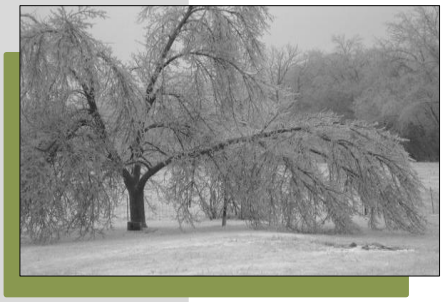
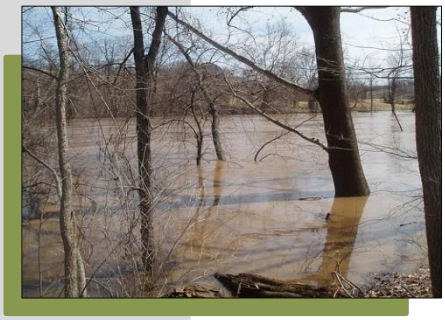
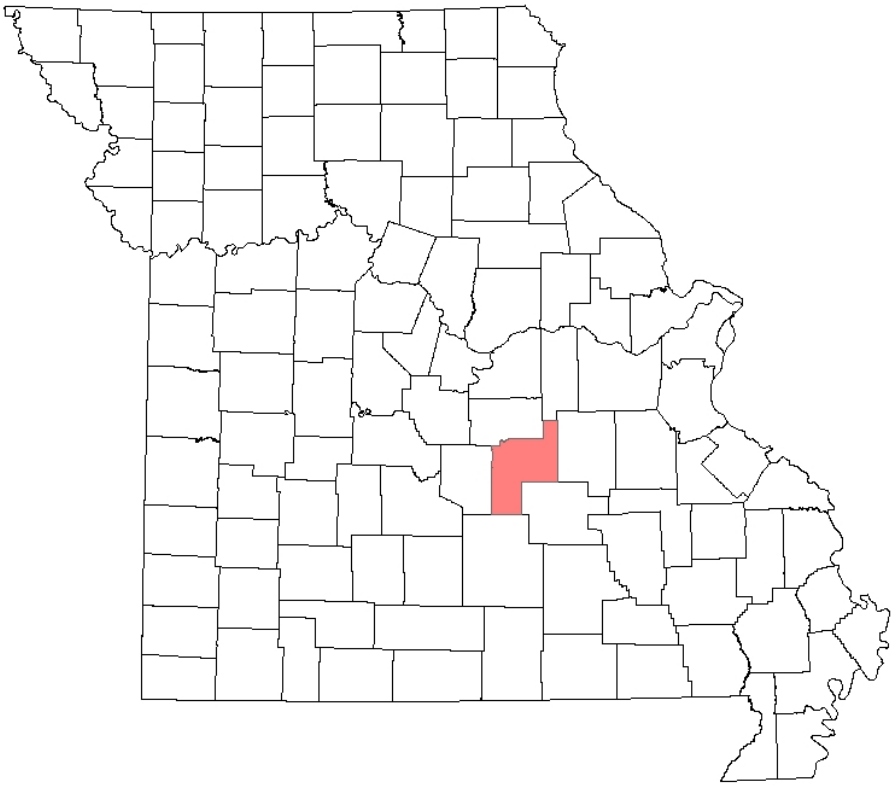




Phelps County Multi-Jurisdiction Natural Hazard Mitigation Plan



Meramec Regional Planning Commission • June, 2021

4 Industrial Drive,
St. James, MO 65559

Phone: (573) 265-2993

Fax: (573) 265-3550

CONTRIBUTORS

Phelps County Hazard Mitigation Planning Committee

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

Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Organization
Gary Hicks	Associate Commissioner	County	Phelps County
Mike Kirn	County EMD	Emergency Management	Phelps County
Steve Flowers	Community Development Director	Community Development	City of Rolla
Brad Woods	City EMD	Emergency Management	City of Rolla
Ron Smith	Fire Chief	Fire & Rescue	City of Rolla
William Gallion	Mayor	Administration	City of Edgar Springs
Doug Smith	Mayor	Administration	City of Doolittle
James Poucher	Mayor	Administration	City of Newburg
Lyle Thomas	Public Works Director	Public Works	City of St. James
John Cutsinger	Parks & Rec Director	Parks & Rec	City of St. James
Ron Jones	Police Chief	Police	City of St. James
Chad Davis	Operations Manager	Rolla Municipal Utilities	City of Rolla
Josh Cahill	Emergency Coordinator	Administration	St. James R-I School District
Merlyn Johnson	Superintendent	Administration	St. James R-1 School District
Dr. Randy Caffey	Superintendent	Administration	Newburg R-II School District
John Fluhrer	Superintendent	Administration	Phelps County R-III School District
Craig Hounsom	Superintendent	Administration	Rolla R-31 School District

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

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

Participating Stakeholder Representatives

Name	Title	Agency/Organization
Cari Restine		Sho-Me Power
Doug Roberts	University Police Chief	Missouri University of Science & Technology
Michelle Bresnahan	Director of Environmental Health and Safety	Missouri University of Science & Technology
Wendy Squires	Emergency Manager	Phelps Health
Melissa Klott		Edgar Springs Rural Fire Protection District
Captain Eddie Blaylock	Troop I Commander	Missouri State Highway Patrol
Steve Davis	Troop I Staff (Lieutenant)	Missouri State Highway Patrol

Wendy Squires	Emergency Management Coord.	Phelps Health
Michelle Bresnahan	Environmental Health & Safety	Missouri University of Science & Technology

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Phelps 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 11, 2016. The original plan was approved in 2004. 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 10 jurisdictions that participated in the planning process:

- Phelps County
- City of Doolittle
- City of Edgar Springs
- City of Newburg
- City of Rolla
- City of St. James
- St. James R-I School District
- Newburg R-II School District
- Phelps County R-III School District
- Rolla 31 School District

Phelps County and the jurisdictions listed above have developed a multi-jurisdictional Hazard Mitigation Plan that was originally approved by FEMA in 2005 with an update approved by FEMA on June 25, 2011 and five years later on August 11, 2016. This current planning effort serves as an update (hereafter referred to as the 2021 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 Phelps County and participating jurisdictions. The MPC updated the risk assessment that identified and profiled hazards that pose a risk to Phelps 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.

- Phelps County
- City of Doolittle
- City of Edgar Springs
- City of Newburg
- City of Rolla
- City of St. James
- St. James R-I School District
- Newburg R-II School District
- Phelps County R-III School District
- Rolla 31 School District

Model Resolution

RESOLUTION NO. _____

A RESOLUTION TO ADOPT THE PHELPS 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 Phelps 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 Phelps 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 Phelps 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

Table of Contents

1.1 Purpose

Phelps County and nine 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 Phelps 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 Phelps County and participating cities and school districts eligible for certain federal disaster assistance as required by the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). Those programs include the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program and Flood Mitigation Assistance Program. The plan has been prepared in accordance with the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and developed and organized within the rules and regulations established under 44 CFR 201.6 published in the *Federal Register* on February 26, 2002 and finalized in October 31, 2007. Guidance for the development of this plan includes FEMA's Local Mitigation Planning

Handbook, March 2013 and FEMA's Local Mitigation Plan Review Guide, October 1, 2011. Those jurisdictions within Phelps County that do not adopt the 2021 plan will not be eligible for funding through these grant programs.

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

1.2 Background and Scope

The 2021 Phelps Hazard Mitigation Plan is an update of the original plan developed and approved in 2004. The first update of the 2004 plan was approved by FEMA in 2011. The second update of the plan was approved on August 11, 2016. 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 2011 and 2016 plan, including the following:

- Phelps County
- City of Doolittle
- City of Edgar Springs
- City of Newburg
- City of Rolla
- City of St. James
- St. James R-I School District
- Newburg R-II School District
- Phelps County R-III School District
- Rolla 31 School District

The information and guidance in this plan document will be used to help guide and coordinate mitigation activities and decisions for local jurisdictions and organizations. Proactive mitigation planning will help reduce the cost of disaster response and recover to local communities and residents by protecting critical infrastructure, reducing liability exposure and minimizing overall community impacts and disruptions. Phelps 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 Phelps 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 Phelps 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 Phelps County Hazard Mitigation Planning Committee first organized in 2019 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 Phelps County Hazard Mitigation plan included assisting in the formation of the mitigation planning committee (HMPC) and facilitating the planning meetings; soliciting public input; and producing the draft and final plan for review by the HMPC, 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 HMPC 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 2019, SEMA secured a grant to develop the Phelps 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. Changes made to the 2021 plan are detailed in Table 1.1.

Table 1.1 Changes Made in Plan Update

Plan Section	Summary of Updates
Chapter 1 – Introduction and Planning Process	Updated members of the Mitigation Planning Committee (MPC) and participating jurisdictions formally adopted the MPC.
Chapter 2 – Planning Area Profile and Capabilities	Noted new GIS capabilities for participating jurisdictions, updated demographics and information provided in jurisdictional questionnaires, updated jurisdictional capabilities.

Plan Section	Summary of Updates
Chapter 3 – Risk Assessment	Combined extreme heat and extreme cold into one hazard: extreme temperatures. Updated data on hazards, updated demographic data.
Chapter 4 – Mitigation Strategy	The mitigation category of each action was added to the action worksheets. The action items were reviewed and updated, and progress made updated in the action worksheets.
Chapter 5 – Plan Implementation and Maintenance	Updated MPC meetings for evaluating and updating the plan quarterly.

The Phelps County Multi-Hazard Mitigation Plan was developed as the result of a collaborative effort among Phelps County, the City of Doolittle, City of Edgar Springs, City of Newburg, City of Rolla, City of St. James, St. James R-I School District, Newburg R-II School District, Phelps County R-III School District, Rolla 31 School District, public agencies, non-profit organizations, the private sector as well as regional, state and federal agencies. MRPC contacted and asked for volunteers to serve on the planning committee from the county and local city governments, school districts, the county health department, local businesses and utility companies. The mailing list is included in **Appendix B: Planning Process**. This cross-section of local representatives was chosen for their experience and expertise in emergency planning and community planning in Phelps County. Staff worked with the Phelps County HMPC 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 HMPC were able to attend meetings. However, all of the jurisdictions provided information to develop the document, submitted questionnaires, reviewed the plan and provided input. Interviews were conducted with stakeholders from the community and several planning meetings were conducted during the plan development.

The 2019 planning process began with a meeting held at the Phelps County Courthouse on January 30, 2020. 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 June 25, 2020. The HMPC 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. The third meeting of the HMPC was held on October 27, 2020. The HMPC reviewed the public survey results, participation requirements and status of participation of jurisdictions; reviewed and discussed draft chapters; reviewed plan maintenance and the adoption process.

The final list of prioritized action items was mailed out to all jurisdictions and entities that had been invited to participate on the HMPC. 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 HMPC 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.

Phelps 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 Rolla and during the pandemic – via internet video and conference call. County officials attended and participated in meetings.

The HMPC 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 HMPC 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:

Randy Verkamp, Larry Strattman, Louis Magdits, Rachel Lucas, Doug Smith, Della Bishop, James Poucher, Phyllis Harris, Rick Krawiecki, Dr. Randy Caffey and John Fluhrer all participated indirectly by providing information, completing the jurisdictional questionnaire, participating in phone calls and email discussions and assisting with adoption of the plan.

Table 1.2 Jurisdictional Representatives Phelps County Mitigation Planning Committee

Name	Title	Department	Jurisdiction/Agency/ Organization	Direct Participation	Indirect Participation
Randy Verkamp	Presiding Commissioner	Admin.	Phelps County		X
Gary Hicks	Associate Commissioner	Admin.	Phelps County	X	
Larry Strattman	Associate Commissioner	Admin.	Phelps County		X
Pam Grow	County Clerk	Admin.	Phelps County		X
Mike Kirn	County EMD	County Emergency Management	Phelps County	X	
Louis J. Magdits	Mayor	Admin.	City of Rolla		X
John Butz	City Administrator	Admin.	City of Rolla		X

Name	Title	Department	Jurisdiction/Agency/ Organization	Direct Participation	Indirect Participation
Steve Flowers	Community Development Director	Community Development	City of Rolla	X	
Brad Woods	City EMD	Emergency Management	City of Rolla	X	
Ron Smith	Fire Chief	Rolla Fire & Rescue	City of Rolla	X	
William Gallion	Mayor	Admin.	City of Edgar Springs	X	
Rachel Lucas	City Clerk	Admin.	City of Edgar Springs		X
Doug Smith	Mayor	Admin.	City of Doolittle		X
Della Bishop	City Clerk	Admin.	City of Doolittle		X
James Poucher	Mayor	Admin.	City of Newburg		X
Phyllis Harris	City Clerk	Admin.	City of Newburg		X
Rick Krawiecki	Mayor	Admin.	City of St. James		X
Lyle Thomas	Public Works Director	Public Works	City of St. James	X	
John Cutsinger	Parks & Rec Director	Parks & Rec	City of St. James	X	
Ron Jones	Chief of Police	Police Dept.	City of St. James	X	
Chad Davis	Operations Manager	Rolla Municipal Utilites	City of Rolla	X	
Cari Restine			Sho-Me Power	X	
Doug Roberts	Chief of University Police	University Police	Missouri University of Science & Technology	X	
Michelle Bresnahan	Director of Environmental Health & Safety	Environmental Health & Safety	Missouri University of Science & Technology	X	
Wendy Squires	Emergency Manager	Emergency Management	Phelps Health Hospital	X	
Melissa Klott		Volunteer Fire	Edgar Springs Rural Fire Protection District	X	
Captain Eddie Blaylock	Commanding Officer of Troop I MSHP	Admin.	Missouri State Highway Patrol	X	
Steve Davis	Lieutenant		Missouri State Highway Patrol	X	
Merlyn Johnson	Superintendent	Admin.	St. James R-I School District	X	
Josh Cahill	Emergency Coordinator	Admin.	St. James R-I School District	X	
Dr. Randy Caffey	Superintendent	Admin.	Newburg R-II School District		X
John Fluhrer	Superintendent	Admin.	Phelps County R-III School District		X
Craig Hounsom	Superintendent	Admin.	Rolla 31 School District	X	

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

Table 1.3 MPC Capability with Six Mitigation Categories[1(b)]

Community Department/Office	Preventive Measures	Structure and Infrastructure Projects		Natural Resource Protection	Public Information	Emergency Services
		Property Protection	Structural Flood Control Projects			
Randy Verkamp, Presiding Commissioner	✓	✓	✓	✓	✓	✓
Gary Hicks, Associate Commissioner	✓	✓	✓	✓	✓	✓
Larry Strattman, Associate Commissioner	✓	✓	✓	✓	✓	✓
Pam Grow	✓	✓				
Mike Kirn	✓	✓	✓	✓	✓	✓
Louis J. Magdits	✓	✓	✓	✓	✓	✓
John Butz, City Administrator	✓	✓	✓	✓	✓	✓
Steve Flowers		✓		✓	✓	
Brad Woods	✓	✓	✓	✓	✓	✓
Ron Smith	✓	✓		✓	✓	✓
William Gallion	✓	✓			✓	
Rachel Lucas		✓				✓
Doug Smith	✓	✓			✓	✓
Della Bishop		✓			✓	
James Poucher	✓	✓	✓		✓	✓
Phyllis Harris		✓	✓			
Rick Krawiecki	✓	✓			✓	✓
Lyle Thomas	✓	✓	✓	✓	✓	✓
John Cutsinger		✓		✓		
Ron Jones		✓			✓	✓
Chad Davis	✓	✓			✓	
Cari Restine	✓	✓			✓	
Doug Roberts		✓			✓	✓
Michelle Bresnahan	✓			✓		
Wendy Squires	✓	✓			✓	✓
Melissa Klott	✓	✓				✓
Captain Eddie Blaylock	✓	✓			✓	✓
Steve Davis	✓	✓				✓
Merlyn Johnson	✓	✓			✓	
Josh Cahill	✓	✓				
Dr. Randy Caffey	✓	✓			✓	

Community Department/Office	Preventive Measures	Structure and Infrastructure Projects		Natural Resource Protection	Public Information	Emergency Services
		Property Protection	Structural Flood Control Projects			
John Fluhrer	✓	✓			✓	
Craig Hounsom	✓	✓			✓	

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.

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

- Phelps County
- City of Doolittle
- City of Edgar Springs
- City of Newburg
- City of Rolla
- City of St. James
- St. James R-I School District
- Newburg R-II School District
- Phelps County R-III School District
- Rolla 31 R-IV School District
- Phelps-Maries Co. Health Dept.
- Charter Cable
- Verizon Wireless
- Fidelity Communications
- Gascosage Electric Cooperative
- Intercounty Electric Co-Op, Inc.
- Crawford Electric Cooperative
- Missouri University of Science & Technology
- Webster University
- Drury University
- Metro Business College
- East Central College
- Columbia College
- Phelps Health
- Missouri Veteran's Home
- Cedar Knoll Home
- County Valley Home
- Centurytel
- American Red Cross
- Ferndale, Inc.
- Heritage Park Skilled Care
- Lea's Haven
- Parkside Assisted Living
- Presbyterian Manor
- Rolla Manor Care
- Rosewood Residential Care
- St. James Nursing Center
- Boys & Girls Town of Missouri
- BNSF Railroad
- All Star Gas
- Ferrellgas
- St. James Ambulance
- Mark Twain National Forest
- Missouri Department of Conservation
- MoDOT
- Poe's Gas
- Walmart Distribution Center
- MoGas Pipeline LLC
- Missouri National Guard Armory
- NUSTAR Pipeline
- FM KKID Radio
- Bott Radio network

- KMNR-Radio
- Phelps County Focus
- Results Radio – KZNN, KTTR, KDAA, KXMO, Shine 104.9
- Rolla Daily News
- St. James Press
- STL Public Radio (Rolla)
- Sunny 104.5

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 HMPC meetings. Most communities and school districts in Phelps 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 1.4**. Documentation of meetings, including sign-in sheets are included in Appendix B: Planning Process.

Table 1.4 Jurisdictional Participation in the Planning Process

Jurisdiction	Meeting #1	Meeting #2	Meeting #3	Interviews	Data Collection Questionnaire/Call	Update/Develop/ Prioritize Mitigation Actions	Review/ Comment on Plan
Phelps County	X	X	X	X	X	X	X
City of Doolittle				X	X	X	X
City of Edgar Springs	X			X	X	X	X
City of Newburg					X	X	X

Jurisdiction	Meeting #1	Meeting #2	Meeting #3	Interviews	Data Collection Questionnaire/Call	Update/Develop/ Prioritize Mitigation Actions	Review/ Comment on Plan
City of Rolla	X	X	X	X	X	X	X
City of St. James	X	X	X	X	X	X	X
St. James R-I			X		X	X	X
Newburg R-II				X	X	X	X
Phelps County R-III				X	X	X	X
Rolla 31			X	X	X	X	X

1.6 The Planning Steps

Phelps County and MRPC worked together to develop the plan and based the planning process in FEMA's *Local Mitigation Planning Handbook (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 1.5 Phelps County Planning Process

Community Rating System (CRS) Planning Steps (Activity 510)	Local Mitigation Planning Handbook Tasks (44 CFR Part 201)
Step 1: Organize	Task 1: Determine the Planning Area and Resources Task 2: Build the Planning Team 44 CFR 201.6(c)(1)
Step 2: Involve the public	Task 3: Create an Outreach Strategy 44 CFR 201.6(b)(2) & (3)
Step 3: Coordinate	Task 4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)
Step 4: Assess the hazard	Task 5: Conduct a Risk Assessment 44 CFR 201.6(c)(2)(i) 44 CFR 201.6(c)(2)(ii) & (iii)
Step 5: Assess the problem	
Step 6: Set goals	Task 6: Develop a Mitigation Strategy 44 CFR 201.6(c)(3)(i); 44 CFR 201.6(c)(3)(iii)
Step 7: Review possible activities	
Step 8: Draft an action plan	
Step 9: Adopt the plan	Task 8: Review and Adopt the Plan
Step 10: Implement, evaluate, revise	Task 7: Keep the Plan Current 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 Phelps 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. Phelps County Commission offered to host the meetings at the courthouse and the first meeting was held there on January 30, 2020. Due to the COVID-19 pandemic, subsequent meetings were held via internet video conference and telephone conference call. The second meeting was convened on June 25, 2020 and the third on October 27, 2020.

At the first meeting on January 30, 2020, MRPC staff made introductions and provided an overview of the Phelps 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. The group started working on reviewing and prioritizing the action items – using both the STAPLEE method and analyzing the cost benefit.

At the second meeting on June 25, 2020, the group reviewed the complete list of action items; determined which had been completed; which should be combined; which were no longer a high or medium priority; and determined if any needed to be added. The 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 HMPC with a request for feedback. All suggestions for changes were incorporated into the plan. MRPC staff shared the results of the public survey. 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 HMPC as they were completed.

At the third meeting on October 27, 2020, the group went over the final results of the public survey; reviewed participation requirements and the status of all jurisdictions; reviewed and discuss those draft chapters that were completed; discussed plan maintenance and the adoption process.

Table 1.6 Schedule of HMPC Meetings outlines the dates that meetings were held and topics covered. Documentation of the planning process can be found in Appendix B: Planning Process.

Table 1.6 Schedule of HMPC Meetings

Meeting	Topics	Date
Planning Meeting #1	Overview of hazard mitigation planning purpose and Phelps County plan; grant programs linked to approved plan; participation requirements and public involvement; data collection questionnaires; discussion of hazards; critical facilities	January 30, 2020
Planning Meeting #2	Overview of hazard mitigation planning and Phelps 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	June 25, 2020
Planning Meeting #3	Review of public survey results, participation requirements and status of jurisdictions, review and discussion of draft chapters, plan maintenance and adoption process and next steps for the planning process and completion of the plan.	October 27, 2020

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 HMPC followed the same process for public involvement and input as suggested by SEMA and FEMA and as was followed during earlier planning processes. The first HMPC meeting was held at the Phelps County Courthouse. Due to the COVID-19 pandemic, subsequent meetings were held via internet video and telephone conference call. 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 were presented for review and discussion. A public survey was conducted, and the results shared with the HMPC. A sample of the survey and the results of the survey are included in Appendix C: Public Survey. HMPC 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 4, 2021. Hard copies of the final draft were placed at the Phelps County Courthouse. 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 Phelps 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 Missouri Highway Patrol, Phelps Health, Edgar Springs Rural Fire Protection District, Missouri S&T and Sho-Me Power. 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
Randy Verkamp	Presiding Commissioner	County	Phelps County
Gary Hicks	Associate Commissioner	County	Phelps County
Larry Stratman	Associate Commissioner	County	Phelps County
Pam Grow	County Clerk	County	Phelps County
Rick Lisenbe	Sherriff	Sherriff's Dept.	Phelps County
Corporal Mike Kirn	EMD	Emergency Management	Phelps County
Louis Magdits	Mayor	Admin.	City of Rolla
John Butz	City Administrator	Admin.	City of Rolla
Carol Daniels	City Clerk	Admin.	City of Rolla
Steve Flowers	Community Development Director	Community Development	City of Rolla
Sean Fagan	Chief of Police	Police	City of Rolla

Name	Title	Department	Jurisdiction/Agency/Organization
Ron Smith	Fire Chief	Fire & Rescue	City of Rolla
Steve Hargis	Public Works Director	Public Works	City of Rolla
Rodney Bourne		Rolla Municipal Utilities	City of Rolla
Floyd Jernigan	Parks & Rec Director	Parks & Rec	City of Rolla
Brady Wilson	Director of Environmental Services	Environmental Services	City of Rolla
Brad Woods	EMD	Emergency Management	City of Rolla
Doug Smith	Mayor	Admin.	City of Doolittle
Vincent Giancolone	Police Chief	Police	City of Doolittle
Della Bishop	City Clerk	Admin.	City of Doolittle
James Poucher	Mayor	Admin.	City of Newburg
Phyllis Harris	City Clerk	Admin.	City of Newburg
Kris Finch	Police Chief	Police	City of Newburg
David Simpson	Water/Sewer Superintendent	Water/Sewer Department	City of Newburg
John Moncrief	Building Inspector		City of Newburg
Rick Krawiecki	Mayor	Admin.	City of St. James
James Fleming	City Administrator	Admin.	City of St. James
Sarah Wheeler	City Clerk	Admin.	City of St. James
Ron Jones	Police Chief	Police	City of St. James
Lyle Thomas	Public Works Director	Public Works	City of St. James
Chuck Hitch	Electric Supervisor	Public Works	City of St. James
Danny Scheel	Street Supervisor	Public Works	City of St. James
John Cutsinger	Parks & Rec Director	Parks & Rec	City of St. James
John Douglas II	Fire Chief	Fire Department	City of St. James
William Keith Gallion	Mayor	Admin.	City of Edgar Springs
Rachel Lucas	City Clerk	Admin.	City of Edgar Springs
Joe Hohner	Police Chief	Police	City of Edgar Springs
Everett Perkins	Water Superintendent	Water	City of Edgar Springs
Merlyn Johnson	Superintendent	Admin.	St. James R-I School District
Dr. Randy Caffey	Superintendent	Admin.	Newburg R-II School District
John Fluhrer	Superintendent	Admin.	Phelps County R-III School District
Dr. Aaron Zalis/ Craig Hounsom	Superintendent	Admin.	Rolla 31 School District

Stakeholders Invited to Participate in the Planning Process

Name	Title	Agency/Organization
John Richards	-	Sho-Me Power Cooperative
-	-	Charter Cable
-	-	Verizon Wireless
-	-	Fidelity Communications
Chris Mueller	-	Centurytel
Carmen Hartwell	-	Gascosage Electric Cooperative
Tony Mallory	-	Crawford Electric Cooperative
Aaron Bradshaw	-	Intercounty Electric Cooperative
Michelle Bresnahan	-	Missouri University of Science & Technology

Name	Title	Agency/Organization
Dr. Greg Edwards	-	Webster University
Kerstin Ellis	-	Drury University
Mary Gapsch	-	Metro Business College
Christina Ayres	-	East Central College
Cory Elfrink	-	Columbia College
Debbie Hallinar	-	Phelps Health
Dave Griffith	-	American Red Cross
Lt. Eddie Blaylock	Commander of Troop I MSHP	MO State Highway Patrol
-	Commanding Officer	Missouri National Guard
Jeff Faulkner	-	BNSF Railroad
-	-	All Star Gas
James Baalman	-	Ferrellgas
-	-	Poe's Gas
Bryan Lambeth	Director	St. James Ambulance District
-	Forest Supervisor	Mark Twain National Forest
-	-	Missouri Department of Conservation
Preston Kramer	District Engineer	Missouri Department of Transportation
-	-	Missouri Veterans' Home
-	-	Cedar Knoll Home
-	-	County Valley Home
-	-	Ferndale, Inc.
-	-	Heritage Park Skilled Care
-	-	Lea's Haven
-	-	Parkside Assisted Living
-	-	Presbyterian Manor
-	-	Rolla Manor Care
-	-	Rosewood Residential Care
-	-	St. James Nursing Center
-	-	Boys & Girls Town of Missouri
-	General Manager	Walmart Distribution Center
-	-	MoGas Pipeline LLC
-	-	NUSTAR Pipeline

Jurisdictional representatives on the HMPC 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.

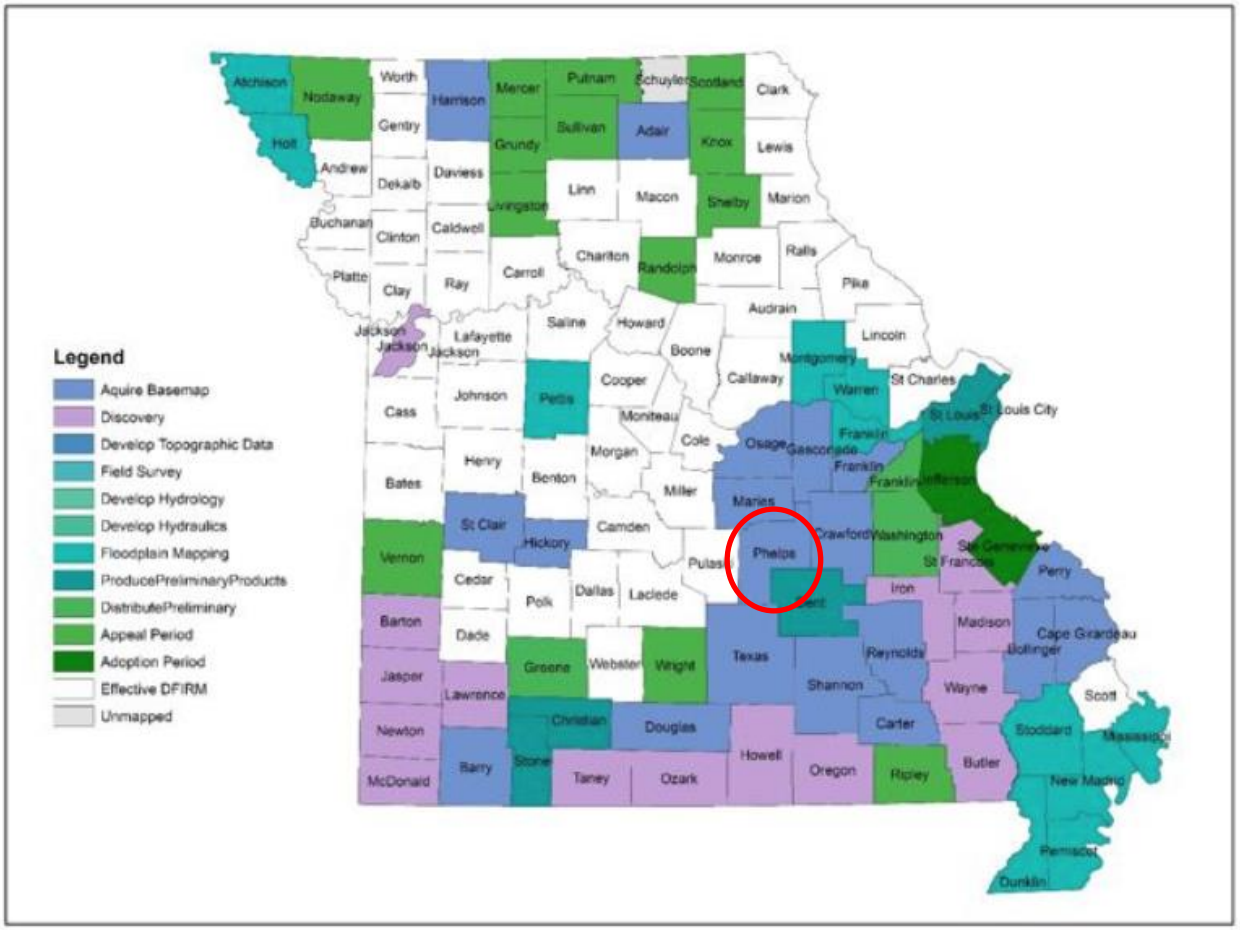
The questionnaire provided to every jurisdiction asked how mitigation actions were being incorporated into other planning documents. The county road and bridge department does a good job of incorporating mitigation projects into their regular maintenance program. Those projects have been incorporated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

Coordination with FEMA Risk MAP Project

The Risk MAP project has begun in Phelps County. As of September 2020, SEMA was working with the US Army Corps of Engineers to update the models used to develop the county's new flood risk data. Updated flood risk data is scheduled to be shared with the county in May 2021 and Preliminary Maps should be delivered in September 2021. The county currently has DFIRM 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 HMPC 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. Phelps County is a rural area with the largest community's population at approximately 20,169.

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 HMPC 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 HMPC reviewed the hazards that affected Phelps County at the first planning meeting on January 30, 2020 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 HMPC 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 HMPC 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 January 30, 2020. 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 HMPC meetings. At the first HMPC meeting the group reviewed the list in the existing plan and decided which actions could be eliminated; what could be combined; what needed to remain on the list; and what needed to be added. It was emphasized that any mitigation actions in the plan that were not likely to be accomplished, due to cost factors or that did not address the risks identified in the risk assessment, should be removed from the list.

Discussions also included mitigation activities that had been completed or were in process that had not been in the original plan document. Each jurisdiction and stakeholder group 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 February 24, 2021.

In order to prioritize action items, the HMPC 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 HMPC 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 HMPC focus on long-term mitigation solutions that demonstrated the future cost savings that could be realized by completing mitigation projects that safeguard lives and protect property.

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

Step 8: Draft an Action Plan

The HMPC reviewed the final list of action items at the January 30, 2020 meeting and completed their review and the prioritization process of the final list at the June 25, 2020 meeting. The final list was then mailed out to all jurisdictions and members of the HMPC for review and approval as everyone was not able to attend the meeting. Staff was directed by the HMPC to take the finalized list after allowing time for comments and draft an action plan.

Step 9: Adopt the Plan (Handbook Task 8)

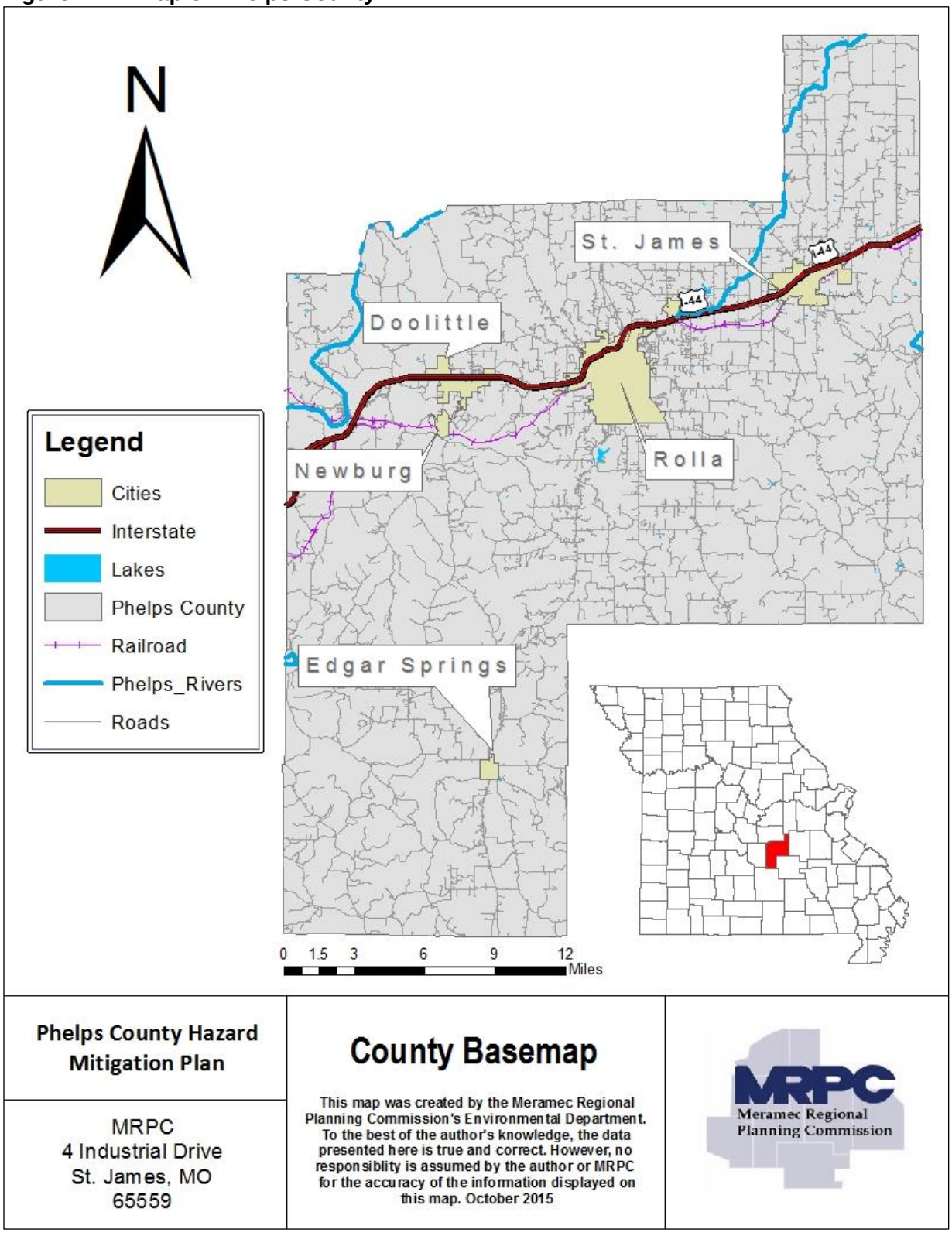
When the first draft of the plan was completed, staff posted the document on the MRPC website and provided a hard copy to the county courthouse. All HMPC members, jurisdictions and surrounding jurisdictions were notified on where to find a copy of the plan to review. If requested, additional hard copies 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 all three planning meetings (January 30, 2020, June 25, 2020 and October 27, 2020) MRPC staff advised the HMPC 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 Phelps County's strategy for implementation, evaluation and revising the plan.

2 PLANNING AREA PROFILE AND CAPABILITIES

2.1 Phelps County Planning Area Profile

Figure 2.1. Map of Phelps County



Phelps County has a population of approximately 44,630 according to the most recent census data illustrates the percentage population growth since 2010 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 2.1.** Furthermore**,** median household income and percentage growth for Phelps County, Missouri, and the United States is provided in **Table 2.2.** Median House value percentage growth for the county, state and nation is found in **Table 2.3**.

Table 2.1. Percent Population Growth for County, State, and Nation 2010-2019

	Total Population		Change Over Period	
Demographic Region	**2010**	**2019**	**Change**	**Percent**
Missouri	5,814,785	6,104,910	290,125	4.99
United States	300,758,215	324,697,795	23,939,580	7.96
Phelps County	39,945	44,630	4,685	11.73

Source: U.S. Census Bureau, Census 2010 Summary File 1; U.S. Census Bureau, 2015-2019 5-Year American Community Survey

Table 2.2. Median Household Income and Percentage Growth for County, State, and Nation 2010 - 2019

	Median Household Income (USD)		Change Over Period	
Demographic Region	**2010**	**2019**	**Change**	**Percent**
United States	$51,914	$62,843	$10,929	21.1
Missouri	$46,262	$55,461	$9,199	19.9
Phelps County	$40,260	$44,154	$3,894	9.7

Source: U.S. Census Bureau, 2006-2010 and 2015-2019 5-Year American Community Survey

Table 2.3. Median House Value Percentage Growth for County, State, and Nation 2010 - 2019

	Median House Value (USD)		Change Over Period	
Demographic Region	**2010**	**2019**	**Change**	**Percent**
United States	$188,400	$217,500	$29,100	15.4
Missouri	$137,700	$157,200	$19,500	14.2
Phelps County	$114,700	$135,000	$20,300	17.7

Source: U.S. Census Bureau, Census 2010 Summary File 3; U.S. Census Bureau, 2015-2019 5-Year American Community Survey

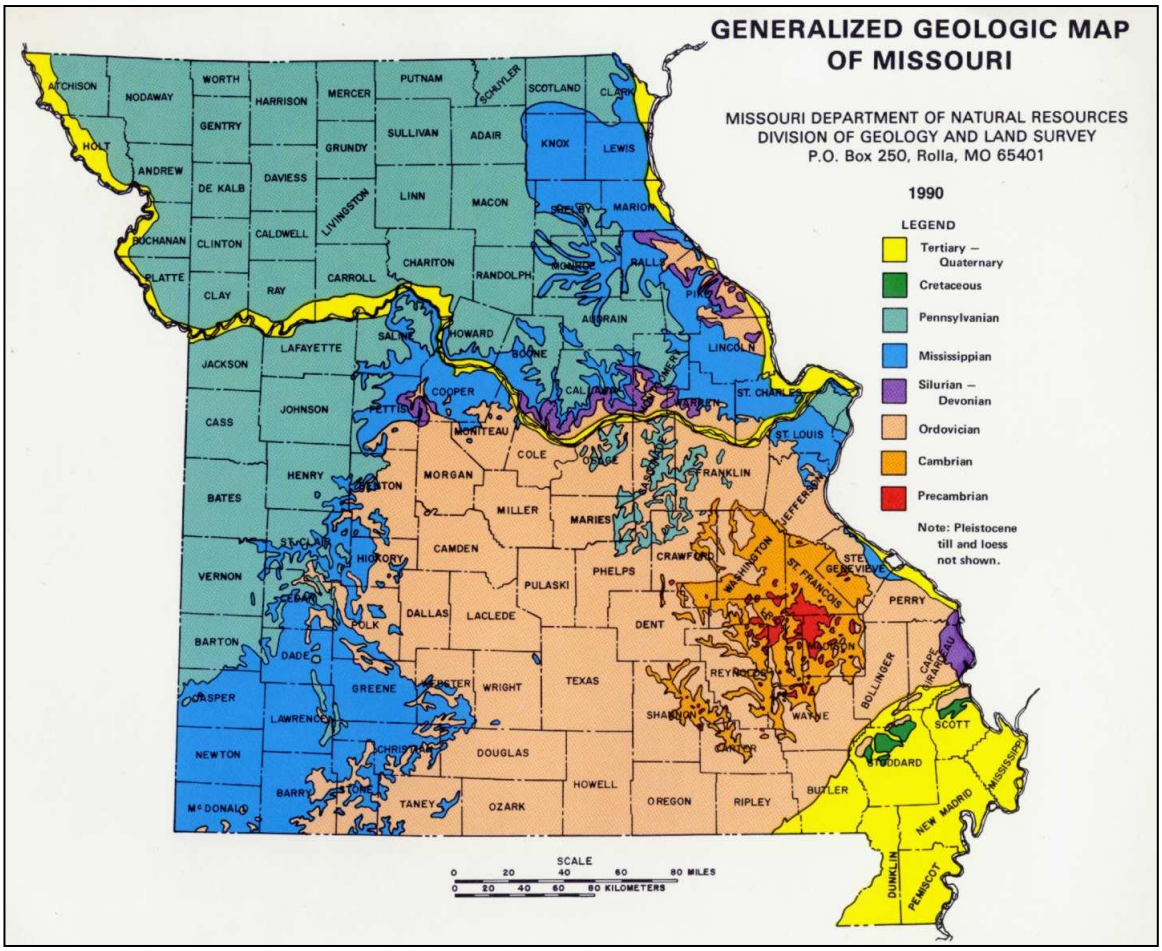
2.1.2 Geography, Geology and Topography

Phelps County has a total land area of 547 square miles. Approximately 31 percent of the land cover in the county is deciduous forest intermixed with 45 percent of grassland. Approximately 18 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 2.5 square miles of total water area. Incorporated jurisdictions within the county include the cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James.
The county seat, Rolla, is located in south central Missouri, approximately 60 miles southwest of

the state capital of Jefferson City, approximately 105 miles northeast of Springfield, Mo. and approximately 100 miles southwest of St. Louis, Mo. The county is bordered on the north by Maries and Gasconade counties. On the east side the county is bordered by Crawford and Dent counties. To the south the county is bordered by Dent and Texas counties. Pulaski County borders Phelps County to the west.

Located within the Ozark Mountains, Phelps County is located in the Ozark Plateau – the largest outcrop area of Ordovician-age rocks in the United States[1]. 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[2]. Portions of this formation contain rock that dissolves and fractures over time from rainwater, thus resulting in the karst features found throughout the Ozarks. **Figure 2.2** depicts a generalized geologic map of Missouri and its counties.

