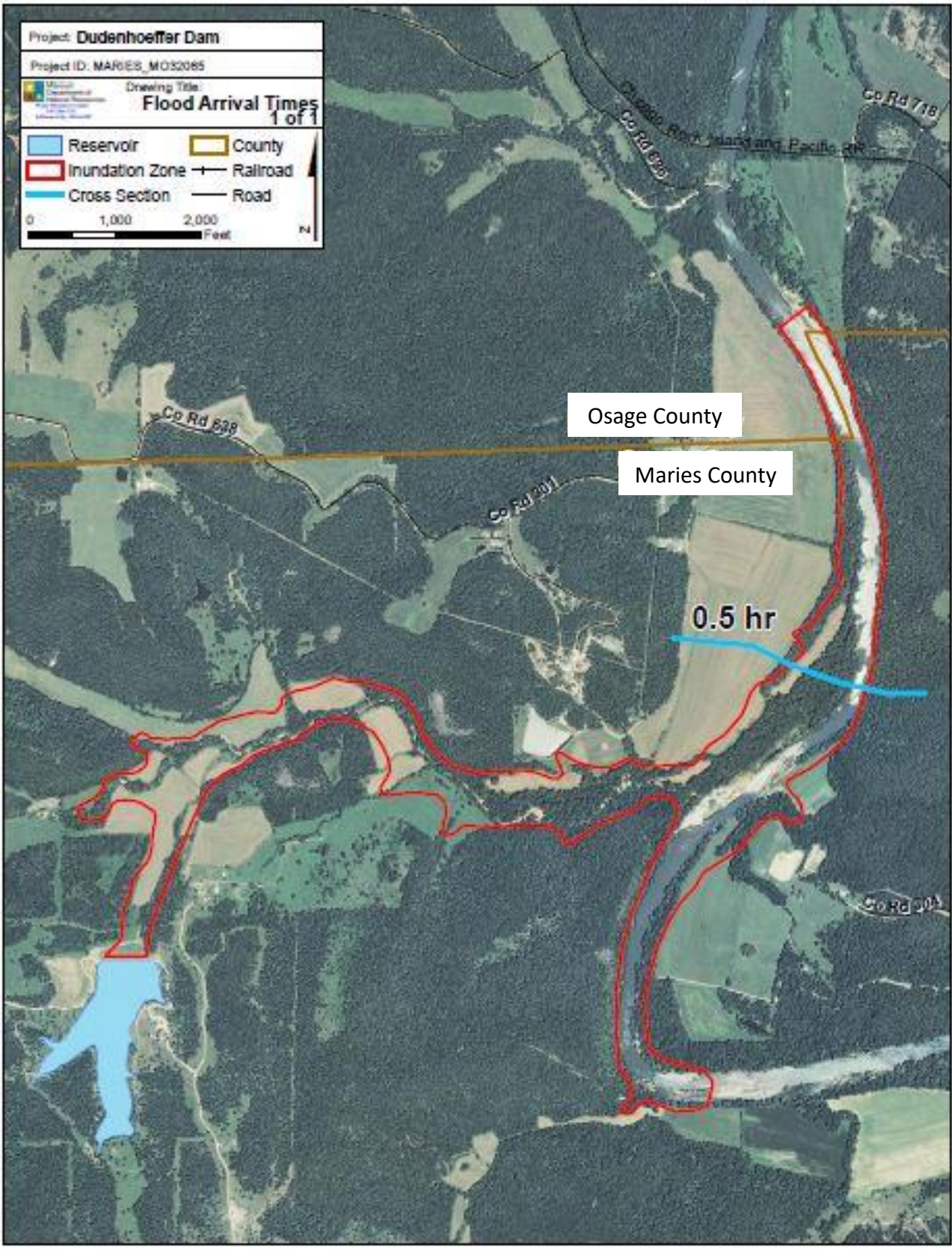


Figure 3.5. Dudenhoeffer Lake Dam Inundation Zone



Upstream Dams Outside the Planning Area

According to the Missouri Department of Natural Resources, Missouri Geological Survey, Water Resources Center, there are no high hazard dams that would flow into Maries County from surrounding counties during a failure event. **Figure 3.6** shows the location of dams that lie outside the county and none are located in areas that would impact Maries County.

Figure 3.6. Upstream Dams Outside Maries County



Source: MSDIS, MRPC

Severity/Magnitude/Extent

The severity/magnitude of dam failure would be similar in some cases to the impacts associated with flood events (see the flood hazard vulnerability analysis and discussion). Based on the hazard class definitions, failure of any of the High Hazard/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. Catastrophic failure of any high hazard dams has the potential to result in greater destruction due to the potential speed of onset and greater depth, extent, and velocity of flooding. Worst case scenario would be a catastrophic failure at any of the high hazard class dams designated in **Table 3.19**.

Previous Occurrences

According to Stanford University's National Performance of Dams Program and the Missouri State Emergency Management Agency, there were 69 recorded dam incidents in Missouri between 1917 and 2008. Fourteen were considered failures^{9,10}. Fortunately, only one drowning has been associated with a dam failure in the state. The problem of unsafe dams in Missouri was underscored by dam failures at Lawrenceton in 1968, Washington County in 1975, Fredricktown in 1977, and a near failure in Franklin County in 1979. A severe rainstorm and flash flooding in October 1998 compromised about a dozen small, unregulated dams in the Kansas City area. But perhaps the most spectacular and widely publicized dam failure in recent years was the failure of the Taum Sauk Hydroelectric Power Plant Reservoir atop Profitt Mountain in Reynolds County, MO.

In the early morning hours of December 14, 2005, a combination of human and mechanical error in the pump station resulted in the reservoir being overfilled. The manmade dam around the reservoir failed and dumped over a billion gallons of water down the side of Profitt Mountain, into and through Johnson's Shut-Ins State Park and into the East Fork of the Black River. The massive wall of water scoured a channel down the side of the mountain that was over 6000 feet wide and 7,000 feet long that carried a mix of trees, rebar, concrete, boulders and sand downhill and into the park¹¹. 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 high¹². This catastrophe has focused the public's attention on the dangers of dam failures and the need to adequately monitor dams to protect the vulnerable.

Despite the significance of the immediate damage done by the Taum Sauk Reservoir dam failure, the incident also highlights the long-term environmental and economic impacts of an event of this magnitude. Four years later, the toll of the flooding and sediment on aquatic life in the park and Black River is still being investigated. Even after the removal of thousands of dump truck loads of debris and mud, the river is still being affected by several feet of sediment left in the park. The local economy, heavily reliant upon the tourism from the park and Black River, has also been hit hard¹³.

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

⁹ http://npdp.stanford.edu/dam_incidents

¹⁰ 2013 Missouri State Hazard Mitigation Plan

¹¹ United States Geological Survey. Damage Evaluation of the Taum Sauk Reservoir Failure using LiDAR. http://mcgsc.usgs.gov/publications/t_sauk_failure.pdf

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

¹³ The Alert. Spring 2006. After the Deluge...What's Ahead for Taum Sauk? By Dan Sherburne.

deteriorate. While hundreds of them need to be rehabilitated, lack of available funding and often questions of ownership loom as obstacles difficult to overcome¹⁴.

Event Description

According to Stanford University's National Performance of Dams Program, no dam incidents have been recorded for Maries County¹⁵.

Probability of Future Occurrence

Since it is unknown which dams, if any might fail at any given time, determining the probability of future occurrence is not possible¹⁶. In addition, dam failure within the county has not occurred according to available data. **Table 3.4** depicts dam failure probability as no data available (NDA).

Vulnerability

Vulnerability Overview

Data was obtained from the 2018 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 3.20** provides vulnerability analysis data for the failure of State-regulated dams in Missouri.

Table 3.20. Vulnerability Analysis for Failure of State-regulated Dams in Missouri

County	Class 1	Class 2	Class 3	Total	Estimated # of Buildings Vulnerable	Average Exposure Value per Structure (\$)	Estimated Total Potential Building Exposure (\$)	Estimated Total Population Exposure	Estimated Building Losses (\$)
Maries	0	2	2	4	18	\$248,753	\$4,477,553	34	\$895,511

Source: 2018 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.

¹⁴ United States Geological Survey Fact Sheet 131-02. October 2002

¹⁵ http://www.npd.standord.edu/dam_incidents

¹⁶ 2013 Missouri State Hazard Mitigation Plan

-
- 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 2018 Missouri State Hazard Mitigation Plan, there is an estimated 18 buildings vulnerable to failure of State-regulated dams (**Figure 3.7**) 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.¹⁷

Figure 3.8 and **Figure 3.9** depict the total estimated building losses and population exposure by county, respectively. The estimated building losses from failure of State-regulated dams are \$1 – \$2 million. The estimated population exposure to failure of State-regulated dams ranges between 1 and 130.

¹⁷ 2018 Missouri State Hazard Mitigation Plan

Figure 3.7. Estimated Number of Buildings Vulnerable to Failure of State-regulated Dams

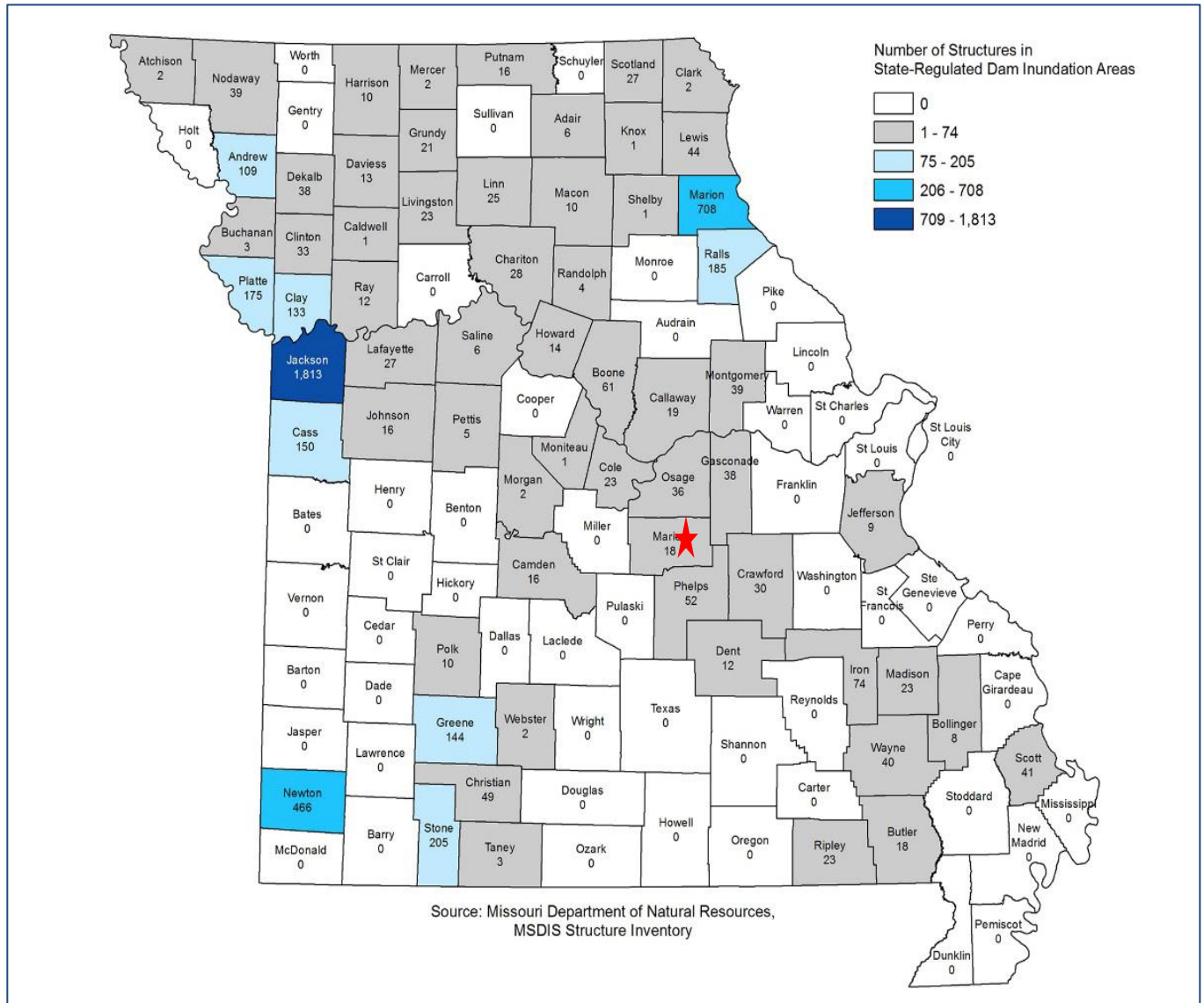
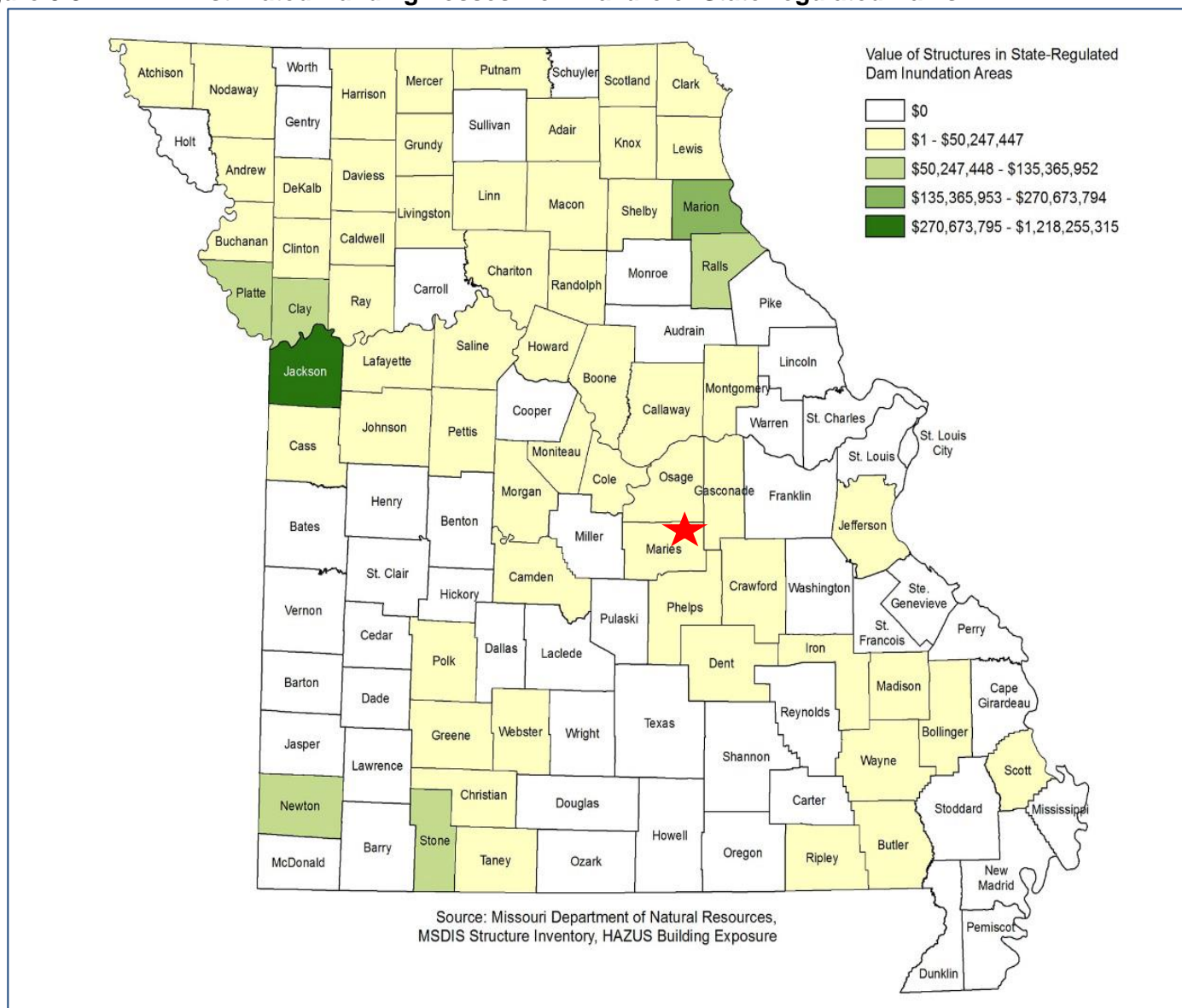


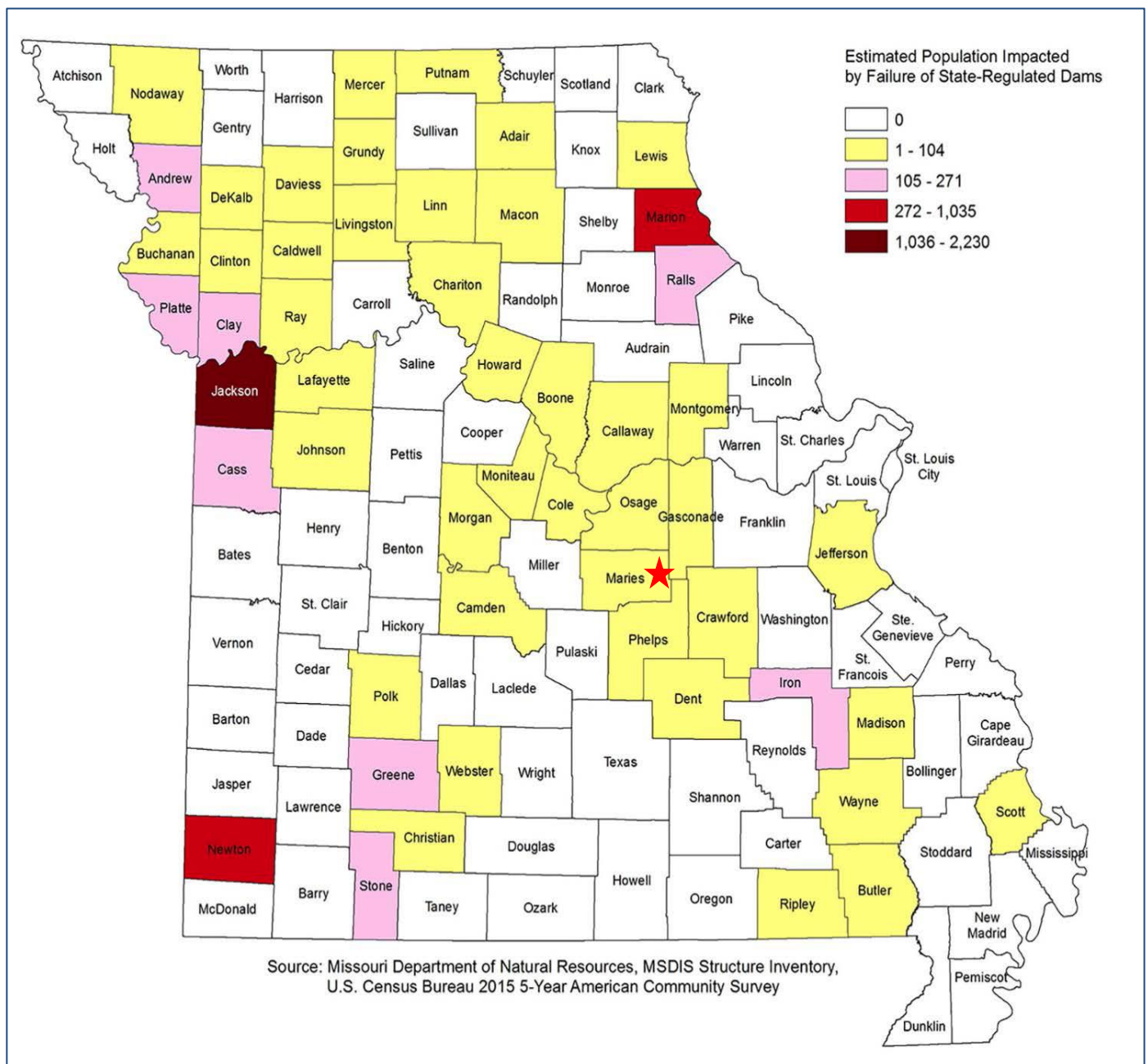
Figure 3.8. Estimated Building Losses from Failure of State-regulated Dams



Source: 2018 Missouri State Hazard Mitigation Plan

*Red star indicates Maries County

Figure 3.9. Estimated Population Exposure to Failure of State-regulated Dams



Source: 2018 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 most obvious worst case dam failure scenario would occur at any High Hazard/Class 1 dam. During a failure event, serious loss to road infrastructure, commercial and residential structures, and human life is likely. However, the majority of dams in Maries County are rural in nature.

Impact of Future Development

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

Hazard Summary by Jurisdiction

Variations in vulnerability across the planning area depend upon multiple variables. For example, with just 4 state-regulated dams and 5 NID high hazard dams (four within the county and one in Osage County), conclusions can be drawn that many of the high hazard dams in the county are un-regulated, and may not be inspected/maintained appropriately. Nonetheless, Maries County school districts and special districts do not have assets located in dam breach inundation areas. The city of Vienna does have one dam – Bowman Lake Dam - that lies just outside the city limits. Although the lake is relatively small, it might pose a hazard to some residential areas, West First Street and Highway 42.

Problem Statement

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

3.4.2 Drought

Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.6, Page 3.235
- Maps of effects of drought, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln; <http://www.drought.unl.edu/>.
- Historical drought impacts, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln; at <http://droughtreporter.unl.edu/>.
- Recorded low precipitation, NOAA Regional Climate Center, (<http://www.hprcc.unl.edu>).
- Water shortages, Missouri's Drought Response Plan, Missouri Department of Natural Resources, <http://dnr.mo.gov/pubs/WR69.pdf>
- Populations served by groundwater by county, USGS-NWIS, <http://maps.waterdata.usgs.gov/mapper/index.html>
- Census of Agriculture, http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1_Chapter_2_County_Level/Missouri/and_
http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- Natural Resources Defense Council, <http://www.nrdc.org/globalWarming/watersustainability/>
- Missouri Department of Natural Resources (MDNR), Drought News, Conditions and Resources
- Missouri Hazard Mitigation Viewer
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website
<https://drive.google.com/file/d/1bPkc0jqF9ofwQLnTL9N0u-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 people¹⁸ - 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 71% of the land in the county is utilized for agricultural purposes. Furthermore, livestock sales comprise 87% of the market of agricultural products sold in Maries County. A drought would directly impact livestock production and the agriculture economy in Maries County¹⁹.

Severity/Magnitude/Extent

The National Drought Monitor Center at the University of Nebraska at Lincoln summarized the potential severity of drought as follows. Drought can create economic impacts on agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to losses in yields in crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and disease to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn place both human and wildlife populations at higher levels of risk. Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Finally, while drought is rarely a direct cause of death, the associated heat, dust and stress can all contribute to increased mortality²⁰.

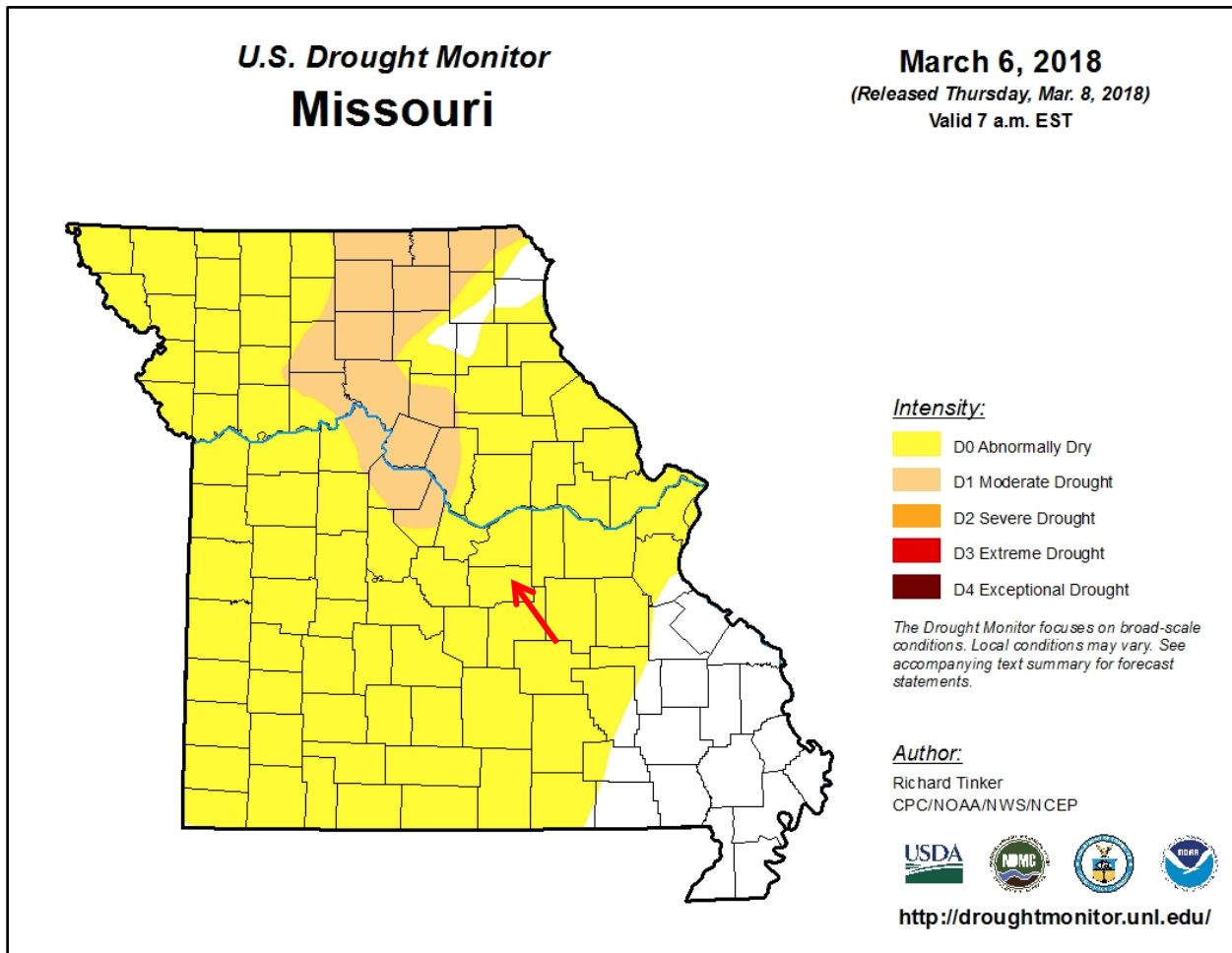
Figure 3.10 depicts a U.S. Drought Monitor map of Missouri on March 6, 2018. This map illustrates the planning area, which could be in drought at any given moment in time. A red arrow indicates the location of the planning area (Maries County).

¹⁸ <http://www.drought.unl.edu/> <http://droughtreporter.unl.edu/>

¹⁹ http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/cp29161.pdf

²⁰ Ibid

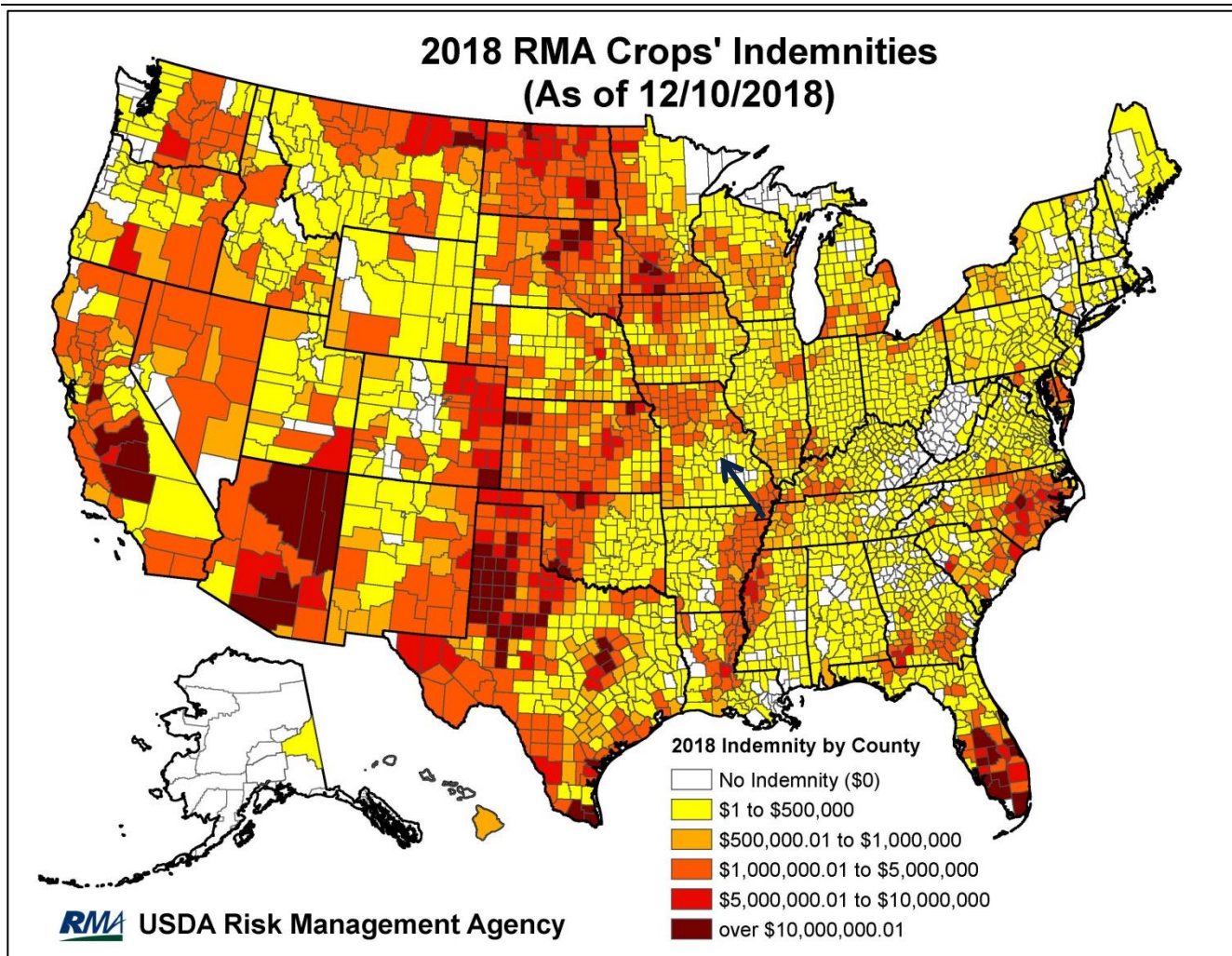
Figure 3.10. U.S. Drought Monitor Map of Missouri on March 6, 2018



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

Figure 3.11 illustrates RMA crop indemnities for 2018 across the United States. Maries County fell in the range of \$1 to \$500,000 for crop indemnities.

Figure 3.11. 2018 RMA Crop Indemnities for the United States



Source: <http://www.rma.usda.gov/data/indemnity/> *Black arrow indicates Maries County

According to the USDA's Risk Management Agency, there have been 46 crop insurance payments due to drought in Maries County since 1998, totaling \$659,806.70. **Table 3.21** illustrates the year, number of payments, and total amount of crop insurance payments.

Table 3.21. Maries County Crop Indemnity Payments (1998-2018)

Year	Number of Payments	Total
1998	1	\$3,130.00
1999	4	\$15,689.00
2000	1	\$393.00
2001	1	\$6,099.00
2002	4	\$5,459.00
2003	2	\$2,641.00
2004	-	-

Year	Number of Payments	Total
2005	-	-
2006	-	-
2007	1	\$4,762.00
2008	-	-
2009	-	-
2010	-	-
2011	4	\$35,797.00
2012	13	\$430,004.50
2013	3	\$5,471.00
2014	2	\$3,825.00
2015	0	-0-
2016	0	-0-
2017	4	\$11,187.20
2018	6	\$135,349.00
TOTAL	46	\$659,806.70

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

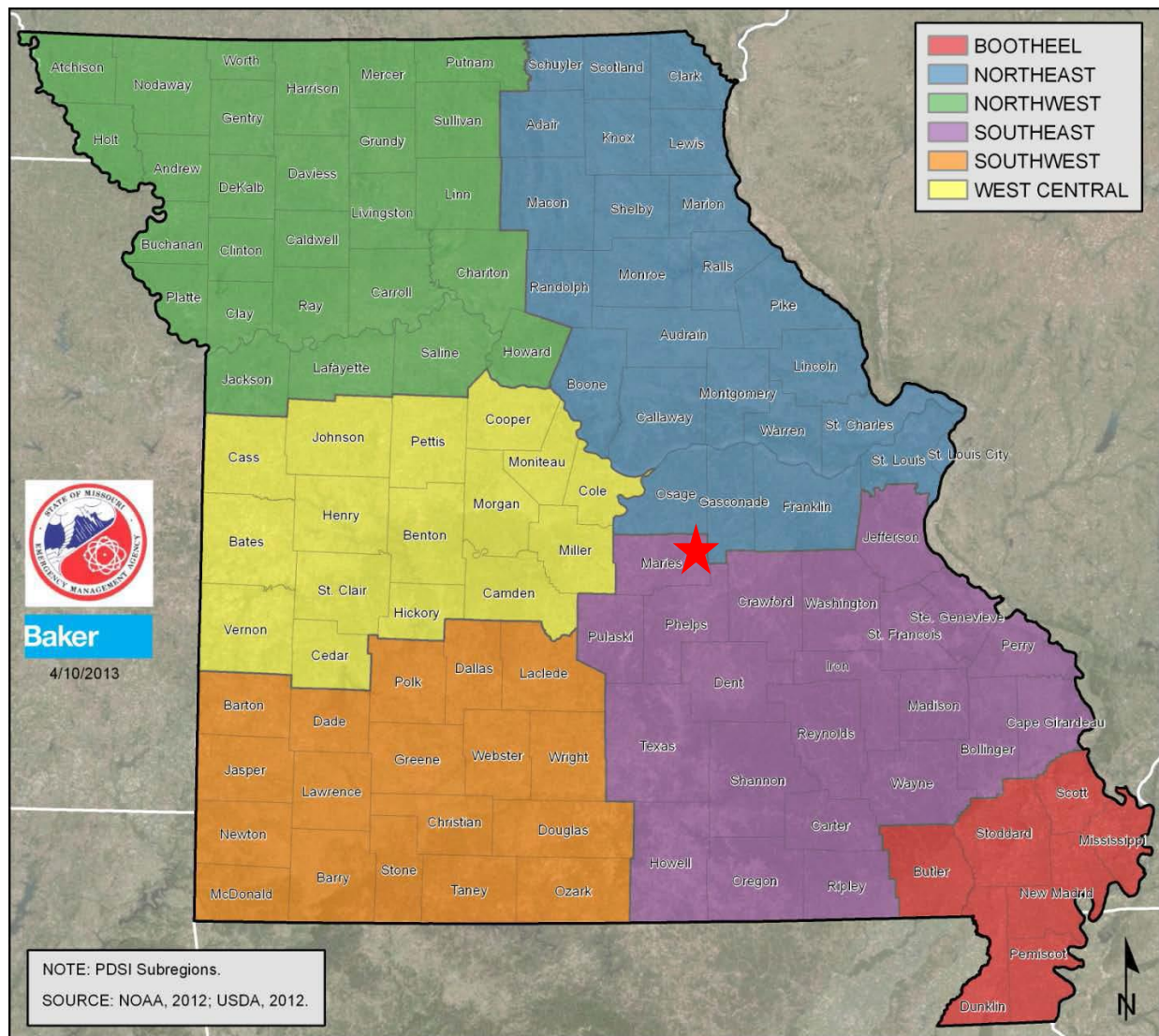
The Palmer Drought Indices measure dryness based on recent precipitation and temperature. The indices are based on a “supply-and-demand model” of soil moisture. Calculation of supply is relatively straightforward, using temperature and the amount of moisture in the soil. However demand is more complicated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

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

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

Figure 3.12 illustrates the Palmer Drought Severity Index sub-regions of Missouri. Maries County is categorized under the Southeast sub-region.

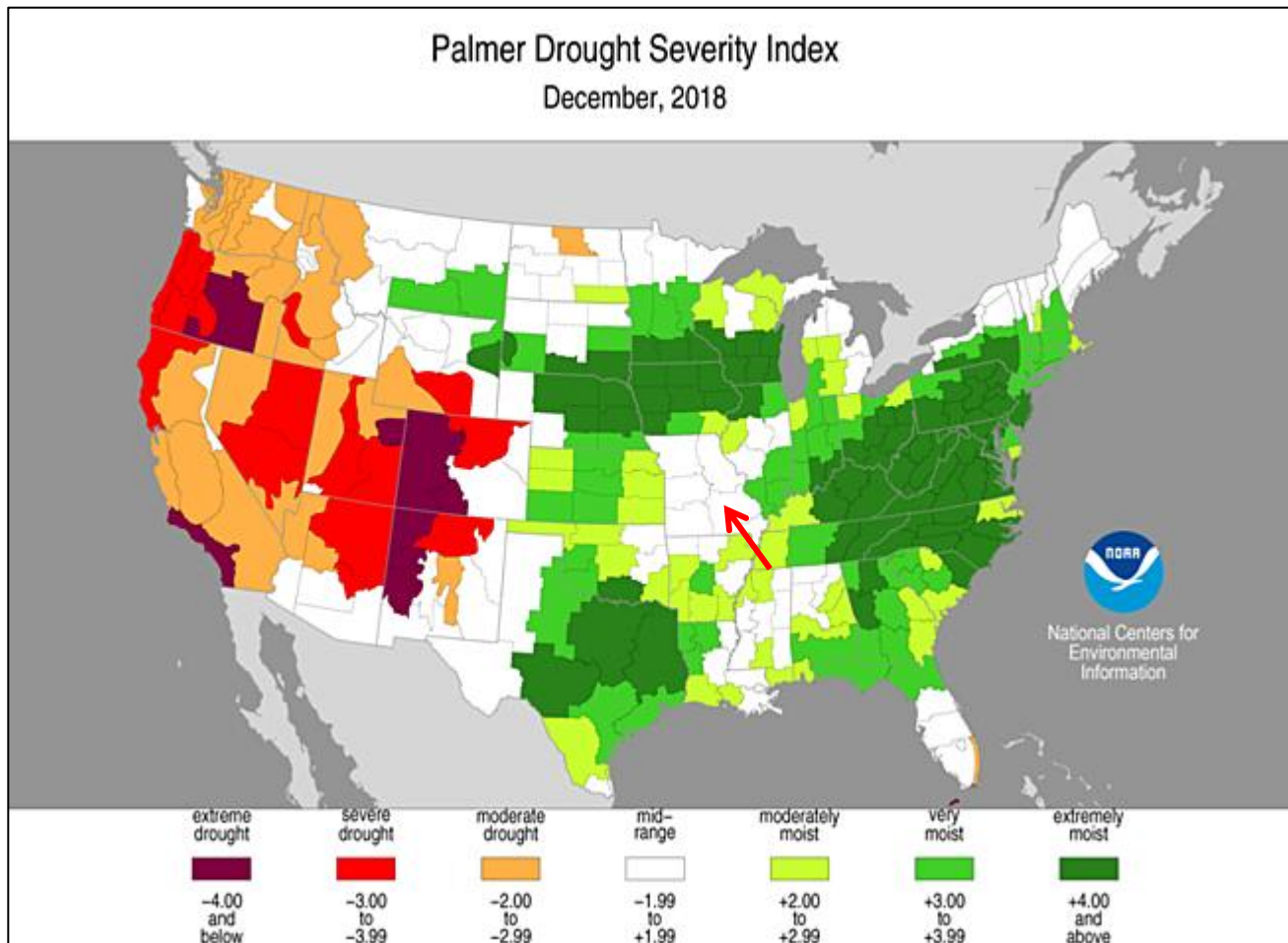
Figure 3.12. Palmer Drought Severity Index: Missouri Sub-regions



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

Figure 3.13 is an example of the Palmer Modified Drought Index for the United States on December, 2018.

Figure 3.13. Palmer Modified Drought Index National Map December, 2018



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

Data was collected from the Missouri Department of Natural Resources (2018 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 3.22**). Communities that exclusively depend upon ground water could experience hardship in the event of a long term drought.

Table 3.22. 2018 Water Source by Jurisdiction

Jurisdiction	% of source that is groundwater
Maries County	100
Belle	100
Vienna	100

Source: Missouri Dept. of Natural Resources, 2017 Census of Missouri Public Water Systems

Previous Occurrences

Table 3.23 offers Palmer Drought Severity Index data for Maries County between 2010 and 2018. This information exemplifies drought conditions on a monthly basis for Missouri's Southeast sub-

region within the United States.

Table 3.23. Palmer Drought Severity Index for Maries County, MO (2010 – 2018)

Month	Year								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan.	Extremely moist	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range	Very moist	Mid-range	Severe drought
Feb.	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Very moist	Mid-range	Mid-range
March	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range	Mid-range
April	Mid-range	Very moist	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range
May	Mid-range	Very moist	Moderate drought	Mid-range	Mid-range	Mid-range	Moderately moist	Very moist	Mid-range
June	Mid-range	Mid-range	Moderate drought	Mid-range	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range
July	Mid-range	Mid-range	Severe drought	Mid-range	Mid-range	Moderately moist	Moderately moist	Moderately moist	Mid-range
Aug.	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Very moist	Very moist	Moderately moist	Mid-range
Sept.	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Moderately moist	Very moist	Mid-range	Mid-range
Oct.	Mid-range	Mid-range	Moderate drought	Moderately moist	Mid-range	Mid-range	Very moist	Mid-range	Mid-range
Nov.	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Very moist	Very moist	Moderate drought	Mid-range
Dec.	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Extremely moist	Moderately moist	Severe drought	Mid-range

Source: <http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/psi/201001-2018112>

Probability of Future Occurrence

To calculate the probability of future occurrence of drought in Maries County, historical climate data was analyzed. There were 33 months of recorded drought (**Table 3.24**) over a 21 year span (January, 1998 to December, 2018). The number of months in drought (33) was divided by the total number of months (252) and multiplied by 100 for the annual average percentage probability of drought (**Table 3.25**). Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increase change of drought.

Table 3.24. Palmer Drought Severity Index for Maries County, MO (1998 – 2018)

Month	Year											
	January	February	March	April	May	June	July	August	September	October	November	December
1998												
1999										X	X	X
2000	X	X	X	X	X	X	X	X	X	X	X	X
2001	X		X	X	X							
2002												
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											

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

*x indicates drought

Table 3.25. Annual Average Percentage Probability of Drought in Maries County, MO

Location	Annual Avg. % P of Drought
Maries County	13.09%

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

*P = probability; see page 3.44 for definition.

Vulnerability

Vulnerability Overview

Data was obtained from the 2018 Missouri State Hazard Mitigation Plan for the drought vulnerability analysis. **Table 3.26** 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. Table 3.27 provides the factors considered and the ranges for the rating values assigned. 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 3.27**) as a result of a drought. Additionally, SEMA has divided the State into 3 regions in regards to drought susceptibility (**Figure 3.14**). 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 irrigation²¹.

²¹ 2018 Missouri State Hazard Mitigation Plan

Figure 3.14. Drought Susceptibility in Missouri

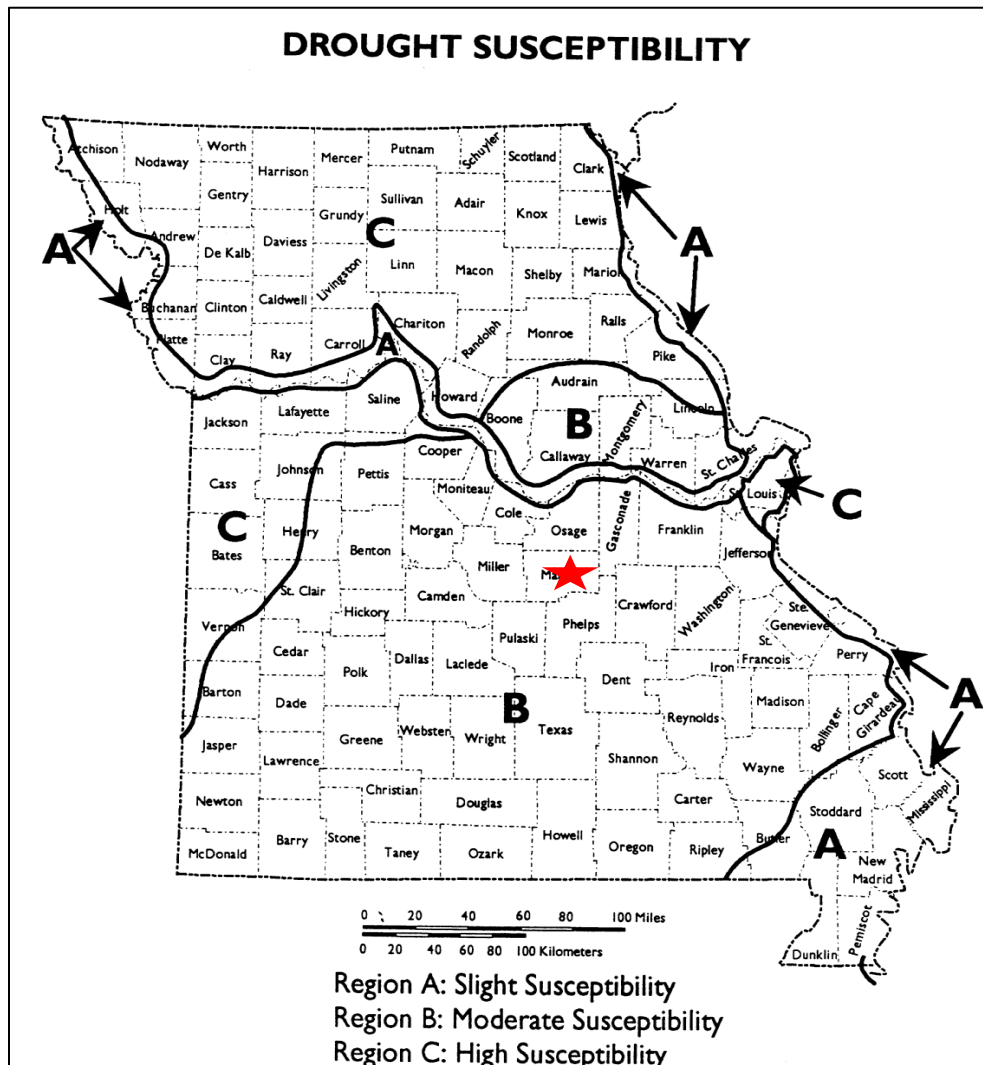


Table 3.26. Ranges for Drought Vulnerability Factor Ratings

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	\$866,000 - \$10,669,000	\$10,669,001 - \$33,252,000	\$33,252,001 - \$73,277,000	\$73,277,001 - \$155,369,000	\$155,369,001 - \$256,080,000
Annualized USDA Crop Claims Paid	<\$340,000	\$340,000 - \$669,999	\$670,000 - \$999,999	\$1M - \$1,299,999	>\$1,300,000
Likelihood of Occurrence of Severe or Extreme Drought	1-1.9%	2-3.9%	4-5.9%	6-8.9%	9-10.72%
Total Drought Vulnerability Rating	7-8	9-10	11-12	13-14	15-17

Source: 2018 Missouri State Hazard Mitigation Plan

Table 3.27. 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
4	\$485,209	\$53,912	1	\$4,576,000	1	6.42	4	10	Low-medium

Source: 2018 Missouri State Hazard Mitigation Plan

Potential Losses to Existing Development

Drought is not limited to a hazard that affects just agriculture, but can extend to encompass the nation's whole economy. Its impact can adversely affect a small town's water supply, the corner grocery store, commodity markets, or tourism. Additionally, extreme droughts have the ability to damage roads, water mains, and building foundations. On average, drought costs the U.S. economy about \$7 billion to \$9 billion a year, according to the National Drought Mitigation Center. Moreover, drought prone regions are also prone to increased fire hazards²².

Impact of Future Development

Impacts of drought on future development within Maries County would be negligible. Population projections as provided by the Missouri Office of Administration suggest that Maries County will increase by approximately 800 individuals within the next 12 years²³. 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.

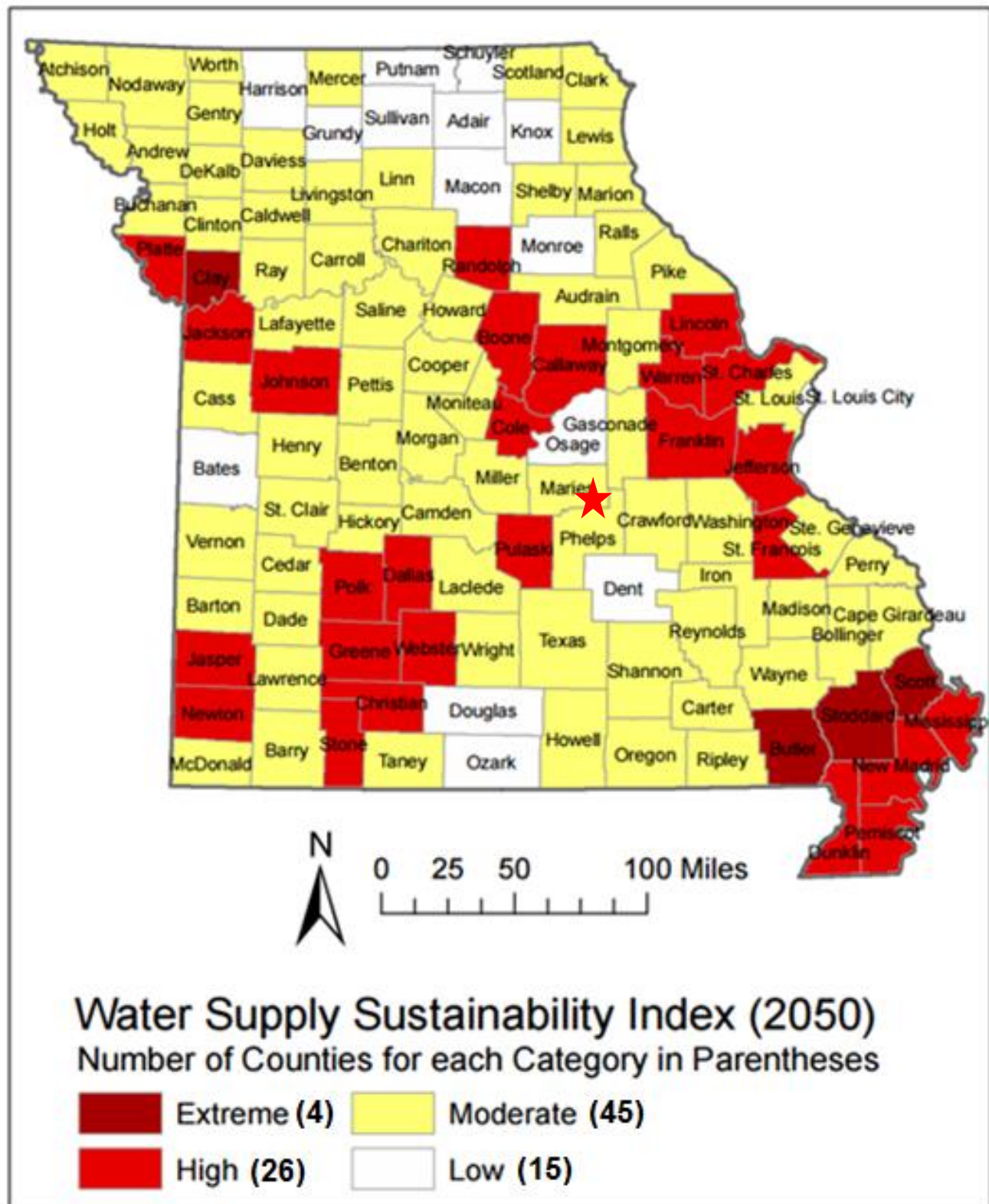
Impact of Climate Change

A new analysis, performed for the Natural Resources Defense Council, examined the effects of climate change on water supply and demand in the contiguous United States. The study found that more than 1,100 counties will face higher risks of water shortages by mid-century as a result of climate change. Two of the principal reasons for the projected water constraints are shifts in precipitation and potential evapotranspiration (PET). Climate models project decreases in precipitation in many regions of the U.S., including areas that may currently be described as experiencing water shortages of some degree. Maries County is predicted to experience moderate water shortages as a result of global warming (**Figure 3.15**) by the year 2050.

²² 2015 Boone County Hazard Mitigation Plan

²³ Missouri Office of Administration <http://oa.mo.gov/budget-planning/demographic-information/population-projections/2000-2030-projections>

Figure 3.15. Water Supply Sustainability Index (2050) with Climate Change Impacts



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

Hazard Summary by Jurisdiction

The variations between jurisdictions are non-existent to minimal. Maries County and the communities of Belle and Vienna utilize ground/well water as their water source. In both 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 low-moderate risk. Climate change predictions also suggest low-moderate risks by the year 2050. Maries County has a strong agricultural economy. Drought would impact commodities, specifically livestock and crops. Potential impacts to local economies and infrastructures are foreseeable in the event of a long term drought.

The county and both cities 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.

3.4.3 Earthquakes

Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.4, Page 3.192
- U.S. Seismic Hazard Map, United States Geological Survey,
http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lq.jpg;
- Impact of Earthquakes on the Central USA
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,
<http://www.igsb.uiowa.edu/Browse/quakes/quakes.htm>;
- Probability of magnitude 5.0 or greater within 100 Years, United States Geological Survey,
<https://geohazards.usgs.gov/eqprob/2009/index.php>

Hazard Profile

Hazard Description

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

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

Geographic Location

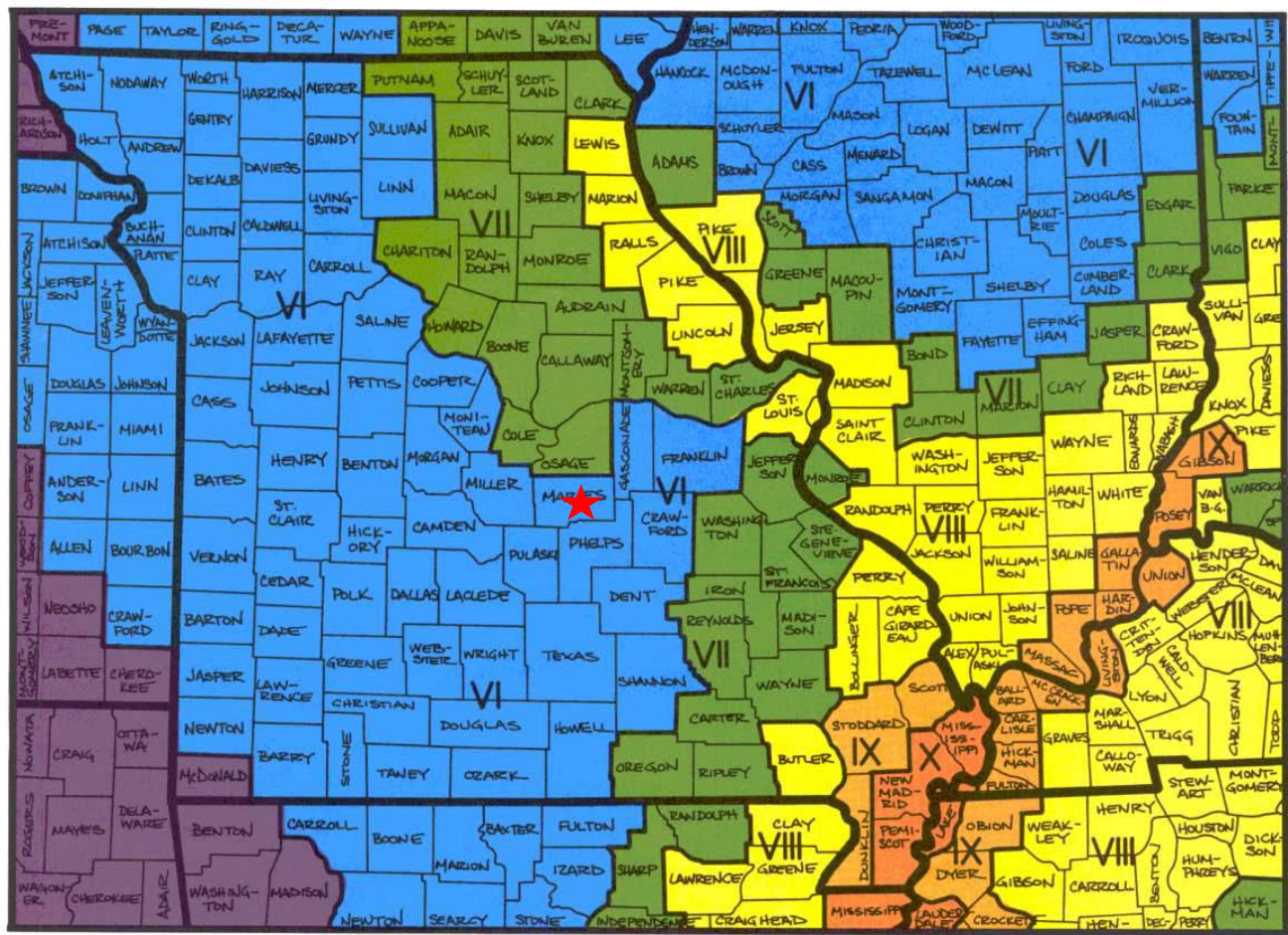
There are eight earthquake source zones in the Central United States, one of which is located within the state of Missouri—the New Madrid Fault. Other seismic zones, because of their close proximity, also affect Missourians. These are the Wabash Valley Fault, Illinois Basin, and the Nemaha Uplift. The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

Figure 3.16 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,

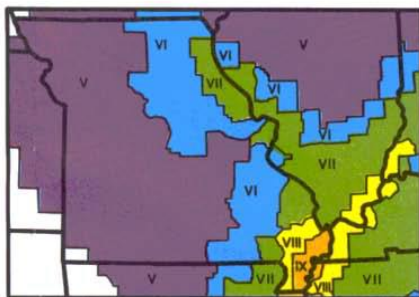
²⁴ Missouri Department of Natural Resources, Facts about the New Madrid Seismic Zone

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 3.17**). 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. Earthquake intensities will not vary across the planning area, which is the case for most Missouri counties. **Figure 3.17** and **Table 3.28** further define Richter Scale intensities.

Figure 3.16. Impact Zones for Earthquake Along the New Madrid Fault



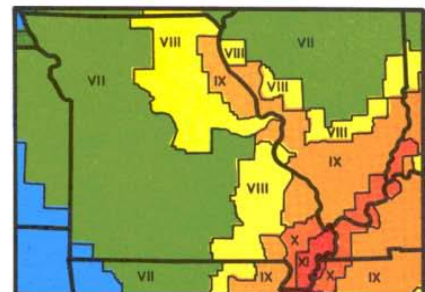
This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.



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



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



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

Figure 3.17. Projected Earthquake Intensities

MODIFIED MERCALLI INTENSITY SCALE	
I People do not feel any Earth movement.	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.
II A few people might notice movement.	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.
III Many people indoors feel movement. Hanging objects swing.	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.
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.	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.
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.	

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.

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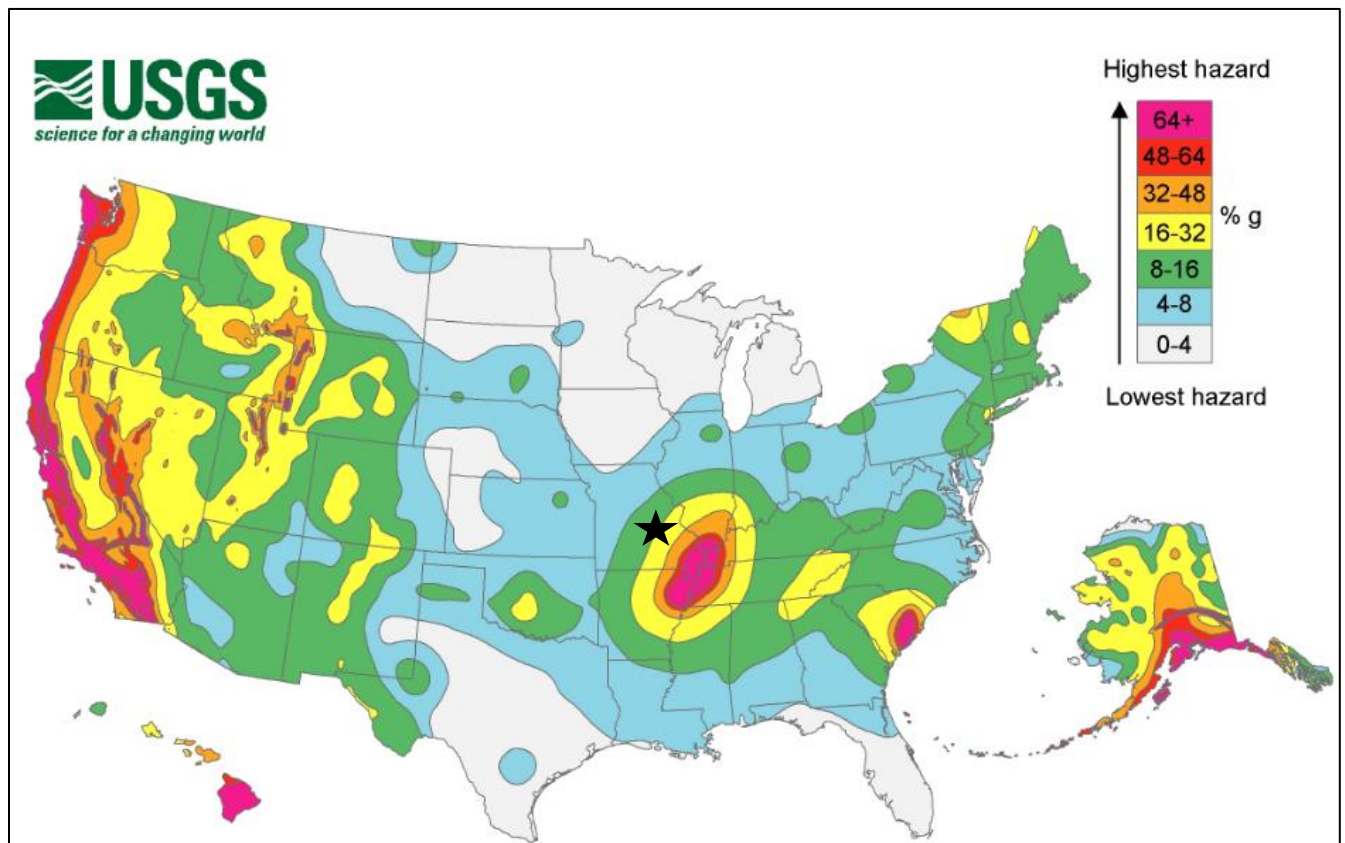
Source: sema.dps.mo.gov

Table 3.28. Richter Scale of Earthquake Magnitude

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

Figure 3.18 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 3.18. 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)²⁵.

Modified Mercalli Intensity Scale

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

Previous Occurrences

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

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

The earthquake generated great waves on the Mississippi River that overwhelmed many boats and washed others high upon the shore. The waves broke off thousands of trees and carried them into the river. High river banks caved in, sand bars gave way, and entire islands disappeared. The

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

violence of the earthquake was manifested by great topographic changes that affected an area of 78,000 to 130,000 square kilometers.

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

The three main shocks probably reached intensity XII, the maximum on the Modified Mercalli scale, although it is difficult to assign intensities, due to the scarcity of settlements at the time. Aftershocks continued to be felt for several years after the initial tremor. Later evidence indicates that the epicenter of the first earthquake (Dec. 16, 1811) was probably in northeast Arkansas. Based on historical accounts, the epicenter of the Feb. 7, 1812, shocks was probably close to the town of New Madrid.

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

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

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

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

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

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

The Nov. 9, 1968, earthquake centered in southern Illinois was the strongest in the central United States since 1895. The magnitude 5.5 shock caused moderate damage to chimneys and walls at

Hermann, St. Charles, St. Louis, and Sikeston, Missouri. The felt areas include all or portions of 23 states¹.

Several area residents observed a small seismic occurrence during the early morning hours of July 8, 2003 in Crawford County. According to information from the USGS, a micro-earthquake happened about 20 miles northeast of Rolla and measured 2.9 on the Richter scale. The earthquake originated at a depth of about 3.1 miles beneath the earth's surface. In southern parts of Missouri, earthquakes of this magnitude happen frequently, but are an unusual event in Dent County.

Small earthquakes continue to occur frequently in Missouri. Averages of 200 earthquakes are detected every year in the New Madrid Seismic Zone alone. Most are detectable only with sensitive instruments, but on an average of every 18 months, southeast Missouri experiences an earthquake strong enough to crack plaster in buildings²⁶.

Vulnerability

Vulnerability Overview

As stated in the 2018 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 very 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 earthquake insurance coverage. The Missouri Department of Insurance, Financial Institutions and Professional Registration (DIFP) prepared a report in 2017 on the state of earthquake insurance coverage in Missouri. The report notes that earthquake coverage has become less available and less affordable over the last 15 years. The cost of earthquake insurance has increased from an average of \$50 per year to \$149 per year. In high risk counties the increases have been more substantial – from \$57 per year in 2000 to \$405 per year in 2017. The number of residences covered by earthquake insurance has dropped over the last 15 years – likely due to the increased cost of premiums. In 2017 the percentage of residential policies with earthquake coverage in Maries County was 26.9 percent with the average cost of coverage at \$71 per year.²⁷

²⁶ Missouri State Hazard Mitigation Plan 2018

²⁷ The State of Earthquake Coverage Report <https://insurance.mo.gov/earthquake/>

Probability of Future Occurrence

No earthquakes have been reported in Maries County since 1998. 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 moderate 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.

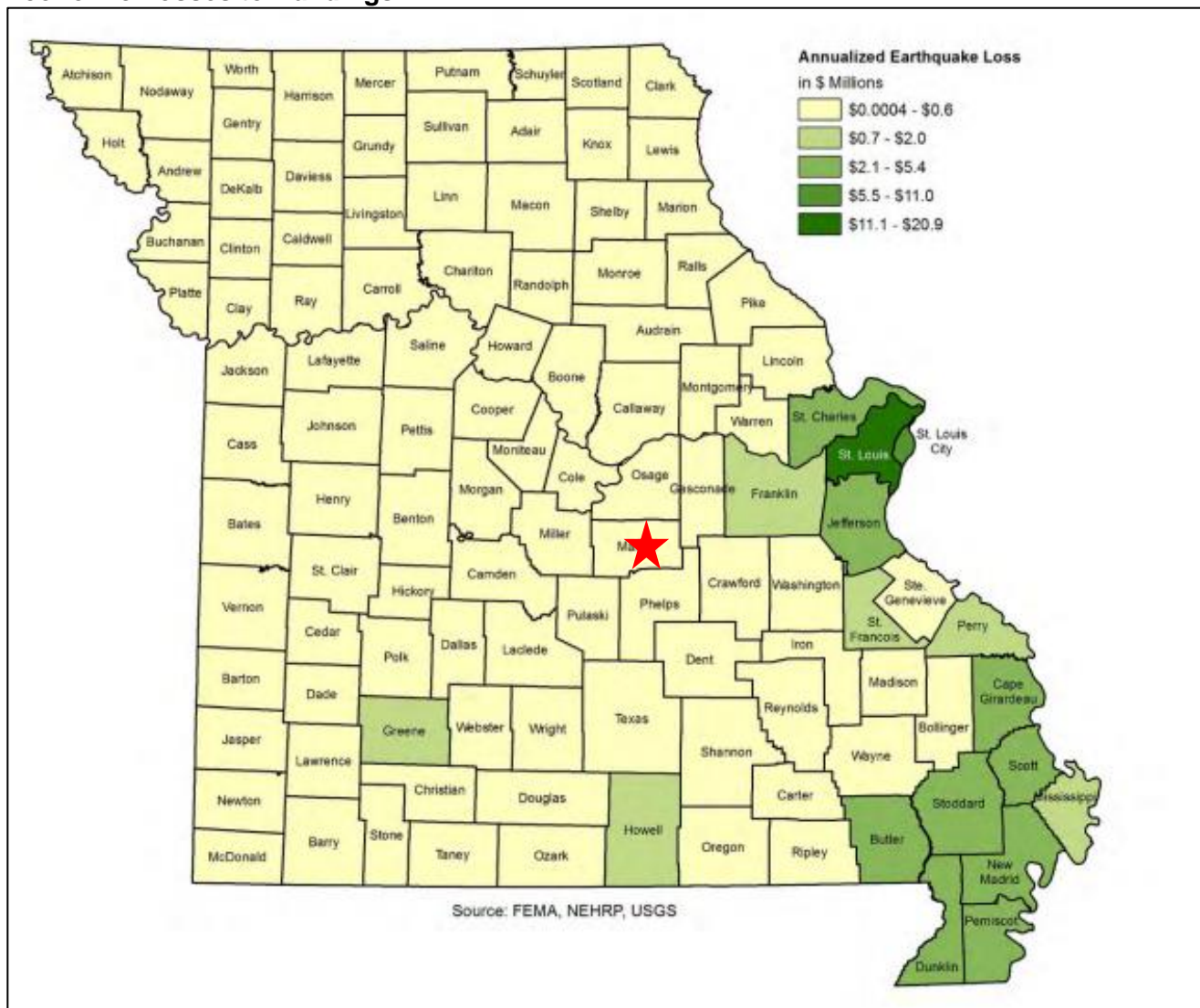
SEMA utilized Hazus V 3.2 to analyze vulnerability and estimate losses to earthquakes. Hazus is a program developed by FEMA which is a nationally applicable standardized methodology that encompasses models for assessing potential losses from earthquakes, floods, and hurricanes. All Hazus analyses were 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’ basis²⁸. 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 3.19** 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 \$4,000 to \$600,000. **Table 3.29** provides information on total estimated losses, estimated losses per capita and loss ratio. This results in the county being ranked 67th 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.²⁹

²⁸ 2018 Missouri State Hazard Mitigation Plan

²⁹ Ibid

Figure 3.19. HAZUS-MH Earthquake Loss Estimation: Annualized Loss Scenario –Direct Economic Losses to Buildings.



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

Table 3.29. 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

*All \$values are in thousands

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

Likewise, SEMA developed a second scenario which incorporated a 2% probability of exceedance in 50 years. This model was to demonstrate a worst case scenario. 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 3.20** illustrates direct economic loss to buildings. Maries County is anticipated to lose between \$700,000 and \$200,000,000 in a 50 year scenario. Moreover, in the same event the county is estimated to experience between 3.1 percent and 7 percent loss (damage) of the total. **Table 3.30** further exemplifies the county's loss ratio. **Figure 3.21** provides estimates of peak ground acceleration and spectral acceleration (ground shaking potential) at intervals of 0.3 and 1.0 seconds, respectively which have a two percent probability of exceedance in the next 50 years. 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 14 percent.

Table 3.30. Hazus-MH Earthquake Loss Estimation: 2% Probability of Exceedance in 50 Years Scenario Results Building Impacts for Maries County (values in thousands)

County	Structural Damage (\$)*	Non-Structural Damage (\$)*	Contents Damage and (\$) *	Inventory Loss	Loss Ratio (%)**	Income Loss (\$)*	Total Loss (\$) ,***
Maries	\$5,576	\$14,984	\$5,419	\$178	2.15	\$790	\$32,050

Source: 2018 Missouri State Hazard Mitigation Plan, Hazus 2.1

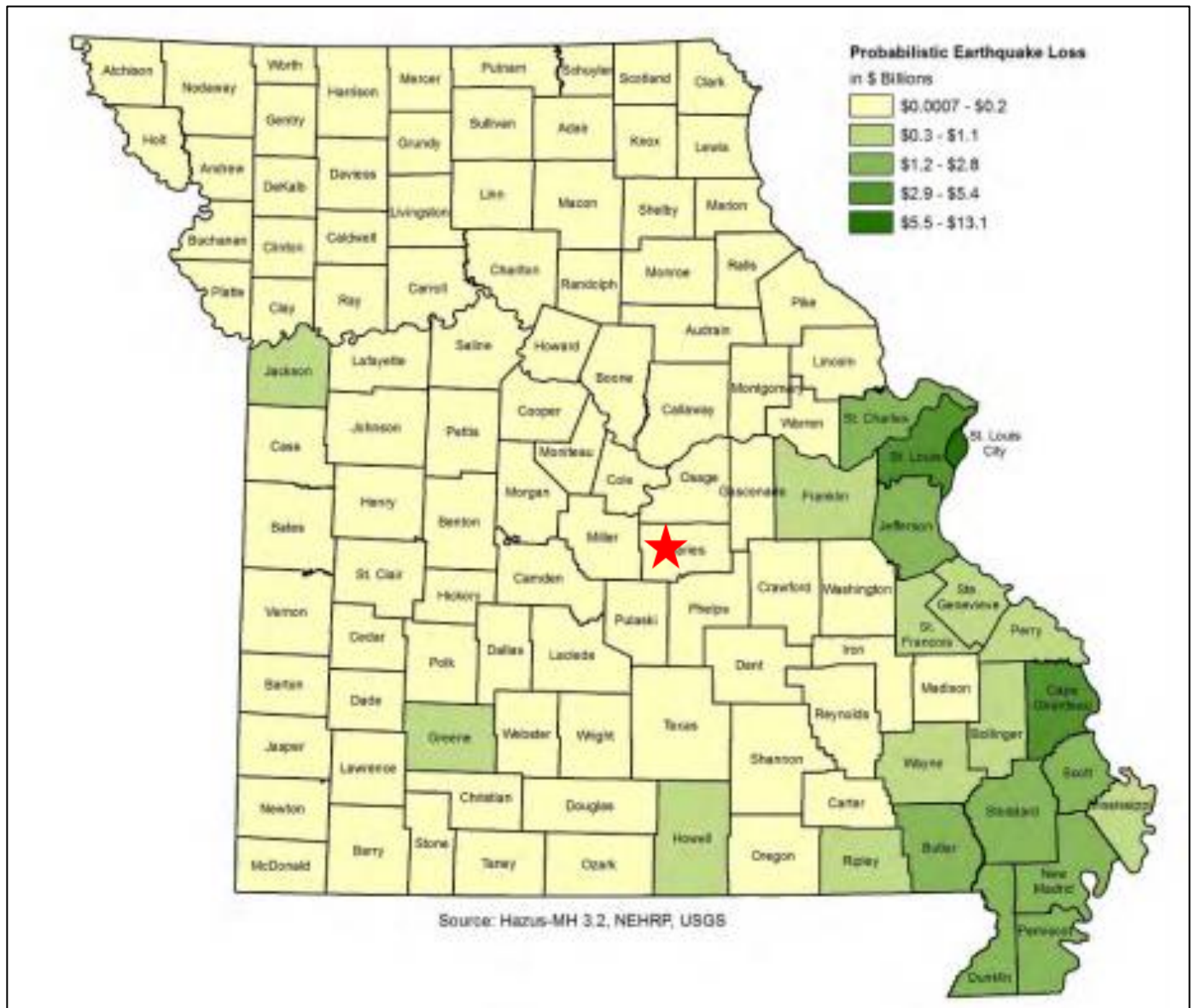
*All \$ values are in thousands

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

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

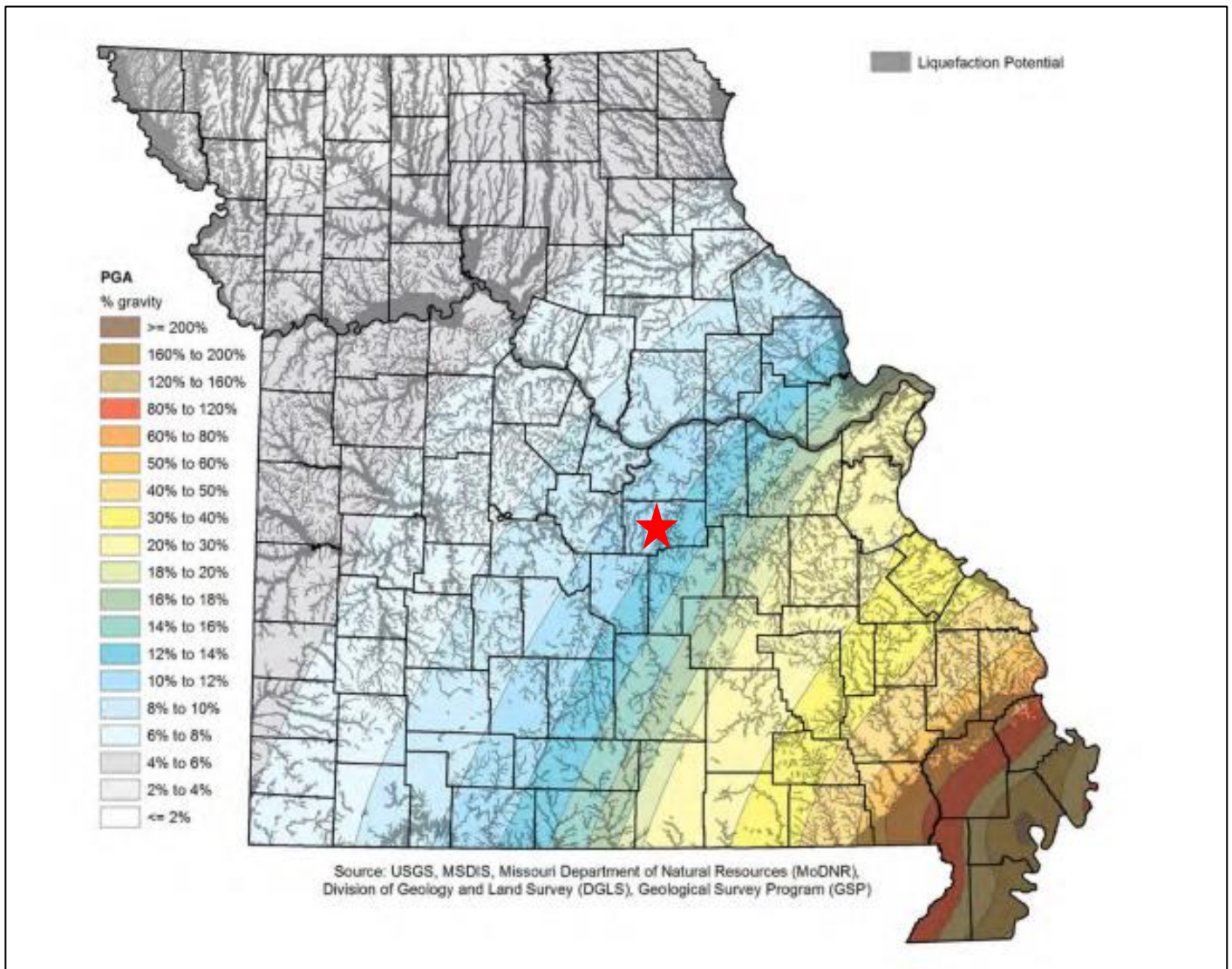
****Note: Total loss numbers provide an estimate of total losses and due to rounding, these numbers may differ slightly from the global summary report outputs from HAZUS

Figure 3.20. HAZUS-MH Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Total Building Loss



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

Figure 3.21. Hazus Earthquake 2% Probability of Exceedance in 50 Years – Ground Shaking and Liquefaction Potential



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

Figure 3.22 depicts a map of the modeled earthquake impacts by county based on building losses, including structural and nonstructural damage, content and inventory loss, and wage and income loss. Maries County shows a loss ratio of 0.2 percent to 3.4 percent. **Figure 3.22** 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 3.31** 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 2018 Missouri Hazard Mitigation Plan, Maries County's loss ratio is 2.15 percent. Maries County ranks 88th in the state for direct economic losses in this scenario.

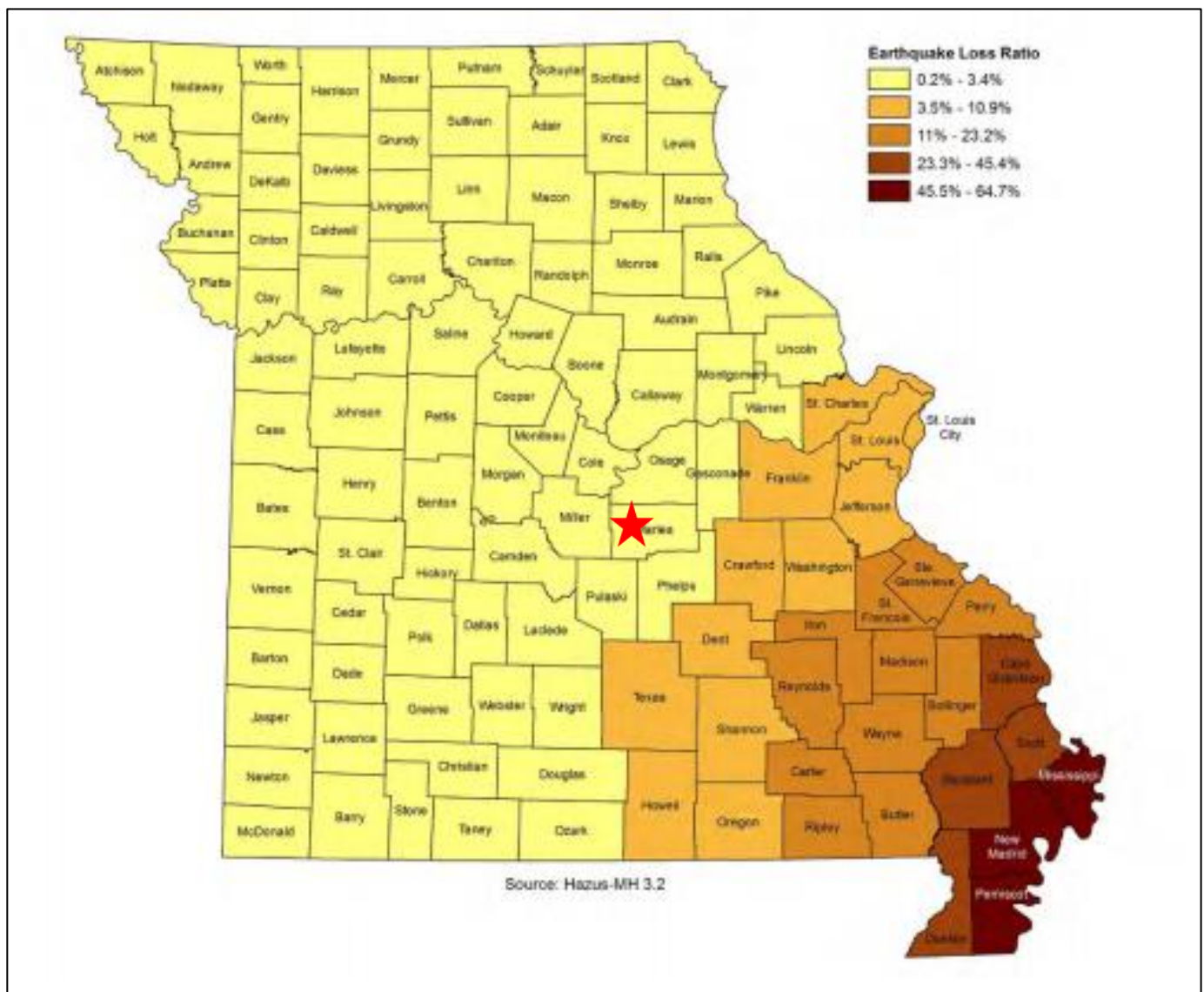
Table 3.31. HAZUS-MH Earthquake Loss Estimation 2% Probability of Exceedance in 50 Years Scenario Direct Economic Losses Results Summary for Maries County*

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: 2018 Missouri Hazard Mitigation Plan

*All values in thousands

Figure 3.22. Hazus Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Loss Ratio



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

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.³⁰

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 significant commercial development at both the developing industrial park near Vichy as well as the expansion of Quaker Windows in the northern part of Maries County. 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 jurisdiction³¹.

Hazard Summary by Jurisdiction

Since earthquake intensity is not likely to vary greatly throughout the planning area, the risk will be the same throughout. Maries County is not near the New Madrid Shock Zone, but it will most likely endure mild secondary effects from the earthquake, such as fire, structure damage, utility disruption, environmental impacts, and economic disruptions/losses. However, damages could differ if there are structural variations in the planning area's built environment. For example, if one community has a higher percentage of residences built prior to 1939 than the other participants, that community is likely to experience higher damages. **Table 3.32** 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. The Belle High School was built in 1934. All other school facilities in the county were built later than 1939. 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.

Table 3.32. Percent of Maries County Residences Built Prior to 1939

Jurisdiction	Number of Residences Built Prior to 1939	% of Residences Built Prior to 1939
Unincorporated Maries County	587	12.6%
Belle	95	10.5%
Vienna	48	15.2%

Source: 2010 U.S. Census Bureau

https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_5YR_DP04&prodType=table

³⁰ Missouri State Hazard Mitigation Plan 2018

³¹ 2015 Boone County Hazard Mitigation Plan

Problem Statement

In a worst case scenario, the county is expected to encounter \$32,050,000 in total economic losses to buildings. Vienna has a higher risk of damage to buildings due to over 15 percent of the homes having been built prior to 1939. In addition, the Belle High School is an older structure and may also be at higher risk from earthquakes.

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

3.4.4 Extreme Temperatures

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
- 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, www.weather.gov/os/heat/index.shtml ;
- Wind Chill chart, National Weather Service, http://www.nws.noaa.gov/om/cold/wind_chill.shtml ;
- Daily temperatures averages and extremes, High Plains Regional Climate Summary,
http://www.hprcc.unl.edu/data/historical/index.php?state=ia&action=select_state&submit=Select+State, <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>;
- Missouri Hazard Mitigation Viewer
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website
<https://drive.google.com/file/d/1bPkc0jqF9ofwQLnTL9N0u-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 3.23** 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 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. For example – using the Heat Index Chart in Figure 3.23 - if the air temperature is 96 degrees Fahrenheit, (found in the top of the table), and the relative humidity is 55 percent (found on the left of the table), the Heat

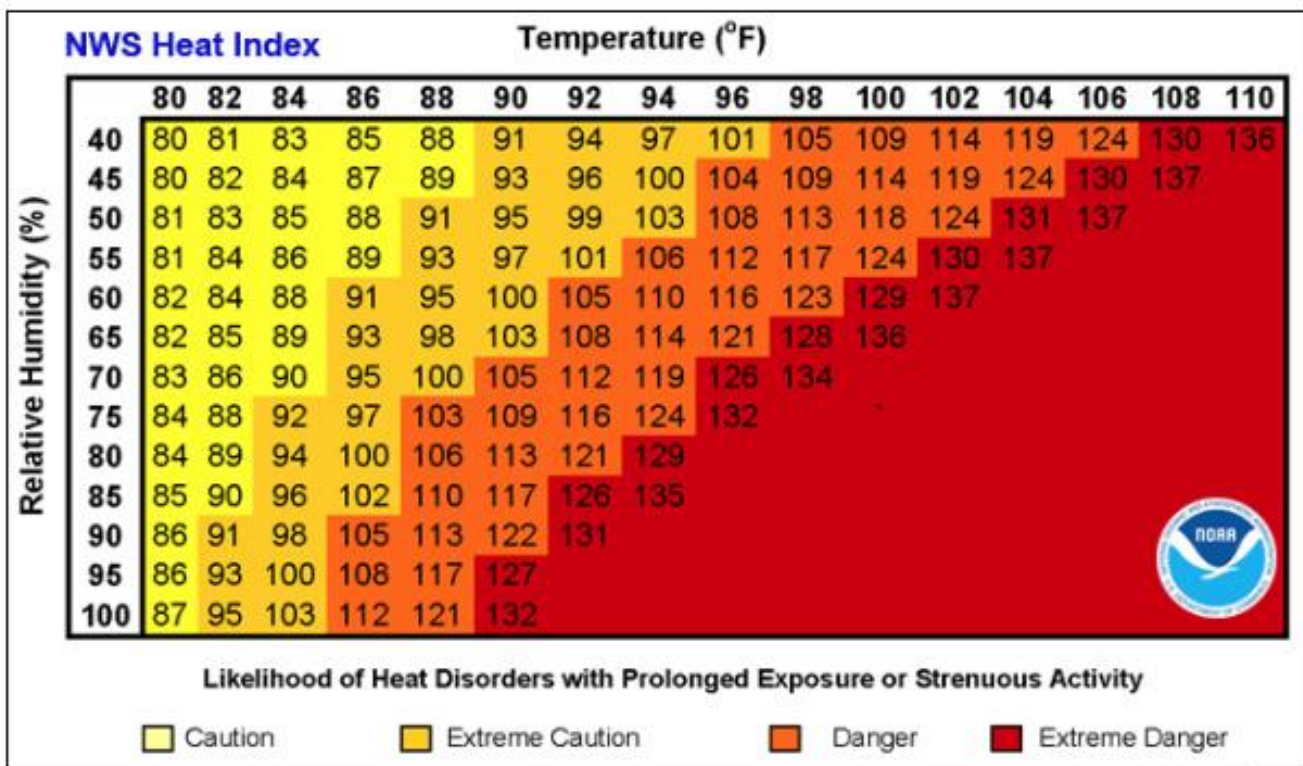
Index is 112 degrees Fahrenheit (the intersection of the 96 degree row and the 55 percent column). Because HI values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15 degrees Fahrenheit. Also, strong winds, particularly with very hot, dry air, 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.

Figure 3.23. Heat Index (HI) Chart



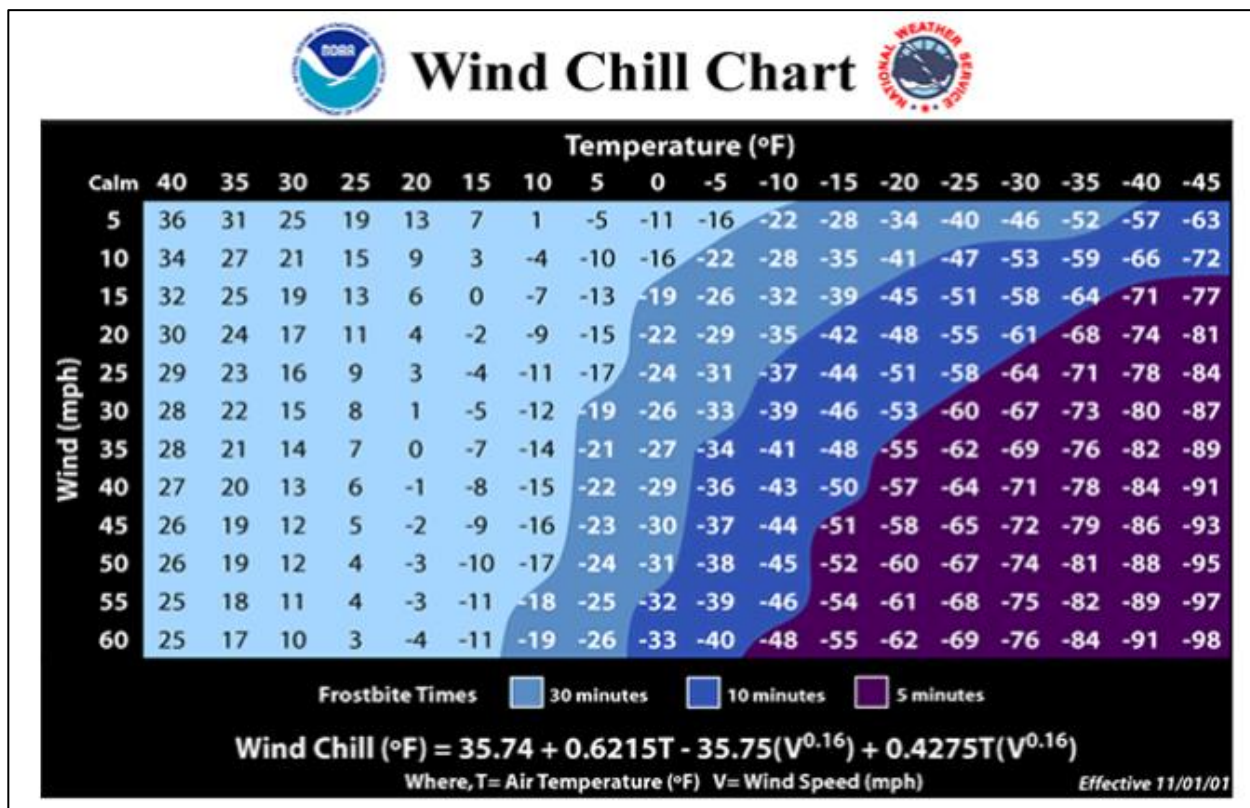
Source: National Weather Service (NWS); <https://www.weather.gov/safety/heat-index>

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.

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 fire, which can be caused by fireplaces and emergency heaters; and frozen/burst pipes.

The NWS Wind Chill Temperature (WCT) index, shown in **Figure 3.24**, 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 figure below 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 3.24. 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 or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for issuing

excessive heat alerts is when for two or more consecutive days: (1) when the maximum daytime Heat Index is expected to equal or exceed 105 degrees Fahrenheit (°F); and the night time minimum Heat Index is 80°F or above. A heat advisory is issued when temperatures reach 105 degrees and a warning is issued at 115 degrees.

The NWS Wind Chill Temperature (WCT) index 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. **Figure 3.24** 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.

Extreme heat can cause stress to crops and animals. However, according to the NOAA Storm Events Data Base, there were no reported agricultural losses for Maries County during that 20 year time period. Data specifically on agricultural losses due to extreme heat was not available on the USDA Risk Management website. Extreme heat can also strain electricity delivery infrastructure overloaded during peak use of air conditioning during extreme heat events. Another type of infrastructure damage from extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

From 1988 through 2011, there were 3,496 fatalities in the U.S. attributed to summer heat. This translates to an annual average of 146 deaths. During the same time period, zero deaths were recorded in Maries County, according to NOAA Storm Events Data Base. The national Weather Service stated that among natural hazards, no other natural disaster – not lightning, hurricanes, tornadoes, floods or earthquakes – causes more deaths.

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

Table 3.33 lists typical symptoms and health impacts due to exposure to extreme heat.

Table 3.33. Typical Health Impacts of Extreme Heat

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

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

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

issued at 115 degrees.

Previous Occurrences

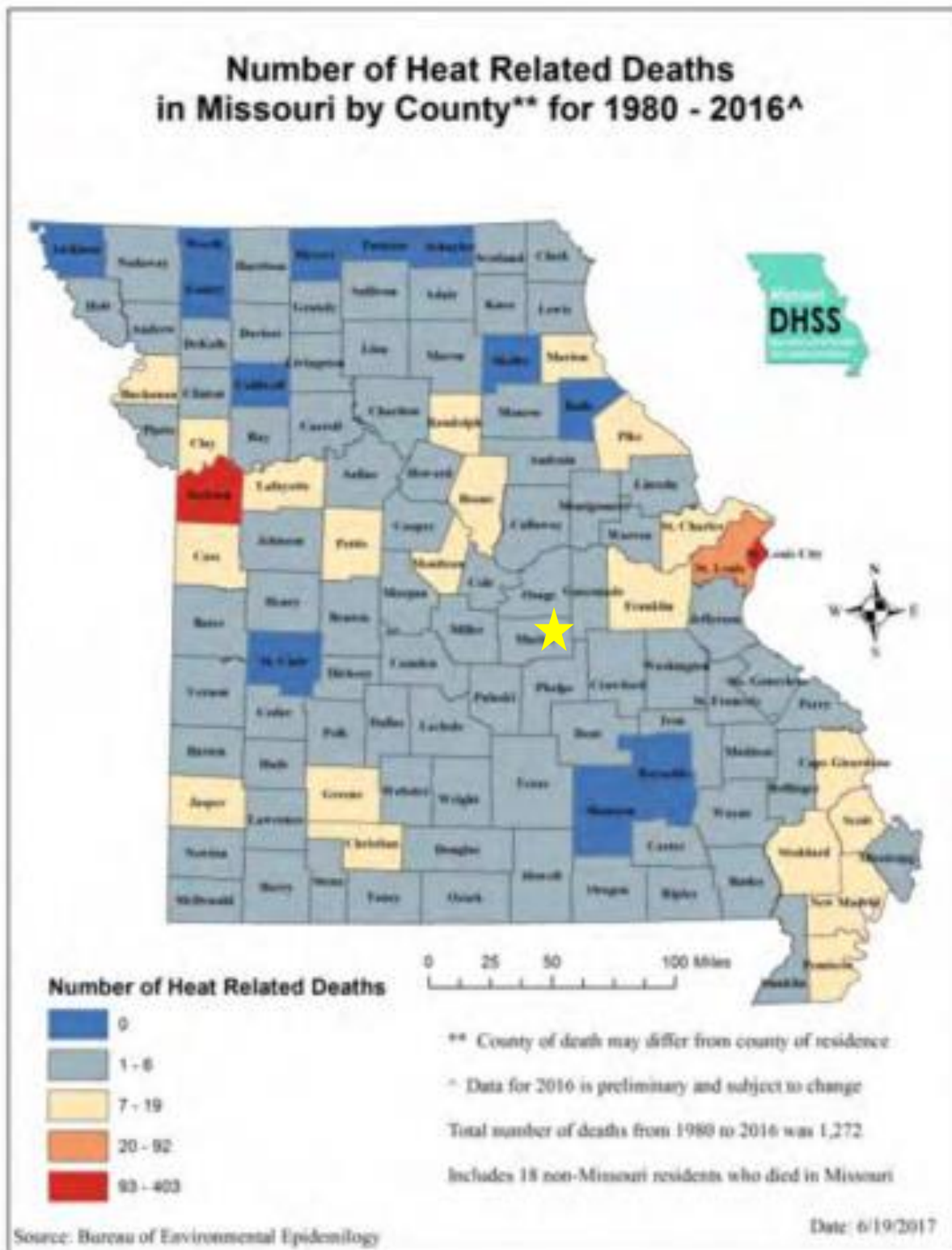
Table 3.34 provides data in relation to record heat events between 1998 and 2018 in Maries County. Maximum heat index values and temperatures are shown for each extreme temperature event. Fortunately, there were zero recorded injuries and fatalities during this time. In addition, **Figure 3.25** illustrates heat related deaths by county in Missouri between 1980 and 2016.

Table 3.34. Maries County Recorded Heat Events 1998 – 2017

Month, Year	# of Event Days	Fatalities	Injuries	Temperature (F°)	Heat Index Values (F°)
7/23/1999	9	0	0	95+	105-115
8/01/1999	18	0	0	95+	100+
8/27/2000	5	0	0	100+	100-110
9/01/2000	4	0	0	100	100+
7/17/2001	15	0	0	90-100	100-110
8/01/2001	9	0	0	-	100-110
6/01/2012	30	0	0	90+	100+
7/01/2012	31	0	0	100	104+
8/01/2012	31	0	0	90+	106
Total	152	0	0	-	-

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

Figure 3.25. Heat Related Deaths in Missouri 2000 - 2016



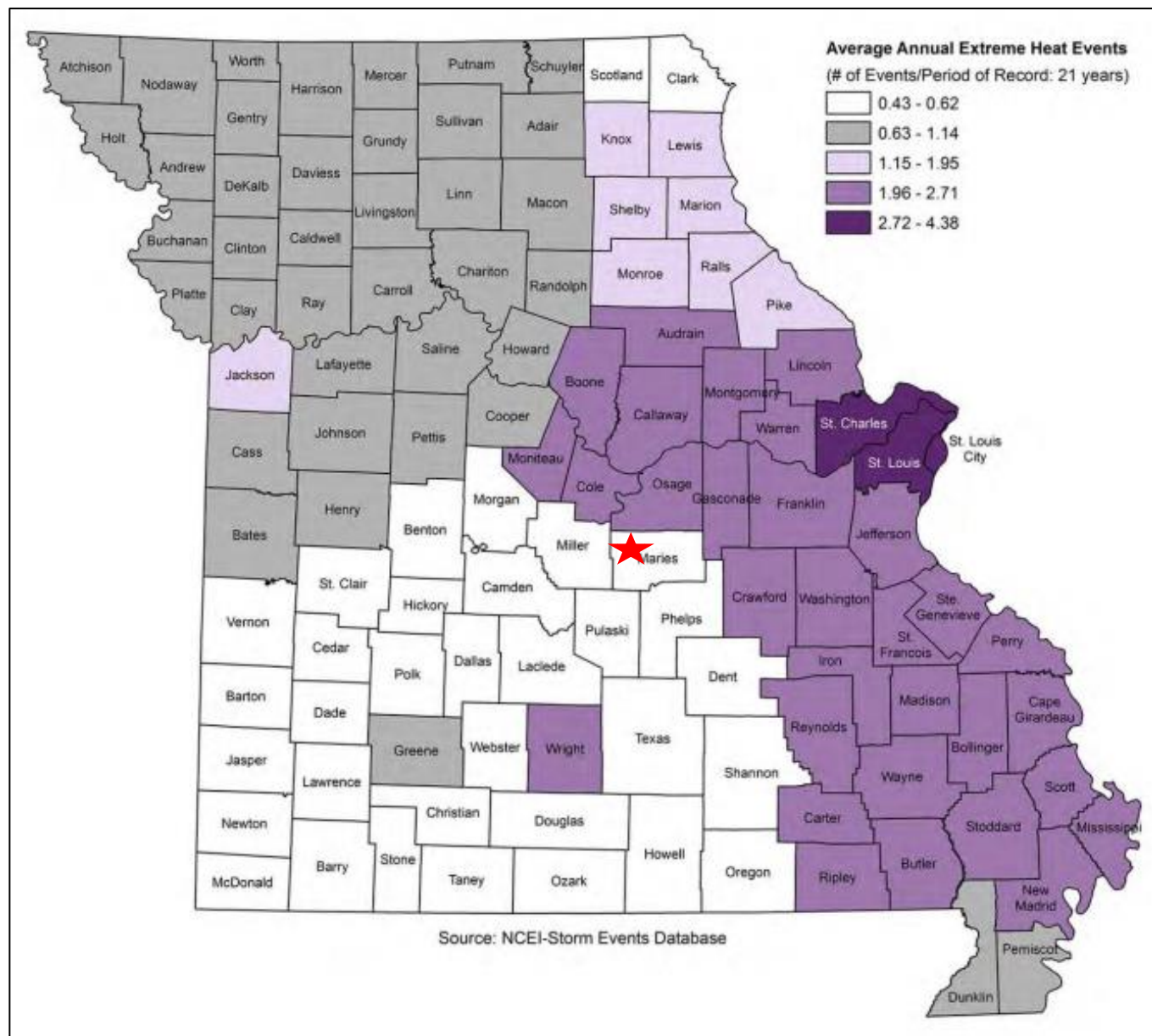
Source: <https://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/stat-report.pdf>

*Yellow star indicates Maries County

Probability of Future Occurrence

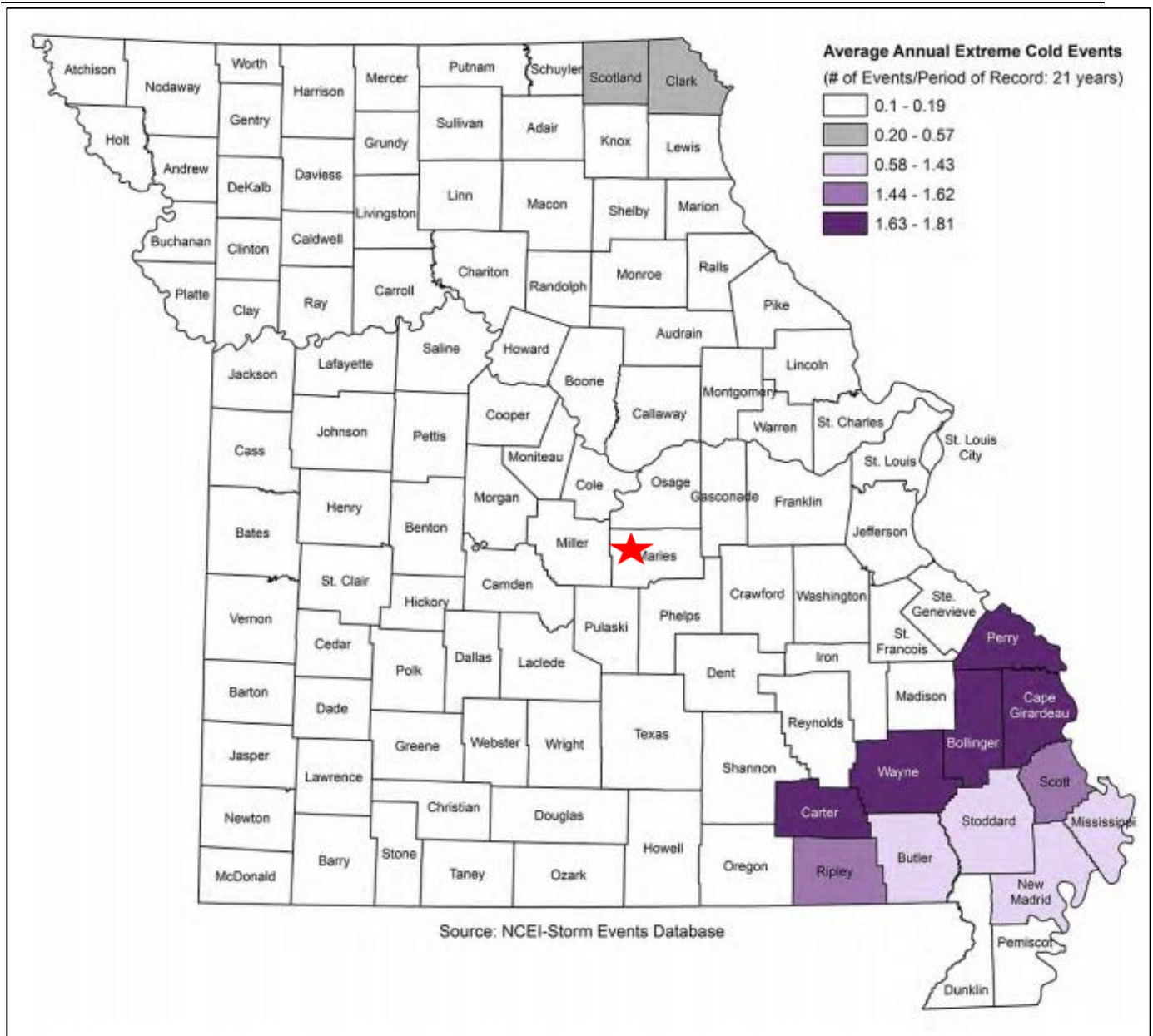
Figure 3.26 illustrates the average annual occurrence for extreme heat statewide. Based on information provided in the 2018 Missouri State Hazard Mitigation Plan, Maries County has an average of .43 to .62 events per year based on data from 21 years. **Figure 3.27** illustrates the average annual occurrence for extreme cold statewide. Maries County has an average of 0.1 to 0.19 events per year based on data from 21 years. It should be noted that there are data limitations due to underreporting of extreme heat and cold events.

Figure 3.26. Average Annual Occurrence for Extreme Heat



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

Figure 3.27. Average Annual Occurrence for Extreme Cold



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

Changing Future Conditions Considerations

According to the 2018 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 21st 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 3.35** shows the typical health impacts of extreme heat. 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 heat (**Table 3.38**). People who are overweight, ill or on certain medication can also be more vulnerable to high temperatures. Unincorporated Maries County has an estimated 20.1 percent of individuals are 65 or older. The city of Belle had the lowest number of older residents with 15.3 percent aged 65 and over. Vienna had the highest rate overall with 25.6 percent of residents falling into the 65 and older category. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather. The exposure to extreme temperatures of farm workers and livestock is also a major concern.

Table 3.35. Typical Health Impacts of Extreme Heat

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

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

The 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, 2016), total population and percentage of population over 65 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. 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 3.36 shows the population, percent of population over 65 and social vulnerability index data for Maries County overall.

Table 3.36. Population, Percent of Population Over 65 and SOVI Data for Maries County

County	Total Population (2015 ACS)	Total Population Rating	Percentage of Population Over 65	Percent of Population Over 65 Rating	SOVI Ranking	SOVI Rating
Maries	9,201	1	19.5	3	Medium High	4

Source: 2018 Missouri Hazard Mitigation Plan

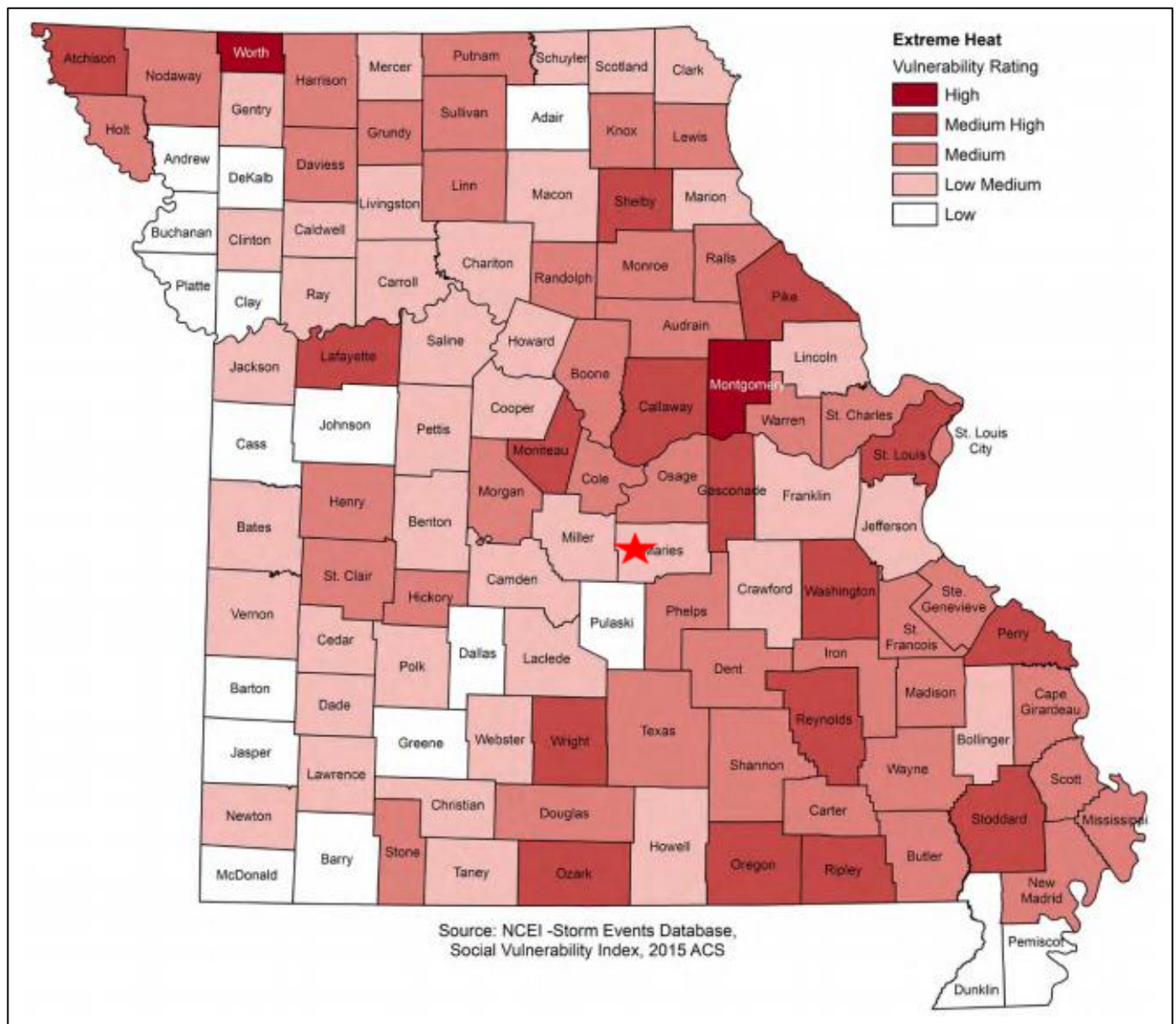
Table 3.37 illustrates the likelihood of occurrence and overall vulnerability rating for extreme temperatures for Maries County. **Figure 3.28** and **Figure 3.29** provide a vulnerability summary for extreme heat and extreme cold, respectively. Maries County has Low-medium vulnerability for extreme heat and Medium vulnerability for extreme cold.

Table 3.37. 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	0.52	1	9	Low Medium	3	0.14	1	9	Medium

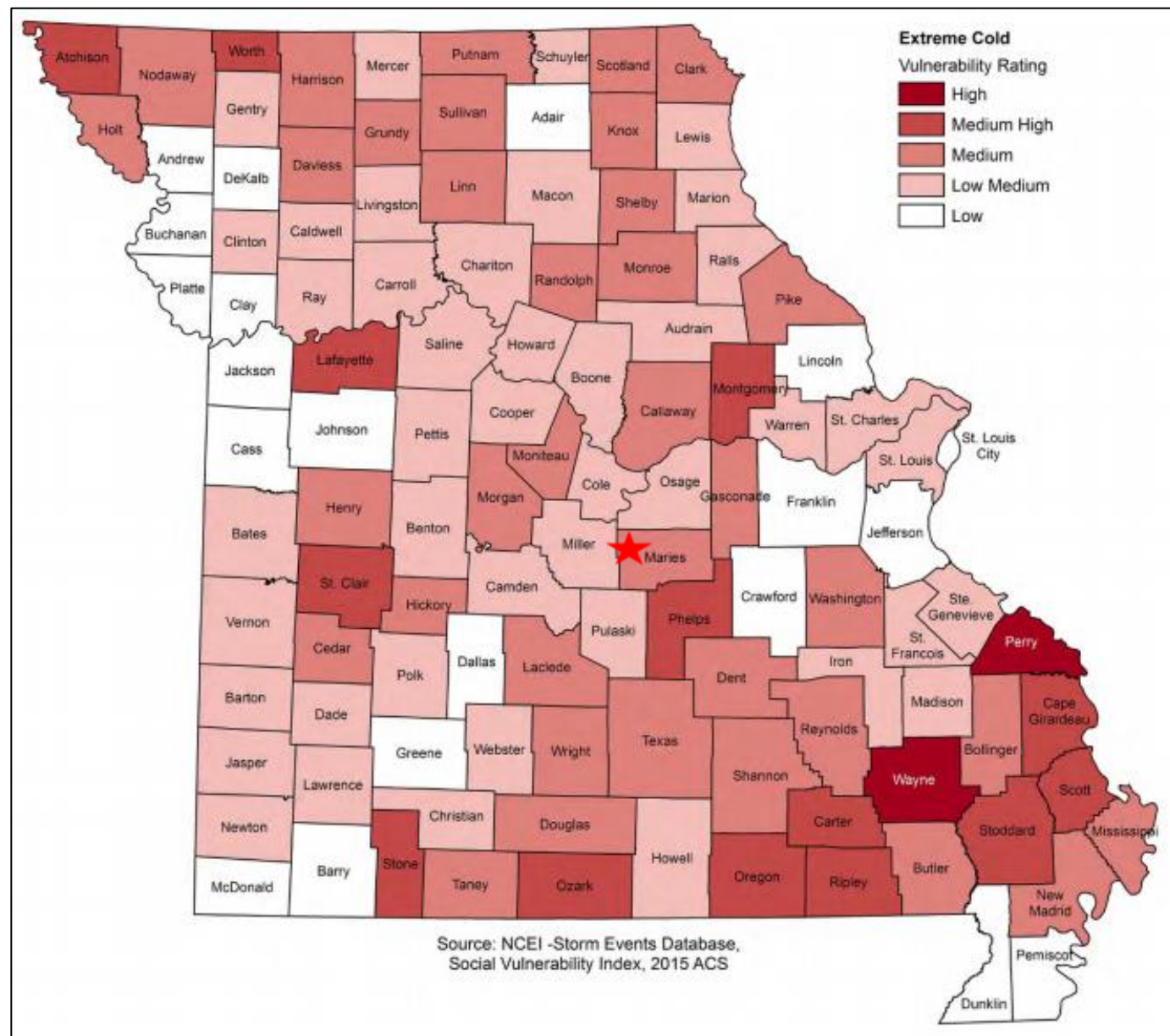
Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.28. Vulnerability Summary for Extreme Heat



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

Figure 3.29. Vulnerability Summary for Extreme Cold



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

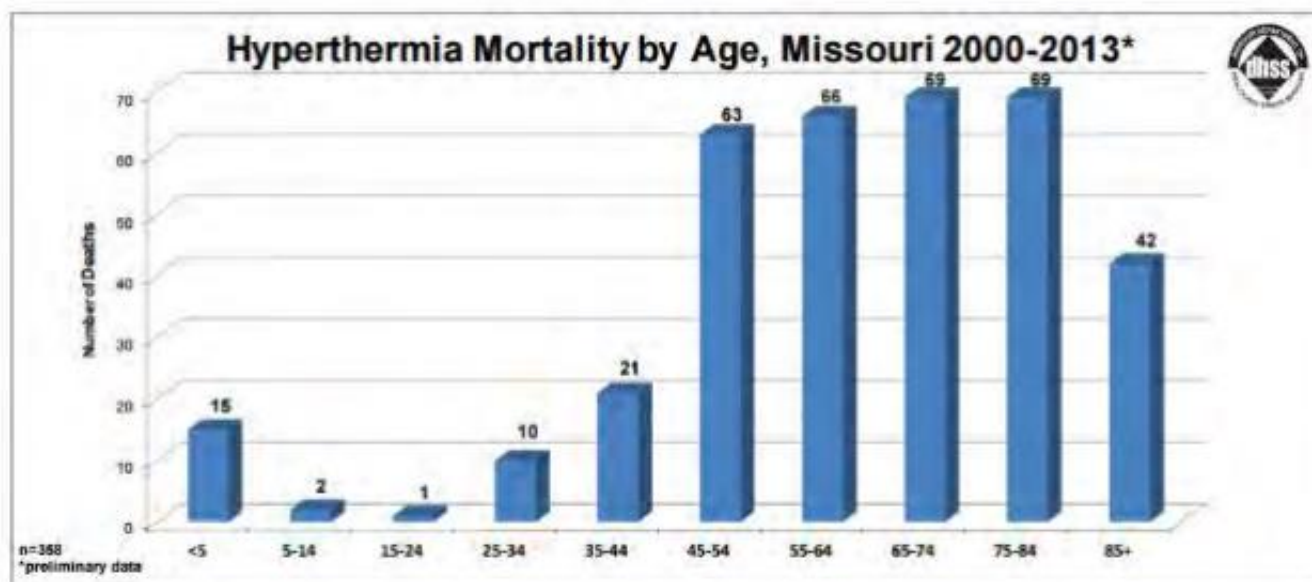
Potential Losses to Existing Development

Extreme Heat/Heat Wave

Of greatest concern during extreme heat events are hyperthermia injuries and deaths. The 2018 Missouri Hazard Mitigation plan states that there were 358 heat-related deaths reported in Missouri from 2000 through 2013. There were 217 (61%) deaths in the metropolitan areas of Kansas City and St. Louis and 141 (39%) deaths in rural parts of the state. Half of the deaths were 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 further increases their risk. Deaths among children under

the age of five are often linked to being left in vehicles during hot weather. Between 2000 and 2013 there were 15 (4%) 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. **Figure 3.30** shows the hyperthermia mortality rate by age for the 2000-2013 timeframe.