Figure 2.2. Generalized Geologic Map of Missouri



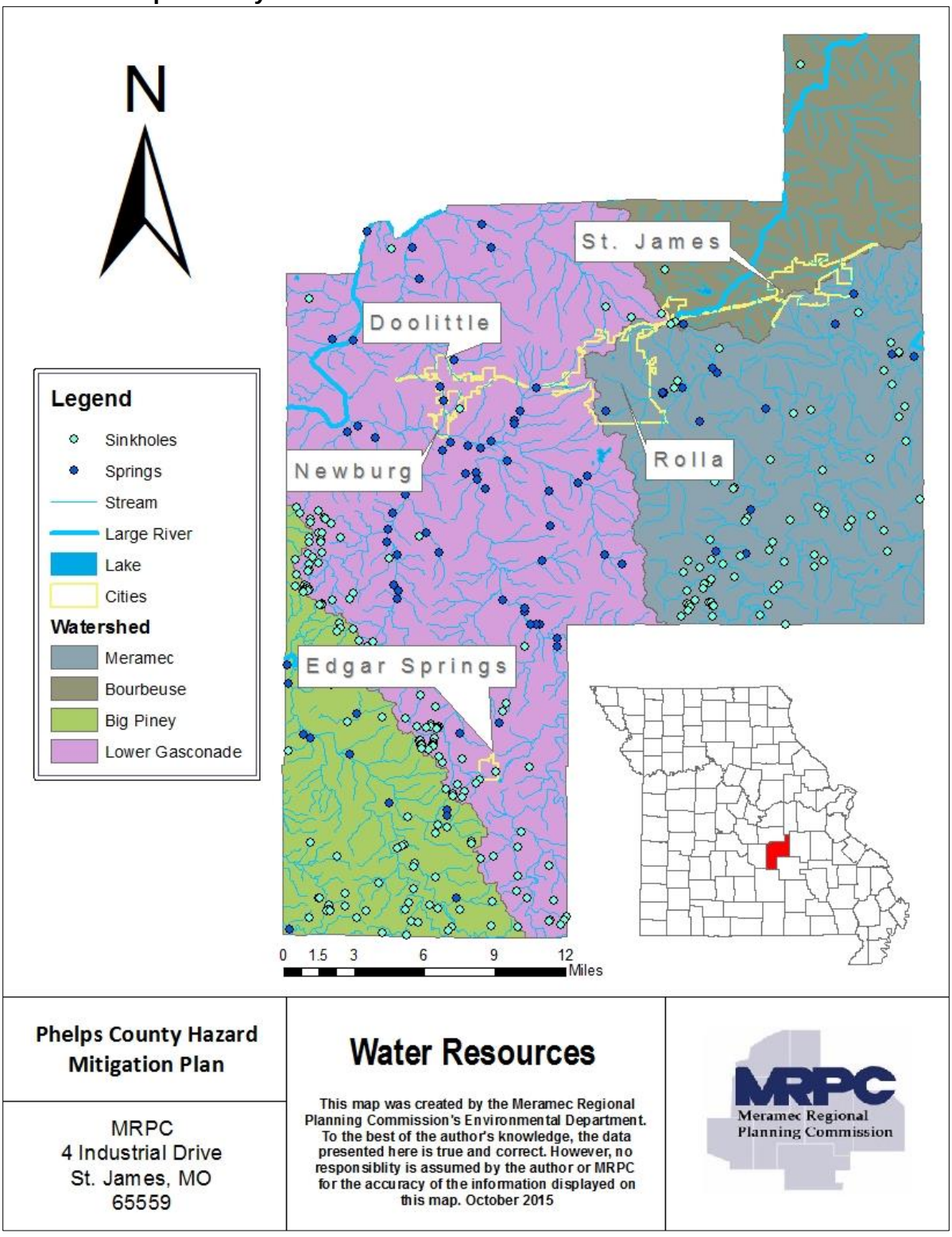
The topography in the county is typical of the Ozarks - rugged limestone hills with rocky ridges and bluffs, and deep, narrow valleys. The area has karst terrain which is characterized by

[1] http://geology.about.com/library/bl/maps/blmissourimap.htm

[2] http://members.socket.net/~joschaper/ordo.html

springs, caves, losing streams and sinkholes. The maximum relief in the county is approximately 500 feet, with the highest elevation at 1,352 above sea level and the lowest elevation at 587 feet above sea level.

Figure 2.3. Phelps County Watershed/Water Resources



Phelps County is comprised of five HUC8 watersheds which include the Big Piney, Bourbeuse, Lower Gasconade and Meramec. The Big Piney Watershed covers the southwest corner of the county. The Lower Gasconade basin runs north and south through the west central part of the county. 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. A number of springs within the middle Gasconade River portions are due to the karst geology of the Roubidoux and Gasconade Dolomite Formation and losing stream segments. The karst topography causes losing portions in the Osage Fork, Roubidoux, North Cobb, Little Piney, Spring, and Mill creeks, and Gasconade River. The entire Gasconade River watershed is reported to have 76 springs and the largest concentration of big springs in the state. The Bourbeuse Watershed covers the northeast corner of the county and the Meramec Watershed comprises approximately a quarter of the county and lies in the southeast corner. The Meramec River and its tributaries including the Bourbeuse River, Dry Creek, Huzzah Creek, Courtois Creek, Hazel Creek, Big River and Mineral Fork also drain parts of Phelps County. Included with this basin are 36 springs, three of these are located in Phelps County.

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 13 inches of snow occurs annually in the Meramec Region. It is unusual for snow to stay on the ground for more than a week or two before it melts. Winter precipitation usually is in the form of rain, snow or both. Conditions sometimes 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 Phelps County are subject to frequent changes in temperature. The average annual temperature is 56.2°F. The average annual high temperature is 65.95°F with the average annual low at 45.05°F. The average high and low in January is 40.5°F and 21.2°F, respectively. In July the average high and low are 88.5°F and 68°F, respectively. A high temperature of 113 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 Phelps County between 2000 and 2019 by jurisdiction. The unincorporated area of Phelps County was determined by subtracting the populations of the incorporated areas from the overall county population.

Table 2.4. Phelps County Population 2010-2019 by Jurisdiction

Jurisdiction	2000 Population	2010 Population	2019 Population	2010-2019 # Change	2010-2019 % Change
Unincorporated Phelps County	18,436	19,701	19,055	-646	-3.28%
Doolittle	644	621	670	49	7.89%
Edgar Springs	190	313	181	-132	-42.17%
Newburg	484	528	479	-49	-9.28%
Rolla	16,367	19,141	20,169	1,028	5.37%
St. James	3,704	4,169	4,076	-93	-2.23%

Source: U.S. Census Bureau, Census 2000 Summary File 1; Census 2010 Summary File 1; U.S. Bureau of the Census, 2015-2019 5-Year American Community Survey

Table 2.5 provides information in regard to the percent of individuals under the age of 5, and over 65 for the county, State, and Nation. In addition, average household size is illustrated in **Table 2.6** including figures for Phelps County, Missouri, and the U.S. In 2019 there were an estimated 20,287 households within the county[3].

Table 2.5. Percent of Individuals Under the Age of 5, and Over 65 for County, State, and Nation (2019)

Location	% Under Age of 5	% Over Age of 65
Phelps County	5.6	15.8
Missouri	6.1	16.5
United States	6.1	15.6

Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

Table 2.6. 2019 Average Household Size for County, State, and Nation

Location	Average Household Size
Phelps County	2.28
Missouri	2.41
United States	2.6

Source: U.S. Census Bureau, 2015-2019 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

[3] U.S. Census Bureau, 2012-2016 5-Year American Community Survey

synthesizes 30 socioeconomic variables which are primarily derived from the United States Census Bureau. **Table 2.7** depicts the Social Vulnerability Index for Phelps County along with its national percentile.

Table 2.7. Social Vulnerability Index (SoVI ®)

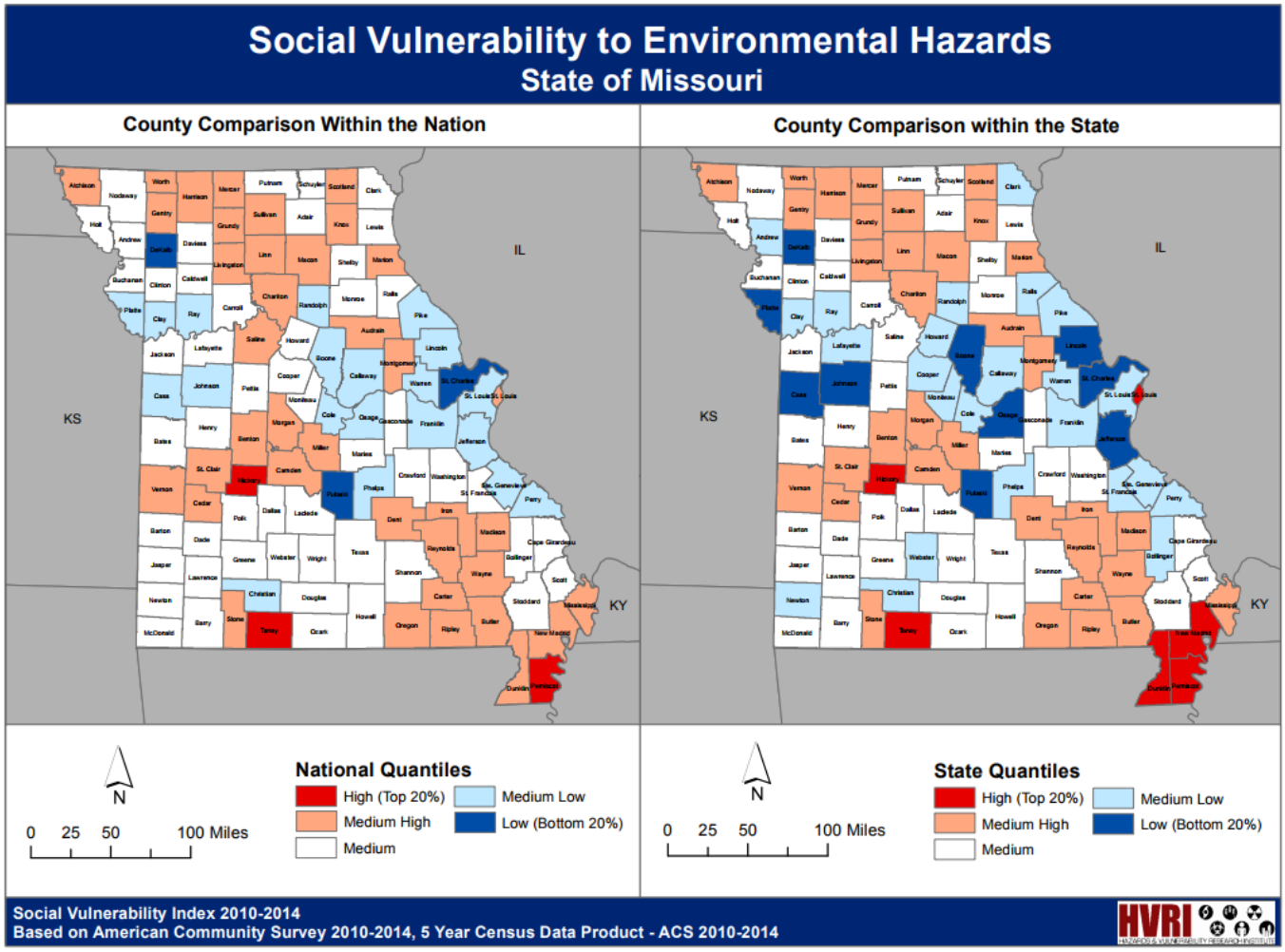
State	County	SoVI Score (10 - 14)	National Percentile (10 - 14)
Missouri	Phelps County	(-)1.789999962	23.6%

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 resiliency[4]. Phelps County's SoVI ® Score illustrates a diminished vulnerability to cope with natural disasters. Additionally, Phelps County is ranked 23.6 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.

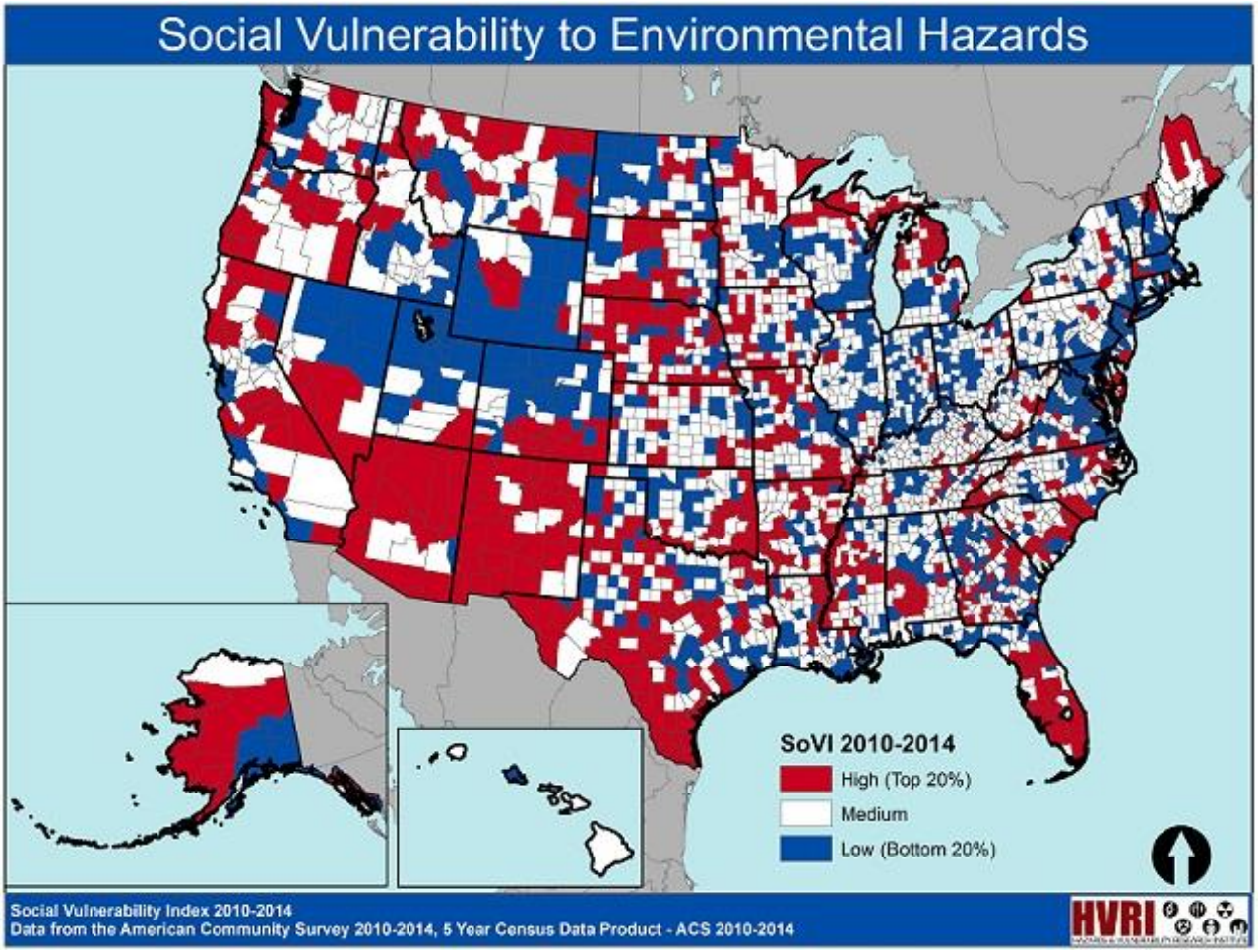
[4] http://webra.cas.sc.edu/hvri/products/sovifaq.aspx

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 Phelps County.

Table 2.8. 2019 Unemployment, Poverty, Education, and Language Percentage Demographics, Phelps 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
Phelps County	55.5	5.2	12.5	30.4	29.1	6.7
Doolittle	55.5	7.0	12.0	27.6	11.8	1.6
Edgar Springs	50.8	3.2	25.6	43.4	14.8	2.5
Newburg	43.4	19.4	30.7	46.4	2.9	0

Jurisdiction	% in Labor Force	% of Population Unemployed	% of Families Below the Poverty Level	High School Diploma ONLY, ages 25+ (%)	Bachelor's degree or higher, ages 25+ (%)	% of population (language spoken at home other than English
Rolla	52.2	5.6	15.4	26.3	35.8	10.5
St. James	61.1	3.3	13.8	31.3	22.9	2.7

Source: U.S. Census Bureau, 2015-2019 American Community Survey, 5-Year American Community Survey

2.1.5 History

Phelps County was created by the legislature on Nov. 13, 1857, from territory originally belonging to Crawford, Pulaski, and Maries counties in South Central Missouri. The county was named for John Phelps of Green County, who was governor from 1877 to 1881. The county seat locating commission designated the area now known as Rolla to be the county seat. When the locating commission made its report, considerable protest was voiced concerning the choice of sites. Approximately 600 citizens of the county signed a petition of protest, citing the fact that only two of the three commission members had met to consider the possible sites for the county seat. The matter went first to the Circuit Court and then to the Supreme Court. Before the high court could make a decision, however, the legislature took action on Jan. 14, 1860, confirming the location of the county seat in Rolla. Starting under a considerable amount of criticism concerning the matter, all members of the county court resigned during April 1858, but later withdrew their resignations.

The town of Rolla did not exist as of Nov. 13, 1857, when the county was created. Only the J. Stever office and John Webber's home were located in the area. Early court business included the location and opening of roads from the county seat to various places within the state including: St. Louis, Springfield, Jefferson City, Lake Spring and Salem. It is in this last road order, dated in July 1858 that the use of the name Rolla first appears in the court records. The name was used earlier, in May 1858, in a deed of railroad land to the county.

On April 26, 1859, the county court ordered the 50 acres donated by Mr. Bishop for the site of the county seat to be surveyed. The survey was conducted by A.E. Buchanan, a young railroad surveyor. Buchanan delivered his plat to the county court on May 31, 1859.

On Feb. 9, 1861, the day of Rolla's first town council meeting, a county-wide meeting was held to determine whether to join the Confederacy in secession. The consensus at that time was not to take any action until there were further developments. Further developments came in April of that year when Fort Sumter was fired upon, and county residents decided to support the South. The May 10th, Circuit Court session saw a heated debate of secession, which broke up the court. Circuit Court Judge James McBride departed to assume command as a Confederate general under Sterling Price. Outside the courthouse, a group of men drew down the United States Flag and raised a Confederate flag, which had been sewn by the women of Rolla. The group then moved to the newspaper office of Charles Walder, a Union supporter and editor of the Rolla Express, and forced him to close his shop. Southern sympathizers patrolled the town day and night, often ordering Union sympathizers to leave town.

On June 14 of that year, General Franz Sigel arrived by train with his 3rd Missouri Infantry and took over the town. From that day until the close of the war, Rolla was in Union hands. The 13th Illinois Infantry Regiment, under Colonel John B. Wyman, was brought in to guard Rolla and the

Pacific Railroad's terminal. It was this regiment that did the basic planning and building of Fort Wyman, although other regiments undertook the task of finishing it. President Lincoln's personal order was that Rolla should be held at all costs. Being situated at the terminus of the railroad, military wagon trains went out from Rolla to all Union armies stationed southwest in Arkansas, Hartville and Springfield and northwest to the Linn Creek area, now known as the Lake of the Ozarks. After General Price's defeat at Pea Ridge in March 1862, several troops that were organized by Gov. Jackson returned home. Confederate sympathizers, unwilling to profess their loyalty and support to the Union after the battle, were treated harshly. One example is the shooting of former Presiding Justice Lewis F. Wright and four of his sons in 1864, after being taken from their homes for “questioning.”

Other towns within the county include Newburg, incorporated in 188 and St. James, incorporated in 1869. Doolittle was incorporated on July 2, 1944 and named after World War II hero Lieutenant Colonel James Doolittle. Edgar Springs was incorporated in the 1970’s.

2.1.6 Occupations

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

Table 2.9. Occupation Statistics, Phelps 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
Phelps County	7,916	3,804	3,487	1,373	2,535
Doolittle	60	55	53	24	47
Edgar Springs	23	11	7	5	14
Newburg	13	59	41	14	14
Rolla	3,802	1,727	1,473	449	741
St. James	565	480	404	65	405

Source: U.S. Census, 2015-2019 American Community Survey, 5-year Estimates.

2.1.7 Agriculture

Due to the rural nature of the area, agriculture and timber are significant factors in the local economy. According to the 2012 Census of Agriculture, the number of farms in the County was 718 encompassing 157,310 total acres[5]. In addition, the average farm was 219 acres. According to the 2017 Census of Agriculture, Phelps County had risen to 728 farms encompassing 159,530 acres, with an average farm size of 219 acres[6]. Furthermore, there are only approximately 12 farms with 1,000 or more acres in the County. Due to the rugged nature of the region, row crop farming is for the most part limited to the river valleys. In 2017, 24,881 acres of cropland were harvested, with forage (hay, haylage, grass silage, and greenchop) being the top crop in the County. Moreover, 31,286 cattle and calves were raised[7]. The average sale per farm was

[5] 2012 Census of Agriculture, USDA, National Agriculture Statistics Service
[6] Source: 2012 Census of Agriculture – County Data, USDA, National Agriculture Statistics Service
[7] 2012 Census of Agriculture, Missouri Farm Commodity Sales, USDA, National Agriculture Statistics Service

$19,230. Lastly, the total number of hired workers in the County was 373[8] individuals comprising 1.84%[9] of the total workforce.

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

2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area

FEMA's Hazard Mitigation Assistance (HMA) grant program provides funding for mitigation activities which have the potential to reduce disaster losses and protect life and property from future disaster damages[10]. Previous FEMA HMA Grants issued in the planning area can be found in **Table 2.10**.

Table 2.10. FEMA HMA Grants in County from 1993-2019

Project Type	Sub applicant	Award Date	Project Total ($)
200.1 Acquisition of Private Real Property - Riverine	Phelps County	07/09/1993	362,589
200.1 Acquisition of Private Real Property - Riverine	Rolla	04/21/1994	0
91.1: Local Multi-Hazard Mitigation Plan	Missouri University of Science & Technology	09/01/2005	103,932
200.1 Acquisition of Private Real Property - Riverine	Phelps County	01/15/2007	1,370
206.2 Safe Room	Phelps County	05/09/2011	804,984
600.1: Warning Systems	Doolittle	05/09/2011	40,160
600.1: Warning Systems	Phelps County	07/19/2018	16,648
600.1: Warning Systems	Newburg	07/19/2018	17,000
200.1: Acquisition of Private Real Property-Riverine	Phelps County	07/23/2018	572,016
Total			1,918,699

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

[8] http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Missouri/st29_2_007_007.pdf
[9] U.S. Census Bureau, 2015-2019 American Community Survey
[10] https://www.fema.gov/media-library/assets/documents/103279

2.1.9 FEMA Public Assistance (PA) Grants in Planning Area

The purpose of the Public Assistance (PA) Grant Program is to support communities' recovery from major disasters by providing them with grant assistance for debris removal, life-saving emergency protective measures, and restoring public infrastructure. Local governments, states, tribes, territories and certain private nonprofit organizations are eligible to apply. Public Assistance is FEMA's largest grant program. **Table 2.11** below gives information about all Public Assistance Grant for the Planning area. It gives the Declaration number, project type and size, the applicant, and the project total. Total PA grants is $7,559,266.28.

Table 2.11. FEMA PA Grants in Phelps County from 1999-2019

Disaster Declaration	Project Type	Project Size	Applicant	Project Total
1412	ROAD DAMAGE	Small	City of Doolittle	$33,563.90
1412	STATION PUMPS	Small	City of Newburg	$6,186.07
1412	ROAD WASHOUTS	Small	Phelps County	$1,025.75
1412	CULVERT DAMAGE	Small	Phelps County	$2,058.03
1412	REPAIR COUNTY ROADS AND BRIDGES	Large	Phelps County	$66,765.67
1412	ROAD REPAIR	Small	Phelps County	$5,808.00
1412	REPAIR OF CITY STREETS	Small	City of Newburg	$11,856.88
1412	ROAD DAMAGE	Small	Phelps County	$8,953.31
1412	ROAD, DITCH AND CULVERT REPAIR	Small	Phelps County	$3,292.27
1412	ROAD AND CULVERT REPAIR	Small	Phelps County	$23,445.03
1412	LWC AND GRAVEL ROAD REPAIR	Small	Phelps County	$1,332.78
1412	REPAIR COUNTY ROADS, CULVERTS AND DITCHES	Small	Phelps County	$4,400.91
1676	EMERGENCY PROTECTIVE MEASURES	Large	City of Rolla	$65,429.34
1676	PUBLIC UTILITIES	Small	City of St. James	$47,641.10
1676	EMERGENCY PROTECTIVE MEASURES	Small	Rolla Municipal Utilities	$5,856.09
1676	PUBLIC UTILITIES	Large	Rolla Municipal Utilities	$266,184.96
1676	DEBRIS REMOVAL	Small	City of Newburg	$3,920.00
1676	EMERGENCY PROTECTIVE MEASURES	Small	City of Rolla	$1,621.59
1676	DEBRIS REMOVAL	Large	City of Rolla	$160,112.98
1676	PUBLIC UTILITIES	Small	City of Newburg	$1,739.12
1676	DEBRIS REMOVAL	Small	City of Doolittle	$1,700.09
1676	PUBLIC UTILITIES	Small	City of Doolittle	$6,072.53
1676	DEBRIS REMOVAL	Small	City of Rolla	$22,529.45
1676	EMERGENCY PROTECTIVE MEASURES	Small	City of Doolittle	$2,920.12
1676	RECREATIONAL OR OTHER	Small	City of Rolla	$0.00
1676	DONATED RESOURCES	Small	City of Doolittle	$1,267.04
1676	DEBRIS REMOVAL	Small	City of St. James	$54,530.04

Disaster Declaration	Project Type	Project Size	Applicant	Project Total
1676	DEBRIS REMOVAL	Small	City of St. James	$4,715.43
1676	EMERGENCY PROTECTIVE MEASURES	Small	Phelps County Commission Road & Bridge Dept	$27,002.69
1676	DEBRIS REMOVAL	Large	Phelps County Commission Road & Bridge Dept	$68,472.88
1676	DEBRIS REMOVAL	Small	University of Missouri Rolla	$4,829.47
1676	EMERGENCY PROTECTIVE MEASURES	Small	University of Missouri Rolla	$4,477.13
1676	DONATED RESOURCES	Small	St. James Fire Protection District	$810.84
1676	DONATED RESOURCES	Small	Rolla Rural Fire Protection District	$1,425.12
1676	EMERGENCY PROTECTIVE MEASURES	Small	Rolla Rural Fire Protection District	$4,275.37
1676	EMERGENCY PROTECTIVE MEASURES	Small	City of Rolla	$17,945.04
1676	DEBRIS REMOVAL	Small	Phelps County Commission Road & Bridge Dept	$8,340.00
1676	EMERGENCY PROTECTIVE MEASURES	Small	St. James Fire Protection District	$2,432.52
1676	EMERGENCY PROTECTIVE MEASURES - POLICE DEPT	Small	City of Rolla	$5,599.18
1749	EMERGENCY PROTECTIVE MEASURES	Small	Phelps County	$9,032.60
1749	ROAD WASHOUT	Small	Phelps County	$27,586.20
1749	ROAD & BRIDGE DAMAGES	Small	Phelps County	$23,113.03
1749	EMERGENCY PROTECTIVE MEASURES	Small	City of Newburg	$1,515.25
1749	ROAD WASHOUT	Small	Phelps County	$12,057.02
1749	ROAD WASHOUTS	Small	Phelps County	$12,260.54
1749	STREET & ROAD DAMAGES	Small	City of Newburg	$7,722.44
1749	ROAD WASHOUT	Small	City of Newburg	$26,465.06
1749	ROAD WASHOUT	Small	Phelps County	$11,638.39
1749	PEDESTRIAN WALKWAY & LOW WATER CROSSING	Small	City of Newburg	$12,844.13
1749	EQUIPMENT STORAGE BUILDING DAMAGE	Small	City of Newburg	$17,830.00
1749	ROADS & CULVERT WASHOUTS	Small	Phelps County	$17,449.59
1749	ROAD WASHOUT	Small	Phelps County	$13,624.17
1749	ROADS & CULVERT WASHOUTS	Small	Phelps County	$6,569.59
1749	ROAD WASHOUT	Small	Phelps County	$5,244.42

Disaster Declaration	Project Type	Project Size	Applicant	Project Total
1749	ROAD WASHOUT	Small	Phelps County	$8,961.75
1749	ROAD WASHOUT	Small	Phelps County	$10,785.03
1749	ROAD WASHOUT	Small	Phelps County	$8,506.15
1749	ROAD WASHOUT	Small	Phelps County	$29,378.48
1749	ROAD WASHOUT - REVISED 7/23/08	Small	Phelps County	$5,489.87
1847	GWC-001 Roads	Small	Phelps County	$8,219.40
1847	GWC-002 / Loss of road surface/base materials	Small	Phelps County	$47,351.79
1847	GWC-004 / Loss of road surface/base materials	Small	Phelps County	$17,234.41
1847	KDP07 - Staging of Rock	Small	Phelps County	$38,904.40
1847	KDP12-CR 5340	Small	Phelps County	$22,626.94
1847	GWC-005 / Loss of road surface/base materials	Small	Phelps County	$30,986.05
1847	KDP13 / CR 1330, Coolbrook, 6330, 2370, 2080, 6100, 663	Small	Phelps County	$54,826.66
1847	KDP10 - CR 1210 Missouri	Small	Phelps County	$43,838.33
1847	KDP14 - CR8360 and CR3600	Small	Phelps County	$11,848.11
1847	KPGW15/ CR 2170, CR2190, CR 2250, CR 2220, CR2270, CR 2	Small	Phelps County	$14,782.54
1847	KPGW17 / Phelps County roads	Small	Phelps County	$31,890.39
1847	KPGW18 / CR 5190	Small	Phelps County	$21,586.15
1847	KDP08 - CR 6070 and 6080	Small	Phelps County	$33,687.19
1847	KPGW23 / Phelps County Roads	Small	Phelps County	$64,042.08
1847	KPGW20 / Phelps County Roads	Small	Phelps County	$29,236.26
1847	KPGW22 / Phelps County Roads	Small	Phelps County	$14,624.38
1847	KPGW21 / Phelps County Roads	Small	Phelps County	$48,014.97
1847	LMNC-01 - City Gravel and Asphalt Street	Small	City of Newburg	$10,894.59
1847	KPGW16 / Phelps County Roads	Small	Phelps County	$26,278.16
1847	KPGW6 / Phelps County Roads	Small	Phelps County	$38,287.08
1847	KPGW3 - Phelps County roads	Small	Phelps County	$44,924.36
1847	KPGW24 - Phelps County roads	Small	Phelps County	$40,667.93
1847	KPGW09 / CR 6190 Missouri	Large	Phelps County	$73,764.23
1847	KPGW27- Road Washouts	Large	Phelps County	$103,918.68
1847	KPGW26 / Road Washouts	Large	Phelps County	$126,223.80
1847	KPGW28 / Road Washouts	Large	Phelps County	$103,637.01
1847	KPGW25 / Road Washouts - 13 Sites	Large	Phelps County	$89,147.67
1847	KPGW30 - Road Washouts - 20 Sites	Large	Phelps County	$138,019.41
1847	KPGW29 / Road Washouts - 17 Sites	Small	Phelps County	$53,729.47
1847	GWKP-019 / Wash out of road surfaces and sub-base	Small	Phelps County	$55,860.86

Disaster Declaration	Project Type	Project Size	Applicant	Project Total
1847	GWKP011 / Washout, Washover, ditching	Small	Phelps County	$61,030.44
1847	GWDW031 - Phelps County Roads	Large	Phelps County	$140,995.75
4144	PCSD01B-Phelps County Cat B	Small	Phelps County	$3,803.36
4144	CNPW02C Newburg Cat C	Small	City of Newburg	$27,752.39
4144	CNPW01E Newburg Cat E	Small	City of Newburg	$1,604.53
4144	PCRD03C	Large	Phelps County	$93,545.69
4144	PCRD02C	Large	Phelps County	$147,481.89
4144	PCSD05C Roads	Large	Phelps County	$121,558.51
4144	PCSD08C - Phelps Damaged Roads	Large	Phelps County	$100,023.73
4144	PCSD01A - Debris Alternative Project	Small	Phelps County	$11,799.77
4144	PCSD07C- Road Damage	Large	Phelps County	$201,260.42
4144	PCSDO6C Gravel Roads	Large	Phelps County	$209,164.26
4144	PCSD04C	Large	Phelps County	$206,117.53
4144	PCSD09C- Roads	Large	Phelps County	$154,392.35
4144	PCSD10C - Phelps County Roads	Large	Phelps County	$291,631.18
4144	PCSD12C Phelps Culvert 5220	Small	Phelps County	$18,374.65
4144	Phelps County Culvert PCSD11C	Small	Phelps County	$34,471.25
4144	Phelps County Culvert PCSD13C	Small	Phelps County	$6,283.09
4238	AH0005A - PAAP - Debris Removal	Small	Phelps County	$14,137.60
4238	AH0001C Roads	Small	Phelps County	$68,876.45
4238	AH0002C - Gravel Roads	Small	Phelps County	$84,499.98
4238	PRC003C - Gravel Road Washout	Small	Phelps County	$94,911.23
4238	PRC006C - Gravel Roads	Large	Phelps County	$234,897.10
4238	PRC007C Gravel Roads	Large	Phelps County	$184,170.43
4238	PRC008C - Gravel Roads	Small	Phelps County	$53,201.95
4238	AH0004C - CMP and Box Culverts	Small	Phelps County	$53,624.61
4250	161SB38 Roadway Ditch washed out	Small	City of Doolittle	$10,159.20
4250	161SB50A - Debris Removal - PAAP Participate	Small	Phelps County	$10,346.55
4250	161SB60C - Phelps County Culverts	Large	Phelps County	$199,447.16
4250	161SB59C - County Roads	Small	Phelps County	$77,435.64
4250	161SB51C - County Road 1,000's	Large	Phelps County	$224,770.45
4250	161SB52C-County Road 2,000's	Small	Phelps County	$92,264.73
4250	161SB53C - County Roads 3,000's	Large	Phelps County	$121,483.00
4250	161SB57C - County Roads 7,000's	Large	Phelps County	$225,348.19
4250	161SB54C - County Roads 4000	Small	Phelps County	$46,531.43
4250	161SB63C - County Road 7530	Small	Phelps County	$10,422.90
4250	161SB55C - County Roads 5000s	Small	Phelps County	$102,541.63
4250	161SB56C-County Roads 6,000's	Large	Phelps County	$298,185.59
4250	161SB58C-County Road 8,000's	Small	Phelps County	$78,564.46

Disaster Declaration	Project Type	Project Size	Applicant	Project Total
4317	CP01208 - Debris Removal PAAP 1-30 days	Small	Phelps County	$8,393.79
4317	CP01221 - PAAP 31 to 90 days	Small	Phelps County	$1,805.87
4317	CP01409 - Low Water Crossing on CR 1280	Small	Phelps County	$0.00
4317	CP01518 - County Gravel Road Washouts located in Sectio	Small	Phelps County	$9,827.86
4317	CP01654 - County Road Gravel road washouts in Section 3	Small	Phelps County	$30,124.18
4317	ST01835 - Gravel Road Washouts in Sector 1000	Small	Phelps County	$22,445.04
4317	ST01779 - County Gravel Road Washouts located in Sectio	Small	Phelps County	$28,873.79
4317	ST02117 - Retaining Wall	Small	City of Newburg	$4,483.26
4317	ST02036 - Gravel Roads and Embankment Washouts	Large	Phelps County	$99,695.85
4317	CP02058 - County Gravel Road Washouts in Sector 4000	Small	Phelps County	$17,116.52
4317	ST02142 - Gravel Road and Ditch Repair	Small	Phelps County	$19,699.48
4317	CP02153 - Gravel Road CR 9000	Small	Phelps County	$10,480.34
4317	ST02139 - Gravel and Asphault Road Washouts	Small	City of Edgar Springs	$36,644.90
4317	CP02155 - Gravel Road and Shoulder Material Loss	Small	Phelps County	$74,802.53
4317	CP02014 - County Road Gravel road washouts in sections	Small	Phelps County	$10,630.67
4317	ST02168 - Gravel Road Washouts Sector 7000	Large	Phelps County	$121,758.68
4317	CP02171 - Gravel Road Washouts in Sector 7000	Small	Phelps County	$23,957.74
4317	ST02167 - Gravel Road Washouts in Sector 6000	Large	Phelps County	$255,644.36
4317	ST02107 - Building and Equipment Damage	Small	City of Edgar Springs	$13,345.61
4317	ST02228 - Damaged Culverts, Low Water Crossings and Gra	Small	City of Newburg	$24,759.01
			Total	**$7,599,266.28**

Source: Federal Emergency Management Agency, 11/30/2020

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 Phelps County

Overview

The jurisdiction of Phelps County includes all unincorporated areas within the county boundaries. Phelps 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.

Phelps 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. Other county officials include a part-time Emergency Management Director, 911 Director, County Health Department Director, Floodplain Administrator, and Road and Bridge Supervisors. The Assessor's office has GIS capabilities.

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. Phelps County has staff resources emergency management and transportation. The county has a 9-1-1 central dispatch center with enhanced 9-1-1 capabilities. Additionally, there is one outdoor warning siren in the county near Jerome.

There are six fire departments located in Phelps County. Five are volunteer departments. Those departments include Doolittle Rural Fire Protection District, Duke Rural Fire Department, Edgar Springs Fire Protection District, Rolla Rural Fire Protection District and St. James Fire Protection District. Rolla Fire & Rescue is a municipal fire department with paid staff. Doolittle, Edgar Springs, Rolla Rural and St. James fire districts are tax supported. Duke and Rolla Fire & Rescue are dues supported. The county is served by the Phelps County Sheriff's Department. The county has a 9-1-1 Central Dispatch Center located at the Rolla City Police Department, 1007 N. Elm Street, Rolla, MO. The county is served by two ambulance districts – Phelps County Ambulance Service and St. James Ambulance District. The county uses Everbridge call notification system to provide alerts to residents. The county owns two fixed generators that serve the County Jail and health department refrigeration backup.

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, impact fees for new development, incur debt through general obligation bonds, incur debt through special tax bonds, and withhold spending in hazard prone areas.

Existing Plans and Policies

The county has a Comprehensive Plan, County Emergency Operations Plan, County Recovery Plan, Economic Development Plan, Regional Transportation Plan, Flood Mitigation Assistance Plan, Critical Facilities Plan, and Floodplain Ordinance. 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, Tri-County Center for Independent Learning, and the 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. Bicycle and car seat safety education is provided by the Coalition for Roadway Safety.

The county also participates in the flood buyout program.

Table 2.12. Demographic and Structure Risk Parameters For Unincorporated Phelps County

Jurisdiction	Total Population	People With a Disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Unincorporated Phelps County	19,055	3,732	742	2,482	876	3,670	709	1,480

Source: Source: U.S. Census Bureau, 2015-2019 5-Years American Community Survey

Table 2.13. Unincorporated Phelps County Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	Yes
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	Yes
City Mitigation Plan	No
County Mitigation Plan	Yes
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018

Capabilities	Status Including Date of Document or Policy
Transportation Plan	Yes – Regional 2019
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	Yes
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	Yes
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes – 3/17/2016
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	Yes
FireWise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	Varies
Economic Development Program	MRPC & Rolla Regional Economic Commission
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	Yes
Engineer	Yes – Contract Only

Capabilities	Status Including Date of Document or Policy
Development Planner	No
Public Works Official	No
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	Yes
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – Regional – MREPC
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	Yes
Economic Development Department	No
Housing Department	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes – MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	Yes
Veterans Groups	Yes
Environmental Organization	Yes
Homeowner Associations	Yes
Neighborhood Associations	Yes
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
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	Yes
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	Yes – Flood Zone

Source: Data Collection Questionnaire, 2020

2.2.2 City of Doolittle

Overview

Doolittle is located in the west central portion of Phelps County. Doolittle is located on U.S. Interstate I-44. Doolittle is a fourth class city with a six-member board of alderman and a mayor. The city also employs a city clerk, city attorney, police chief, and a city superintendent. The city population from the 2019 5-year ACS data is 670, in 2010 it was 621, which shows a population growth of almost eight percent.

Technical and Fiscal Resources

Doolittle is a participating community in the National Flood Insurance Program and has a Flood Insurance Study. The City of Doolittle has a police department located in the city hall. The Central Communications Center, located in and operated by the Rolla Police Department, is contracted by Phelps County to provide 911 dispatching throughout the county. The office is staffed 24 hours a day. There are two outdoor warning sirens in Doolittle that are activated by the Center in Rolla.

The Phelps County Ambulance Service accommodates the western two-thirds of the county, including the City of Doolittle. There is also a Rural Fire Protection District located in Doolittle, which serves a portion of Phelps County including the Newburg School District. The Duke Rural Fire Department in Pulaski County serves the Doolittle portions of Highways J & K.

Public education programs are provided locally by the fire protection district and regionally by the Coalition for Roadway Safety and Phelps-Maries County Health Department. There is also a community page on Facebook for public sharing of emergency information for Doolittle, Newburg, and Jerome.

Over 23 percent of housing units in Doolittle are mobile homes, this is the highest percentage of mobile homes in the county. A greater percent of mobile homes increases the city's risk to damages from several hazards.

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

Table 2.14. Demographic and Structure Risk Parameters For Doolittle

Jurisdiction	Total Population	With a disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Doolittle	670	129	10	101	46	120	49	70

Source: Source: U.S. Census Bureau, 2015-2019 5-Years American Community Survey

Table 2.15. City of Doolittle 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 – 2006
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	No
County Mitigation Plan	Yes – 2016
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018

Capabilities	Status Including Date of Document or Policy
Transportation Plan	Yes – regional updated annually
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	No
Building Code	No
Floodplain Ordinance	Yes – 2/20/08
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
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)	No
ISO Fire Rating	9
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No

Capabilities	Status Including Date of Document or Policy
Development Planner	No
Public Works Official	Yes – Sewer
Emergency Management Director	No
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – 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	Yes – MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	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	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, 2020

2.2.3 City of Edgar Springs

Overview

Edgar Springs is located in the southern portion of Phelps County. State highways 63 and 28 intersect the City of Edgar Springs. Edgar Springs 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, City Superintendent. The city population from the 2019 5-year ACS data is 181, in 2010 it was 313, which shows a population decline of over 42 percent.

Technical and Fiscal Resources

Edgar Springs currently participates in the National Flood Insurance Program. The Central Communications Center, located in and operated by the Rolla Police Department, is contracted by Phelps County to provide 911 dispatching throughout the county. The office is staffed 24 hours a day. The Phelps County Ambulance Service accommodates the western, two-thirds of the county, including the City of Edgar Springs. The city has one outdoor warning siren that is activated by the Center in Rolla. There is one FEMA approved tornado shelter at the Phelps County R-III School district that is available to the public.

The Phelps County Ambulance Service accommodates the western two-thirds of the county, including the City of Edgar Springs. Law enforcement in the community is provided by three police officers stationed at City Hall. The Edgar Springs Rural Fire Protection District provides fire protection.

Public education programs are provided regionally by the Coalition for Roadway Safety and Phelps-Maries County Health Department.

The City of Edgar Springs has the highest percent of the population under the age of 5, with almost ten percent.

Table 2.16 below shows the demographic and structure statistics, and **Table 2.17** describes the mitigation capabilities of the city.

Table 2.16. Demographic and Structure Risk Parameters For Edgar Springs

Jurisdiction	Total Population	With a disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Edgar Springs	181	56	4	57	18	26	23	14

Source: Source: U.S. Census Bureau, 2015-2019 5-Years American Community Survey

Table 2.17. City of Edgar Springs 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 – 2016
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018
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	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	No
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Director	Yes

Capabilities	Status Including Date of Document or Policy
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – 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	Yes – MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	No
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	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, 2020

2.2.4 City of Newburg

Overview

Newburg is located in the west central portion of Phelps County. Newburg is located on Highway T, south of U.S. Interstate I-44. Newburg is a fourth class city with a four member board of aldermen and a mayor. The city employs a city clerk, attorney, police judge, police chief, and water/sewer superintendent. The city population from the 2019 5-year ACS data is 479, in 2010 it was 528, which shows a population decline of over nine percent.

Technical and Fiscal Resources

Newburg is a participating community in the National Flood Insurance Program. The city has a Flood Insurance Study and maintains certificates of elevation. The city has a floodplain ordinance that is maintained by the city's emergency management director. The City of Newburg has a

police department located in the city hall. The Central Communications Center, located in and operated by the Rolla Police Department, is contracted by Phelps County to provide 911 dispatching throughout the county. The office is staffed 24 hours a day. There are two outdoor warning sirens in Newburg that are activated by the Center in Rolla.

The Phelps County Ambulance Service accommodates the western two-thirds of the county, including the City of Newburg. There is also a Rural Fire Protection District located in Doolittle, which serves a portion of Phelps County including the Newburg School District.

Public education programs are provided locally by the fire protection district and regionally by the Coalition for Roadway Safety and Phelps-Maries County Health Department. There is also a community page on Facebook for public sharing of emergency information for Doolittle, Newburg, and Jerome.

Newburg has the highest percent of population over 65 (24.6 percent), houses built prior to 1939 (43.1 percent), population with a disability (35.3 percent), and families living below the poverty line (37.8 percent). A greater percent of pre-1939 homes increases the city's risk to damages from several hazards and a large percent of vulnerable populations increases the risk of injury or death due to hazards.

Table 2.18 below shows the demographic and structure statistics, and **Table 2.19** describes the mitigation capabilities of the city.

Table 2.18. Demographic and Structure Risk Parameters For Newburg

Jurisdiction	Total Population	With a Disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Newburg	479	170	0	178	18	118	132	12

Source: Source: U.S. Census Bureau, 2018 5-Year American Community Survey

Table 2.19. City of Newburg 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, 2006
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	No
County Mitigation Plan	Yes – 2016
Debris Management Plan	Yes
Economic Development Plan	Yes – Regional CEDS 2018
Transportation Plan	Yes – regional 2019
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	Yes – ICC
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
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)	No
ISO Fire Rating	8
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	Yes
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	Yes – Contractor
Development Planner	No
Public Works Official	Yes

Capabilities	Status Including Date of Document or Policy
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes - MREPC
County Emergency Management Commission	No
Sanitation Department	Yes
Transportation Department	No
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	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	No
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	No
Authority to levy taxes for a specific purpose	No
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, 2020

2.2.5 City of Rolla

Overview

Rolla is centrally located on the Interstate 44 corridor, and serves as the seat of Phelps County. Rolla is a third class city with a twelve-member city council and a mayor. The city employs a full-time city administrator, city clerk, community development director, prosecutor, chief of police, fire chief, public works director, municipal utilities manager, parks and recreation director, municipal judge, director of environmental services, and an Emergency Management Director. The city population from the 2019 5-year ACS data is 20,169, in 2010 it was 19,141, which shows a population growth of over five percent.

Technical and Fiscal Resources

Rolla participates in the National Flood Insurance Program. Rolla has a Flood Insurance Plan and maintains certificates of elevation. The city has a floodplain ordinance #3500, Chapter 15 Article 6. The Central Communications Center, located in and operated by the Rolla Police Department, is contracted by Phelps County to provide 9-1-1 dispatching throughout the county. The office is staffed 24 hours a day. The Phelps County Ambulance Service accommodates the western, two-thirds of the county, including the City of Rolla. Rolla receives fire protection services from both the City of Rolla Fire & Rescue and Rolla Rural Fire Protection Association. In addition, the Missouri State Highway Patrol Troop I Headquarters is located in the city of Rolla.

The city has ten severe weather sirens that are activated by the central dispatch center with coordination from the city fire chief. In addition to being served by Phelps County 9-1-1, the city has dispatch capability through the city police dispatch. Additional warning is provided through the mass notification system (Everbridge), as well as RAVE Missouri S&T notification system, and radio/television public address system.

The City of Rolla has 17 fixed location 2NW generators for critical infrastructure throughout the city, including City Hall, Rolla Municipal Utilities (two locations), The Centre, Fire Station 1 @ 2, Rolla Police Department, and Cedar Street Baptist Church which serves as a shelter.

Rolla's Community Development Department administers and enforces all building codes, 2000 ICC codes, fire codes, housing codes, BOCA codes, plumbing codes, mechanical codes and the National Electric Code. The city has ICC certified inspectors on staff, including the city building official, city zoning inspector and the city administrator. All residential and non-residential construction – both new and renovations – require a building permit and inspections by the city.

The fire department provides a number of education/outreach programs in the community and school district, including flood awareness and safety, hazardous weather awareness and preparedness, Fire Safety Week, and home smoke detectors. The city also provides environmental (solid waste) education in the school district as well as civic groups and community meetings. Rolla Public Works and Rolla Municipal Utilities provides education regarding water and electric conservation and the MS4 program and storm water management.

There is an annual Kid's Safety Day in Rolla that includes car seat and seat belt safety, fire preparedness, and other safety for families. In addition, public education programs are provided regionally by the Coalition for Roadway Safety and Phelps-Maries County Health Department. There a public Facebook pages for City of Rolla Missouri City Hall, City of Rolla Environmental Services, Rolla Police Department, City of Rolla Fire & Rescue, and Rolla Municipal Utilities.

Mitigation Actions

In 2004, a bond was passed to improve and build new storm water detention ponds and box culverts throughout the city. This action helped removed approximately 200 homes from the floodplain.

Rolla Municipal Utilities provides secondary power to Phelps Health (hospital) and provides a proactive tree trimming policy to prevent power failures during wind/ice storms.

The City of Rolla has the highest percentage of non-English speaking population. In addition, the

city has vulnerable populations at B.W. Robinson State School, Choices for people, Phelps Health (hospital), six nursing homes, Rolla Towers Apartments, and Rolla Apartments McCutchen.

Table 2.20 below shows the demographic and structure statistics, and **Table 2.21** describes the mitigation capabilities of the city.

Table 2.20. Demographic and Structure Risk Parameters For Rolla

Jurisdiction	Total Population	With a Disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Rolla	20,169	2,716	1,984	5,021	1,274	2,369	341	228

Source: Source: U.S. Census Bureau, 2018 5-Years American Community Survey

Table 2.21. City of Rolla Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	Yes – January 17, 2006
Builder's Plan	No
Capital Improvement Plan	Yes – August 2019
City Emergency Operations Plan	Yes – December 2019
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	Yes – 2015
County Mitigation Plan	Yes – 2016
Debris Management Plan	No
Economic Development Plan	Yes – regional CEDS 2018, RREC 2005
Transportation Plan	Yes – regional 2019
Land-use Plan	Yes – January 17, 2006
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	Yes – March 2019
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes – Ordinance #3799
Building Code	Yes, IBC 2018
Floodplain Ordinance	Yes – 2008
Subdivision Ordinance	Yes – Ordinance #3799
Tree Trimming Ordinance	Yes – Ordinance #4490
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes – 2008
Drainage Ordinance	Yes – 2008
Site Plan Review Requirements	Yes – Limited
Historic Preservation Ordinance	Yes – Ordinance #3799
Landscape Ordinance	Yes
Program	
Zoning/Land Use Restrictions	Yes

Capabilities	Status Including Date of Document or Policy
Codes Building Site/Design	Yes
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	Yes
Firewise Community Certification	Yes
Building Code Effectiveness Grading (BCEGs)	Yes – 4
ISO Fire Rating	2
Economic Development Program	Yes – Rolla Regional Economic Commission
Land Use Program	Yes
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	Yes – March 2019
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	Yes
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	Yes
Land Use Map	Yes
Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	Yes
Engineer	Yes
Development Planner	Yes
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	Yes – Arson Team
Emergency Response Team	Yes
Hazardous Materials Expert	Yes
Local Emergency Planning Committee	Yes – MREPC
County Emergency Management Commission	No
Sanitation Department	Yes
Transportation Department	Yes – Rolla Public Works
Economic Development Department	No – Contract – Rolla Economic Development Commission
Housing Department	Yes – Rolla Public Housing Authority
Regional Planning Agencies	Yes - MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Environmental Organization	Yes

Capabilities	Status Including Date of Document or Policy
Homeowner Associations	Yes
Neighborhood Associations	Yes
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
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	Yes

Source: Data Collection Questionnaire, 2020

2.2.6 City of St. James

Overview

Saint James is located in the eastern portion of Phelps County on U.S. Interstate I-44. St. James is a third class city with an eight member city council and a mayor. The city also employs a city clerk, city attorney, police chief, fire chief/EMD, utilities superintendent, street supervisor, police chief, judge, parks and recreation director, tourist information director, and community development director. The city population from the 2019 5-year ACS data is 4,076, in 2010 it was 4,169, which shows a population decline of two percent.

Technical and Fiscal Resources

St. James participates in the National Flood Insurance Program. Law enforcement in the community is provided by a police department. The Central Communications Center, located in and operated by the Rolla Police Department, is contracted by Phelps County to provide 9-1-1 dispatching throughout the county. The office is staffed 24 hours a day. The city has three warning sirens which are controlled by the St. James Fire Department. In addition, Everbridge notification system is used as well as a city Facebook page.

The St. James Ambulance District serves St. James and the eastern one-third portion of Phelps County. The city is also responsible for the St. James Fire Protection District. The fire station serves as the city EOC with the Tourist Center and Middle School serving as backup locations. The City of St. James has three portable generators and one fixed generator.

The city has a floodplain ordinance #631, adopted in 2000 and amended #903 in 2008. St. James has building codes that were adopted in 1975 as well as ICC codes, National Electric Codes. St. James also has a zoning ordinance, site plan review requirements, and stormwater management

ordinance #612 adopted in November 1999. Building permits, codes and ordinances are enforced by the city's code administrator.

Fliers regarding electric and natural gas safety are mailed to residents with utility bills annually and are also made available to the public at the Tourist Center. The Natural Gas Department also offers trainings upon request to local groups. The St. James Police Department provides DARE education and is heavily involved with the St. James Coalition. The coalition is responsible for the creation and distribution of educational fliers for all ages to be distributed through schools and community events. In 2019 the St. James Senior Center began a health fair geared towards aging residents.

Additional public education programs are provided regionally by the Coalition for Roadway Safety and Phelps-Maries County Health Department.

Mitigation Actions

The city is in the process of constructing a 10" watermain to connect the Parker Lane Water Tower and Well to the Football Field Tower and Well. In addition, the city is continuing to replace aged electric infrastructure, implementing a policy of underground secondary electric for new construction. The city also has an active tree trimming program in order to reduce damages and power outages due to hazardous weather events.

While not the highest rate in the county, the city does have a significant population over the age of 65 (18 percent) and The Missouri Veterans Home.

Table 2.22 below shows the demographic and structure statistics, and **Table 2.23** describes the mitigation capabilities of the city.

Table 2.22. Demographic and Structure Risk Parameters For St. James

Jurisdiction	Total Population	With a Disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
St. James	4,076	650	102	730	286	736	180	10

Source: Source: U.S. Census Bureau, 2015-2019 5-Year American Community Survey

Table 2.23. City of St. James Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	Yes – 2012
Builder's Plan	No
Capital Improvement Plan	Yes – 2019
City Emergency Operations Plan	No – Under Development
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	No

Capabilities	Status Including Date of Document or Policy
County Mitigation Plan	Yes – 2016
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018
Transportation Plan	Yes – regional 2019
Land-use Plan	Yes – 2012
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No – Under Development
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes - ICC 2015, Ordinance #19-1147
Floodplain Ordinance	Yes – 2015, Ordinance #19-1139
Subdivision Ordinance	Yes
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	Yes
Landscape Ordinance	Yes
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	Yes
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	Yes
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	6
Economic Development Program	Yes
Land Use Program	Yes
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	Yes
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2016) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	Yes
Staff/Department	

Capabilities	Status Including Date of Document or Policy
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	Yes
Engineer	No
Development Planner	Yes
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – MREPC
County Emergency Management Commission	No
Sanitation Department	Yes
Transportation Department	No
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	No
Salvation Army	No
Veterans Groups	Yes
Environmental Organization	Yes
Homeowner Associations	Yes
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
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	Yes

Source: Data Collection Questionnaire, 2020

Table 2.24 summarizes the mitigation capabilities of Phelps County and its jurisdictions.

Table 2.24. Mitigation Capabilities Summary Table

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
Planning Capabilities						
Comprehensive Plan	Yes	No	No	No	Yes – 1/7/2006	Yes – 2012

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
Builder's Plan	No	No	No	No	No	No
Capital Improvement Plan	No	No	No	No	Yes – 2019	Yes – 2019
City Emergency Operations Plan	No	No	No	No	Yes-2019	No
County Emergency Operations Plan	Yes - 2006	Yes - 2006	Yes - 2006	Yes - 2006	Yes – 2006	Yes - 2006
Local Recovery Plan	No	No	No	No	No	No
County Recovery Plan	Yes	No	No	No	No	No
City Mitigation Plan	n/a	No	No	No	Yes	No
County Mitigation Plan	Yes – 2016	Yes – 2016	Yes – 2016	Yes – 2016	Yes – 2016	Yes – 2016
Debris Management Plan	No	No	No	Yes	No	No
Economic Development Plan	Yes – CEDS 2018	Yes – CEDS 2018	Yes – CEDS 2018	Yes – CEDS 2018	Yes – RECC 2005, CEDS 2018	Yes- CEDS 2018
Transportation Plan	Yes – Regional 2019	Yes – Regional 2019	Yes – Regional 2019	Yes – Regional 2019	Yes – Regional 2019	Yes – Regional 2019
Land-use Plan	No	No	No	No	Yes – 1/17/2006	Yes - 2012
Flood Mitigation Assistance (FMA) Plan	Yes	No	No	No	No	No
Watershed Plan	No	No	No	No	Yes - 2019	No
Firewise or other fire mitigation plan	No	No	No	No	No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	Yes	No	No	No	No	No
Policies/Ordinances						
Zoning Ordinance	No	No	No	No	Yes	Yes
Building Code	No	No	No	Yes – ICC	Yes-IBC 2018	Yes – ICC 2015

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
Floodplain Ordinance	Yes – 3/17/2016	Yes – 2/20/2008	Yes	Yes	Yes-2008	Yes – 2018
Subdivision Ordinance	No	No	No	No	Yes	Yes
Tree Trimming Ordinance	No	No	No	No	Yes	Yes
Nuisance Ordinance	No	Yes	No	Yes	Yes	Yes
Storm Water Ordinance	No	No	No	No	Yes – 2008	Yes
Drainage Ordinance	No	No	No	No	Yes – 2008	Yes
Site Plan Review Requirements	No	No	No	No	Yes	Yes
Historic Preservation Ordinance	No	No	No	No	Yes	Yes
Landscape Ordinance	No	No	No	No	Yes	Yes
Program						
Zoning/Land Use Restrictions	No	No	No	No	Yes	Yes
Codes Building Site/Design	No	No	No	No	Yes	Yes
Hazard Awareness Program	No	No	No	No	N/A	Yes
National Flood Insurance Program	Yes	Yes	Yes	Yes	Yes	Yes
NFIP Community Rating System (CRS) Participating Community	No	No	No	No	No	No
National Weather Service (NWS) Storm Ready	Yes	No	No	No	Yes	Yes
Firewise Community Certification	No	No	No	No	Yes	No
Building Code Effectiveness Grading (BCEGs)	No	No	No	No	Yes – 4	No
ISO Fire Rating	Varies	9	No	8	2	6

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
Economic Development Program	Yes	No	No	No	Yes	Yes
Land Use Program	No	No	No	No	Yes	Yes
Public Education/Awareness	No	No	No	No	Yes	Yes
Property Acquisition	No	No	No	No	No	No
Planning/Zoning Boards	No	No	No	No	Yes	Yes
Stream Maintenance Program	No	No	No	No	Yes – 2019	Yes
Tree Trimming Program	No	Yes	No	No	Yes	Yes
Engineering Studies for Streams (Local/County/Regional)	No	No	No	No	Yes	No
Mutual Aid Agreements	Yes	Yes	Yes	Yes	Yes	Yes
Studies/Reports/Maps						
Hazard Analysis/Risk Assessment (City)	No	No	No	No	No	No
Hazard Analysis/Risk Assessment (County)	Yes – 2016, 2020	Yes – 2016, 2020	Yes – 2016, 2020	Yes – 2016, 2020	Yes – 2016, 2020	Yes – 2016, 2020
Evacuation Route Map	Yes	No	Yes	No	No	No
Critical Facilities Inventory	Yes – 2016, 2020	Yes – 2016, 2020	Yes – 2016, 2020	Yes – 2016, 2020	Yes – 2016, 2020	Yes – 2016, 2020
Vulnerable Population Inventory	No	No	No	No	Yes	No
Land Use Map	No	No	No	No	Yes	Yes
Staff/Department						
Building Code Official	No	No	No	Yes	Yes	Yes
Building Inspector	No	No	No	No	Yes	Yes

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
Mapping Specialist (GIS)	Yes	No	No	No	Yes	Yes
Engineer	Yes	No	No	No	Yes	No
Development Planner	No	No	No	No	Yes	Yes
Public Works Official	No	Yes - Sewer	No	Yes	Yes	Yes
Emergency Management Director	Yes	No	Yes	Yes	Yes	Yes
NFIP Floodplain Administrator	Yes	Yes	Yes	Yes	Yes	Yes
Bomb and/or Arson Squad	No	No	No	No	Yes	No
Emergency Response Team	Yes	No	No	No	Yes	No
Hazardous Materials Expert	No	No	No	No	Yes	No
Local Emergency Planning Committee	Yes - MREPC	Yes - MREPC	Yes - MREPC	Yes - MREPC	Yes - MREPC	Yes - MREPC
County Emergency Management Commission	No	No	No	No	No	No
Sanitation Department	No	No	No	Yes	Yes	Yes
Transportation Department	Yes	No	No	No	Yes	No
Economic Development Department	No	No	No	No	No	No
Housing Department	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA	Yes – Rolla PHA	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC	Yes - MRPC	Yes - MRPC	Yes - MRPC	Yes - MRPC	Yes - MRPC
Historic Preservation	No	No	No	No	No	No
Non-Governmental Organizations (NGOs)						
American Red Cross	No	No	No	No	Yes	No
Salvation Army	Yes	No	No	No	Yes	No
Veterans Groups	Yes	No	No	No	Yes	Yes
Environmental Organization	Yes	No	No	No	Yes	Yes

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
Homeowner Associations	Yes	No	No	No	Yes	Yes
Neighborhood Associations	Yes	No	No	No	Yes	No
Chamber of Commerce	Yes	No	No	No	Yes	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes – Lions Club	No	No	Yes	Yes
Financial Resources						
Ability to apply for Community Development Block Grants	Yes	Yes	Yes	Yes	Yes	Yes
Ability to fund projects through Capital Improvements funding	Yes	Yes	Yes	No	Yes	Yes
Authority to levy taxes for a specific purpose	Yes	Yes	Yes	No	Yes	Yes
Fees for water, sewer, gas, or electric services	No	Yes	Yes	Yes	Yes	Yes
Impact fees for new development	Yes	No	No	No	Yes	Yes
Ability to incur debt through general obligation bonds	Yes	Yes	Yes	Yes	Yes	Yes
Ability to incur debt through special tax bonds	Yes	Yes	Yes	Yes	Yes	Yes
Ability to incur debt through private activities	No	No	No	No	No	No
Ability to withhold spending in hazard prone areas	Yes	No	No	No	Yes	Yes

Source: Data Collection Questionnaires, 2020

2.2.7 Public School District Profiles and Mitigation Capabilities

The following school districts are participating jurisdictions in this plan: St. James R-I School District, Newburg R-II School District, Phelps County R-III School District and Rolla 31 School District. As public institutions responsible for the care and education of the county's children, these school districts share an interest with Phelps 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

All school districts (with the exception of Phelps County R-III) have NOAA all hazard radios on site to provide early warning of hazard events. Phelps County R-III is in the process of ordering new NOAA all hazard radios and in the meantime relies on local radio broadcasts and cell phone alerts. In addition, each school district has fire alarms and intercom systems capable of providing specific instructions in the event of an emergency. St. James R-I and Rolla 31 School Districts operate an automated phone and text message system capable of contacting all parents in the event of an emergency.

Existing Plans and Policies

All four school districts have an emergency management plan and weapons policy.

Other Mitigation Activities

All schools participating in the plan conduct regular fire, earthquake, tornado drills, and lock-down security training at varying frequencies from quarterly to once an academic year. Phelps County R-III is the only school district that has a designated safe area for tornados that meets FEMA standards.

New Construction

St. James R-I School District is currently finishing a large renovation project to the high school. A secondary gym was converted to an auditorium. A practice gym was added on to an open courtyard. The old part of the school was gutted, renovated, and brought up to accessibility and safety standards. During construction a structural issue was found in the existing building's roof, that was added on to the current project. The school district also completed the construction of a preschool addition to the elementary school which was completed prior to the start of the 2020-2021 school year.

Newburg R-II School District is planning updates to the roof of the vo-ag building, as well as lighting heat and air, all of which are in a hazard area.

Phelps County R-III School District does not anticipate a new building or major renovation project in the near future.

Since the last Hazard Mitigation Plan the Rolla 31 school district completed construction of a new cafeteria enlargement, new science wing, new wrestling room, new office area and classrooms at the Rolla High School. A new cafeteria and classrooms were also constructed at the Junior High

building.

In the next five years the district anticipates construction at three buildings. Rolla High School anticipates a new gymnasium, renovations to the old gymnasium, a new band and choir room and includes a safe room. The Junior High building anticipates a new band and choir room including a safe room. Truman Elementary anticipates construction of a new library and office space with a safe room included. None of the Rolla 31 buildings are in hazard areas.

Table 2.25. School District Buildings and Enrollment Data, 2020

District Name	Building Name	Enrollment
St. James R-I		
	Lucy Wortham James Elementary	795
	St. James Middle School	459
	St. James High School	609
Newburg R-II		
	Newburg Elementary	205
	Newburg High School	198
Phelps County R-III		
	Phelps County Elementary	170
Rolla 31		
	Col. John B. Wyman Elem.	525
	Harry S Truman Elem.	422
	Mark Twain Elem.	455
	Rolla Middle	948
	Rolla Jr. High	600
	Rolla Sr. High	1242
	Rolla Technical Center	0
	Rolla Technical Institute	0

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

Figure 2.6. Phelps County School Districts

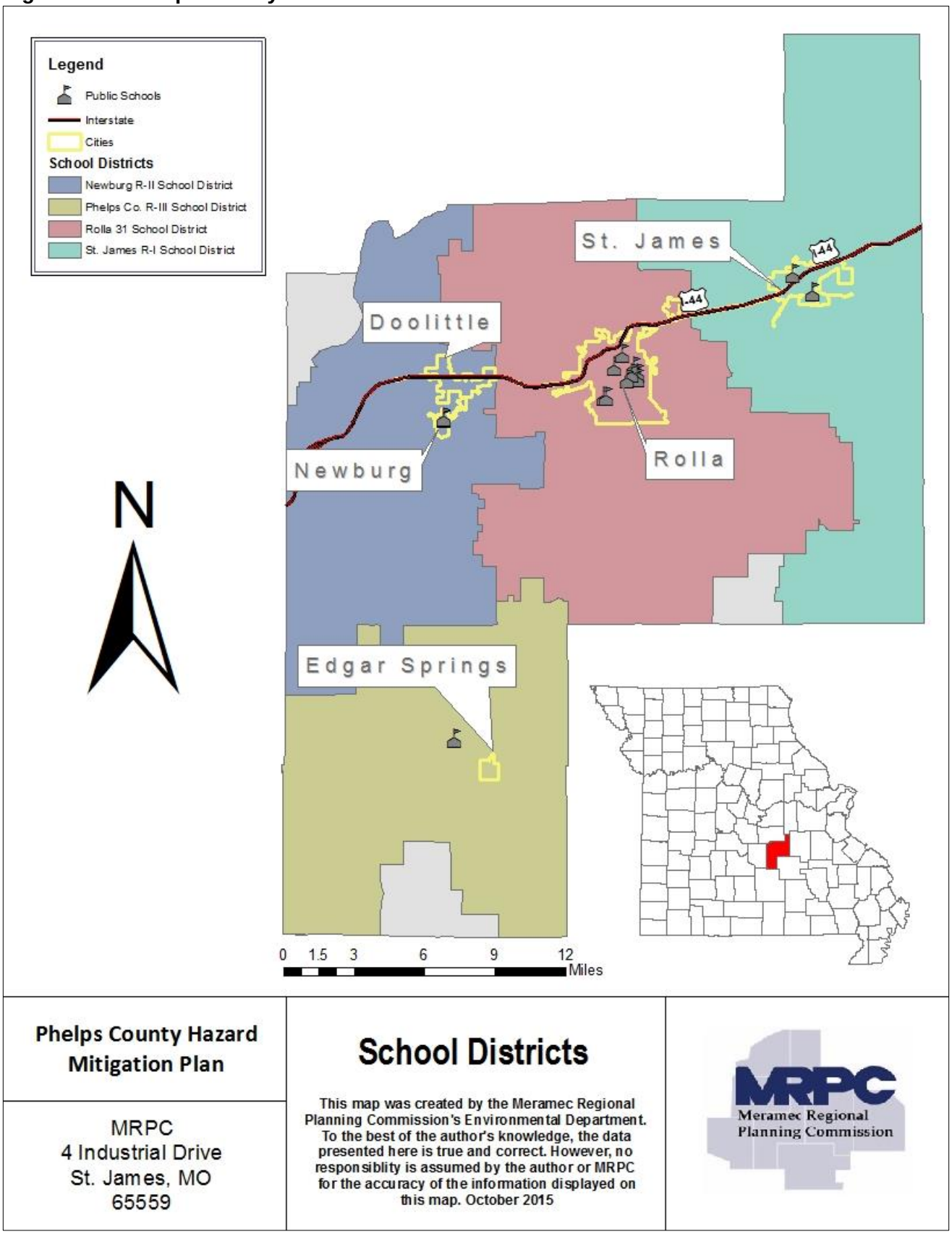


Table 2.26. Summary of Mitigation Capabilities for School Districts

Capability	St. James R-I	Newburg R-II	Phelps County R-III	Rolla 31
Planning Elements				
Master Plan/Date	Yes – 10/4/2019	Yes – 2014	Yes – 2017	Yes – 2017
Capital Improvement	Yes – 12/15/2020	No	Yes – 2017	Yes – 2017
School Emergency Plan/Date	Yes – 10/4/2020	Yes	Yes – 2015	Yes – 2020
Weapons Policy/Date	Yes – 8/16/2018	Yes – 5/31/2013	Yes – 2019	Yes – 2020
Personnel Resources				
Full-Time Building Official (Principal)	Yes	Yes	Yes	Yes
Emergency Manager	No	Yes	Yes	No
Grant Writer	No	Yes	No	No
Public Information Officer	No	Yes	No	No
Financial Resources				
Capital Improvements Project Funding	Yes	Yes	No	Yes
Local Funds	Yes	Yes	Yes	Yes
General Obligation	No	No	No	Yes
Special Tax Bonds	No	No	No	No
Private Activities/Donations	Yes	No	Yes	Yes
State and Federal Funds/Grants	Yes	Yes	No	Yes
Other				
Privately or Self-Insured?	MUSIC School Consortium Insurance	Privately	MUSIC	MUSIC
Fire Evacuation Training	Quarterly	2x per year minimum	2x per year	Annually
Tornado Sheltering Exercises	Annually	1x per year minimum	Annually	Annually
Public Address/Emergency Alert System	VOIP Intercom System	Intercom System	Phones with Speaker System	PA System, Phone and Text Message System for Parents
NOAA Weather Radios	Yes	Yes	No	Yes

Lock-Down Security Training	Annually	1x per year minimum	Annually	Annually
Mitigation Programs	No	No	No	No
Tornado Shelter/Safe-room	No	No – not FEMA certified	Yes – FEMA Tornado Shelter	No
Campus Police	2 Rotating School Resource Officers	No – use Phelps Co, City of Doolittle	School Resource Officer	3 School Resource Officers

Source: Data Collection Questionnaires, 2020

There are numerous post-secondary schools in Phelps County. These campuses and their locations are shown in Error! Reference source not found..

Table 2.28 Phelps 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 Degrees
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
Columbia College	Hwy 63 N. Rolla, MO 65401	Main campus in Columbia, MO Associate and Bachelor degrees

3 RISK ASSESSMENT

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

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

This chapter is divided into four main parts:

- **Section 3.1 Hazard Identification** identifies the hazards that threaten the planning area and provides a factual basis for elimination of hazards from further consideration;
- **Section 3.2 Assets at Risk** provides the planning area's total exposure to natural hazards, considering critical facilities and other community assets at risk;
- **Section 3.3 Land Use and Development** discusses 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 Phelps 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 Phelps County Hazard Mitigation Plan:

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

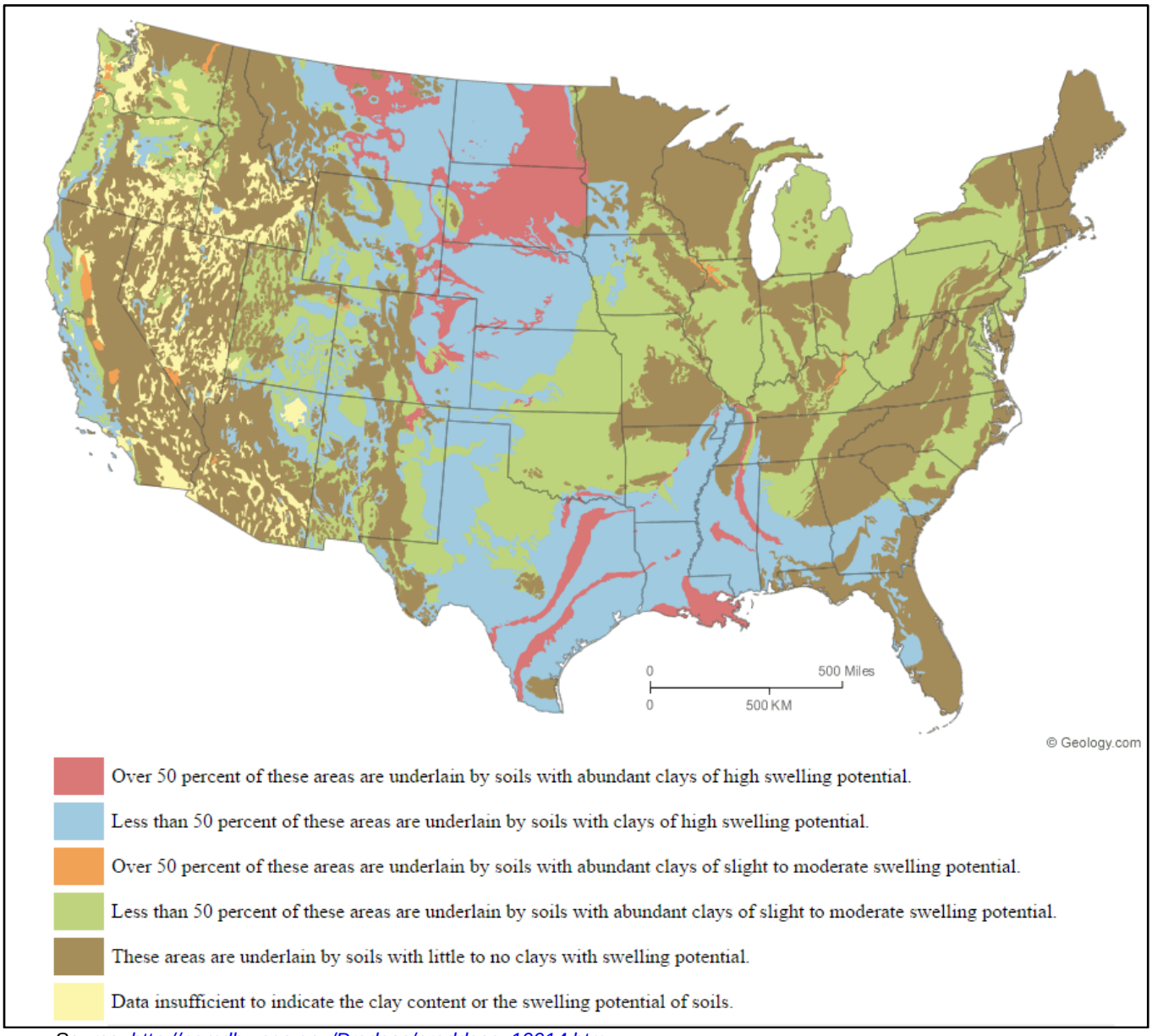
Hazard	Reason for Omission
Avalanche	No mountains in the planning area.
Coastal Erosion	Planning area is located in the Midwest, not on any coast.
Coastal Storm	Planning area is located in the Midwest, not on any coast.

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 Phelps 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 73 federally declared disasters since 1953. Of those, 45 have occurred between 2000 and 2019. All of these disasters have been weather related – severe wind and rainstorms, tornadoes, flooding, hail, ice storms and winter storms. **Table 3.2** lists the federal disaster declarations for Phelps County from 1990 through 2017.

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

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-995	Missouri Flooding, Severe Storm	Declaration Date: July 09, 1993 Incident Period: June 10, 1993 to October 25, 1993	IA
DR-1412	Severe Storms, Tornadoes	Declaration Date: May 06, 2002 Incident Period: April 24, 2002 to June 10, 2002	PA
DR-1463	Severe Storms, Tornadoes, Flooding	Declaration Date: May 06, 2003 Incident Period: May 04, 2003 to May 30, 2003	IA

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
EM-3232	Hurricane Katrina Evacuation	Declaration Date: September 10, 2005 Incident Period: August 29, 2005 to October 01, 2005	PA
DR-1631	Severe Storms, Tornadoes, Flooding	Declaration Date: March 16, 2006 Incident Period: March 08, 2006 to March 13, 2006	IA
DR-1676	Severe Winter Storms, Flooding	Declaration Date: January 15, 2007 Incident Period: January 12, 2007 to January 22, 2007	PA
EM-3281	Severe Winter Storms	Declaration Date: December 12, 2007 Incident Period: December 08, 2007 to December 15, 2007	PA
DR-1742	Severe Storms, Tornadoes, Flooding	Declaration Date: February 05, 2008 Incident Period: January 07, 2008 to January 10, 2008	PA
DR-1749	Severe Storms, Flooding	Declaration Date: March 19, 2008 Incident Period: March 17, 2008 to May 09, 2008	IA, PA
EM-3303	Severe Winter Storm	Declaration Date: January 30, 2009 Incident Period: January 26, 2009 to January 28, 2009	PA
DR-1847	Severe Storms, Tornadoes, Flooding	Declaration Date: June 19, 2009 Incident Period: May 08, 2009 to May 16, 2009	PA
EM-3317	Severe Winter Storm	Declaration Date: February 03, 2011 Incident Period: January 31, 2011 to February 05, 2011	PA
DR-1980	Severe Storms, Tornadoes, Flooding	Declaration Date: May 09, 2011 Incident Period: April 19, 2011 to June 06, 2011	IA
DR-4144	Severe Storms, Straight-line Winds, Flooding	Declaration Date: September 06, 2013 Incident Period: August 02, 2013 to August 14, 2013	PA
DR-4238	Severe Storms, Tornadoes, Straight-line Winds, Flooding	Declaration Date: August 07, 2015 Incident Period: May 15, 2015 to July 37, 2015	PA

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
EM-3374	Severe Storms, Tornadoes, Straight-line Winds, Flooding	Declaration Date: January 2, 2016 Incident Period: December 22, 2015-January 9, 2016	PA
DR-4250	Severe Storms, Tornadoes, Straight-line Winds, Flooding	Declaration Date: January 21, 2016 Incident Period: December 23, 2015-January 9, 2016	IA, PA
DR-4317	Severe Storms, Tornadoes, Straight-line Winds, Flooding	Declaration Date: June 2, 2017 Incident Date: April 28, 2017 to May 11, 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. “X” indicates the jurisdiction is impacted by the hazard, and a "-" indicates the hazard is not applicable to that jurisdiction. As Phelps 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.

Table 3.3. Hazards Identified for Each Jurisdiction

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme Heat	Fires (Urban/Structural and wild)	Flooding (River and Flash)	Land Subsidence/Sinkholes	Thunderstorms/High Winds/ Lightning/Hail	Tornado	Severe Winter Weather
Phelps County	x	x	x	x	x	x	x	x	x	x
Doolittle	x	x	x	x	x	x	x	x	x	x
Edgar Springs	x	x	x	x	x	x	x	x	x	x
Newburg	x	x	x	x	x	x	x	x	x	x
Rolla	x	x	x	x	x	x	x	x	x	x
St. James	x	x	x	x	x	x	x	x	x	x
School Districts										
Phelps Co. R-III	x	x	x	x	x	x	x	x	x	x
Newburg R-II	x	x	x	x	x	x	x	x	x	x
St. James R-I	x	x	x	x	x	x	x	x	x	x
Rolla 31	x	x	x	x	x	x	x	x	x	x

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. Phelps 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 throughout the county and are localized in their effects. The focal area of urbanization includes the cities of Doolittle, Edgar Springs, Newburg, Rolla, and St. James. 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 four tables, population data is based on 2019 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 3.4. Maximum Population and Building Exposure by Jurisdiction

Jurisdiction	2019 Population	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Unincorporated Phelps County	19,055	11,220	$1,346,306,000	$725,110,000	$2,071,416,000
Doolittle	670	298	$47,433,000	$27,270,000	$74,703,000
Edgar Springs	181	128	$18,416,000	$10,021,000	$28,437,000
Newburg	479	203	$42,636,000	$22,621,000	$65,257,000
Rolla	20,169	5,939	$1,182,855,000	$677,811,000	$1,860,666,000
St. James	4,076	1,478	$302,447,000	$209,599,000	$512,046,000
Total	44,630	19,266	$2,940,093,000	$1,672,432,000	$4,612,525,000

Sources: U.S. Census Bureau, 2015-2019 5-Year American Community Survey; 2018 Missouri State Hazard Mitigation Plan

Table 3.5 calculates the total value of buildings and contents within each jurisdiction of the County. The total exposure values for the County were derived from the inventory data associated with FEMA's loss estimation software HAZUS. Content values were also included and were estimated as a percentage of building value based on their property type, using FEMA HAZUS estimated content

replacement values. Those content values are 50 percent for residential, 100 percent for commercial and governmental and 150% for industrial.

Table 3.5. Building Values/Exposure by Usage Type

Jurisdiction	Agriculture	Commercial	Education	Government	Industrial	Residential	Total
Phelps County	$15,524.40	$84,061.51	$1,539.37	$4,299.9	$16,308.31	$1,224,572.50	$1,346,306.01
Doolittle	$144.32	$6,636.43	$0	$614.27	$0	$40,037.85	$47,432.89
Edgar Springs	$94.71	$1,106.07	$0	$614.27	$0	$16,601.06	$18,416.12
Newburg	$22.55	$8,479.88	$6,157.51	$307.13	$0	$27,668.43	$42,635.52
Rolla	$162.37	$220,477.12	$89,283.96	$15,049.65	$13,343.16	$844,538.37	$1,182,854.65
St. James	$103.73	$64,520.89	$4,618.13	$614.27	$28,168.91	$204,420.92	$302,446.88
Total	$16,052.08	$385,281.90	$101,598.97	$21,499.49	$57,820.38	$2,357,838.9	$2,940,091.80

Source: FEMA HAZUS, Missouri State Hazard Mitigation Plan
** All values in 1,000s of dollars.*

Table 3.6. Building Counts by Usage Type

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Other	Total
Phelps County	7,524	228	11	3,442	15	11,220
Doolittle	246	18	0	32	2	298
Edgar Springs	102	3	0	21	2	128
Newburg	170	23	0	5	5	203
Rolla	5,189	598	9	36	107	5,939
St. James	1,256	175	19	23	5	1,478
TOTAL:	14,487	1,045	39	3,559	136	19,266

Source: Missouri GIS Database (MSDIS)

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 ($)
Phelps County R-III	170	1	4,454,359.49	509,453.95	4,963,813.44
Newburg R-II	403	2	13,539,770.03	3,861,063.53	17,400,833.56
Rolla 31	4,192	8	135,674,851.84	26,194,863.10	161,869,714.94

Public School District	Enrollment	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
St. James R-I	1,863	3	55,027,833.00	10,882,530.96	65,910,363.96

Source: https://ogi.oa.mo.gov/DESE/schoolSearch/index.html; 2020 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.

The table below (**Table 3.8**) 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.