Figure 3.30. Hyperthermia Mortality of Age, Missouri 2000-2013



Source: Missouri DHSS, <http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper4.pdf>

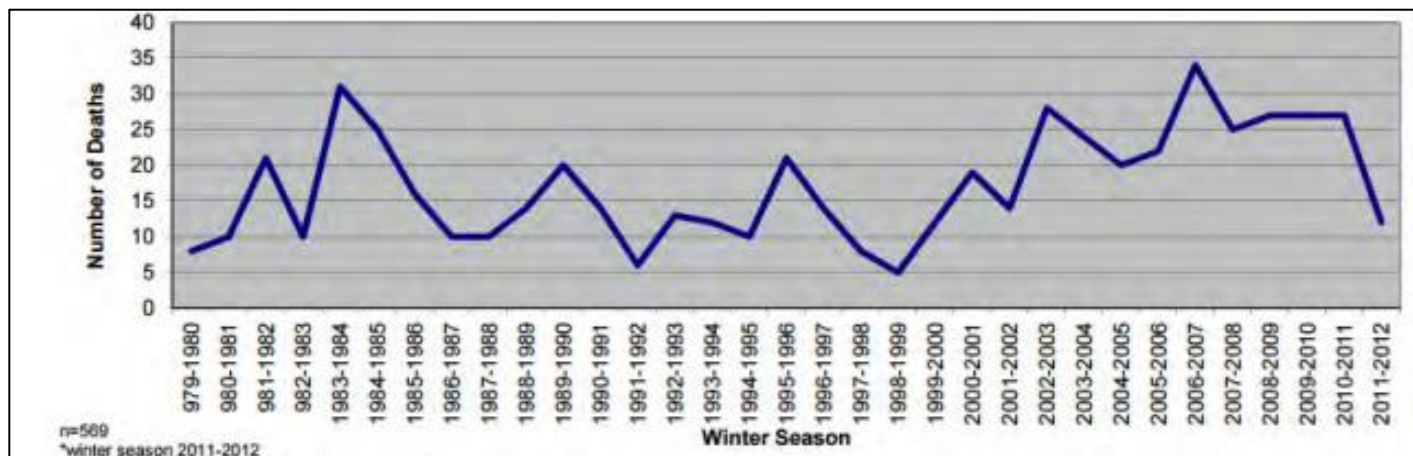
During extreme heat events structural, road, and electrical infrastructure are vulnerable to damages. Depending upon temperatures and duration of extreme heat, losses will vary.

Extreme Cold

According to the Missouri Department of Health and Senior Services, 569 people died in Missouri due to extreme cold conditions between 1979 and 2012, see **Figure 3.31**. 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 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%) of the 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 3.31. Hypothermia Deaths, Missouri: Winter Seasons 1979-2012



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

Impact of Future Development

Population trends from 2000 to 2017 for Maries County and the cities of Belle and Vienna indicate that the population in unincorporated areas has fallen by an estimated 5.1 percent. The city of Belle's population has increased by a significant 28.2 percent. The city of Vienna has grown by 5.3 percent. Population growth can result in increased age groups that are more susceptible to extreme heat and cold. Additionally, as populations increase, so does the strain on each jurisdiction's electricity and road infrastructure. Local government and local emergency management should take extreme heat and cold in consideration when upgrades occur to the local power grid.

Hazard Summary by Jurisdiction

Those at greatest risk for heat-related illness and deaths include children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications or have medical conditions that make them more vulnerable. To determine jurisdictions within the planning area with populations more vulnerable to extreme heat, demographic data was obtained from the 2013-2017 census on population percentages in each jurisdiction comprised of those under age 5 and over age 65. Data was not available for overweight individuals and those on medications vulnerable to extreme heat or with medical conditions that made them more vulnerable. **Table 3.38** 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 3.38. County Population Under Age 5 and Over Age 65 (2012-2016)

Jurisdiction	Population Under 5 Years	Population 65 Years and over
Incorporated Maries County	4.6%	20.1%
Belle	5.8%	15.3%
Vienna	6.8%	25.6%

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Due to lack of data, strategic buildings that lack air-conditioning could not be analyzed for this report.

Additionally, school policy data 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. Maries County and the city of Vienna have a high percentage of individuals 65 and over, 20.1 percent and 25.6 percent respectively.

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 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 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

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

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, unincorporated Maries County and the city of Vienna have the highest risk because both have large populations of people aged 65 and over (**Table 3.38**).

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.

3.4.5 Wildfires

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
- Missouri Department of Conservation Wildfire Data Search at
<http://mdc4.mdc.mo.gov/applications/FireReporting/Report.aspx>
- Statistics, Missouri Division of Fire Safety;
- National Statistics, US Fire Administration;
- Fire/Rescue Mutual Aid Regions in Missouri;
- Forestry Division of the Missouri Dept. of Conservation;
- National Fire Incident Reporting System (NFIRS),
<http://www.dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.php>
- Firewise, www.firewise.org
- University of Wisconsin Slivis Lab, http://silvis.forest.wisc.edu/maps/wui_main
- 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 700 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. However, there are no National Forest lands in Maries County.

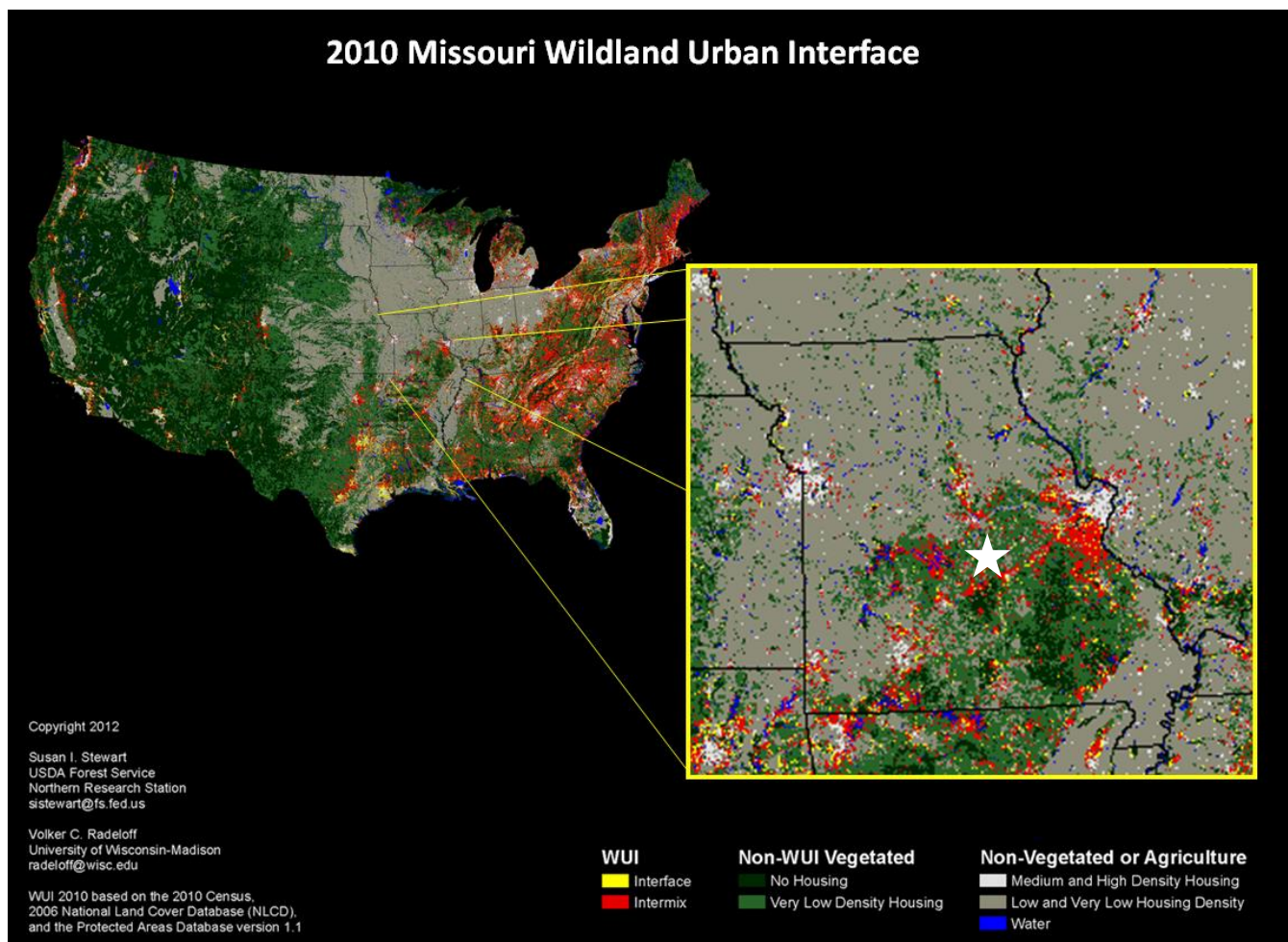
Most of Missouri fires occur during the spring season between February and May. The length and severity of both structural and wildland fires depend largely on weather conditions. Each year, an average of about 3,200 wildfires burn more than 52,000 acres of forest and grassland in Missouri. Spring in 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 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

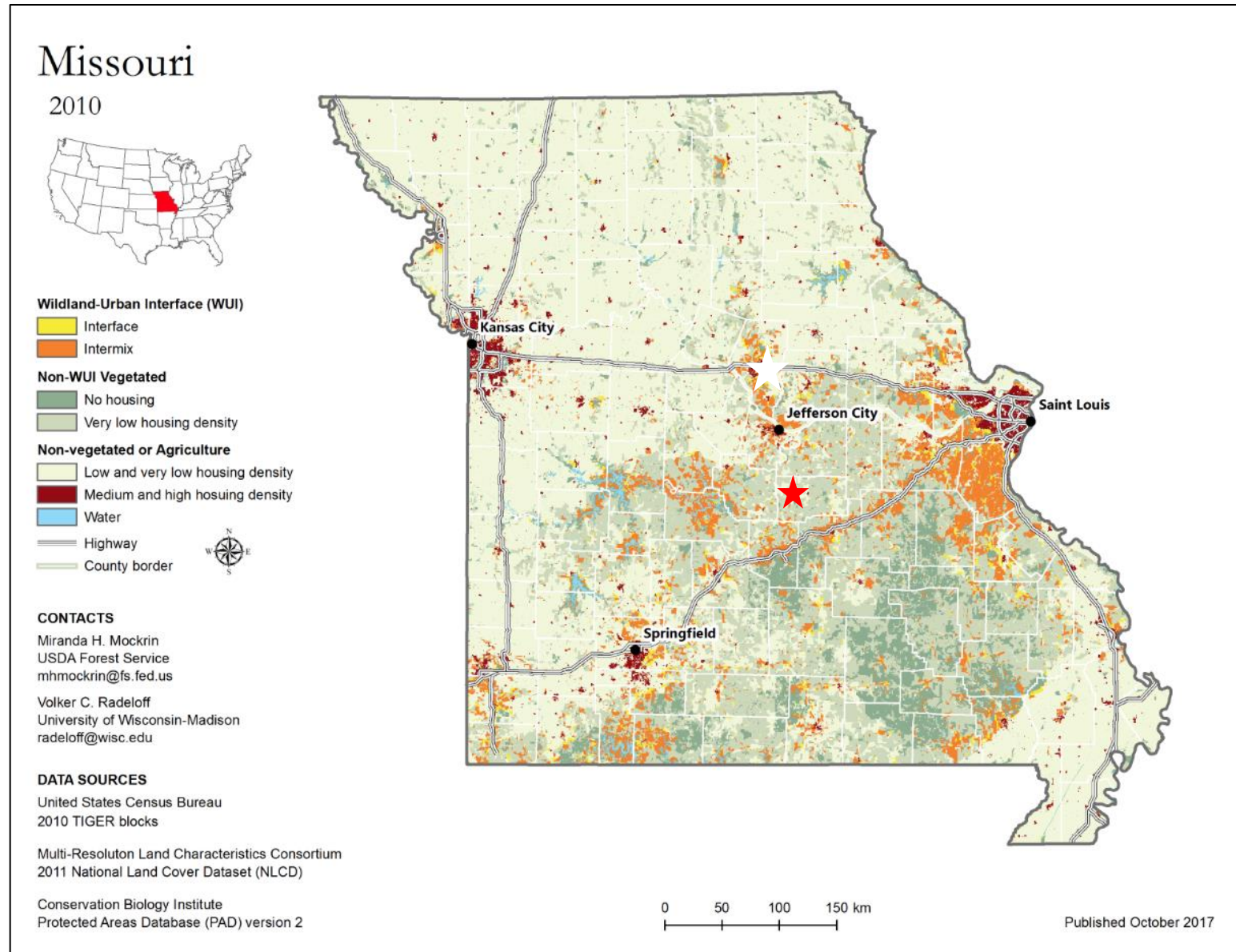
The risk of wildfire does not vary widely across the planning area. However, damages due to wildfires are expected to be higher in communities with more wildland–urban interface (WUI) areas. WUI refers to the zone of transition between unoccupied land and human development and needs to be defined in the plan. Within the WUI, there are two specific areas identified: 1) Interface and 2) Intermix. The interface areas are those areas that abut wildland vegetation and the Intermix areas are those areas that intermingle with wildland areas (**Figure 3.32**). To determine specific WUI areas and variations, data was obtain from ArcGIS, Streets and SILVIS (**Figure 3.33**). According to the WUI area map of Maries County, Both Belle and Vienna partially reside in a WUI area.

Figure 3.32. 2010 Missouri Wildland Urban Interface (WUI)



Source: <http://silvis.forest.wisc.edu/maps/wui/>; White star roughly estimates Maries County's location

Figure 3.33. Maries County Wildlife Urban Interface



Source: http://silvis.forest.wisc.edu/GeoData/WUI_cp12/maps/gifs/white/Missouri_WUI_cp12_white_2010.gif; *Red star indicates Maries County

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 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 2000 and 2018 there were 280 wildfires reported in Maries County, according to wildfire reporting to the Missouri Department of Conservation³². This is an average of 15.5 wildfires per year. The size of the fires varied from as small as .1 acre to as large as 500 acres. **Table 3.39** shows the cause of wildfires, number of wildfires and acres burned for the period 2000-2018. Debris fires account for the largest number of fires and the greatest number of acres burned.

Table 3.39. 2000-2018 Maries County Wildfires by Cause

Cause	Number	Acres	% Number	% Acres
Equipment	19	143.64	8%	3%
Debris	117	2,115.1	42%	47%
Arson	4	7.1	1%	<1%
Unknown	40	162.95	14%	4%
Unreported	4	232	1%	5%
Miscellaneous	96	1,864.96	34%	41%
Totals	280	4,525.75	100%	100%

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

³² <http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx>

Probability of Future Occurrence

From the data obtained from the Missouri Department of Conservation³³ (Appendix: F), 565 wildfire events occurred in Maries County between 2000 and 2018. This information was utilized to determine the annual average percent probabilities of wildfires. Since multiple occurrences are anticipated per year (280 events/19 years), the probability of wildfires per year is 100% with an average of 14.73 events per year **Table 3.41**.

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

Location	Annual Avg. % P	Avg. Number of Events
Maries County	100%	14.73

*P = probability; see page 3.24 for definition.

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.³⁴

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.³⁵

Vulnerability

Vulnerability Overview

According to the 2018 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 17.77 wildfires per year, impacting 330 acres (**Table 3.41**).

The state plan also indicates that Maries County is at the lowest possible likelihood for building damage from wildfires – likely from the low population numbers in the county. **Figure 3.34** illustrates the likelihood of wildfire events based on data from 2004-2016. **Figure 3.34** provides a

³³ <http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx>

³⁴ 2018 Missouri Hazard Mitigation Plan

³⁵ Ibid

map that illustrates the average annual acreage burned.

Table 3.41. Statistical Data for Wildfire Vulnerability in Maries County

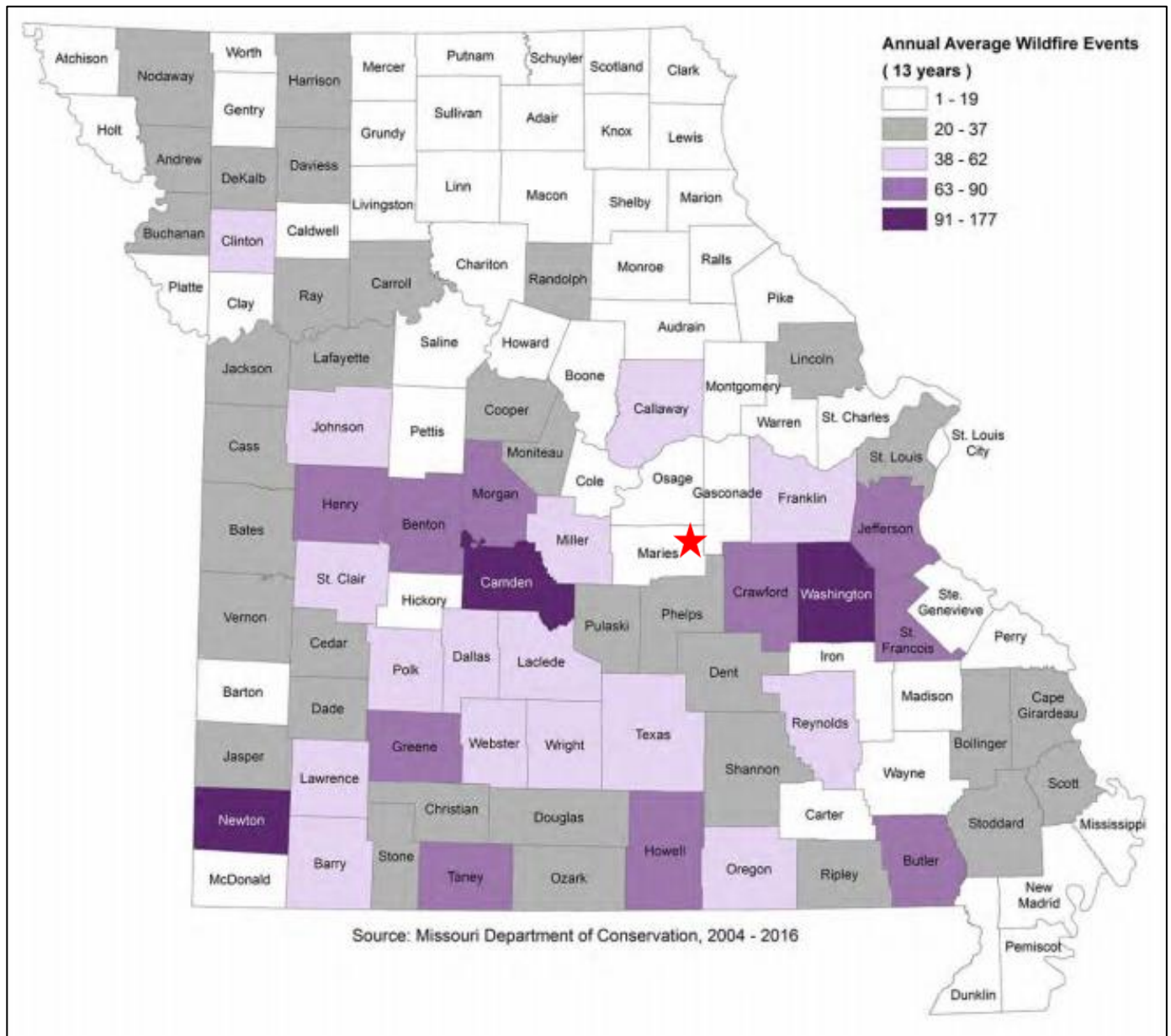
Number of Wildfires 2004-2016	Likelihood of Occurrence (#/year)	Total Acres Burned	Average Annual Acreage Burned
231	17.77	4,289.73	330

Source: 2018 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), HAZUS building exposure value data and wildland urban interface and intermix area data from the University of Wisconsin-Madison SILVIS Lab.

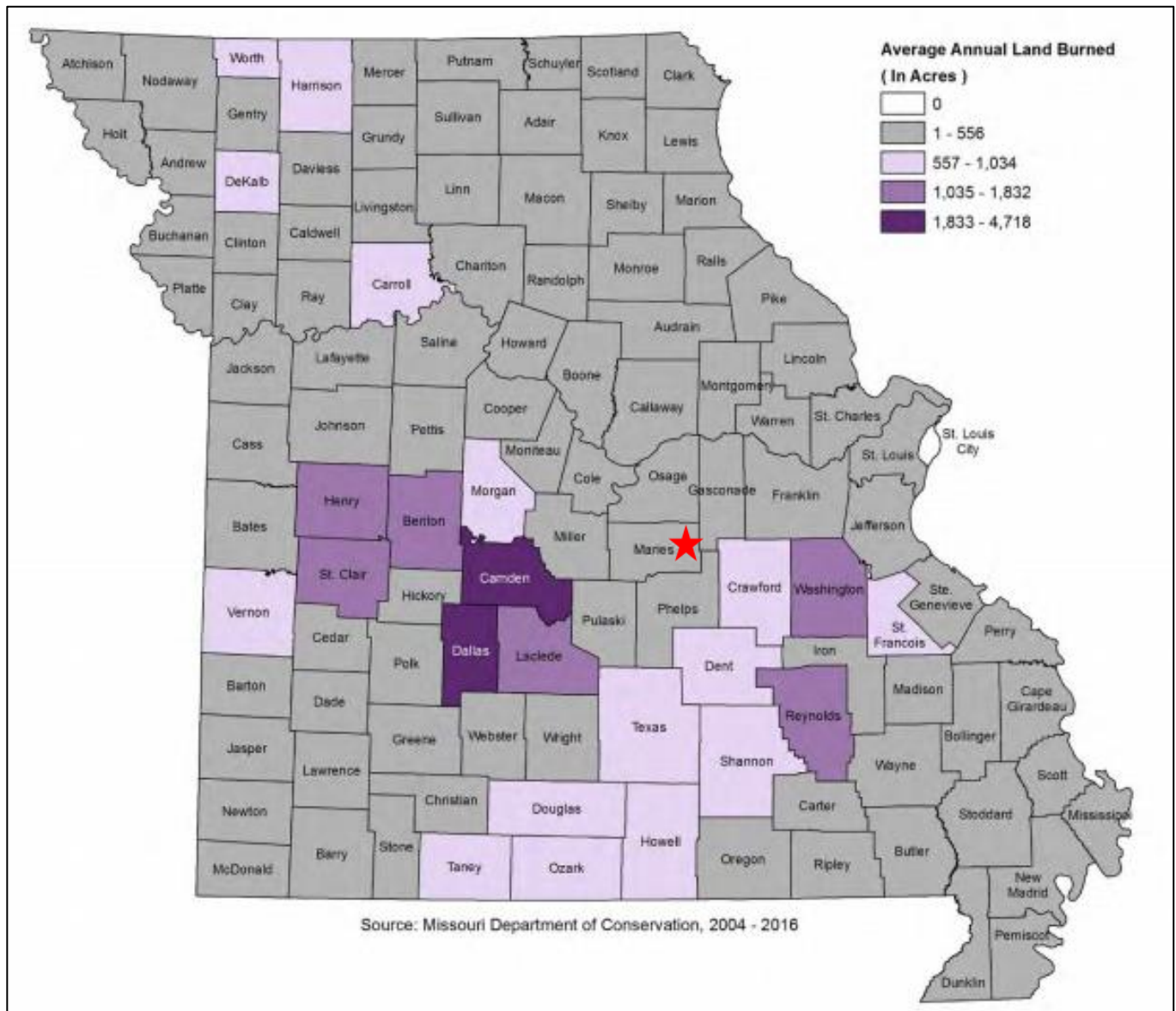
The results of that analysis, including estimated number of structures, value of structures and population are illustrated in **Table 3.42**. The total estimated number of structures vulnerable to wildfires is 1,761. The overall value of structures vulnerable to wildfire in Maries County is estimated at \$391,873,122. To further illustrate vulnerability in Maries County, maps from the 2018 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 3.36**. Maries County shows that it has fewer the 3,217 structures within these areas. **Figure 3.37** shows the estimated value of structures in the WUI interface and intermix areas. **Figure 3.38** illustrates the number of people at risk to wildfire in the WUI interface and intermix areas.

Figure 3.34. Likelihood of Wildfire Events, 2004-2016



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

Figure 3.35. Average Annual Acreage Burned



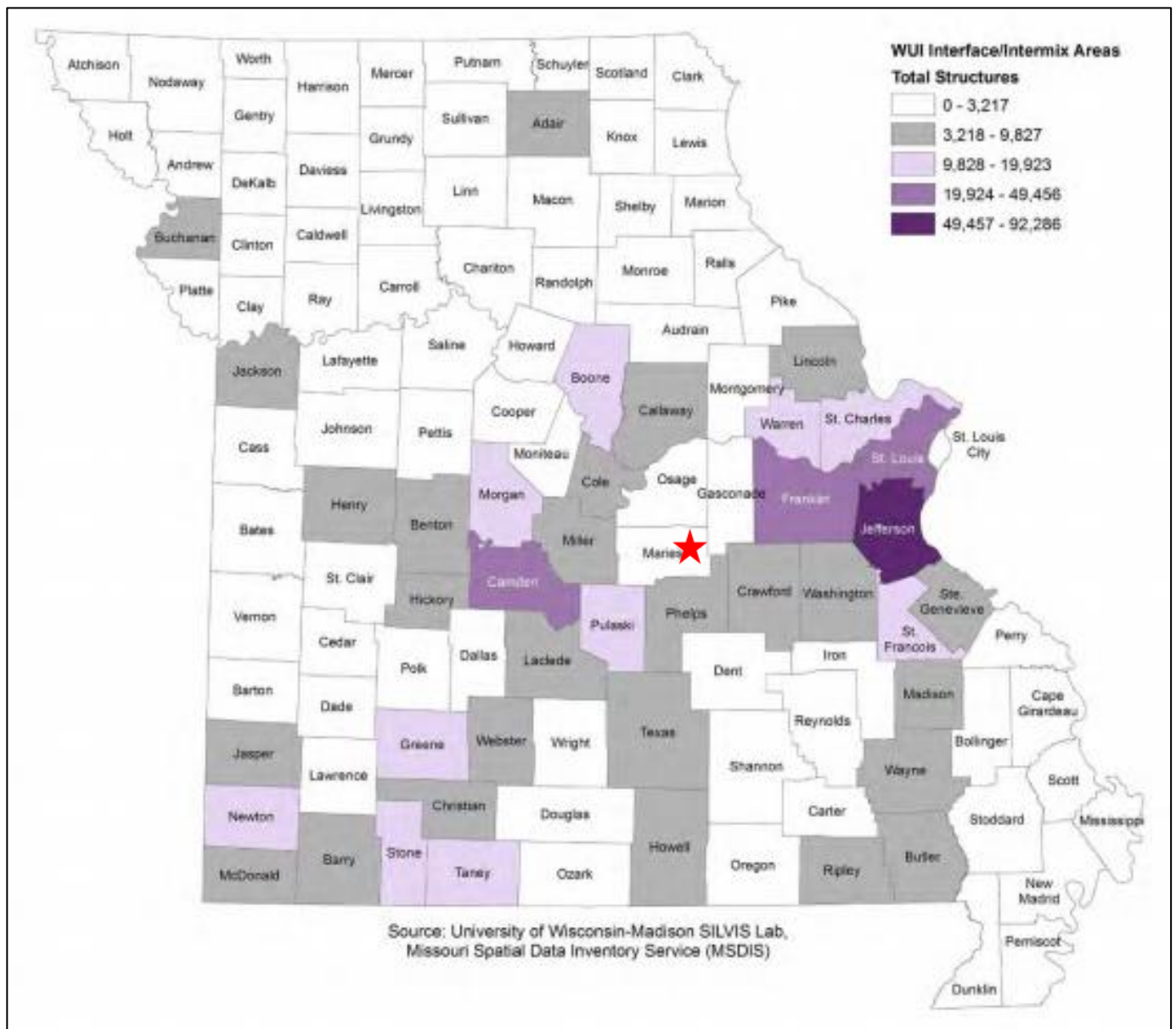
Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Maries County,

Table 3.42. Estimated Numbers and Values of Structures and Population Vulnerable to Wildfire in Maries County

Maries County	Number of Structures	Value of Structures	Population
Agriculture	436	\$89,982,245	
Commercial	141	\$83,370,713	
Education	2	\$2,847,429	
Government	3	\$1,552,200	
Industrial	2	\$3,096,389	
Residential	1,183	\$211,024,147	
Totals	1,767	\$391,873,122	2,839

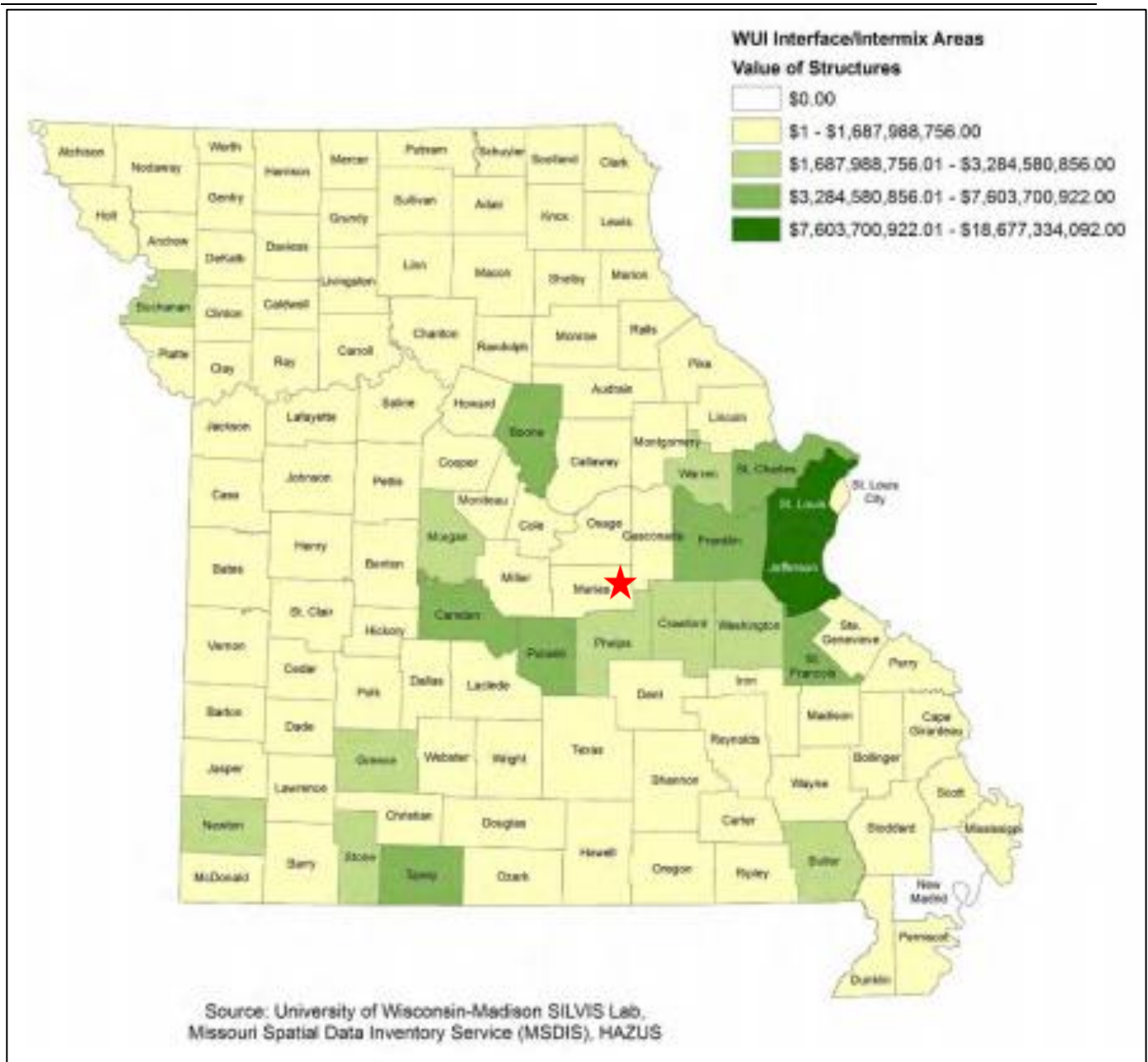
Source: 2018 Missouri State Hazard Mitigation Plan

Figure 3.36. Number of Structures in WUI Interface and Intermix Areas



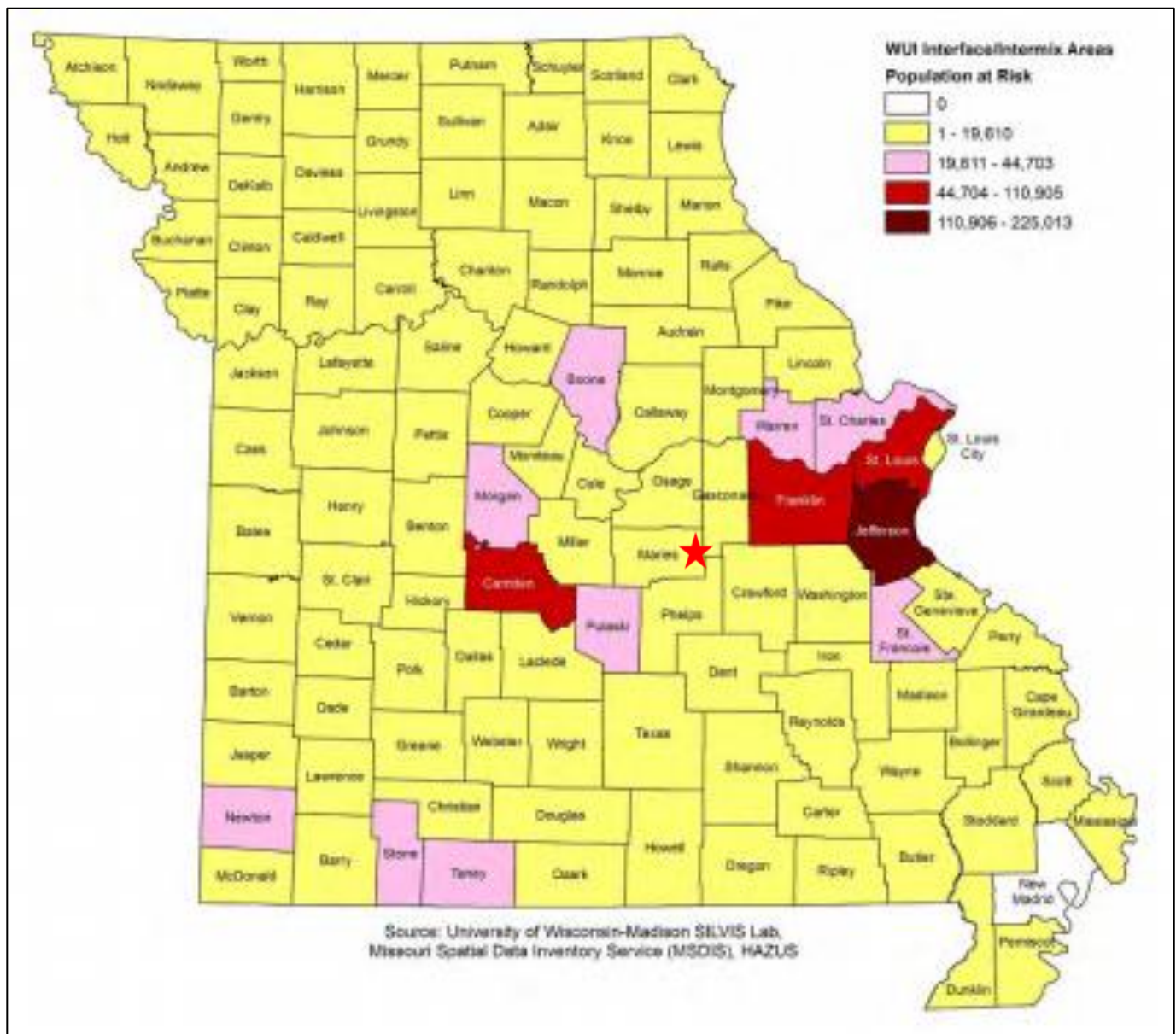
Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County,

Figure 3.37. Value of Structures in the WUI Interface and Intermix Areas



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

Figure 3.38. Population at Risk to Wildfire in WUI Interface and Intermix Areas



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

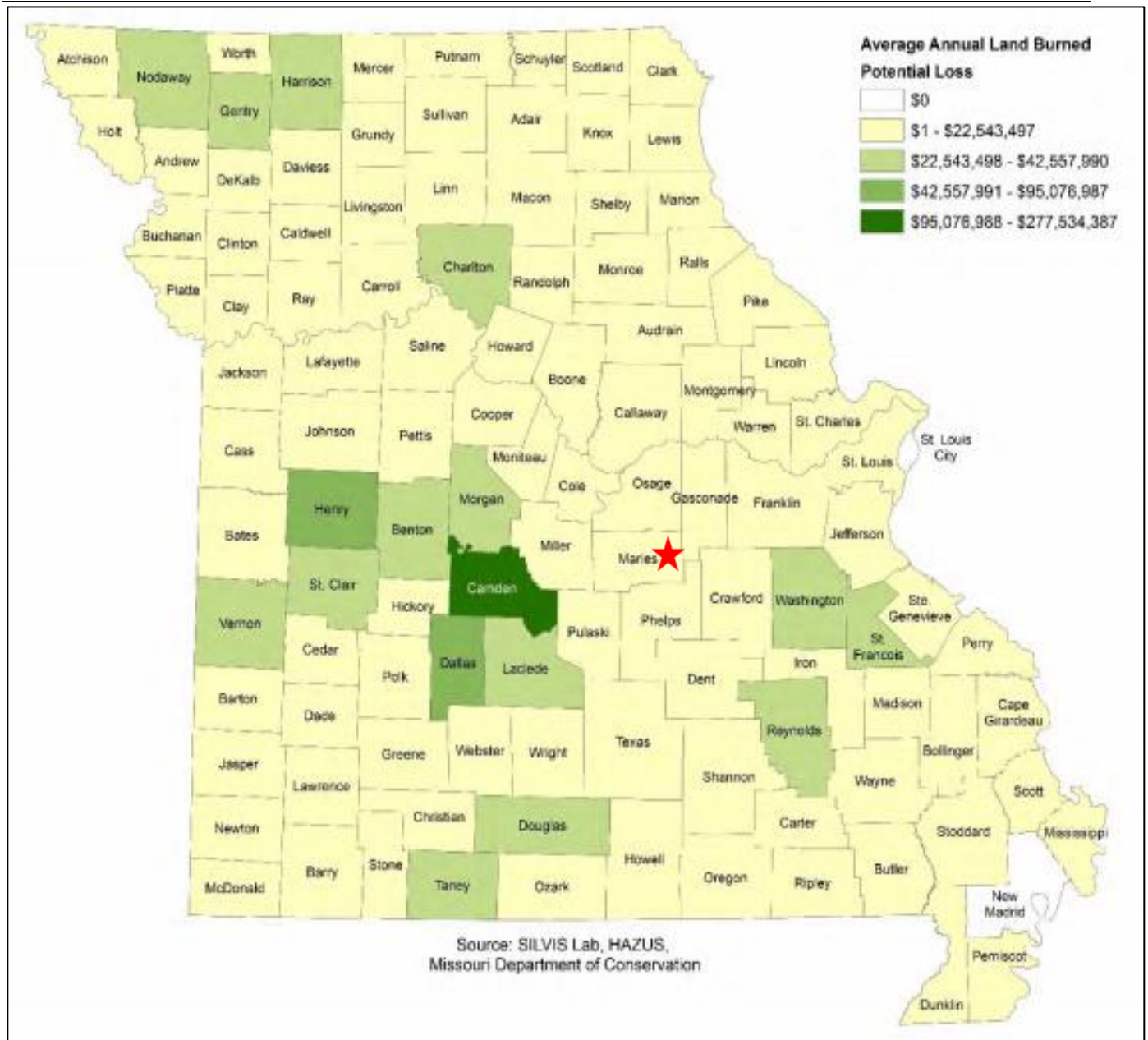
Potential Losses to Existing Development

As there was not data available on Maries County specific losses, data was used from the 2018 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 3.43** and **Figure 3.39** that follows provide the potential loss figures for Maries County based on this methodology.

Table 3.43. 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
18,145.4	\$391,873,122	\$21,596	330	\$7,126,773

Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.39. Annualized Wildfire Damages

Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

Impact of Future Development

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

Hazard Summary by Jurisdiction

As long as drought conditions are not severe, future wildfires in Maries County should have a negligible adverse impact on the community, as it would affect a small percentage of the population. 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. Both cities and school districts are in WUI areas, but are closer to fire services.

Problem Statement

An estimated 1,767 structures and 2,839 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.

3.4.6 Flooding (Flash and River)

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
- Watershed map, Environmental Protection Agency,
http://cfpub.epa.gov/surf/county.cfm?fips_code=19169
- FEMA Map Service Center, Digital Flood Insurance Rate Maps (DFIRM) for all jurisdictions, if available, msc.fema.gov/portal
- NFIP Community Status Book, <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book>
- NFIP claims status, BureauNet, <http://bsa.nfipstat.fema.gov/reports/reports.html>
- Flood Insurance Administration—Repetitive Loss List (this must be requested from the State Floodplain Management agency or FEMA)
- National Centers for Environmental Information, Storm Events Database,
<http://www.ncdc.noaa.gov/stormevents/>
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- FEMA Data Visualization Tool, <https://www.fema.gov/data-visualization-floods-data-visualization>
- 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 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). Below are FIRMs for unincorporated Maries County, Belle and Vienna (**Figure 3.40 through Figure 3.46**). Digital data for SFHAs is not available. **Table 3.44** shows Maries County NCEI flood events by location between 1998 and 2017.

Figure 3.40. Maries County, Missouri Special Flood Hazard Areas (SFHAs)

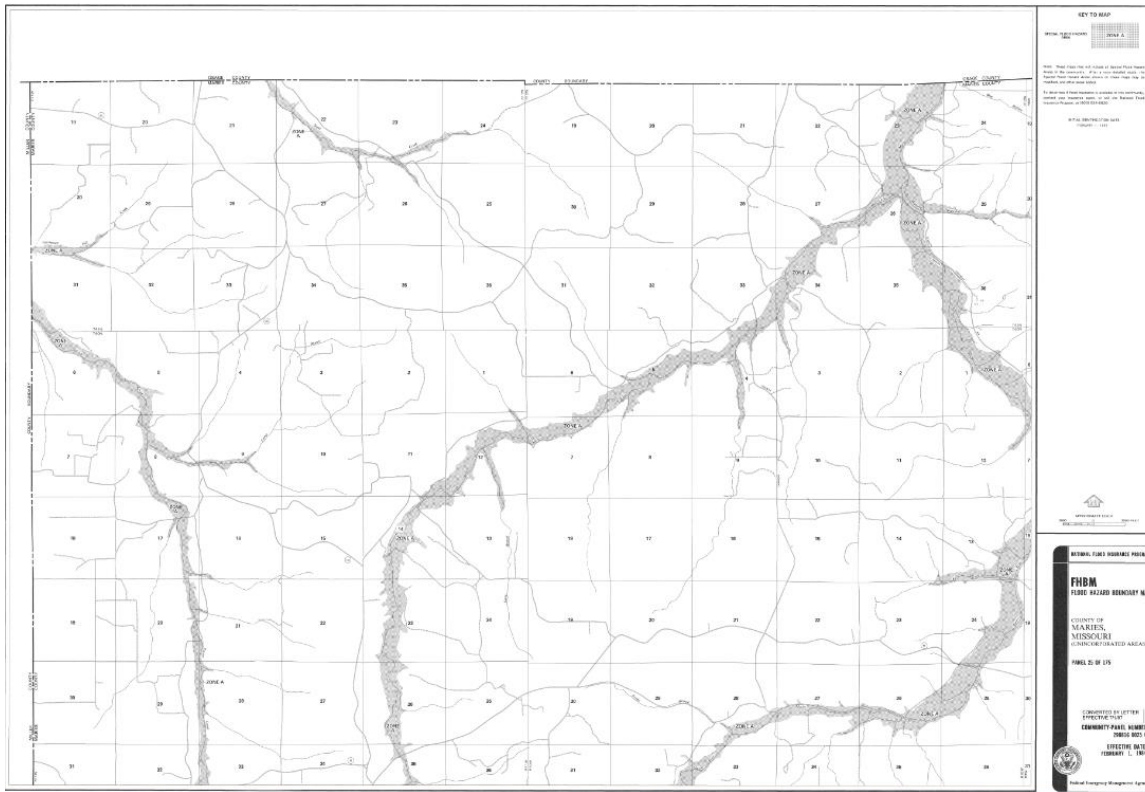


Figure 3.41. Maries County and City of Vienna, Missouri Special Flood Hazard Areas (SFHAs)

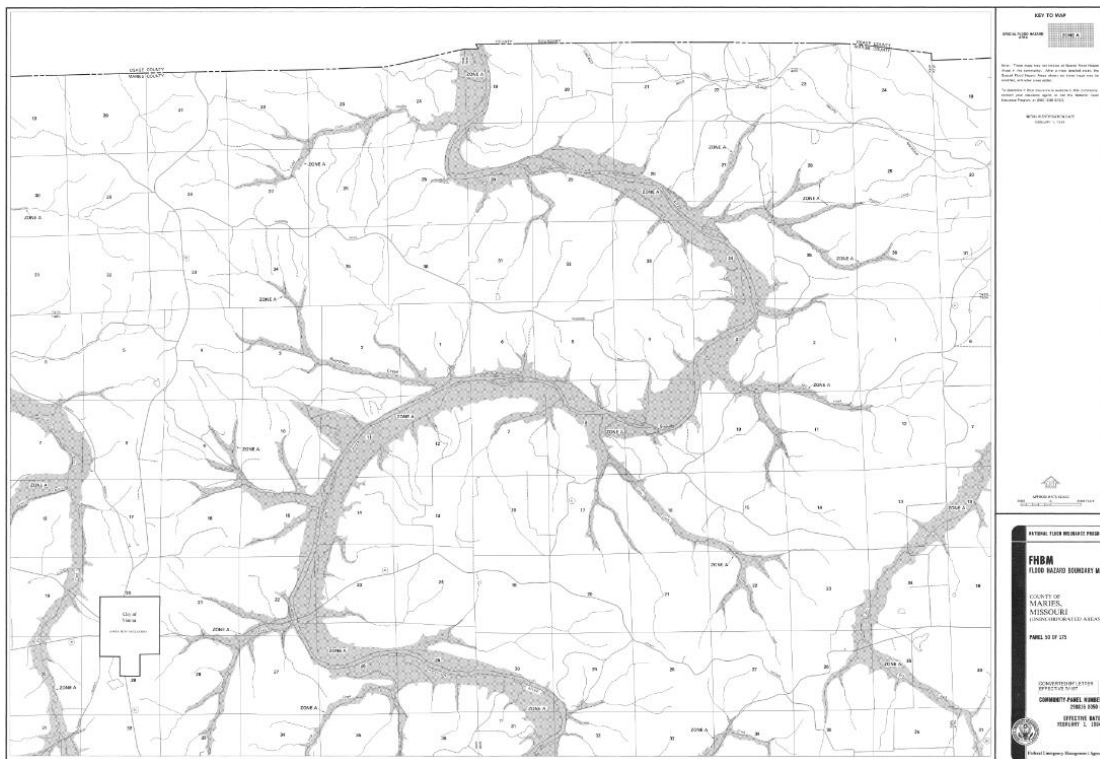
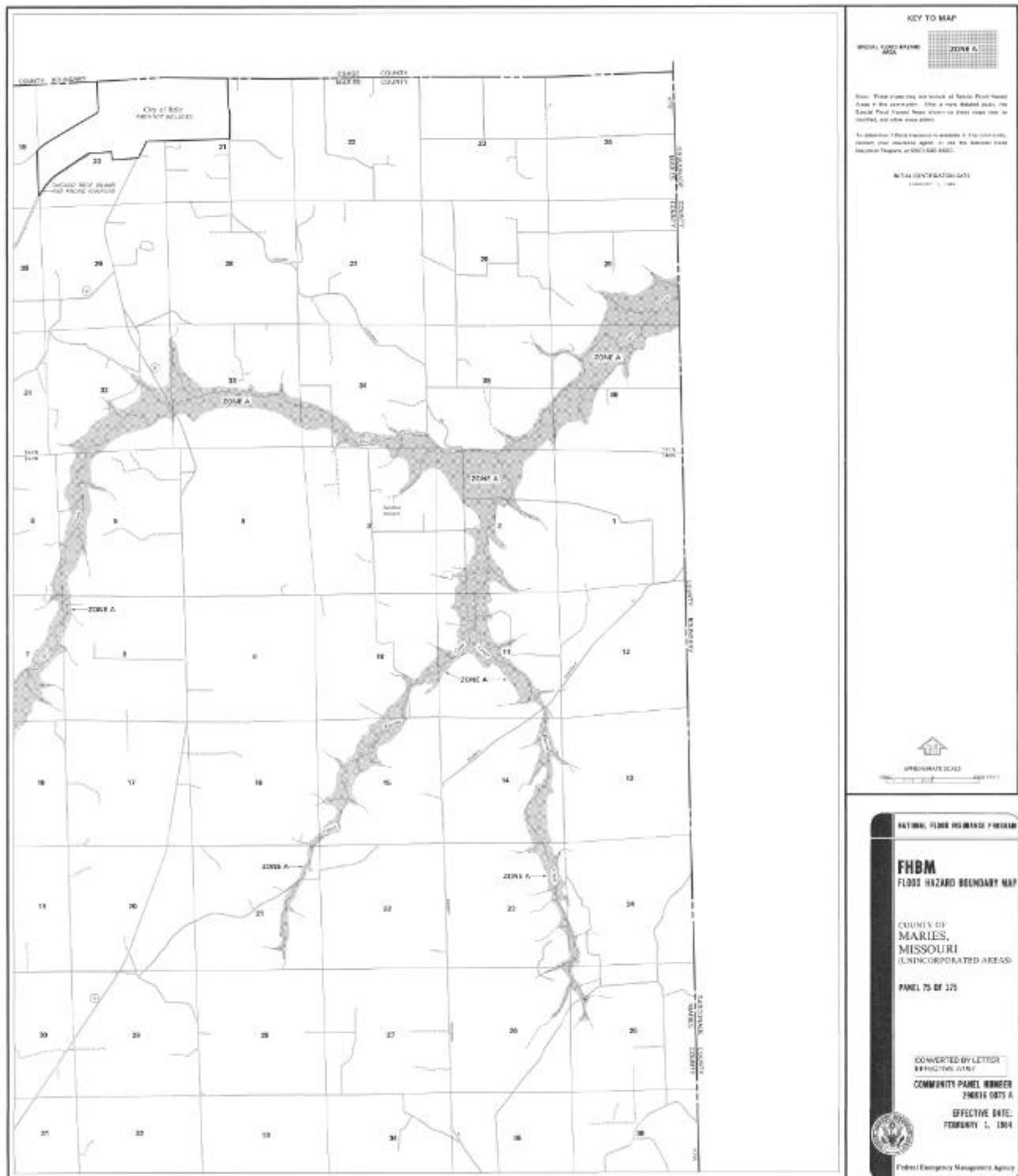


Figure 3.42. Maries County and City of Belle, Missouri Special Flood Hazard Areas (SFHAs)



[illegible]

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Figure 3.45. Maries County, Missouri Special Flood Hazard Areas (SFHAs)

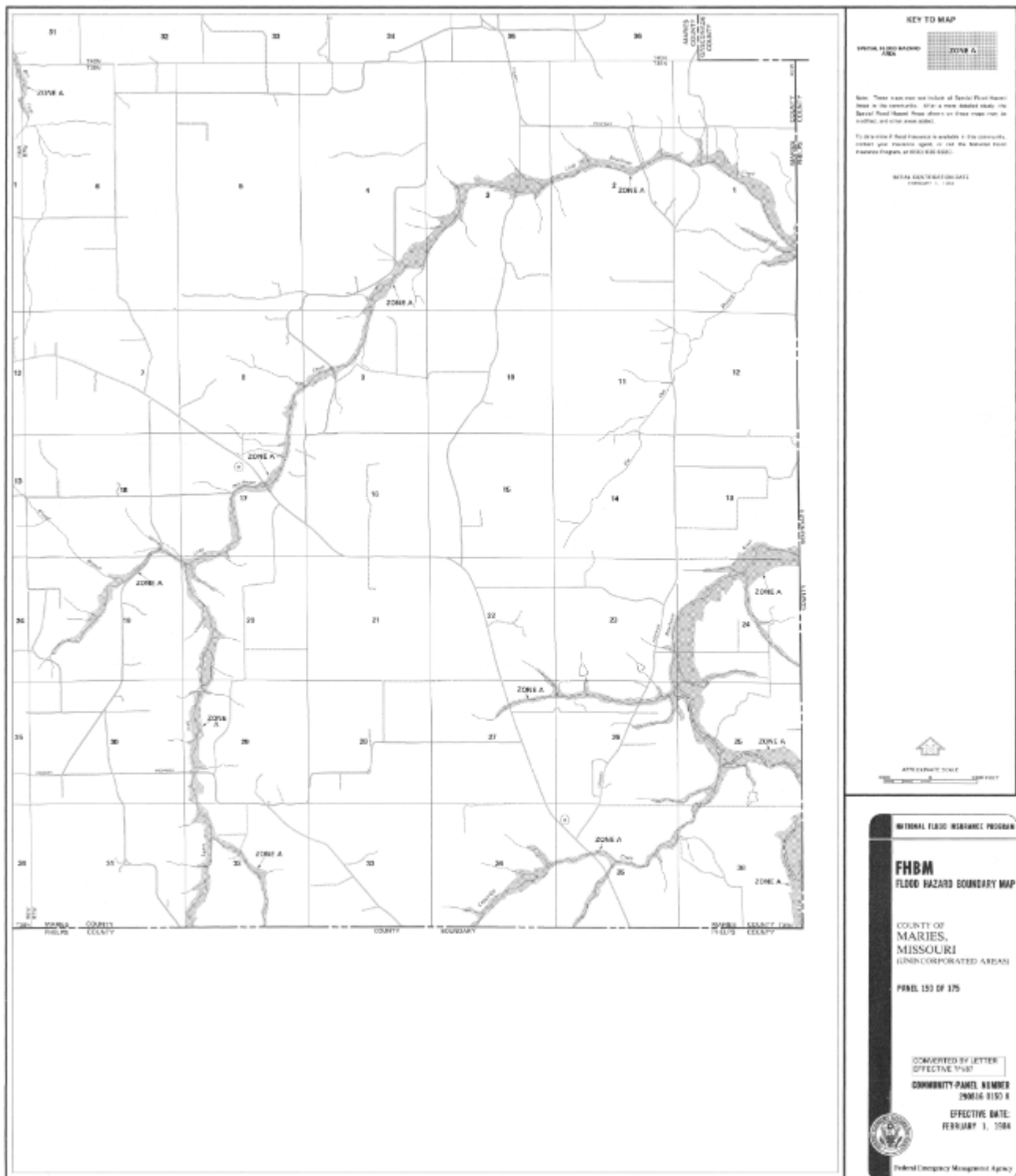


Figure 3.46. Maries County, Missouri Special Flood Hazard Areas (SFHAs)

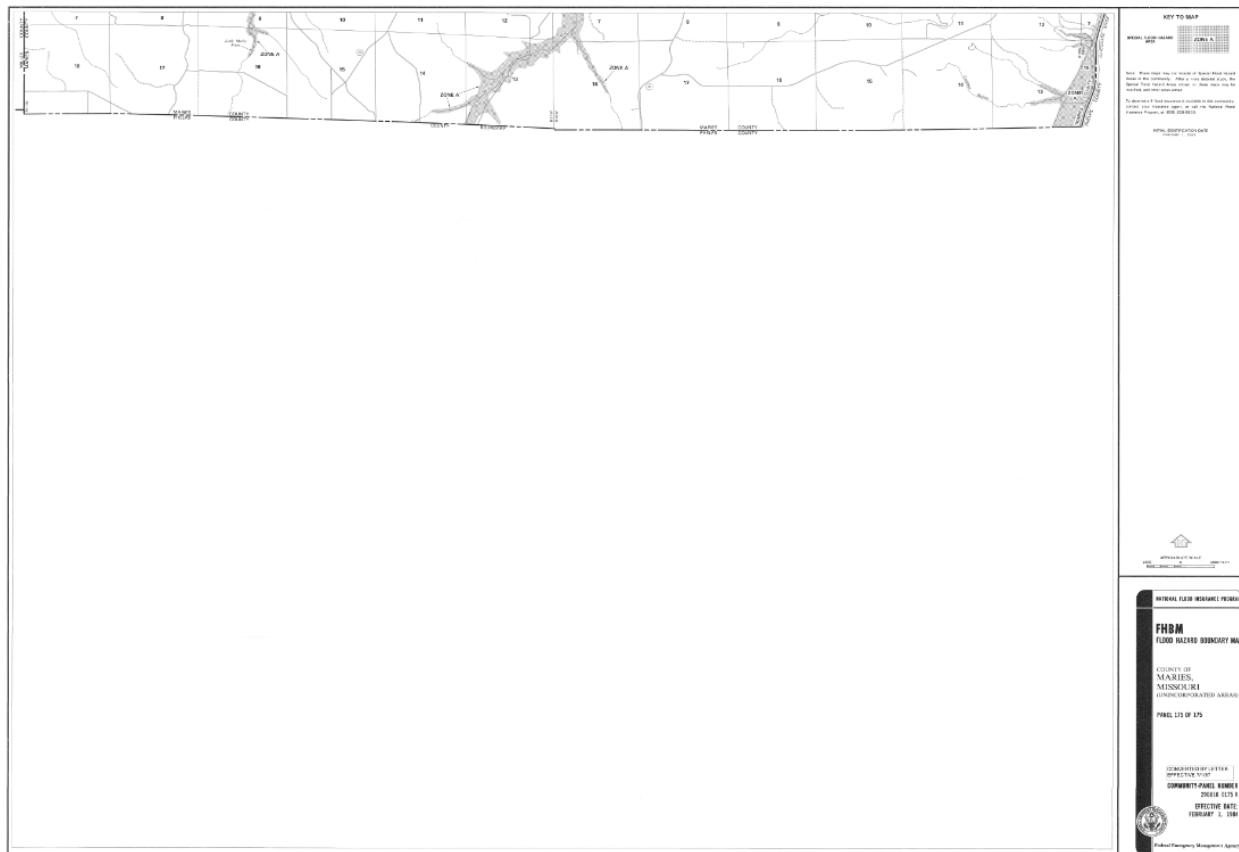


Table 3.44. Summary of Maries County NCEI Flood Events by Location, 1998-2018

Location	# of Events
Maries County	8
Belle	2
Hayden	1
Rolla/Vichy Airport	1
Shantytown	2
Vienna	4
Veto	2

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 are unincorporated areas of the county, but these two communities also have a high rate of flash flood events (8 and 6 respectively). **Table 3.45** provides information in regards to flash flood events between 1998 and 2018.

Table 3.45. Maries County NCEI Flash Flood Events by Location, 1998-2018

Location	# of Events
Maries County - Countywide	2
North Portion (county)	2
West Portion (county)	1
South Portion (county)	1
North Central Portion (county)	1
Brinktown	8
Belle	5
Vienna	9
Vichy	3
Van Cleve	3
Yarna	2
Shantytown	6
Rolla/Vichy Airport	3
Safe	1
Summerfield	2
High Gate	1

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 2018 State Hazard Mitigation Plan. Flooding along Missouri's major rivers generally results in slow-moving disasters. River crest levels are forecast several days in advance, allowing communities downstream sufficient time to take protective measures, such as sandbagging and evacuations. Nevertheless, floods exact a heavy toll in terms of human suffering and losses to public and private property. By contrast, flash flood events in recent years have caused a higher number of deaths and major property damage in many areas of Missouri.

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

Public health concerns may result from flooding, requiring disease and injury surveillance. Community sanitation to evaluate flood-affected food supplies may also be necessary. Private water and sewage sanitation could be impacted, and vector control (for mosquitoes and other entomology concerns) may be necessary.

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

Between 1998 and 2018, there were 30 recorded flood-related crop insurance claims with total losses of \$424,404 due to flooding within Maries County³⁶. **Table 3.46** shows crop losses for the period 1998 through 2018 (years with no losses are not shown).

³⁶ <http://www.rma.usda.gov/data/cause.html>

Table 3.46. Recorded USDA Crop Insurance Losses (Flood) for Maries County 1998 – 2018

1998	2008	2009	2013	2015	2016	2017
\$9,597	\$46,418	\$40,658	\$203,134.50	\$90,752.00	\$13,963.00	\$19,882.00

Source: USDA \ Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>

National Flood Insurance Program (NFIP) Participation

Table 3.47 depicts jurisdictions within the planning area that participate in NFIP. In addition, **Table 3.48** provides the number of policies in force, amount of insurance in force, number of closed losses, and total payments for Maries County and the city of Vienna.

Table 3.47. NFIP Participation in Maries County

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	Regular-Emergency Program Entry Date
-	Belle, City of	N	-	-
290647	Vienna, City of	Y	08/01/79	08/01/79
290816	Maries County	Y	01/05/84	01/05/85

Source: NFIP Community Status Book, 5/18/18; BureauNet, <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book>; M= No elevation determined – all Zone A, C, and X: NSFHA = No Special Flood Hazard Area; E=Emergency Program;

Table 3.48. NFIP Policy and Claim Statistics as of 05/18/2018

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Vienna, City of	1	0	2	\$18,310.00
Maries County	25	\$44,845,200	104	\$3,687,282.43

Source: NFIP Community Status Book, [05/18/2018]; BureauNet, <https://protect2.fireeye.com/url?k=8a472659-d6065a76-8a45ea93-0cc47a6d17a8-4f92b28e814f9424&u=http://bsa.nfipstat.fema.gov/reports/reports.html>; *Closed Losses are those flood insurance claims that resulted in payment.

Maries County has the highest number of policies, losses and total payments with \$3,687,282.43 compared to Vienna's \$18,310.00.

RiskMAP

Risk mapping, assessment, and planning is a FEMA program which provides communities with flood information and tools to enhance their mitigation plan and take action to better protect their citizens. The project kick-off meeting for RiskMAP in Maries County was held in December 2018 and the county is in the data development phase. The Modernized FIRM Status for the county is No Activity.

Repetitive Loss/Severe Repetitive Loss Properties

Repetitive Loss Properties (RL) are those properties with at least two flood insurance payments of \$5,000 or more in a 10-year period.

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, as of 4/30/18, there are 26 repetitive loss residential properties and one repetitive loss commercial property in unincorporated Maries County. There is one severe repetitive loss residential property in the unincorporated area of the county. The city of Vienna has one repetitive loss residential property which has had three losses with total payments of \$786,297.01. As of 1/1/2019 one residential property in Vienna has been mitigated, leaving 27 un-mitigated repetitive loss properties in unincorporated areas of the county.

Previous Occurrences

Table 3.49 provides information regarding Presidential Flooding Disaster Declarations between 1998 and 2017 for Maries County.

Table 3.49. Maries County Presidential Flooding Disaster Declarations 1998 to 2017

Declaration No.	Date	State	Incident Description
DR-1676	01/12/2007	Missouri	Missouri Severe Winter Storms and Flooding
DR-1742	01/07/2008	Missouri	Missouri Severe Storms, Tornadoes and Flooding
DR-1749	03/17/2008	Missouri	Missouri Severe Storms and Flooding
DR-1809	09/11/2008	Missouri	Missouri Severe Storms, Flooding, and a Tornado
DR-1847	05/08/2009	Missouri	Missouri Severe Storms, Tornadoes, and Flooding
DR-4130	09/06/2013	Missouri	Missouri Severe Storms, Straight-line Winds, Tornadoes, and Flooding
DR-4144	10/08/2013	Missouri	Missouri Severe Storms, Straight-line Winds, and Flooding
DR-4238	08/31/2015	Missouri	Missouri Severe Storms, Straight-line Winds, and Flooding
EM-3374	12/22/2015	Missouri	Missouri Severe Storms, Tornadoes, Straight-Line Winds, and Flooding
DR-4250	01/21/2016	Missouri	Heavy Rains, Widespread Flash Flooding, and Flooding
DR-4317	05/24/17	Missouri	Severe Storms, Tornadoes, Straight-line Winds 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 3.50** and **Table 3.51** provide this information. Additionally, narratives available for each event are included.

Table 3.50. NCEI Maries County Riverine Flood Events Summary, 1998 to 2018

Year	# of Events	# of Deaths	# of Injuries	Property Damages (\$)	Crop Damages (\$)
1998	1	0	0	419.00K	0
2002	6	0	0	10.00K	0
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	0	0	500.00K	0
2018	1	0	0	0	0
Total	20	1	0	1,144.00K	0

Source: NCEI, data accessed [2/22/2019]

Narratives on flood events:

1. **07/26/1998:** A series of thunderstorm complexes over central and south central Missouri produced widespread flooding. Cooperative weather stations reported over 8 inches of rain at Versailles (Morgan County), Rolla (Phelps County, and Salem (Dent County). In Maries County, three bridges were destroyed including a local landmark “swinging rope” bridge near Vienna which was built in 1930. Flooding caused widespread damage to roads and low water crossings and bridges. The Missouri Governor declared a state of emergency for several counties in central Missouri including Benton, Dent, Maries, Miller, Morgan, Phelps, and Shannon.
2. **01/31/2002:** A prolonged moderate rainfall event occurred over the Ozarks from the early morning to the evening hours of January 31, 2002. One day earlier, heavy rainfall provided nearly one inch of rain over the flooded areas, which made for already wet soil conditions prior to this event.

A shallow arctic front, which provided the focus for a large scale overrunning precipitation event, was nearly stationary along the Arkansas border during the day. The rainfall began early Thursday morning with an almost continuous influx of steady rainfall from 9 am January 31, to approximately 6 pm that evening. Rainfall rates were generally low and ranged from one half, to three quarters of an inch per hour in the heaviest downpours. However, a general one to two tenths per hour was more consistent with the overall rainfall pattern, with isolated convective activity during the afternoon hours. 24 hour rainfall totals, including Doppler radar estimates in the flooded areas, ranged from one inch, to nearly three inches in Phelps, Pulaski, Texas, Howell and Shannon Counties.

Numerous low water crossings, streams and county roads were flooded throughout the event. Several of the county roads were closed and did not reopen until Friday morning, February 1, 2002. The hardest hit areas were in Pulaski and Shannon Counties where Cave, Spring, and Creek roadways along the Big Piney River, and Highway H between Highway 16 and 106, were closed for nearly 24 hours.

3. **02/01/2002:** This is the continuation of the flood event of January 31, 2002. Although the rainfall had ended, runoff continued which caused several roads, low water crossings, and

small streams to remain flooded through the morning. Runoff from the small streams caused the Big Piney River to rise above flood stage early Friday morning. Also, the Gasconade River, North Fork, Jacks Fork, and Eleven Point Rivers of central and south central Missouri rose significantly during this event.

4. **04/19/2002:** A prolonged flooding event developed over portions of the Lake of the Ozarks region from late April 19th through early morning of April 21st. The initial flash flooding eased during the early morning of April 20th as the complex of thunderstorms moved east of the area. However, runoff continued which allowed small streams, creeks and even the larger Gasconade River in maries County to flood during the first part of the weekend.

Additional thunderstorms develop during the afternoon and evening of April 20th, which produced an additional one to three inches of rain over the already saturated soils over the area. This produced another flash flooding episode where creeks and small streams rose rapidly in a short period of time. This prolonged flooding event eased during the early morning of April 21st. However, numerous county roads and low water crossings remained closed or impassable for nearly 36 hours.

5. **05/08/2002:** The flash flooding event on the 7th and early 8th, became a major flooding event across all of southern and central Missouri through the early afternoon of May 9th. In addition to the numerous road closures, bridges blocked by debris, evacuations of towns, campgrounds, parks, and moderate river flooding, many communities had their worst flooding in more than 10 years. The American Red Cross set up shelters in Branson and Cassville due to evacuations. Flooded roadways forced several school districts across southwest Missouri to close for a few days. Several areas of west central Missouri also had crop damage.
6. **05/12/2002:** This is the continuation of the flooding that occurred over portions of southern Missouri on May 12th and 13th. Although numerous low water crossings, bridges, and area rivers flooded for the second time in less than a week, this area was more concentrated over portions of southwest Missouri and portions of extreme south central Missouri. One of the more significant factors this time with the flooding is that the area lakes rose to critical levels, especially Bull Shoals and Table Rock Lake, where the water rose to a few feet below the flood pool.

This flooding event prolonged the closure of numerous roads and low water bridges over central and southern Missouri. The additional heavy rain also worsened already existing river flooding over the region. Polk County received over eight inches of rainfall during a 12 hour period which caused most of the southern part of the county to have significant road erosion. Parts of Dent County also reported significant basement flooding and road erosion.

7. **05/17/2002:** This is the continuation of the flooding from May 16th and 17th. Runoff was excessive over south central Missouri and portions of southwest Missouri where local rivers and smaller tributaries continued to rise. The runoff slowly subsided during the early morning hours of May 18th.

During the first three weeks of May, many areas of the Ozarks and southeast Kansas received between seven and twelve inches of rainfall. Not only did this cause major flooding of roadways, rivers and creeks, this contributed to lake levels rising to near record heights. Bull Shoals Lake rose so high that it caused Highway K to flood for several weeks. It forced seven families that live along Highway K to travel to and from their homes via canoes or rafts. A city park was closed for several weeks on Lake Taneycomo and caused their local fair to be cancelled.

The significant and widespread flooding that occurred over the region caused the President to declare the following counties in southern Missouri disaster areas; Camden, Cedar, Christian, Dent, Greene, Hickory, Jasper, Laclede, McDonald, Newton, Polk, Stone, Texas, Vernon, Wright, Barry, Barton, Dade, Dallas, Webster, Taney, Douglas, Howell, Oregon, Lawrence and Shannon counties.

8. **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.
9. **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.
10. **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.

11. **10/29/2009:** Showers and thunderstorms produced flooding across Southwest Missouri with isolated wind damage in Neosho. Several low water crossings were reported flooded across Maries County.
12. **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.
13. **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.
14. **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.
15. **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.

16. **06/01/2013:** Heavy rainfall led to flooding across the Missouri Ozarks. Numerous low water crossings in Maries County were flooded.
17. **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.
18. **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.
19. **03/29/2018:** Several rounds of thunderstorms caused heavy rainfall and minor flooding. Route E was closed due to flooding.

Table 3.51. NCEI Maries County Flash Flood Events Summary, 1998 to 2017

Year	# of Events	# of Deaths	# of Injuries	Property Damages (\$)	Crop Damages (\$)
1998	4	0	0	0	0
2002	5	0	0	20.00K	0
2003	1	0	0	0	0
2004	1	0	0	0	0
2005	3	0	0	0	0
2006	1	0	0	0	0
2007	2	0	0	0	0
2008	7	0	0	1.00K	0
2009	3	0	0	25.00K	0
2011	3	0	0	0	0
2012	3	0	0	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
Total	50	0	0	801.00K	0

Source: NCEI, data accessed [2/28/2019]

Narratives on flash flood events:

1. **3/17/1998:** Heavy rain caused flooding along Highway N, at the Maries River.
2. **3/19/1998:** Heavy rain falling on saturated ground caused flooding along Highway N at the

Maries River, three miles east of Brinktown.

3. **06/04/1998:** One and one half inches to five inches of rain fell across the area producing the flooding of numerous low water crossings across the area. Both secondary and some state highways affected.
4. **06/08/1998:** Widespread one to three inch rainfall caused the flooding of low water crossings on numerous secondary roads and a few state highways.
5. **04/19/2002:** A complex of strong to severe thunderstorms developed over the southwestern portions of the Lake of the Ozarks region during the afternoon and early evening of April 19th and moved slowly eastward over Camden, Maries, Miller, Phelps and Pulaski Counties.

The airmass was very moist which allowed for the storms to produce torrential rainfall in a short period of time. In addition, the storms propagated over the same areas producing rainfall rates of two to four inches per hour. Radar estimated between six and eight inches of rain fell in these areas during the early evening hours. A broad area of two to four inches fell around the six to eight inch band, which allowed for significant flooding to occur. Numerous low water crossings, county and state roads were flooded or closed during the height of the storm.

6. **05/09/2002:** This extraordinary event consisted of three primary waves of severe weather and flooding. The first occurred during the early morning of May 7th. The second consisted of four separate severe weather and flooding events which overlapped and lasted from the mid-morning of May 7th to near sunrise on May 8th. The last wave of severe weather and flooding swept through the area during the evening of May 8th, into the early morning hours of May 9th.

Rainfall amounts of four to eight inches fell across the area during this 36 to 48 hour period. Excessive rainfall amounts greater than 10 inches were shown over Bourbon, Crawford, Vernon, Cedar and Morgan counties, with several observers reporting amounts in excess of 11 inches.

The widespread heavy rain amounts and periods of torrential rainfall rates resulted in extensive flooding of small streams and creeks, county roads, low water crossings and other low lying areas. Major highways were also affected. The widespread flooding forced evacuations in several communities and the closing of some schools.

7. **05/12/2002:** Another in a series of thunderstorm complexes moved across the area producing excessive rainfall on the already saturated soils. Most of the heavy rainfall began across central Missouri Sunday morning May 12th, and then produced another round of torrential rainfall Sunday evening. By Monday morning May 13th, a large area of two inches fell north of Interstate 44, with the heaviest bands of three to six inches from Joplin northeast to Greenfield, Bolivar and Urbana. Another area of excessive rain fell over eastern Texas, northern Shannon, and southern Dent counties where locally three to six inches fell.
8. **07/10/2002:** Nearly three inches of rain in a short period of time caused damage to area homes.
9. **07/18/2002:** Three to four inches of rain fell over northern and eastern portions of Maries County in less than two hours. It caused Highway Z near Belle to close.
10. **07/18/2003:** Brief flooding was also observed on Highway Z east of Vienna.

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11. **07/30/2004:** Flash flooding washed out a section of Highway 42 near the community of Belle.
 12. **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.
 13. **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.
 14. **06/10/2005:** Thunderstorms caused flash flooding in a couple of areas across Maries County. Sections of County Roads 623 and 621 were inundated.
 15. **08/27/2006:** A section of Highway AA near the Little Maries Creek became impassable to motorists from flash flooding.
 16. **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.
 17. **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 flooded over a section of a county road in northwest Maries County.
 18. **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.

19. **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.
20. **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.

21. **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.
22. **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.
23. **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.
24. **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.
25. **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.
26. **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.
27. **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.
28. **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.

29. **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.
30. **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.
31. **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.
32. **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.
33. **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.
34. **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.
35. **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.
36. **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.
37. **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.

38. **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.
39. **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.
40. **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.
41. **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.
42. **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.

Probability of Future Occurrence

From the data obtained from the NCEI ³⁷, there were 20 riverine flood events (**Table 3.50**) over a period of 21 years. This information was utilized to determine the annual average percent probability of riverine flooding (**Table 3.52**). The probability of riverine flooding in Maries County per year is 95 percent (20 events/21 years x 100) with an average of .95 events per year. Furthermore, data was obtained for flash flooding within the county. Maries County endured 50 flash flooding events (**Table 3.51**) over a 21 year period. The probability of flash flooding in Maries County per year is 100% (50 events/21 years x 100) with an average of 2.4 events per year (**Table 3.53**).

Table 3.52. Annual Average % Probability of Riverine Flooding in Maries County

Location	Annual Avg. % P	Avg. Number of Events
Maries County	95%	.95

*P = probability; see page 3.24 for definition.

³⁷ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

Table 3.53. Annual Average % Probability of Flash Flooding in Maries County

Location	Annual Avg. % P	Avg. Number of Events
Maries County	100%	2.4

*P = probability; see page 3.24 for definition.

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 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 road beds. In some instances, steep slopes that are saturated with water may cause mud or rock slides onto roadways. These damages can cause costly repairs for state, county and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard.

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 4.0, 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. As Maries County does not have digital FIRMS, the Hazus software was utilized to generate the flood hazard boundary and associated depth of flooding. Model parameters include:

- Thirty meter resolution Digital Elevation Models (DEM) were used as the terrain base to develop hydrologic and hydraulic models
- Streams and rivers with a minimum drainage basin area of 10 square miles were modeled as all experiencing a base flood at the same time
- U.S. Geological Survey hydrologic regional regression equations and stream gage data were included in Hazus

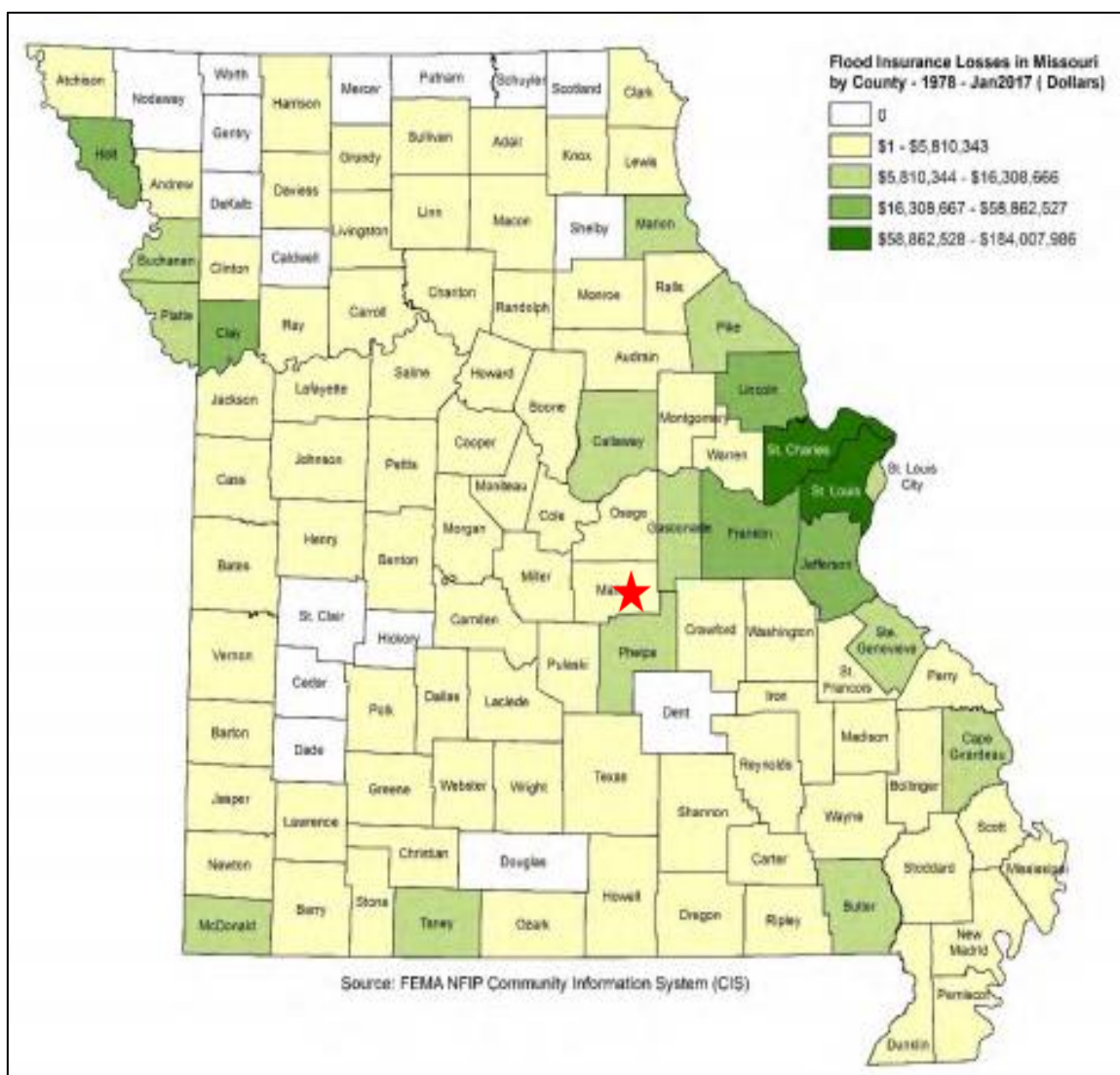
This method was the least preferred of the three methods, but although the RiskMAP process has started in Maries County, data is not available.

In addition to the Hazus flood runs, 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 BureauNet which documents losses from 1978 to the present (November 30, 2017 for the State Plan). 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 (No buyouts in Maries County)

Figure 3.47 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.

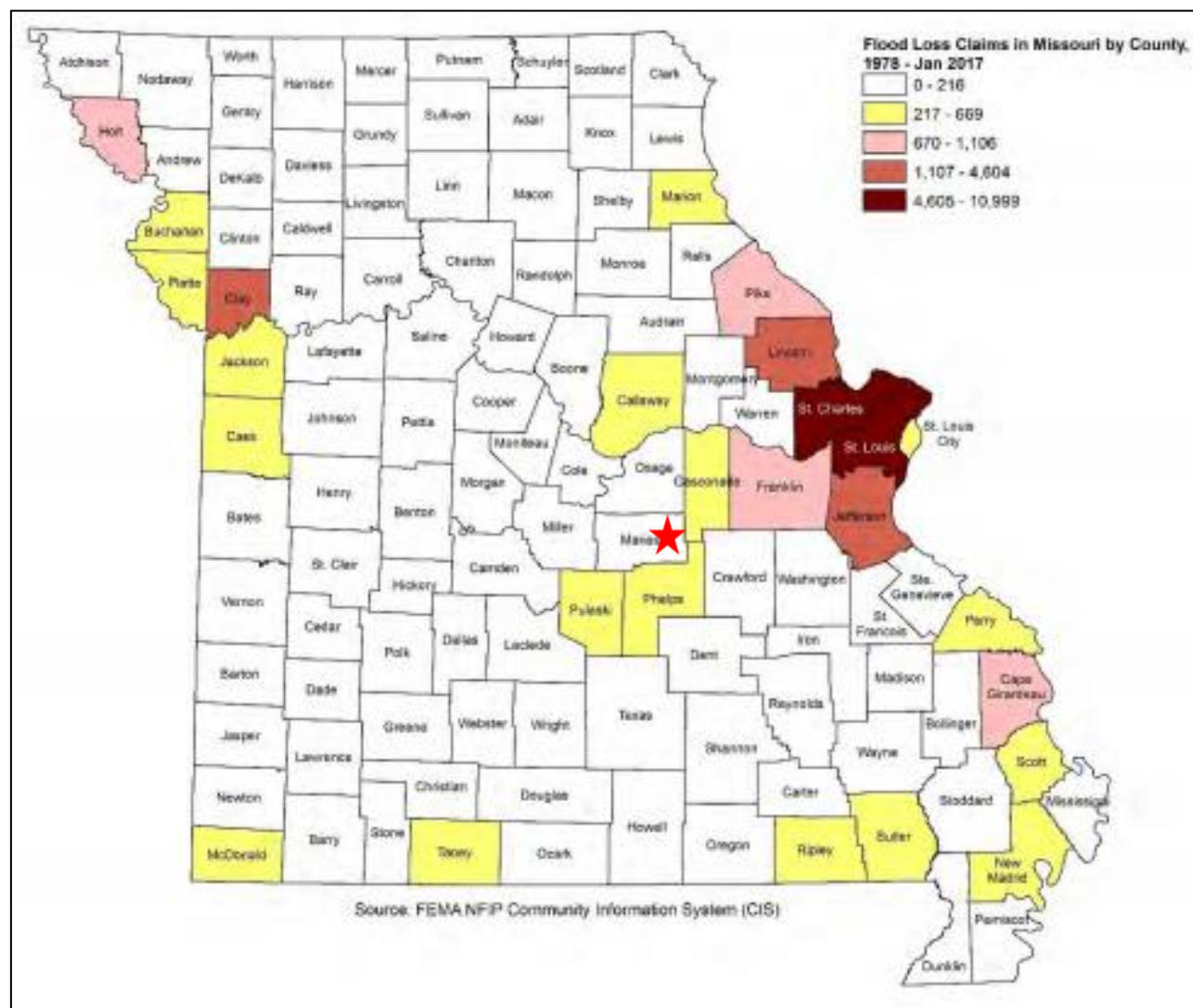
Figure 3.47. Map of Funds Paid Historically for Flood Insurance Losses in Missouri by County 1978 - January 2017



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

Figure 3.48 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 3.48. Flood Loss Claims in Missouri by County, 1978 – January 2017



Source: 2018 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 and Hazus floodplain data. **Table 3.54** provides information regarding total direct building loss and income loss to Maries County. **Table 3.55** provides information on exposure of buildings. According to the Missouri Spatial Data Information Service (MSDIS) there are 47 residential structures at risk of flood. Hazus shows the number of building exposed to flood damage at 18, with 12 potentially substantially damaged in a one percent annual chance of a flood.

Table 3.54. 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
\$955,863,000	\$14,377,000	\$7,518,000	\$89,000	\$21,984,000	\$13,000	\$21,997,000	1.50

Source: 2018 Missouri State Hazard Mitigation Plan

Table 3.55. Maries County Structures Exposure

# MSDIS Residential Structures Exposed	# Hazus Buildings Exposed	# Substantially Damaged
47	18	12

Source: 2018 Missouri State Hazard Mitigation Plan

This same analysis indicates that 268 people would be displaced in Maries County and 24 would need to be sheltered in the event of a major flood.

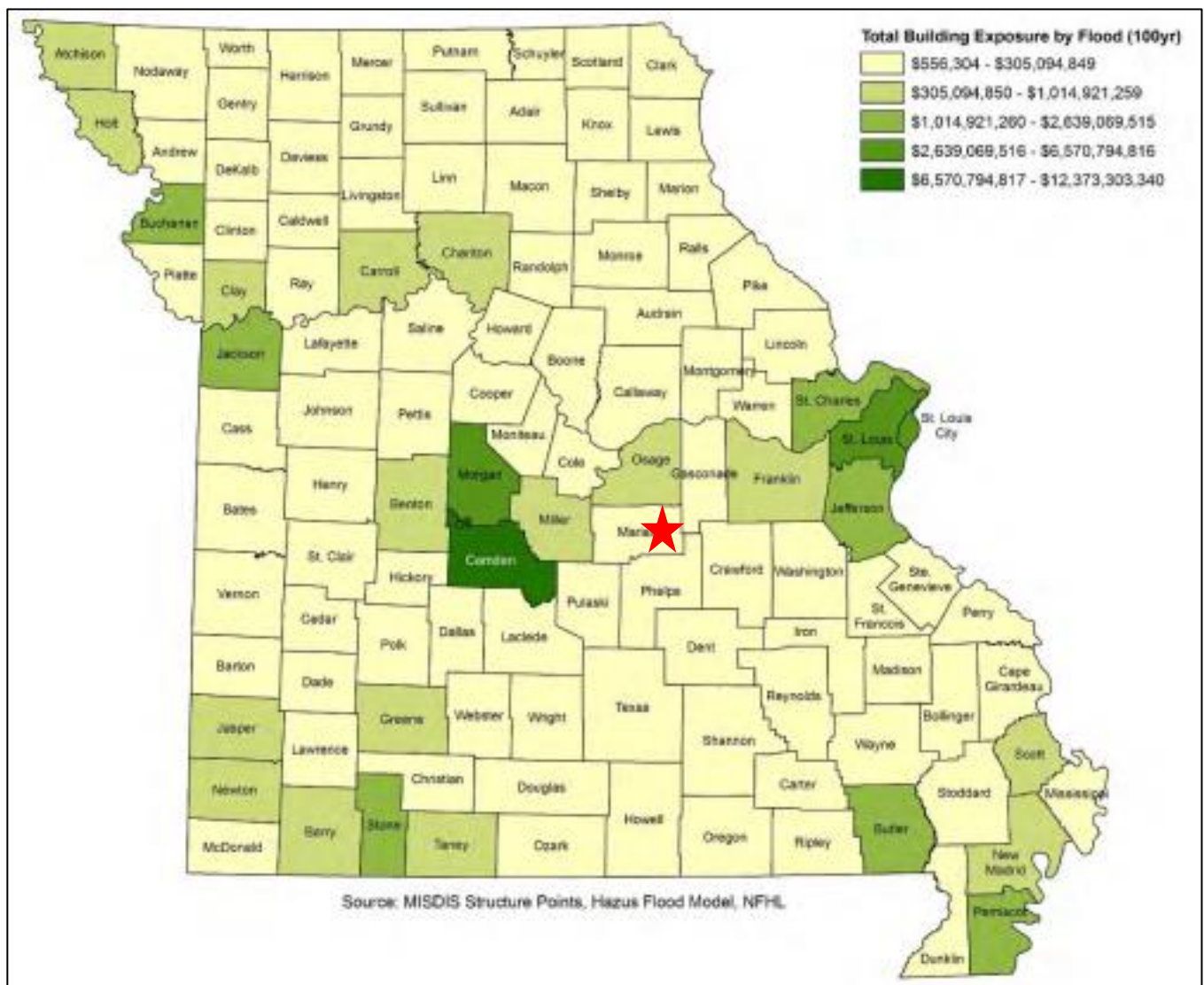
Table 3.56 presents the results of the primary indicators for Maries County – residential, agricultural, commercial, education, government and industrial. This table illustrates the number of affected structures and estimated losses. **Figure 3.49** shows the building exposure for the Hazus Base-Flood Scenario. Figure 3.50 illustrates the building impacted ratio for a 100-year flood.

Table 3.56. 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
47	\$178,381	47	\$206,381	10	\$591,282	0	\$0	0	\$0	0	\$0	115	\$976,043

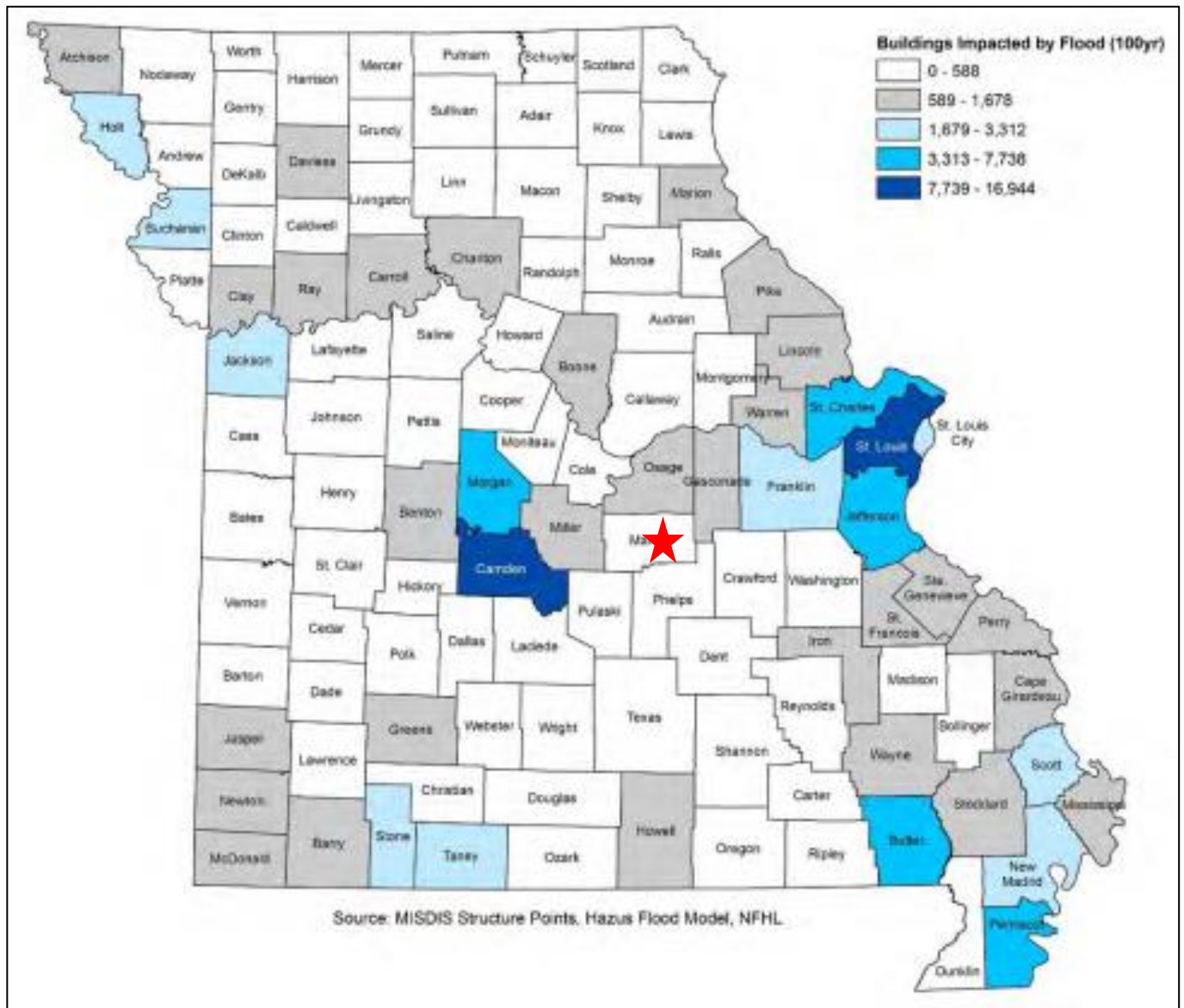
Source: 2018 Missouri State Hazard Mitigation Plan

Figure 3.49. Hazus Countywide Base-Flood Scenarios: Building Exposure



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

Figure 3.50. Hazus Countywide Base-Flood Scenarios: Building Impacted Ratio



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

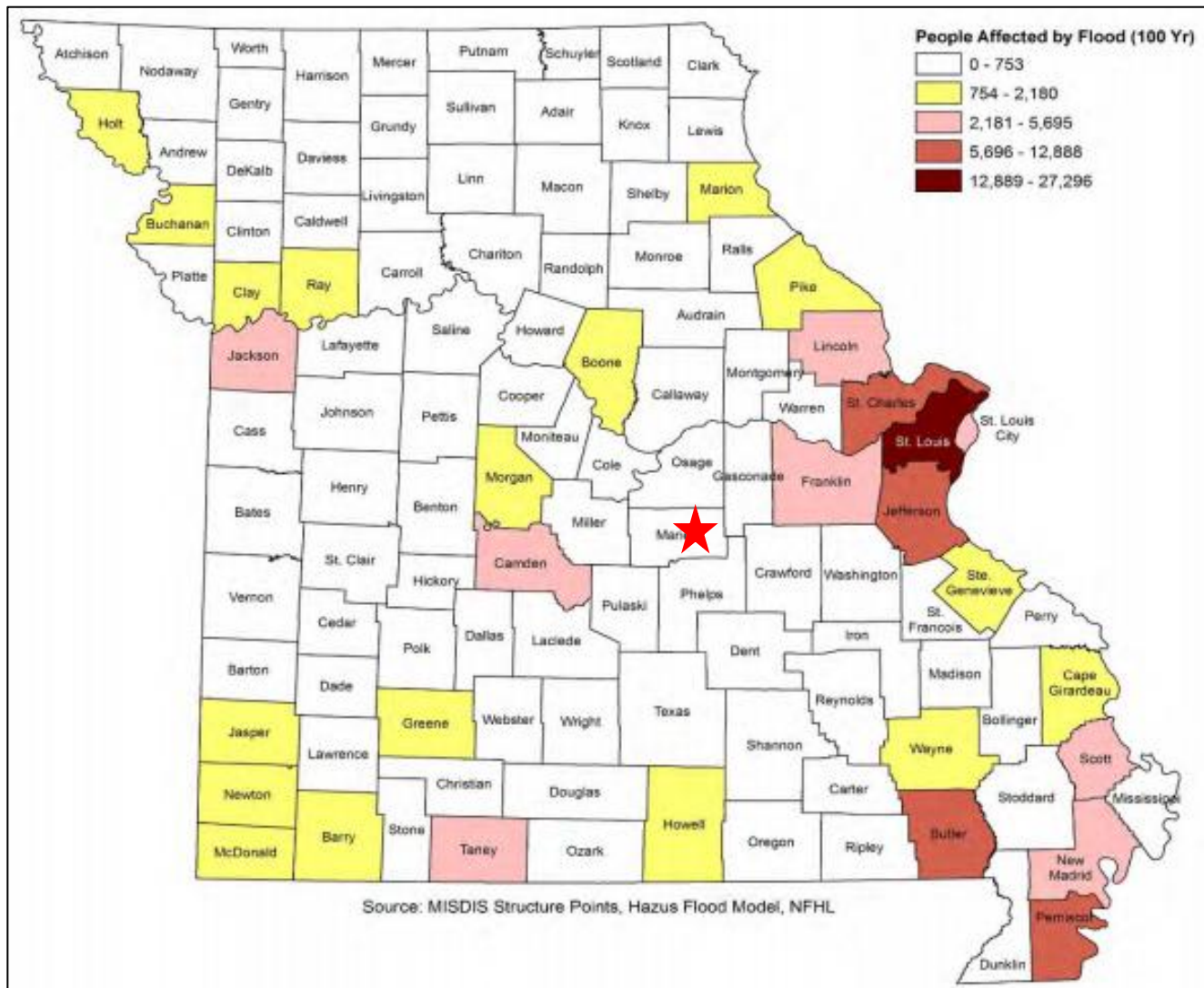
Lastly, the State determined the estimated number of displaced households and need for shelters within Maries County in the event of a 100 year flood. **Table 3.57** and **Figure 3.51** illustrate this information.

Table 3.57. Estimated Displaced People and Shelter Needs for Maries County

County	Displaced People	Displaced Population Requiring Shelter
Maries	268	24

Source: 2018 Missouri State Hazard Mitigation Plan

Figure 3.51. Hazus Countywide Base-Flood Scenarios: Displaced People



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

Potential Losses to Existing Development

Maries County and Vienna both contain a portion of the 100 Year Floodplain, although the area affected by floodplain in Vienna is very small. According to the HAZUS model, Maries County has a building loss ratio of 1.5 percent for countywide base-flood scenarios. The statewide average building loss ratio is 1.40 which makes Maries County's ratio in the medium range. Additionally, the county has 27 repetitive loss properties and Vienna has one repetitive loss property – which has been mitigated. With the annual average probability for flooding at 95 percent and 100 percent for flash floods, Maries County's existing development is vulnerable to flood. Especially development located in low-lying areas, near rivers or streams, or where drainage systems are not adequate are prone to flooding. Fortunately there are no critical facilities located in the floodplain for Maries County, Belle or the school districts. Vienna's wastewater facility is located near the floodplain but historically has not had problems with flooding.

Impact of Future Development

Impact of future development is correlated to floodplain management and regulations set forth by the county and jurisdictions³⁸. Future development within low-lying areas near rivers and streams, or where interior drainage systems are not adequate to provide drainage during heavy rainfall events should be avoided. Additionally, future development would also increase impervious surface causing additional water run-off and drainage problems during heavy rainfall events.

Hazard Summary by Jurisdiction

Vulnerability to flooding varies slightly across the planning area. The jurisdictions most vulnerable to flooding include Maries County and the city of Vienna. Since 1998 there have been 50 incidents of flooding or flash flooding in Maries County; 13 incidents in and around Vienna; and seven incidents in and around Belle (**Table 3.50, Table 3.50**). Although Vienna has one repetitive loss property, records indicate that it has been mitigated; whereas the county's 27 repetitive loss properties have not.

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 – CR231, CR406, CR440, CR442, CR444, CR450, CR454, CR521, CR523, CR527, CR621, CR623, CR624, CR628, CR634, CR642, CR827. 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. However, due to the lack of digital mapping it is difficult to identify commercial and residential properties within the floodplain. 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 floodplain 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

The county 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 insure that future deaths and injuries do not occur. Local governments should consider making improvements to roads and low water crossings that consistently flood by placing them on a hazard mitigation projects list, and actively seek funding to successfully complete the projects.

³⁸ 2015 Boone County Hazard Mitigation Plan

3.4.7 Land Subsidence/Sinkholes

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

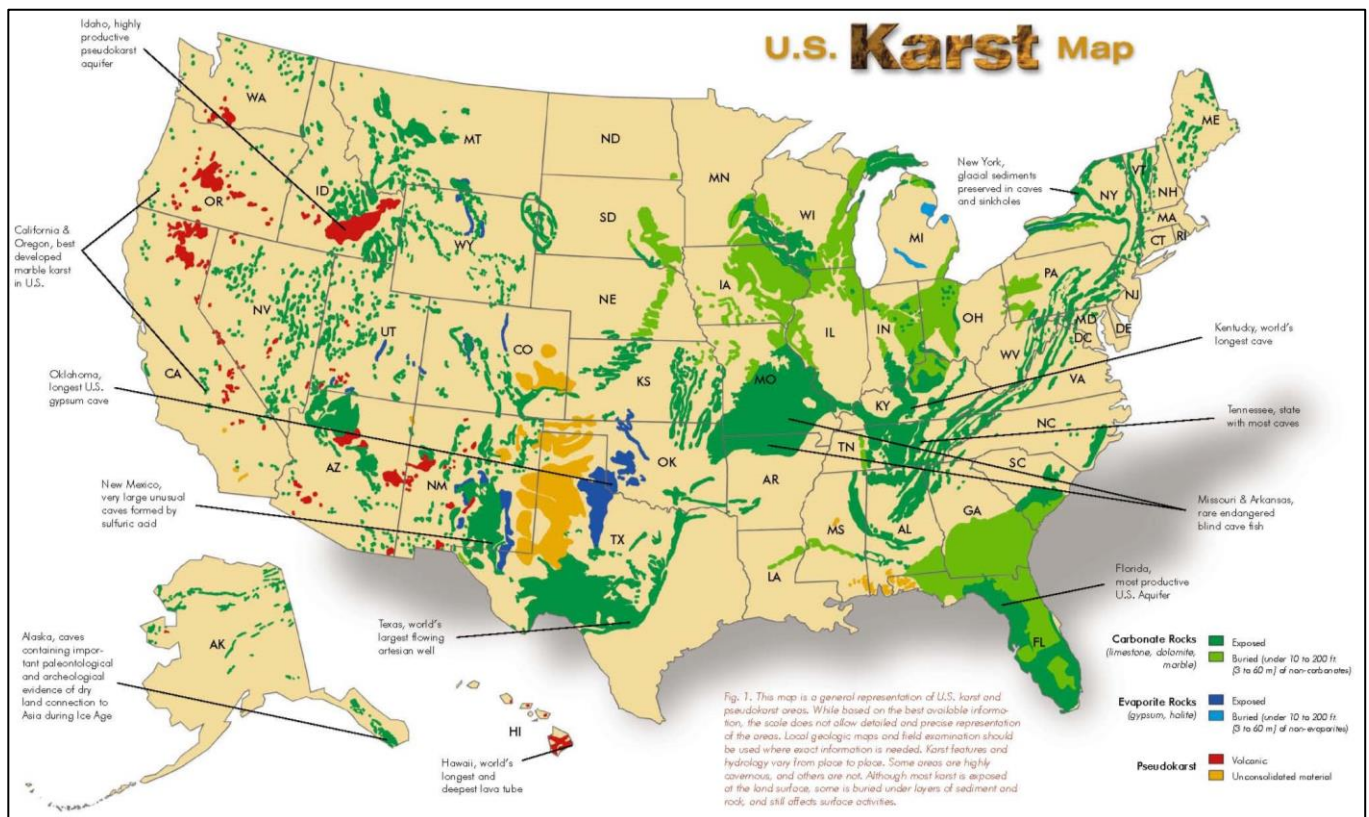
According to the U.S. Geological Survey (USGS), the most damage from sinkholes tends to occur in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. Fifty-nine percent of Missouri is underlain by thick, carbonate rock that makes Missouri vulnerable to sinkholes. Sinkholes

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

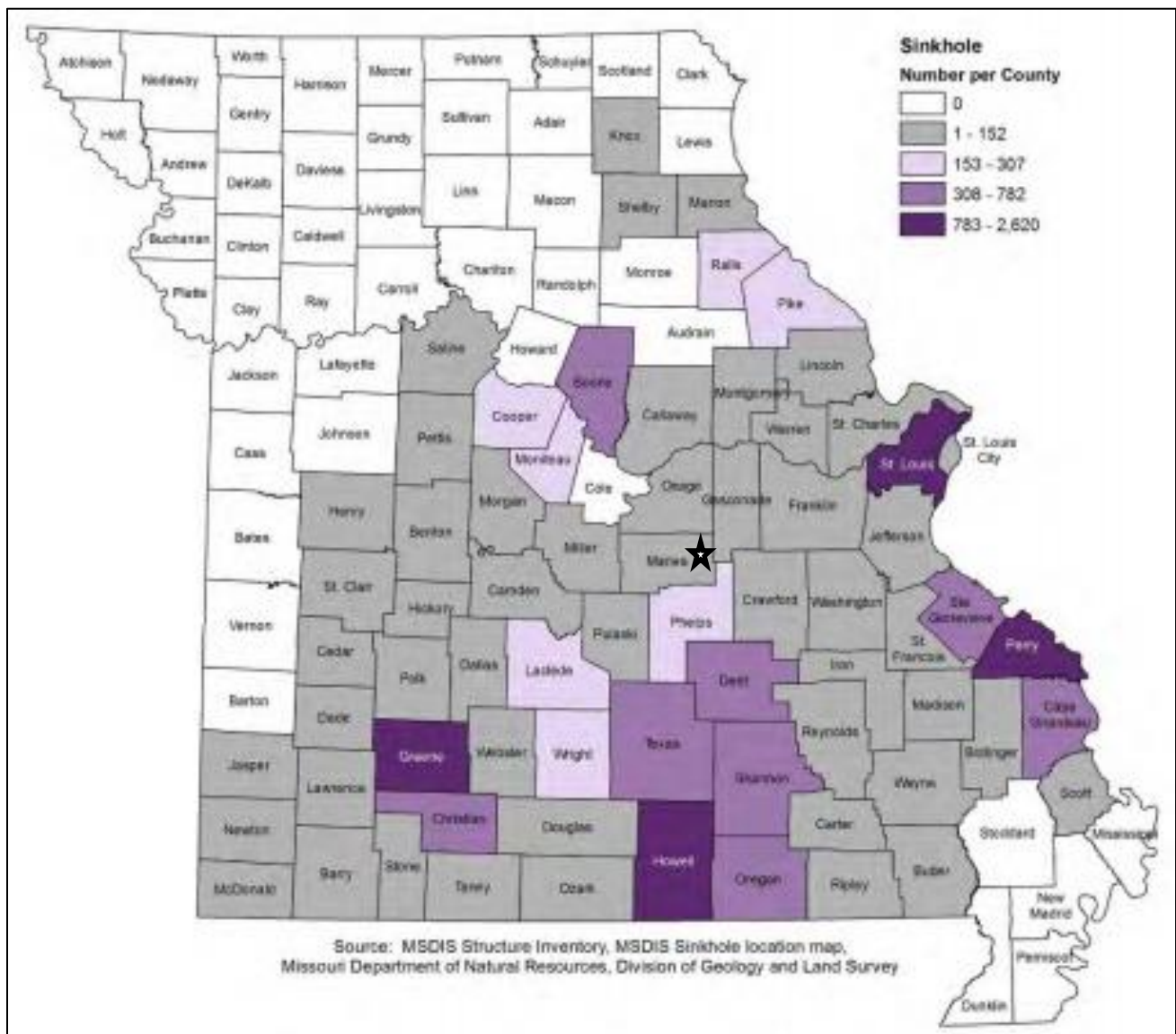
Figure 3.52 depicts karst topography across the United States. Missouri's karst topography is comprised of carbonate rocks such as limestone, dolomite, and marble. Variability in areas prone to sinkholes does not differ greatly across the county. According to the 2018 Missouri State Hazard Mitigation Plan there are nine sinkholes that have been recorded within Maries County (**Figure 3.53**). In addition, the Plan states that there are 243 mines in Maries County - as shown in **Figure 3.54**. 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 3.52. U.S. Karst Map



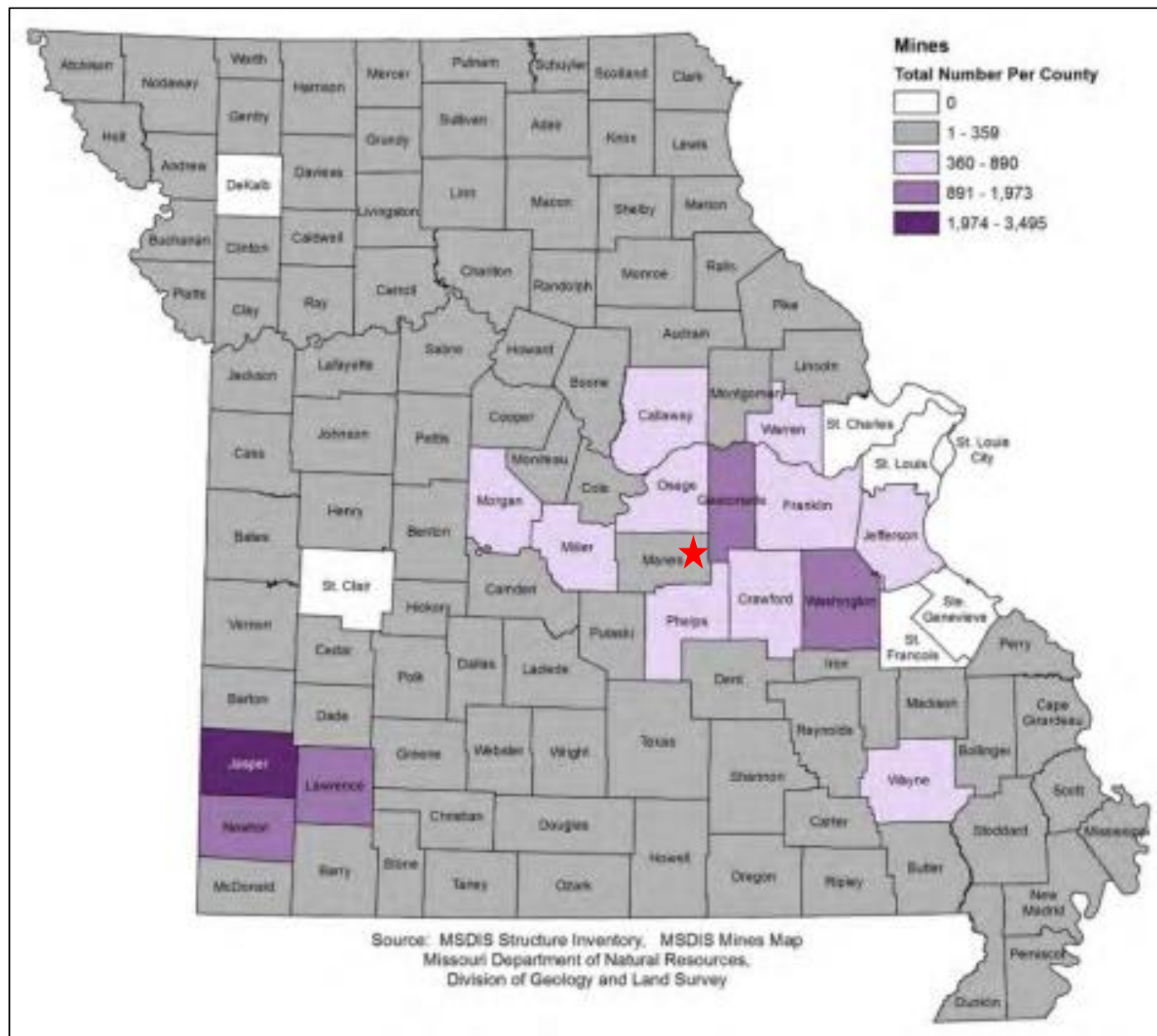
Source: http://www.northeastern.edu/protect/wp-content/uploads/US_KarstMap.jpg

Figure 3.53. Sinkholes Counts per County



Source: 2018 Missouri Hazard Mitigation Plan; *Black star indicates Maries County

Figure 3.54. Mines Counts Per County



Source: 2018 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.³⁹

³⁹ 2018 Missouri Hazard Mitigation Plan

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 2018 State Plan mentions 18 documented sinkhole "notable events". The plan stated that sinkholes are common to Missouri and the probability is high that they will occur in the future. To date, Missouri sinkholes have rarely had major impacts on development nor have they caused serious damage.

Previous Occurrences

Although there are sinkholes and sinkhole areas in Maries County 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.

Probability of Future Occurrence

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

Vulnerability

Vulnerability Overview

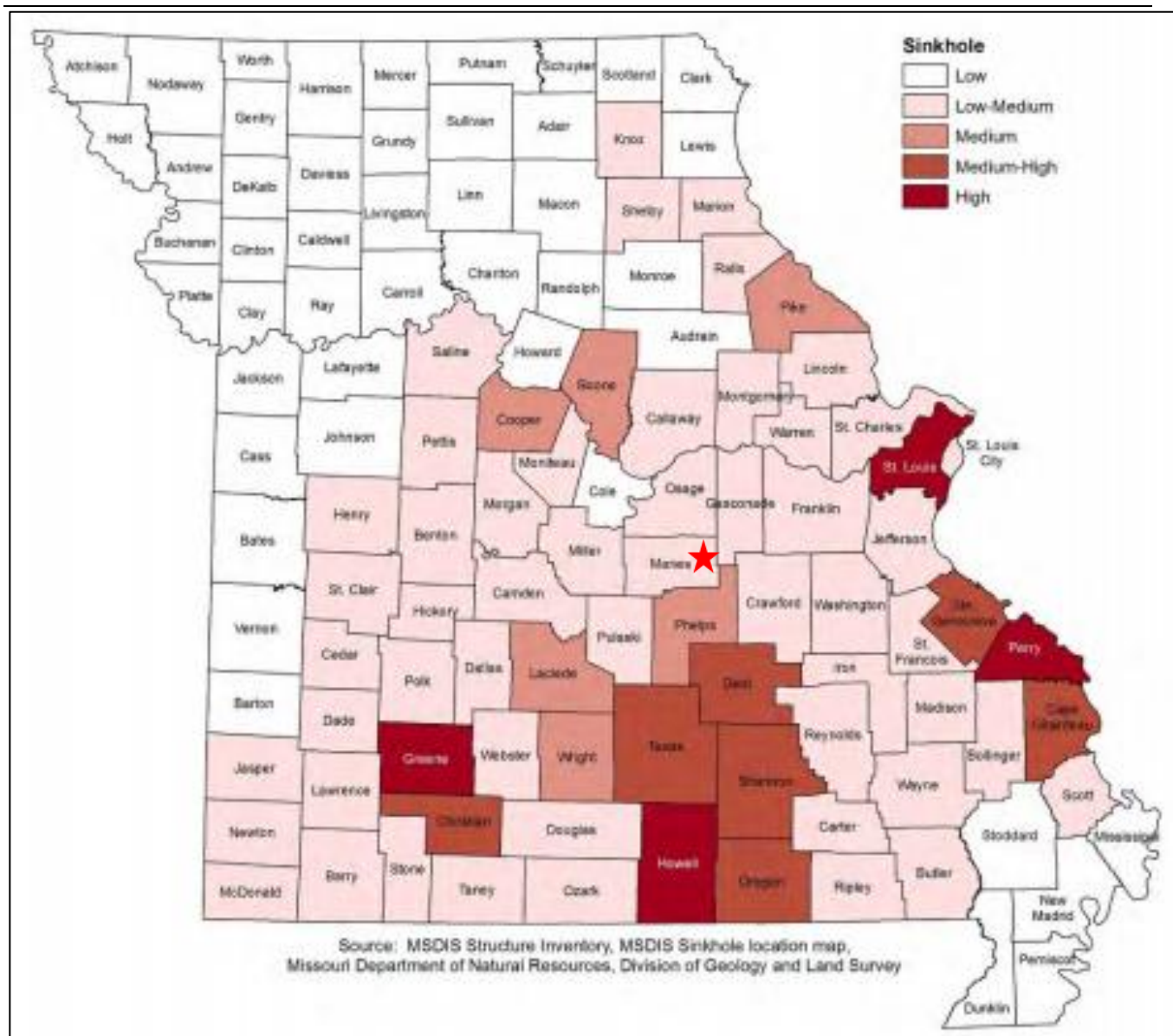
Unfortunately, no statistics are available for the number of subsurface locations that may potentially collapse in the future, forming a sinkhole. According to the state plan, if a county has fewer than 200 sinkholes, the risk is considered 2 - low-medium. For mines, the state plan calculates that Maries County's risk is also rated as 2 – low-medium. See **Table 3.58**, **Figure 3.55** and **Figure 3.56** further illustrate the sinkhole and mining rating values respectively.