Table 3.8 Phelps County Critical Facilities by Type and Jurisdiction

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Emergency Facilities						
	Phelps County	Phelps County Ambulance Dist.	504 18th St.	Rolla	MO	65401
	Rolla	Rolla Emergency Mgmt. & Cntrl. Comm.	1007 N Elm St.	Rolla	MO	65401
	St. James	St. James Ambulance Dist.	103 N. Louise	St. James	MO	65559
Fire Department Facilities						
	Doolittle	Doolittle Rural Fire Prot. Dist.1	281 Bouman St.	Doolittle	MO	65550
	Doolittle	Doolittle Rural Fire Prot. Dist.2	11845 Main St.	Jerome	MO	65529
	Duke	Duke Rural Fire Dist.	30003 CR 6630	Duke	MO	65461
	Edgar Springs	Edgar Springs Rural FD	1150 Broadway	Edgar Springs	MO	65462
MO000569	Rolla	Rolla Fire and Rescue #1	1490 E. 10th St.	Rolla	MO	65401
	Rolla	Rolla Fire and Rescue #2	400 W. 4th St.	Rolla	MO	65401
	Rolla	Rolla Rural Fire Prot. Dist. 1	1575 E. Lions Club Dr.	Rolla	MO	65401
	Rolla	Rolla Rural Fire Prot. Dist. 2	18953 S. Hwy. 63	Rolla	MO	65401
	Rolla	Rolla Rural Fire Prot. Dist. 3	10830 Private Dr. 2074	Rolla	MO	65401
	St. James	St. James Fire Prot. Dist. 1	300 E. Eldon St.	St. James	MO	65559
	St. James	St. James Fire Prot. Dist. 2	15995 S. Hwy. 68	St. James	MO	65559
Law Enforcement Facilities						
	Doolittle	Doolittle Police Dept.	380 Eisenhower St.	Doolittle	MO	65401
	Edgar Springs	Edgar Springs Police Dept.	555 Broadway	Edgar Springs	MO	65462
	State	Missouri Hwy. Patrol Troop I	1301 Nagogami Rd	Rolla	MO	65401
MO000351	Newburg	Newburg Police Dept.	30 W. 2nd St.	Newburg	MO	65550
MO000377	Phelps County	Phelps County Sheriff	500 W 2nd St.	Rolla	MO	65550
MO000047	Rolla	Rolla Police Dept.	1007 N Elm St.	Rolla	MO	65401

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Law Enforcement Facilities						
	Rolla	University Police, MO S&T	1201 N. State St.	Rolla	MO	65401
MO000245	St. James	St. James City Police	200 N. Bourbeuse St.	St. James	MO	65559
Medical Facilities						
	Phelps County	Phelps Health	1000 West 10th St.	Rolla	MO	65401
	Phelps County	Phelps-Maries Health Dept.	200 N. Main, Suite G51	Rolla	MO	65401
	Rolla	Rolla Dialysis	1503 E. 10th St.	Rolla	MO	65401
	Rolla	Physician Surgery Center, LLC	1500 Hwy. 72 E.	Rolla	MO	65401
	Rolla	Rolla Family Clinic	1060 S. Bishop Ave.	Rolla	MO	65401
	Rolla	Phelps Health Medical Group, Inc.	1050 W. Tenth St.	Rolla	MO	65401
	Rolla	Mercy Clinic	1605 Martin Springs Dr., Ste. 230	Rolla	MO	65401
	St. James	Phelps Health Medical Group	1000 N. Jefferson	St. James	MO	65559
	St. James	Mercy Clinic Family Medicine	107 W. Eldon St.	St. James	MO	65559
School Facilities						
MO000937	Edgar Springs	Phelps Co. Elem.	17790 State Rte. M	Edgar Springs	MO	65462
MO000935	Newburg	Newburg Elem.	701 Wolf Pride Dr.	Newburg	MO	65550
MO000936	Newburg	Newburg High	701 Wolf Pride Dr.	Newburg	MO	65550
MO000108	Rolla	B W Robinson State School	300 Lanning Ln.	Rolla	MO	65401
MO000932	Rolla	Rolla Technical Inst.	1304 E. 10th St.	Rolla	MO	65401
MO000933	Rolla	Harry S. Truman Elem.	1001 E. 18th St.	Rolla	MO	65401
MO000934	Rolla	Rolla Sr. High	900 Bulldog Run	Rolla	MO	65401
MO001524	Rolla	Rolla Seventh-Day Adventist Sch.	814 Hwy. O	Rolla	MO	65401
MO001628	Rolla	St. Patrick Elem. School	19 St. Patrick Ln.	Rolla	MO	65401
MO002256	Rolla	Col. John B. Wyman Elem.	402 Lanning Ln.	Rolla	MO	65401
MO002257	Rolla	Rolla Jr. High	1360 Soest Rd.	Rolla	MO	65401
MO002258	Rolla	Mark Twain Elem.	1100 Mark Twain Dr.	Rolla	MO	65401
MO002259	Rolla	Rolla Middle	1111 Soest Rd.	Rolla	MO	65401
MO002260	Rolla	Rolla Technical Cntr.	500 Forum Dr.	Rolla	MO	65401
MO000930	St. James	Lucy Wortham James Elem.	314 S. Jefferson	St. James	MO	65559
MO000931	St. James	St. James Middle	1 Tiger Dr.	St. James	MO	65559
MO002151	St. James	St. James High	101 E. Scioto	St. James	MO	65559
	St. James	Tiger Cubs 1	220 E. Scioto	St. James	MO	65559
	St. James	Tiger Cubs 2	316 S. Jefferson	St. James	MO	65559
	St. James	Alternative High School	224 E. Scioto	St. James	MO	65559

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Childcare Facilities						
	Rolla	Mickelson, Kristina Lynn	11075 Woodale Dr.	Rolla	MO	65401
	Rolla	Marrero, Carmen	13550 County Rd 8100	Rolla	MO	65401
	Rolla	Rolla Head Start Center	1811 E. 10th St.	Rolla	MO	65401
	Rolla	Stepping Stones Child Care Center	814 B Highway O	Rolla	MO	65401
	Rolla	Greentree Child Care and Learning Cntr.	800 Greentree Rd.	Rolla	MO	65401
	Rolla	Christian Life Center Child Development Center	305 E. 1st St.	Rolla	MO	65401
	Rolla	First Presbyterian Preschool	919 E. Tenth St.	Rolla	MO	65401
	Rolla	All Gods Children Day Care	400 Olive St.	Rolla	MO	65401
	Rolla	Kiddie Korner Learning Center & Preschool	302 N. Olive St.	Rolla	MO	65401
	Rolla	Salem Avenue Baptist Church Day Care	1501 Hwy. 72 E.	Rolla	MO	65401
	Rolla	Wands, Debbie	207 Christy Dr.	Rolla	MO	65401
	Rolla	Giesler, Pamela Lynn	307 Williams Rd.	Rolla	MO	65401
	Rolla	First United Methodist Church Preschool	804 Main St.	Rolla	MO	65401
	Rolla	Tender Hearts Preschool Academy, LLC	11697 CR. 8030	Rolla	MO	65401
	St. James	Perona, Loretta Sue	323 Winter Dr.	St. James	MO	65559
	St. James	St. John Lutheran Hand in Hand Preschool	221 W. James Blvd.	St. James	MO	65559
	St. James	St. James Head Start Center	1518 Lola Ln.	St. James	MO	65559
Nursing Homes						
	Rolla	Choices For People Adult Day Care	1815 Forum Dr.	Rolla	MO	65401
	Rolla	Oak Pointe of Rolla	1000 E. Lions Club Dr.	Rolla	MO	65401
	Rolla	Rosewood Residential Care	13450 CR. 7040	Rolla	MO	65401
	Rolla	Parkside - Assisted Living by Americare	1700 E. 10th St.	Rolla	MO	65401
	Rolla	Rolla Presbyterian Manor	1200 Homelife Plaza	Rolla	MO	65401
	St. James	St. James Living Center	415 Sidney St.	St. James	MO	65559
	St. James	Cedar Knoll Home	13635 State Rte. V	St. James	MO	65559
	St. James	Ferndale, Inc.	15677 CR. 2430	St. James	MO	65559
	St. James	Country Valley Home	15750 CR. 2430	St. James	MO	65559
	St. James	Missouri Veterans Home	620 N. Jefferson	St. James	MO	65559

Source: 2020 Data Collection Questionnaires, Missouri DHSS https://healthapps.dhss.mo.gov/childcaresearch/, https://healthapps.dhss.mo.gov/showmeltc/default.aspx

Table 3.9 includes a summary of the inventory of critical and essential facilities and infrastructure in the planning area. The list was compiled from the 2020 Data Collection Questionnaire, the Meramec Regional Hazardous Materials Emergency Response Plan and the National Bridge Inventory.

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

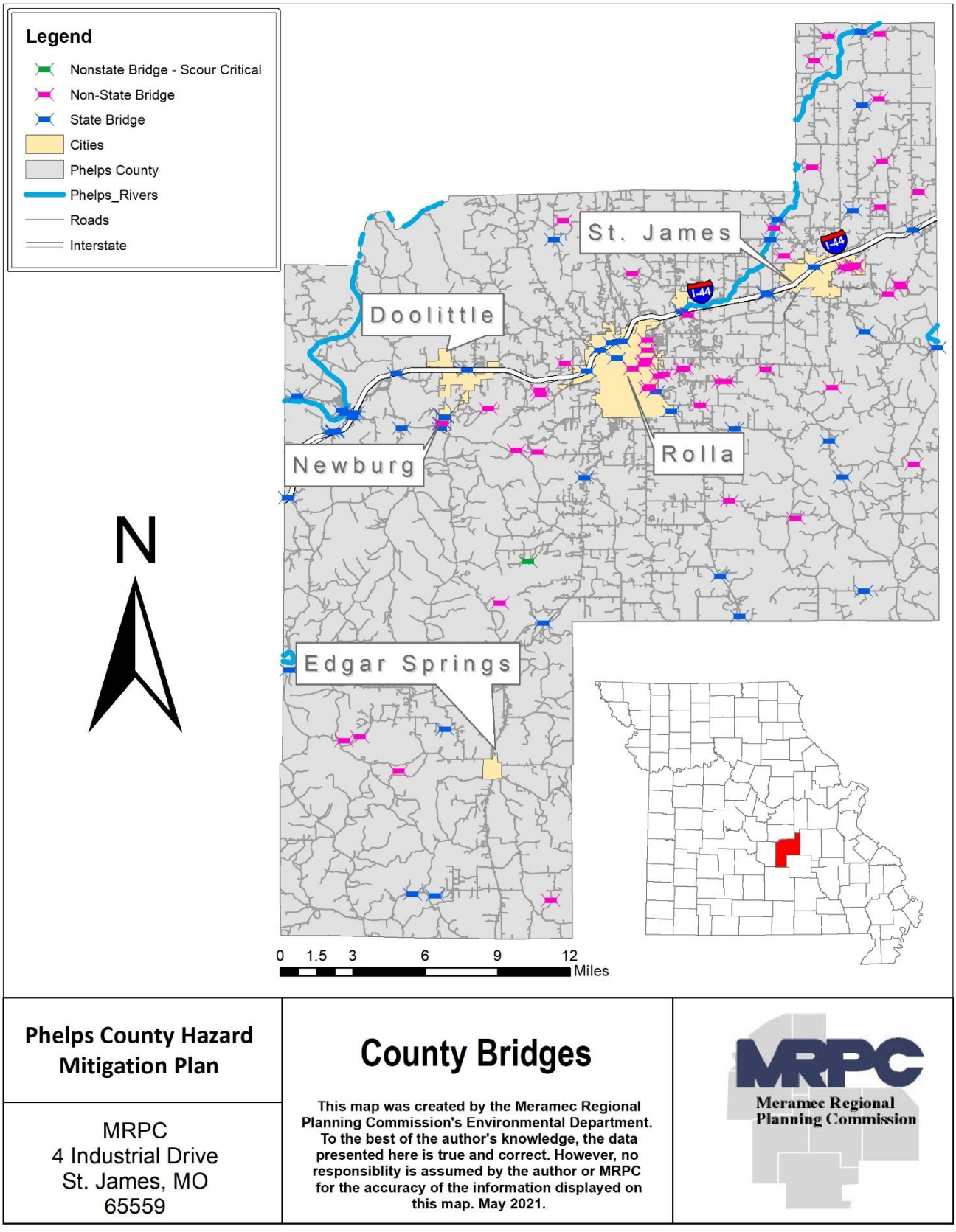
	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	State & Non-State Structures (Bridge)	Hospital/Health Care	Military	Pipeline/Pump Station	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	Total
Unincorporated Phelps County	-	-	-	-	-	1	-	1	-	-	46	-	-	-	-	1	1	1	-	-	-	2	-	**53**
Doolittle	-	-	-	-	-	-	1	1	-	-	2	-	-	-	-	1	1	-	-	-	-	-	-	**6**
Edgar Springs	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	1	1	-	5	1	-	2	1	**14**
Newburg	-	-	-	-	-	-	1	1	-	1	5	-	-	-	-	1	1	1	1	2	-	2	1	**17**
Rolla	1	1	16	-	1	-	3	1	-	-	13	9	1	-	10	3	1	1	13	8	-	68	1	**151**
St. James	-	-	4	-	-	-	1	1	-	-	2	2	-	-	5	1	1	1	3	3	-	11	1	**36**
Totals	**1**	**1**	**20**	**-**	**1**	**1**	**7**	**6**	**-**	**2**	**68**	**11**	**1**	**-**	**15**	**8**	**>6**	**4**	**22**	**14**	**-**	**85**	**>4**	**277**

Source: 2020 Data Collection Questionnaires, National Bridge Inventory, 2020 MREPC Hazardous Materials Emergency Response Plan

According to the National Bridge Inventory there are a total of 156 bridges in Phelps County[3]. **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 Phelps County. The County Road 7460 bridge spanning the Little Piney Creek has a scour index of 3.

[3] http://www.fhwa.dot.gov/bridge/nbi/no10/county.cfm

Figure 3.2. Phelps County Bridges



Source: MSDIS, MoDOT, MRPC

3.2.3 Other Assets

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

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

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

Table 3.10. Threatened and Endangered Species in Phelps County

Common Name	Scientific Name	Status
Amphibians		
Eastern Hellbender	*Cryptobranchus alleganiensis*	Endangered (S)
Clams		
Pink Mucket	*Lampsilis abrupta*	Endangered (F) (S)
Scaleshell Mussel	*Leptodea leptodon*	Endangered (F) (S)
Snuffbox Mussel	*Epioblasma triquetra*	Endangered (F) (S)
Spectaclecase	*Cumberlandia monodonta*	Endangered (F) (S)
Sheepnose Mussel	*Plethobasus cyphyus*	Endangered (F) (S)
Ebonyshell	*Fusconaia ebena*	Endangered (S)
Elaphantear	*Elliptio crassidens*	Endangered (S)
Insects		
Hine's Emerald Dragonfly	*Somatochlora hineana*	Endangered (F)
Fishes		
Topeka Shiner	*Notropis topeka*	Endangered (S)
Birds		
Northern Harrier	*Circus cyaneus*	Endangered (S)
Peregrine Falcon	*Falco peregrinus*	Endangered (S)
Flowering Plants		
Running Buffalo Clover	*Trifolium stoloniferum*	Endangered (F)
Eastern prairie fringed orchid	*Plantanthera leucophaea*	Threatened (F) Endangered (S)
Mammal		
Gray bat	*Myotis grisescens*	Endangered (F) (S)
Indiana bat	*Myotis sodalis*	Endangered (F)
Northern long-eared bat	*Myotis septentrionalis*	Threatened (F)
Eastern spotted skunk	*Spilogale putorius*	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, https://nature.mdc.mo.gov/status/endangered

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

Table 3.11. Conservation Areas in Phelps County

Area Name	Address	City
Beaver Creek CA	From Rolla, Take Hwy 63 south 3 miles	Near Rolla
Bohigian CA	From I-44 in Doolittle, take Rte. T south to Newburg, then Rte. P west 5 miles, then Rte. AA south to parking lot	Near Newburg
Bray (Marguerite) CA	From Rolla I-44 exit 184, take Kingshighway east, then Bridge School Road (CR 7000) south 3 miles.	Near Rolla
Gasconade Dist. Hq.	From Rolla at the 185 exit of I-44, take Rte. E north 1.5 miles, then Rte. Y west to the first driveway on right	Near Rolla
Jerome Access	In Jerome from Rte. D/Main St. take Prewett Rd north 0.10 mile	Near Jerome
Little Prairie CA	From Rolla, take the north outer road of I-44 east about 5 miles, then Rte. RA north to the area	Near Rolla
Maramec Spring Fish Hatchery	From St. James, take Hwy 8 southeast 6 miles to Maramec Spring Park	Near St. James
Maramec Spring Park	From St. James, take Hwy 8 southeast 6 miles to Maramec Spring Park	Near St. James
Rolla (Ber Juan Lake)	From Hwy 63 head east on 10th St. and one block north on Holloway St.	Rolla
Rolla (Schuman Park Lake)	From the junction of Hwy 63/N. Oak St., take N. Oak St. south to E. 16th St. to Schuman Park Lake	Rolla
Rosati Towersite	From Rosati, take Rte. KK southwest 0.50 mile	Near Rosati
Woods (Woodson K) Mem CA	Southeast of St. James on Hwy 8	Near St. James

Source: https://nature.mdc.mo.gov/discover-nature/find/places?area_name=&counties=5700&location%5Bdistance%5D=50&location%5Borigin%5D=

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

Table 3.12. Community Owned Parks in Phelps County

Park Name	Address	City
Alhambra Grotto Recreation Park	-	Near Newburg
Asher State Wildlife Management	Off Hwy NN	Near St. James
Barnitz Park	Off E 5th St.	Rolla
Ber Juan Park	Farrar Dr.	Rolla
Buehler Park	Off Kingshighway	Rolla
Dry Fork State Wildlife Area	Off Hwy 68	Near St. James
Green Acres Park	Off S Olive St.	Rolla
Hart Park	Nelson Hart Rd	St. James
Lions Club Park	Off S Bishop Ave	Rolla
Little Prairie Community Lake	Prairie Lake Rd	Near Rolla
Regional Fairground	Off Hwy 63	Rolla
Ridgeview Park	Off Ridgeview Rd	Rolla
Schuman Park	Off N Oak St	Rolla
Ponzer Park	901 N Elm St	Rolla

Source: Google Search

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

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

Property	Address	City	Date Listed
Community Theater	117 First St.	Newburg	12/20/06
Gourd Creek Cave Archaeological	Address Restricted	-	7/29/69
Headquarters, Rolla Division of the Bureau of Mines	1300 Bishop	Rolla	4/24/17
Meramec Iron works District	7 mi. S of St. James on MO 8	St. James	4/16/69
National Bank of Rolla Building	718 Pine St.	Rolla	12/28/01
Ozark Iron Furnace Stack	2 mi. W of Newburg	Newburg	6/15/70
Phelps County Courthouse	3rd and Main Streets	Rolla	1/7/93
Phelps County Jail	Park St. between 2nd and 3rd	Rolla	5/10/90
Rolla Ranger Station Historic District	Bridge School Road and Kingshighway	Rolla	8/04/03
St. James Chapel	Church and Meramec Streets	St. James	7/28/83
Verkamp Shelter	Address Restricted	-	7/30/74

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

Economic Resources: **Table 3.14** provides major non-government employers in the planning area. There are approximately 131 employer establishments within the county, employing on average 8

individuals each[4].

Table 3.14. Major Non-Government Employers in Phelps County

Employer Name	Product or Service	Employees
Brewer Science	Semiconductor Manufacturing Equi	250-499
Royal Canin	Dog & Cat Food	100-249
Vacuum Cleaner Museum	Household Vacuum Cleaners	100-249
Kohl's	Department Store	100-249
Lowe's Home Improvement	Home Center	100-249
Menards	Home Center	100-249
Tacony Manufacturing	Vacuum Cleaners	100-249
Walmart Supercenter	Department Store	250-499
Geology & Land Survey Div	Geological Consultants	100-249
Choices for People	Adult Day Care	100-249
Heritage Park Skilled Care	Rehabilitation Services	100-249
Pathways Community Behavioral	Mental Health Services	100-249
The Centre	Health Club Studio & Gymnasium	100-249
Cub Creek Science Camp	Camp	100-249
McDonald's	Limited-Service Restaurant	250-499

Source: https://meric.mo.gov/industry/business-locator, 2020 Data Collection Questionnaires

Agriculture plays an important role in Phelps County. However, the Agribusiness Employment Location Quotient for the county is 0.11; meaning that there is a relatively low share of agribusiness employment to its share of total national employment[5]. In addition, there were 86 individuals working in the agriculture industry, comprising 0.83% of the total workforce in 2017[6]. Furthermore, the market value of products sold in 2017 was $14.0 million; 82% from livestock sales and 18% from crop sales.

[4] https://www.census.gov/quickfacts/fact/table/Phelpscountymissouri/HSG650216
[5] https://meric.mo.gov/media/pdf/rural-missouri-asset-mapping
[6] https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_S2405&prodType=table

3.3 Land Use and Development

3.3.1 Development Since Previous Plan

Table 3.15 provides population growth statistics for Phelps County.

Table 3.15. Phelps County Population Growth, 2010-2019

Jurisdiction	2010 Population	2019 Population	2010-2019 # Change	2010-2019 % Change
Unincorporated Phelps County	19,701	19,055	-646	-3.28%
Doolittle	621	670	49	7.89%
Edgar Springs	313	181	-132	-42.17%
Newburg	528	479	-49	-9.28%
Rolla	19,141	20,169	1,028	5.37%
St. James	4,169	4,076	-93	-2.23%

Source: U.S. Bureau of the Census, 2015-2019 5 Year American Community Survey; Census 2010 Summary File 1

Typically, population growth or decline is generally accompanied by an increase or decrease in the number of housing units. **Table 3.16** provides the change in numbers of housing units in the planning area from 2010-2019.

Table 3.16. Change in Housing Units, 2010-2019

Jurisdiction	Housing Units 2010	Housing Units 2019	2010-2019 # Change	2010-2019 % change
Unincorporated Phelps County	6,998	8,645	1,647	23.54%
Doolittle	300	294	-6	-2.0%
Edgar Springs	146	103	-43	-29.45%
Newburg	278	306	28	10.07%
Rolla	8,139	9,088	949	11.66%
St. James	1,671	1,851	180	10.77%

Source: U.S. Census Bureau, 2015-2019 5 Year American Community Survey; U.S. Bureau of the Census, Census 2010 Summary File 1

3.3.2 Future Land Use and Development

Jurisdictions reported anticipated future developments within the next five years (2021-2026). Phelps County and the cities of Doolittle, Edgar Springs, and Newburg did not anticipate any major future developments within the next five years.

The City of Rolla is continuing the commercial development along Forum Plaza, Kingshighway, Downtown, and North Bishop. Significant development is anticipated in the former Missouri S&T golf course and Highway 63 and 72 intersection in the next few years. In the next two years there will be significant investment ($15M) in the Southeast and Vichy Sewer Treatment Plants. At the Rolla National Airport $3M will be invested in rehabbing runway 4-22. A pedestrian bridge over Interstate I-44 at Highway E is currently in progress as well as full redevelopment of the Kingshighway corridor. Design work is underway for the realignment of University Drive and North Pine Street (Downtown). A new animal shelter is also in the city's plans for the next 2-5 years.

The City of St. James is upgrading the St. James Wastewater Treatment Plant to accommodate blending for compliance with VCA. Sanitary sewer collection I&I reduction throughout the city is planned. The city is in the process of constructing a 10" watermain to connect the Parker Lane Water Tower and Well to the Football Field Tower and Well. In addition, the city is continuing to replace aged electric infrastructure, implementing a policy of underground secondary electric for new construction.

St. James R-I School District is currently finishing a large renovation project to the high school. A secondary gym was converted to an auditorium. A practice gym was added on to an open courtyard. The old part of the school was gutted, renovated, and brought up to accessibility and safety standards. During construction a structural issue was found in the existing building's roof, that was added on to the current project. The school district also completed the construction of a preschool addition to the elementary school which was completed prior to the start of the 2020-2021 school year. The school district is interested in adding a FEMA certified tornado saferoom in the near future, if adequate resources can be garnered.

Newburg R-II School District is planning updates to the roof of the vocational-ag building, as well as lighting heat and air, all of which are in a hazard area. The school district is interested in adding a FEMA certified tornado saferoom in the near future, if adequate resources can be garnered.

Phelps County R-III School District does not anticipate a new building or major renovation project in the near future. This school district has a FEMA certified tornado saferoom.

Since the last Hazard Mitigation Plan the Rolla 31 school district completed construction of a new cafeteria enlargement, new science wing, new wrestling room, new office area and classrooms at the Rolla High School. A new cafeteria and classrooms were also constructed at the Junior High building.

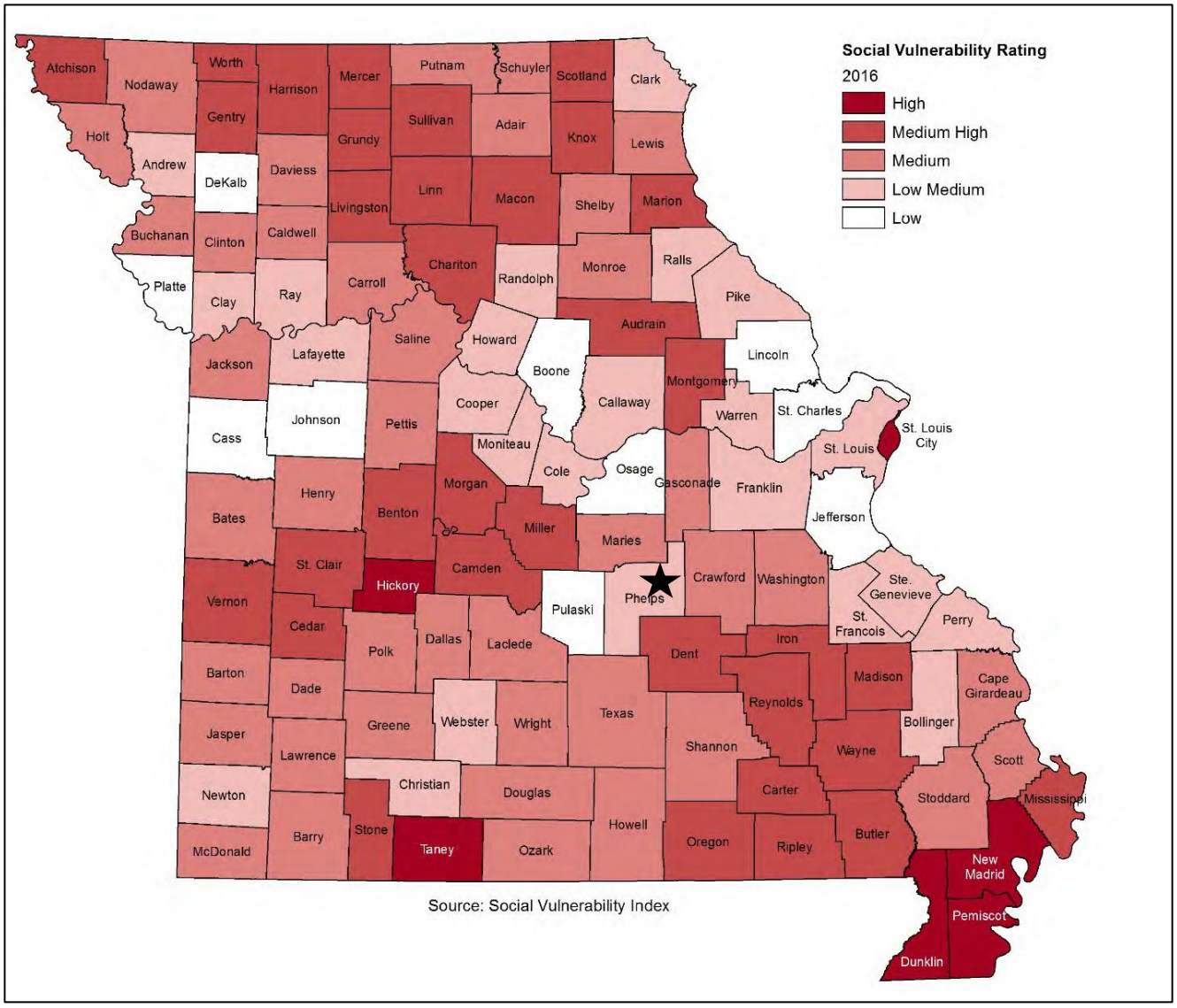
In the next five years the district anticipates construction at three buildings. Rolla High School anticipates a new gymnasium, renovations to the old gymnasium, a new band and choir room and includes a safe room. The Junior High building anticipates a new band and choir room including a safe room. Truman Elementary anticipates construction of a new library and office space with a safe room included. The school district is interested in adding a FEMA certified tornado saferoom in the near future, if adequate resources can be garnered. None of the Rolla 31 buildings are in hazard areas.

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

Socioeconomic Profile

The Missouri State Hazard Mitigation Plan provides ratings for social vulnerability for each of the counties in the state based on 42 socioeconomic and built environment variables that research suggests contribute to a community's ability to prepare for, respond to, and recover from hazards. Based on that data, Phelps County has a "low-medium" social vulnerability rating (Figure 3.3). 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 created[7].

Figure 3.3. Social Vulnerability Rating for Phelps County



Source: 2018 Missouri State Hazard Mitigation Plan
*Black star indicates Phelps County

[7] https://ded.mo.gov/programs/business/missouri-works

3.4 Hazard Profiles, Vulnerability, and Problem Statements

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

Strength/Magnitude/Extent: This includes information about the strength, 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. Strength, magnitude, and extent can also include the speed of onset and the duration of hazard events. Describing the strength/magnitude/extent of a hazard is not the same as describing its potential impacts on a community. Strength/magnitude/extent defines the characteristics of the hazard regardless of the people and property it affects.

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

Probability of Future Occurrence: The frequency of recorded past events is used to estimate the likelihood of future occurrences. Probability was determined by dividing the number of recorded events by the number of years and multiplying by 100. This gives the percent chance of the event happening in any given year. For events occurring more than once annually, the probability will be reported 100% in any given year, with a statement of the average number of events annually. For hazards such as drought that may have gradual onset and extended duration, probability can be based on the number of months in drought in a given time-period and expressed as the probability for any given month to be in drought.

Changing Future Conditions Considerations: 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 Phelps 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: This section will describe the potential impacts of each hazard – the consequences of the effect of the hazard on the jurisdiction and its assets (including types and numbers, of buildings, critical facilities, etc.)

Previous and Future Development: This section will include information on how changes in development have impacted the community's vulnerability to this hazard. 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.

Hazard Summary by Jurisdiction: For hazard risks that vary by jurisdiction, this section will provide an overview of the variation and the factual basis for that variation.

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**

3.17 and **Table 3.18**, respectively.

Table 3.17. MDNR Dam Hazard Classification Definitions

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

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

Table 3.18. NID Dam Hazard Classification Definitions

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

Source: National Inventory of Dams

Geographic Location

Dams in Planning Area

According to the National Inventory of Dams there are 30 recorded dams in Phelps County; including 12 high hazard dams; one significant hazard dams; and 17 low hazard dams. The Missouri Department of Natural Resources also tracks dams in the state and has identified two Class 1 dams, one Class 2 dam, and one Class 3 dam. **Table 3.19** provides the name of the dam, DNR hazard class and NID hazard class for each of the identified dams in Phelps County. There are four state-regulated dams in Phelps 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 3.20** provides the names, locations, and other pertinent information for all NID High Hazard Dams in the planning area.

Table 3.19. Phelps County Dams Hazard Risk

Name of Dam	DNR Hazard Class	NID Hazard Class
Affolter Lake Dam	2	**High**
Amos Lake Dam	3	Low
Ashby Lake Dam	3	Low
Bedell Lake Dam	3	Low
Blues Pond Dam	1	**High**
Boyd Lake Dam	3	Low
Brays Lake Dam	1	**High**
Cardetti Lake Dam	2	**High**
Dennis Lake Dam	2	**High**
Egan Lake Dam	3	Low
Essie Dam	3	Low
Foster Lake Dam	3	Low
Harke Lake Dam	3	Low
Hayes Dam	3	Low
Highway Lake dam	3	Low
Knoblauch Lake Dam	2	**High**
Lake Scioto Dam	2	**High**
Martin Lake Dam	3	Low
McCloskey Lake Dam	3	Low
McNulty Lake Dam	2	**High**
Moty Lake Dam	3	Low
Scott's Pond Dam	2	**High**
Seliga Lake Dam	3	Low
Seven Springs Lake Dam	3	Low
Tripoli Valley Dam	1	**High**
Walnut Glenn Lake Dam	3	Significant
Walnut Hill Lake Dam	2	**High**
Wayman-Fuhring Lake Dam	3	Low
Wheegate Lake Dam	3	Low
William E Towell Dam	1	**High**

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

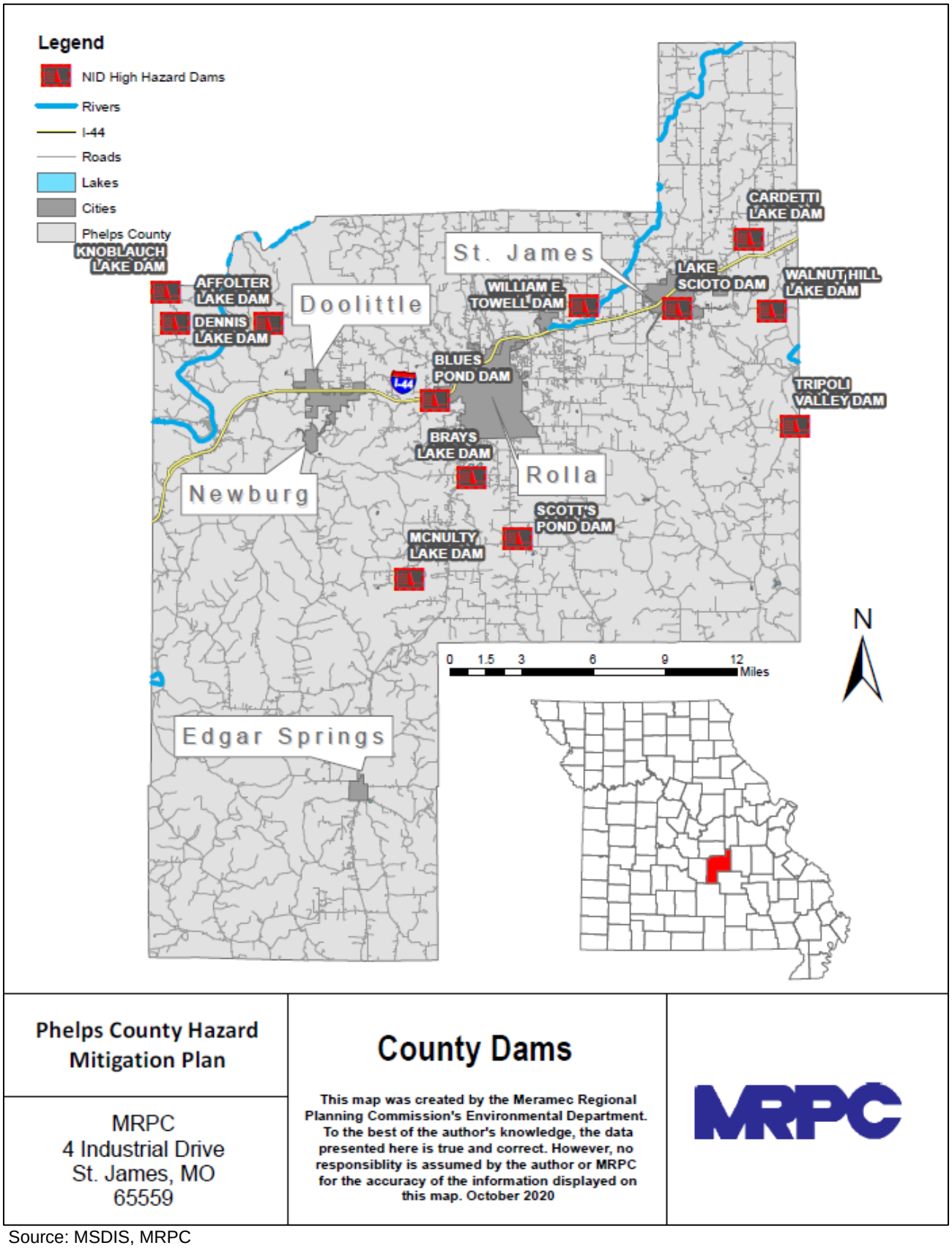
Table 3.20. NID High Hazard Class Dams in the Phelps County Planning Area

Dam Name	NIDID	Hazard Potential *	NID Height (Ft.)	NID Storage	River	Nearest City *	Distance To City (Mi.) *
Affolter Lake Dam	MO31336	High	30	32	TR-Tick Creek	Doolittle	4
Blues Pond Dam	MO31538	High	23	98	TR- Little Beaver Creek	Rolla	0
Brays Lake Dam	MO30098	High	79	3636	Abbott Branch-Beaver Creek	Rolla	2
Cardetti Dam	MO30257	High	25	187	TR-Clear Creek	St. James	1.6
Dennis Lake Dam	MO31546	High	25	80	Mungy Branch	Jerome	4
Knoblauch Lake Dam	MO31547	High	25	241	TR-Duncan Creek	Jerome	6.8
Lake Scioto Dam	MO30097	High	44	216	TR-Luther Branch Creek	St. James	0
McNulty Lake Dam	MO31915	High	34	491	Grouro Creek	Rolla	6
Scott's Pond Dam	MO30389	High	21	202	TR-Little Dry Fork River	Rolla	4.5
Tripoli Valley Dam	MO30345	High	26	83	TR_Meramec River	St. James	5.5
Walnut Hill Lake Dam	MO31335	High	20	86	TR-Dry Fork River	St. James	3
William E. Towell Dam	MO30090	High	48	2490	Tributary of Boubeuse River	Rolla	1.6

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 3.4 depicts locations of NID high hazard dams located in the planning area. If a dam failure were to occur in Phelps County, depending upon dam and location, the severity would range between negligible to life threatening. Road infrastructure, residential structures, commercial buildings, and public buildings are all vulnerable to losses. There are no areas of assembly in dam inundation zones within the county. Three dam inundation maps were available from the Missouri Department of Natural Resources. These State Regulated Dams include William E. Towell Dam, Lake Scioto Dam, and Brays Lake Dam (**Figure 3.5** through **Figure 3.8**). In addition, ArcGIS and the 100 year flood data were utilized to *estimate* dam inundation zones for the rest of Phelps County's high hazard dams (**Figure 3.9** through **Figure 3.16**).