Table 3.58. Sinkhole/Mine Rating Values for Maries County

Factor	1 (Low)	2 (Low-medium)	3(Medium)	4 (Medium-high)	5 (High)
Sinkholes per county	0	1-200	201-400	401-800	801+
Mines per county	0-100	101-250	251-500	501-750	751+

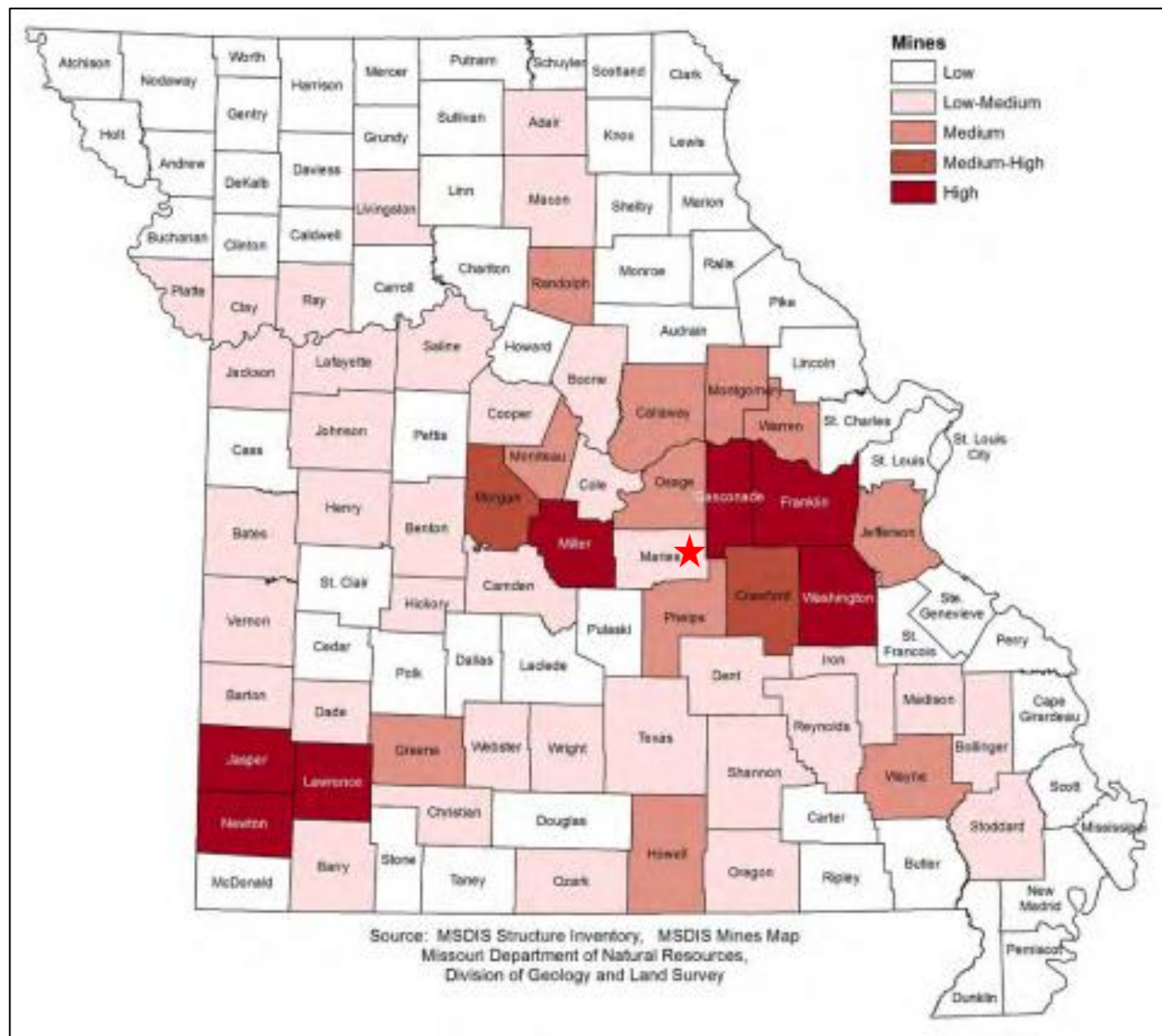
Source: 2018 Missouri Hazard Mitigation Plan, Yellow highlight shows values for Maries County

Figure 3.55. Sinkhole Rating Value by County



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

Figure 3.56. Mine Rating Value By County



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

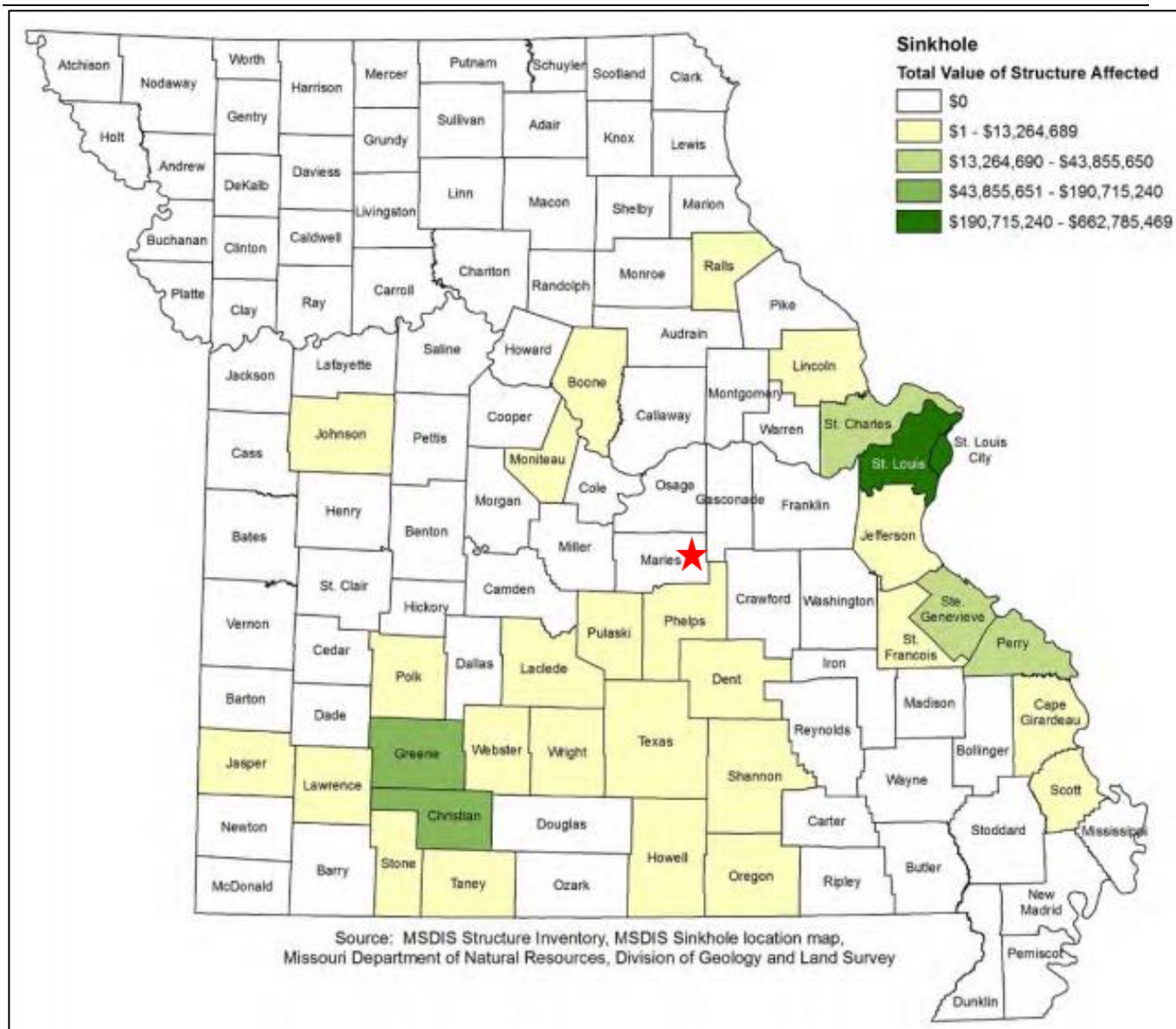
Potential Losses to Existing Development

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 vicinity⁴⁰. 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.

⁴⁰ <http://sinkhole.org/commonsigns.php>

The 2018 Missouri Hazard Mitigation Plan devised a method of estimating potential losses using GIS data. **Figure 3.57** shows the ranking of structures that could potentially be impacted by sinkholes by county. This map shows that Maries County has \$0 total value of structures affected.

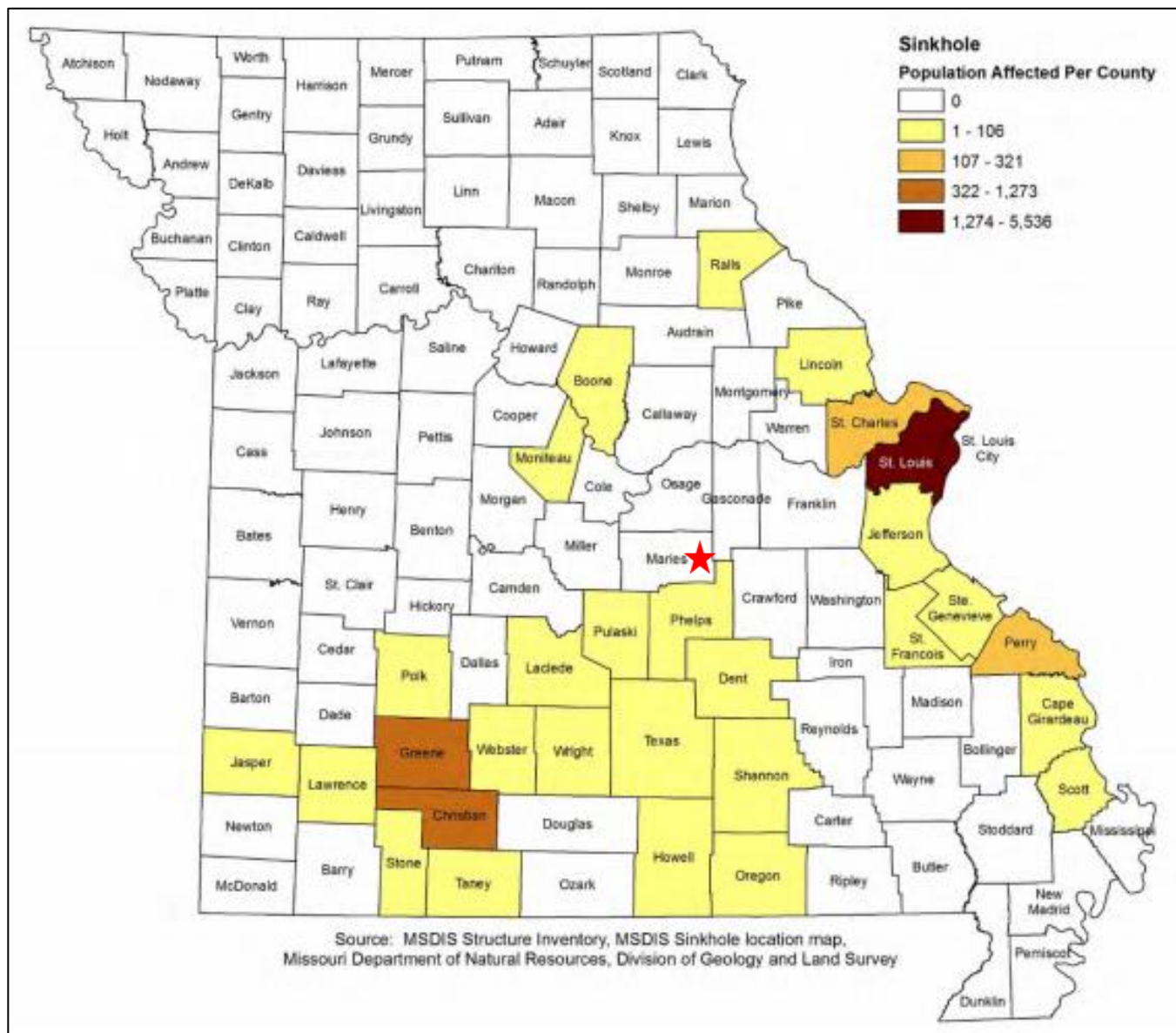
Figure 3.57. Ranking of Structures Potentially Impacted by Sinkholes by County



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

Figure 3.58 shows the population potentially impacted by sinkholes and again, Maries County shows that zero population will be affected by sinkholes.

Figure 3.58. Ranking of Population Potentially Impacted by Sinkholes by County



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

Impact of Future Development

Future development over or near abandoned mines and in locations at risk of sinkhole formation will increase the hazard vulnerability. Information regarding regulations limiting construction near sinkholes is very limited. According to the state plan, Maries County's risk in regards to these hazards is moderately low.

Hazard Summary by Jurisdiction

According to the state plan, Maries County's risk is low to moderate. 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 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.

3.4.8 Thunderstorm/High Winds/Lightning/Hail

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
- FEMA 320, Taking Shelter from the Storm, 3rd edition, _
http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf
- Lightning Map, National Weather Service,
http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf National Weather Service, http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf
- Death and injury statistics from lightning strikes, National Weather Service.
- Wind Zones in the U.S. map, FEMA,
http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm;
- Annual Windstorm Probability (65+knots) map U.S. 1980-1994, NSSL,
http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif
- Hailstorm intensity scale, The Tornado and Storm Research Organization (TORRO),
<http://www.torro.org.uk/site/hscale.php>;
- NCEI data;
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- National Severe Storms Laboratory – hail map,
http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif
- Missouri Hazard Mitigation Viewer
<http://bit.ly/MoHazardMitigationPlanViewer2018> - Website
<http://drive.google.com/file/d/1bPkc0JgF9ofwQLnTL9N0u-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

Hazard Profile

Hazard Description

Thunderstorms

A thunderstorm is defined as a storm that contains lightning and thunder which is caused by unstable atmospheric conditions. When cold upper air sinks and warm moist air rises, storm clouds or 'thunderheads' develop resulting in thunderstorms. This can occur singularly, as well as in clusters or lines. The National Weather Service defines a thunderstorm as "severe" if it includes hail that is one inch or more, or wind gusts that are at 58 miles per hour or higher. At any given moment across the world, there are about 1,800 thunderstorms occurring. Severe thunderstorms most often

occur in Missouri in the spring and summer, during the afternoon and evenings, but can occur at any time. Other hazards associated with thunderstorms are heavy rains resulting in flooding (**Section 3.4.6**) and tornadoes (**Section 3.4.9**)

High Winds

A severe thunderstorm can produce winds causing as much damage as a weak tornado. The damaging winds of thunderstorms include downbursts, microbursts, and straight-line winds. Downbursts are localized currents of air blasting down from a thunderstorm, which induce an outward burst of damaging wind on or near the ground. Microbursts are minimized downbursts covering an area of less than 2.5 miles across. They include a strong wind shear (a rapid change in the direction of wind over a short distance) near the surface. Microbursts may or may not include precipitation and can produce winds at speeds of more than 150 miles per hour. Damaging straight-line winds are high winds across a wide area that can reach speeds of 140 miles per hour.

Lightning

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

Hail

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

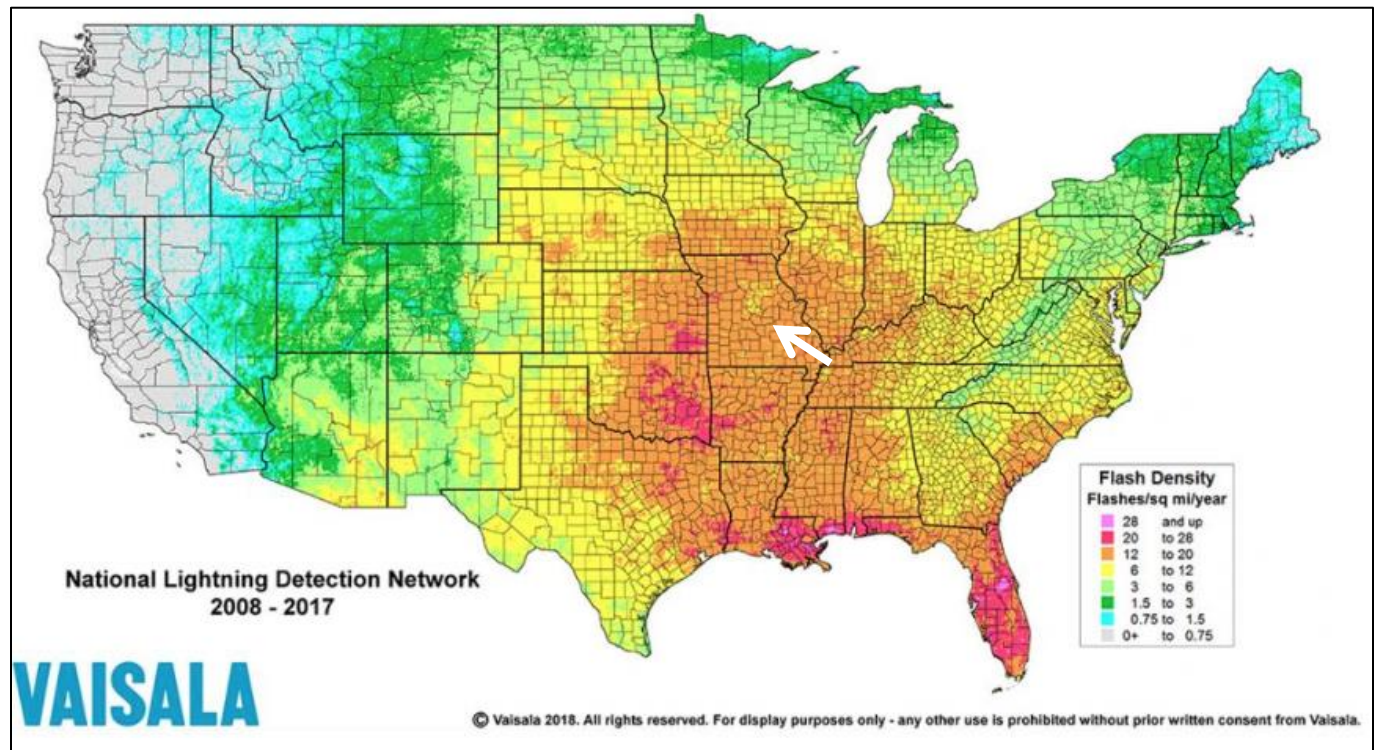
At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a $\frac{1}{4}$ " diameter or pea sized hail requires updrafts of 24 miles per hour, while a $2\frac{3}{4}$ " diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest hailstone in diameter recorded in the United States was found in Vivian, South Dakota on July 23, 2010. It was eight inches in diameter, almost the size of a soccer ball. Soccer-ball-sized hail is the exception, but even small pea-sized hail can do damage.

Geographic Location

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

Figure 3.59 depicts the location and frequency of lightning in Missouri. Additionally, the map indicates that the flash density of Maries County ranges between 6 and 8 flashes per square kilometer per year.

Figure 3.59. Location and Frequency of Lightning in Missouri

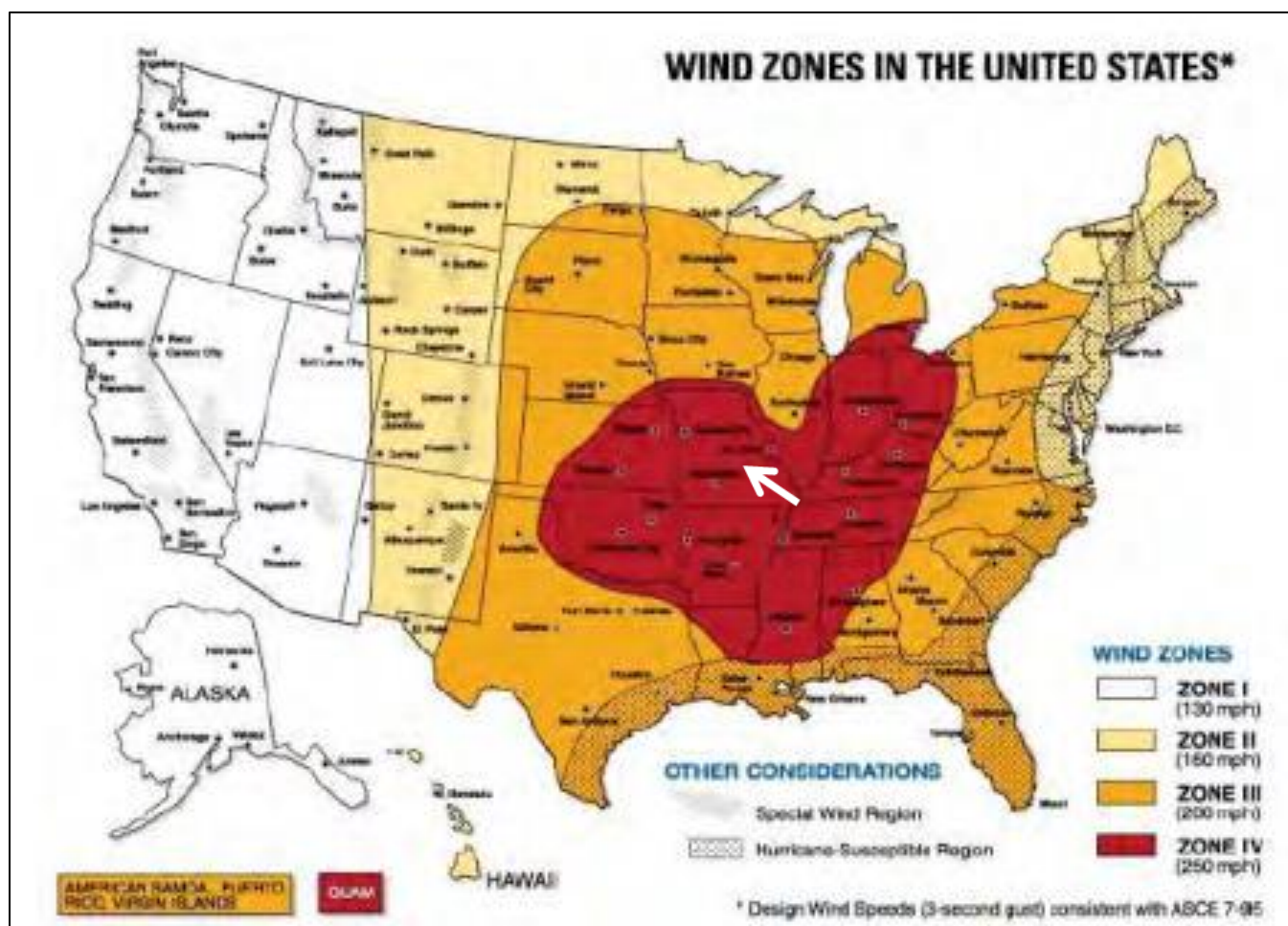


Source: National Weather Service,
<http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx>

* 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 3.60**).

Figure 3.60. Wind Zones in the United States



Source: FEMA 320, *Taking Shelter from the Storm*, 3rd edition, https://www.fema.gov/pdf/library/ism2_s1.pdf

*Maries County is indicated by a white arrow.

Severity/Magnitude/Extent

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

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

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

Based on information provided by the Tornado and Storm Research Organization (TORRO), **Table 3.59** below describes typical damage impacts of the various sizes of hail.

Table 3.59. Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	DiameterSize (inches)	Description	Typical Damage Impacts
Hard Hail	5 - 9	0.2 - 0.4	Pea	No damage
Potentially Damaging	10 - 15	0.4 - 0.6	Mothball	Slight general damage to plants, crops
Significant	16 - 20	0.6 - 0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	21 - 30	0.8 - 1.2	Walnut	Severe damage to fruit and crops, damage to glass, plastic structures, paint and wood scored
Severe	31 - 40	1.2 – 1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	41 – 50	1.6 – 2.0	Golf ball > pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	51 - 60	2.0 - 2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	61 – 75	2.4 – 3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	76 – 90	3.0 – 3.5	Large orange > soft ball	Severe damage to aircraft bodywork
Super Hailstorms	91 – 100	3.6 – 3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.
Super Hailstorms	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.

Source: Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University

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

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

Between 1998 and 2018, there were 65 recorded crop insurance claims for Thunderstorms, lightning, high wind, and hail in Maries County.

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

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Previous Occurrences

Due to the lack of available parameters, heavy rain is utilized in the place of thunderstorms in **Table 3.60**. Moreover, thunderstorm wind and strong wind was included with high winds. NCEI data was obtained for lightning, and hail events between 1998 and 2018 as well (**Table 3.61**, **Table 3.61**, and **Table 3.62**). 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 3.60. NCEI Maries County Heavy Rain Events Summary, 1998 to 2018

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Rainfall (Inch)
2018	2	0	0	0	3.15

Source: NCEI, data accessed [2/25/19]

Table 3.61. NCEI Maries County High Wind Events Summary, 1998 to 2018 (Thunderstorm)

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
1998	2	0	1	\$31K	-
1999	2	0	0	0	50 kts.
2000	2	0	0	0	57 kts.
2001	2	0	0	\$100K	50 kts.
2002	4	0	0	\$15K	62 kts.
2003	5	0	0	0	65 kts.
2004	2	0	0	0	55 kts.
2005	5	0	0	\$2K	60 kts.
2006	1	0	0	0	50 kts.
2007	2	0	0	\$20K	54 kts.

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
2008	3	0	0	\$4K	55 kts.
2009	2	0	0	\$12K	50 kts.
2010	2	0	0	\$35K	61 kts.
2011	4	0	0	\$3K	52 kts.
2012	2	0	0	0	52 kts.
2013	2	0	0	0	52 kts.
2014	2	0	0	0	52 kts.
2015	4	0	0	\$10K	52 kts.
2016	2	0	0	0	53 kts.
2017	3	0	0	\$5K	52 kts.
TOTAL	53	0	1	\$237K	-

Source: NCEI, data accessed [2/25/19]

Table 3.62. NCEI Maries County Lightning Events Summary, 1998 to 2018

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

Source: NCEI, data accessed [2/25/19]

Table 3.63. NCEI Maries County Hail Events Summary, 1998 to 2018

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
1998	2	0	0	5.00K	1.00
1999	1	0	0	0	0.75
2001	5	0	0	0	1.00
2002	2	0	0	0	0.75
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

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
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
Total	61	0	0	5.00K	-

Source: NCEI, data accessed [2/25/19]

Agriculture is an important piece of the economy for Maries County. The tables below (**Table 3.64**, and **Table 3.65**) summarize past crop damages as indicated by crop insurance claims. The tables illustrate 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 "Excessive Moisture/Precipitation/ Rain" and "Wind/Excessive Wind" as two causes of loss categories that align with this hazard. Between 1998 and 2018 a total of 65 insurance claims were paid out for damages due to excessive moisture, precipitation. The total claims paid for this cause were \$463,824.50.

For the time period 1998-2018, there was one crop insurance claim made for wind and excessive wind damage in the amount of \$2,019.00. See **Table 3.65** below.

Table 3.64. Crop Insurance Claims Paid In Maries County from Excessive Moisture/Precipitation/Rain 1998-2018

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
1998	All Other Crops	Excessive Moisture/Precipitation/Rain	\$2,567.00
1999	All Other Crops	Excessive Moisture/Precipitation/Rain	\$3,104.00
2000	All Other Crops	Excessive Moisture/Precipitation/Rain	\$604.00
2001	All Other Crops	Excessive Moisture/Precipitation/Rain	\$989.00
2004	All Other Crops	Excessive Moisture/Precipitation/Rain	\$3,643.00
2008	All Other Crops	Excessive Moisture/Precipitation/Rain	\$1,668.00
2009	All Other Crops	Excessive Moisture/Precipitation/Rain	\$3,120.00
2010	All Other Crops	Excessive Moisture/Precipitation/Rain	\$1,487.00
2011	All Other Crops	Excessive Moisture/Precipitation/Rain	\$1,181.00
2012	Corn	Excessive Moisture/Precipitation/Rain	\$645.00
2013	Corn Soybeans	Excessive Moisture/Precipitation/Rain	\$35,976.00 \$65,892.50
2014	Soybeans	Excessive Moisture/Precipitation/Rain	\$3,614.00
2015	Corn Grain Sorghum Soybeans	Excessive Moisture/Precipitation/Rain	\$155,879.00 \$15,922.00 \$102,163.00
2016	Corn Soybeans	Excessive Moisture/Precipitation/Rain	\$19,765.00 \$20,405.00
2017	Corn Grain Sorghum Soybeans	Excessive Moisture/Precipitation/Rain	\$14,928.00 1,370.00 \$8,582.00
2018	Soybeans	Excessive Moisture/Precipitation/Rain	\$320.00
Total	-	Excessive Moisture/Precipitation/Rain	\$463,824.50

Source: USDA Risk Management Agency, Insurance Claims, <https://www.rma.usda.gov/data/cause>

Table 3.65. Crop Insurance Claims Paid in Maries County from Wind/Excessive Wind 1998-2018

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2000	All Other Crops	Wind/Excessive Wind	\$2,019.00

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 ⁴¹, annual average percent probabilities were calculated for heavy rainfall, high winds, lightning, and hail. Heavy rainfall has a 9.5 percent annual average percent probability of occurrence (2 events/21 years x 100) (**Table 3.66**). Heavy rainfall events can be found in **Table 3.60**.

The annual average percent probability for high winds within the county is 100 percent (53 event/21 years *

⁴¹ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

100) (**Table 3.67**). High wind events can be found in **Table 3.61**.

In Maries County, no lightning events (**Table 3.62**) in 21 years were recorded.

Lastly, the annual average percent probability of hail occurrence is 100% (61 events/21 years) with an average of 2.9 events per year (**Table 3.69**). Hail events can be found in **Table 3.63**.

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

Location	Annual Avg. % P
Maries County	9.5%

*P = probability; see page 3.24 for definition.

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

Location	Annual Avg. % P	Avg. # of Events
Maries County	100%	2.52

*P = probability; see page 3.24 for definition.

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

Location	Annual Avg. % P
Maries County	0%

The probability of lighting damage within the county is very low; however there is still a chance for occurrence.

*P = probability; see page 3.24 for definition.

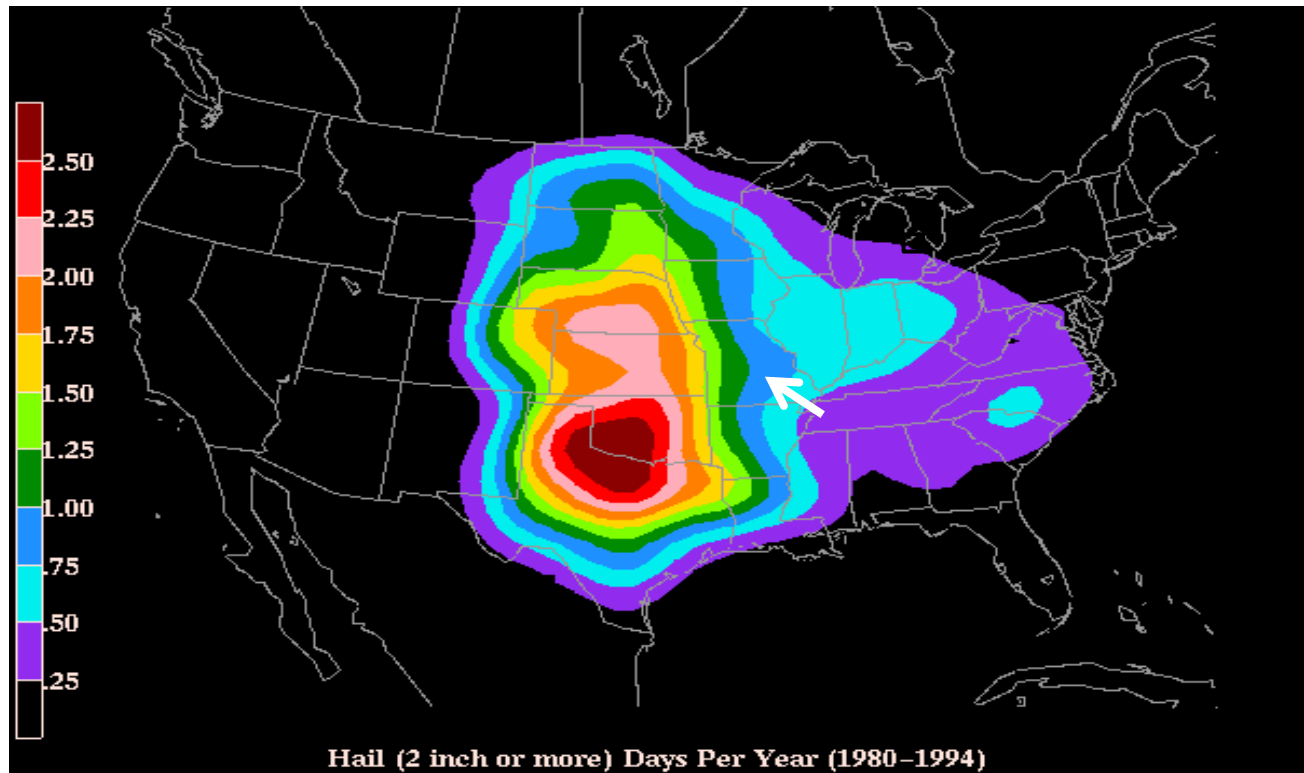
Table 3.69. Annual Average % Probability of Hail in Maries County

Location	Annual Avg. % P	Avg. # of Events
Maries County	100%	2.9

*P = probability; see page 3.24 for definition.

Figure 3.61 depicts a map based on hailstorm data from 1980-1994. It shows the probability of hailstorm occurrence (2" diameter or larger) based on number of days per year. The location of Maries County is identified with a white arrow.

Figure 3.61. Annual Hailstorm Probability (2" diameter or larger), 1980 - 1994



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

* White arrow indicates Maries County

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 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.⁴²

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 1998-2018), 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.⁴³

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 3.70 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 3.71** provides the calculated ranges applied to determine overall vulnerability of Missouri counties to severe thunderstorms.

⁴² <http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx> and <http://www.lightningsafety.noaa.gov/> Potential Losses to Existing Development

⁴³ 2018 Missouri Hazard Mitigation Plan

Table 3.70. Ranges for Severe Thunderstorm Vulnerability Factor Ratings

Factors Considered	Low (1)	Low Medium (2)	Medium (3)	Medium High (4)	High (5)
Common Factors					
Housing Density (# per sq. mile)	4.11-44.23	44.24-134.91	134.92-259.98	259.99-862.69	862.70-2836.23
Building Exposure (\$)	\$269,532-\$3,224,641	\$3,224,642-\$8,792,829	\$8,792,830-\$22,249,768	\$22,249,769-\$46,880,213	\$46,880,214-\$138,887,850
Percent Mobile Homes	0.2-4.5%	4.6-8.8%	8.9-14%	14.1-21.2%	21.3-33.2%
Social Vulnerability	1	2	3	4	5
Wind					
Likelihood of Occurrence (# of events/ yrs. of data)	0.90 - 2.90	2.91 - 4.57	4.58 - 7.00	7.01 - 12.05	12.06 - 20.86
Average Annual Property Loss (annual property loss/ yrs of data)	\$0.00 – \$81,047.62	\$81,047.63 – \$200,428.57	\$200,428.58 – \$363,500.00	\$363,500.01 – \$837,242.86	\$837,242.87 – \$2,481,809.52
Hail					
Likelihood of Occurrence (# of events/ yrs. of data)	1.19 - 2.76	2.77 - 4.86	4.87 - 7.81	7.82 - 12.38	12.39 - 18.10
Average Annual Property Loss (annual property loss/ yrs. of data)	\$0.00 - \$41,547.62	\$41,547.63 – \$171,980.95	\$171,980.96 – \$467,857.14	\$467,857.15 – \$9,714,523.81	\$9,714,523.82 – \$40,594,285.71
Lightning					
Likelihood of Occurrence (# of events/ yrs. of data)	0-.05	.06-0.14	0.15-0.29	0.30-0.43	0.44-0.67
Average Annual Property Loss (annual property loss/ yrs. Of data)	\$0-\$476.19	\$476.20-\$1,904.76	\$1,904.77-\$7,476.19	\$7,476.20-\$13,142.86	\$13,142.87-\$57,000

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.71. Ranges for Severe Thunderstorm Combined Vulnerability Rating

	Low (1)	Low Medium (2)	Medium (3)	Medium High(4)	High (5)
Severe Thunderstorm Combined Vulnerability	12-16	17-19	20-23	24-29	30-36

Source: 2018 Missouri Hazard Mitigation Plan

According to the Hazus data included in the 2018 state plan, Maries County has total building exposure to severe thunderstorms of \$955,863,000. **Table 3.72** 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 percent of mobile homes in the county is rated as medium-high at 16.9 percent of the housing stock. **Table 3.73**, 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 3.72. 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
\$955,863,000	1	8.71	1	Medium	3	16.9	4

Source: 2018 Missouri Hazard Mitigation Plan

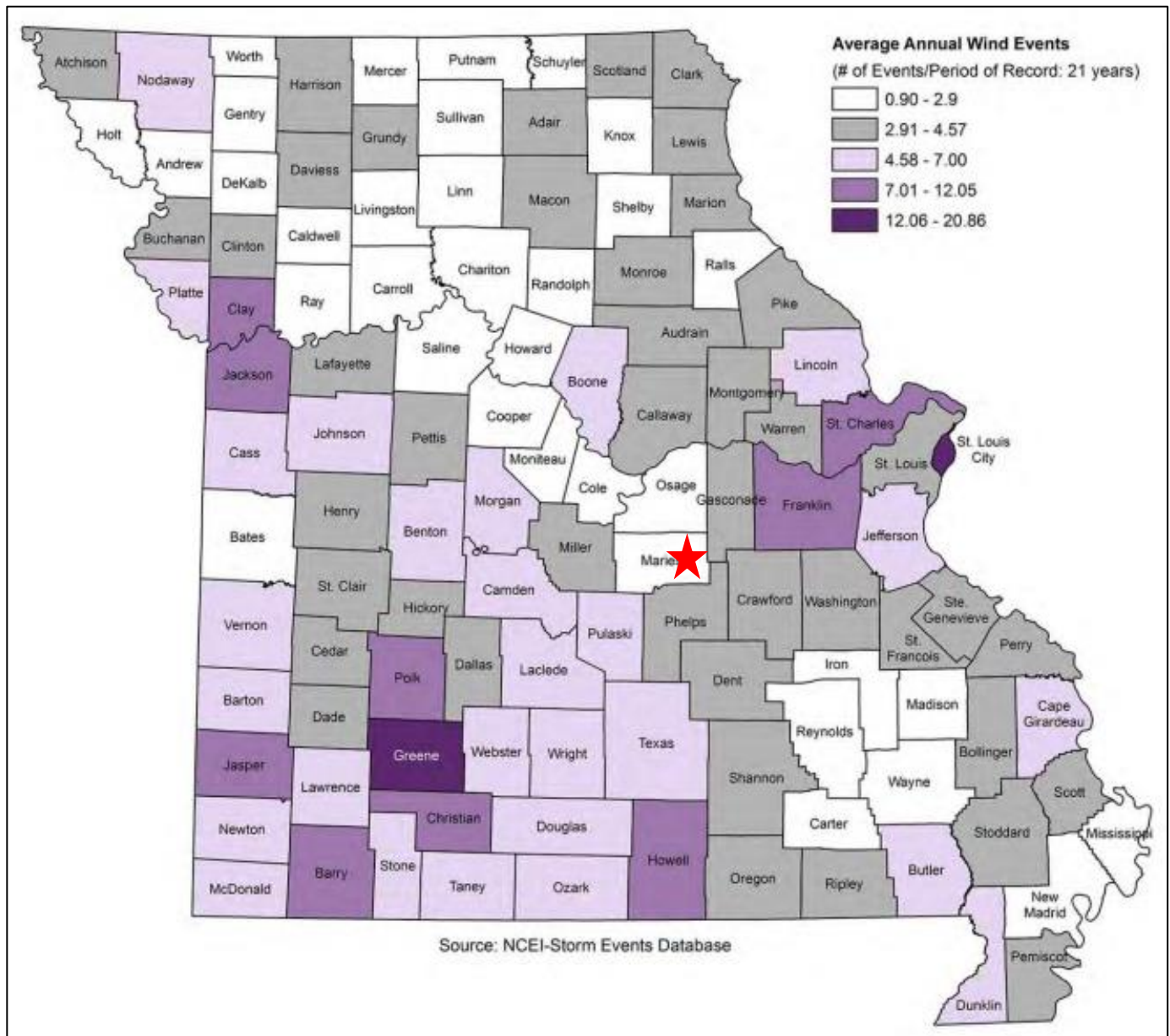
Table 3.73. Number of High Wind, Hail and Lightning Events, Likelihood of Occurrence and Associated Ratings for Maries County

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
51	2.429	1	66	3.143	2	0	0.00	1

Source: 2018 Missouri Hazard Mitigation Plan

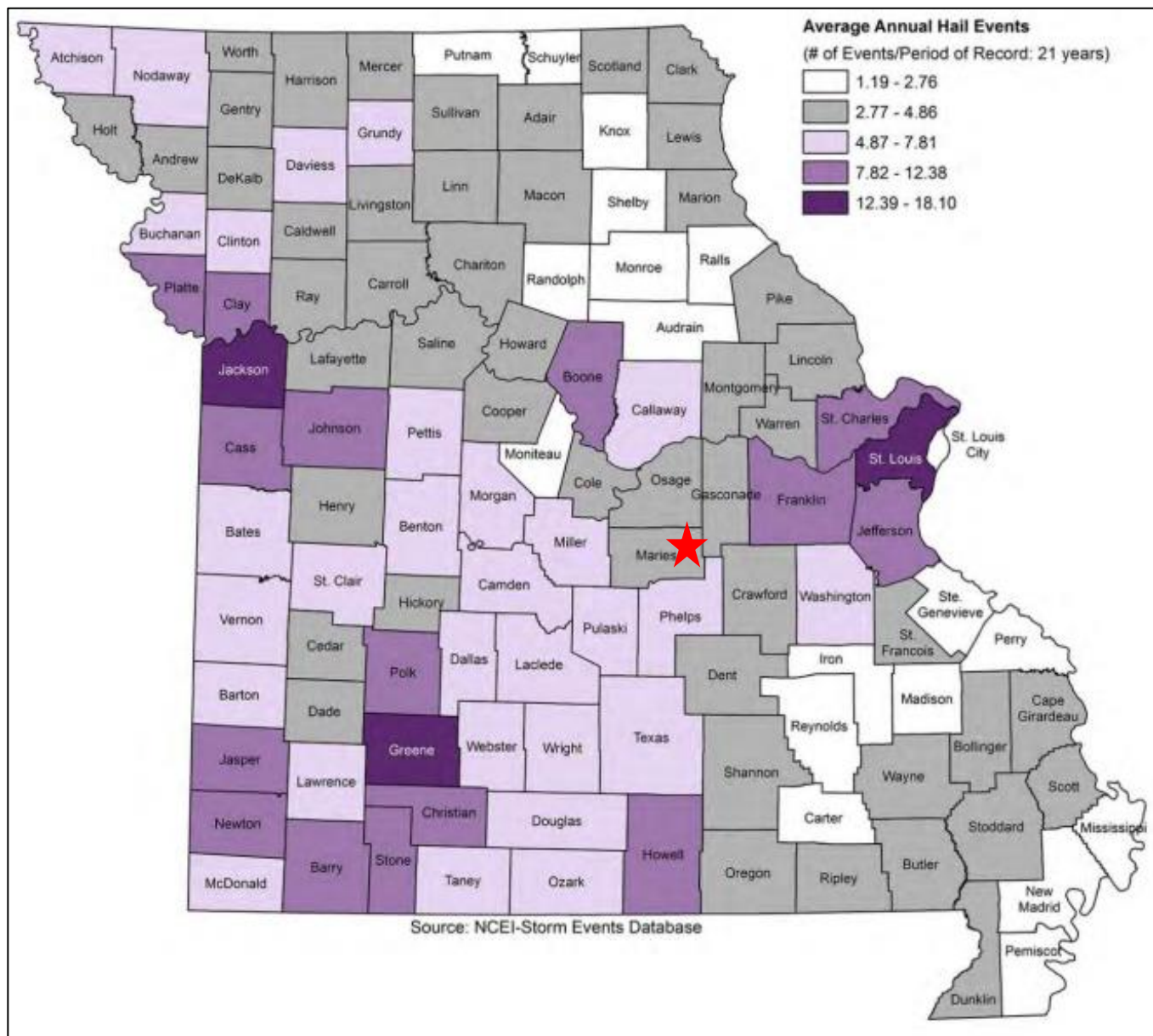
Figure 3.62 through **Figure 3.64** have been pulled from the 2018 Missouri Hazard Mitigation Plan and further depict the average annual likelihood of occurrence of high winds, hail, and lightning events in Missouri.

Figure 3.62. Average Annual High Wind Events (40 MPH and Higher)



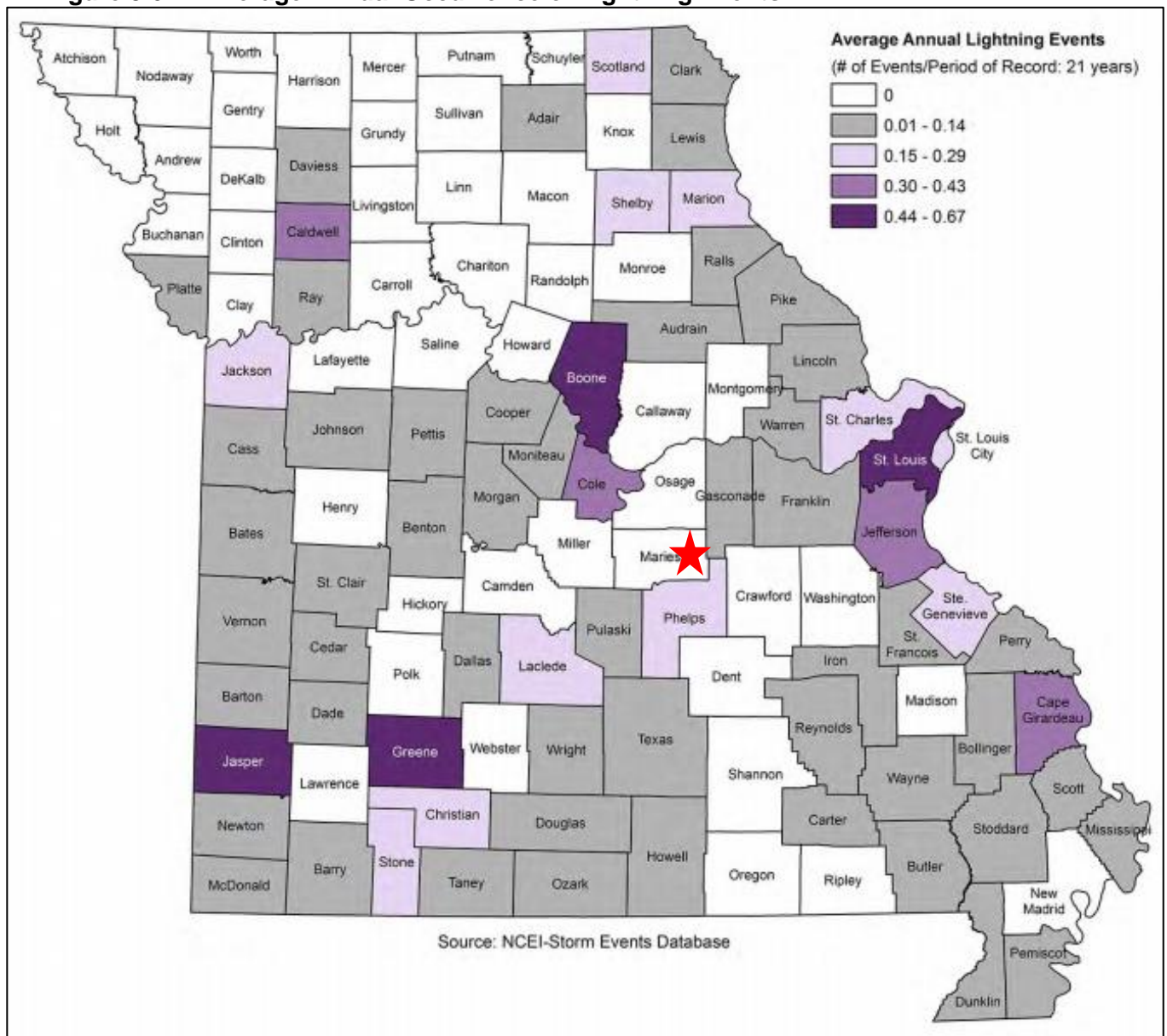
Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Maries County

Figure 3.63. Average Annual Occurrence of Damaging Hail Events



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

Figure 3.64. Average Annual Occurrence of Lightning Events



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

Table 3.74 provides additional data obtained from the National Centers for Environmental Information for property loss to complete the overall vulnerability analysis.

Table 3.74. 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
\$11,048	1	\$238	1	\$0	1

Source: 2018 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 3.71**. **Table 3.75** provides the calculated vulnerability rating for the severe thunderstorm hazard. **Figure 3.65** that follows provides the mapped results of this analysis by county⁴⁴.

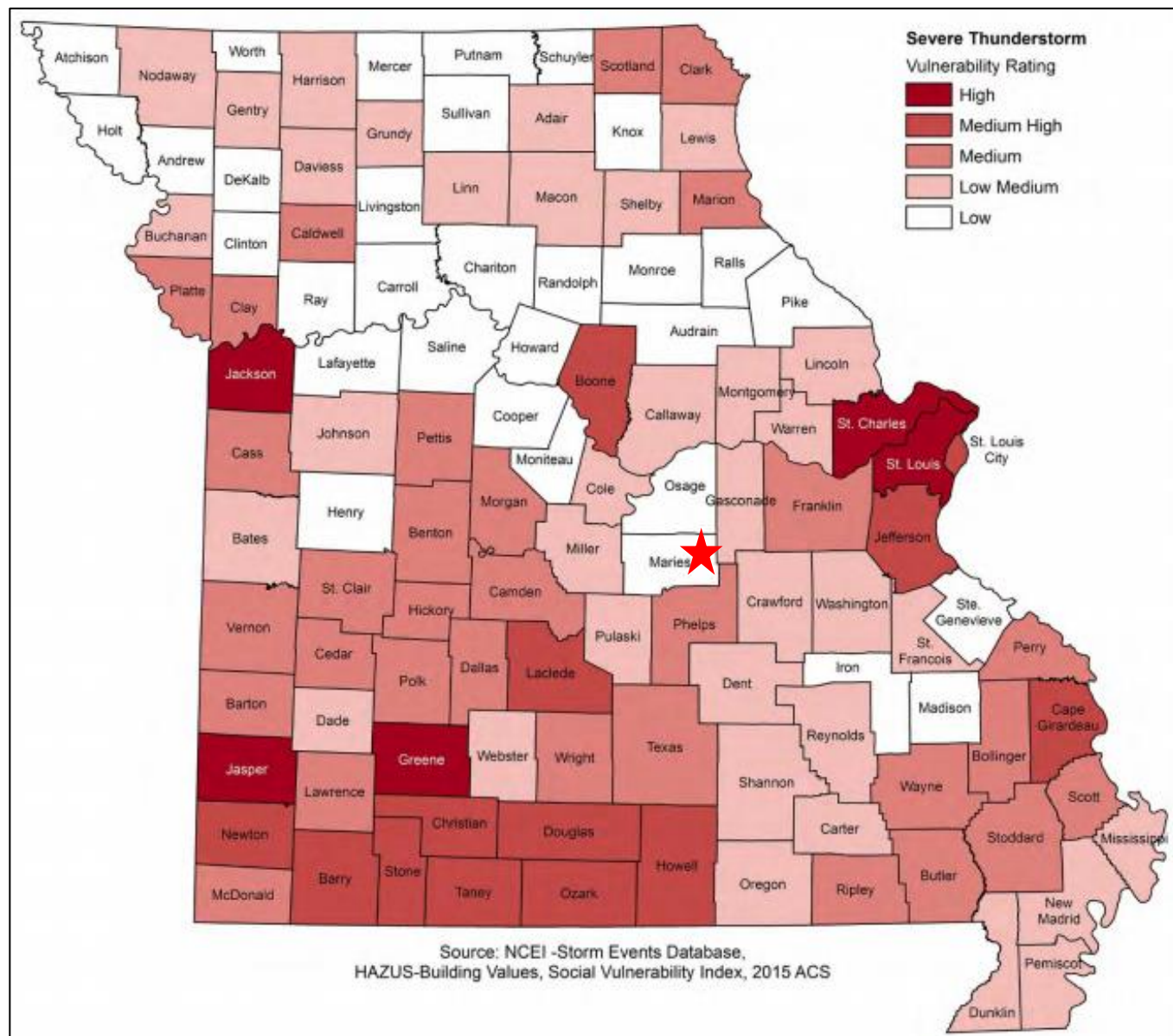
Table 3.75. Severe Thunderstorm Vulnerability Rating for Maries County

Total Sum of All Factor Ratings	Overall Vulnerability Rating for Thunderstorms	Overall Vulnerability Rating for Thunderstorms Description
16	1	Low

Source: 2018 Missouri State Hazard Mitigation Plan

⁴⁴ 2018 Missouri State Hazard Mitigation Plan

Figure 3.65. Vulnerability Summary for Severe Thunderstorms



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

Potential Losses to Existing Development

According to the NCEI Maries County experienced approximately \$242,000 in property damages from severe thunderstorms between 1998 and 2018. This is an average of \$11,523.80 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 area⁴⁵.

⁴⁵ 2015 Boone County Hazard Mitigation Plan

Previous and Future Development

Population trends from 2000 to 2017 for Maries County and the cities of Belle and Vienna indicate that the population in unincorporated areas has fallen by an estimated 5.1 percent. The city of Belle's population has increased by a significant 28.2 percent. The city of Vienna has grown by 5.3 percent. So it is reasonable to assume that similar growth in the communities will continue and the population in unincorporated areas may fall slightly. 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 damages from severe thunderstorms. The jurisdictions with the highest percent of houses built before 1939 include both the city of Vienna (15.2%) and unincorporated Maries County (12.6%). Additionally, unincorporated Maries County has a higher percentage of mobile homes and unsecured buildings, which are more prone to damages.

Problem Statement

The NCEI Storm Events Database notes over 60 thunderstorm and wind events in Maries County since 1998, with over \$570,843.00 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.

3.4.9 Tornado

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
- NWS Enhanced F Scale for Tornado Damage including damage indicators and degrees of damage 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; <https://www.fema.gov/fema-p-320-taking-shelter-storm-building-safe-room-yourhome-or-small-business>
- Tornado Alley in the U.S. map, <http://tornadochaser.com/education/tornado-alley/>
- National Centers for Environmental Information, <http://www.NCEI.noaa.gov/stormevents/>
- Tornado History Project, map of tornado events, <http://www.tornadohistoryproject.com/tornado/Missouri>
- 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 3.4.8**, Thunderstorm/High Wind/Hail/Lightning.

Essentially, tornadoes are a vortex storm with two components of winds. The first is the rotational winds that can measure up to 500 miles per hour, and the second is an uplifting current of great strength. The dynamic strength of both these currents can cause vacuums that can overpressure structures from the inside.

Although tornadoes have been documented in all 50 states, most of them occur in the central United States due to its unique geography and presence of the jet stream. The jet stream is a high-velocity stream of air that separates the cold air of the north from the warm air of the south. During the winter, the jet stream flows west to east from Texas to the Carolina coast. As the sun moves north, so does the jet stream, which at summer solstice flows from Canada across Lake Superior to Maine. During its move northward in the spring and its recession south during the fall, the jet stream crosses Missouri, causing the large thunderstorms that breed tornadoes.

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

The average forward speed of a tornado is 30 miles per hour but may vary from nearly stationary to 70 miles per hour. The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. Tornadoes are most likely to occur in the afternoon and evening, but have been known to occur at all hours of the day and night.

Geographic Location

In Missouri, tornadoes occur most frequently between April and June, with April and May usually producing the most tornadoes. However, tornadoes can arise at any time of the year. While tornadoes can happen at any time of the day or night, they are most likely to occur between 3 p.m. and 9 p.m. Furthermore, tornadoes can occur anywhere across the state of Missouri, including 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 Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (**Table 3.76**) 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 3.76. Enhanced F Scale for Tornado Damage

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

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

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.77**. 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 3.77. Enhanced Fujita Scale with Potential Damage

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

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

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

Previous Occurrences

Table 3.78 illustrates NCEI data reported for tornado events and damages from 1993 to 2018 in the planning area. Prior to 1993, only highly destructive tornadoes were recorded.

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.

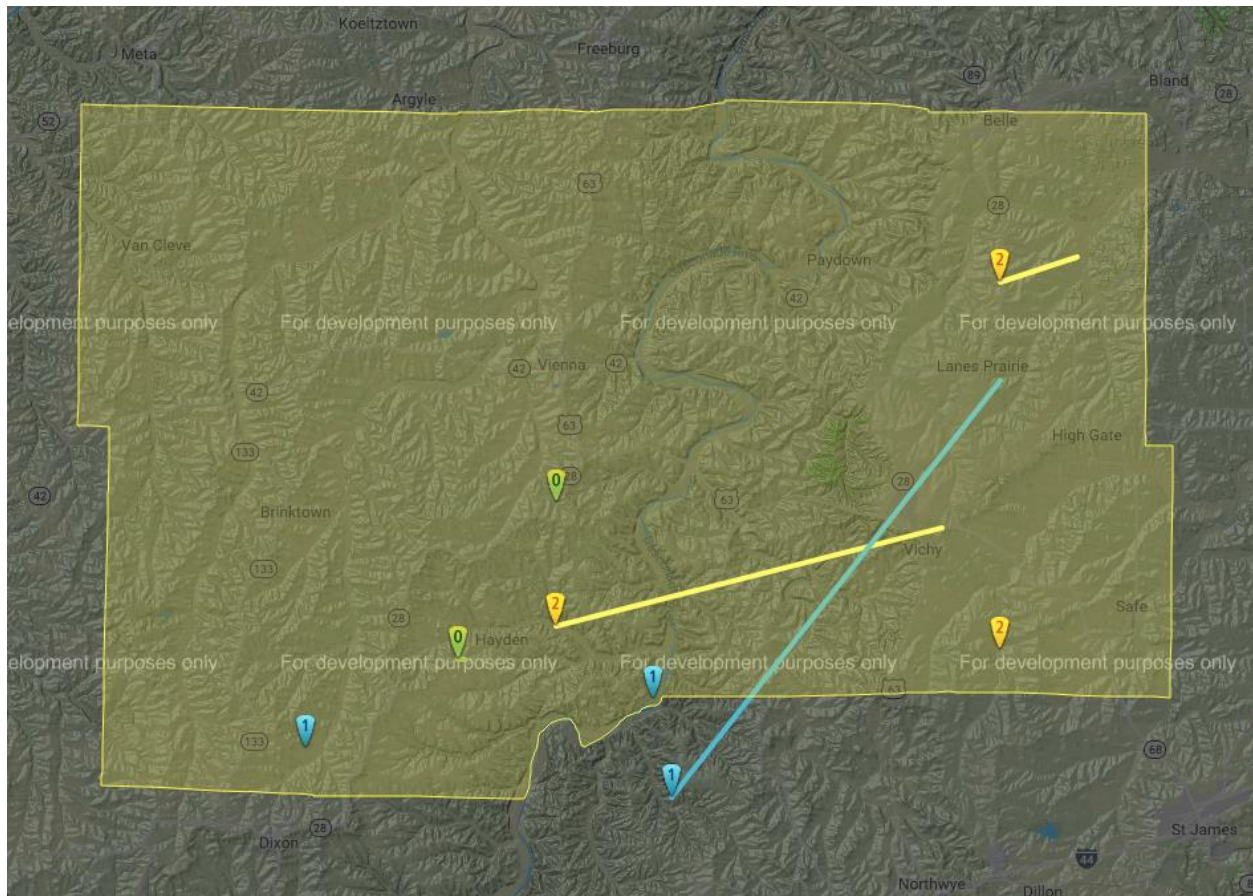
Table 3.78. Recorded Tornadoes in Maries County, 1993 – 2018

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
06/01/1999	7S Brinktown	7S Brinktown	1	200	F1	0	0	\$75.00K	-
05/04/2003	4S Vienna	4S Vienna	.2	20	F0	0	0	\$0	0
01/07/2008	2SSW Veto	OESE Lanes Prairie	11.29	100	EF0	0	1	\$5.00M	0
07/01/2015	2WSW Hayden	2WSW Hayden	0.2	50	EF0	0	0	\$0	0
Total	-	-	-	-	-	0	1	\$5,075.00M	0

Source: National Centers for Environmental Information, <http://www.ncdc.noaa.gov/stormevents/>

Figure 3.66 depicts historic tornado paths across Maries County.

Figure 3.66. Maries County Map of Historic Tornado Paths (1974 – 2015)



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

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 1998 and 2017.

Probability of Future Occurrence

From the data obtained from the NCEI⁴⁶, an annual average percent probability was calculated for tornadoes within Maries County (**Table 3.79**). There is a 20 percent annual average probability of a tornado occurrence (4 events/20 years x 100). Tornado events can be found in **Table 3.78**. In addition, Figure 3.67, obtained from the 2018 Missouri State Hazard Mitigation Plan, also illustrates tornado probabilities across the United States and further shows Maries County's average probability of 20 percent.