Figure 3.4. NID High Hazard Dam Locations in Phelps County



Source: MSDIS, MRPC

Figure 3.5. William E. Towell Dam Inundation Zone

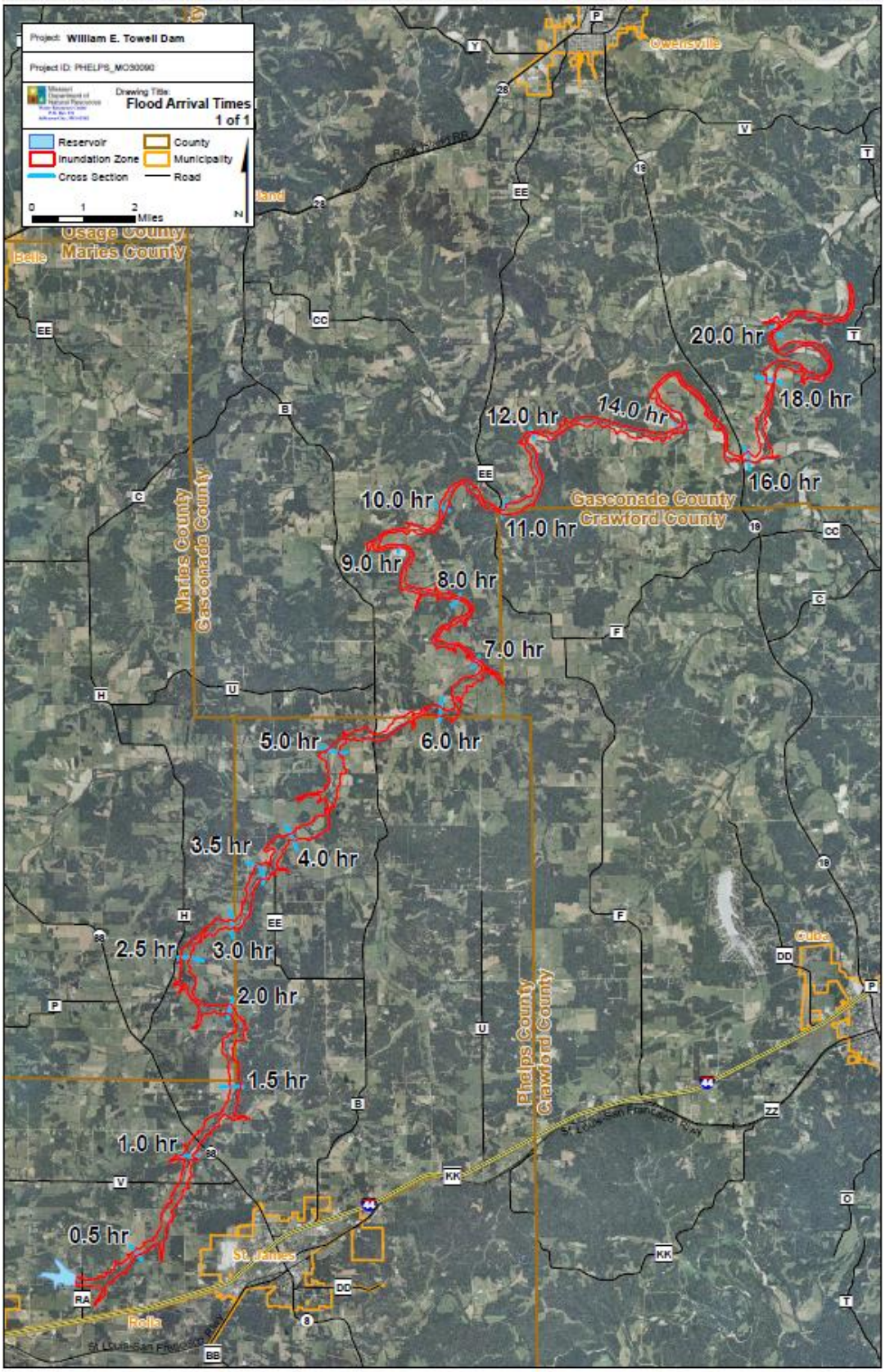


Figure 3.6. Lake Scioto Dam Inundation Zone

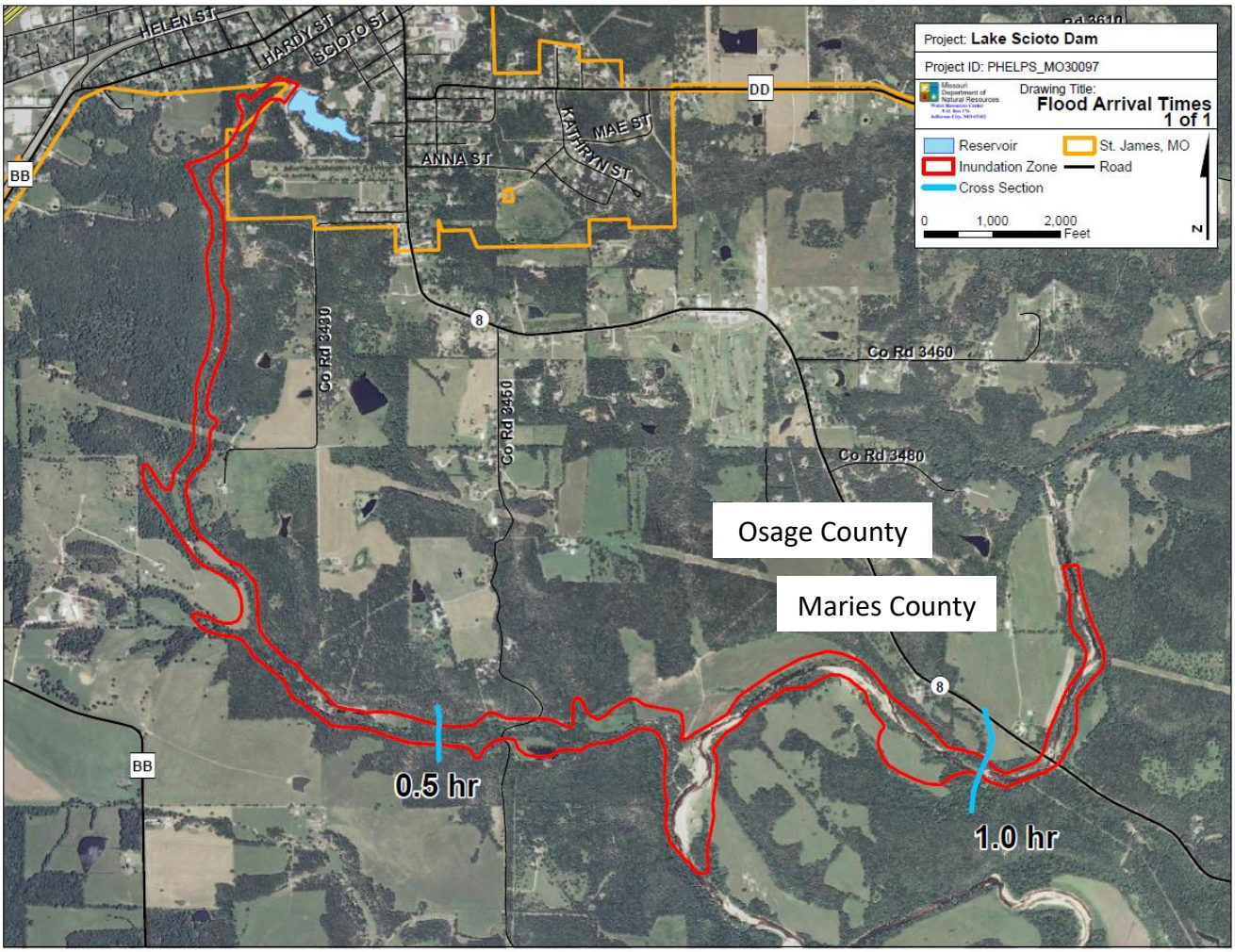


Figure 3.7. Brays Lake Dam Inundation Zone

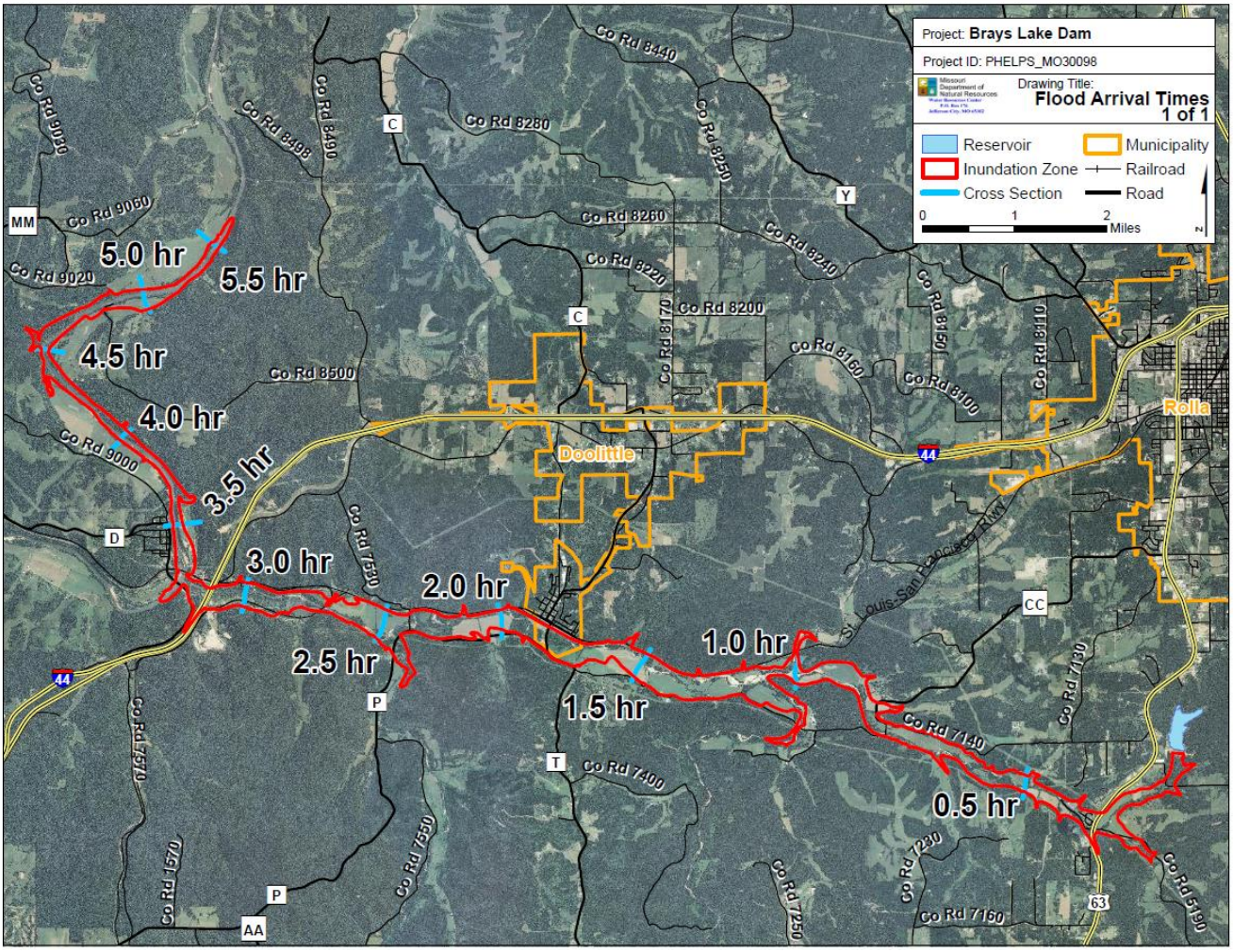
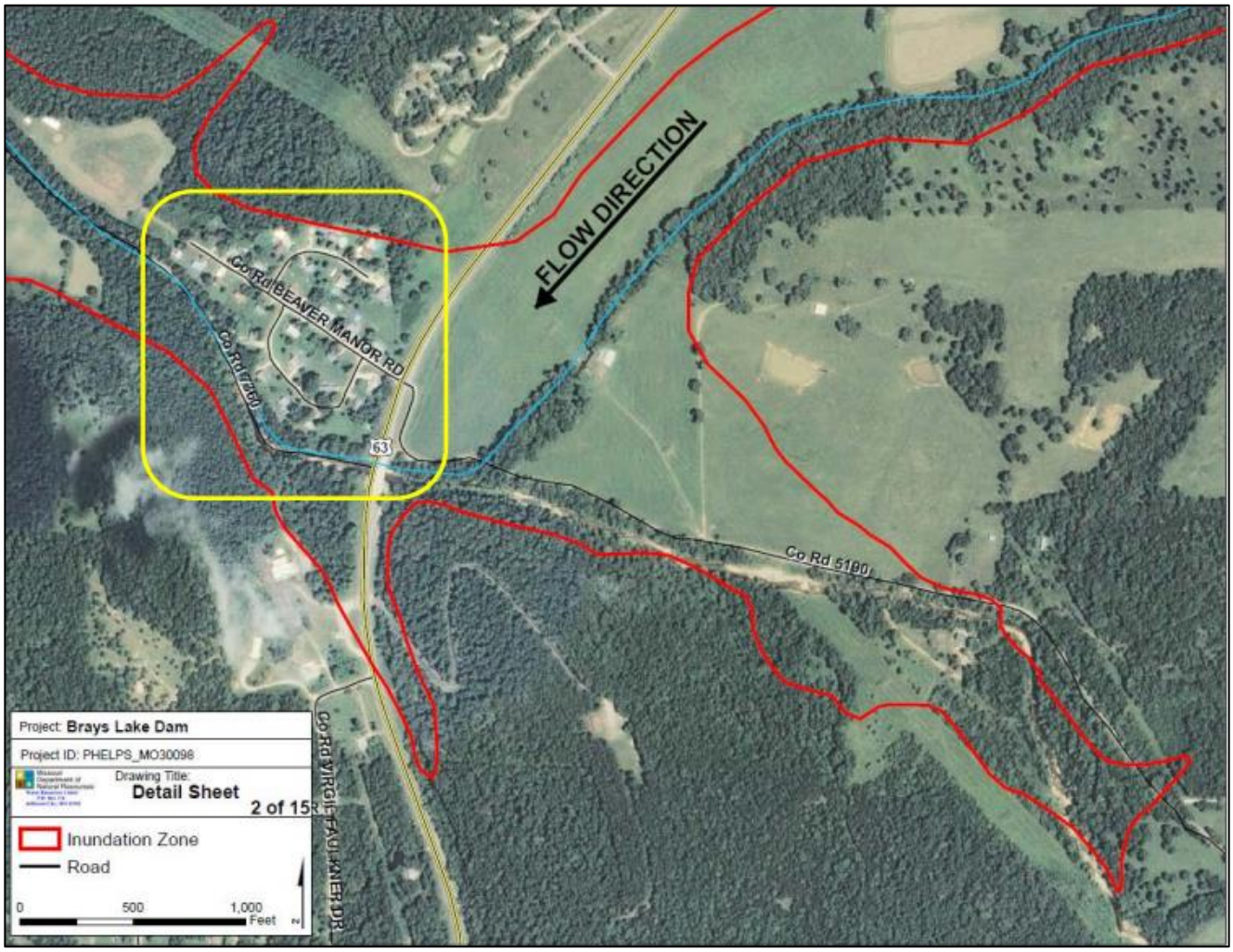


Figure 3.8. Brays Lake Dam Inundation Zone Continued



*Note: The yellow box outlines the subdivision on Beaver Manor Road

Figure 3.9. Blues Pond Dam Inundation Zone

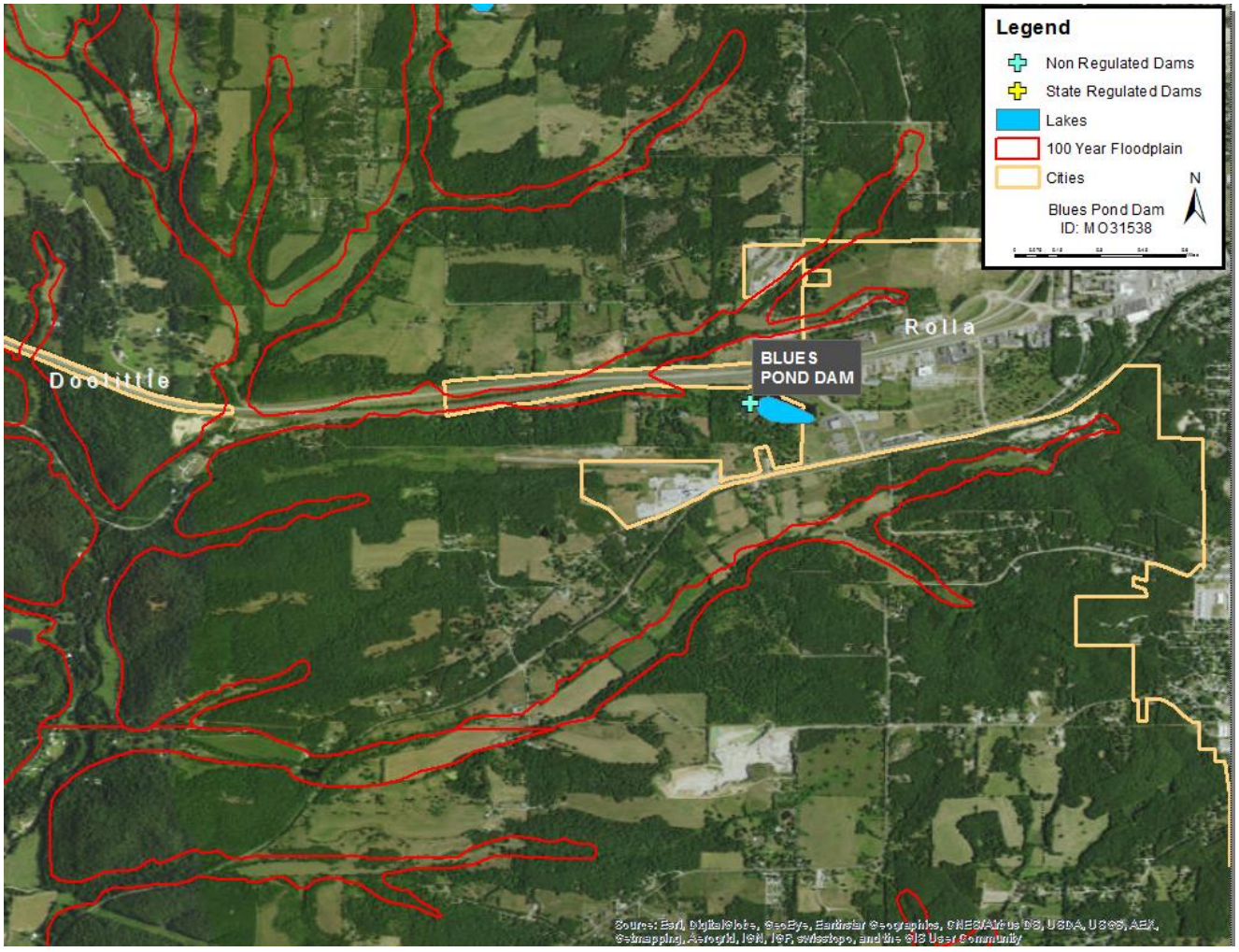


Figure 3.10. Tripoli Valley Dam Inundation Zone

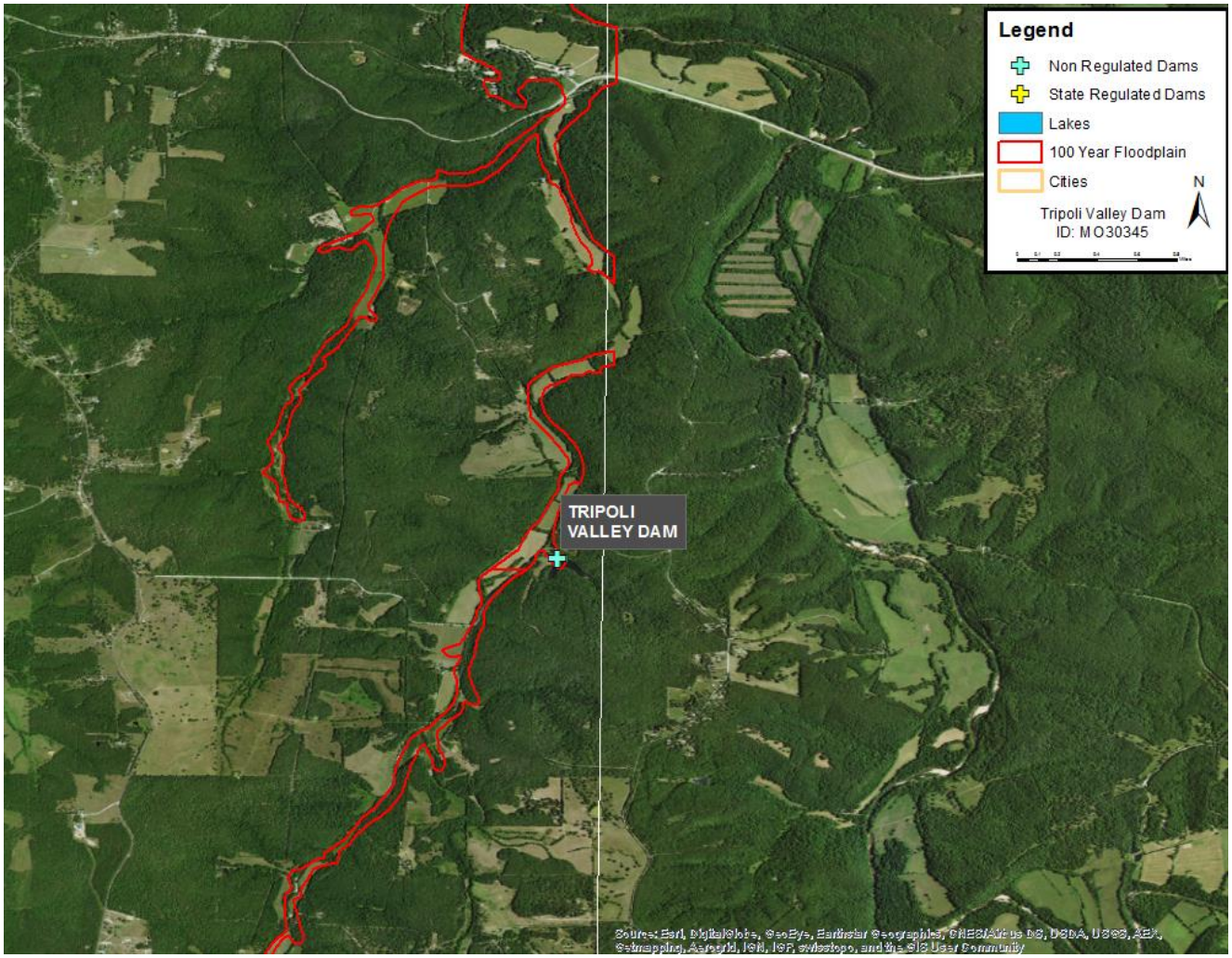


Figure 3.11. Walnut Hill Lake Dam Inundation Zones

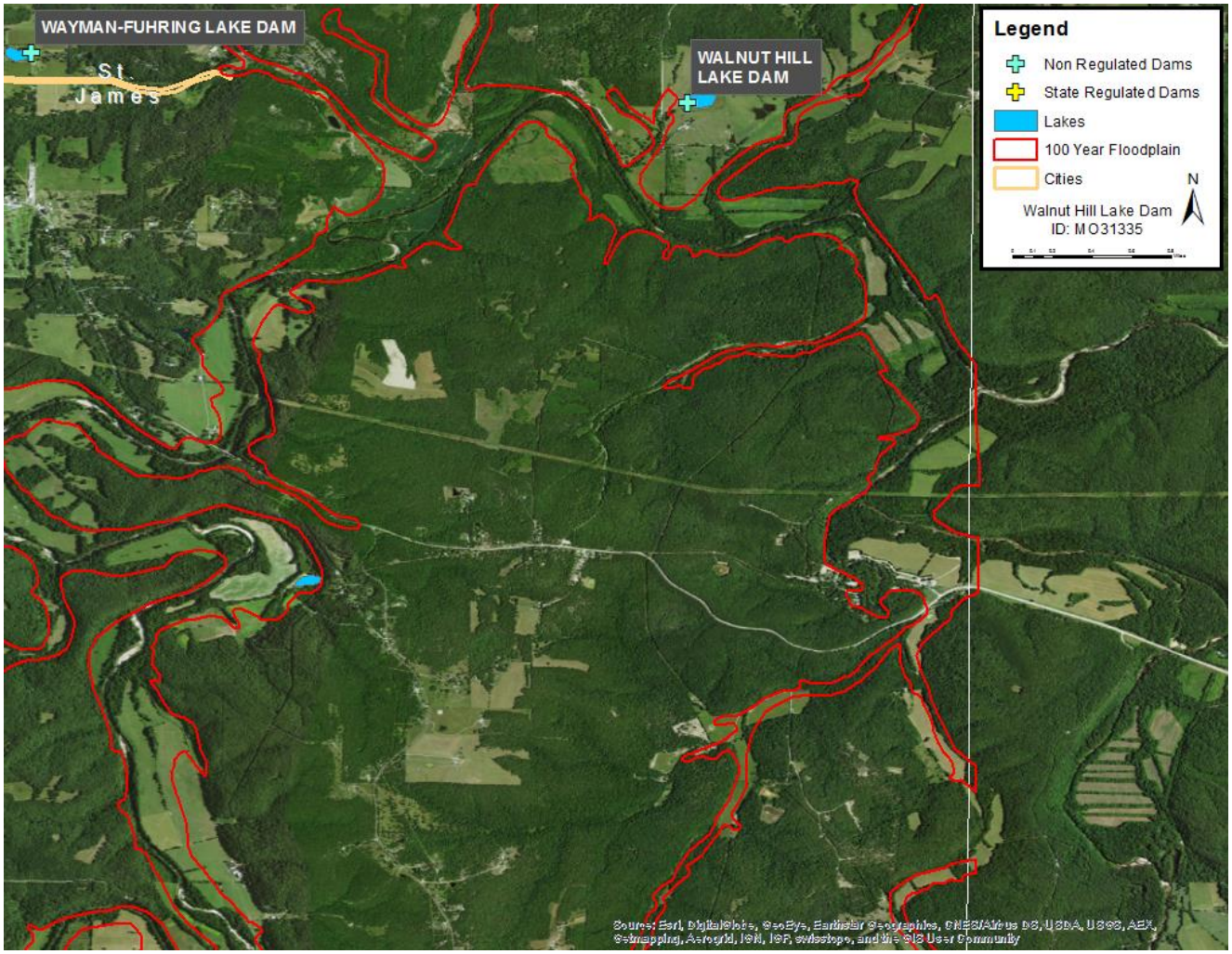


Figure 3.12. Knoblauch Lake and Dennis Lake Dam Inundation Zones

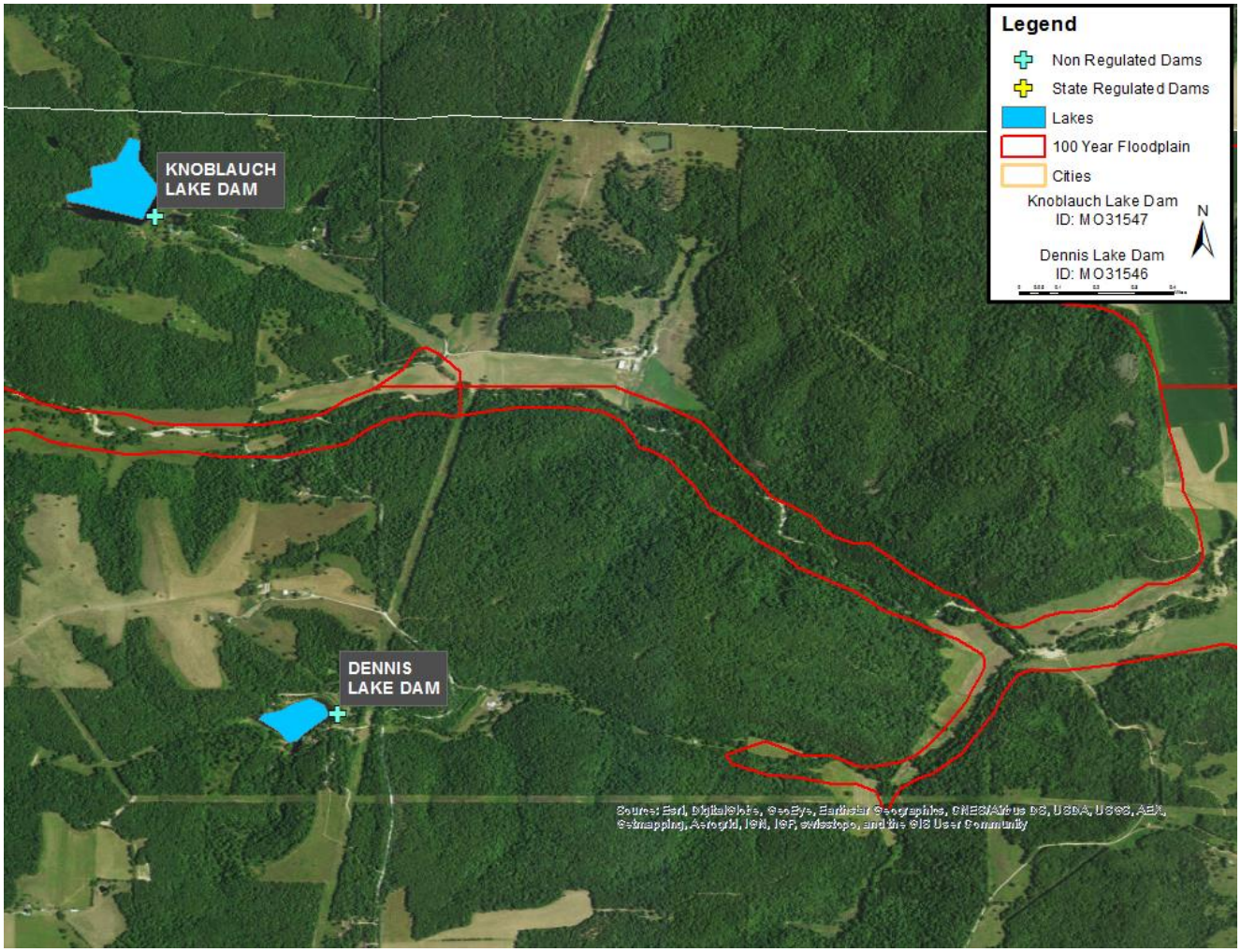


Figure 3.13. Affolter Lake Dam Inundation Zone

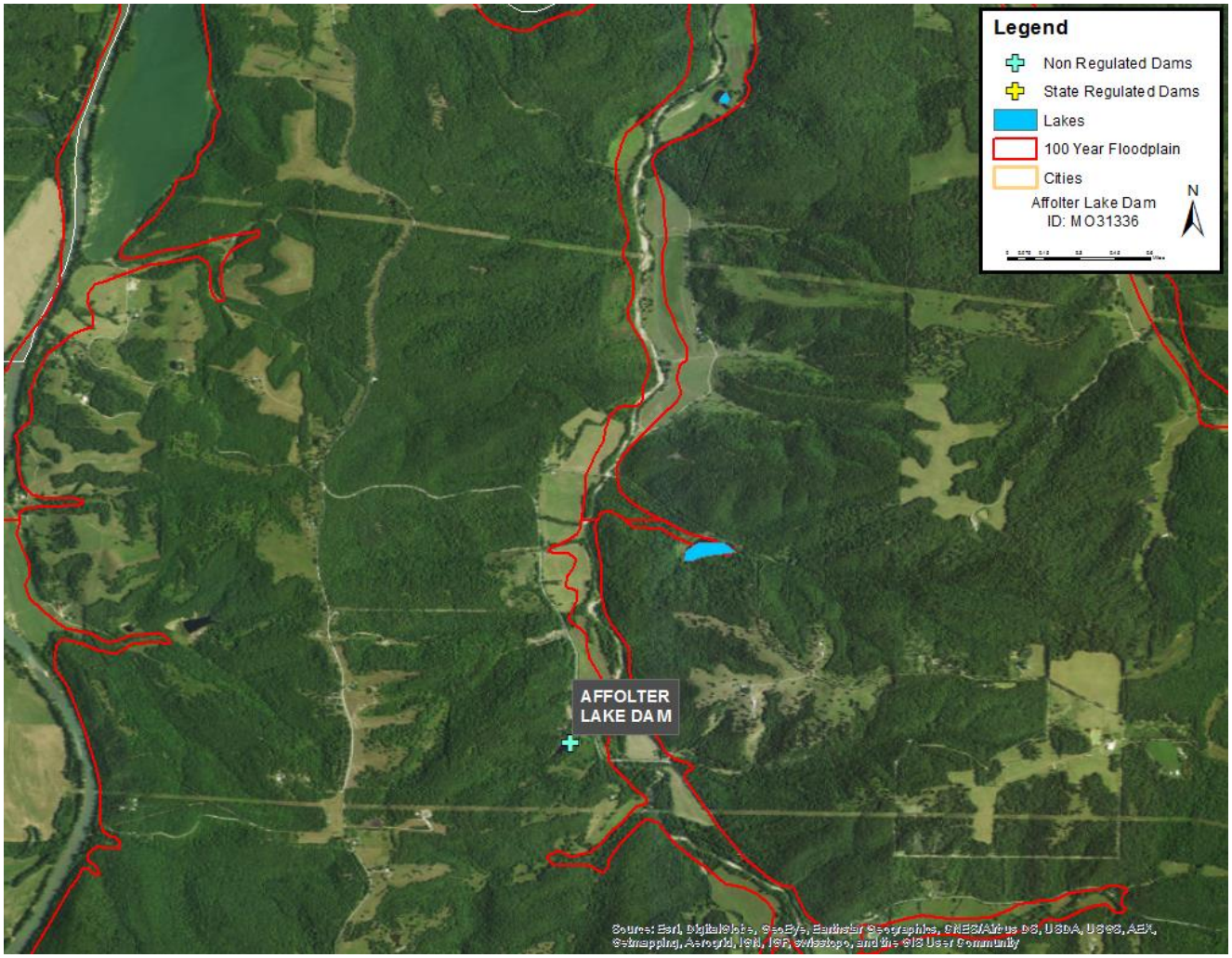


Figure 3.14. Cardetti Lake Dam Inundation Zone

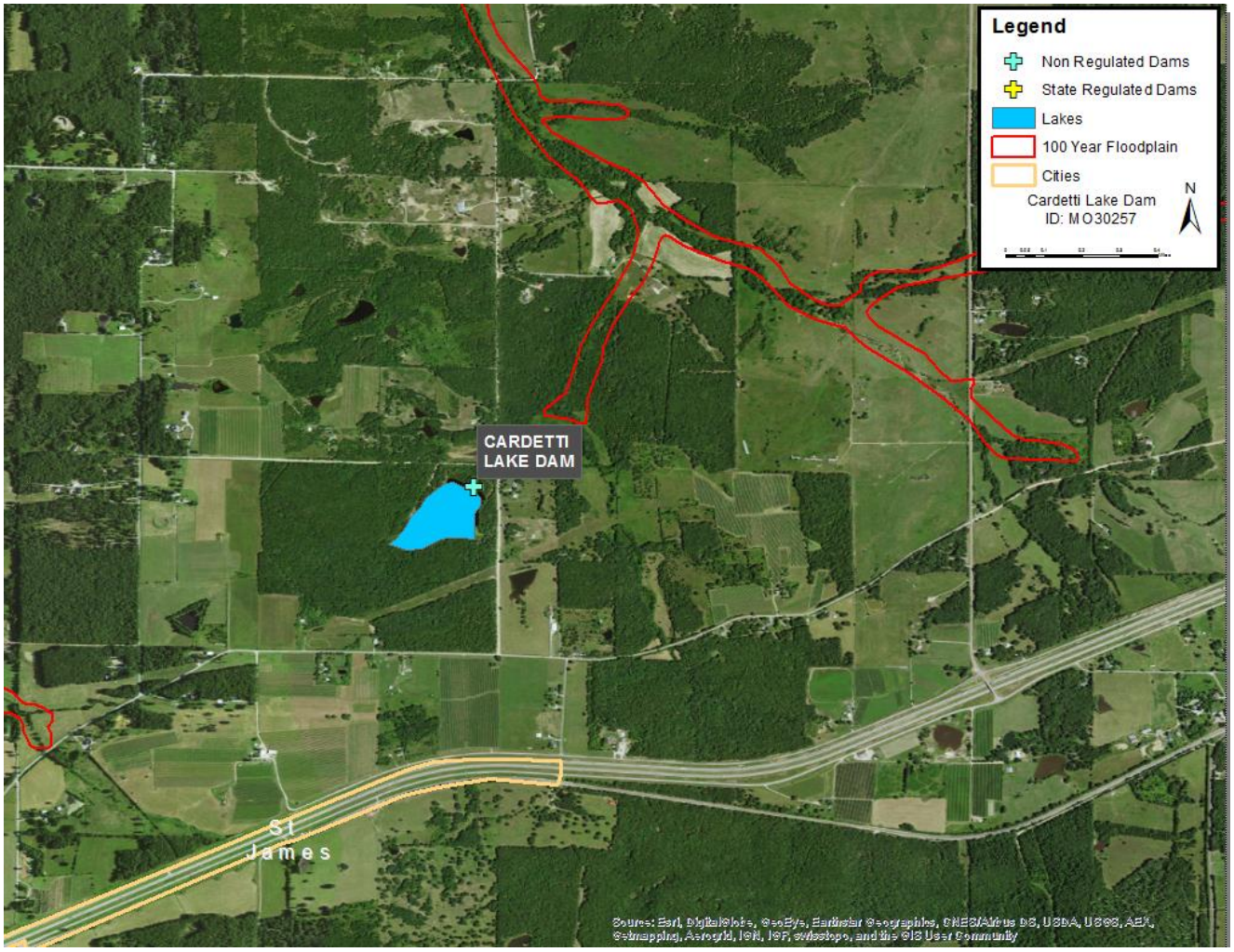


Figure 3.15. Scott's Pond Dam Inundation Zone

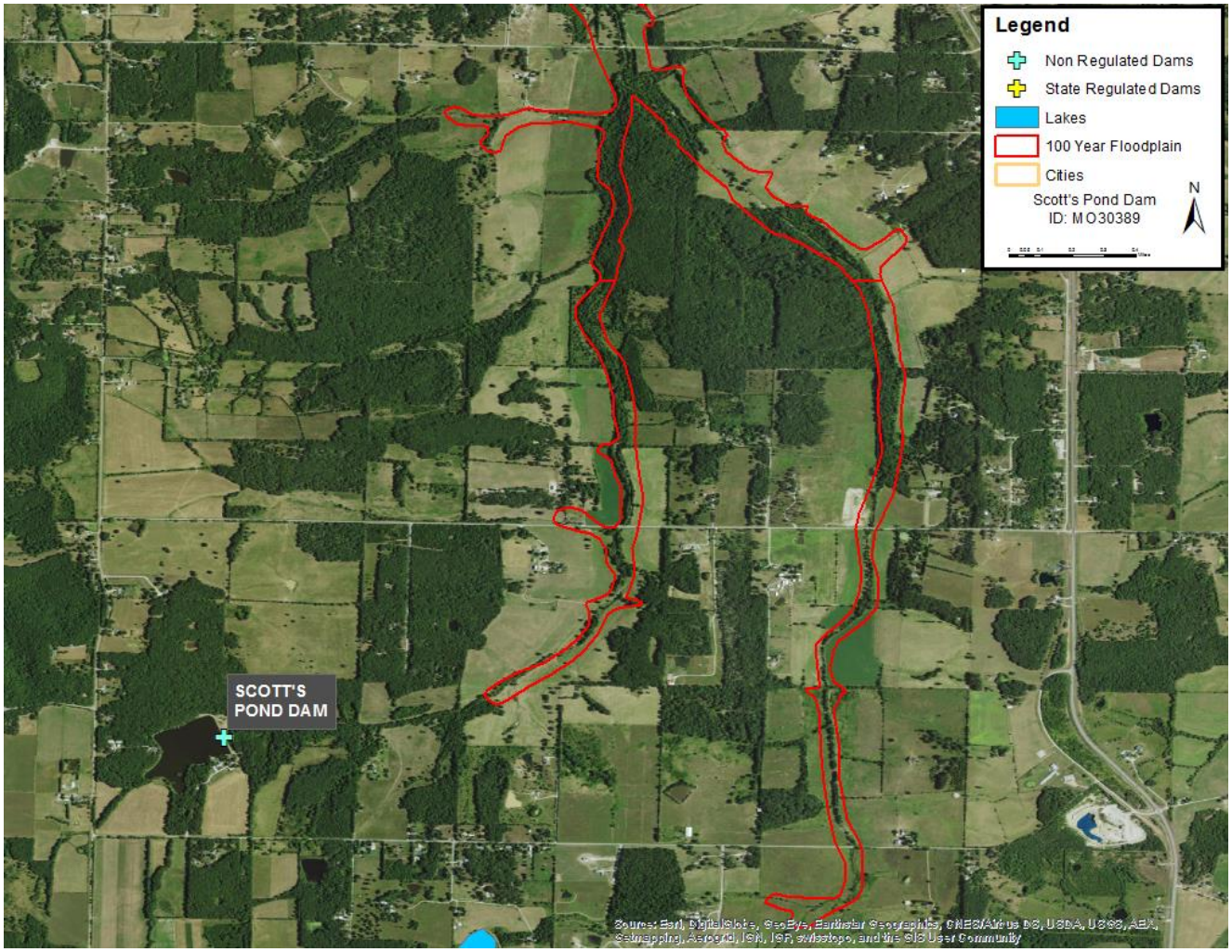
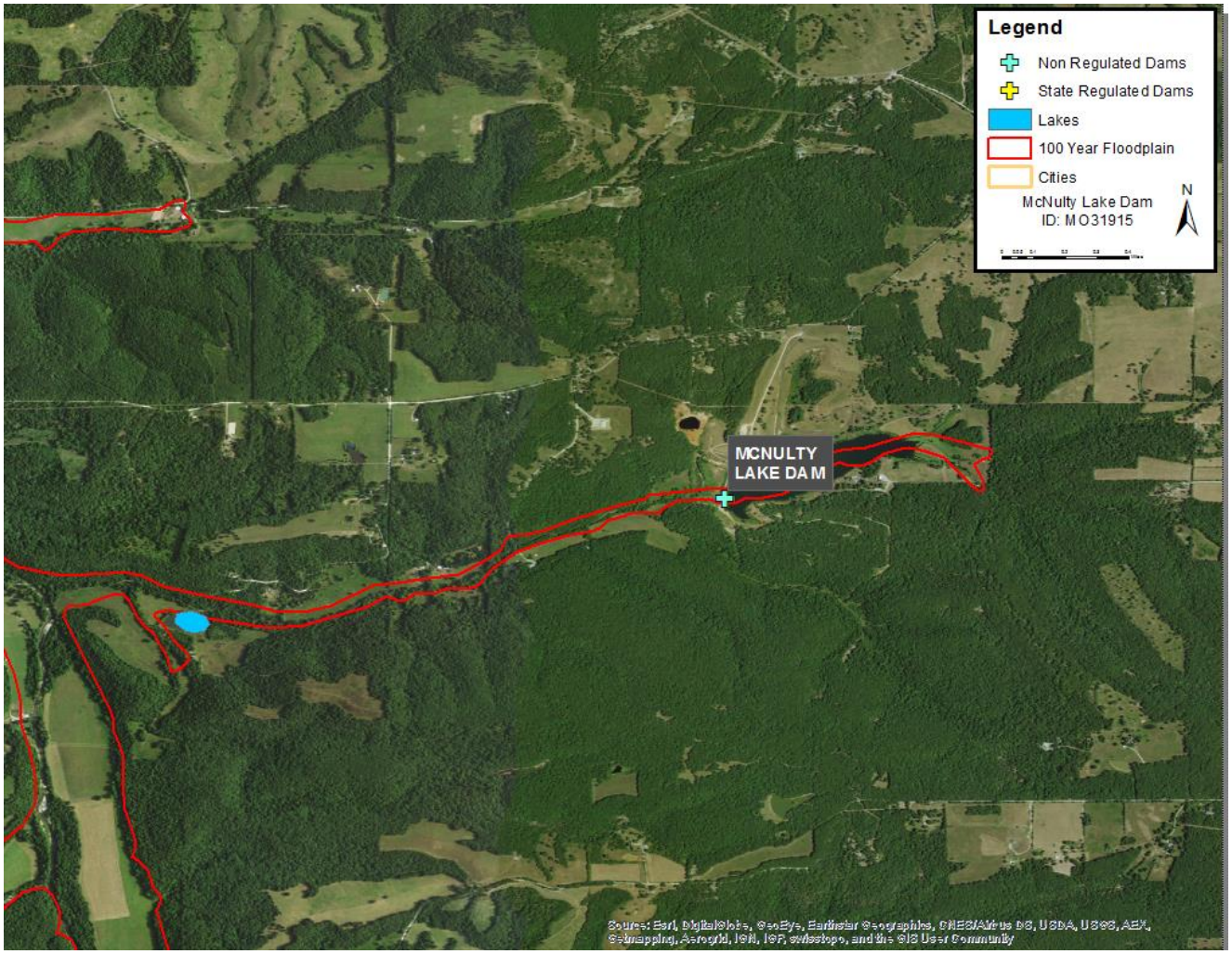


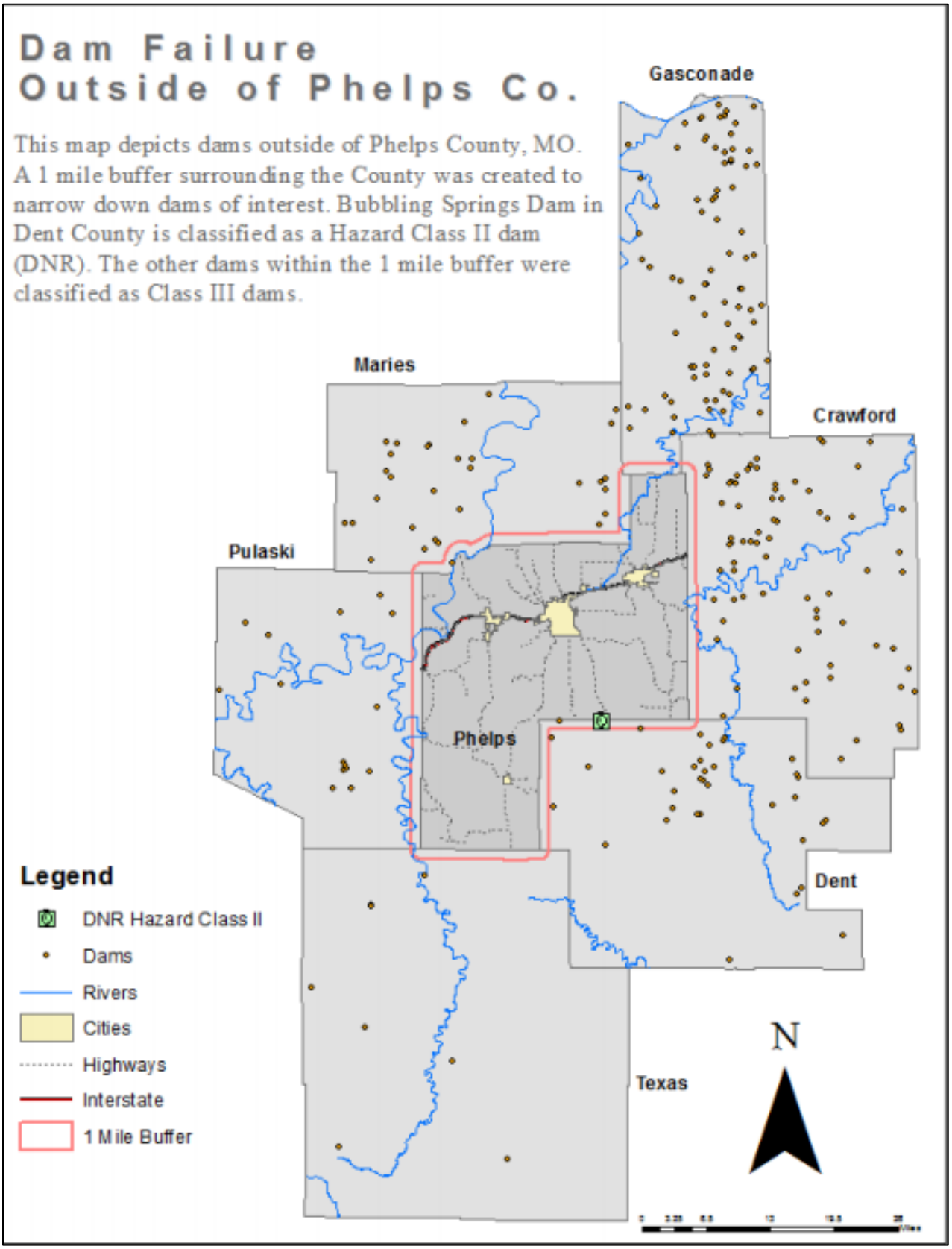
Figure 3.16. McNulty Lake Dam Inundation Zone



Upstream Dams Outside the Planning Area

Figure 3.17 depicts dams outside of Phelps County that could impact the planning area in the event of failure. All but one dam is classified as low hazard. Bubbling Springs Dam in Dent County is the only dam classified as a significant hazard dam. Impacts would be negligible in the event of failure due to the rural nature of the area.

Figure 3.17. Upstream Dams Outside Phelps County



Source: MSDIS, MRPC

Strength/Magnitude/Extent

The strength/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 Brays Lake Dam. With a subdivision located downstream, residents would have approximately 15 minutes to evacuate their homes. Serious residential damage and loss of life is likely.

Previous Occurrences

According to Stanford University's National Performance of Dams Program and the Missouri State Emergency Management Agency, there were 86 recorded dam incidents in Missouri between 1917 and 2008. For the 42-year period from 1975 to 2016 for which dam failure statistics are available, 19 dam failures and 68 incidents are recorded. 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 park[8]. The deluge destroyed Johnson's Shut-Ins State Park facilities, including the campground, and deposited sediment, boulders and debris into the park. The flood of debris diverted the East Fork of the Black River into an older channel and turned the river chocolate brown. Fortunately the breach occurred in mid-winter. Five people were injured when the park superintendent's home was swept away by the flood, but all were rescued and eventually recovered. Had it been summer, and the campground filled with park visitors, the death toll could have been very high[9]. This catastrophe has focused the public's attention on the dangers of dam failures and the need to adequately monitor dams to protect the vulnerable.

Despite the significance of the immediate damage done by the Taum Sauk Reservoir dam failure, the incident also highlights the long-term environmental and economic impacts of an event of this magnitude. Four years later, the toll of the flooding and sediment on aquatic life in the park and Black River is still being investigated. Even after the removal of thousands of dump truck loads of debris and mud, the river is still being affected by several feet of sediment left in the park. The local economy, heavily reliant upon the tourism from the park and Black River, has also been hit hard[10].

The only incidents involving dams in Phelps County include Brays Lake Dam and McNulty Lake Dam

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

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

[10] The Alert. Spring 2006. After the Deluge…What's Ahead for Taum Sauk? By Dan Sherburne.

on May 13, 1991.

Event Description

McNulty Lake Dam: Water was flowing approximately 1 foot above the emergency spillway sill. Reservoir status: approximately 1.2 feet above normal pool. Erosion was noted in the south groin and on the south end of the dam along with south abutment, appeared to withstand the flood with minimal damage.

Brays Lake Dam: Downstream residents were concerned that the dam had failed, but the reservoir was actually 36.5 feet below the crest. A very intense rainstorm had cause Beaver Creek to flood. Upon inspection, seepage was found in the right groin of the dam.

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 possible[11]. In addition, dam failure within the county has not occurred according to available data.

Changing Future Conditions Considerations

According to the Missouri State Hazard Mitigation Plan, studies have been conducted to investigate the impact of climate change scenarios on dam safety. Dam failure is already tied to flooding and the increased pressure flooding places on dams. The impacts of changing future conditions on dam failure will most likely be those related to changes in precipitation and the likelihood of flooding. Projections of changes in future conditions suggest that precipitation may increase and occur in more extreme events, which may increase risk the flooding, putting stress on dams and increasing the likelihood of dam failure.[i12]

The safety of dams in the future can be based on an evaluation of changes in design floods and the freeboard available to accommodate an increase in flood levels. The results from the studies indicate that the design floods with the corresponding outflow floods and flood water levels will increase in the future. This increase will affect the safety of the dams in the future. Studies concluded that the total hydrological failure probability of a dam will increase in the future climate and that the extent and depth of flood waters will increase by the future dam break scenario.[13]

Vulnerability

Vulnerability Overview

Data was obtained from the 2018 Missouri State Hazard Mitigation Plan for the vulnerability analysis of dam failure for Phelps County. There are however data limitations regarding dams unregulated by the State of Missouri due to height requirements. These limitations hinder vulnerability analysis; nonetheless, failure potential still exists. **Table 3.21** provides vulnerability analysis data for the failure of State-regulated dams in Missouri.

[11] 2018 Missouri State Hazard Mitigation Plan
[12] Ibid.
[13] Ibid.

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

County	Class 1	Class 2	Class 3	Total	Estimated # of Buildings Vulnerable	Average Exposure Value per Structure ($)	Estimated Total Potential Building Exposure ($)	Estimated Total Population Exposure	Estimated Building Losses ($)
Phelps	2	1	1	4	52	$205,823	$10,702,801	96	$2,140,560

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.
- 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.

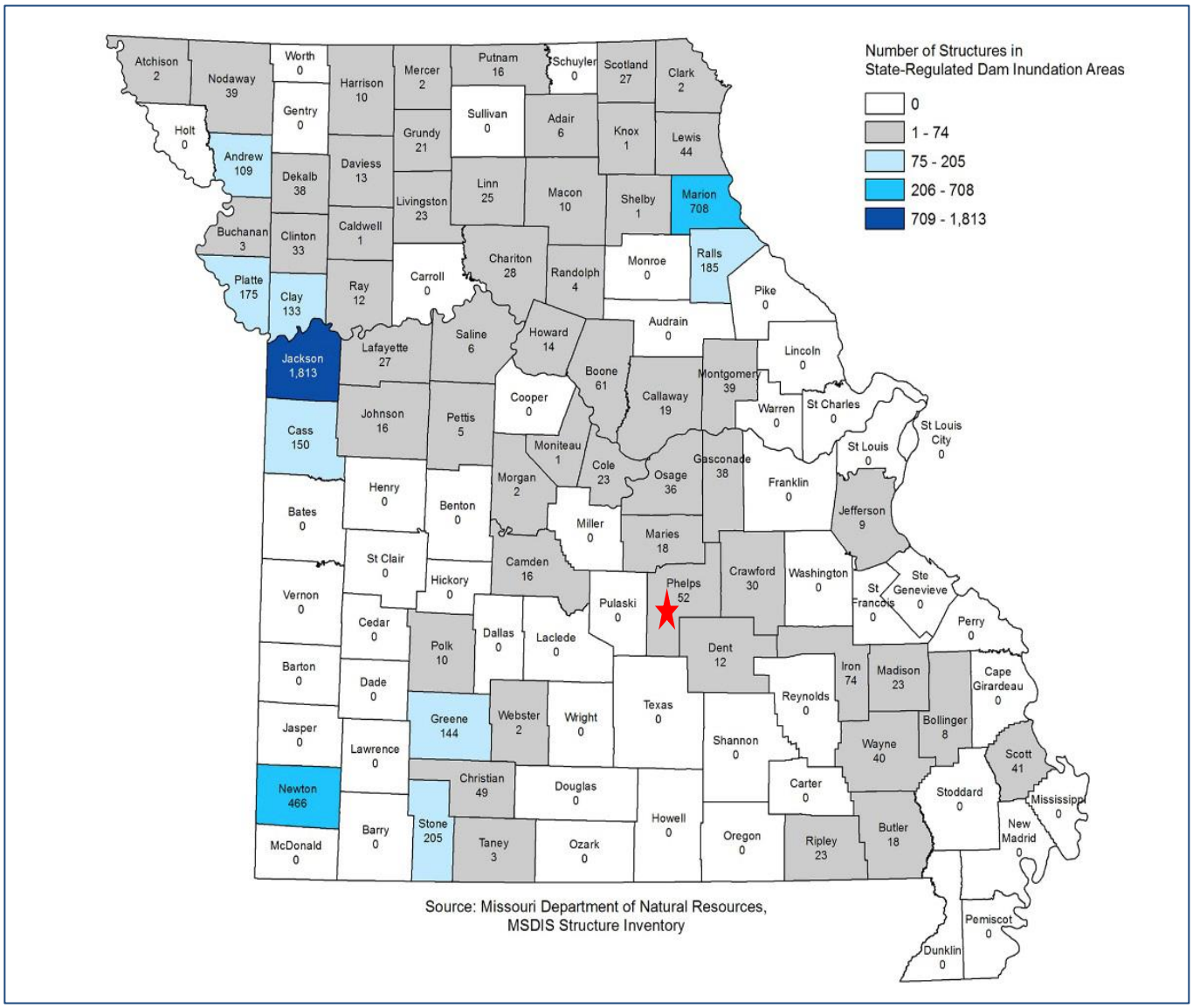
According to the 2018 Missouri State Hazard Mitigation Plan, there is an estimated 52 buildings vulnerable to failure of State-regulated dams (**Figure 3.18**) in Phelps County. Furthermore, the state quantified potential loss estimates in terms of property damages. To execute the analysis, the following 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.[14]

Figure 3.19 and **Figure 3.20** depict the total estimated building losses and population exposure by county, respectively. The estimated building losses from failure of State-regulated dams is $2.14 million. The estimated population exposure to failure of State-regulated dams ranges between 1 and 104.

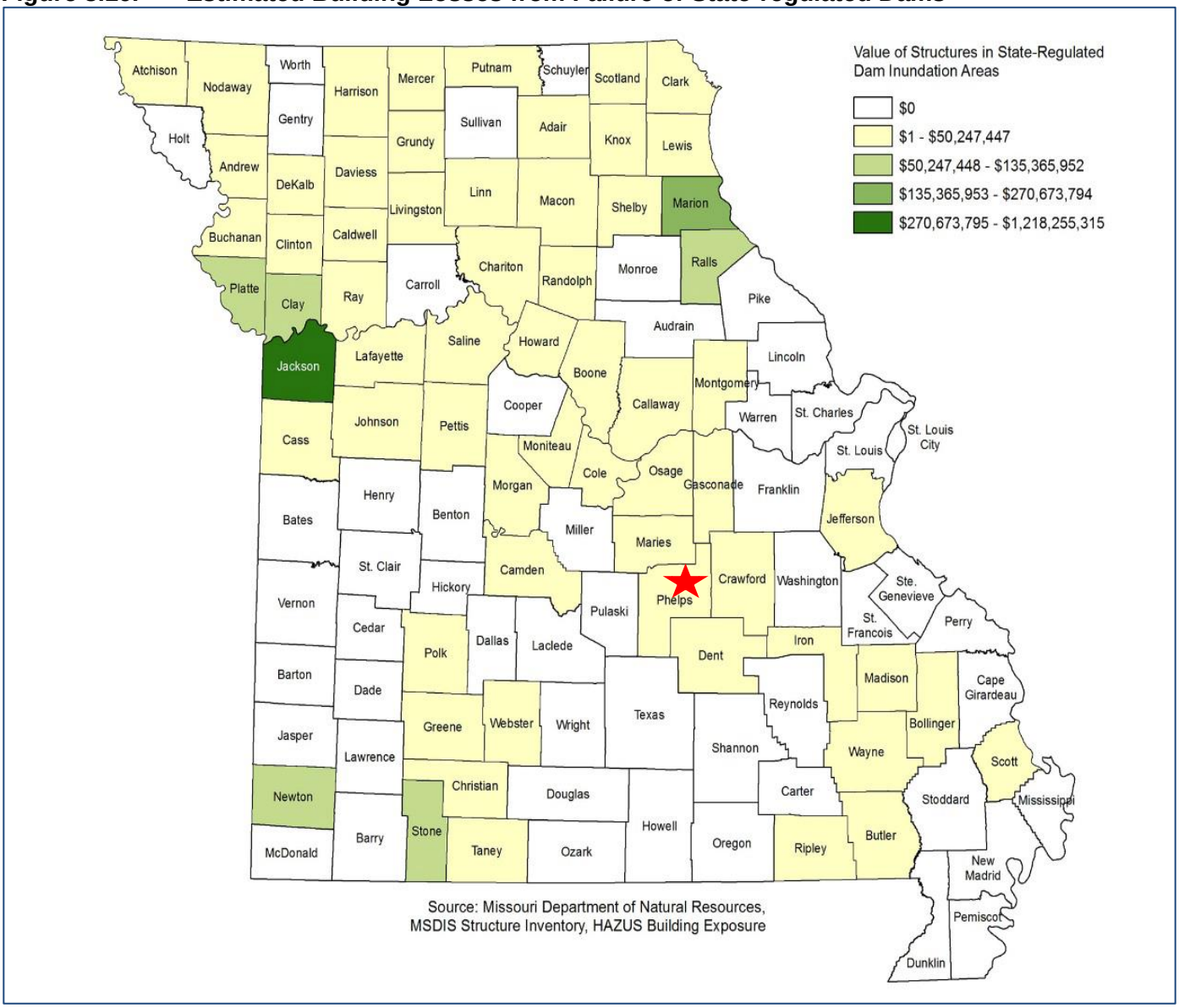
Figure 3.18. Estimated Number of Buildings Vulnerable to Failure of State-regulated Dams



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

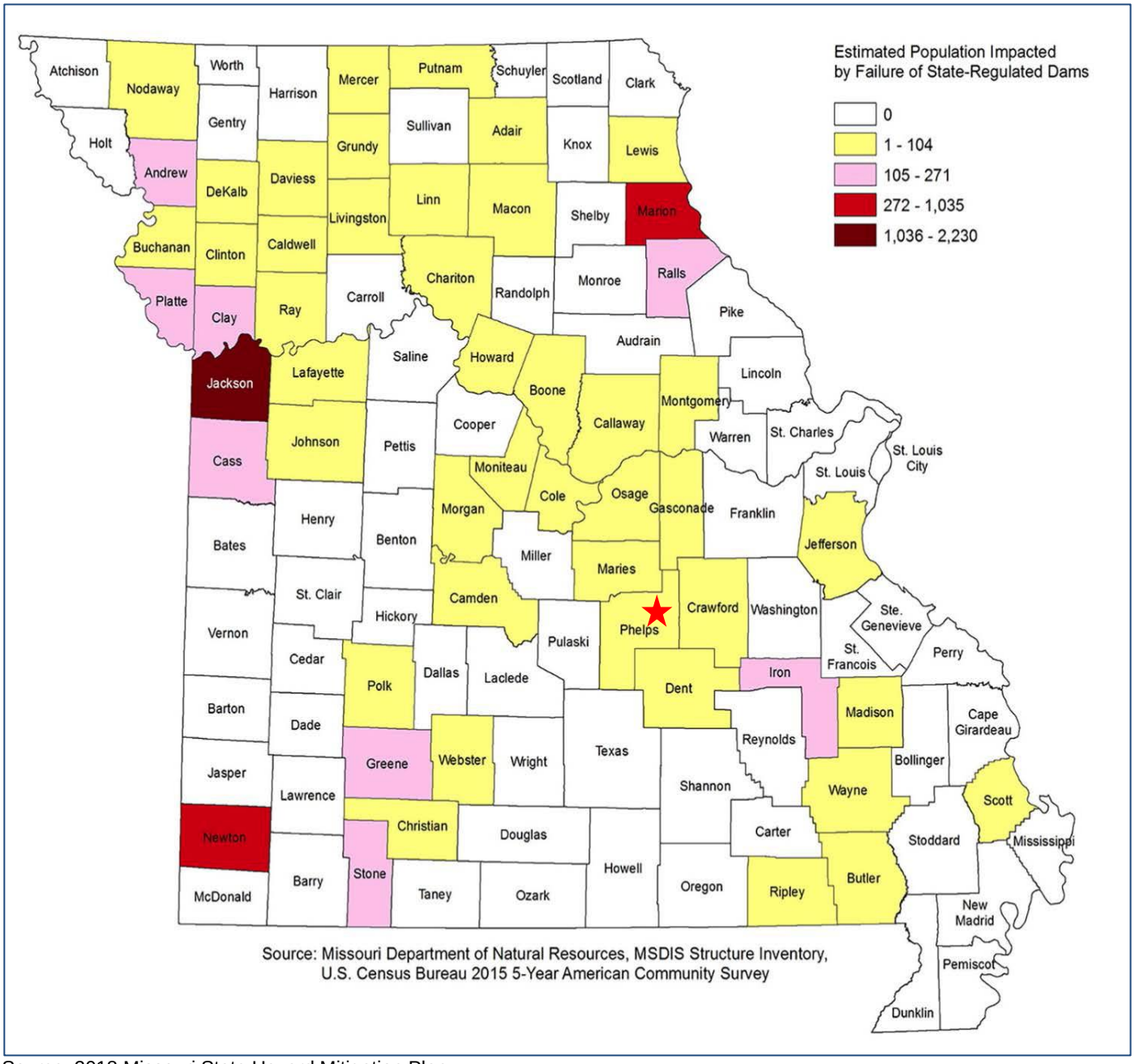
[14] 2018 Missouri State Hazard Mitigation Plan

Figure 3.19. Estimated Building Losses from Failure of State-regulated Dams



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

Figure 3.20. Estimated Population Exposure to Failure of State-regulated Dams



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

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

During the event of failure, William E. Towell Dam (**Figure 3.5**) would experience serious loss to road infrastructure downstream of the dam. Lake Scioto Dam (**Figure 3.6**) failure severity would be limited; primarily impacting road infrastructure. However, if Brays Lake Dam (**Figure 3.7**) was breached, serious loss to road infrastructure, residential structures, and human life is probable; specifically, impacting the subdivision on Beaver Manor Road (**Figure 3.8**). During the event of failure, water

would reach the subdivision in approximately 15 minutes[15].

William E. Towell Dam Downstream Crossings

- Rte. RA
- Co Rd 2250
- Co Rd 2220
- Rte. V
- State Hwy 68
- Co Rd 432
- Co Rd 1280
- Co Rd 1300
- Rte. B
- Bowen Cemetery Rd
- Red Bird Rd
- Glasser Hollow Rd
- Rte. EE
- Koenig Rd
- Enke Rd
- State Hwy 19
- Hog Trough Rd

Lake Scioto Dam Downstream Crossings

- Co Rd 3450
- State Hwy 8

Brays Lake Dam Downstream Crossings

- Co Rd 5180
- Co Rd 5190
- US 63
- Co Rd 7360
- Rte. T
- I-44

During the event of Blues Pond Dam failure, approximately 10 or more structures, including Rolla's Southwest Waste Water Treatment Plant, as well as road infrastructure could experience serious loss (**Figure 3.9**). During the event of the Tripoli Valley Dam failure, 10 or more permanent dwellings could experience serious loss (**Figure 3.10**). In addition, the Knoblauch Lake Dam (**Figure 3.12**), Cardetti Lake Dam (**Figure 3.14**), and McNulty Lake Dam (**Figure 3.16**) failure, could impact residential structures; along with road infrastructure. The remaining dams, Walnut Hill Lake Dam (**Figure 3.11**), Dennis Lake Dam (**Figure 3.12**), Affolter Lake Dam (**Figure 3.13**), and Scotts Pond Dam (**Figure 3.15**) are located in rural areas. Damages would be limited to road infrastructure during the event of failure.

Blues Pond Dam Downstream Crossing

- I-44
- Southwest Wastewater Treatment Plant
- 7100

Tripoli Valley Dam Downstream Crossing

[15] Missouri Department of Natural Resources

- Gunter Rd

Walnut Hill Lake Dam Downstream Crossing
- Boys Town Rd
- State Hwy 8

Knoblauch Lake Dam Downstream Crossing
- Bacon Rd

Dennis Lake Dam Downstream Crossing
- Bacon Rd

Affolter Lake Dam Downstream Crossing
- State Hwy C

Cardetti Lake Dam Downstream Crossing
- Vineyard Rd
- Co Rd 1090
- Co Rd 1140
- Co Rd 1210

Scotts Pond Dam Downstream Crossing
- Haas Rd
- Co Rd 151
- Co Rd 147

McNulty Lake Dam Downstream Crossing
- Merry Meadows Farm Rd
- Vessie Rd
- S Hudgens Rd

The city of Rolla has two small dams under 25 feet that are not listed by NID or state-regulated, Ber Juan Dam and Shuman Lake Dam. In the event that the Ber Juan dam was breached it would flood some residences and roads. In the event that the Shuman Lake Dam was breached it would flood railroad tracks. The City of Rolla states that the breach of Shuman Lake is highly unlikely due to the presence of overflow and the dam was built to vastly exceed the amount of water held.

Impact of Previous and Future Development

Previous and 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. No development is planned in any floodplain or areas downstream of dams in the county or cities.

Hazard Summary by Jurisdiction

Variations in vulnerability across the planning area depend upon multiple variables. For example, with just 4 state-regulated dams and 12 NID high hazard dams, 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, Phelps County school districts and special districts do not have assets located in dam breach inundation areas. The city of Rolla does have one dam – Blues Pond Dam - that poses a hazard to some residential areas, a wastewater treatment plant, and road infrastructure.

Problem Statement

In summary, the hazard risk for dam failure in Phelps 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 landowners 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/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
    - Vulnerability to drought by County
    - Crop insurance claims due to drought by County

Hazard Profile

Hazard Description

Drought is generally defined as a condition of moisture levels significantly below normal for an extended period of time over a large area that adversely affects plants, animal life, and humans. A drought period can last for months, years, or even decades. There are four types of drought conditions relevant to Missouri, according to the 2018 Missouri State Hazard Mitigation Plan, which are as follows.

- Meteorological drought is defined in terms of the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. A meteorological drought must be considered as region-specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.

- Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (e.g., streamflow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to

show up in components of the hydrological system such as soil moisture, streamflow, and ground water and reservoir levels. As a result, these impacts also are out of phase with impacts in other economic sectors.

- Agricultural drought focus is on soil moisture deficiencies, differences between actual and potential evaporation, reduced ground water or reservoir levels, etc. Plant demand for water depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil.
- Socioeconomic drought refers to when physical water shortage begins to affect people[16] - which impacts supply and demand of some economic commodity.

Geographic Location

All areas and jurisdictions in Phelps 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 Phelps County rely on groundwater resources for drinking water. Approximately 36% of the land in the county is utilized for agricultural purposes. Furthermore, livestock sales comprise 84% of the market of agricultural products sold in Phelps County. A drought would directly impact livestock production and the agriculture economy in Phelps County[17].

Strength/Magnitude/Extent

The National Drought Monitor Center at the University of Nebraska at Lincoln summarized the potential severity of drought as follows. Drought can create economic impacts on agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to losses in yields in crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and disease to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn place both human and wildlife populations at higher levels of risk. Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Finally, while drought is rarely a direct cause of death, the associated heat, dust and stress can all contribute to increased mortality[18].

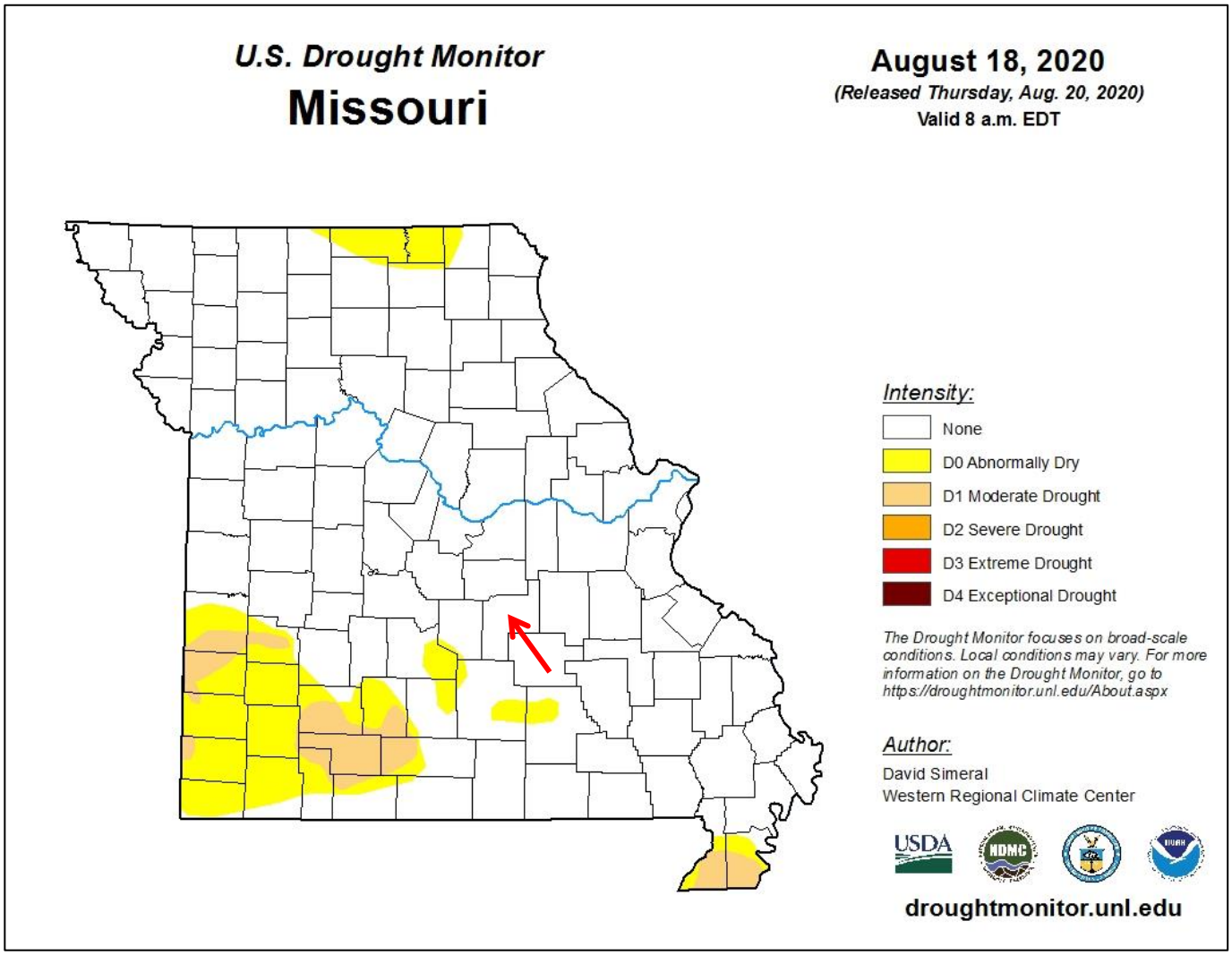
Figure 3.21 depicts a U.S. Drought Monitor map of Missouri on August 18, 2020. This map illustrates the planning area, which could be in drought at any given moment in time. A red arrow indicates the location of the planning area (Phelps County).

[16] http://www.drought.unl.edu/ http://droughtreporter.unl.edu/

[17] http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/cp29161.pdf

[18] Ibid

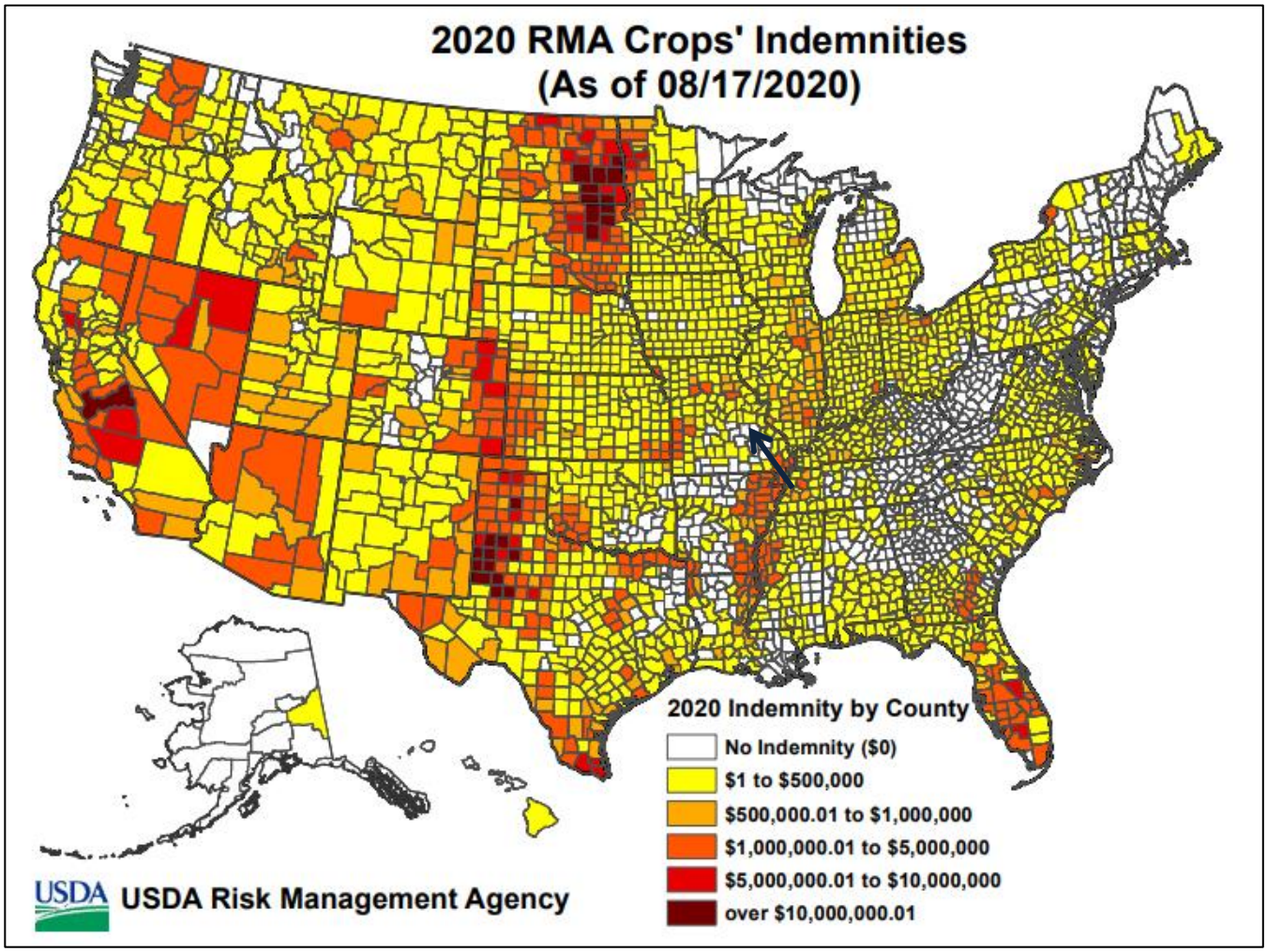
Figure 3.21. U.S. Drought Monitor Map of Missouri on August 18, 2020



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

Figure 3.22 illustrates RMA crop indemnities for 2020 across the United States. Phelps County fell in the $0 category for crop indemnities.

Figure 3.22. 2020 RMA Crop Indemnities for the United States



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

According to the USDA's Risk Management Agency, there have been 4 crop insurance payments due to drought in Phelps County since 1999, totaling $659,806.70. **Table 3.22** illustrates the year, number of payments, and total amount of crop insurance payments.

Table 3.22. Phelps County Crop Indemnity Payments (1999-2019)

Year	Number of Payments	Total
1999	1	$2834.00
2000	-	-
2001	-	-
2002	-	-
2003	1	$1518.00
2004	-	-
2005	-	-
2006	-	-

Year	Number of Payments	Total
2007	-	-
2008	-	-
2009	-	-
2010	-	-
2011	-	-
2012	-	-
2013	-	-
2014	-	-
2015	-	-
2016	-	-
2017	1	$2982.00
2018	1	$1659.00
2019	-	-
TOTAL	**4**	**$8,993.00**

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

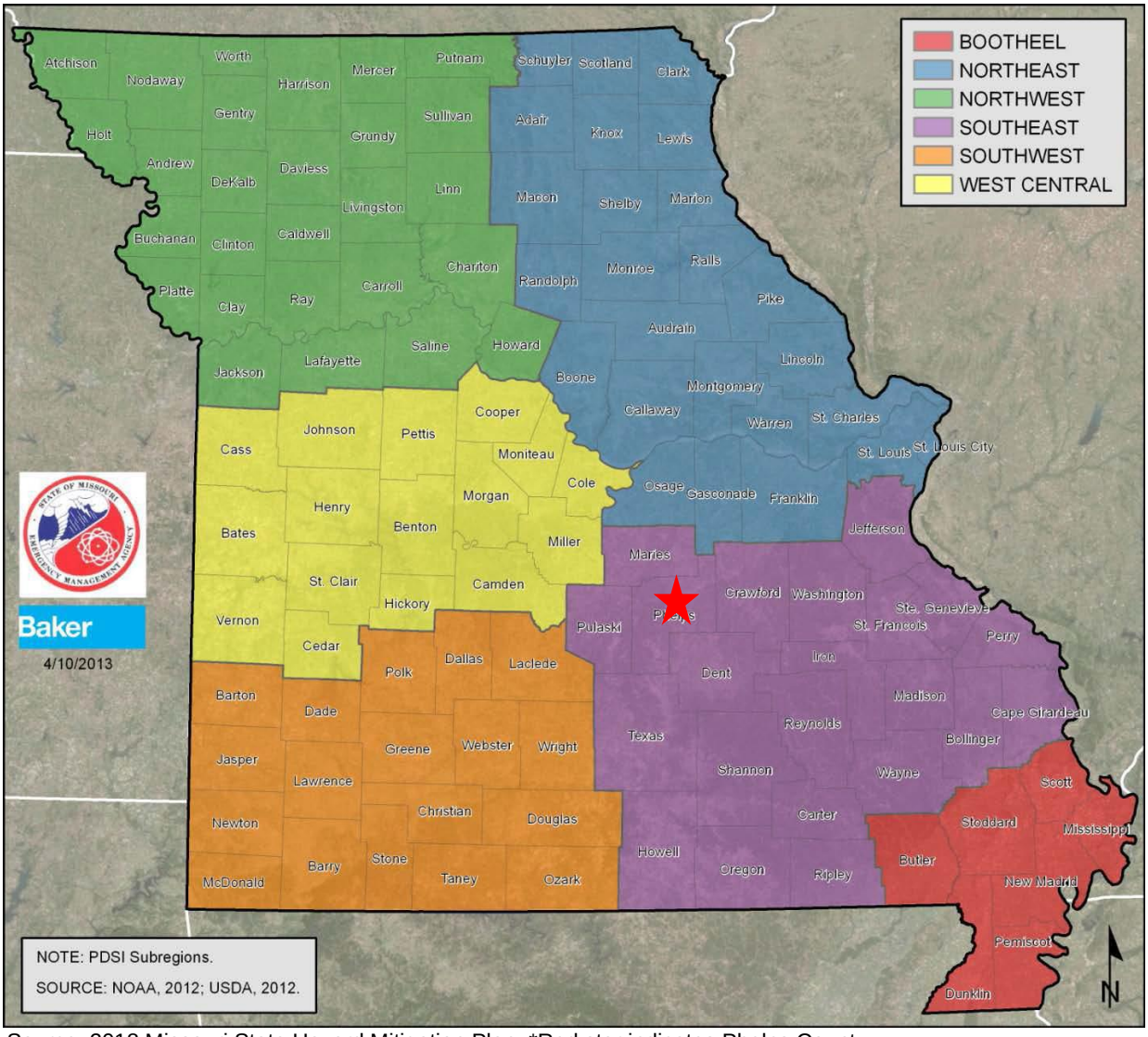
The Palmer Drought Indices measure dryness based on recent precipitation and temperature. The indices are based on a "supply-and-demand model" of soil moisture. Calculation of supply is relatively straightforward, using temperature and the amount of moisture in the soil. However, demand is more complicated 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 3.23 illustrates the Palmer Drought Severity Index sub-regions of Missouri. Phelps County is categorized under the Southeast sub-region.

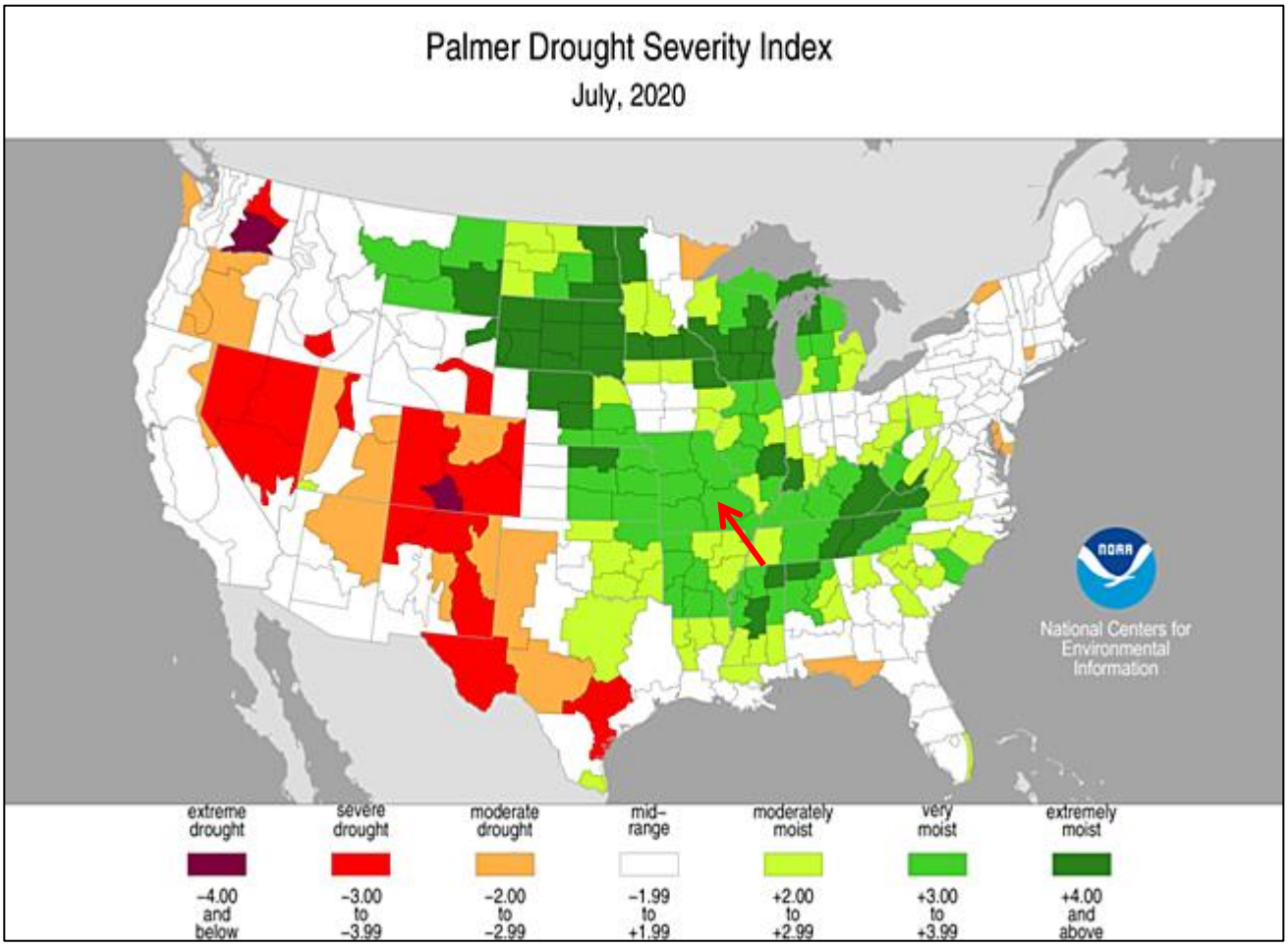
Figure 3.23. Palmer Drought Severity Index: Missouri Sub-regions



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

Figure 3.24 is an example of the Palmer Modified Drought Index for the United States on July, 2020.

Figure 3.24. Palmer Modified Drought Index National Map July, 2020



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

Data was collected from the Missouri Department of Natural Resources (2020 Census of Missouri Public Water Systems) to determine water source by jurisdiction. Phelps County and the cities of Doolittle, Edgar Springs, Newburg, Rolla, and St. James utilize well water as their sole source of water (**Table 3.23**). Communities that exclusively depend upon ground water could experience hardship in the event of a long-term drought.

Table 3.23. 2020 Water Source by Jurisdiction

Jurisdiction	% of source that is groundwater
Phelps County	100
Doolittle	100
Edgar Springs	100
Newburg	100
Rolla	100
St. James	100

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

Previous Occurrences

Table 3.24 offers Palmer Drought Severity Index data for Phelps County between 2010 and 2019. This information exemplifies drought conditions on a monthly basis for Missouri's Southeast sub-region within the United States.

Table 3.24. Palmer Drought Severity Index for Phelps County, MO (2010 – 2019)

	Year									
Month	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Jan.	Extremely moist	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range	Very moist	Mid-range	Severe drought	Moderately moist
Feb.	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Very moist	Mid-range	Mid-range	Moderately moist
March	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range	Mid-range	Moderately moist
April	Mid-range	Very moist	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range	Moderately moist
May	Mid-range	Very moist	Moderate drought	Mid-range	Mid-range	Mid-range	Moderately moist	Very moist	Mid-range	Very moist
June	Mid-range	Mid-range	Moderate drought	Mid-range	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range	Very moist
July	Mid-range	Mid-range	Severe drought	Mid-range	Mid-range	Moderately moist	Moderately moist	Moderately moist	Mid-range	Very moist
Aug.	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Very moist	Very moist	Moderately moist	Mid-range	Extremely moist
Sept.	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Moderately moist	Very moist	Mid-range	Mid-range	Very moist
Oct.	Mid-range	Mid-range	Moderate drought	Moderately moist	Mid-range	Mid-range	Very moist	Mid-range	Mid-range	Very moist
Nov.	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Very moist	Very moist	Moderate drought	Mid-range	Extremely moist
Dec.	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Extremely moist	Moderately moist	Severe drought	Mid-range	Very moist

Source: https://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/psi/201001-201912

Probability of Future Occurrence

To calculate the probability of future occurrence of drought in Phelps County, historical climate data was analyzed. There were 33 months of recorded drought (**Table 3.25**) over a 21-year span (January, 1999 to December, 2019). 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 3.26**). Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increase change of drought.

Table 3.25. Palmer Drought Severity Index for Phelps County, MO (1999 – 2019)

	Year											
Month	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
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											
2019												

Source: https://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/psi/199901-201912
*x indicates drought

Table 3.26. Annual Average Percentage Probability of Drought in Phelps County, MO

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

Source: NOAA National Centers for Environmental Information, Historical Palmer Drought Indices
*P = probability; see page 3.44 for definition.

Changing Future Conditions Considerations

According to the 2018 Missouri Hazard Mitigation Plan, severe drought is a natural part of Missouri's climate and is a risk to agriculture. Future increases in evaporation rates due to higher temperatures may increase the intensity of naturally occurring droughts. Although it is believed that springs will be wetter, summer droughts are likely to be more severe. Higher evaporation and lower summer rainfall are likely to reduce river flows. The number of heavy rainfall events is predicted to increase, with the overall total rainfall amounts to remain the same. This indicates that there will be periods of heavy rainfall followed by longer periods of dry days. Higher temperatures and increased evapotranspiration increase the likelihood of drought and its negative impact on agriculture.[19]

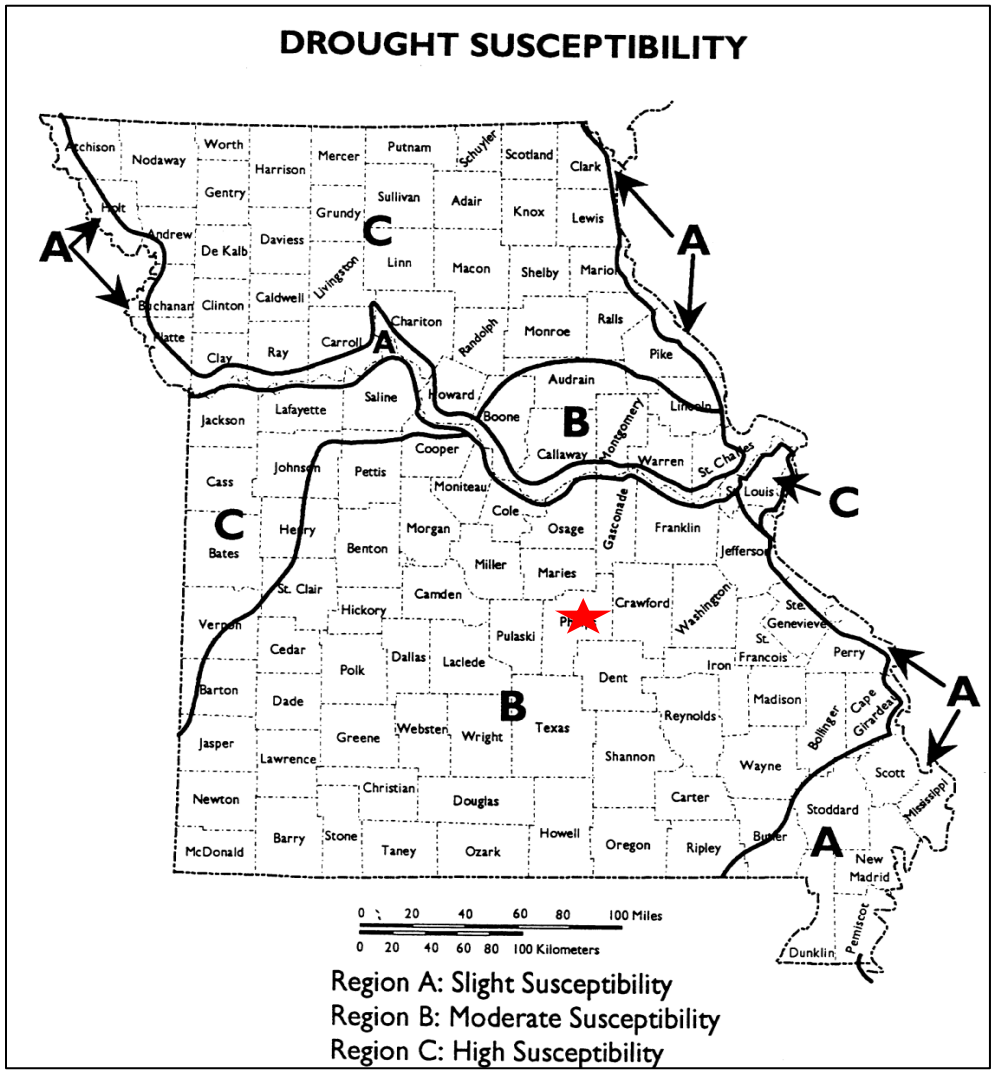
Vulnerability

Vulnerability Overview

Data was obtained from the 2018 Missouri State Hazard Mitigation Plan for the drought vulnerability analysis. **Table 3.27** depicts the ranges for drought vulnerability factor ratings created by SEMA. The array ranges between 1 (low) and 5 (high). The factors considered include social vulnerability, crop exposure ratio, annualized crop claims paid and likelihood of occurrence. Once the ranges were determined and applied to all factors considered in the analysis, the ratings were combined to determine an overall vulnerability rating for drought. Phelps County is determined as having a low-medium vulnerability to crop loss (**Table 3.28**) as a result of a drought. Additionally, SEMA has divided the State into 3 regions in regards to drought susceptibility (**Figure 3.25**). Phelps County is included in Region B (Moderate Susceptibility). Region B is described as having groundwater sources that are suitable in meeting domestic and municipal water needs, but due to required well depths, irrigation wells are very expensive. Also, the topography is commonly unsuitable for row-crop irrigation[20].