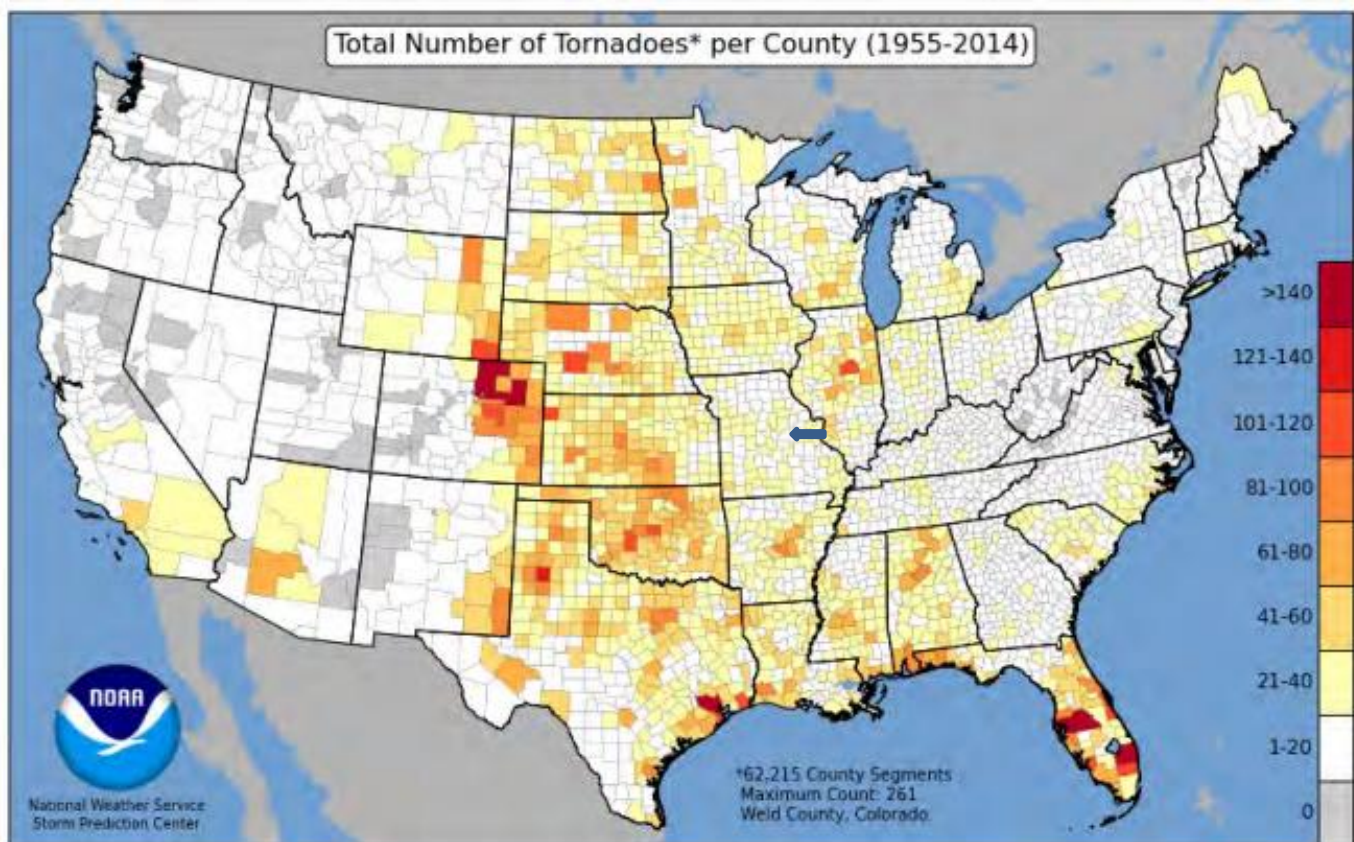
Table 3.79. Annual Average % Probability of Tornadoes in Maries County

Location	Annual Avg. % P
Maries County	20%

*P = probability; see page 3.24 for definition.

⁴⁶ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

Figure 3.67. Tornado Activity in the United States



Source: 2018 Missouri State Hazard Mitigation Plan, *Blue arrow indicates Maries County

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.⁴⁷ 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 3.68** is referred to as "Tornado Alley".

The 2018 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 (2015 ACS), 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, 2016) 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

⁴⁷ 2018 Missouri Hazard Mitigation Plan

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.

Figure 3.68. Tornado Alley in the U.S.



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

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

Table 3.80 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 3.81** illustrates the ranges for tornado combined vulnerability rating.

Table 3.80. Ranges for Tornado Vulnerability Factor Ratings

Factors Considered	Low (1)	Low-medium (2)	Medium (3)	Medium-High (4)	High (5)
Common Factors					
Building Exposure (\$)	\$269,532-\$3,224,641	\$3,224,642-\$8,792,829	\$8,792,830-\$22,249,768	\$22,249,769-\$46,880,213	\$46,880,214-\$138,887,850
Population Density (#per sq. mile)	4.11-44.23	44.24-134.91	134.92-259.98	259.99-862.69	862.70-2,836.23
Social Vulnerability	1	2	3	4	5
Percent Mobile Homes	0.2-4.5%	4.51-8.8%	8.81-14%	14.01-21.2%	21.21-33.2%
Likelihood of Occurrence (# of events/ yrs. of data)	0.119 - 0.208	0.209 - 0.313	0.314 - 0.417	0.418 - 0.552	0.553 - 0.791
Total Annualized Property Loss (\$ / yrs. of data)	\$974 - \$281,874	\$281,875 - \$991,825	\$991,826 - \$2,099,000	\$2,099,001 - \$5,047,474	\$5,047,475 - \$42,467,109

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.81. Ranges for Tornado Combined vulnerability Rating

	Low (1)	Low-medium (2)	Medium (3)	Medium-High (4)	High (5)
Tornado Combined Vulnerability	7-10	11-12	13-14	15-16	17-21

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.82 provides data on building exposure, population density, SOVI and mobile home data for Maries County that is used to determine overall vulnerability.

Table 3.82. 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
\$955,863,000	1	17.01	1	Medium	3	16.9	4

Source: 2018 Missouri Hazard Mitigation Plan

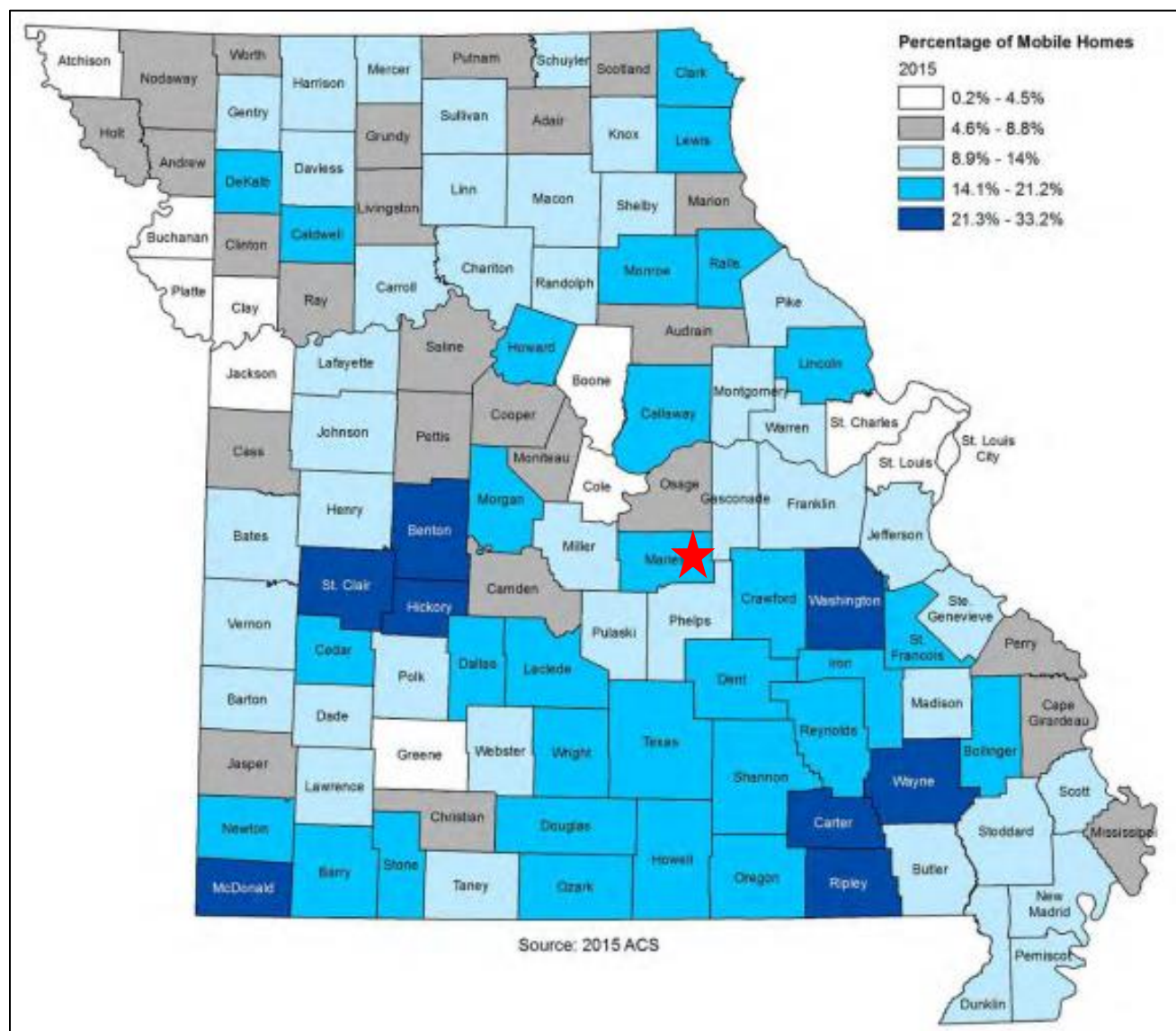
Table 3.83 provides additional data, obtained from the National Centers for Environmental Information to complete the overall vulnerability analysis and the total overall vulnerability rating for tornadoes. **Figure 3.69** shows the percent of mobile homes per county throughout the state with Maries County determined to have medium high mobile home density at 14.1 percent to 21.2 percent. **Figure 3.70** provides the average annual occurrence of tornadoes in Missouri and illustrates that Maries County falls into the lowest quadrant for historical events – 11 to 20 percentile. Finally, **Figure 3.71** shows the county's overall vulnerability to tornadoes – Low – Medium.

Table 3.83. 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
9	0.134	1	\$80,228	1	11	Low-Medium

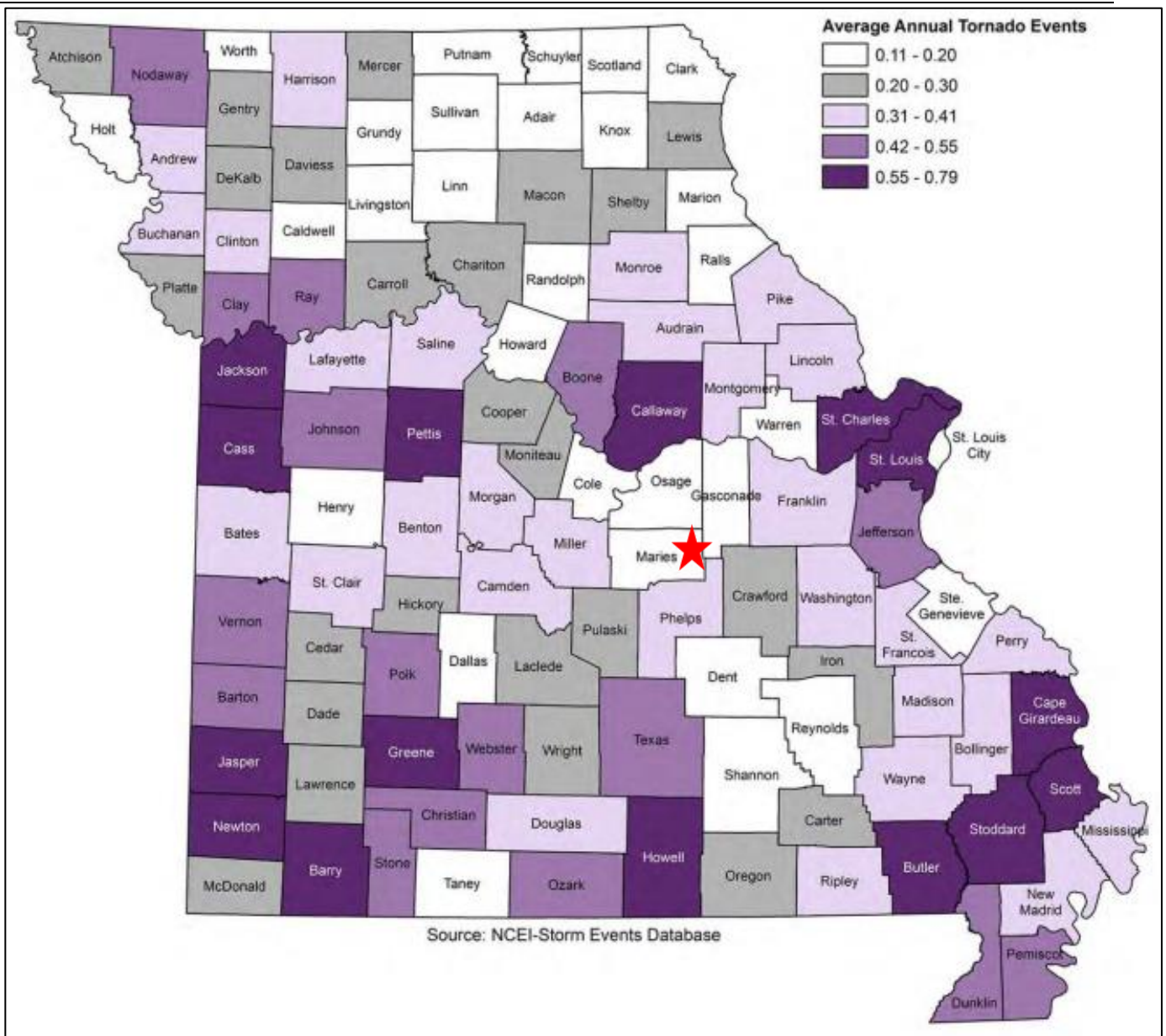
Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.69. Missouri – Percent of Mobile Homes Per County



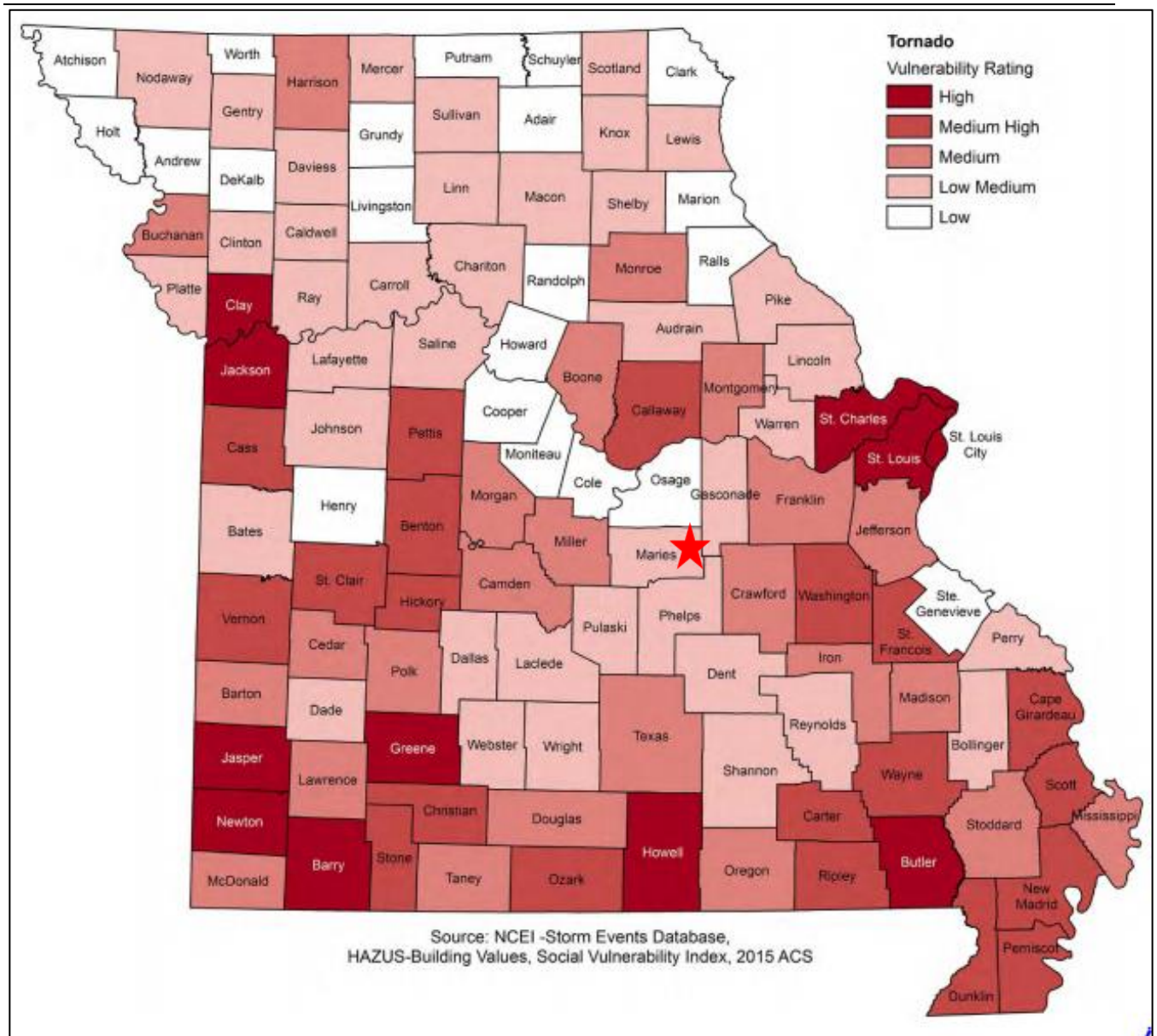
Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Maries County

Figure 3.70. Average Annual Occurrence for Tornadoes



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

Figure 3.71. Overall Vulnerability to Tornadoes



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

Potential Losses to Existing Development

There has been a total of \$5,075,000 in damage due to tornadoes within Maries County in the previous 20 years. With this information we can estimate that each year there will be approximately \$253,750 in loss to existing development. Additionally, the largest recorded tornado in the planning area has been an F-1. Utilizing this information we can infer that there is potential for another tornado of equivalence.

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.

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 3.32** for jurisdictions most vulnerable to damage due to the age of the structure. Based on structure age, the city of Vienna would have higher vulnerability due to 15.2 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 3.84**, unincorporated Maries County, with 562 mobile homes – 15.3 percent of housing in the count, is most vulnerable to losses due to the number of mobile homes residing within the jurisdiction. Belle has 54 or 6.9 percent of the occupied housing stock as mobile homes. Vienna has 21 or 8.8 percent.

Table 3.84. Percentage of Mobile Homes in Maries County, 2017

Jurisdiction	Number of Mobile Homes	Percentage of Mobile Homes*
Unincorporated Maries County	562	15.3
Belle	54	6.9
Vienna	21	8.8

Source: U.S. Census Bureau, 2013-2017 5-Year American Community Survey

*Number of mobile homes per jurisdiction/total occupied housing units per jurisdiction

**Total housing units for all jurisdictions = 4,679

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 build their own storm shelters to prepare for emergencies. Local governments should encourage residents to purchase weather radios to ensure that everyone has sufficient access to information in times of severe weather.

3.4.10 Winter Weather/Snow/Ice/Severe Cold

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
- Wind chill chart, National Weather Service, <http://www.nws.noaa.gov/om/winter/windchill.shtml>;
- Average Number of House per year with Freezing Rain, American Meteorological Society. "Freezing Rain Events in the United States." <http://ams.confex.com/ams/pdfpapers/71872.pdf>;
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- Any local Road Department data on the cost of winter storm response efforts.
- National Centers for Environmental Information, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>
- 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.

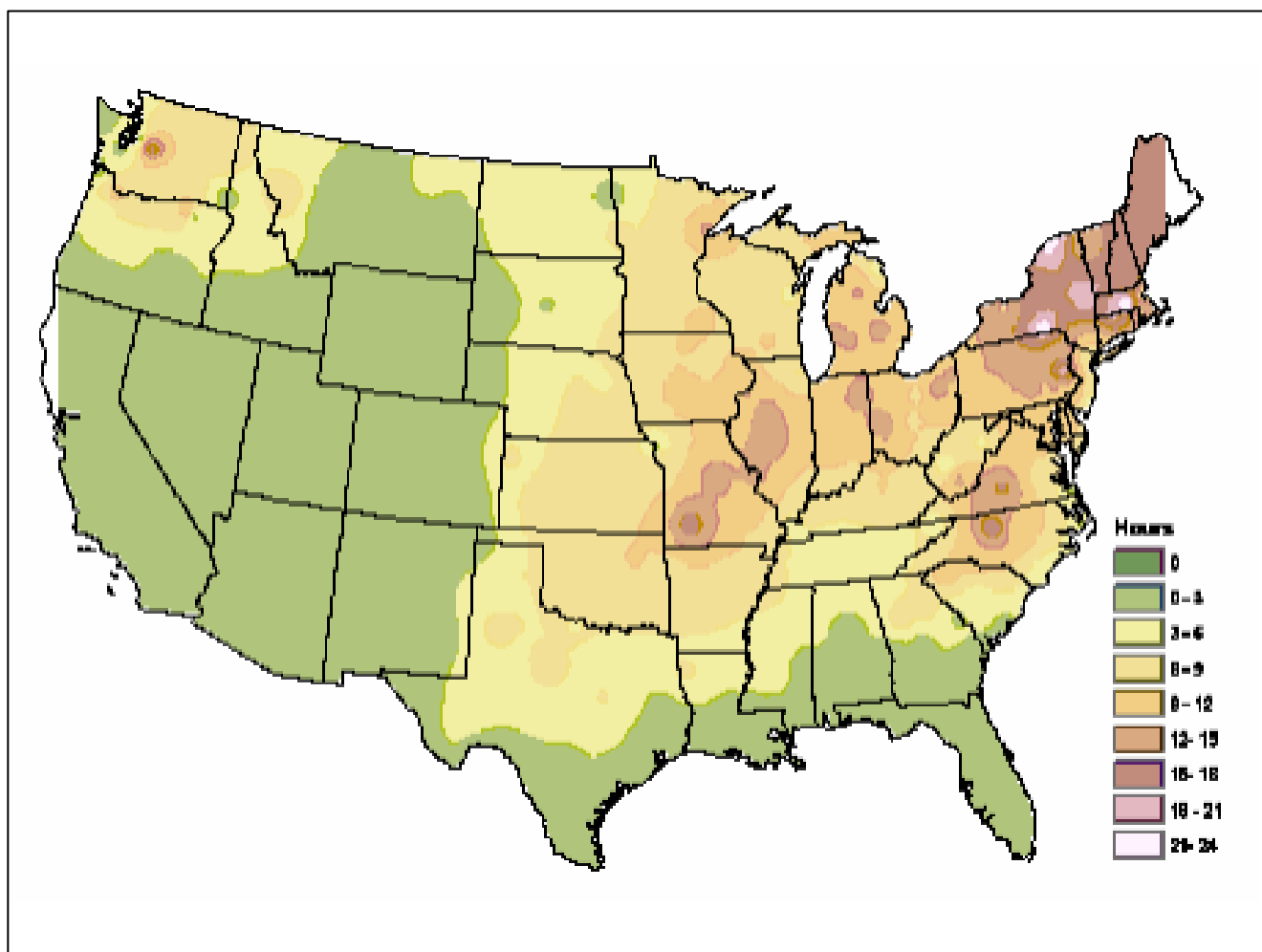
- **Blizzard**—Winds of 35 miles per hour or more with snow and blowing snow reducing visibility to less than ¼ mile for at least three hours.
- **Blowing Snow**—Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls**—Brief, 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 snows to freezing rain annually. Major snowstorms typically occur once each year, causing multiple school closings, as well as suspending business and government activity. Maries County is vulnerable to heavy snow, ice, extreme cold temperatures and freezing rain.

Figure 3.72 illustrates statewide average number of hours per year with freezing rain. Maries County receives approximately 9 to 12 hours.

Figure 3.72. 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 extreme cold, heavy snowfall, ice, and strong winds which can push the wind chill well below zero degrees in the planning area. Heavy snow can bring a community to a standstill by inhibiting transportation (in whiteout conditions), weighing down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make transportation difficult and hazardous. Ice can also become a problem on roadways if the air temperature is high enough that precipitation falls as freezing rain rather than snow.

Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower a building's heating

system and cause water and sewer pipes to freeze and rupture. Extreme cold also increases the likelihood for ice jams on flat rivers or streams. When combined with high winds from winter storms, extreme cold becomes extreme wind chill, which is hazardous to health and safety.

The National Institute on Aging estimates that more than 2.5 million Americans are elderly and especially vulnerable to hypothermia, with the isolated elders being most at risk. About 10 percent of people over the age of 65 have some kind of bodily temperature-regulating defect, and 3-4 percent of all hospital patients over 65 are hypothermic.

Also at risk are those without shelter, those who are stranded, or who live in a home that is poorly insulated or without heat. Other impacts of extreme cold include asphyxiation (unconsciousness or death from a lack of oxygen) from toxic fumes from emergency heaters; household fires, which can be caused by fireplaces and emergency heaters; and frozen/burst pipes.

Buildings with overhanging tree limbs are more vulnerable to damage during winter storms when limbs fall. Businesses experience loss of income as a result of closure during power outages. In general heavy winter storms increase wear and tear on roadways though the cost of such damages is difficult to determine. Businesses can experience loss of income as a result of closure during winter storms.

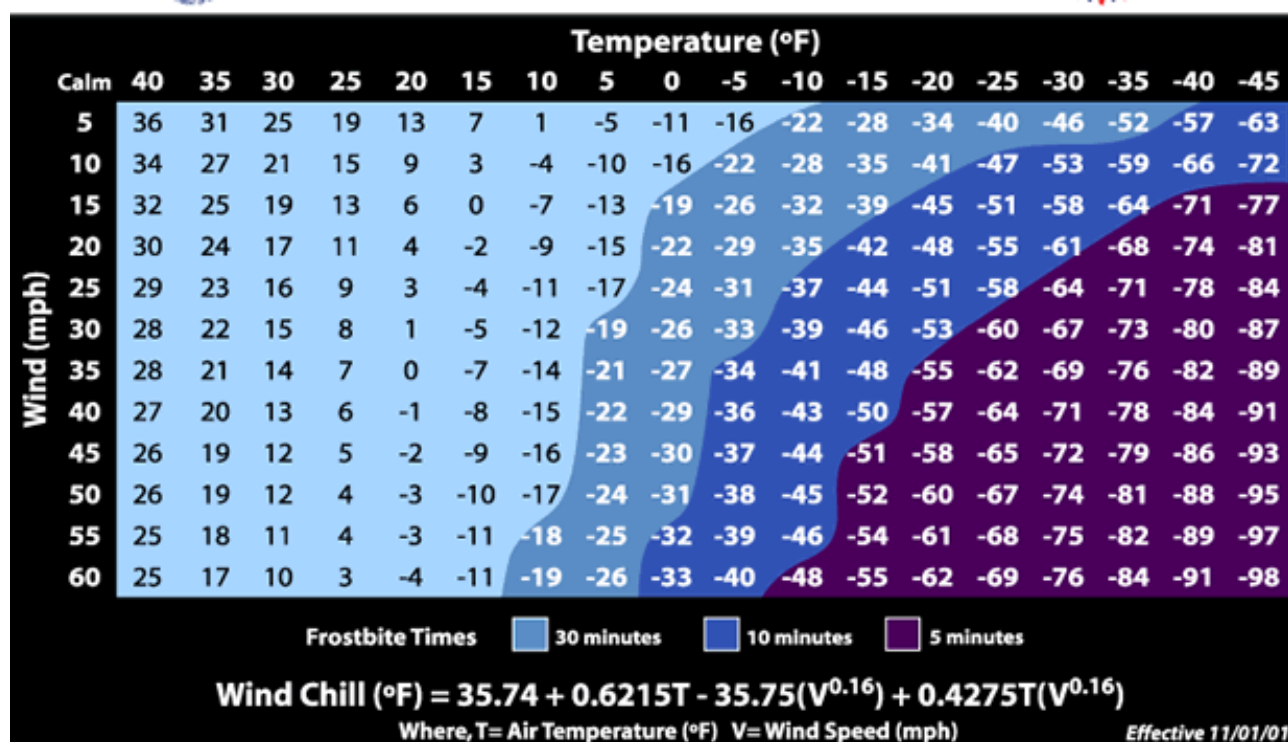
Overhead power lines and infrastructure are also vulnerable to damages from winter storms. In particular, ice accumulation during winter storms can damage power lines and equipment. Damages also occur to lines and equipment from falling trees and tree limbs weighted down by ice. Potential losses could include cost of repair or replacement of damaged facilities, and lost economic opportunities for businesses.

Secondary effects from loss of power could include burst water pipes in homes without electricity during winter storms. Public safety hazards include risk of electrocution from downed power lines. Specific amounts of estimated losses are not available due to the complexity and multiple variables associated with this hazard. Standard values for loss of service for utilities reported in FEMA's 2009 BCA Reference Guide, the economic impact as a result of loss of power is \$126 per person per day of lost service.

Wind can greatly amplify the impact of cold ambient air temperatures. Provided by the National Weather Service, **Figure 3.73** below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Winter storms, cold, frost, and freeze all can influence or negatively impact crop production. However, data obtained from the USDA's Risk Management Agency for insured crop losses indicates that there were no claims paid in Maries County between 1998 and 2018 for severe winter weather.

Figure 3.73. Wind Chill Chart



Source: National Weather Service, <http://www.nws.noaa.gov/om/winter/windchill.shtml>

Previous Occurrences

Data was obtained from the NCEI for winter weather reported events and damages between 1998 and 2018 (**Table 3.85**). This data includes variables such as blizzard, cold/wind chill, extreme cold/wind chill, heavy snow, ice storm, sleet, winter storm, and winter weather. Additionally, narratives for specific events are listed below.

Table 3.85. NCEI County A Winter Weather Events Summary, 1998 - 2018

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Winter Storm	12/20/1998	0	0	0
Winter Storm	01/01/1999	0	0	0
Heavy Snow	12/12/2000	0	0	0
Extreme Cold/Wind Chill	12/12/2000 – 01/03/2001	0	0	0
Ice Storm	12/15/2000	0	0	0
Ice Storm	02/21/2001	0	0	0
Winter Storm	03/02/2002	0	0	0
Winter Storm	12/24/2002	0	0	0
Winter Storm	02/23/2003	0	0	0

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
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
Winter Storm	01/20/2007	0	0	0
Ice Storm	01/12/2007	0	\$3.30M	0
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
Total	24	0	3.85M	0

Source: NCEI, data accessed [2/25/19]

Notable Winter Narratives:

1. **01/01/1999:** A band of snow and sleet (in addition to the ice) fell from southwest to central Missouri. Three to six inch amounts occurred in southwest Missouri in the Springfield, Galena, Ozark, and Buffalo areas. Heavier amounts of 5 to 10 inches occurred in central Missouri near the Lake of the Ozarks. The heaviest 8 to 10 inches of snow occurred in Morgan and northern Miller Counties.
2. **12/12/2000 – 12/31/2000:** A major winter storm dropped as much as 14 inches of snow across the Missouri Ozarks on 12/12/2000. Due to the weight of the snowfall, some roofs and carports were damaged along with some minor power outages. The heavy snow was followed by abnormally cold air moving into the Ozarks in the middle of December and this pattern continued through the early part of January. On 12/15/2000 an ice storm added to the accumulation of ice and snow. The combination of deep snow cover and an abnormally strong arctic air mass kept temperatures 10 to 20 degrees below normal.
3. **01/12/2007 – 01/14/2007:** Considered one of the greatest disasters to impact southwest Missouri. Several counties, mainly along and north of I-44 corridor, experienced ice accumulations up to two and a half inches. 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.
4. **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. **01/26/2009 – 01/28/2009:** A significant winter storm brought a combination of freezing drizzle, freezing rain, sleet and snow to the Missouri Ozarks. A significant accumulation of wintry mix of freezing rain, sleet and snow resulted in treacherous travel conditions. Ice accretion of near one quarter inch or less was followed by one to three inches of sleet and snow.
6. **02/28/2009:** A winter storm brought heavy snowfall to portions of central and south central Missouri. A relatively narrow band of four to eight inch accumulations set up northwest to southeast from the Truman Lake area to the eastern Ozarks. Heavy snow with accumulations of four to seven inches.
7. **02/01/2011:** A major winter storm brought heavy wintry precipitation to the Missouri Ozarks and southeast Kansas on February 1, 2011. Snowfall amounts ranged from around 20 to 24 inches in parts of west central into central Missouri to trace amounts over south central Missouri. In addition to the heavy snowfall, winds of 15 to 30 mph with some gusts near 40 mph occurred during the day and nighttime hours of February 1st creating significant blowing and drifting of snow along with bitterly cold wind chills. This created blizzard conditions with near zero visibility at times and snow drifts up to several feet. Travel was extremely treacherous with some roads impassable.
8. **02/21/2013:** A winter storm brought a mix of snow and sleet accompanied by thunder. Sleet accumulations ranged from one to two inches with snow accumulations ranging from one to two inches.
9. **01/05/2014:** A winter storm brought heavy snow to much of the Missouri Ozarks with accumulations of six to 12 inches generally along and north of I-44. Northwest winds of 20 to 35 mph resulted in significant blowing and drifting snow along with bitterly cold wind chills. Maries County had snow accumulations of six to 10 inches.
10. **03/02/2014:** A winter storm impacted the Missouri Ozarks. Precipitation began as a mixture of freezing rain and sleet across much of the region, with rain changing to freezing rain and sleet across far southern Missouri as the storm progressed. Many locations across southern Missouri also saw thunderstorms with reports of thunder sleet. Precipitation changed to snow during the day and as Arctic air mass overspread the area. In Maries County sleet accumulations of around ½ inch with snow accumulations of one to two inches.

Maries County has been included in three federal disaster declarations for ice storms since 2007.⁴⁸ Data obtained from the USDA's Risk Management Agency for insured crop losses indicates that there were no claims paid in Maries County between 1998 and 2018 for severe winter weather.

Probability of Future Occurrence

From the data obtained from the NCEI⁴⁹, annual average percent probabilities were calculated for winter weather within Maries County (**Table 3.85**). There were 24 recorded events (**Table 3.85**) over a 21 year period. There is 100 percent annual average probability of winter weather occurrence (24 events/21 years), with an average of 1.14 events per year.

⁴⁸ <https://www.fema.gov/data-visualization-summary-disaster-declarations-and-grants>

⁴⁹ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

Table 3.86. Annual Average % Probability of Winter Weather in Maries County

Location	Annual Avg. % P	Avg. # of Events
Maries County	100%	1.14

*P = probability; see page 3.24 for definition.

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 2018 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, 2016)
- HAZUS Building Exposure Value data
- Housing density data from the U.S. Census (2015 ACS)
- 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 3.87 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 ratings was computed for severe winter weather. Those can be seen in **Table 3.88**. The housing density, building exposure and SOVI data for Maries County can be found in **Table 3.89**.

Table 3.87. Ranges for Severe Winter Weather Vulnerability Factor Ratings

Factors Considered	Low (1)	Low Medium (2)	Medium (3)	Medium High (4)	High (5)
Common Factors					
Housing Density (# per sq. mile)	4.11-44.23	44.24-134.91	134.92-259.98	259.99-862.69	862.70-2836.23
Building Exposure (\$)	\$269,532-\$3,224,641	\$3,224,642-\$8,792,829	\$8,792,830-\$22,249,768	\$22,249,769-\$46,880,213	\$46,880,214-\$138,887,850
Social Vulnerability	1	2	3	4	5
Likelihood of Occurrence (# of events/ yrs. of data)	1.05-1.43	1.44-1.76	1.77-2.10	2.11-2.67	2.68-4.57
Average Annual Property Loss (annual property loss/ yrs. Of data)	\$0-\$143,095.24	\$143,095.25-\$406,666.67	\$406,666.68-\$1,191,000.95	\$1,191,000.96-\$3,184,761.90	\$3,184,761.91-\$5,861,666.67

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.88. Ranges for Severe Winter Weather Combined Vulnerability Rating

	Low (1)	Low-medium (2)	Medium (3)	Medium-high-4	High (5)
Severe Winter Weather Combined Vulnerability	7-8	8-10	10-12	12-15	15-22

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.89. Housing Density, Building Exposure and SOVI Data for Maries County

Total Building Exposure (Hazes)	Building Exposure Rating	Housing Density	Housing Density Rating	SOVI Ranking	SOVI Rating
\$955,863,000	1	8.71	1	Medium	3

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.90 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 1.14 or 100 percent per year. The total annualized property loss is \$185,952, 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 3.90. Additional Statistical Data Compiled for Vulnerability Analysis for Maries County

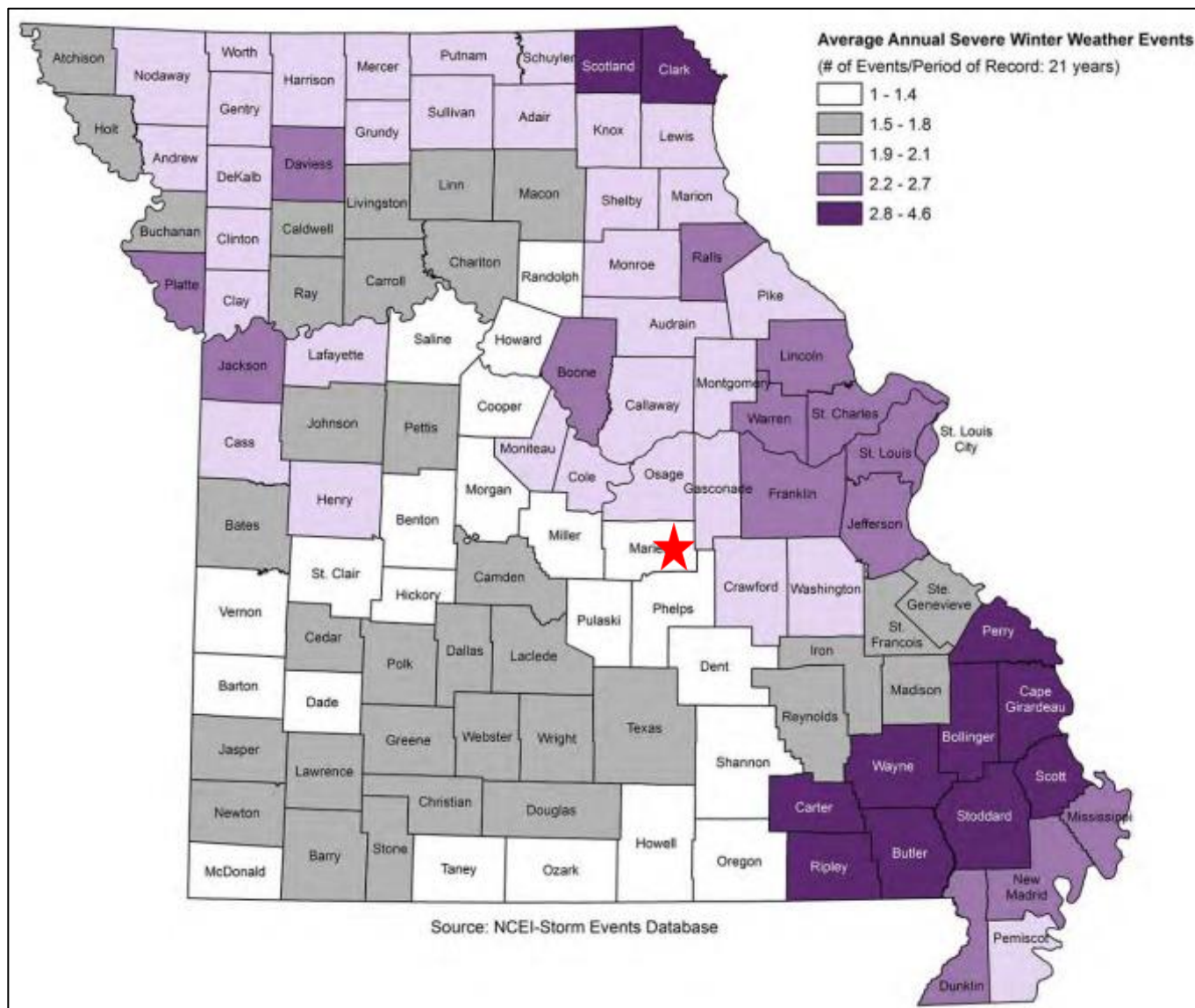
Total number of Winter Weather Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating	Overall Vulnerability Rating	Overall Vulnerability Rating Description
24	1.1429	1	\$185,952	2	8	Low

Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.74 illustrates the average annual occurrence of severe winter weather statewide. Maries County falls into the Low category of 1 to 1.4 events per year.

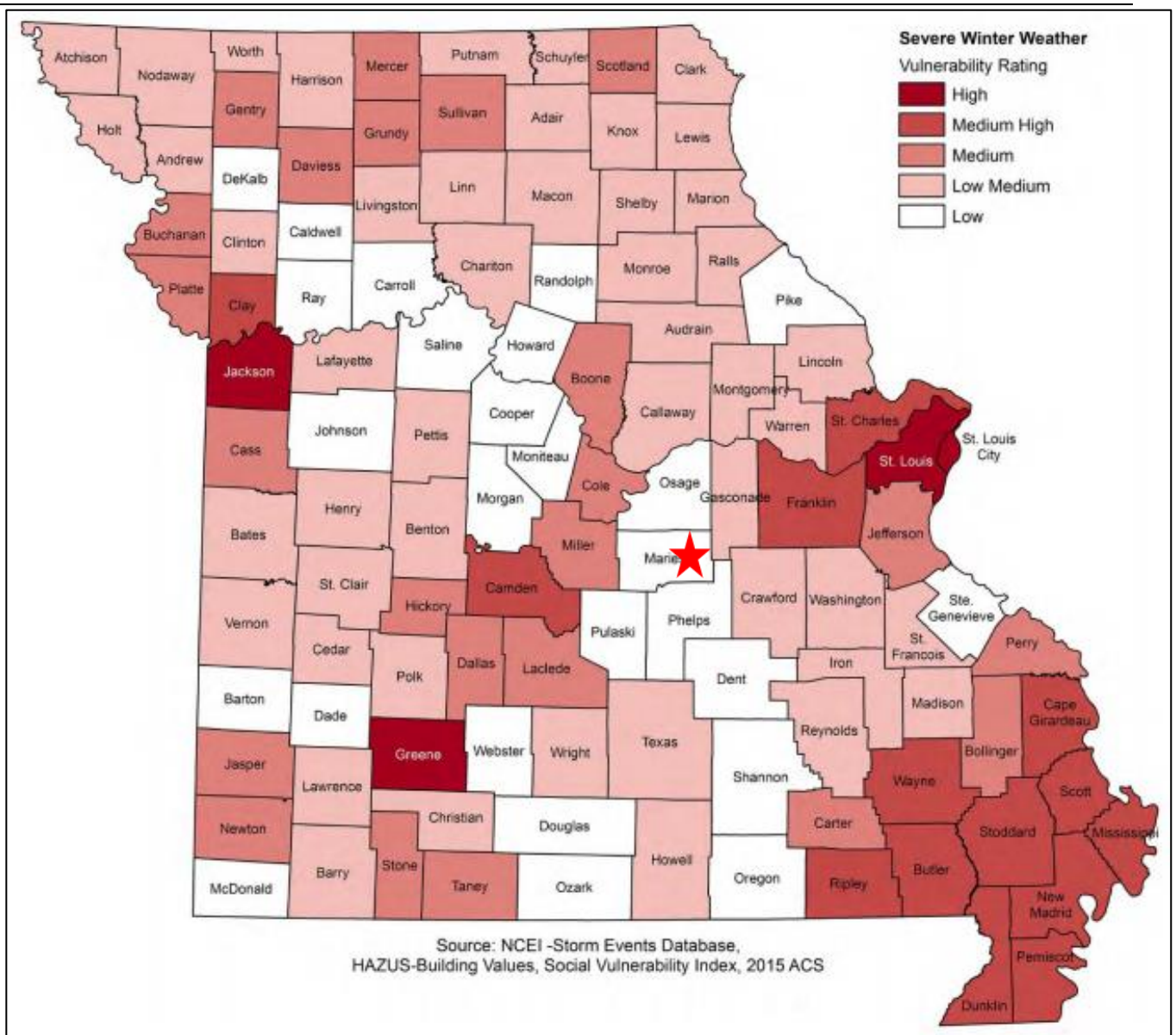
Figure 3.75 provides an illustration of the vulnerability summary of all Missouri counties for severe winter weather. Again, Maries County falls into the Low rating for overall vulnerability.

Figure 3.74. Average Annual Occurrence of Severe Winter Weather Events



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

Figure 3.75. Vulnerability Summary for Severe Winter Weather



Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Maries County

Potential Losses to Existing Development

The next severe winter storm will most likely close schools and businesses for multiple days, and make roadways hazardous for travel. Heavy ice accumulation may damage electrical infrastructures, causing prolonged power outages for large portions of the region. In addition, freezing temperatures make water lines vulnerable to freeze/thaw. Fallen tree limbs also pose a threat to various structures/infrastructures across the county. According to the 2018 state plan, Maries County can expect annual property losses of \$185,952 due to severe winter storms.

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 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 high number of mobile homes tend to experience increased damages. Unincorporated Maries County has the highest abundance of mobile homes, making the area more prone to increase exposure to damage. 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 preparing for power outages.

4 MITIGATION STRATEGY

4	MITIGATION STRATEGY	4.1
4.1	<i>Goals.....</i>	4.1
4.2	<i>Identification and Analysis of Mitigation Actions.....</i>	4.2
4.3	<i>Implementation of Mitigation Actions</i>	4.5

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 (October 1, 2012)*.

- **Mitigation Goals** are general guidelines that explain what you want to achieve. Goals are long-term policy statements and global visions that support the mitigation strategy. The goals address the risk of hazards identified in the plan.
- **Mitigation Actions** are specific actions, projects, activities, or processes taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan's mission and goals.

4.1 Goals

44 CFR Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

This planning effort is an update to Maries County's existing hazard mitigation plan originally approved by FEMA in August 2006 and updated and approved by FEMA on August 25, 2014. Therefore, the goals from the updated 2014 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 first meeting to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the 2014 State Hazard Mitigation Plan goals were reviewed. As the existing goals were broad, still applicable, and supported the 2014 State Hazard Mitigation Plan goals, the MPC saw no reason to make any changes. The Maries County goals are as follows:

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

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

Goal 3: Promote education, outreach, research and development programs to improve the

knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.

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

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

Goal 6: Secure resources for investment in hazard mitigation.

4.2 Identification and Analysis of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

During the first MPC meeting, the committee discussed what needed to be updated in the risk assessment. Changes in risk since adoption of the previously approved plan were discussed. Since the last update, there has been death due to natural hazard events. Action items were reviewed and suggestions made for changes to address the changes in risk. Discussions from the actions from the previous plan included completed actions, on-going actions, and actions upon which progress had not been made. The MPC discussed SEMA's identified funding priorities and the types of mitigation actions generally recognized by FEMA.

The MPC determined to include problem statements in the plan update at the end of each hazard profile, which had not been done in the previously approved plan. The problem statements summarize the risk to the planning area presented by each hazard, and include possible methods to reduce that risk.

The focus of Meeting #2 was to review, prioritize and update the mitigation strategy. The MPC reviewed the list of actions proposed in the previous mitigation plan and proposed additional mitigation actions. Facilitators also provided suggestions for actions based on what some of the surrounding counties had included in their plans. Participants were also encouraged to refer to the current State Plan and provided a link to the FEMA's publication, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)*. This document was developed by FEMA as a resource for identification of a range of potential mitigation actions for reducing risk to natural hazards and disasters.

During the review of the plan document, MPC members were encouraged to review the details of the risk assessment vulnerability analysis specific to their jurisdiction.

The MPC reviewed the actions from the previously approved plan for progress made since the plan had been adopted. Copies of the list of actions for each jurisdiction were provided to MPC members at planning meetings and were emailed out to all members. Action items were reviewed and the MPC provided updates on the status of action items during both planning meetings and the meeting with the road and bridge department. Each action item was reviewed and assigned one of the following:

- Completed, with a description of the progress,

- Not Started/Continue in Plan Update, with a discussion of the reasons for lack of progress,
- In Progress/Continue in Plan Update, with a description of the progress made to date or
- Deleted, with a discussion of the reasons for deletion.

Based on the status updates, there were 15 completed actions, nine deleted actions, three actions that were combined with other, similar actions, and 30 continuing actions.

0 provides a summary of the completed and deleted actions from the previous plan.

Table 4.1. Summary of Completed and Deleted Actions from the Previous Plan

Completed Actions	Completion Details (date, amount, funding source)
1.1.1 Implement an education program on personal emergency preparedness that teaches residents how to prepare emergency medical kits that include water, blankets, flashlights, etc.; learn how to shut off their home utilities in times of emergency; and be self-sufficient for one to three days in the event of a disaster	The County has an established program for promoting individual and family emergency preparedness. County makes Ready-in-3 brochures available through several outlets including the Health Department and local emergency response agencies; and shares press releases on emergency preparedness for residents.
1.1.2 Continue to educate residents about precautions that should be taken during threats of natural disasters such as severe weather and heat waves.	The County, County Health Department and local emergency response agencies have established a program to educate residents on what precautions to take during threats of natural disasters such as severe weather and heat waves.
1.1.7 Schools need to continue to conduct emergency preparedness exercises on a regular basis.	Schools currently operate with a regular schedule of fire, tornado and earthquake drills.
1.2.3 Partner with local radio stations to assure that appropriate warning of impending disasters is provided to all residents in the countywide listening area.	The County EMD states that although there are no radio stations located in Maries County,
1.3.1 Continue to encourage tree trimming and dead tree removal by utility companies and local government.	The County, cities and utility companies all have tree trimming and dead tree removal programs in place.
1.3.5 Regularly review and update school emergency plans.	The two school districts both regularly review and update school emergency plans per State requirements.
2.1.5 Continue to evaluate and update emergency operations plans.	The County EMD states that LEOPs are regularly reviewed and updated by all jurisdictions. The Meramec Regional Emergency Planning Committee provides updates to all local government and emergency responders on an annual basis.
3.1.1 Distribute SEMA brochures on natural hazards, preparedness and NFIP at public facilities and events.	The Health Department, EMD and emergency response agencies provide information and distribute SEMA brochures on natural hazards, preparedness and NFIP in public facilities and/or at local events.
3.1.2 Distribute regular press releases from county and city EMD offices concerning hazards, where they strike, frequency, preparation and how to mitigate.	Information is distributed via local media on natural hazards, where they strike, frequency, how to prepare and how to mitigate. NFIP and floodplain management brochures are available through several county offices.
3.3.2 Distribute press release by cities/county regarding adopted mitigation measures to keep public abreast of changes and/or new regulations.	Local media attends commission and city council meetings and provides information through press releases that highlight any mitigation measures being conducted or regulations being enforced by local jurisdictions.

Completed Actions	Completion Details (date, amount, funding source)
4.1.2 Continue to encourage and facilitate training opportunities in all areas of preparedness and response to insure the capabilities and safety of citizens and responders and encourage joint trainings/drills between agencies, public and private entities (including schools and businesses).	The County, cities, local emergency response agencies and schools work together on a number of trainings and drills on a regular basis.
4.2.2 Encourage meetings between EMD, city and county government and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects	This action item has been/will continue to be addressed by the Region I Area Coordinator.
5.1.3 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.	The hazard mitigation plan is reviewed regularly and has been incorporated into the Community Economic Development plan for the region as well as with emergency operations plans and procedures.
6.1 .1 Encourage meetings between EMD, city/county officials and SEMA to familiarize officials with mitigation planning, implementation and budgeting for mitigation projects.	This action item has been/continue to be addressed by the Region I Area Coordinator. (Also a duplicate of 4.2.2.)
6.1.4 Encourage local jurisdictions to budget for mitigation projects.	This action is being addressed by all jurisdictions through current and on-going planning efforts.
Deleted Actions	Reason for Deletion
1.1.3 Provide to citizens through local media and make available at local government buildings, information on individual mitigation activities such as building personal shelters and assuring that propane tanks are appropriately tied down.	The planning group ranked this as a low priority.
2.1.3 Encourage businesses/government/schools to develop emergency plans	Duplicate of 1.1.4 Promote the development and/or update of emergency plans by businesses.
2.1.4 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.	Duplicate of 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.
2.3.1 Encourage minimum standards for building codes in all cities.	Duplicate of 2.1.2. Encourage the development and implementation of minimum building codes in all communities.
3.2.1 Encourage local residents to purchase weather radios through press release and brochures.	Duplicate of 1.2.2. Continue to promote use of weather radios by local residents to insure advanced warning about threatening weather.
3.4.3 Encourage the development of a county-wide CERT program and educate the public on how they can benefit from this type of program.	Duplicate of 1.1.5 Continue to provide CERT training and encourage the development of CERTS throughout the county through training opportunities and public awareness.
5.1.2 Encourage all communities to develop storm water management plans.	The planning group ranked this as a low priority.

Deleted Actions	Reason for Deletion
5.1.4 Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.	The planning group ranked this as a low priority.
6.1.5 Whenever possible, pool different agency resources to achieve widespread mitigation results.	Duplicate of 4.1.3 Pool different agency resources to achieve widespread mitigation planning results.
Combined Actions	Explanation
3.4.4 Raise awareness of the need to secure propane tanks to reduce the risk from dislodged tanks during flooding, tornadoes and high winds.	Combined with 2.3.2 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.
5.1.1 Encourage communities to budget for enhanced warning systems.	Combined with 1.2.1 Continue to encourage cities to obtain early warning systems and improved communications systems.
6.1.2 Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	Combined with 1.3.2 Continue to review and consider road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property.

Source: Previously approved County Hazard Mitigation Plan; MPC committee; data collection questionnaires

4.3 Implementation of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include an action strategy describing how the actions identified in paragraph (c)(2)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefits review of the proposed projects and their associated costs.

Jurisdictional MPC members were encouraged to meet with others in their community to discuss the actions to be included in the updated mitigation strategy. Throughout the MPC consideration and discussion, emphasis was placed on the importance of a benefit-cost analysis in determining project priority. The Disaster Mitigation Act requires benefit-cost review as the primary method by which mitigation projects should be prioritized. The MPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the Missouri State Hazard Mitigation Plan. The benefit/cost review at the planning stage primarily consisted of a qualitative analysis, and was not the detailed process required grant funding application. For each action, the plan sets forth a narrative describing the types of benefits that could be realized from action implementation. The cost was estimated as closely as possible, with further refinement to be supplied as project development occurs.

FEMA's STAPLEE methodology was used to assess the costs and benefits, overall feasibility of mitigation actions, and other issues impacting project. During the prioritization process, the MPC worked together to review and assign scores. The process posed questions based on the STAPLEE elements as well as the potential mitigation effectiveness of each action. Scores were based on the responses to the questions as follows:

Definitely yes = 3 points

Maybe yes = 2 points

Probably no = 1
Definitely no = 0

The following questions were asked for each proposed action.

S: Is the action socially acceptable?

T: Is the action technically feasible and potentially successful?

A: Does the jurisdiction have the administrative capability to successfully implement this action?

P: Is the action politically acceptable?

L: Does the jurisdiction have the legal authority to implement the action?

E: Is the action economically beneficial?

E: Will the project have an environmental impact that is either beneficial or neutral? (score “3” if positive and “2” if neutral)

Will the implemented action result in lives saved?

Will the implanted action result in a reduction of disaster damage?

In addition to the STAPLEE process, each action item was also reviewed for Benefit/Cost. These two aspects of the prioritization process were scored as follows:

Benefit – two (2) points were added for each of the following avoided damages (8 points maximum = highest benefit)

- Injuries and/or casualties
- Property damages
- Loss-of-function/displacement impacts
- Emergency management costs/community costs

Cost – points were subtracted according to the following cost scale (-5 points maximum = highest cost)

- (-1) = Minimal – little cost to the jurisdiction involved
- (-3) = Moderate – definite cost involved but could likely be worked into operating budget
- (-5) = Significant – cost above and beyond most operating budgets; would require extra appropriations to finance or to meet matching funds for a grant

Note: For the Benefit/Cost Review, the benefit and cost of actions which used the word “encourage” were evaluated as if the action or strategy being encouraged was actually to be carried out.

In addition, the group considered the cost of mitigation versus the long-term savings in relation to potential lives saved and property damage avoided.

Total Score – The scores for the STAPLEE Review and Benefit/Cost Review were added to determine a Total Score for each action.

Priority Scale – To achieve an understanding of how a Total Score might be translated into a Priority Rating, a sample matrix was filled out for the possible range of ratings an action might receive on both the STAPLEE and Benefit/Cost Review. The possible ratings tested ranged between:

- A hypothetical action with “Half probably NO and half maybe YES” answers on STAPLEE (i.e. poor STAPLEE score) and Low Benefit/High Cost: Total Score = 7

- A hypothetical action with “All definitely YES” on STAPLEE and High Benefit/Little Cost:
Total Score = 28

An inspection of the possible scores within this range led to the development of the following Priority Scale based on the Total Score in the STAPLEE- Benefit/Cost Review process:

20 – 28 points = High Priority
14-19 points = Medium Priority
13 points and below = Low Priority

The results of the STAPLEE process and Benefit/Cost analysis were then mailed out to all MPC members for feedback and consensus.

The final scores are listed below in the analysis of each action. Correspondence regarding the STAPLEE process is included in Appendix C: A spreadsheet with the action items and final scores is illustrated in Figure 4.1.

Jurisdictional Floodplain Management Programs

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>. Vienna does not currently participate in active monitoring activities within the floodplain.