[19] 2018 Missouri State Hazard Mitigation Plan
[20] Ibid.

Figure 3.25. Drought Susceptibility in Missouri



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

Table 3.27. 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 3.28. Vulnerability of Phelps 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	$0	$0	1	$1,857,000	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 hazards[21].

Impact of Future Development

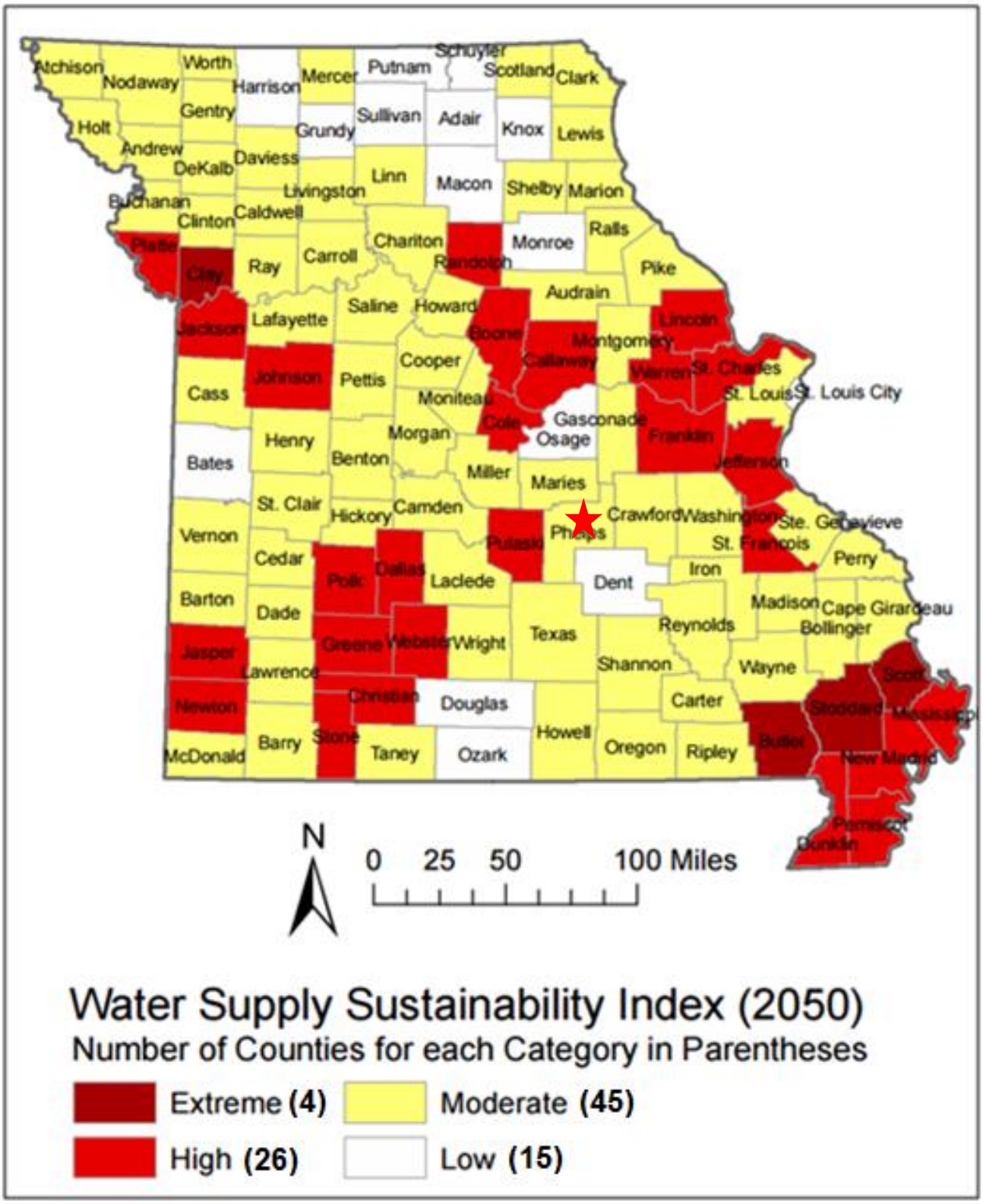
Impacts of drought on future development within Phelps County would be negligible. Population projections as provided by the Missouri Office of Administration suggest that Phelps County will increase by approximately 3,000 individuals by 2030[22]. Moreover, with an increasing population, water use and 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. Phelps County is predicted to experience moderate water shortages as a result of global warming (**Figure 3.26**) by the year 2050.

[21] https://drought.unl.edu/
[22] Missouri Office of Administration http://mcdc.missouri.edu/applications/MO-county-factsheets/?c=29161

Figure 3.26. Water Supply Sustainability Index (2050) with Climate Change Impacts



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

Hazard Summary by Jurisdiction

The variations between jurisdictions are non-existent to minimal. All communities in Phelps County utilize ground/well water as their water source. In all cities, drought conditions would be the same as those experienced in rural areas, but the magnitude would be different with only lawns and local gardens impacted. Long term drought, spanning months at a time, could negatively impact the amount of potable drinking water available.

Problem Statement

In summary, drought within Phelps County is considered low-moderate risk. Climate change predictions also suggest low-moderate risks by the year 2050. Phelps County has some 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 all 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_lg.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 Phelps 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 earthquake[23].

Geographic Location

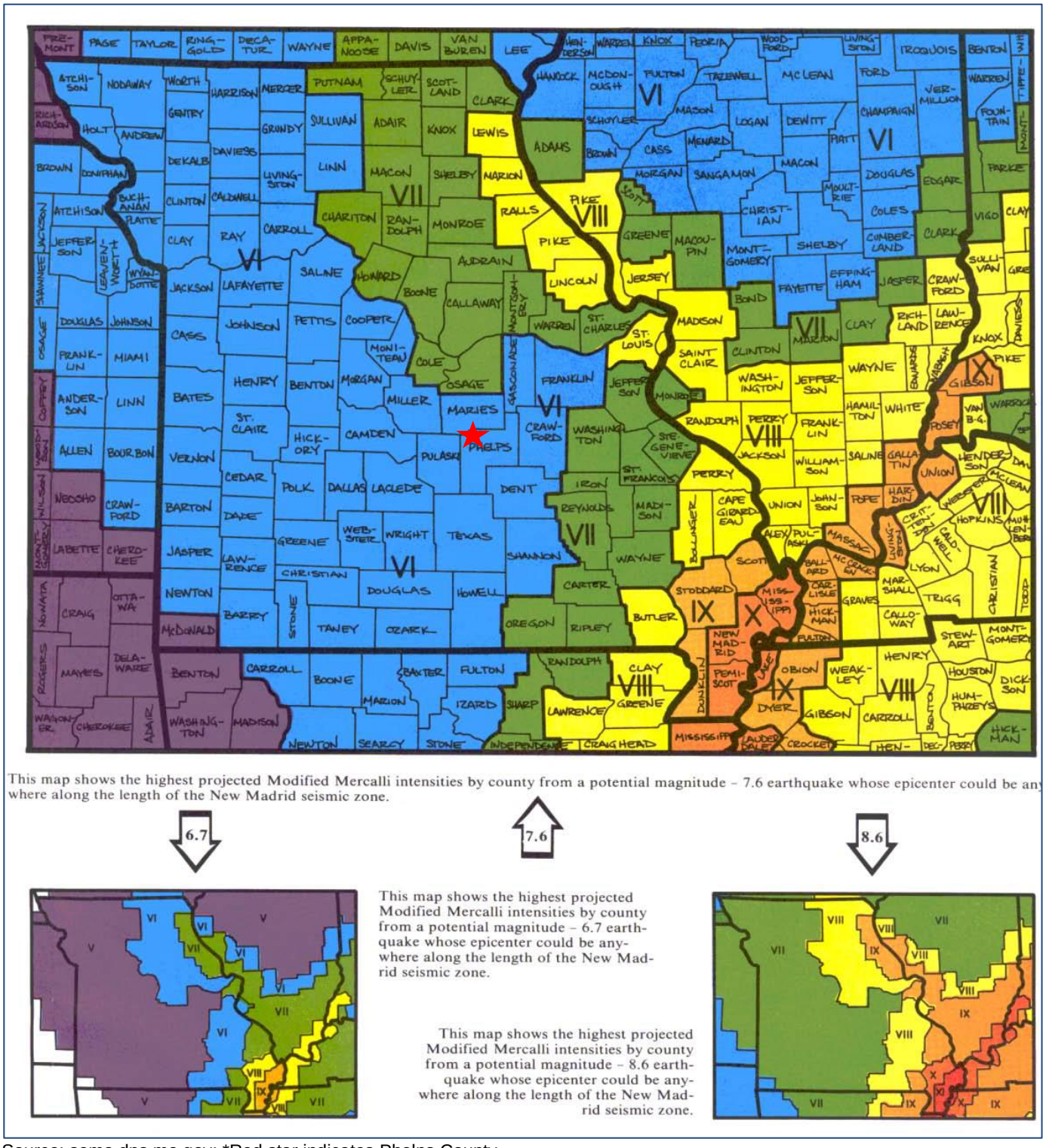
There are eight earthquake source zones in the Central United States, one of which is located within the state of Missouri—the New Madrid Fault. Other seismic zones, because of their close proximity, also affect Missourians. These are the Wabash Valley Fault, Illinois Basin, and the Nemaha Uplift. The 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 3.27 depicts impact zones for a magnitude 7.6 earthquake along the New Madrid Fault along with associated Modified Mercalli Intensities. Phelps County is indicated by a red star. Furthermore,

[23] Missouri Department of Natural Resources, Facts about the New Madrid Seismic Zone

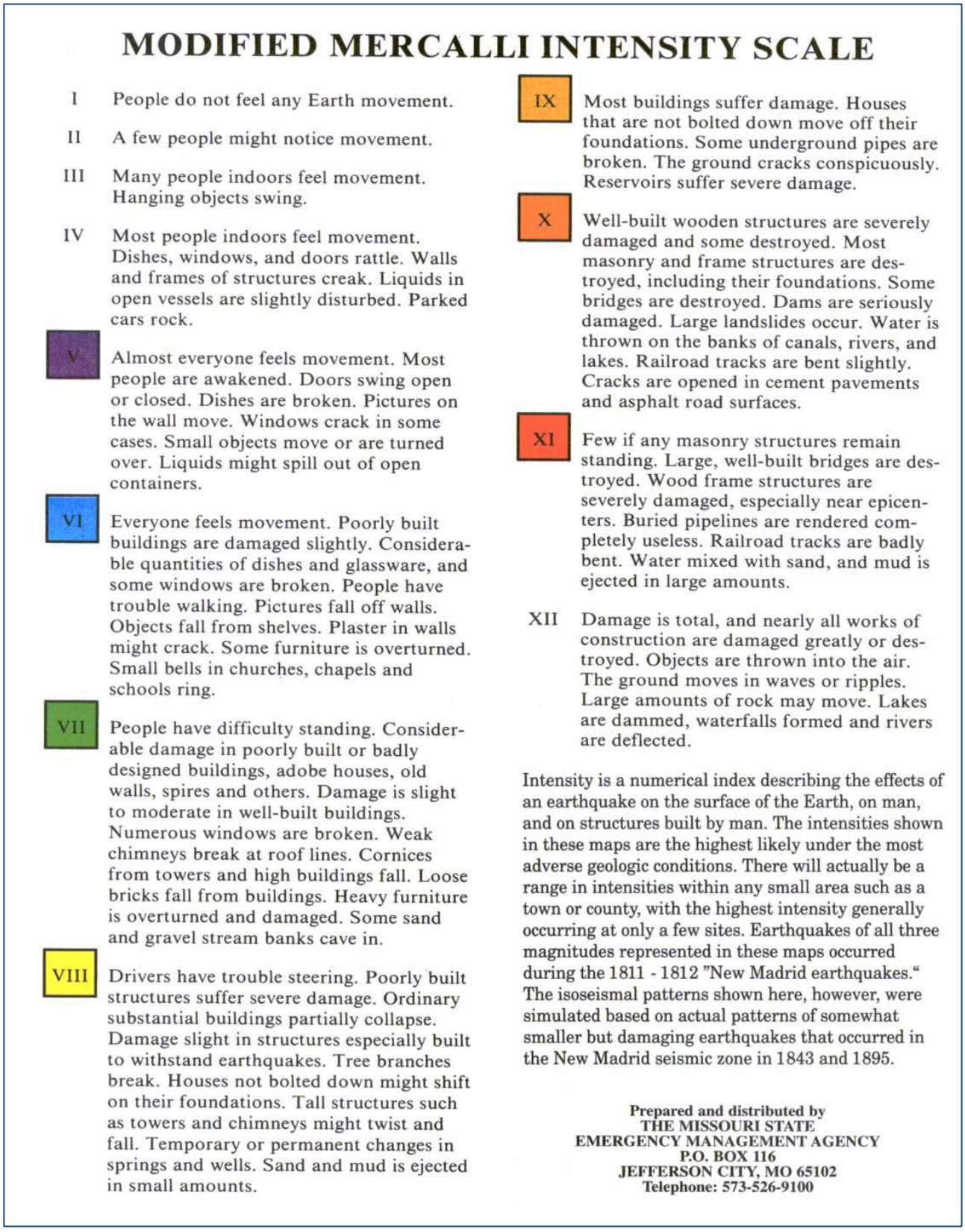
the Modified Mercalli Intensities for potential 6.7 and 8.6 magnitude earthquakes are illustrated. In the event of a 6.7 magnitude earthquake, Phelps County would experience a Modified Mercalli Intensity of V (**Figure 2.27**). This intensity is categorized as being almost felt by everyone. Most people are awakened. Doors swing open or closed. Dishes are broken. Pictures on the wall move. Windows crack in some cases. Small objects move or are turned over. Liquids might spill out of open containers. Additionally, in the occurrence of 7.6 and 8.6 magnitude earthquakes; the county would experience Modified Mercalli Intensities of VI and VII respectively. There will be a range in intensities within any small area such as a town or county, with the highest intensity generally occurring at only a few sites. **Figure 3.28** and **Table 3.29** further define Richter Scale intensities.

Figure 3.27. Impact Zones for Earthquake Along the New Madrid Fault



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

Figure 3.28. Projected Earthquake Intensities



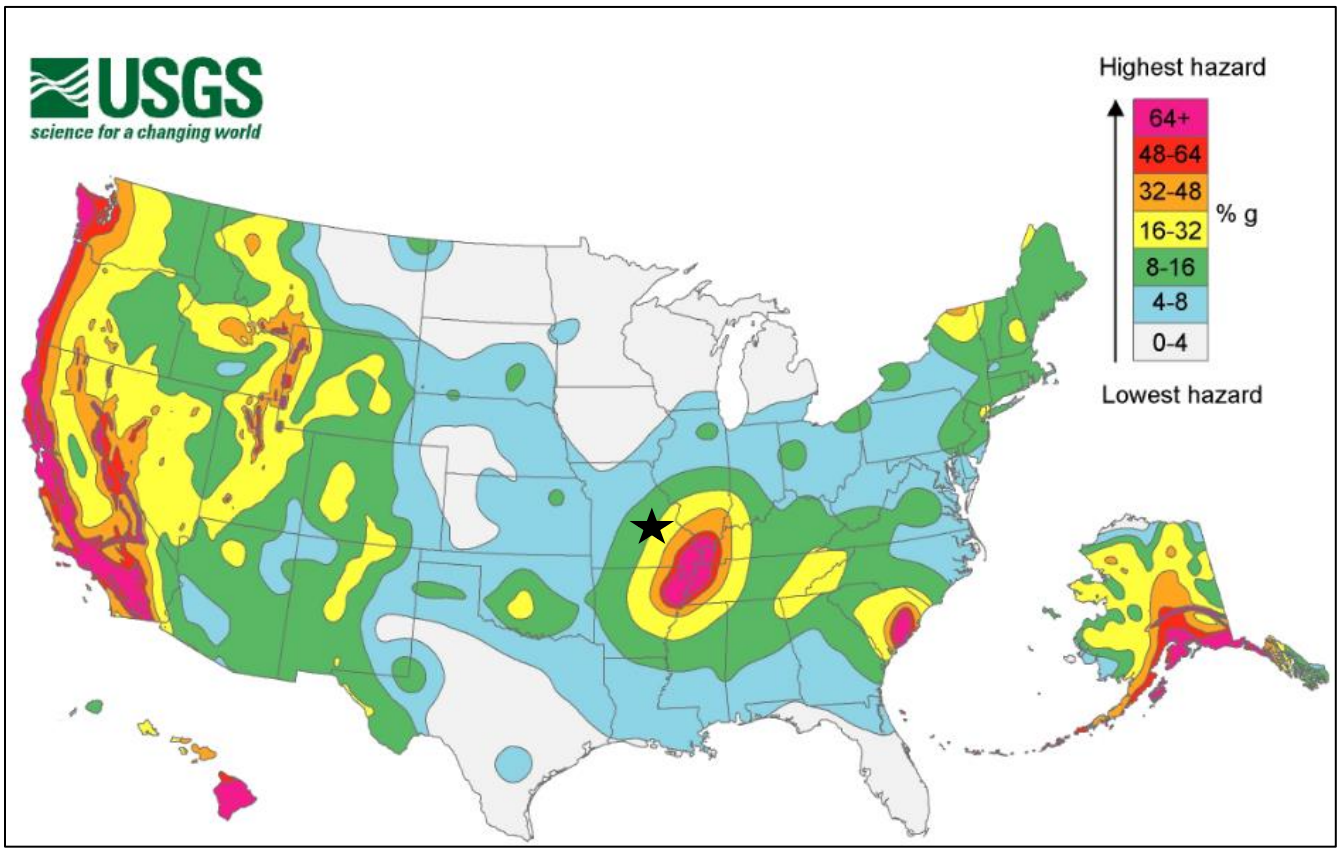
Source: sema.dps.mo.gov

Table 3.29. 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 3.29 illustrates the seismicity in the United States. A black star indicates the location of Phelps 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 3.29. United States Seismic Hazard Map



Source: USGS, http://earthquake.usgs.gov; *Black star indicates Phelps County

Strength/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 a 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)[24].

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

[24] Measuring the Size of an Earthquake, http://earthquake.usgs.gov/learn/topics/measure.php

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

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

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

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

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

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

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

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

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

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

Hermann, St. Charles, St. Louis, and Sikeston, Missouri. The felt areas include all or portions of 23 states[ii].

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 buildings[25].

Probability of Future Occurrence

No earthquakes have been reported in Phelps County since 1999. 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.

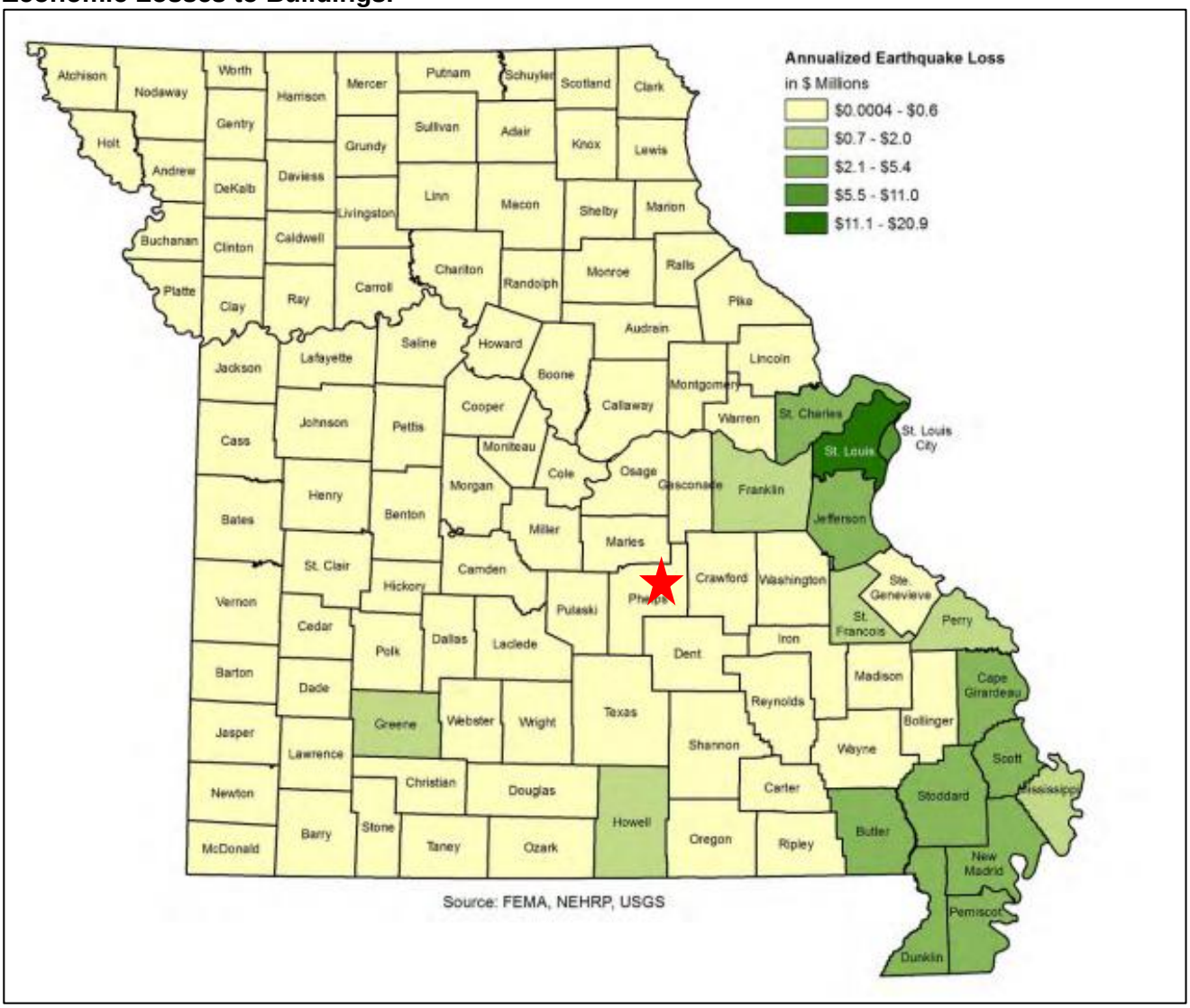
The 2018 Missouri Hazard Mitigation Plan states that there have been 31 recorded earthquake events greater than or equal to M 4.0 in the 43-year period from 1973 to 2018. According to this data, annual probability calculates to 72 percent. Additionally, the USGS estimated in 2006 that the probability 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’ basis[26]. 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 3.30** which shows annualized loss scenario direct economic losses to buildings. In this scenario, the annualized earthquake loss for buildings in Phelps County in any one year is estimated to be $4,000 to $600,000. **Table 3.30** provides information on total estimated losses, estimated losses per capita and loss ratio. This results in the county being ranked 25th 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.[27]

[25] Missouri State Hazard Mitigation Plan 2018
[26] 2018 Missouri State Hazard Mitigation Plan
[27] Ibid

Figure 3.30. HAZUS-MH Earthquake Loss Estimation: Annualized Loss Scenario –Direct Economic Losses to Buildings.



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

Table 3.30. HAZUS-MH Earthquake Loss Estimation-Phelps County: Annualized Loss Scenario

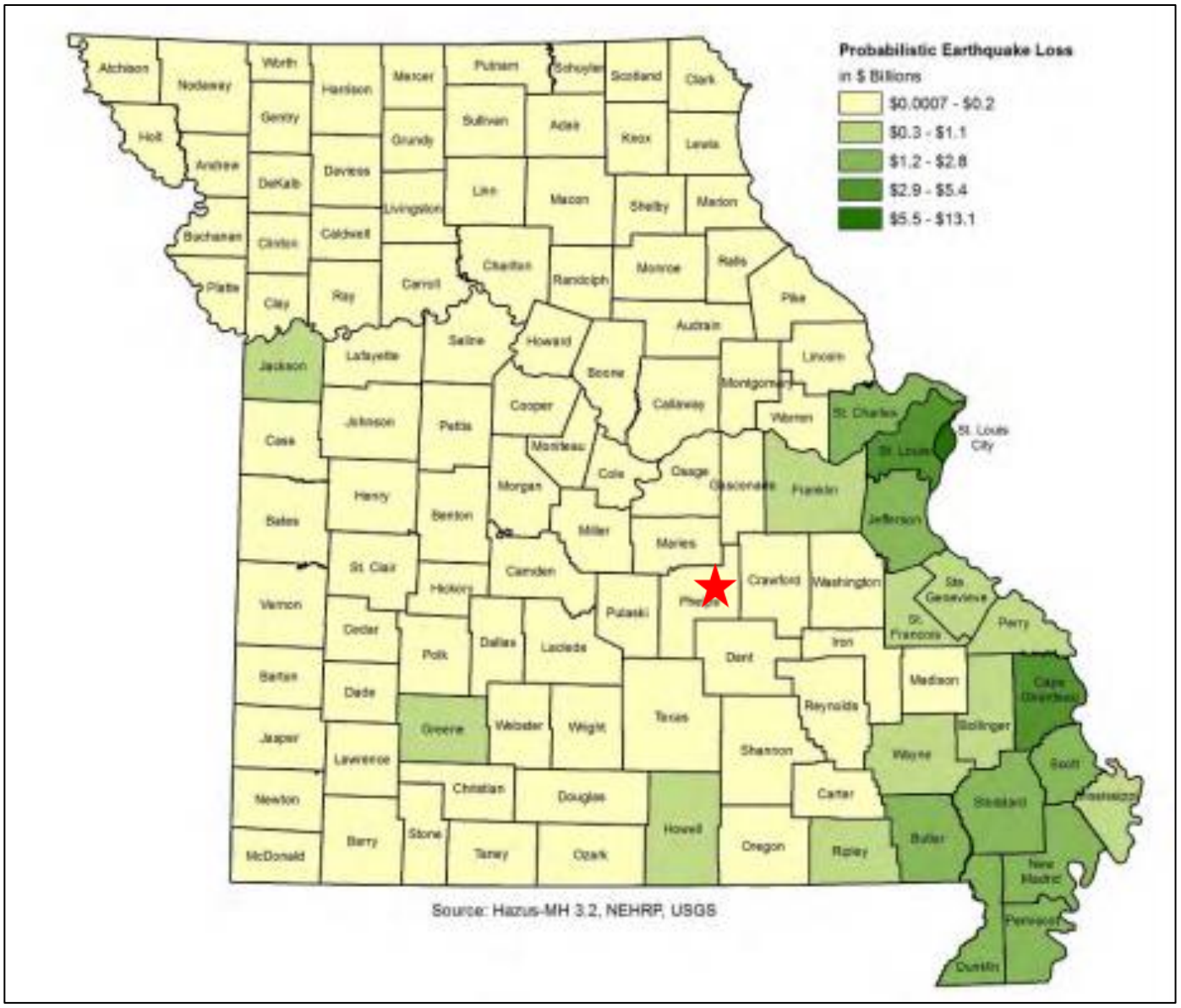
Total Losses in $ Thousands	Loss Per Capita, In $ Thousands	Loss Ratio in $ Per Million	Statewide Ranking for Expected Losses
$334	$0.0074	$70	25th

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**

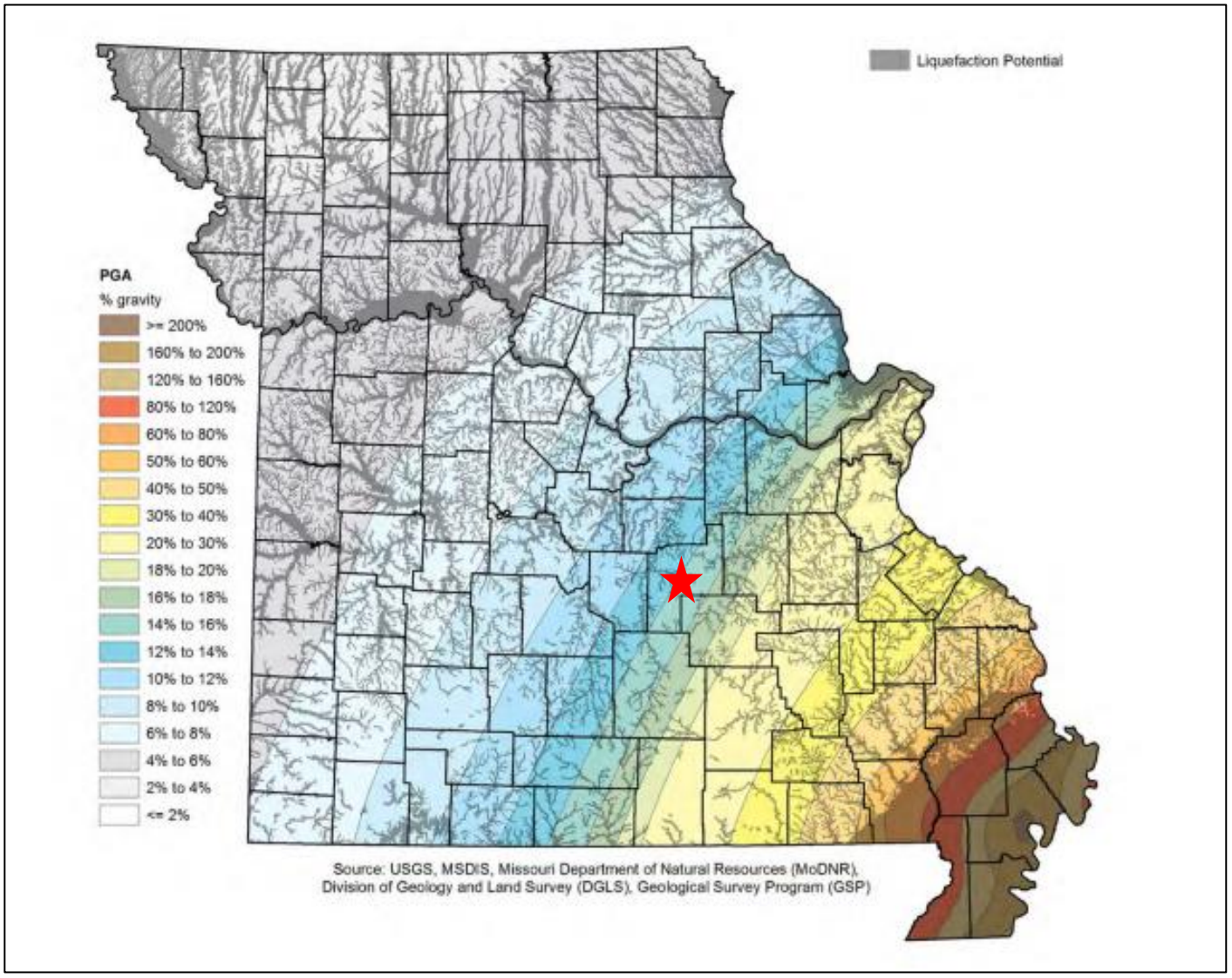
3.31 illustrates direct economic loss to buildings. Phelps County is anticipated to lose between $700,000 and $200,000,000 in a 50-year scenario. Moreover, in the same event the county is estimated to experience between 3.1 percent and 7 percent loss (damage) of the total. **Figure 3.32** provides estimates 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. Phelps County is estimated to have peak ground acceleration between 10 percent and 18 percent.

Figure 3.31. 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 Phelps County*

Figure 3.32. Hazus Earthquake 2% Probability of Exceedance in 50 Years – Ground Shaking and Liquefaction Potential



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

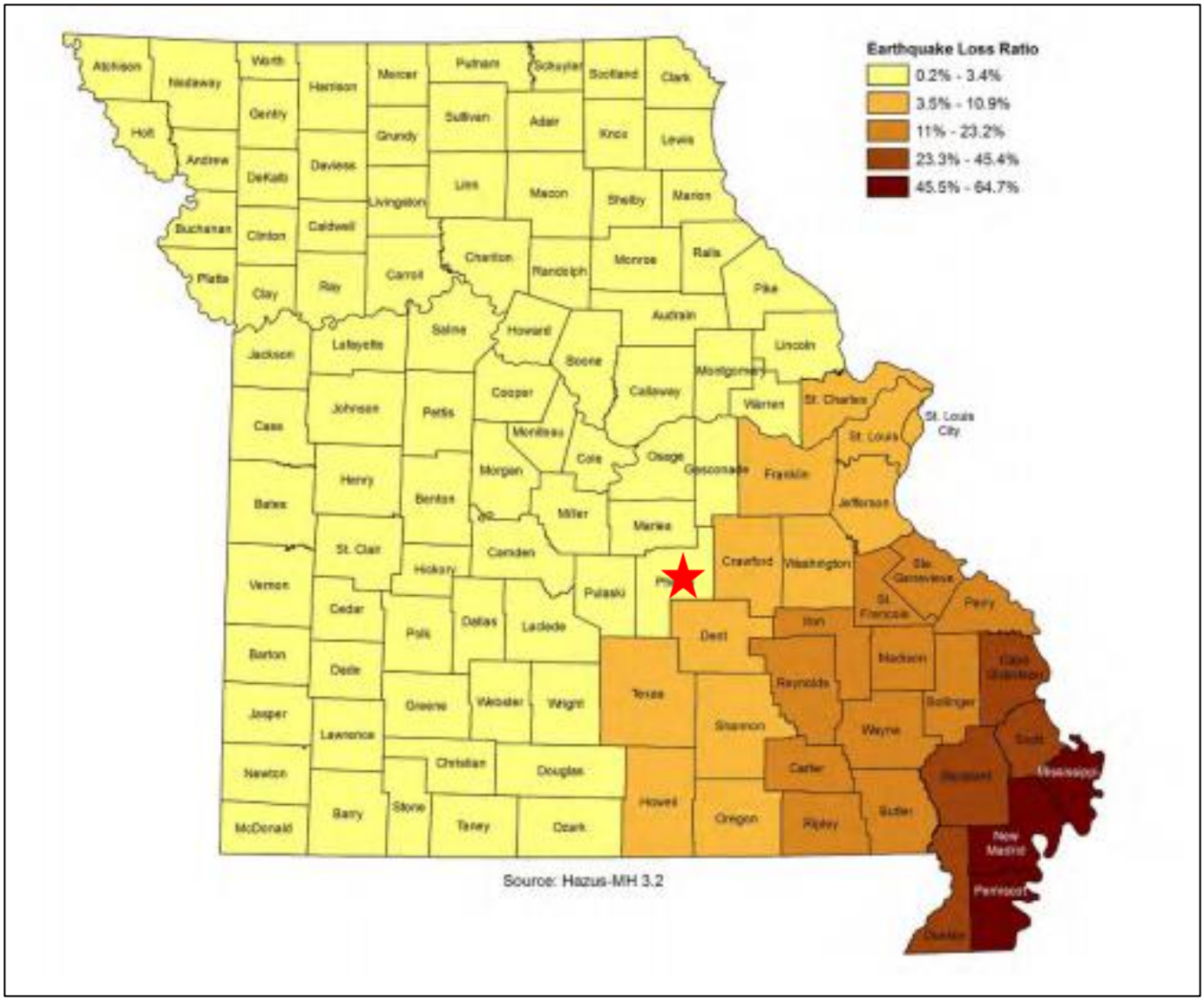
Figure 3.33 depicts a map of the modeled earthquake impacts by county based on building losses, including structural and nonstructural damage, content and inventory loss, and wage and income loss. Phelps County shows a loss ratio of 0.2 percent to 3.4 percent. **Figure 3.33** depicts loss ratio by county, 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 Phelps County, including structural, nonstructural, inventory, contents, relocation costs, capital related loss, wages and rental income loss. According to the 2018 Missouri Hazard Mitigation Plan, Phelps County's loss ratio is 3.10 percent. Phelps County ranks 26th 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 Phelps 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
$38,019	$108,793	$40,517	$843	3.10	$24,804	$9,319	$14,269	$10,713	$247,276

Source: 2018 Missouri Hazard Mitigation Plan
**All values in thousands*

Figure 3.33. 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 Phelps 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.[28]

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. Phelps County is rural with few clusters of population. Infrastructure in the region such as highways, bridges, pipelines, communication lines and railroads might suffer damage, which would adversely affect Phelps County, even if the county itself did not suffer heavy damage. Infrastructure could take a significant time to repair.

An important tool for homeowners to address the risk of earthquake damage to property is the purchase of earthquake insurance coverage. The Missouri Department of Insurance, Financial Institutions and Professional Registration (DIFP) prepared a report in 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 2018 the percentage of residential policies with earthquake coverage in Phelps County was 22.2 percent with the average cost of coverage at $94 per year.[29]

Potential Losses to Existing Development

Phelps County's buildings are suggested to lose between $4,000 and $600,000 in any one year, thus ranking the County as being ranked as 25th in the state for expected losses. In the HAZUS scenario

[28] Missouri State Hazard Mitigation Plan 2018

[29] The State of Earthquake Coverage Report https://insurance.mo.gov/earthquake/

illustrated in Figure 3.32, Phelps County has a loss ratio of .2 percent to 3.4 percent. The loss ratio indicates impacts on local economies in the event of an earthquake, and the difficulty for jurisdictions to recover from said event. According to the 2018 Missouri State Hazard Mitigation Plan, Phelps would suffer total building losses of $700,000 - $200,000,000 in a two percent HAZUS-MH 50-year scenario.

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 on the western edge of the City of Rolla, which has an IBC building code last updated in 2018. As new development arises, minimum standards of building codes should be established in all jurisdictions to decrease the potential damage/loss should an earthquake occur.

The Revised Statutes of MO, Section 160.451 require that: The governing body of each school district which can be expected to experience an intensity of ground shaking equivalent to a Modified Mercalli Intensity of VII or above from an earthquake occurring along the New Madrid Fault with a potential magnitude of 7.6 on the Richter Scale shall establish an earthquake emergency procedure system in every school building under its jurisdiction[30].

Hazard Summary by Jurisdiction

There will be a range in intensities within any small areas such as a town or county, with the highest intensity generally occurring at only a few sites. Phelps County is not near the New Madrid Seismic Zone, but it will most likely endure mild secondary effects from the earthquake, such as fire, structure damage, utility disruption, environmental impacts, and economic disruptions/losses. However, damages could differ if there are structural variations in the planning area's built environment. For example, if one community has a higher percentage of residences built prior to 1939 than the other participants, that community is likely to experience higher damages. **Table 3.32** depicts the percent of residences built prior to 1939 in Phelps County. In addition, if school districts have buildings built prior to 1939, those facilities may be at higher risk of damage should an earthquake occur. If a major earthquake should occur, Phelps County would likely be impacted by the number of refugees traveling through the area seeking safety and assistance.

Table 3.32. Phelps County Residences Built Prior to 1939

Jurisdiction	Number of Residences Built Prior to 1939	% of Residences Built Prior to 1939
Unincorporated Phelps County	709	8.2%
Doolittle	49	16.7%
Edgar Springs	23	22.3%
Newburg	132	43.1%
Rolla	341	3.8%
St. James	180	9.7%

Source: US Census Bureau 2015-2019 ACS Data

[30] https://revisor.mo.gov/main/OneSection.aspx?section=160.451

Problem Statement

In a worst case scenario, the county is expected to encounter $247,276,000 in total economic losses to buildings. Newburg has a higher risk of damage to buildings due to over 43 percent of the homes having been built prior to 1939.

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

3.4.4 Extreme Temperatures

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/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
    - Average annual occurrence for extreme heat by County
    - Vulnerability to extreme heat by County
    - Average annual occurrence for extreme cold by County
    - Vulnerability to extreme cold by County

Hazard Profile

Hazard Description

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several days. Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index chart shown in **Figure 3.34** 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 3.33 - 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

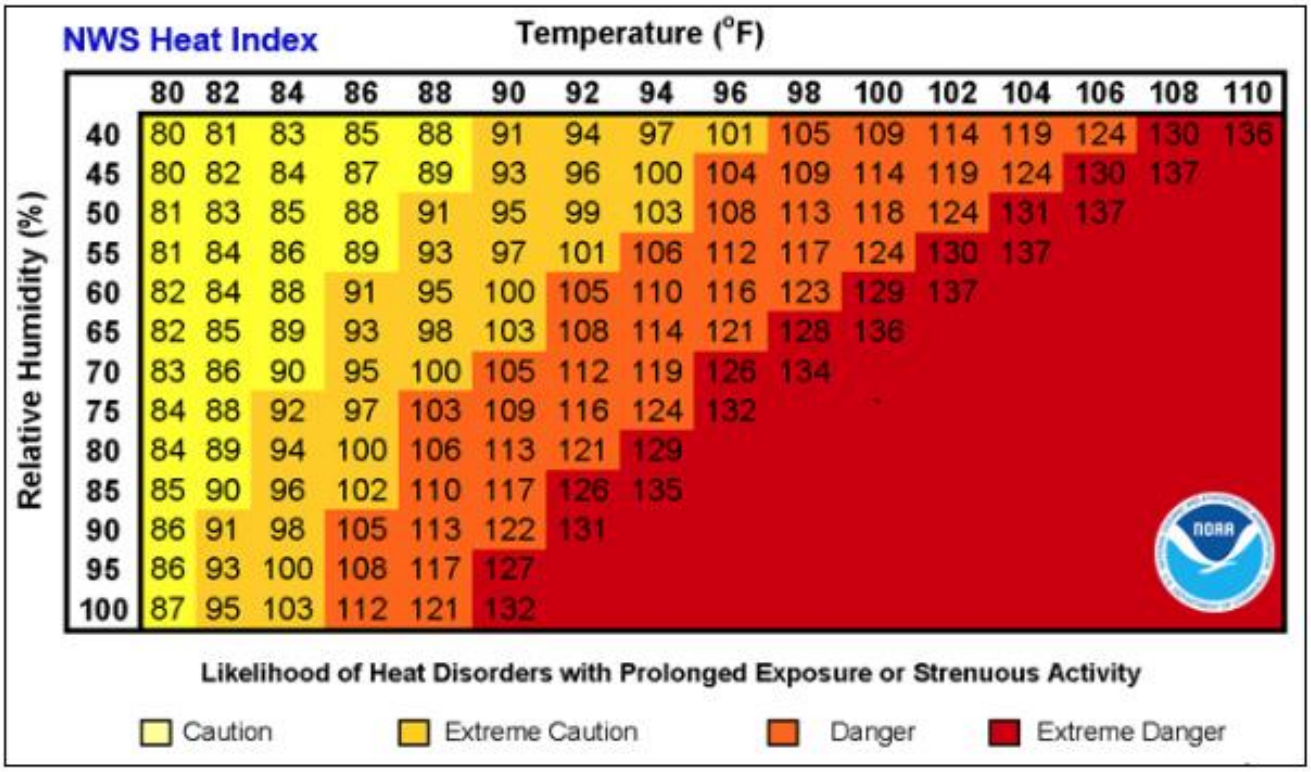
increase HI values by up to 15 degrees Fahrenheit. Also, strong winds, particularly with very hot, dry air, can be extremely dangerous.