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 Report¹; NSFHA (SEMA)

¹ www.fema.gov/cis/mo.html

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 1 = Prob NO 2 = Maybe YES 0 = Def NO													
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
1.1.4	Promote the development and/or update of emergency plans by businesses, local governments and schools.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
1.1.5	Continue to provide CERT training and encourage the development of CERTs throughout the county through training opportunities and public awareness.	2	2	2	2	3	2	2	15	IC, PD,	4	-1	3	18	M
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.	2	2	2	3	3	2	3	17	IC, PD,	4	-2	2	19	M
1.2.1	Continue to encourage local governments to budget for and obtain enhanced early warning systems and improved communications systems.	3	3	2	3	3	1	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
1.2.2	Continue to promote weather radios to local residents through press releases and brochures to insure advanced warning about threatening weather.	2	2	2	3	3	2	3	17	IC, EMCC	4	-2	2	19	M
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.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.3.2	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.	3	3	2	3	3	2	2	18	IC, PD, LF, EMCC	8	-1	7	25	H
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.	3	2	2	2	2	2	3	16	IC, EMCC	4	-1	3	19	M
1.3.4	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.	3	3	2	3	3	1	3	18	IC, LF, EMCC	6	-5	1	19	M
2.1.1	Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.	2	2	2	2	2	1	3	14	IC, PD, LF, EMCC	8	-5	3	17	M

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES							1 = Prob NO 0 = Def NO						
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
2.1.2	Encourage the development and implementation of minimum building codes in all communities.	2	2	2	2	3	1	2	14	PD, LF, EMCC	6	-3	3	17	M
2.1.6	Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.	2	2	2	2	3	2	3	16	PD, LF	4	-3	1	17	M
2.2.1	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.	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
2.2.2	Encourage the development of storm water management plans.	2	2	2	2	3	2	3	16	PD, LF	4	-3	1	17	M
2.3.2	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.	2	2	2	1	2	2	2	13	IC, PD, EMCC	8	-3	5	18	M
2.3.3	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
2.3.4	Encourage the City of Belle to become a member of the NFIP.	2	3	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
3.2.2	Encourage meetings between EMD, city/county officials and SEMA to familiarize officials with mitigation planning, implementation and budgeting for mitigation projects.	2	2	2	2	2	2	2	14	IC, PD, LF, EMCC	8	-3	5	19	M
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.	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 1 = Prob NO 2 = Maybe YES 0 = Def NO													
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Loss Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
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.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
3.4.1	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)	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
3.4.2	Publicize local, regional and/or statewide drills/exercises.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
4.1.1	Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
4.1.3	Whenever possible pool different agency resources to achieve widespread mitigation results.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
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.	3	3	2	2	3	3	3	19	IC, EMCC	4	-1	3	22	H
5.3.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.	2	2	2	2	3	1	3	15	IC, PD, LF, EMCC	8	-5	3	18	M
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.	3	2	2	2	3	2	2	16	IC, PD, LF, EMCC	8	-1	7	23	H
6.2.1	Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.	2	1	1	1	2	2	2	11	IC, PD, LF, EMCC	8	-5	3	14	M
6.2.2	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H

Maries County

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

Action 1.1.4: Promote the development and/or update of emergency plans by businesses, local governments and schools.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Lack of emergency plans by businesses, local government units and schools.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.4
Name of Action or Project:	Development of emergency plans by businesses, local government units and schools.
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$4,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	23 – High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
Progress Report	
Action Status	Continuing
Report of Progress	Both Belle and Vienna are part of the county-wide LEOP. Both school districts have emergency plans in place. Victoria Gardens and Maries Manor, local nursing homes, both have emergency plans. The Maries County Bank has also developed an emergency plan.

Action 1.1.5: Continue to provide CERT training and encourage the development of CERTs throughout the county through training opportunities and public awareness.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Need to improve citizen preparedness and ability to respond to disasters with basic first aid, search and rescue and utility shut off training.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.5
Name of Action or Project:	CERT training and development
Action or Project Description:	Provide and encourage CERT training and encourage the development of CERTs throughout the county through training opportunities and public awareness efforts.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$1,000 per class
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	18 – Medium Priority
Timeline for Completion:	On-going.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	The county EMD is working on developing a county-wide CERT program but has not reached the point of holding classes.

Action 1.2.1: Continue to encourage local governments to budget for and obtain enhanced early warning systems and improved communications systems.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of early warning systems and communications systems in unincorporated areas.
Hazard(s) Addressed:	All hazards.
Action or Project	
Action/Project Number:	1.2.1
Name of Action or Project:	Improving early warning and communications capabilities.
Action or Project Description:	Maries County Commission needs to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Maries County.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, Local Planners, Local Emergency Response Agencies
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs, County Budget
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Both local school districts have texting/phone/email systems in place to contact parents. Both Belle and Vienna have one warning siren each. There are no warning sirens located in unincorporated areas of the county.

Action 1.2.2: Continue to promote weather radios to local residents through press release and brochures to insure advanced warning about threatening weather.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of early warning systems for severe weather in rural areas of the county.
Hazard(s) Addressed:	Tornadoes, severe winter weather, severe thunderstorm/high winds/lightning/hail, extreme temperatures, flooding
Action or Project	
Action/Project Number:	1.2.2
Name of Action or Project:	Improving early warning for severe weather.
Action or Project Description:	The county should continue to encourage residents to invest in weather radios to improve early warning for severe weather for residents in rural areas of Maries County.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$500 - \$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Although the county has promoted weather radios in the past, there is currently no coordinated effort to encourage residents to purchase weather radios. Both school districts maintain weather radios.

Action 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.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with absence of data concerning natural disasters.
Hazard(s) Addressed:	Dam Failure, Land Subsidence/Sinkholes, Tornado and Wildfire
Action or Project	
Action/Project Number:	1.2.4
Name of Action or Project:	Monitor developments in data availability for the purpose of improving hazard mitigation planning.
Action or Project Description:	Monitor developments in data availability concerning the impact 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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission, local planners
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOPs, floodplain ordinance
Progress Report	
Action Status	In progress and on-going
Report of Progress	Some work has been done on this action item at the state and federal level. Improved data is becoming available for a number of different hazards including dam failure.

Action 1.3.2: 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.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquake events.
Hazard(s) Addressed:	Floods and Earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Review road and bridge upgrades for potential mitigation actions
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission, Road & Bridge Dept., Local Planners
Action/Project Priority:	25 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, County Budget
Progress Report	
Action Status	Continuing and in progress
Report of Progress	<p>The county has a policy to upgrade and improve all road and bridge projects where possible. Improvements since the last update include:</p> <p>New pier on CR409 bridge; extended bridges on CR605, CR452 and CR411 to reduce scouring; new bridge on CR 607; new bridge on CR408 that replaced a low water slab; extended the low water slab on CR 450 and CR218 to reduce scouring; new, higher elevation bridge on CR320. In addition the county routinely builds up roads to prevent flooding and wash outs. Improvements include installing larger culverts when replacements are done.</p>

Action 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.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of tornado shelters and warming and cooling centers during times of extreme heat and cold, and power outages
Hazard(s) Addressed:	Severe Weather, Winter Storms, Tornadoes, Extreme Heat
Action or Project	
Action/Project Number:	1.3.3
Name of Action or Project:	Establish and maintain designated storm shelters, as well as heating and cooling centers
Action or Project Description:	Establish designated shelters for residents to be used as shelters during tornado warnings, as well as heating and cooling centers during extreme heat or power outages.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The county EMD has established shelters at the county courthouse in Vienna and the Masonic Lodge in Belle. Both shelters are opened each time the tornado sirens are activated and are stocked with supplies. These also serve as evacuation shelters. The Knights of Columbus hall has been established as the evacuation point for Maries Manor nursing home.

Action 1.3.4: Encourage the designation of storm shelters and the construction of certified tornado safe rooms in or near schools and large employment centers that currently do not have access to safe rooms.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	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.
Hazard(s) Addressed:	Severe Storms and Tornadoes
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Encourage construction of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$1,000 to \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going until facilities are constructed
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs, School Emergency Plan, Capital Improvement Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	No progress at this time. The cost of constructing certified tornado shelters is an obstacle and neither school district currently has 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 and infrastructure and the local economy.

Action 2.1.1: Continue to encourage self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
Hazard(s) Addressed:	Earthquakes and Tornadoes
Action or Project	
Action/Project Number:	2.1.1
Name of Action or Project:	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
Action or Project Description:	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornadoes or severe weather.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$1,500 – \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, local emergency response agencies
Action/Project Priority:	17 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Although the county EMD has done safety walk-throughs of several facilities in the county, those inspections have not included structural resistance to tornadoes and earthquakes.

Action 2.1.2: Encourage the development and implementation of minimum building codes in all communities.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities to property and communities in the event of a natural disaster due to substandard construction.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Encourage the adoption of minimum building codes in all communities.
Action or Project Description:	Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$1,000-\$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, local planners
Action/Project Priority:	17 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing Not Started
Report of Progress	There has been no progress in this area.

Action 2.1.6: Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities to property and communities in areas that do not possess adequate storm water management plans.
Hazard(s) Addressed:	Flood, Severe Weather
Action or Project	
Action/Project Number:	2.1.6
Name of Action or Project:	Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.
Action or Project Description:	Provide information on the benefits of requiring contractors to develop and provide storm water management plans in all new development – both residential and commercial.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$1,000-\$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission, local planners
Action/Project Priority:	17 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing - Not Started
Report of Progress	There has been no progress in this area.

Action 2.2.1: 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.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities of properties in the floodplain during a flood event.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.2.1
Name of Action or Project:	Floodplain education/awareness
Action or Project Description:	Educate residents about the dangers of floodplain development and the benefits of the NFIP
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,000 - \$6,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Floodplain Coordinator, Maries County Commission
Action/Project Priority:	25 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain management ordinances, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Information, brochures, etc. on floodplain development and the NFIP is available through the floodplain manager and floodplain coordinator for the county. A direct mailing to all residents with property in the floodplain has been done since the last plan update. 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 2.3.2: Encourage local governments to develop and implement regulations for the securing hazardous materials tanks and mobile homes to reduce hazards during storms and flooding and high winds and raise awareness of the need to secure propane tanks to reduce the risk of dislodged tanks during these disasters.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with unsecured hazardous materials, tanks, and mobile homes during flood, severe weather, or tornado events.
Hazard(s) Addressed:	Flood, Severe Weather, Tornado
Action or Project	
Action/Project Number:	2.3.2
Name of Action or Project:	Encourage the development of regulations or ordinances for securing materials tanks and mobile homes to reduce hazards during storms and flooding.
Action or Project Description:	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.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$3,000 - \$10,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, Floodplain Manager, County Commission
Action/Project Priority:	18 – Medium Priority
Timeline for Completion:	10 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, and services
Local Planning Mechanisms to be Used in Implementation, if any:	County ordinances, builders plans, LEOP, building codes, floodplain ordinances
Progress Report	
Action Status	Continuing Not Started
Report of Progress	N/A

Action 2.3.3: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and unregulated floodplain development.
Hazard(s) Addressed:	Flood, Severe Weather
Action or Project	
Action/Project Number:	2.3.3
Name of Action or Project:	Floodplain management compliance enforcement.
Action or Project Description:	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$4,000 - \$10,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Floodplain Coordinator, Maries County Commission
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain ordinances
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Maries County continues to insure 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 2.3.4: Encourage the city of Belle to become a member of the NFIP.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flash flooding.
Hazard(s) Addressed:	Flood, Severe Weather
Action or Project	
Action/Project Number:	2.3.4
Name of Action or Project:	Encourage the city of Belle to become a member of the NFIP
Action or Project Description:	Encourage the city of Belle to become a member of the NFIP and provide residents with the opportunity to purchase flood insurance.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$1,000 - \$2,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Floodplain Coordinator, Maries County Commission
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain ordinances, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing - no progress
Report of Progress	N/A

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

Action 3.2.2: Encourage meetings of EMD, city/county officials and SEMA to familiarize officials with mitigation planning, implementation and budgeting for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge/information of officials in regards to mitigation planning, implementation, and budgeting for mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.2.2
Name of Action or Project:	Mitigation awareness/education meetings with local officials and SEMA
Action or Project Description:	Encourage meetings of EMD, city/county officials & SEMA to familiarize officials with mitigation planning, implementation & budgeting for mitigation projects.
Applicable Goal Statement:	Promote education, outreach, research, and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.
Estimated Cost:	\$0
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission, SEMA Area Coordinator
Action/Project Priority:	19 - M
Timeline for Completion:	On-going
Potential Fund Sources:	N/A
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing - Ongoing
Report of Progress	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.

Action 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.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan and merge with other community planning activities.
Action or Project Description:	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, Local Planners, MPC
Action/Project Priority:	21 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOPs, Hazard Mitigation Plan, School Emergency Plan, County Budget, Economic Development Plan, Transportation Plan, Floodplain Ordinances
Progress Report	
Action Status	Continuing – On-going
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. The Maries County Road & Bridge Department has incorporated mitigation activities into their regular maintenance program. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 3.3.2: Implement a public awareness program on the benefits of hazard mitigation – both public and private – by distributing press release and brochures (by local governments and school districts) on adopted mitigation measures to help the public stay abreast of changes and/or new regulations.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	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.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.2
Name of Action or Project:	Hazard Mitigation Awareness Program
Action or Project Description:	Distribute press releases and brochures on hazard mitigation and local hazard mitigation projects at public facilities and events
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, local emergency response agencies, MPC
Action/Project Priority:	26 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	Local media outlets report on county road and bridge projects and the benefits of the improvements made. 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 3.4.1: 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, extreme cold).

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge by the general public of proper measures to take during times of threatening conditions.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.4.1
Name of Action or Project:	Public education
Action or Project Description:	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, extreme temperatures).
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$500 - \$2,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, Phelps-Maries County Health Department
Action/Project Priority:	26 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	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. This is an on-going activity.

Action 3.4.2: Publicize local, regional and/or statewide drills/exercises.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerability associated with the lack of knowledge in regards to the proper measures to take during hazard events.
Hazard(s) Addressed:	All hazards.
Action or Project	
Action/Project Number:	3.4.2
Name of Action or Project:	Publicizing drills.
Action or Project Description:	Publicize county or citywide drills to make the general public aware of training/exercises being conducted locally and raise awareness of emergency preparedness and what measure should be taken.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. Local governments make the public aware of drills/trainings/exercises through press release to the media and follow up articles on drills. SEMA also publicizes drills that are being done on a regional or statewide level.

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

Action 4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication among organizations/agencies for mitigation related planning.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.1
Name of Action or Project:	Encourage joint meetings of different organizations/agencies and continued communication on mitigation.
Action or Project Description:	Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission, County EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Floodplain Ordinances, LEOP, County Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. Region I Fire Chiefs meet regularly. The Region I SEMA area coordinator holds quarterly meetings throughout the six-county region, including in Maries County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Whenever possible, pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Lack of resources to carry out mitigation projects
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.3
Name of Action or Project:	Pool different agency resources to achieve widespread mitigation results.
Action or Project Description:	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission, Floodplain Managers
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Floodplain Ordinances, LEOP, County Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. All jurisdictions reported that they are interested in finding ways to pool resources to accomplish mitigation projects. The city of Vienna expressed interest in working with the county on storm sirens. The county currently works with landowners to cost-share the installation of culverts.

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

Action 5.2.2: 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.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated lack of adequate storm shelters.
Hazard(s) Addressed:	Tornadoes, severe storms
Action or Project	
Action/Project Number:	5.2.2
Name of Action or Project:	Assessment of public buildings as potential storm shelters, designation of suitable facilities and development of accessibility plans
Action or Project Description:	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.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	22 – High Priority
Timeline for Completion:	One to ten years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – in progress
Report of Progress	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 5.3.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.3.1
Name of Action or Project:	Government purchase of properties in the floodplain
Action or Project Description:	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission, County EMD, Floodplain Manager/Coordinator
Action/Project Priority:	18 - M
Timeline for Completion:	N/A
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain ordinances, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	N/A

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.3: Work with state/local/federal agencies to include mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication and coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Cross coordination with local/state/federal agencies to include mitigation in all economic and community development projects.
Action or Project Description:	Work with local/state/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$2,500 -\$9,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission, Local Planners, local Economic Developers, community development organizations
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, County Budget, CEDS
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.2.1: Encourage cities and counties to consider implementing cost-share programs with private property owner for hazard mitigation projects that benefit the jurisdiction as a whole.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects for individuals
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Encourage development and implementation of mitigation cost-share programs
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, County Budget
Progress Report	
Action Status	Continuing in progress
Report of Progress	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 6.2.2: Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Lack of public knowledge of the importance/benefit of hazard mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.2.2
Name of Action or Project:	Public awareness program on benefits of public and private hazard mitigation projects.
Action or Project Description:	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$750 - \$1,750
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission
Action/Project Priority:	26 - H
Timeline for Completion:	5 years to implement and then on-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, County Budget
Progress Report	
Action Status	Continuing in Progress
Report of Progress	There has been some progress on this activity. Press releases on the hazard mitigation planning process raise awareness. The local media attend all county commission meetings and report on road and bridge improvements and discussions on hazard mitigation. This activity would benefit from the development and distribution or posting of brochures on hazard mitigation and press releases devoted to this specific topic.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Maries County
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$750 - \$2,750
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission, Local Planners, County Engineers, MPC
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	This is an on-going activity. Hazard mitigation projects are reviewed and prioritized each time the hazard mitigation plan is reviewed and updated. These priorities should be reviewed following any major disasters in the county.

Belle

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

Action 1.1.4: Promote the development and/or update of emergency plans by businesses, local governments and schools.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Lack of emergency plans by businesses, local government units and schools.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.4
Name of Action or Project:	Development of emergency plans by businesses, local government units and schools.
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$4,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen
Action/Project Priority:	23 – High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
Progress Report	
Action Status	Continuing
Report of Progress	Belle is part of the county-wide LEOP. Victoria Gardens and Maries Manor, local nursing homes, both have emergency plans. The Maries County Bank has also developed an emergency plan.

Action 1.2.1: Continue to encourage local governments to budget for and obtain enhanced early warning systems and improved communications systems.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of early warning systems and communications systems.
Hazard(s) Addressed:	All hazards.
Action or Project	
Action/Project Number:	1.2.1
Name of Action or Project:	Improving early warning and communications capabilities.
Action or Project Description:	City of Belle needs to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Maries County.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Local Planners, Local Emergency Response Agencies
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs, City Budget
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Belle has one warning siren.

Action 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.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with absence of data concerning natural disasters.
Hazard(s) Addressed:	Dam Failure, Land Subsidence/Sinkholes, Tornado and Wildfire
Action or Project	
Action/Project Number:	1.2.4
Name of Action or Project:	Monitor developments in data availability for the purpose of improving hazard mitigation planning.
Action or Project Description:	Monitor developments in data availability concerning the impact 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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Local Planners
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	In progress and on-going
Report of Progress	Some work has been done on this action item at the state and federal level. Improved data is becoming available for a number of different hazards including dam failure.

Action 1.3.2: 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.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquake events.
Hazard(s) Addressed:	Floods and Earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Review road and bridge upgrades for potential mitigation actions
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Public Works Dept., Local Planners
Action/Project Priority:	25 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, City Budget
Progress Report	
Action Status	Continuing and in progress
Report of Progress	The city reviews each street project to determine if it would benefit from enlarging culverts to improve drainage.

Action 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.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of tornado shelters and warming and cooling centers during times of extreme heat and cold, and power outages
Hazard(s) Addressed:	Severe Weather, Winter Storms, Tornadoes, Extreme Heat
Action or Project	
Action/Project Number:	1.3.3
Name of Action or Project:	Establish and maintain designated storm shelters, as well as heating and cooling centers
Action or Project Description:	Establish designated shelters for residents to be used as shelters during tornado warnings, as well as heating and cooling centers during extreme heat or power outages.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – in progress
Report of Progress	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.

Action 1.3.4: Encourage the designation of storm shelters and the construction of certified tornado safe rooms in or near schools and large employment centers that currently do not have access to safe rooms.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	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.
Hazard(s) Addressed:	Severe Storms and Tornadoes
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Encourage construction of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$1,000 to \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going until facilities are constructed
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, City Budget
Progress Report	
Action Status	Continuing – no progress
Report of Progress	No progress at this time. The cost of constructing certified tornado shelters is an obstacle and neither the city nor the school district currently has any 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 and infrastructure and the local economy.

Action 2.1.1: Continue to encourage self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
Hazard(s) Addressed:	Earthquakes and Tornadoes
Action or Project	
Action/Project Number:	2.1.1
Name of Action or Project:	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
Action or Project Description:	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornadoes or severe weather.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$1,500 – \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local emergency response agencies
Action/Project Priority:	17 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, City Budget, Hazard Mitigation Plan, Critical Facility Budgets
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Although the county EMD has done safety walk-throughs of some facilities in the city, those inspections have not included structural resistance to tornadoes and earthquakes.

Action 2.2.2: Encourage the development of storm water management plans.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities to property and communities in areas that do not possess adequate storm water management plans.
Hazard(s) Addressed:	Flood, Severe Weather
Action or Project	
Action/Project Number:	2.2.2
Name of Action or Project:	Encourage cities to develop storm water management plans
Action or Project Description:	Provide information on the benefits of developing a community storm water management plan.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$1,000-\$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Local Planners, Mayor, Board of Aldermen
Action/Project Priority:	17 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing - Not Started
Report of Progress	There has been no progress in this area.

Action 2.3.2: Encourage local governments to develop and implement regulations for the securing hazardous materials tanks and mobile homes to reduce hazards during storms and flooding and high winds and raise awareness of the need to secure propane tanks to reduce the risk of dislodged tanks during these disasters.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with unsecured hazardous materials, tanks, and mobile homes during flood, severe weather, or tornado events.
Hazard(s) Addressed:	Flood, Severe Weather, Tornado
Action or Project	
Action/Project Number:	2.3.2
Name of Action or Project:	Encourage the development of regulations or ordinances for securing materials tanks and mobile homes to reduce hazards during storms and flooding.
Action or Project Description:	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.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$3,000 - \$10,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen
Action/Project Priority:	18 – Medium Priority
Timeline for Completion:	10 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, and services
Local Planning Mechanisms to be Used in Implementation, if any:	City ordinances, builders plans, LEOP, building codes
Progress Report	
Action Status	Continuing Not Started
Report of Progress	N/A

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

Action 3.3.1: 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.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan & merge with other planning activities.
Action or Project Description:	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the city.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Local Planners, MPC, Board of Aldermen
Action/Project Priority:	21 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, , City Budget, Economic Development Plan, Transportation Plan
Progress Report	
Action Status	Continuing – On-going
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 3.3.2: Implement a public awareness program on the benefits of hazard mitigation – both public and private – by distributing press release and brochures (by local governments and school districts) on adopted mitigation measures to help the public stay abreast of changes and/or new regulations.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	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.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.2
Name of Action or Project:	Hazard Mitigation Awareness Program
Action or Project Description:	Distribute press releases and brochures on hazard mitigation and local hazard mitigation projects at public facilities and events
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local emergency response agencies
Action/Project Priority:	26 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	Local media outlets report on city road and bridge projects and the benefits of the improvements made. 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 3.4.2: Publicize local, regional and/or statewide drills/exercises.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerability associated with the lack of knowledge in regards to the proper measures to take during hazard events.
Hazard(s) Addressed:	All hazards.
Action or Project	
Action/Project Number:	3.4.2
Name of Action or Project:	Publicizing drills.
Action or Project Description:	Publicize citywide drills to make the general public aware of training/exercises being conducted locally and raise awareness of emergency preparedness and what measure should be taken.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. The city makes the public aware of drills/trainings/exercises through press release to the media and follow up articles on drills. SEMA also publicizes drills that are being done on a regional or statewide level.

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

Action 4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication among organizations/agencies for mitigation related planning.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.1
Name of Action or Project:	Encourage joint meetings of different organizations/agencies and continued communication on mitigation.
Action or Project Description:	Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, City EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, City Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. Region I Fire Chiefs meet regularly. The Region I SEMA area coordinator holds quarterly meetings throughout the six-county region, including in Maries County. This program could benefit from a amore coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Whenever possible, pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Lack of resources to carry out mitigation projects
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.3
Name of Action or Project:	Pool different agency resources to achieve widespread mitigation results.
Action or Project Description:	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Public Works Dept.
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, City Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. All jurisdictions reported that they are interested in finding ways to pool resources to accomplish mitigation projects.

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

Action 5.2.2: 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.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated lack of adequate storm shelters.
Hazard(s) Addressed:	Tornadoes, severe storms
Action or Project	
Action/Project Number:	5.2.2
Name of Action or Project:	Assessment of public buildings as potential storm shelters, designation of suitable facilities and development of accessibility plans
Action or Project Description:	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.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	22 – High Priority
Timeline for Completion:	One to ten years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The county EMD has made some progress on this action item. The Masonic Lodge in Belle has been designated as a shelter. Accessibility plans are in place for this location and it has shelter supplies. The city would benefit from having more detailed assessments done and additional shelters designated.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.3: Work with state/local/federal agencies to include mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication and coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Cross coordination with local/state/federal agencies to include mitigation in all economic and community development projects.
Action or Project Description:	Work with local/state/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$2,500 -\$9,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Local Planners, local Economic Developers, community development organizations
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, City Budget, CEDS
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.2.1: Encourage cities and counties to consider implementing cost-share programs with private property owner for hazard mitigation projects that benefit the jurisdiction as a whole.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects for individuals
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Encourage development and implementation of mitigation cost-share programs
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, City Budget
Progress Report	
Action Status	Continuing no progress
Report of Progress	N/A

Action 6.2.2: Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Lack of public knowledge of the importance/benefit of hazard mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.2.2
Name of Action or Project:	Public awareness program on benefits of public and private hazard mitigation projects.
Action or Project Description:	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$750 - \$1,750
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen
Action/Project Priority:	26 - H
Timeline for Completion:	5 years to implement and then on-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, City Budget
Progress Report	
Action Status	Continuing in Progress
Report of Progress	There has been some progress on this activity. Press releases on the hazard mitigation planning process raise awareness. The local media attend all city board of aldermen meetings and report on public works projects and discussions on hazard mitigation. This activity would benefit from the development and distribution or posting of brochures on hazard mitigation and press releases devoted to this specific topic.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	City of Belle
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$750 - \$2,750
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Local Planners, City Engineer, MPC
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	This is an on-going activity. Hazard mitigation projects are reviewed and prioritized each time the hazard mitigation plan is reviewed and updated. These priorities should be reviewed following any major disasters in the city.

Vienna

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

Action 1.1.4: Promote the development and/or update of emergency plans by businesses, local governments and schools.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Lack of emergency plans by businesses, local government units and schools.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.4
Name of Action or Project:	Development of emergency plans by businesses, local government units and schools.
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$4,500 - \$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen
Action/Project Priority:	23 – High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
Progress Report	
Action Status	Continuing
Report of Progress	Vienna is part of the county-wide LEOP. Victoria Gardens and Maries Manor, local nursing homes, both have emergency plans. The Maries County Bank has also developed an emergency plan.

Action 1.2.1: Continue to encourage local governments to budget for and obtain enhanced early warning systems and improved communications systems.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of early warning systems and communications systems.
Hazard(s) Addressed:	All hazards.
Action or Project	
Action/Project Number:	1.2.1
Name of Action or Project:	Improving early warning and communications capabilities.
Action or Project Description:	City of Vienna needs to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Maries County.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Local Planners, Local Emergency Response Agencies, Board of Aldermen
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs, City Budget
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Vienna has one warning siren.

Action 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.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with absence of data concerning natural disasters.
Hazard(s) Addressed:	Dam Failure, Land Subsidence/Sinkholes, Tornado and Wildfire
Action or Project	
Action/Project Number:	1.2.4
Name of Action or Project:	Monitor developments in data availability for the purpose of improving hazard mitigation planning.
Action or Project Description:	Monitor developments in data availability concerning the impact 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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Local Planners, Mayor, Board of Aldermen
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs, floodplain ordinance
Progress Report	
Action Status	In progress and on-going
Report of Progress	Some work has been done on this action item at the state and federal level. Improved data is becoming available for a number of different hazards including dam failure.

Action 1.3.2: 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.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquake events.
Hazard(s) Addressed:	Floods and Earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Review road and bridge upgrades for potential mitigation actions
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Public Works Dept., Local Planners
Action/Project Priority:	25 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, City Budget
Progress Report	
Action Status	Continuing and in progress
Report of Progress	The city reviews each road and bridge project and determines if it will benefit from an upgrade of culvert size to improve drainage.

Action 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.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of tornado shelters and warming and cooling centers during times of extreme heat and cold, and power outages
Hazard(s) Addressed:	Severe Weather, Winter Storms, Tornadoes, Extreme Heat
Action or Project	
Action/Project Number:	1.3.3
Name of Action or Project:	Establish and maintain designated storm shelters, as well as heating and cooling centers
Action or Project Description:	Establish designated shelters for residents to be used as shelters during tornado warnings, as well as heating and cooling centers during extreme heat or power outages.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The county EMD has established a shelter at the county courthouse in Vienna. The shelter is opened each time the tornado siren is activated and is stocked with supplies. It also serves as an evacuation shelter. The Knights of Columbus hall has been established as the evacuation point for Maries Manor nursing home.

Action 1.3.4: Encourage the designation of storm shelters and the construction of certified tornado safe rooms in or near schools and large employment centers that currently do not have access to safe rooms.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	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.
Hazard(s) Addressed:	Severe Storms and Tornadoes
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Encourage construction of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going until facilities are constructed
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, City Budget
Progress Report	
Action Status	Continuing – no progress
Report of Progress	No progress at this time. The cost of constructing certified tornado shelters is an obstacle and neither the city nor the school district currently has 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 and infrastructure and the local economy.

Action 2.1.1: Continue to encourage self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
Hazard(s) Addressed:	Earthquakes and Tornadoes
Action or Project	
Action/Project Number:	2.1.1
Name of Action or Project:	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
Action or Project Description:	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornadoes or severe weather.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$1,500 – \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local emergency response agencies
Action/Project Priority:	17 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, City Budget, Hazard Mitigation Plan, Critical Facility Budgets
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Although the county EMD has done safety walk-throughs of some facilities, those inspections have not included structural resistance to tornadoes and earthquakes.

Action 2.2.1: 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.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities of properties in the floodplain during a flood event.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.2.1
Name of Action or Project:	Floodplain education/awareness
Action or Project Description:	Educate residents about the dangers of floodplain development and the benefits of the NFIP
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$2,000 - \$6,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	25 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain management ordinances, LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Press releases on floodplain requirements and the NFIP are done annually. This is a program that requires on-going activity as people move in and out of the city.

Action 2.2.2: Encourage the development of storm water management plans.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities to property and communities in areas that do not possess adequate storm water management plans.
Hazard(s) Addressed:	Flood, Severe Weather
Action or Project	
Action/Project Number:	2.2.2
Name of Action or Project:	Encourage cities to develop storm water management plans
Action or Project Description:	Provide information on the benefits of developing a community storm water management plan.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$1,000-\$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Local Planners, Mayor, Board of Aldermen
Action/Project Priority:	17 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing - Not Started
Report of Progress	There has been no progress in this area.

Action 2.3.2: Encourage local governments to develop and implement regulations for the securing hazardous materials tanks and mobile homes to reduce hazards during storms and flooding and high winds and raise awareness of the need to secure propane tanks to reduce the risk of dislodged tanks during these disasters.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with unsecured hazardous materials, tanks, and mobile homes during flood, severe weather, or tornado events.
Hazard(s) Addressed:	Flood, Severe Weather, Tornado
Action or Project	
Action/Project Number:	2.3.2
Name of Action or Project:	Encourage the development of regulations or ordinances for securing materials tanks and mobile homes to reduce hazards during storms and flooding.
Action or Project Description:	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.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$3,000 - \$10,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, City Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	18 – Medium Priority
Timeline for Completion:	10 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, and services
Local Planning Mechanisms to be Used in Implementation, if any:	City ordinances, builders plans, LEOP, building codes, floodplain ordinances
Progress Report	
Action Status	Continuing Not Started
Report of Progress	N/A

Action 2.3.3: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and unregulated floodplain development.
Hazard(s) Addressed:	Flood, Severe Weather
Action or Project	
Action/Project Number:	2.3.3
Name of Action or Project:	Floodplain management compliance enforcement.
Action or Project Description:	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	\$4,000 - \$10,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain ordinances
Progress Report	
Action Status	Continuing in Progress
Report of Progress	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.

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

Action 3.3.1: 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.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate hazard mitigation plan & merge with other planning activities.
Action or Project Description:	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Local Planners, MPC
Action/Project Priority:	21 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan, City Budget, Economic Development Plan, Transportation Plan, Floodplain Ordinances
Progress Report	
Action Status	Continuing – On-going
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 3.3.2: Implement a public awareness program on the benefits of hazard mitigation – both public and private – by distributing press release and brochures (by local governments and school districts) on adopted mitigation measures to help the public stay abreast of changes and/or new regulations.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	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.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.2
Name of Action or Project:	Hazard Mitigation Awareness Program
Action or Project Description:	Distribute press releases and brochures on hazard mitigation and local hazard mitigation projects at public facilities and events
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, local emergency response agencies
Action/Project Priority:	26 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	Local media outlets report on county road and bridge projects and the benefits of the improvements made. 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 3.4.2: Publicize local, regional and/or statewide drills/exercises.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerability associated with the lack of knowledge in regards to the proper measures to take during hazard events.
Hazard(s) Addressed:	All hazards.
Action or Project	
Action/Project Number:	3.4.2
Name of Action or Project:	Publicizing drills.
Action or Project Description:	Publicize citywide drills to make the general public aware of training/exercises being conducted locally and raise awareness of emergency preparedness and what measure should be taken.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. The city makes the public aware of drills/trainings/exercises through press release to the media and follow up articles on drills. SEMA also publicizes drills that are being done on a regional or statewide level.

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

Action 4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication among organizations/agencies for mitigation related planning.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.1
Name of Action or Project:	Encourage joint meetings of different organizations/agencies and continued communication on mitigation.
Action or Project Description:	Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, City EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Floodplain Ordinances, LEOP, City Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. Region I Fire Chiefs meet regularly. The Region I SEMA area coordinator holds quarterly meetings throughout the six-county region, including in Maries County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Whenever possible, pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Lack of resources to carry out mitigation projects
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.3
Name of Action or Project:	Pool different agency resources to achieve widespread mitigation results.
Action or Project Description:	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, City Floodplain Manager
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Floodplain Ordinances, LEOP, City Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. All jurisdictions reported that they are interested in finding ways to pool resources to accomplish mitigation projects. The city of Vienna expressed interest in working with the county on storm sirens.

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

Action 5.2.2: 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.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated lack of adequate storm shelters.
Hazard(s) Addressed:	Tornadoes, severe storms
Action or Project	
Action/Project Number:	5.2.2
Name of Action or Project:	Assessment of public buildings as potential storm shelters, designation of suitable facilities and development of accessibility plans
Action or Project Description:	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.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	22 – High Priority
Timeline for Completion:	One to ten years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The county EMD has made some progress on this action item. The county courthouse in Vienna has been designated as a shelter. Accessibility plans are in place for this location and it has shelter supplies in place. The city would benefit from having more detailed assessments done and additional shelters designated.

Action 5.3.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.3.1
Name of Action or Project:	Government purchase of properties in the floodplain
Action or Project Description:	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, City Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	18 - M
Timeline for Completion:	N/A
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain ordinance
Progress Report	
Action Status	Continuing – no progress
Report of Progress	N/A

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.3: Work with state/local/federal agencies to include mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication and coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Cross coordination with local/state/federal agencies to include mitigation in all economic and community development projects.
Action or Project Description:	Work with local/state/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$2,500 -\$9,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Local Planners, local Economic Developers, community development organizations
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, City Budget, economic development plans, CEDS
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.2.1: Encourage cities and counties to consider implementing cost-share programs with private property owner for hazard mitigation projects that benefit the jurisdiction as a whole.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects for individuals
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Encourage development and implementation of mitigation cost-share programs
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, City Budget
Progress Report	
Action Status	Continuing no progress
Report of Progress	No progress has been made in this area.

Action 6.2.2: Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Lack of public knowledge of the importance/benefit of hazard mitigation projects.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.2.2
Name of Action or Project:	Public awareness program on benefits of public and private hazard mitigation projects.
Action or Project Description:	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$750 - \$1,750
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen
Action/Project Priority:	26 - H
Timeline for Completion:	5 years to implement and then on-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, City Budget
Progress Report	
Action Status	Continuing in Progress
Report of Progress	There has been some progress on this activity. Press releases on the hazard mitigation planning process raise awareness. The local media attend all city board meetings and report on discussions on hazard mitigation. This activity would benefit from the development and distribution or posting of brochures on hazard mitigation and press releases devoted to this specific topic.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	City of Vienna
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$750 - \$2,750
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Local Planners, City Engineer, MPC
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	This is an on-going activity. Hazard mitigation projects are reviewed and prioritized each time the hazard mitigation plan is reviewed and updated. These priorities should be reviewed following any major disasters in the city.

Maries County R-I

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

Action 1.1.6: Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan, including evacuation and safety procedures.

Action Worksheet	
Name of Jurisdiction:	Maries County R-I
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge of natural hazard preparedness, evacuation and safety procedures by school staff.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.6
Name of Action or Project:	Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.
Action or Project Description:	Educate school staff on natural hazards, emergency plans, and evacuation and safety procedures.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
Estimated Cost:	\$1,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, School Emergency Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	In progress – an on-going activity. The school district regularly trains teachers and staff on natural hazards and proper procedures and conducts drills on fire, tornado, active shooter and earthquake on at least an annual basis.

Action 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.

Action Worksheet	
Name of Jurisdiction:	Maries County R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with absence of data concerning natural disasters.
Hazard(s) Addressed:	Dam Failure, Land Subsidence/Sinkholes, Tornado and Wildfire
Action or Project	
Action/Project Number:	1.2.4
Name of Action or Project:	Monitor developments in data availability for the purpose of improving hazard mitigation planning.
Action or Project Description:	Monitor developments in data availability concerning the impact 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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local Planners, School Board, Superintendent
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, School Emergency Plan
Progress Report	
Action Status	In progress and on-going
Report of Progress	Some work has been done on this action item at the state and federal level. Improved data is becoming available for a number of different hazards including dam failure.

Action 1.3.4: Encourage the designation of storm shelters and the construction of certified tornado safe rooms in or near schools and large employment centers that currently do not have access to safe rooms.

Action Worksheet	
Name of Jurisdiction:	Maries R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools 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.
Hazard(s) Addressed:	Severe Storms and Tornadoes
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Encourage construction of certified tornado safe rooms and storm shelters in schools
Action or Project Description:	Disseminate information on the importance of and funding sources for constructing storm shelters, especially certified tornado safe rooms near schools that currently do not have access to safe rooms.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going until facilities are constructed
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs, School Emergency Plan, District Budget
Progress Report	
Action Status	Continuing – no progress
Report of Progress	No progress at this time. The cost of constructing certified tornado shelters is an obstacle and neither school district currently has plans to expand/build which would provide an opportunity to incorporate a certified tornado safe room into the plans.

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

Action 3.3.1: 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.

Action Worksheet	
Name of Jurisdiction:	Maries R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan & merge with other planning activities.
Action or Project Description:	Re-evaluate the hazard mitigation plan, merge with other district planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the district.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the district's staff and students about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board, Local Planners, MPC
Action/Project Priority:	21 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOPs, Hazard Mitigation Plan, School Budget, Economic Development Plan, Transportation Plan, Land-use Plan, Floodplain Ordinances
Progress Report	
Action Status	Continuing – On-going
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 3.3.2: Implement a public awareness program on the benefits of hazard mitigation – both public and private – by distributing press release and brochures (by local governments and school districts) on adopted mitigation measures to help the public stay abreast of changes and/or new regulations.

Action Worksheet	
Name of Jurisdiction:	Maries County R-I
Risk / Vulnerability	
Problem being Mitigated:	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.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.2
Name of Action or Project:	Hazard Mitigation Awareness Program
Action or Project Description:	Distribute press releases and brochures on hazard mitigation and local hazard mitigation projects at public facilities and events
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among school staff and students about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent
Action/Project Priority:	26 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	Local media outlets report on school activities and any hazard mitigation actions. 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 3.4.2: Publicize local, regional and/or statewide drills/exercises.

Action Worksheet	
Name of Jurisdiction:	Maries County R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerability associated with the lack of knowledge in regards to the proper measures to take during hazard events.
Hazard(s) Addressed:	All hazards.
Action or Project	
Action/Project Number:	3.4.2
Name of Action or Project:	Publicizing drills.
Action or Project Description:	Publicize drills involving the school district to make the general public aware of training/exercises being conducted locally and raise awareness of emergency preparedness and what measures should be taken.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the staff and students about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. The school district makes the public aware of drills/trainings/exercises through press releases to the media and follow up articles on drills. SEMA also publicizes drills that are being done on a regional or statewide level.

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

Action 4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.

Action Worksheet	
Name of Jurisdiction:	Maries County R-I
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication among organizations/agencies for mitigation related planning.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.1
Name of Action or Project:	Encourage joint meetings of different organizations/agencies and continued communication on mitigation.
Action or Project Description:	Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Floodplain Ordinances, LEOP, District Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. The Region I SEMA area coordinator holds quarterly meetings throughout the six-county region, including in Maries County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Whenever possible, pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Maries County R-I
Risk / Vulnerability	
Problem being Mitigated:	Lack of resources to carry out mitigation projects
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.3
Name of Action or Project:	Pool different agency resources to achieve widespread mitigation results.
Action or Project Description:	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Floodplain Ordinances, LEOP, District Budget, School Emergency Plan
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. All jurisdictions reported that they are interested in finding ways to pool resources to accomplish mitigation projects.

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

Action 5.2.2: 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.

Action Worksheet	
Name of Jurisdiction:	Maries County R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the lack of adequate storm shelters.
Hazard(s) Addressed:	Tornadoes, severe storms
Action or Project	
Action/Project Number:	5.2.2
Name of Action or Project:	Assessment of public buildings as potential storm shelters, designation of suitable facilities and development of accessibility plans
Action or Project Description:	Conduct an assessment of district facilities to determine if they can serve as storm shelters for staff, students and potentially for local citizens. Formally designate those that are suitable as safe shelters and develop accessibility plans for district staff and students and the public during times of need.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	22 – High Priority
Timeline for Completion:	One to ten years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, School Emergency Plan
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The district has designated areas within the schools to shelter in during tornadoes and severe storms. The school district would benefit from having more detailed assessments done of school facilities to insure that they are using the best safe areas of the school for tornado shelter. Accessibility plans are in place for staff and students, but the area would benefit from studying the possibility of using these areas for the general public if adequate shelters are not currently available.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Maries County R-I
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$750 - \$2,750
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Board, Superintendent, MPC
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	This is an on-going activity. Hazard mitigation projects are reviewed and prioritized each time the hazard mitigation plan is reviewed and updated. These priorities should be reviewed following any major disasters in the school district.

Maries County R-II

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

Action 1.1.6: Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan, including evacuation and safety procedures.

Action Worksheet	
Name of Jurisdiction:	Maries County R-II
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge of natural hazard preparedness, evacuation and safety procedures by school staff.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.6
Name of Action or Project:	Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.
Action or Project Description:	Educate school staff on natural hazards, emergency plans, and evacuation and safety procedures.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
Estimated Cost:	\$1,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, School Emergency Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	In progress – an on-going activity. The school district regularly trains teachers and staff on natural hazards and proper procedures and conducts drills on fire, tornado, active shooter and earthquake on at least an annual basis.

Action 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.

Action Worksheet	
Name of Jurisdiction:	Maries County R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with absence of data concerning natural disasters.
Hazard(s) Addressed:	Dam Failure, Land Subsidence/Sinkholes, Tornado and Wildfire
Action or Project	
Action/Project Number:	1.2.4
Name of Action or Project:	Monitor developments in data availability for the purpose of improving hazard mitigation planning.
Action or Project Description:	Monitor developments in data availability concerning the impact 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.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Board, School Superintendent
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOPs, floodplain ordinance
Progress Report	
Action Status	In progress and on-going
Report of Progress	Some work has been done on this action item at the state and federal level. Improved data is becoming available for a number of different hazards including dam failure.

Action 1.3.4: Encourage the designation of storm shelters and the construction of certified tornado safe rooms in or near schools and large employment centers that currently do not have access to safe rooms.

Action Worksheet	
Name of Jurisdiction:	Maries R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools 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.
Hazard(s) Addressed:	Severe Storms and Tornadoes
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Encourage construction of certified tornado safe rooms and storm shelters in schools
Action or Project Description:	Disseminate information on the importance of and funding sources for constructing storm shelters, especially certified tornado safe rooms in or near schools that currently do not have access to safe rooms.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	19 – Medium Priority
Timeline for Completion:	On-going until facilities are constructed
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOPs, School Emergency Plan, District Budget
Progress Report	
Action Status	Continuing – no progress
Report of Progress	No progress at this time. The cost of constructing certified tornado shelters is an obstacle and neither school district currently has plans to expand/build which would provide an opportunity to incorporate a certified tornado safe room into the plans.

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

Action 3.3.1: 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.

Action Worksheet	
Name of Jurisdiction:	Maries R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Re-evaluate the hazard mitigation plan and merge with other planning activities.
Action or Project Description:	Re-evaluate the hazard mitigation plan, merge with other district planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the district.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the staff and students about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,000 - \$5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board, Local Planners, MPC
Action/Project Priority:	21 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, School Emergency Plan, District Budget
Progress Report	
Action Status	Continuing – On-going
Report of Progress	As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 3.3.2: Implement a public awareness program on the benefits of hazard mitigation – both public and private – by distributing press release and brochures (by local governments and school districts) on adopted mitigation measures to help the public stay abreast of changes and/or new regulations.

Action Worksheet	
Name of Jurisdiction:	Maries County R-II
Risk / Vulnerability	
Problem being Mitigated:	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.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.2
Name of Action or Project:	Hazard Mitigation Awareness Program
Action or Project Description:	Distribute press releases and brochures on hazard mitigation and local hazard mitigation projects at public facilities and events
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the staff and students about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	26 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, School Emergency Plan
Progress Report	
Action Status	Continuing – on-going
Report of Progress	Local media outlets report on school activities and any hazard mitigation actions. 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 3.4.2: Publicize local, regional and/or statewide drills/exercises.

Action Worksheet	
Name of Jurisdiction:	Maries County R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerability associated with the lack of knowledge in regards to the proper measures to take during hazard events.
Hazard(s) Addressed:	All hazards.
Action or Project	
Action/Project Number:	3.4.2
Name of Action or Project:	Publicizing drills.
Action or Project Description:	Publicize district drills to make the general public aware of training/exercises being conducted locally and raise awareness of emergency preparedness and what measures should be taken.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the staff, students and public about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	\$500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, School Emergency Plan, LEOP
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. The school district makes the public aware of drills/trainings/exercises through press releases to the media and follow up articles on drills. SEMA also publicizes drills that are being done on a regional or statewide level.

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

Action 4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.

Action Worksheet	
Name of Jurisdiction:	Maries County R-II
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication among organizations/agencies for mitigation related planning.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.1
Name of Action or Project:	Encourage joint meetings of different organizations/agencies and continued communication on mitigation.
Action or Project Description:	Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, Floodplain Ordinances, LEOP, District Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. The Region I SEMA area coordinator holds quarterly meetings throughout the six-county region, including in Maries County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Whenever possible, pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Maries County R-II
Risk / Vulnerability	
Problem being Mitigated:	Lack of resources to carry out mitigation projects
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.3
Name of Action or Project:	Pool different agency resources to achieve widespread mitigation results.
Action or Project Description:	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, District Budget, School Emergency Plan
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. All jurisdictions reported that they are interested in finding ways to pool resources to accomplish mitigation projects.

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

Action 5.2.2: 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.

Action Worksheet	
Name of Jurisdiction:	Maries County R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated lack of adequate storm shelters.
Hazard(s) Addressed:	Tornadoes, severe storms
Action or Project	
Action/Project Number:	5.2.2
Name of Action or Project:	Assessment of public buildings as potential storm shelters, designation of suitable facilities and development of accessibility plans
Action or Project Description:	Conduct an assessment of district facilities to determine if they can serve as potential storm shelters for staff, students and potentially for local citizens. Formally designate those that are suitable as safe shelters; and develop accessibility plans for district staff, students and the public during times of need.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	22 – High Priority
Timeline for Completion:	One to ten years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, School Emergency Plan
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The district has designated areas within the schools to shelter in during tornadoes and severe storms. The school district would benefit from having more detailed assessments done of school facilities to insure that they are using the best safe areas of the school for tornado shelter. Accessibility plans are in place for staff and students, but the area would benefit from studying the possibility of using these areas for the general public if adequate shelters are not currently available.

Action 6.3.1: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.

Action Worksheet	
Name of Jurisdiction:	Maries County R-II
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.3.1
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	\$750 - \$2,750
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Board, Superintendent, MPC
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	This is an on-going activity. Hazard mitigation projects are reviewed and prioritized each time the hazard mitigation plan is reviewed and updated. These priorities should be reviewed following any major disasters in the school district.

5 PLAN MAINTENANCE PROCESS

5 PLAN MAINTENANCE PROCESS5.1

5.1 Monitoring, Evaluating, and Updating the Plan..... 5.1

5.1.1 Responsibility for Plan Maintenance 5.1

5.1.2 Plan Maintenance Schedule 5.2

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5.2 Incorporation into Existing Planning Mechanisms 5.3

5.3 Continued Public Involvement 5.6

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

Progress on the proposed actions can be monitored by evaluating changes in vulnerabilities identified in the plan. The MPC (or other designated responsible entity) during the annual meeting should review changes in vulnerability identified as follows:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions;
- Increased vulnerability due to hazard events; and/or
- Increased vulnerability as a result of new development (and/or annexation).

Future 5-year updates to this plan will include the following activities:

- Consideration of changes in vulnerability due to action implementation;
- Documentation of success stories where mitigation efforts have proven effective;
- Documentation of unsuccessful mitigation actions and why the actions were not effective;
- Documentation of previously overlooked hazard events that may have occurred since the previous plan approval;
- Incorporation of new data or studies with information on hazard risks;
- Incorporation of new capabilities or changes in capabilities;

- Incorporation of growth data and changes to inventories; and
- Incorporation of ideas for new actions and changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the participating jurisdictions will adopt the following process:

- Each proposed action in the plan identified an individual, office, or agency responsible for action implementation. This entity will track and report on an annual basis to the jurisdictional MPC (or designated responsible entity) member on action status. The entity will provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing risk.
- If the action does not meet identified objectives, the jurisdictional MPC (or designated responsible entity) member will determine necessary remedial action, making any required modifications to the plan.

Changes will be made to the plan to remedy actions that have failed or are not considered feasible. Feasibility will be determined after a review of action consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring of this plan. Updating of the plan will be accomplished by written changes and submissions, as the MPC (or designated responsible entity) deems appropriate and necessary. Changes will be approved by the Maries County Hazard Mitigation Planning Committee and the governing boards of the other participating jurisdictions.

5.2 Incorporation into Existing Planning Mechanisms

44 CFR Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Where possible, plan participants, including school and special districts, will use existing plans and/or programs to implement hazard mitigation actions. Additionally, as jurisdictions review and update existing planning mechanisms, relevant action items and data from the HMP will be integrated. Those existing plans and programs were described in **Section 2.2** of this plan. Based on the capability assessments of the participating jurisdictions, communities in 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.

0 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

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
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 improvements. EMD will review LEOP and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Belle	Emergency Operations Plan (part of county) 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.	Mayor, Aldermen and public works department will work toward incorporating hazard mitigation projects into city budget where possible and future public works improvements. EMD will review LEOP and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
Vienna	Emergency Operations Plan (part of county) County Mitigation Plan Regional Transportation Plan Comprehensive Economic Development Strategy (construction budget) Public Works Construction Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. City EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	Mayor, Aldermen and public works department will work toward incorporating hazard mitigation projects into city budget where possible and future public works improvements. EMD will review LEOP and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Maries County R-I	School Emergency Plan District Budget	School board and superintendent reviewed school emergency plan to see where hazard mitigation actions could be incorporated.	School board and superintendent will review School Emergency Plan 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	School Emergency Plan District Budget	School board and superintendent reviewed school emergency plan to see where hazard mitigation actions could be incorporated.	School board and superintendent will review School Emergency Plan 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 2018

Including hazard mitigation is now routine for any planning projects or plan updates carried out by the Meramec Regional Planning Commission (MRPC). Applicable goals and action items from hazard mitigation plans have been incorporated into the regional transportation plan as well as the Community Economic Development Strategy for the region. Both of these documents are resources for cities and counties within the eight county area and are updated on a regular basis with input from city and county representatives. This review and update process has helped city and county representatives better understand and appreciate the importance of including hazard mitigation in all applicable plans. In addition, MRPC and the hazard mitigation planning committee are also working to encourage the incorporation of hazard mitigation into the planning activities of all local governments, school districts and local entities through presentations and

participation in planning activities.

5.3 Continued Public Involvement

44 CFR Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

The hazard mitigation plan update process provides an opportunity to publicize success stories resulting from the plan's implementation and seek additional public comment. Information about the annual reviews will be posted in the local newspaper as well as on the Meramec Regional Planning Commission's website following each annual review of the mitigation plan. When the MPC reconvenes for the five-year update, it will coordinate with all stakeholders participating in the planning process. Included in this group will be those who joined the MPC after the initial effort to update and revise the plan. Public notice will be posted and public participation will be actively solicited, at a minimum, through available website postings and press releases to local media outlets, primarily newspapers.

6 Appendix

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D: Adoption Resolutions.....	6.41
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F: MDC Wildfire Data Search	6.49

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B: Planning Process

HMPC Mailing list

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Kath Mayne American Red Cross 1511 S. Providence Road Columbia, MO 65203	Karen McHugh MO SEMA Floodplain Management Officer 2302 Militia Drive, PO Box 116 Jefferson City, MO 65102	Robert Gramke U.S. Army Corps of Engineers 1222 Spruce Street St. Louis, MO 63103-2822
FEMA Region VII ATTN: Ken Sessa 9221 Ward Parkway, Suite 300 Kansas City, MO 64114-3372	U.S. Fish & Wildlife Service Ecological Services Field Office Josh Hundley, Biologist 101 Park DeVillie Drive, Suite A Columbia, MO 65203-0057	Chris Newbold Missouri Department of Conservation 3500 E Gans Road Columbia, MO 65201
J.R. Flores USDA, NRCS Parkade Center, Suite 250 601 Business Loop 70 West Columbia, MO 65203	Steve Davis, Lieutenant Missouri State Highway Patrol P.O. Box 128 Rolla, MO 65401	CenturyLink 2111 Missouri Blvd. Jefferson City, MO 65109
Belle Banner P.O. Box 711 Belle, MO 65013	Maries County Advocate 1110 Highway 28, Suite B Belle, MO 65013	Maries County Gazette P.O. Box 711 Belle, MO 65013
KKID Radio 1415 Forum Drive Rolla, MO 65401	Results Radio P.O. Box 727 Rolla, MO 65402	Sunny 104.5 1051 Kingshighway , Suite 6 Rolla, MO 65401
KPLA 1002 Diamond Ridge, Suite 400 Jefferson City, MO 65109	Maries Medical Clinic PCRMC 606 Highway 63 S Vienna, MO 65582	

For Immediate Release

September 17, 2018

For more information contact

Ryan Dunwoody at (573) 265-2993

Public meeting scheduled for Maries County Hazard Mitigation Plan update

VIENNA – City and county officials, school leaders, emergency management agencies and interested residents are invited to attend a public meeting September 27 to discuss updates to the Maries County Hazard Mitigation Plan.

The meeting will be held at 10 a.m. in the conference room in the basement of the county courthouse located at 211 4th St., Vienna, Mo 65582.

The county must have an approved hazard mitigation plan in order for Maries County schools, cities, agencies and others to access state hazard mitigation grant funds. The plan includes an assessment of natural hazards, showcases past accomplishments and sets goals and action items to reduce the impact of natural hazards in the future.

Meramec Regional Planning Commission (MRPC) is updating the plan in partnership with the Maries County Commission. Questions may be directed to MRPC Environmental Programs Specialist Ryan Dunwoody at rdunwoody@meramecregion.org or 573-265-2993.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. A professional staff of 25, directed by the MRPC board, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at www.meramecregion.org or on Facebook at www.facebook.com/meramecregion.

MEMORANDUM

TO: Maries County Hazard Mitigation Planning Committee

FROM: Ryan Dunwoody, MRPC Senior Environmental Specialist

DATE: September 19, 2018

SUBJECT: Hazard mitigation planning meeting September 27, 2018

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 must submit an approved, updated hazard mitigation plan to SEMA and FEMA by February 1, 2019 in order to continue to be eligible for hazard mitigation grant funds and certain recovery funds after a natural disaster occurs. It is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

A meeting of the Maries County Hazard Mitigation Planning Committee is scheduled for Thursday, September 27 at 10:00 a.m. at the Maries County Courthouse, Basement conference room in Vienna, MO. The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. This can include activities such as improvements to roads and bridges that were prone to flooding, new programs that have reduced risk to residents and/or businesses and new tornado shelters that have been constructed in the past five years. Additionally, we request that each jurisdiction and school district bring a filled out Hazard Mitigation Plan Questionnaire (included). After the meeting we will answer questions and assist with filling out the questionnaire.

As the county, each city and school district will be asked to formally approve and adopt the 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 emergency management offices, law enforcement, city/county officials, fire protection, road and bridge departments, utilities and public works, local health services, disaster relief volunteer services and other appropriate groups. If you are not able to attend, please send a representative from your organization. It is very important that we have good participation from all stakeholders in 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: rdunwoody@merameregion.org. I look forward to seeing you at the meeting.

RD

Enclosures

Advisory Committee Meeting
Maries County Hazard Mitigation Plan Update
AGENDA
10:00 a.m. ~ Sept. 27, 2018
Maries County Courthouse, Basement Conference Room
211 4th Street, Vienna, MO 65582

- I. Welcome and Introductions – Tammy Snodgrass**
- II. Overview of Hazard Mitigation Planning and Maries County Hazard Mitigation Plan**
Staff will provide an overview of the planning process and a brief review of the existing hazard mitigation plan
- III. Discussion of Goals and Objectives and Progress Made in Five Years**
Staff will lead the review of existing goals and a group discussion on what progress has been made in addressing hazard mitigation over the past five years.
- IV. Discussion of Possible Changes to Goals and Action Items for Next Five Years**
After reviewing the plan document and looking at what has been accomplished, the group will be asked to discuss if needs have changed and what, if any changes need to be made to goals and action items for the revised plan.
- V. Integration of Other Data, Reports, Studies, Plans**
What other information is available locally that could be included in the hazard mitigation plan? What other plans need to incorporate aspects of the hazard mitigation plan?
- VI. Review of Disasters/Deaths/Injuries over the Past Five Years**
Staff will provide data on disaster declarations for the past five years. Participants are asked to share any additional information on specific damage that occurred to infrastructure, critical infrastructure, neighborhoods, etc. Of particular interest is any information on deaths or injuries attributed to natural disasters.
- VII. Setting of Date and Time for Next Meeting**
- VIII. Adjourn**

NOTICE OF PUBLIC MEETING

Date and time of posting: **September 17, 2018 at 2:00 p.m.**

Notice is hereby given that the **Maries County Hazard Mitigation Planning Committee** will meet at 10:00 a.m. on **Thursday, September 27, 2018** at the Maries County Courthouse, Basement conference room at 211 4th Street, Vienna, MO 65582.

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Overview of Hazard Mitigation Planning and Maries County Hazard Mitigation Plan
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Discussion of Possible Changes to Goals and Action Items for Next Five Years
- Integration of Other Data, Reports, Studies, Plans
- Review of Disasters/Deaths/Injuries over the Past Five Years
- Setting of Date and Time for Next Meeting
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Ryan Dunwoody
#4 Industrial Drive
St. James, MO 65559
(573) 265-2993

rdunwoody@meramecregion.org

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

Maries County Hazard Mitigation Plan Review Meeting
September 27, 2018 ~ 10:00 a.m.

Name	Representing	Email Address	Phone #	Address
Sherry James	City of Vienna	sjames@viennamissouri.org	573-422-3549	P.O. Box 196 Vienna, MO
Shon Westert	City of Vienna	-	573-422-3549	↑ same
Renée Kottwitz	Maries County	rwitz@mariesco.org	573-308-1881	P.O. Box 205 Vienna, MO 65582
Chris Heitman	Maries County	cheitman@mariesco.org	573 422-3381	''
Katie Strawbridge	Phelps/ Maries Co Health Dept	Katie.Strawbridge@phelpscounty.org	573-458-6010	200 N. Main St. 551 Rolla, MO 65401
Scott John	Maries County	STONW@MARIESCO.ORG	573-422-3381	P.O. Box 213 VIENNA, MO 65582
Dean Dault	Maries Co.		578-5957	
Jeff Kyr	Maries Co	JEFFK@GMAIL.COM	573-619-4170	Meta MO 65054

Figure 4.4 Prioritization of Mitigation Actions										3 = Def YES 2 = Maybe YES		1 = Prob NO 0 = Def NO							
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority				
1.1.1	Implement an education program on personal emergency preparedness that teaches residents how to prepare emergency medical kits that include water, blankets, flashlights, etc.; learn how to shut off their home utilities in times of emergency; and be self-sufficient for one to three days in the event of a disaster.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H				
1.1.2	Continue to educate residents about precautions that should be taken during threats of natural disasters such as severe weather and heat waves.	3	3	3	3	3	2	3	20	IC, LF, EMCC	6	-1	5	25	H				
1.1.3	Provide to citizens through local media and make available at local government buildings, information on individual mitigation activities such as building personal shelters and assuring that propane tanks are appropriately tied down.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H				
1.1.4	Promote the development and/or update of emergency plans by businesses, local governments and schools.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-3	5	23	H				
1.1.5	Continue to provide CERT training and encourage the development of CERTs throughout the county through training opportunities and public awareness.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H				
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.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H				
1.1.7	Schools need to continue to conduct emergency preparedness exercises on a regular basis.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H				
1.2.1	Continue to encourage cities to obtain early warning systems and improved communications systems.	3	3	2	3	3	1	3	18	IC, PD, LF, EMCC	8	-3	5	23	H				
1.2.2	Continue to promote use of weather radios by local residents to insure advanced warning about threatening weather.	3	3	3	3	3	3	3	21	IC, EMCC	4	-1	3	24	H				
1.2.3	Partner with local radio stations to ensure that appropriate warning of impending disasters is provided to all residents in the countywide listening area.	3	3	3	3	3	3	3	21	IC, EMCC	4	-1	3	24	H				
1.2.4	Monitor developments in data availability concerning the impact of dam failure, tornados, sinkholes, land subsidence and wildfire upon Maricopa County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H				
1.2.5	Continue to encourage tree trimming and dead tree removal programs by utility companies and local government.	3	3	3	3	3	2	2	19	IC, PD, LF, EMCC	8	-3	5	24	H				

Mitigation Strategy

4.28

		3 = Def YES 2 = Maybe YES							1 = Prob NO 0 = Def NO											
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority					
1.3.2	Continue to review and consider road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property.	3	3	2	3	3	2	2	18	IC, PD, LF, EMCC	8	-1	7	25	H					
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.	3	3	3	3	3	3	3	21	IC, LF, EMCC	6	-1	5	26	H					
1.3.4	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.	3	3	2	3	3	1	3	18	IC, LF, EMCC	6	-5	1	19	M					
1.3.5	Regularly review and update school emergency plans	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H					
2.1.1	Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.	3	2	2	3	3	1	3	17	IC, PD, LF, EMCC	8	-5	3	20	H					
2.1.2	Encourage the development and implementation of minimum building codes in all communities.	2	2	2	2	3	1	2	14	PD, LF, EMCC	6	-3	3	17	M					
2.1.3	Encourage businesses/government/schools to develop emergency plans.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-3	5	26	H					
2.1.4	Monitor developments in data availability concerning the impact of dam failure, tornados, sinkholes, land subsidence and wildfire upon Maries County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H					
2.1.5	Continue to evaluate and update emergency operation plans.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H					
2.1.6	Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.	2	2	2	2	3	2	3	16	PD, LF	4	-3	1	17	M					
2.2.1	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.	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H					
2.2.2	Encourage the development of storm water management plans.	2	2	2	2	3	2	3	16	PD, LF	4	-3	1	17	M					

Vienna Senior Center - Cooling Center

Belle?

Vienna Dam

check? MRPC press release + brochures for County

Figure 4.4 Prioritization of Mitigation Actions										3 = Def YES 2 = Maybe YES		1 = Prob NO 0 = Def NO						
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority			
2.3.1	Encourage minimum standards for building codes in all cities.	2	2	2	2	3	1	2	14	PD, LF, EMCC	6	-3	3	17	M			
2.3.2	Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds	2	2	2	1	2	2	2	13	IC, PD, EMCC	8	-3	5	18	M			
2.3.3	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			
2.3.4	Encourage the City of Belle to become a member of the NFIP.	2	3	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H			
3.1.1	Distribute SEMA brochures on natural disasters, preparedness and NFIP at public facilities and events.	3	3	3	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H			
3.1.2	Distribute regular press releases from county and city EMD offices concerning hazards, where they strike, frequency, preparedness and how to mitigate.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H			
3.2.1	Encourage local residents to purchase weather radios through press releases and brochures.	3	3	3	3	3	2	3	20	IC, EMCC	4	-1	3	23	H			
3.2.2	Encourage meetings between EMD, city/county officials and SEMA to familiarize officials with mitigation planning, implementation and budgeting for mitigation projects.	3	3	3	2	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H			
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.	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H			
3.3.2	Distribute press releases by cities/county/schools regarding adopted mitigation measures to keep public abreast of changes and/or new regulations.	3	3	3	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H			
3.4.1	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)	3	3	3	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H			
3.4.2	Publicize local, regional and/or statewide drills/exercises.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H			
3.4.3	Encourage the development of a county-wide CERT program and educate the public on how they can benefit from this type of program.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H			

mean city ordinances
inspector
no building
permit
allowing no
mobile homes
have to be on
sight

Active shooter
training

?

Mitigation Strategy

4.30

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES							1 = Prob NO 0 = Def NO											
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Loss Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority					
3.4.4	Raise awareness of the need to secure propane tanks to reduce the risk from dislodged tanks during flooding, tornados and high winds. <i>keep</i>	2	2	2	2	3	2	3	16	IC, PD, LF, EMCC	8	-3	5	21	H					
4.1.1	Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning. <i>Don't</i>	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H					
4.1.2	Continue to encourage training opportunities in all areas of preparedness and response to insure the capabilities and safety of citizens and responders and encourage joint training/drills between agencies, public and private entities (including schools and businesses). <i>Don't</i>	2	2	3	3	2	3	3	18	IC, PD, LF, EMCC	8	-1	7	25	H					
4.1.3	Pool different agency resources to achieve widespread mitigation planning results. <i>keep</i>	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H					
4.2.1	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. <i>repeat</i>	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H					
4.2.2	Encourage meetings between EMD, city and county government and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects. <i>repeat</i>	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H					
5.1.1	Encourage communities to budget for enhanced warning systems. <i>keep</i>	3	2	2	3	3	2	3	18	IC, LF, EMCC	6	-3	3	21	H					
5.1.2	Encourage all communities to develop storm water management plans. <i>repeat</i>	2	2	1	1	3	1	3	13	PD	2	-5	-3	10	L					
5.1.3	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. <i>repeat</i>	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H					
5.1.4	Encourage cities to require contractor storm water management plans in all new development—both residential and commercial properties. <i>repeat</i>	2	2	2	2	3	2	3	16	PD	2	-3	-1	15	M					
5.1.5	Encourage the construction of storm shelters, especially tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms. <i>repeat</i>	3	3	2	3	3	2	3	19	IC, EMCC	4	-5	-1	18	M					
5.1.6	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. <i>Don't</i>	3	3	2	2	3	3	3	19	IC, EMCC	4	-1	3	22	H					

Mitigation Strategy

4.31

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES							1 = Prob NO 0 = Def NO						
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Loss Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
5.3.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area. <i>help</i>	2	2	2	2	3	1	3	15	IC, PD, LF, EMCC	8	-5	3	18	M
6.1.1	Encourage meetings between EMD, city/county officials and SEMA to familiarize officials with mitigation planning, implementation and budgeting for mitigation projects. <i>repeat</i>	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
6.1.2	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met. <i>help</i>	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects. <i>process</i>	3	2	2	2	3	2	2	16	IC, PD, LF, EMCC	8	-1	7	23	H
6.1.4	Encourage local jurisdictions to budget for mitigation projects. <i>repeat</i>	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-5	3	23	H
6.2.1	Whenever possible, pool different agency resources to achieve widespread mitigation results. <i>repeat</i>	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
6.2.1	Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole. <i>process</i>	2	1	1	1	2	2	2	11	IC, PD, LF, EMCC	8	-5	3	14	M
6.2.2	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures. <i>process</i>	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property. <i>process</i>	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H

*help
vienna
recomm upgrade
shen
county + sirens*

For immediate release
Nov. 21, 2018

For more information, contact

Ryan Dunwoody or Tammy Snodgrass at (573) 265-2993

Public meeting scheduled Dec. 11 for Maries County Hazard Mitigation Plan update

MARIES COUNTY – City and county officials, school leaders, emergency management agencies and interested residents are invited to attend a public meeting Dec. 11 to discuss updates to the Maries County Hazard Mitigation Plan. The meeting will be held at 10 a.m. in the conference room in the basement of the Maries County Courthouse, 211 Fourth St., Vienna, Mo 65582.

The county must have an approved hazard mitigation plan in order for Maries County schools, cities, agencies and others to access state hazard mitigation grant funds. The plan includes an assessment of natural hazards, showcases past accomplishments and sets goals and action items to reduce the impact of natural hazards in the future.

In addition to the planning meeting, a public survey is available on-line at www.meramecregion.org, starting Nov. 27, or via MRPC's Facebook page at www.facebook.com/meramecregion. If you wish to provide input into the planning process, but are not able to attend the planning meetings, please complete the survey no later than Dec. 7. All survey responses will be submitted to the planning group for review and inclusion into the plan update.

Meramec Regional Planning Commission (MRPC) is updating the plan in partnership with the Maries County Commission. The latest version of the Maries County plan from 2014 is available online at <https://www.meramecregion.org/wp-content/uploads/2018/09/Maries-Co-HMP-2014-1-1.pdf>.

Questions may be directed to MRPC Environmental Programs Specialist Ryan Dunwoody at rdunwoody@meramecregion.org or 573-265-2993.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. A professional staff of 25, directed by the MRPC board, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at www.meramecregion.org or on Facebook at www.facebook.com/meramecregion.

MEMORANDUM

TO: Maries County Hazard Mitigation Planning Committee

FROM: Ryan Dunwoody, MRPC Senior Environmental Specialist

DATE: November 21, 2018

SUBJECT: Second Hazard Mitigation Planning Meeting December 11, 2018

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 must submit an updated hazard mitigation plan draft to SEMA by February 1, 2019 in order to continue to be eligible for some hazard mitigation grants, so it is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

A **second meeting** of the **Maries County Hazard Mitigation Planning Committee** is **scheduled for Tuesday, December 11 at 10:00 a.m.** at the **Maries County Courthouse, Basement conference room in Vienna, MO**. The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will review and prioritize action items. Lastly, results from a public survey will be discussed.

Public Survey: Please take time to fill out the survey which can be found at <https://goo.gl/forms/EBMRiPwmxaFUSnBC2>. The survey can also be found on our Facebook page at <https://www.facebook.com/meramecregion/>. Please share the survey on your Facebook page as well.

As the county, each city and school district 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 emergency management offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups. If you are not able to attend, please send a representative from your organization. It is very important that we have good participation from all stakeholders in Maries County.

Thank you for your assistance in addressing hazard mitigation for Osage County. If you have any questions, contact me at (573) 265-2993, or via e-mail: rdunwoody@merameregion.org. I look forward to seeing you at the meeting.

RD

Enclosures

**Advisory Committee Meeting
Maries County Hazard Mitigation Plan Update
AGENDA
10:00 a.m. ~ December 11, 2018
Maries County Courthouse, Basement Conference Room
211 4th Street, Vienna, MO 65582**

- I. Welcome and Introductions – Tammy Snodgrass**
- II. Overview of Hazard Mitigation Planning and Maries County Hazard Mitigation Plan**
Staff will provide an overview of the planning process and a brief review of the existing hazard mitigation plan
- III. Discussion of Action Items for Next Five Years**
A list of action items discussed at the last meeting will be distributed for viewing. Staff will lead the review of action items from the first planning meeting. Additional action items will be requested as the meeting progresses.
- IV. Prioritization of Action Items**
Attendees will be asked to provide input on the prioritization of action items in the plan.
- V. Integration of Other Data, Reports, Studies, Plans**
What other information is available locally that could be included in the hazard mitigation plan? What other plans need to incorporate aspects of the hazard mitigation plan?
- VI. Setting of Date and Time for Next Meeting**
- VII. Adjourn**

NOTICE OF PUBLIC MEETING

Date and time of posting: **November 20, 2018 ~ 1:00 p.m.**

Notice is hereby given that the **Maries Co. Hazard Mitigation Planning Committee** will meet at 10:00 a.m. on **Tuesday, December 11, 2018** at the Maries County Courthouse, Basement conference room at 211 4th Street, Vienna, MO 65582.

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Review and Prioritize Action Items
- Public Survey Results and Discussion
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Ryan Dunwoody
#4 Industrial Drive
St. James, MO 65559
(573) 265-2993

rdunwoody@meramecregion.org

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

Maries County Hazard Mitigation Plan Review Meeting
December 11, 2018 ~ 10:00 a.m.

Name	Representing	Email Address	Phone #	Address
Jan Murray	Marion R-1 School	jimurray@viennaeagles.org	573-422-3363	300 4th Street Vienna, MO 65582
MARK PARKER	MARIES R-1 School	mparker@viennaeagles.org	573-422-3304	300 4th St. Vienna, MO 65582
Linda Adkins	Marion Co Grantee	adkins8593@gmail.com	517-422-9987	PO Box 202 Vienna MO 65582
MARK Buschmann	Vienna Fire Prot Dist	mark.buschmann@coarts.mo.gov	573-690-5436	P.O. Box 386 Vienna Mo. 65582
Denise Kottwitz	Maries County EMA + JHEARTFOR	rwitz2@mariesco.org	573-368-1881	PO Box 205 Vienna Mo 65582
SCOTT JONW	MARIES County	SJONW@MARIESCO.ORG	263-0503 573-422-3381	PO Box 23 VIENNA MO
Shanda Snodgrass	Maries R-1 School	ssnodgrass@viennaeagles.org	573-422-3365	PO Box 218 300 4th St. Vienna, MO 65582

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
1.1.4	Promote the development and/or update of emergency plans by businesses, local governments and schools.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
1.1.5	Continue to provide CERT training and encourage the development of CERTs throughout the county through training opportunities and public awareness.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H M
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.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H M
1.2.1	Continue to encourage cities to obtain early warning systems and improved communications systems.	3	3	2	3	3	1	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
1.2.2	Continue to promote use of weather radios by local residents to insure advanced warning about threatening weather.	3	3	3	3	3	3	3	21	IC, EMCC	4	-1	3	24	H M
1.2.4	Monitor developments in data availability concerning the impact of dam failure, tornados, sinkholes, land subsidence and wildfire upon Maries County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.3.2	Continue to review and consider road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property.	3	3	2	3	3	2	2	18	IC, PD, LF, EMCC	8	-1	7	25	H
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.	3	3	3	3	3	3	3	21	IC, LF, EMCC	6	-1	5	26	H M
1.3.4	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.	3	3	2	3	3	1	3	18	IC, LF, EMCC	6	-5	1	19	M
2.1.1	Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.	3	2	2	3	3	1	3	17	IC, PD, LF, EMCC	8	-5	3	20	H M
2.1.2	Encourage the development and implementation of minimum building codes in all communities.	2	2	2	2	3	1	2	14	PD, LF, EMCC	6	-3	3	17	M
2.1.3	Encourage businesses/government/schools to develop emergency plans.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-3	5	26	H

Businesses
Maries Munc/
Victoria Creek
Maries Bank

Figure 4.4 Prioritization of Mitigation Actions

		3 = Def YES 1 = Prob NO 2 = Maybe YES 0 = Def NO													
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
2.1.4	Monitor developments in data availability concerning the impact of dam failure, tornados, sinkholes, land subsidence and wildfire upon Maries County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
2.1.5	Continue to evaluate and update emergency operation plans.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
2.1.6	Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.	2	2	2	2	3	2	3	16	PD, LF	4	-3	1	17	M
2.2.1	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..	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
2.2.2	Encourage the development of storm water management plans.	2	2	2	2	3	2	3	16	PD, LF	4	-3	1	17	M
2.3.1	Encourage minimum standards for building codes in all cities.	2	2	2	2	3	1	2	14	PD, LF, EMCC	6	-3	3	17	M
2.3.2	Encourage local governments to develop and implement regulations for the securing of hazardous materials tanks and mobile homes to reduce hazards during flooding and high winds	2	2	2	1	2	2	2	13	IC, PD, EMCC	8	-3	5	18	M
2.3.3	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
2.3.4	Encourage the City of Belle to become a member of the NFIP.	2	3	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
3.2.1	Encourage local residents to purchase weather radios through press releases and brochures.	3	3	3	3	3	2	3	20	IC, EMCC	4	-1	3	23	H
3.2.2	Encourage meetings between EMD, city/county officials and SEMA to familiarize officials with mitigation planning, implementation and budgeting for mitigation projects.	3	3	3	2	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H M

Caroline

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES								1 = Prob NO 0 = Def NO						
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Loss Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority	
3.3.1	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.	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H	
3.3.2	Distribute press releases by cities/county/schools regarding adopting adopted mitigation measures to keep public abreast of changes and/or new regulations.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H	
3.4.1	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)	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H	
3.4.2	Publicize local, regional and/or statewide drills/exercises.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H	
3.4.3	Encourage the development of a county-wide CERT program and educate the public on how they can benefit from this type of program.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H	
3.4.4	Raise awareness of the need to secure propane tanks to reduce the risk from dislodged tanks during flooding, tornados and high winds.	2	2	2	2	3	2	3	16	IC, PD, LF, EMCC	8	-3	5	21	H	
4.1.1	Continue to encourage joint meetings of different organizations/ agencies for mitigation related planning. <i>Fire Dept. Quarterly Meetings</i>	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H	
4.1.3	Pool different agency resources to achieve widespread mitigation planning results. <i>Fire Dept. Mutual aid agreements</i>	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H	
4.2.1	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.	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H	
4.2.2	Encourage meetings between EMD, city and county government and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H	
5.1.1	Encourage communities to budget for enhanced warning systems.	3	2	2	3	3	2	3	18	IC, LF, EMCC	6	-3	3	21	H	
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.	3	3	2	2	3	3	3	19	IC, EMCC	4	-1	3	22	H	

End Fire Dept

continue City

Combine 2-3-2

Combine 1-2-1

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES							1 = Prob NO 0 = Def NO										
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Loss Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority				
5.3.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.	2	2	2	2	3	1	3	15	IC, PD, LF, EMCC	8	-5	3	18	M				
6.1.2	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H				
6.1.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects.	3	2	2	2	3	2	2	16	IC, PD, LF, EMCC	8	-1	7	23	H				
6.1.5	Whenever possible, pool different agency resources to achieve widespread mitigation results.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H				
6.2.1	Encourage cities and counties to consider implementing cost-share programs with private property owners for hazard mitigation projects that benefit the jurisdiction as a whole.	2	1	1	1	2	2	2	11	IC, PD, LF, EMCC	8	-5	3	14	M				
6.2.2	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H				
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H				

Combine 1.3.2

Combine 4.1.3

Project

Combine

Email sent 3/11/19:

Dear Members of the Maries County Hazard Mitigation Planning Committee:

A complete draft of the updated Maries County Hazard Mitigation Plan are now available for you to review on the MRPC website. You can find it here - <https://www.meramecregion.org/publications/>. We have posted all five chapters of the plan.

The first draft of the document is due to SEMA on March 15th. We can still make changes to the document after the first draft is submitted, but I would like to have any suggestions for changes made to me no later than March 25th.

I have attached an in-kind match form. Please track any time you or any others in your organization spend reviewing the document and submit your in-kind match form to me as soon as you have finished your review. The county is still short \$2,750 in in-kind match. We can't count the time any elected officials spend – but everyone else's time can be used to meet this match requirement.

Let me know if you have any questions or if I can provide you with any additional information.

Best Regards,

Tamara F. Snodgrass

Assistant Director/Environmental Programs Manager
Meramec Regional Planning Commission
4 Industrial Drive
St. James, MO 65559
Phone: (573) 265-2993, extension 104
FAX: (573) 265-3550
tsnodgrass@meramecregion.org

For immediate release
March 14, 2019

For more information, contact
Tammy Snodgrass at (573) 265-2993

Public comment being accepted on Maries County Hazard Mitigation Plan until March 31

MARIES COUNTY—Public comment is being accepted until March 31, 2019, 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 2019 plan update is located under the Hazard Mitigation Plans by County along with the county's approved 2014 plan. . A hard copy of the plan is also available at the Maries County Courthouse.

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 the Maries County Commission, Maries County Sheriff's Department, Maries County Emergency Management, City of Belle, City of Vienna, Belle Volunteer Fire Department, Vienna Fire Protection District, Vichy Volunteer Fire Protection District, Maries County R-I School District and Maries County R-II School District.

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.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. A professional staff of 25, directed by the MRPC board, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

If you need assistance locating the plan or have questions, please contact Tammy Snodgrass at MRPC at 573-265-2993 or by email at tsnodgrass@meramecregion.org.

To keep up with the latest MRPC news and events, visit the MRPC website at www.meramecregion.org or on Facebook at www.facebook.com/meramecregion.

Mailing list for surrounding jurisdictions:

Dr. Scott Smith, Supt. Gasconade County R-I 170 Blue Pride Drive Hermann, MO 65041	Dr. Chuck Garner, Supt. Gasconade County R-II P.O. Box 536 Owensville, MO 65066	Lyle Best, Supt. Osage County R-I 614 Poplar St. Chamois, MO 65024
Dr. Lenice Basham, Supt. Osage County R-II 141 Wildcat Drive Linn, MO 65051	Chuck Woody, Supt. Osage County R-III P.O. Box 37 Westphalia, MO 65085	Merlyn Johnson, Supt. St. James R-I 122 East Scioto Street St. James, MO 65559
Dr. Lynne Reed Newburg R-II P.O. Box C Newburg, MO 65550	John Fluhrer, Supt. Phelps County R-III 17790 State Route M Edgar Springs, MO 65462	Dr. Aaron Zalis, Supt. Rolla 31 500A Forum Dr. Rolla, MO 65401
Doug Jacobson, Supt. Swedeborg R-III 17507 Hwy T Richland, MO 65556	Doug Smith, Supt. Richland R-IV 714 E. Jefferson Richland, MO 65556	Dr. Randy Caffey, Supt. Laquey R-V P.O. Box 130 Laquey, MO 65534
Dr. Brian Henry, Supt. Waynesville R-VI 200 Fleetwood Dr. Waynesville, MO 65583	Duane Doyle, Supt. Dixon R-I 106 W. Fourth St. Dixon, MO 65459	Gary Doerhoff, Supt. Crocker R-II P.O. Box 488 Crocker, MO 65452
Pres. Commissioner Larry Miskel Gasconade County Commission 119 E. First St. Hermann, MO 65041	Mayor Ron Shafferkoetter City of Bland P.O. Box 40 Bland, MO 65014	Mayor Kelly Head City of Gasconade 493 Oak St. Gasconade, MO 65061-3005
Mayor Dr. Robert Koerber 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	Pres. Commissioner Darryl Griffin Osage County Commission 106 E. Main St. Linn, MO 65051	Chairperson Chris Brundick Village of Argyle P.O. Box 22 Argyle, MO 65001

Mayor Elise Brochu
City of Chamois
200 S. Main St.
Chamois, MO 65024

Mayor Harold Libbert
City of Meta
P.O. Box 65
Meta, MO 65058

Mayor Billy Barton
City of Doolittle
380 Eisenhower
Doolittle, MO 65401

Mayor Louis J. Magdits, IV
City of Rolla
P.O. Box 979
Rolla, MO 65402

Mayor Glen Smith
City of Crocker
P.O. Box 116
Crocker, MO 65452

Mayor Dr. George Lauritson
City of St. Robert
194 Eastlawn Ave. #A
St. Robert, MO 65584

Eldon R-I School district
Matt Davis, Supt.
112 South Pine Street
Eldon, MO 65026

Doug Kempler, Supt.
St. Elizabeth R-IV School District
240 Church St.
St. Elizabeth, MO 65075

Chairperson Darryl Haller
Village of Freeburg
P.O. Box 121
Freeburg, MO 65035

Mayor Tammy Massman
City of Westphalia
P.O. Box 36
Westphalia, MO 65085

Mayor Kevin Melton
City of Edgar Springs
P. O. Box 13
Edgar Springs, MO 65462

Mayor Jim White
City of St. James
100 S. Jefferson St.
St. James, MO 65559

Mayor Mycal Brown
City of Dixon
P.O. Box 177
Dixon, MO 65459

Mayor Luge Hardman
City of Waynesville
100 Tremont Center
Waynesville, MO 65583

Lyndel Whittle, Supt.
Iberia R-V School District
201 Pemberton Drive
Iberia, MO 65486

Mayor Larry Henderson
City of Eldon
101 S. Oak
Eldon, MO 65026

Mayor Dwight Massey
City of Linn
P.O. Box 498
Linn, MO 65051

Pres. Commissioner Randy Verkamp
Phelps County Commission
200 N. Main St.
Rolla, MO 65401

Mayor James Poucher
City of Newburg
P.O. Drawer K
Newburg, MO 65550

Pres. Commissioner Gene Newkirk
Pulaski County Commission
301 Historic 66 East
Waynesville, MO 65583

Mayor Eldon Haun
City of Richland
P.O. Box 798
Richland, MO 65556

Pres. Commissioner Tom Wright
Miller County Commission
P.O. Box 11
Tuscumbia, MO 65082

Jason Price, Supt.
Miller County R-III School District
P.O. Box 1
Tuscumbia, MO 65082

C: Public Survey

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 (Vienna) |
| <input type="checkbox"/> City of Belle | <input type="checkbox"/> Maries County R-II School District (Belle) |
| <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 |
| ____ Levee Failure | ____ Land Subsidence / Sinkholes | ____ Severe Winter Weather |
| ____ Dam Failure | ____ Drought | ____ Tornadoes |
| | ____ Extreme Temperatures | ____ Wildfire |

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
____ Levee Failure	____ Land Subsidence / Sinkholes	____ Severe Winter Weather
____ Dam Failure	____ Drought	____ Tornadoes
	____ Extreme Temperatures	____ Wildfire

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) |
-

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.

Please return your completed survey to:

Tamara Snodgrass or Ryan Dunwoody,
Meramec Regional Planning Commission
4 Industrial Drive ~ St. James, MO 65559

Phone: 573-265-2993, ext. 104 or 110 ~ FAX: 573-265-3550

tsnodgrass@meramecregion.org or rdunwoody@meramecregion.org

RESULTS OF 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.

Number of Responses

- | | |
|--------------------------------|--|
| 8 Unincorporated Maries County | 4 Maries County R-I School District (Vienna) |
| 5 City of Belle | 7 Maries County R-II School District (Belle) |
| 1 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

Type of Hazard	% Ranked Unlikely	% Ranked Occasional	% Ranked Likely	% Ranked Highly Likely
Flooding	28%	28%	12%	32%

Type of Hazard	% Ranked Unlikely	% Ranked Occasional	% Ranked Likely	% Ranked Highly Likely
Earthquake	56%	32%	12%	4%
Severe Thunderstorms	4%	-	36%	60%
Levee Failure	84%	8%	4%	4%
Land Subsidence/ Sinkholes	40%	44%	8%	8%
Severe Winter Weather	8%	4%	28%	60%
Dam Failure	84%	4%	8%	4%
Drought	8%	20%	32%	40%
Tornadoes	8%	12%	36%	44%
Extreme Temperatures	4%	8%	44%	44%
Wildfire	28%	44%	20%	8%

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

Type of Hazard	Negligible	Limited	Critical	Catastrophic
Flooding	21%	45%	21%	13%
Earthquake	21%	33%	29%	17%
Severe Thunderstorms	-	29%	38%	33%

Type of Hazard	Negligible	Limited	Critical	Catastrophic
Levee Failure	71%	21%	4%	4%
Land Subsidence/ Sinkholes	385	54%	4%	4%
Severe Winter Weather	-	25%	42%	33%
Dam Failure	75%	13%	8%	4%
Drought	4%	35%	39%	22%
Tornadoes	4%	13%	39%	43%
Extreme Temperatures	4%	22%	48%	26%
Wildfire	33%	21%	42%	4%

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:

Results by Number of Votes for Each Action

Type of Action	Number of Votes
Flood Prone Property Acquisition & Structure Demolition/Relocation	5
Flood-Prone Structure Elevation	5
Dry Floodproofing of Historical Residential Structures and/or Non-residential Structures	2
Minor Localized Flood Reduction projects (storm water management or localized flood control projects)	9
Structural Retrofitting of Existing Buildings to Add a Tornado Safe Room	17

Type of Action	Number of Votes
Storm Sirens	17
Retrofitting of Existing Buildings and Facilities from Wind Damage	9
New Tornado Safe Room Construction	14
Electrical utilities Infrastructure Retrofit	10
Soil Erosion Stabilization	6
Wildfire Mitigation	5

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.

“Help with rebuilding.”

Please return your completed survey to:

Tamara Snodgrass or Ryan Dunwoody,
Meramec Regional Planning Commission
4 Industrial Drive ~ St. James, MO 65559

Phone: 573-265-2993, ext. 104 or 110 ~ FAX: 573-265-3550

tsnodgrass@meramecregion.org or rdunwoody@meramecregion.org

D: Adoption Resolutions

RESOLUTION NO. 040119

**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 Commission fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

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

WHEREAS, Maries County Commission 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 Commission 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

4-1-19

Date



Witness

4-1-19

Date

RESOLUTION NO. 4-9-2019

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



Witness

4/9/19

Date

4/9/19

Date

RESOLUTION NO. 19-01

**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

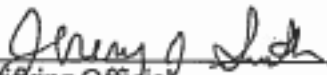
WHEREAS, the Missouri State Emergency Management Agency and Federal Emergency Management Agency officials have reviewed the Maries County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

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 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

4.8.19
Date


Witness

4-8-19
Date

RESOLUTION NO. 1 - 2019

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

WHEREAS, 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, Maries County R-I School District fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

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

WHEREAS, 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 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 Maries County R-I School 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.

Cindy Petershagen
Certifying Official

April 9, 2019
Date

Mike Potts
Witness

April 9, 2019
Date

RESOLUTION NO. 4-25-19

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

WHEREAS, 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, Maries County R-II School District fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

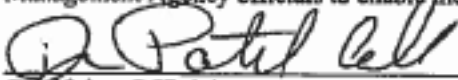
WHEREAS, the Missouri State Emergency Management Agency and Federal Emergency Management Agency officials have reviewed the Maries County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

WHEREAS, 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 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 Maries County R-II School 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

4-25-19
Date


Witness

4-25-19
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
Emergency Facilities						
	Maries County	Maries Osage Ambulance District	164 Ballpark Rd.	Vienna	MO	65582
	Maries County	EOC	211 4 th St.	Vienna	MO	65582
Fire Department Facilities						
MO000082	Belle	Belle Volunteer Fire Department	106 W Third St.	Belle	MO	65013
MO000437	Vienna	Vienna Fire Protection Dist.	308 N Mill St.	Vienna	MO	65582
MO000439	Vichy	Vichy Volunteer Fire Prot. Dist.	14812 Hwy 63 South	Vichy	MO	65580
Law Enforcement Facilities						
MO000077	Belle	Belle Police Dept.	106 E 3 rd St.	Belle	MO	65013
MO000298	Maries County	Maries County Sheriff	211 4 th St.	Vienna	MO	65582
	Vienna	Vienna Police Department	424 8 th St.	Vienna	MO	65582
Medical Facilities						
	Maries County	Phelps-Maries County Health Dept.	200 N Main St.	Rolla	MO	65401
School Districts						
	Vienna	Vienna Elem.	300 4 th St.	Vienna	MO	65582
	Vienna	Vienna High	300 4 th St.	Vienna	MO	65582
	Vienna	Visitation Inter-Parish School	105 N Coffey St.	Vienna	MO	65582
	Belle	Belle Elem.	402 W Third	Belle	MO	65013
	Belle/Bland	Maries Co. Middle	300 S Main	Bland	MO	65401
	Belle	Bell High	504 W Third	Belle	MO	65013

Source: Meramec Region Community Data Mining for Hazard Mitigation Planning (2014)

F: MDC Wildfire Data Search

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2018-07614-177917</u>	04/16/2018	Maries	Meta Fire & Rescue Fpd	Equipment	7.83
<u>2018-07614-177916</u>	03/24/2018	Maries	Meta Fire & Rescue Fpd	Debris	.35
<u>2018-06305-176064</u>	03/14/2018	Maries	Vienna Fire Prot. Dist.	Debris	3.99
<u>2018-06305-166038</u>	02/03/2018	Maries	Vienna Fire Prot. Dist.	Debris	5.24
<u>2017-06313-165071</u>	12/19/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	9
<u>2017-06313-164918</u>	12/06/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	12
<u>2017-06313-164919</u>	12/02/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
<u>2017-06313-164920</u>	11/30/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
<u>2017-06313-164924</u>	11/25/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
<u>2017-06313-159351</u>	10/02/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2
<u>2017-06313-159171</u>	09/15/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2
<u>2017-06313-158123</u>	07/02/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	8

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2017-06313-158122</u>	05/22/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2
<u>2017-06313-158121</u>	03/15/2017	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	4
<u>2017-06313-158120</u>	03/06/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1.5
<u>2017-06313-158119</u>	03/05/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
<u>2017-06313-158118</u>	02/19/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
<u>2017-06313-158117</u>	02/19/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
<u>2017-06313-158116</u>	02/17/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
<u>2017-08518-145654</u>	02/13/2017	Maries	Dixon Rural Fire Protection District	Unknown	2
<u>2017-06313-158114</u>	02/13/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1.5
<u>2017-06313-158113</u>	02/10/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	7
<u>2017-06313-158112</u>	02/03/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
<u>2017-06313-158111</u>	02/03/2017	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
<u>2016-06303-141961</u>	11/16/2016	Maries	Belle Volunteer Fire Department	Unknown	10

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2016-06303-141959</u>	09/02/2016	Maries	Belle Volunteer Fire Department	Unknown	.1
<u>2016-06303-140873</u>	05/22/2016	Maries	Belle Volunteer Fire Department	Debris	.5
<u>2016-06313-141136</u>	04/08/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	.5
<u>2016-06313-141137</u>	04/06/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	5
<u>2016-06313-141135</u>	04/01/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1
<u>2016-06313-141134</u>	03/28/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	2
<u>2016-06313-141133</u>	03/26/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1.5
<u>2016-06313-141132</u>	03/25/2016	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	5
<u>2017-08518-145637</u>	03/25/2016	Maries	Dixon Rural Fire Protection District	Debris	5
<u>2017-08518-145640</u>	03/05/2016	Maries	Dixon Rural Fire Protection District	Debris	1.5
<u>2017-08518-145641</u>	03/05/2016	Maries	Dixon Rural Fire Protection District	Unknown	2
<u>2017-08518-145646</u>	02/18/2016	Maries	Dixon Rural Fire Protection District	Debris	2
<u>2017-08518-145648</u>	02/07/2016	Maries	Dixon Rural Fire Protection District	Unknown	20

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2017-08518-145650</u>	02/06/2016	Maries	Dixon Rural Fire Protection District	Unknown	5
<u>2017-08518-145653</u>	01/30/2016	Maries	Dixon Rural Fire Protection District	Debris	6
<u>2016-07614-142359</u>	01/21/2016	Maries	Meta Fire & Rescue Fpd	Equipment	4
<u>2016-06303-132693</u>	12/25/2015	Maries	Belle Volunteer Fire Department	Debris	.01
<u>2015-08518-130633</u>	11/14/2015	Maries	Dixon Rural Fire Protection District	Debris	1
<u>2016-06303-132691</u>	11/08/2015	Maries	Belle Volunteer Fire Department	Debris	.01
<u>2015-08518-130636</u>	10/30/2015	Maries	Dixon Rural Fire Protection District	Debris	2
<u>2015-06303-130449</u>	10/24/2015	Maries	Belle Volunteer Fire Department	Equipment	1
<u>2015-06313-129842</u>	10/20/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	.75
<u>2015-08518-129514</u>	10/16/2015	Maries	Dixon Rural Fire Protection District	Unknown	1
<u>2015-08518-129512</u>	10/15/2015	Maries	Dixon Rural Fire Protection District	Unknown	.1
<u>2015-06305-129852</u>	10/12/2015	Maries	Vienna Fire Prot. Dist.	Unknown	18
<u>2015-08518-129508</u>	10/07/2015	Maries	Dixon Rural Fire Protection District	Debris	2

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2015-06313-129840</u>	09/25/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	15
<u>2015-06313-129839</u>	09/25/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
<u>2015-08518-129501</u>	09/13/2015	Maries	Dixon Rural Fire Protection District	Unknown	.5
<u>2015-06313-129838</u>	09/13/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	.75
<u>2015-08518-129500</u>	09/03/2015	Maries	Dixon Rural Fire Protection District	Unknown	5
<u>2015-06313-129837</u>	09/01/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	.1
<u>2015-06303-129677</u>	07/30/2015	Maries	Belle Volunteer Fire Department	Unknown	.1
<u>2015-06303-129683</u>	07/25/2015	Maries	Belle Volunteer Fire Department	Equipment	.01
<u>2015-06313-129836</u>	05/18/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	4
<u>2015-06303-129675</u>	05/02/2015	Maries	Belle Volunteer Fire Department	Unknown	4
<u>2015-06313-129835</u>	04/18/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	7
<u>2015-06303-129674</u>	03/31/2015	Maries	Belle Volunteer Fire Department	Unknown	1
<u>2015-06303-129681</u>	03/23/2015	Maries	Belle Volunteer Fire Department	Unknown	2

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2015-06313-129834</u>	03/23/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	20
<u>2015-06303-129673</u>	03/23/2015	Maries	Belle Volunteer Fire Department	Unknown	3
<u>2015-08518-125193</u>	03/08/2015	Maries	Dixon Rural Fire Protection District	Unknown	20
<u>2015-06303-129672</u>	02/14/2015	Maries	Belle Volunteer Fire Department	Unknown	.5
<u>2015-06313-129833</u>	02/12/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
<u>2015-06313-129832</u>	02/08/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1.5
<u>2015-06313-129831</u>	01/19/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2.5
<u>2015-08518-117914</u>	01/18/2015	Maries	Dixon Rural Fire Protection District	Debris	1
<u>2015-06313-129830</u>	01/12/2015	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	.5
<u>2014-06313-111596</u>	08/28/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
<u>2014-06313-111595</u>	07/27/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
<u>2014-06313-111594</u>	06/11/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	14
<u>2014-08518-107424</u>	05/08/2014	Maries	Dixon Rural Fire Protection District	Equipment	1

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2014-08518-107423</u>	05/05/2014	Maries	Dixon Rural Fire Protection District	Equipment	.5
<u>2014-06313-111593</u>	04/16/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	6
<u>2014-06305-100462</u>	04/12/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	20
<u>2014-06305-099573</u>	04/06/2014	Maries	Vienna Fire Prot. Dist.	Not Reported	30
<u>2014-08518-097845</u>	04/01/2014	Maries	Dixon Rural Fire Protection District	Unknown	2
<u>2014-08518-097844</u>	03/30/2014	Maries	Dixon Rural Fire Protection District	Debris	1
<u>2014-08518-097843</u>	03/30/2014	Maries	Dixon Rural Fire Protection District	Debris	1
<u>2014-06313-111591</u>	03/26/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	9
<u>2014-08518-096804</u>	03/25/2014	Maries	Dixon Rural Fire Protection District	Equipment	1
<u>2014-06313-111590</u>	03/24/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	9
<u>2014-07614-112441</u>	03/22/2014	Maries	Meta Fire & Rescue Fpd	Miscellaneous	5
<u>2014-08518-096802</u>	03/21/2014	Maries	Dixon Rural Fire Protection District	Debris	45
<u>2014-06313-111589</u>	03/20/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	15

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2014-06313-111588</u>	03/16/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	12
<u>2014-06313-111586</u>	03/16/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
<u>2014-08518-096502</u>	03/15/2014	Maries	Dixon Rural Fire Protection District	Debris	25
<u>2014-08518-096503</u>	03/15/2014	Maries	Dixon Rural Fire Protection District	Debris	65
<u>2014-06305-095503</u>	03/15/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	50
<u>2014-06305-095504</u>	03/15/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	3
<u>2014-06305-095502</u>	03/15/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	40
<u>2014-06313-111587</u>	03/15/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
<u>2014-06305-095466</u>	03/15/2014	Maries	Vienna Fire Prot. Dist.	Debris	2
<u>2014-06313-111585</u>	03/13/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	8
<u>2014-08518-095976</u>	03/13/2014	Maries	Dixon Rural Fire Protection District	Debris	1
<u>2014-06313-111583</u>	03/11/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
<u>2014-08518-095230</u>	03/10/2014	Maries	Dixon Rural Fire Protection District	Debris	25

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2014-08518-095228</u>	03/10/2014	Maries	Dixon Rural Fire Protection District	Unknown	10
<u>2014-06313-111582</u>	03/10/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	80
<u>2014-08518-095229</u>	03/10/2014	Maries	Dixon Rural Fire Protection District	Debris	75
<u>2014-06632-096144</u>	03/07/2014	Maries	Iberia Rural Fire Protection District	Unknown	2
<u>2014-07614-112439</u>	03/01/2014	Maries	Meta Fire & Rescue Fpd	Debris	2
<u>2014-06313-111581</u>	02/25/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2
<u>2014-06313-111580</u>	02/24/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	12
<u>2014-06313-111579</u>	02/24/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	18
<u>2014-06305-094485</u>	02/23/2014	Maries	Vienna Fire Prot. Dist.	Equipment	2
<u>2014-08518-095054</u>	02/23/2014	Maries	Dixon Rural Fire Protection District	Debris	12
<u>2014-06313-111578</u>	02/23/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
<u>2014-06305-094478</u>	02/23/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	5
<u>2014-08518-095057</u>	02/22/2014	Maries	Dixon Rural Fire Protection District	Debris	5

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2014-06313-111577</u>	02/21/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
<u>2014-06313-111576</u>	02/19/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	8
<u>2014-08518-095056</u>	02/18/2014	Maries	Dixon Rural Fire Protection District	Unknown	.1
<u>2014-08518-093963</u>	01/30/2014	Maries	Dixon Rural Fire Protection District	Debris	2.5
<u>2014-06313-111575</u>	01/29/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	21
<u>2014-06313-111574</u>	01/29/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	20
<u>2014-06313-111573</u>	01/29/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	8
<u>2014-08518-093962</u>	01/27/2014	Maries	Dixon Rural Fire Protection District	Debris	1
<u>2014-06305-093708</u>	01/27/2014	Maries	Vienna Fire Prot. Dist.	Debris	2
<u>2014-06313-111572</u>	01/26/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	7
<u>2014-06313-111571</u>	01/26/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	25
<u>2014-06305-093553</u>	01/25/2014	Maries	Vienna Fire Prot. Dist.	Miscellaneous	15
<u>2014-06313-111294</u>	01/25/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	80

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2014-06313-111293</u>	01/20/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	15
<u>2014-06313-111292</u>	01/20/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	10
<u>2014-06305-093552</u>	01/19/2014	Maries	Vienna Fire Prot. Dist.	Equipment	7
<u>2014-08518-093327</u>	01/19/2014	Maries	Dixon Rural Fire Protection District	Unknown	.1
<u>2014-06313-111290</u>	01/19/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	22
<u>2014-06313-111291</u>	01/15/2014	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
<u>2014-07614-112434</u>	01/14/2014	Maries	Meta Fire & Rescue Fpd	Miscellaneous	1
<u>2014-08518-093328</u>	01/14/2014	Maries	Dixon Rural Fire Protection District	Debris	100
<u>2013-08518-092059</u>	11/29/2013	Maries	Dixon Rural Fire Protection District	Equipment	.1
<u>2013-08518-092056</u>	11/17/2013	Maries	Dixon Rural Fire Protection District	Debris	3
<u>2013-08518-092055</u>	11/11/2013	Maries	Dixon Rural Fire Protection District	Debris	3
<u>2013-08518-092053</u>	11/10/2013	Maries	Dixon Rural Fire Protection District	Arson	.1
<u>2013-08518-092060</u>	09/15/2013	Maries	Dixon Rural Fire Protection District	Debris	1

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2013-08518-092061</u>	07/06/2013	Maries	Dixon Rural Fire Protection District	Debris	.1
<u>2013-08518-087244</u>	04/07/2013	Maries	Dixon Rural Fire Protection District	Debris	12
<u>2013-07614-112431</u>	03/15/2013	Maries	Meta Fire & Rescue Fpd	Miscellaneous	1
<u>2013-08518-084845</u>	01/25/2013	Maries	Dixon Rural Fire Protection District	Miscellaneous	.1
<u>2012-08518-076880</u>	08/28/2012	Maries	Dixon Rural Fire Protection District	Unknown	4
<u>2012-08518-076879</u>	08/23/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	5
<u>2012-08518-076878</u>	08/22/2012	Maries	Dixon Rural Fire Protection District	Debris	70
<u>2012-08518-076872</u>	08/05/2012	Maries	Dixon Rural Fire Protection District	Debris	.1
<u>2012-07609-077965</u>	07/29/2012	Maries	Freeburg Community Fire Association	Debris	25
<u>2012-07614-074859</u>	07/18/2012	Maries	Meta Fire & Rescue Fpd	Equipment	5
<u>2012-08518-074290</u>	07/18/2012	Maries	Dixon Rural Fire Protection District	Unknown	4
<u>2012-06305-073827</u>	07/15/2012	Maries	Vienna Fire Prot. Dist.	Miscellaneous	.25
<u>2012-08518-076881</u>	06/26/2012	Maries	Dixon Rural Fire Protection District	Debris	1

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2012-08518-074263</u>	06/26/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	1
<u>2012-08518-074200</u>	06/21/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	6
<u>2012-06305-072241</u>	06/14/2012	Maries	Vienna Fire Prot. Dist.	Equipment	12
<u>2012-06305-072261</u>	06/08/2012	Maries	Vienna Fire Prot. Dist.	Equipment	15
<u>2012-08518-071069</u>	04/09/2012	Maries	Dixon Rural Fire Protection District	Debris	2
<u>2012-08518-071067</u>	04/01/2012	Maries	Dixon Rural Fire Protection District	Debris	1
<u>2012-08518-068871</u>	03/13/2012	Maries	Dixon Rural Fire Protection District	Debris	1.5
<u>2012-08518-068889</u>	03/05/2012	Maries	Dixon Rural Fire Protection District	Debris	20
<u>2012-08518-071030</u>	03/04/2012	Maries	Dixon Rural Fire Protection District	Debris	200
<u>2012-06305-067678</u>	03/04/2012	Maries	Vienna Fire Prot. Dist.	Not Reported	200
<u>2012-07614-069068</u>	03/04/2012	Maries	Meta Fire & Rescue Fpd	Debris	200
<u>2012-08518-071029</u>	03/03/2012	Maries	Dixon Rural Fire Protection District	Debris	25
<u>2012-08518-071024</u>	02/26/2012	Maries	Dixon Rural Fire Protection District	Debris	1

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2012-08518-071023</u>	02/26/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	1
<u>2012-06313-068550</u>	02/23/2012	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
<u>2012-06313-068549</u>	02/17/2012	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
<u>2012-07614-069081</u>	02/12/2012	Maries	Meta Fire & Rescue Fpd	Debris	450
<u>2012-06313-068529</u>	02/02/2012	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	30
<u>2012-06313-068487</u>	02/01/2012	Maries	Vichy Volunteer Fire Protection Assoc	Debris	1
<u>2012-08518-067062</u>	01/22/2012	Maries	Dixon Rural Fire Protection District	Debris	10
<u>2012-08518-065981</u>	01/06/2012	Maries	Dixon Rural Fire Protection District	Miscellaneous	1.5
<u>2012-06632-099024</u>	01/06/2012	Maries	Iberia Rural Fire Protection District	Debris	1
<u>2012-07614-065458</u>	01/04/2012	Maries	Meta Fire & Rescue Fpd	Miscellaneous	1
<u>2012-06313-068486</u>	01/03/2012	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
<u>2011-08518-061351</u>	10/16/2011	Maries	Dixon Rural Fire Protection District	Debris	5
<u>2011-07614-061421</u>	10/08/2011	Maries	Meta Fire & Rescue Fpd	Equipment	1

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2011-08518-060609</u>	09/12/2011	Maries	Dixon Rural Fire Protection District	Debris	2
<u>2011-08518-059000</u>	07/30/2011	Maries	Dixon Rural Fire Protection District	Miscellaneous	1
<u>2011-08518-058999</u>	07/28/2011	Maries	Dixon Rural Fire Protection District	Debris	4
<u>2011-08518-059013</u>	07/18/2011	Maries	Dixon Rural Fire Protection District	Miscellaneous	1
<u>2011-08518-056566</u>	04/13/2011	Maries	Dixon Rural Fire Protection District	Unknown	1
<u>2011-08518-056565</u>	04/09/2011	Maries	Dixon Rural Fire Protection District	Not Reported	1
<u>2011-08518-056324</u>	04/09/2011	Maries	Dixon Rural Fire Protection District	Debris	30
<u>2011-08518-056325</u>	04/09/2011	Maries	Dixon Rural Fire Protection District	Debris	30
<u>2011-08518-056303</u>	04/08/2011	Maries	Dixon Rural Fire Protection District	Debris	1
<u>2011-08518-056143</u>	04/05/2011	Maries	Dixon Rural Fire Protection District	Debris	25
<u>2011-08518-056118</u>	04/03/2011	Maries	Dixon Rural Fire Protection District	Debris	2
<u>2011-08518-056116</u>	04/01/2011	Maries	Dixon Rural Fire Protection District	Debris	2
<u>2011-06305-054806</u>	03/12/2011	Maries	Vienna Fire Prot. Dist.	Debris	3

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2011-07614-054552</u>	03/02/2011	Maries	Meta Fire & Rescue Fpd	Miscellaneous	400
<u>2011-07614-054422</u>	02/20/2011	Maries	Meta Fire & Rescue Fpd	Unknown	1
<u>2011-08518-054461</u>	02/18/2011	Maries	Dixon Rural Fire Protection District	Debris	2
<u>2011-08518-054430</u>	02/18/2011	Maries	Dixon Rural Fire Protection District	Debris	3
<u>2011-08519-078421</u>	02/18/2011	Maries	Crocker Rural Fire Protection District	Unknown	15
<u>2011-07614-052658</u>	01/03/2011	Maries	Meta Fire & Rescue Fpd	Debris	1
<u>2010-08518-052684</u>	11/07/2010	Maries	Dixon Rural Fire Protection District	Debris	.5
<u>2010-08518-052804</u>	10/29/2010	Maries	Dixon Rural Fire Protection District	Debris	.1
<u>2010-08518-052801</u>	10/29/2010	Maries	Dixon Rural Fire Protection District	Debris	.5
<u>2010-08518-052771</u>	10/22/2010	Maries	Dixon Rural Fire Protection District	Debris	15
<u>2010-08518-052740</u>	10/20/2010	Maries	Dixon Rural Fire Protection District	Debris	50
<u>2010-08518-052769</u>	10/04/2010	Maries	Dixon Rural Fire Protection District	Debris	.1
<u>2009-07614-038741</u>	03/17/2009	Maries	Meta Fire & Rescue Fpd	Debris	5

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2009-07614-037775</u>	02/22/2009	Maries	Meta Fire & Rescue Fpd	Miscellaneous	10
<u>2009-07614-037774</u>	02/22/2009	Maries	Meta Fire & Rescue Fpd	Debris	7
<u>2009-07614-037772</u>	02/21/2009	Maries	Meta Fire & Rescue Fpd	Miscellaneous	500
<u>2009-07614-037626</u>	02/19/2009	Maries	Meta Fire & Rescue Fpd	Miscellaneous	40
<u>2008-07614-033733</u>	03/13/2008	Maries	Meta Fire & Rescue Fpd	Debris	5
<u>2007-08518-034234</u>	08/15/2007	Maries	Dixon Rural Fire Protection District	Equipment	.2
<u>2007-07614-029792</u>	05/23/2007	Maries	Meta Fire & Rescue Fpd	Equipment	3
<u>2007-08518-034241</u>	04/30/2007	Maries	Dixon Rural Fire Protection District	Unknown	2.5
<u>2007-08518-034242</u>	04/30/2007	Maries	Dixon Rural Fire Protection District	Unknown	2.5
<u>2007-00102-029979</u>	03/11/2007	Maries	ADAIR CO RFD #3	Arson	3
<u>2006-06313-025466</u>	09/05/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	.1
<u>2006-06313-025465</u>	08/23/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	35
<u>2006-06313-025462</u>	07/22/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2006-06313-025461</u>	04/21/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	3
<u>2006-06313-025460</u>	04/07/2006	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	.05
<u>2006-06313-025458</u>	03/28/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	.75
<u>2006-08110-023861</u>	03/25/2006	Maries	St. James Fire Protection District	Debris	1
<u>2006-06313-025457</u>	03/19/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	5
<u>2006-07614-012636</u>	03/03/2006	Maries	Meta Fire & Rescue Fpd	Debris	15
<u>2006-07614-012635</u>	02/28/2006	Maries	Meta Fire & Rescue Fpd	Debris	10
<u>2006-06313-011771</u>	02/28/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	6
<u>2006-06313-011774</u>	02/20/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	2.3
<u>2006-06313-011778</u>	02/15/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	1
<u>2006-06313-011780</u>	02/14/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	.2
<u>2006-08110-023855</u>	02/14/2006	Maries	St. James Fire Protection District	Debris	3
<u>2006-06313-011783</u>	02/14/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	2

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2006-06313-011772</u>	02/12/2006	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1.5
<u>2006-06313-011785</u>	01/27/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	.5
<u>2006-06313-011787</u>	01/27/2006	Maries	Vichy Volunteer Fire Protection Assoc	Debris	5
<u>2006-06313-011790</u>	01/24/2006	Maries	Vichy Volunteer Fire Protection Assoc	Equipment	2
<u>2006-06313-011792</u>	01/14/2006	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	5
<u>2005-08518-008165</u>	03/20/2005	Maries	Dixon Rural Fire Protection District	Debris	10
<u>2005-08110-008122</u>	03/15/2005	Maries	St. James Fire Protection District	Debris	2
<u>2005-08110-008115</u>	03/09/2005	Maries	St. James Fire Protection District	Debris	2
<u>2005-08518-008150</u>	03/06/2005	Maries	Dixon Rural Fire Protection District	Debris	7.5
<u>2005-08518-008148</u>	03/06/2005	Maries	Dixon Rural Fire Protection District	Debris	12
<u>2005-06632-007150</u>	03/06/2005	Maries	Iberia Rural Fire Protection District	Debris	2
<u>2005-08518-008146</u>	03/05/2005	Maries	Dixon Rural Fire Protection District	Debris	3.5
<u>2005-08518-008143</u>	03/05/2005	Maries	Dixon Rural Fire Protection District	Debris	3

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2005-06305-006734</u>	02/11/2005	Maries	Vienna Fire Prot. Dist.	Debris	2
<u>2004-06305-004641</u>	04/04/2004	Maries	Vienna Fire Prot. Dist.	Debris	3
<u>2004-06305-004640</u>	04/02/2004	Maries	Vienna Fire Prot. Dist.	Debris	.25
<u>2004-06305-004635</u>	03/22/2004	Maries	Vienna Fire Prot. Dist.	Debris	3
<u>2004-06305-004634</u>	03/21/2004	Maries	Vienna Fire Prot. Dist.	Debris	18
<u>2004-06305-004637</u>	03/08/2004	Maries	Vienna Fire Prot. Dist.	Debris	6
<u>2004-08518-004548</u>	03/01/2004	Maries	Dixon Rural Fire Protection District	Debris	200
<u>2004-08518-004545</u>	03/01/2004	Maries	Dixon Rural Fire Protection District	Debris	4
<u>2004-08518-004546</u>	03/01/2004	Maries	Dixon Rural Fire Protection District	Debris	
<u>2004-00001-005808</u>	02/29/2004	Maries	MDC REPORTING REGION - CENTRAL	Miscellaneous	.2
<u>2004-08518-004547</u>	02/29/2004	Maries	Dixon Rural Fire Protection District	Debris	170
<u>2004-06305-004638</u>	02/28/2004	Maries	Vienna Fire Prot. Dist.	Debris	.25
<u>2004-00001-005809</u>	02/28/2004	Maries	MDC REPORTING REGION -	Debris	35

View	Discovered Date	County	Station	Cause	Acres Burned
			CENTRAL		
<u>2004-06305-004636</u>	02/28/2004	Maries	Vienna Fire Prot. Dist.	Debris	40
<u>2004-06305-004639</u>	02/28/2004	Maries	Vienna Fire Prot. Dist.	Debris	40
<u>2004-06313-003783</u>	02/27/2004	Maries	Vichy Volunteer Fire Protection Assoc	Debris	2.5
<u>2004-06313-003782</u>	02/21/2004	Maries	Vichy Volunteer Fire Protection Assoc	Miscellaneous	.5
<u>2004-06313-003781</u>	02/19/2004	Maries	Vichy Volunteer Fire Protection Assoc	Debris	.25
<u>2004-08518-004538</u>	02/19/2004	Maries	Dixon Rural Fire Protection District	Arson	2
<u>2004-08518-004539</u>	02/19/2004	Maries	Dixon Rural Fire Protection District	Arson	2
<u>2003-06305-001144</u>	04/15/2003	Maries	Vienna Fire Prot. Dist.	Debris	10
<u>2003-00001-003069</u>	04/14/2003	Maries	MDC REPORTING REGION - CENTRAL	Debris	6
<u>2003-06313-001133</u>	04/13/2003	Maries	Vichy Volunteer Fire Protection Assoc	Debris	2
<u>2003-06305-001142</u>	04/13/2003	Maries	Vienna Fire Prot. Dist.	Debris	.25
<u>2003-06305-001141</u>	04/05/2003	Maries	Vienna Fire Prot. Dist.	Debris	30

View	Discovered Date	County	Station	Cause	Acres Burned
<u>2003-06305-001140</u>	03/22/2003	Maries	Vienna Fire Prot. Dist.	Debris	2
<u>2003-06313-001132</u>	03/09/2003	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1.5
<u>2003-06313-001131</u>	03/08/2003	Maries	Vichy Volunteer Fire Protection Assoc	Debris	20
<u>2003-06305-001138</u>	02/12/2003	Maries	Vienna Fire Prot. Dist.	Debris	1
<u>2003-06313-001130</u>	02/05/2003	Maries	Vichy Volunteer Fire Protection Assoc	Unknown	1.5
<u>2003-06305-001137</u>	01/27/2003	Maries	Vienna Fire Prot. Dist.	Debris	1
<u>2002-06313-001129</u>	12/15/2002	Maries	Vichy Volunteer Fire Protection Assoc	Debris	7
<u>2002-06313-001127</u>	11/22/2002	Maries	Vichy Volunteer Fire Protection Assoc	Not Reported	1
<u>2002-00001-001336</u>	11/08/2002	Maries	MDC REPORTING REGION - CENTRAL	Equipment	80