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 3.34. Heat Index (HI) Chart



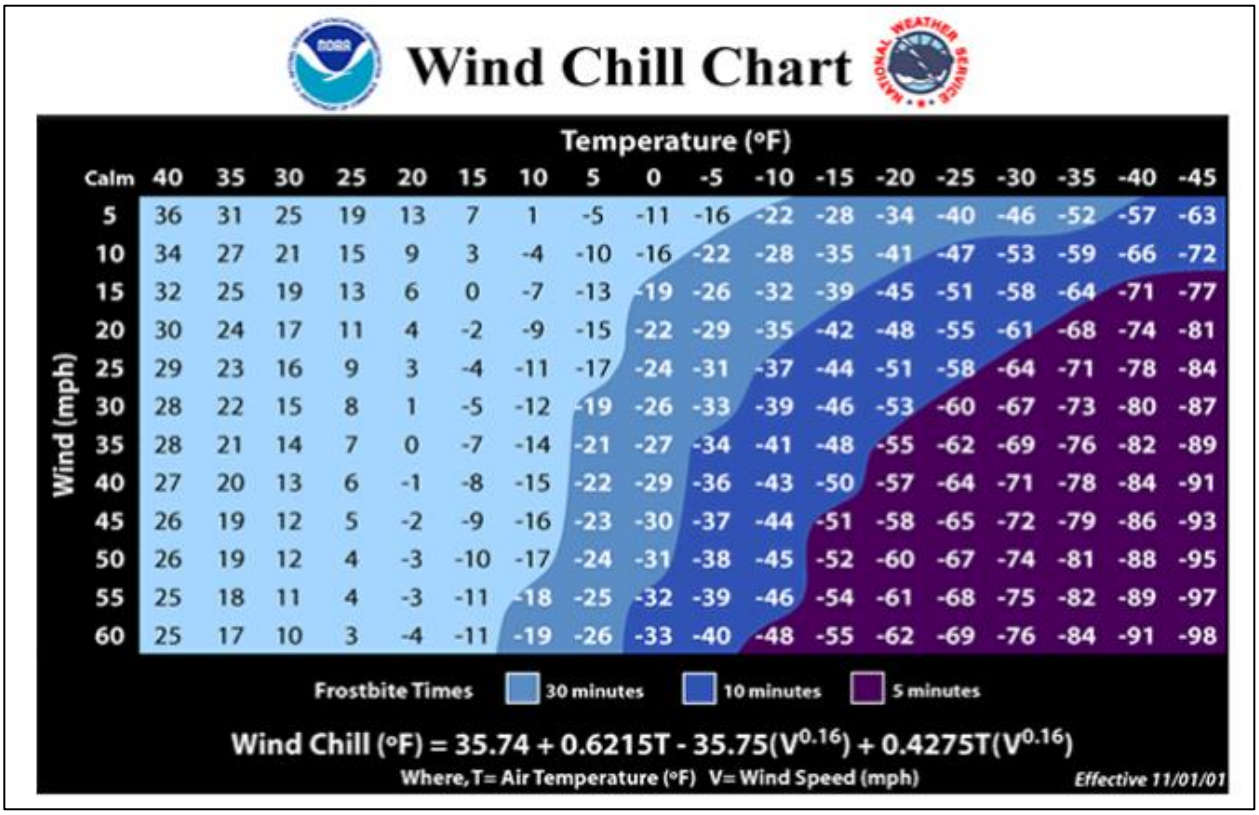
Source: National Weather Service (NWS); https://www.weather.gov/safety/heat-index
Note: Exposure to direct sun can increase Heat Index values by as much as 15°F. The shaded zone above 105°F corresponds to a HI that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

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 3.35,** 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 3.35. 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 Phelps 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 3.35** 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 and USDA Risk Management website, there were no reported agricultural losses for Phelps County during that 20 year time period. 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 Phelps 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

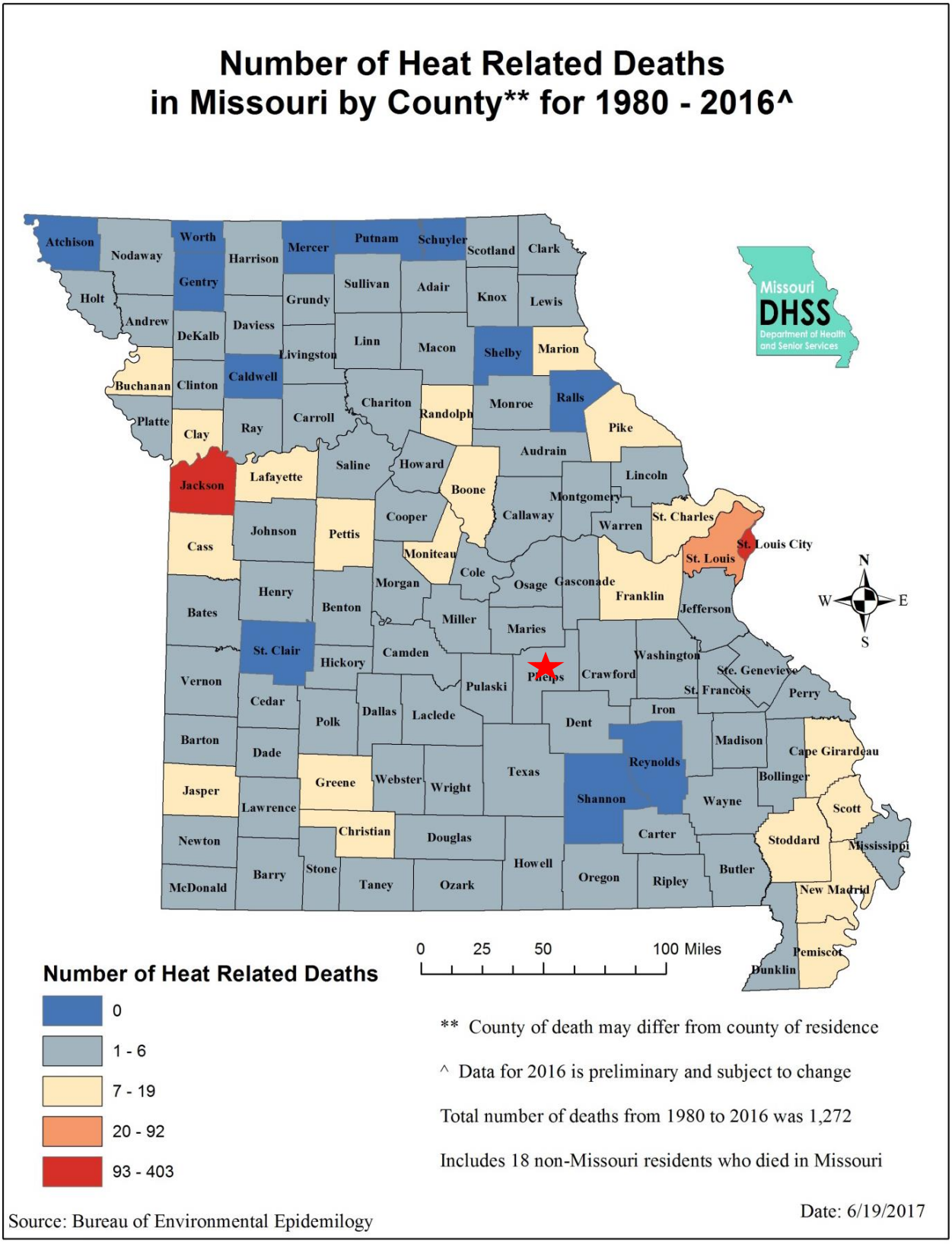
Table 3.34 provides data in relation to record heat events between 1999 and 2019 in Phelps County. Maximum heat index values and temperatures are shown for each extreme temperature event. Fortunately, there were zero recorded injuries and fatalities during this time. In addition, **Figure 3.36** illustrates heat related deaths by county in Missouri between 1980 and 2016.

Table 3.34. Phelps County Recorded Heat Events 1999 – 2019

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 3.36. Heat Related Deaths in Missouri 2000 - 2016

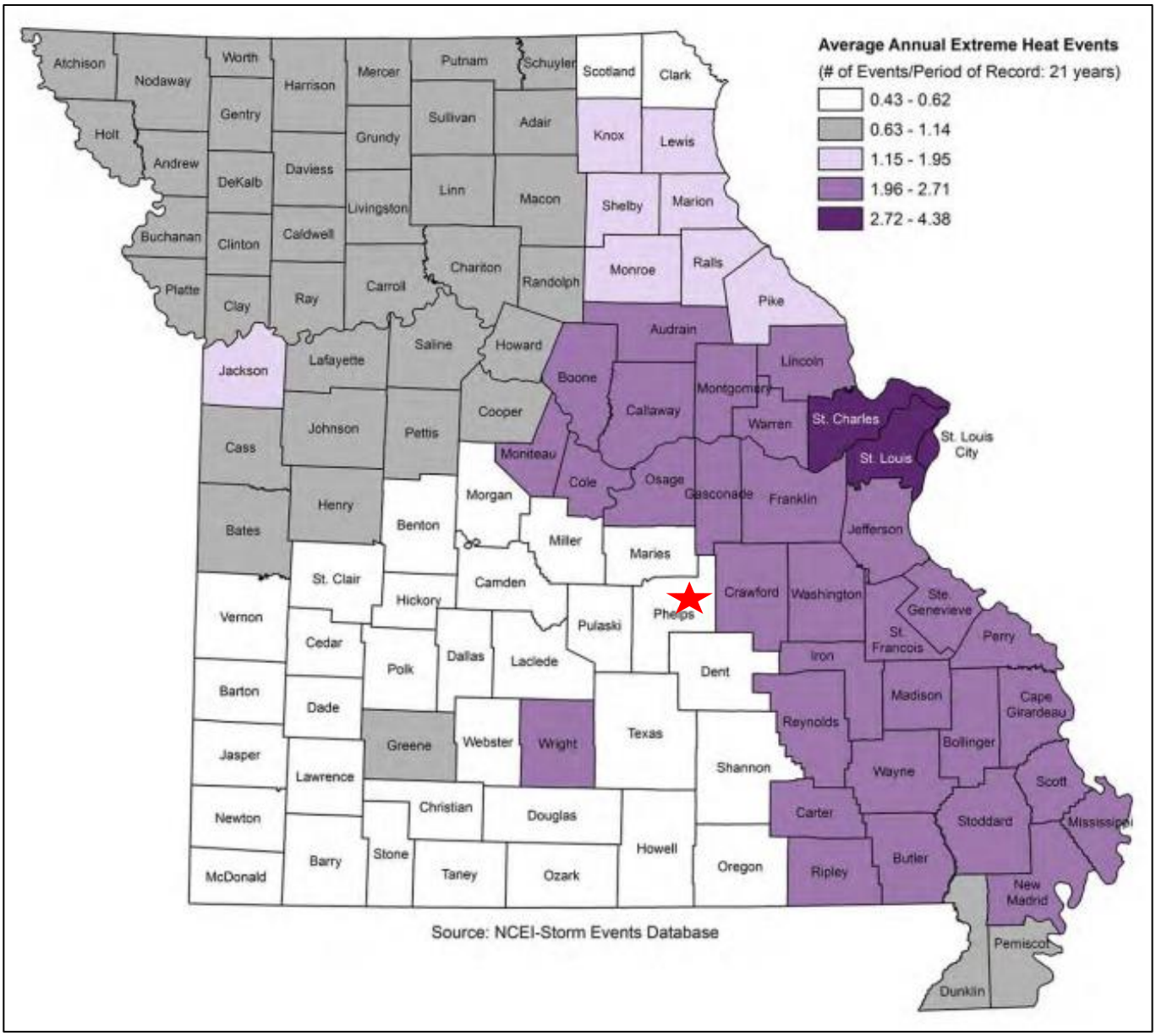


Source: https://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/stat-report.pdf
*Red star indicates Phelps County

Probability of Future Occurrence

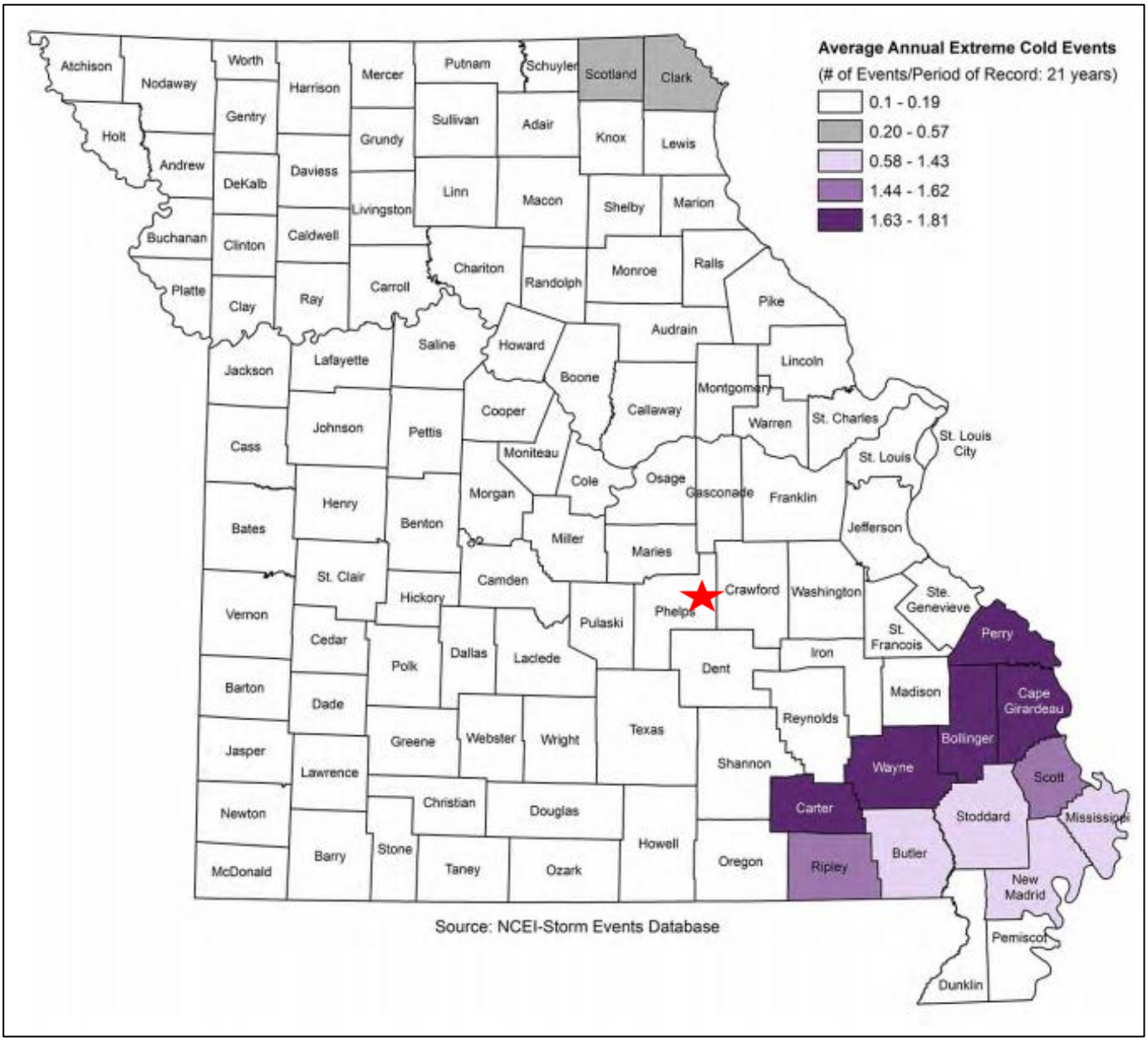
Figure 3.37 illustrates the average annual occurrence for extreme heat statewide. Based on information provided in the 2018 Missouri State Hazard Mitigation Plan, Phelps County has an average of .43 to .62 events per year based on data from 21 years. **Figure 3.38** illustrates the average annual occurrence for extreme cold statewide. Phelps 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 3.37. Average Annual Occurrence for Extreme Heat



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

Figure 3.38. Average Annual Occurrence for Extreme Cold



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

Phelps 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 Phelps County has an estimated 19.2 percent of individuals are 65 or older. The city of Rolla had the lowest number of older residents with 11.7 percent aged 65 and over. Newburg had the highest rate overall with 24.6 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), 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 Phelps County overall.

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

County	Total Population Rating	Percentage of Population Over 65	Percent of Population Over 65 Rating	SOVI Ranking	SOVI Rating
Phelps	4	14.6	2	Medium High	4

Source: 2018 Missouri Hazard Mitigation Plan

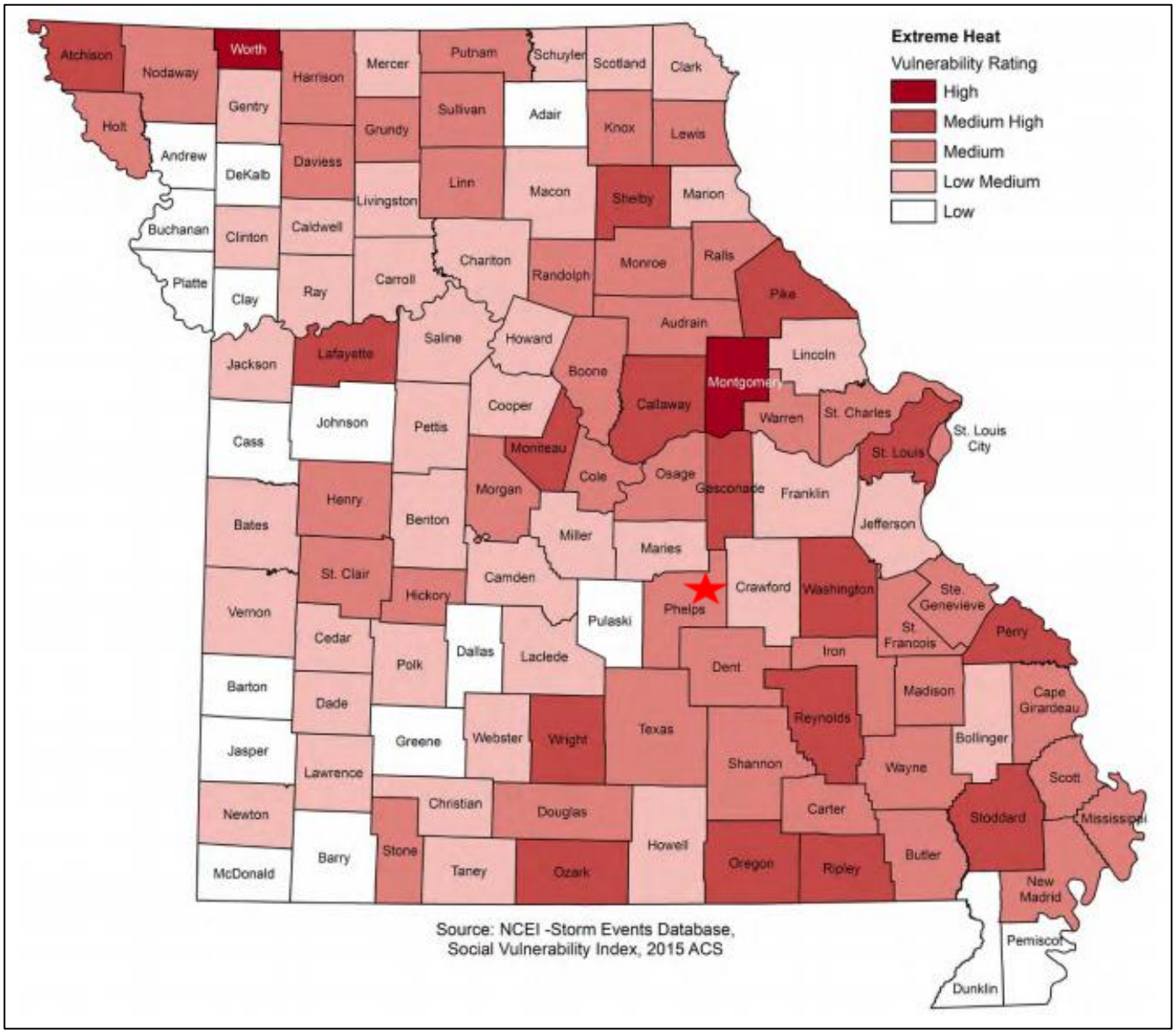
Table 3.37 illustrates the likelihood of occurrence and overall vulnerability rating for extreme temperatures for Phelps County. **Figure 3.39** and **Figure 3.40** provide a vulnerability summary for extreme heat and extreme cold, respectively. Phelps County has Medium vulnerability for extreme heat and Medium-High vulnerability for extreme cold.

Table 3.37. Phelps 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	11	Medium	3	0.14	1	11	Medium High

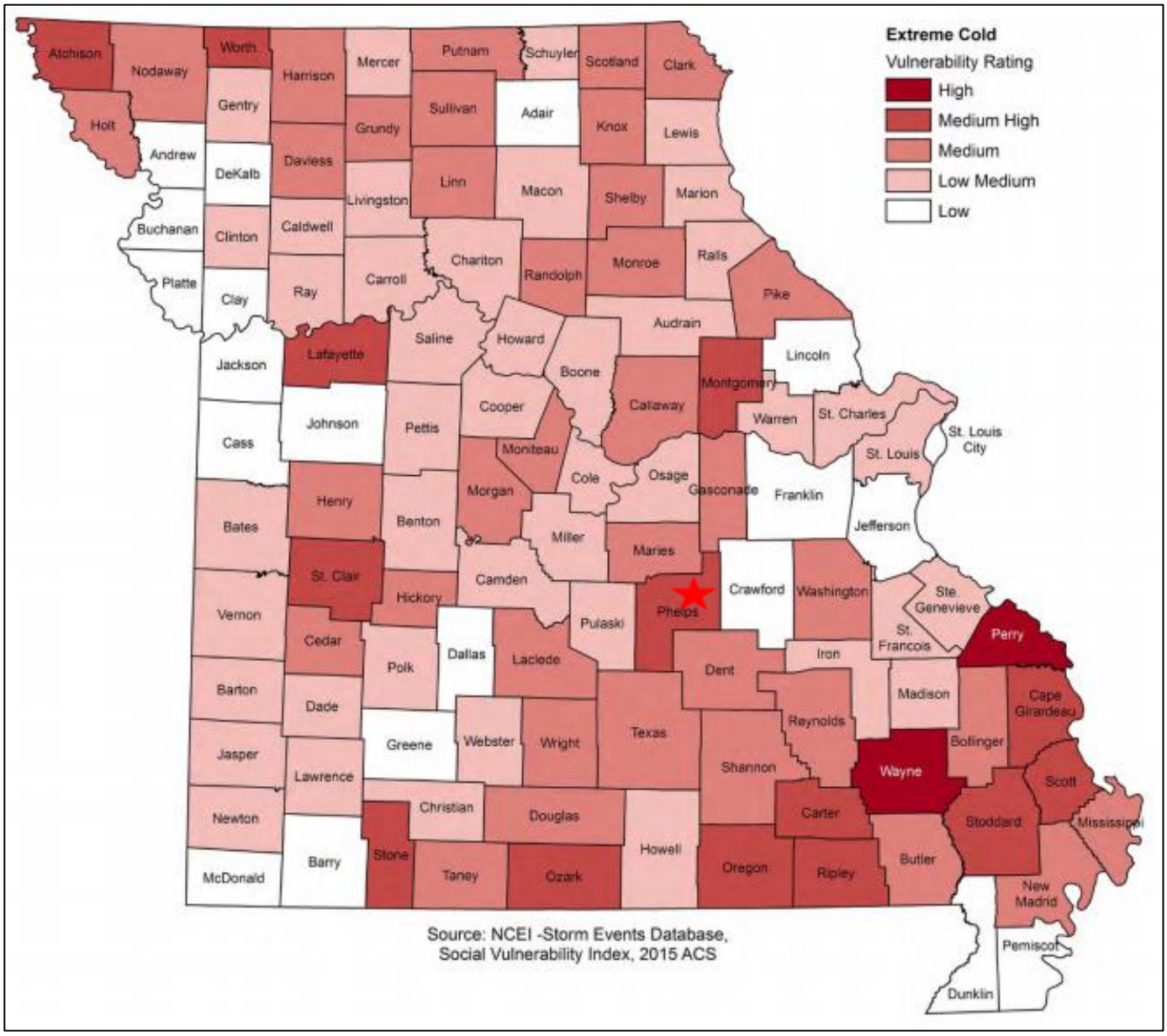
Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.39. Vulnerability Summary for Extreme Heat



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

Figure 3.40. Vulnerability Summary for Extreme Cold



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

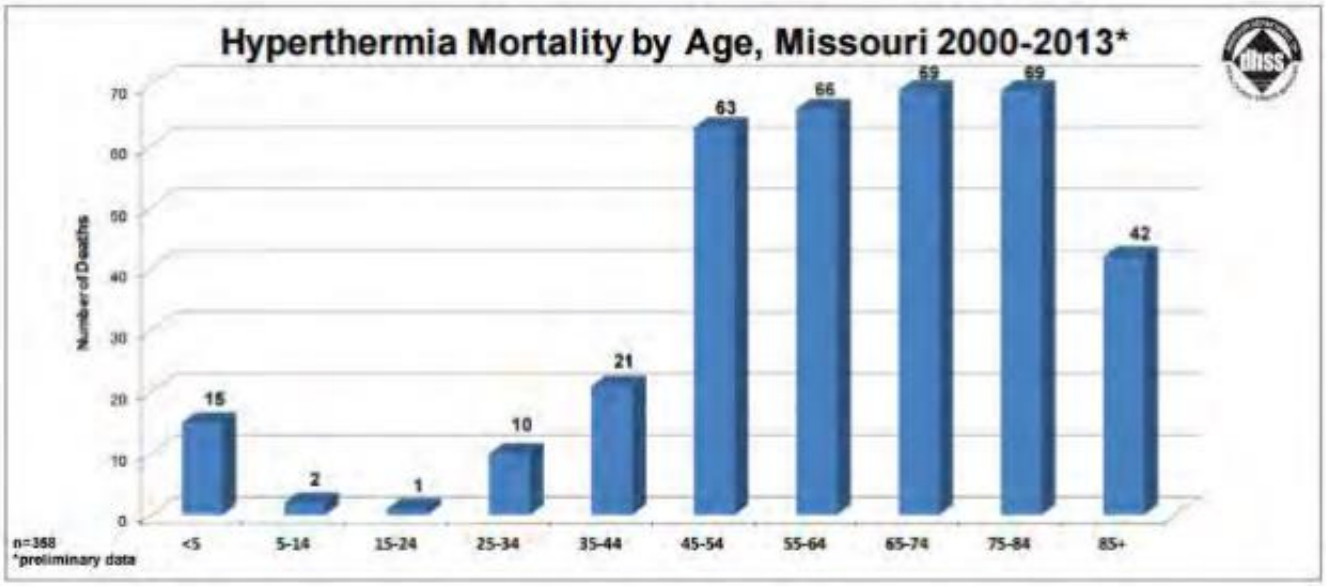
Potential Losses to Existing Development

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 3.41** shows the hyperthermia mortality rate by age for the 2000-2013 timeframe.

Figure 3.41. Hyperthermia Mortality of Age, Missouri 2000-2013



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

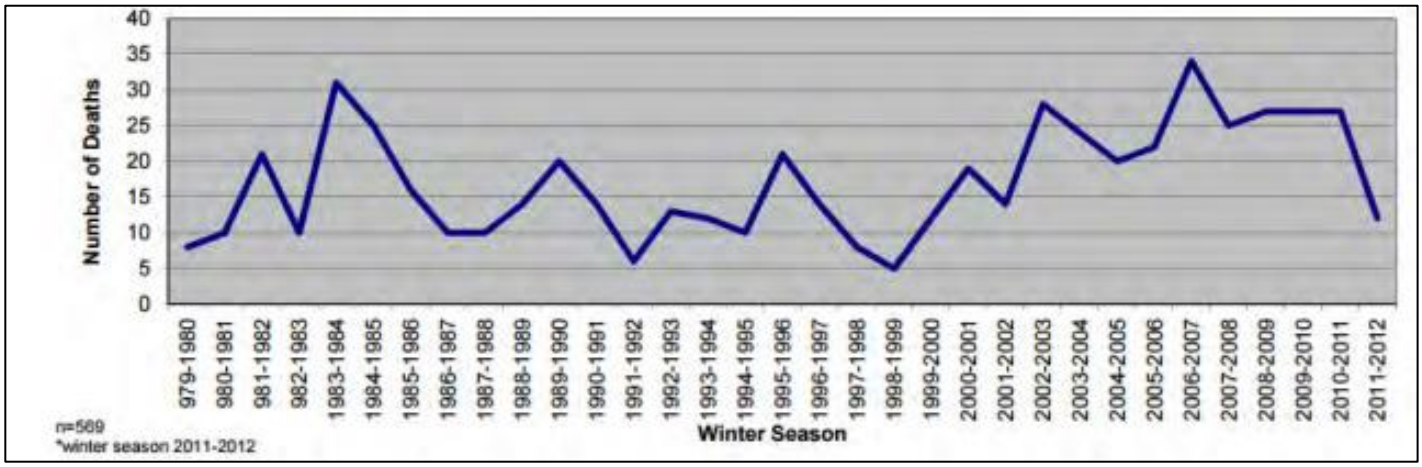
During extreme heat events structural, road, and electrical infrastructure are vulnerable to damages. Depending upon temperatures and duration of extreme heat, losses will vary.

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 3.42**. 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%) 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 3.42. Hypothermia Deaths, Missouri: Winter Seasons 1979-2012



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

Impact of Previous and Future Development

Population trends from 2010 to 2019 for Phelps County indicate that the population in unincorporated areas has fallen by an estimated 3.3 percent. The city of Doolittle's population has increased by a 7.9 percent. The city of Edgar Springs has fallen by 42.2 percent. Overall the county's population has grown 11.7 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 2015-2019 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 (2015-2019)

Jurisdiction	Population Under 5 Years	Population 65 Years and over
Unincorporated Phelps County	4.6%	19.2%
Doolittle	6.9%	17.9%
Edgar Springs	9.9%	14.4%
Newburg	3.8%	24.6%
Rolla	6.3%	11.7%

Jurisdiction	Population Under 5 Years	Population 65 Years and over
St. James	7.0%	18.1%

Source: U.S. Census Bureau, 2015-2019 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. The city of Newburg has a high percentage of individuals 65 and over, with 24.6 percent.

Many people do not realize how deadly a heat wave can be. Extreme heat is a natural disaster that is not as dramatic as floods or tornadoes. Working with the Phelps 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 loos-fitting, lightweight and light colored clothes that dover 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 Phelps County and the city of Newburg 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.

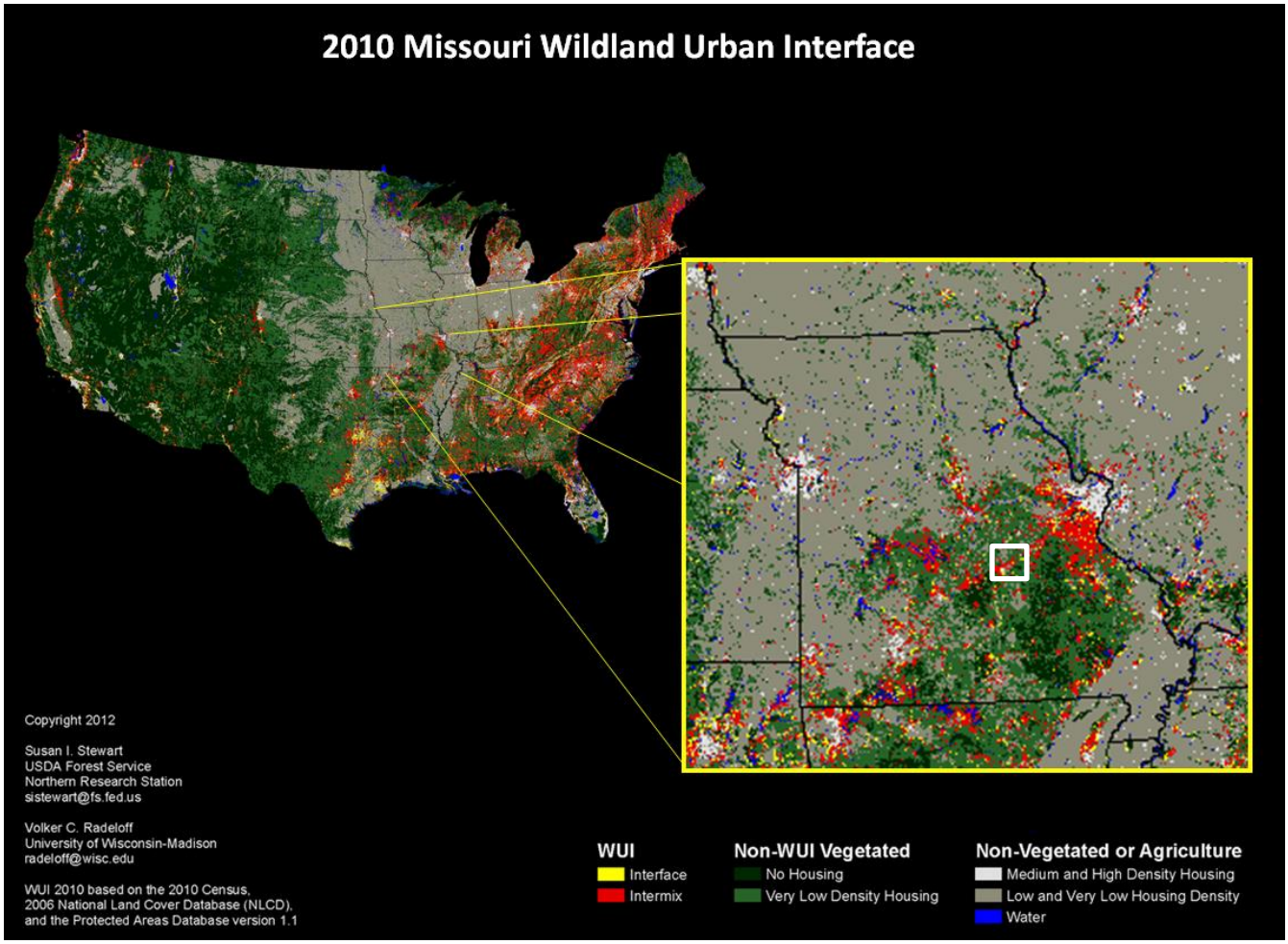
Most of Missouri fires occur during the spring season between February and May. The length and severity of both structural and wildland fires depend largely on weather conditions. Each year, an average of about 3,200 wildfires burn more than 52,000 acres of forest and grassland in Missouri. Spring in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

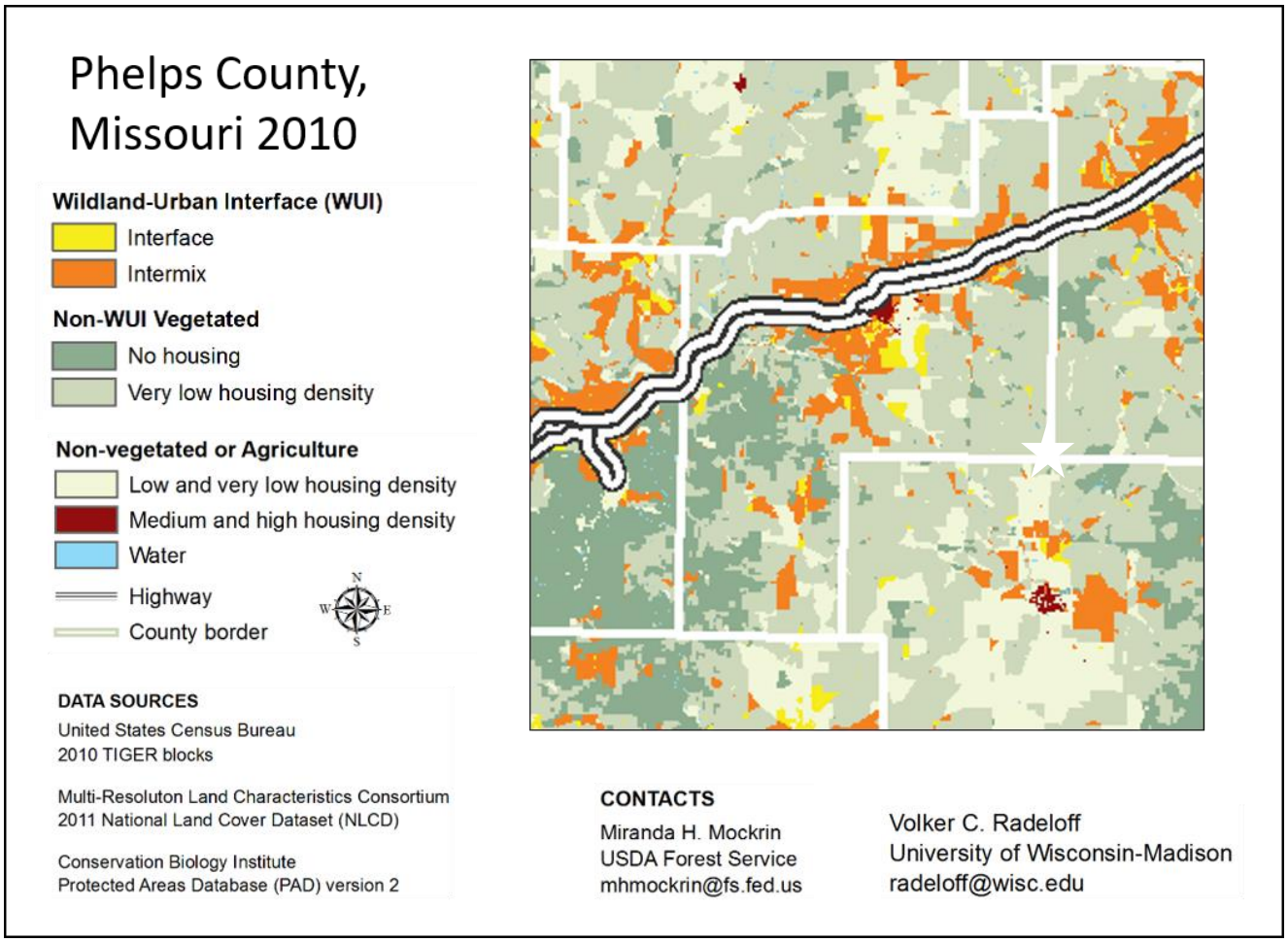
The risk of wildfire does not vary widely across the planning area. However, damages due to wildfires are expected to be higher in communities with more wildland–urban interface (WUI) areas. WUI refers to the zone of transition between unoccupied land and human development and needs to be defined in 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 3.43**). To determine specific WUI areas and variations, data was obtained from ArcGIS, Streets and SILVIS (**Figure 3.44**). According to the WUI area map of Phelps County, all cities partially reside in a WUI area. The greatest risk areas are north of I-44 in Rolla, east of Rolla, south of Rolla, the southwest side of St. James, and the city of Newburg.

Figure 3.43. 2010 Missouri Wildland Urban Interface (WUI)



Source: http://silvis.forest.wisc.edu/maps/wui; White square roughly estimates Phelps County's location

Figure 3.44. Phelps County Wildlife Urban Interface



Source: http://silvis.forest.wisc.edu/GeoData/WUI_cp12/maps/gifs/white/Missouri_WUI_cp12_white_2010.gif

Strength/Magnitude/Extent

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

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

While very unusual, crown fires can and do occur in Missouri native hardwood forests during prolonged periods of drought combined with extreme heat, low relative humidity, and high wind. Tornadoes, high winds, wet snow and ice storms in recent years have placed a large amount of woody material on the forest floor that causes wildfires to burn hotter and longer. These conditions also make it more difficult for fire fighters 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 2019 there were 504 wildfires reported in Phelps County, according to wildfire reporting to the Missouri Department of Conservation[31]. This is an average of 25.2 wildfires per year. The size of the fires varied from as small as .01 acre to as large as 1000 acres. **Table 3.39** shows the cause of wildfires, number of wildfires and acres burned for the period 2000-2019. Debris fires account for the largest number of fires and the greatest number of acres burned.

Table 3.39. 2000-2018 Phelps County Wildfires by Cause

Cause	Number	Acres	% Number	% Acres
Equipment	6	55.18	1.2%	0.8%
Debris	212	2,625.45	42.1%	39.4%
Arson	23	252.15	4.5%	3.8%
Campfire	4	224.12	0.8%	3.4%
Lightning	2	89.22	0.4%	1.3%
Fireworks	1	0.02	0.2%	0.0003%
Smoking	3	80.33	0.6%	1.2%
Railroad	4	2.5	0.8%	0.04%
Powerline	1	0.17	0.2%	0.003%
Unknown	155	2512.3	30.8%	37.7%
Not Reported	8	399.76	1.6%	6.0%
Miscellaneous	85	427.97	16.9%	6.4%
Totals	**504**	**6669.17**	**100%**	**100%**

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

Probability of Future Occurrence

From the data obtained from the Missouri Department of Conservation[32] (Appendix: F), 504 wildfire events occurred in Phelps County between 2000 and 2019. This information was utilized to determine the annual average percent probabilities of wildfires. Since multiple occurrences are anticipated per year (504 events/20 years), the probability of wildfires per year is 100% with an average of 25.2 events per year **Table 3.40**.

[31] http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx
[32] http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx

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

Location	Annual Avg. % P	Avg. Number of Events
Phelps County	100%	25.2

*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.[33]

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.[34]

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 Phelps County should expect to have 27.85 wildfires per year, impacting 271 acres **(Table 3.41**).

The state plan also indicates that Phelps County is at the lowest possible likelihood for building damage from wildfires – likely from the low population numbers in the county. **Figure 3.45** illustrates the likelihood of wildfire events based on data from 2004-2016. **Figure 3.46** provides a map that illustrates the average annual acreage burned.

Table 3.41. Statistical Data for Wildfire Vulnerability in Phelps County

Number of Wildfires 2004-2016	Likelihood of Occurrence (#/year)	Total Acres Burned	Average Annual Acreage Burned
362	27.85	3,518.90	271

Source: 2018 Missouri State Hazard Mitigation Plan

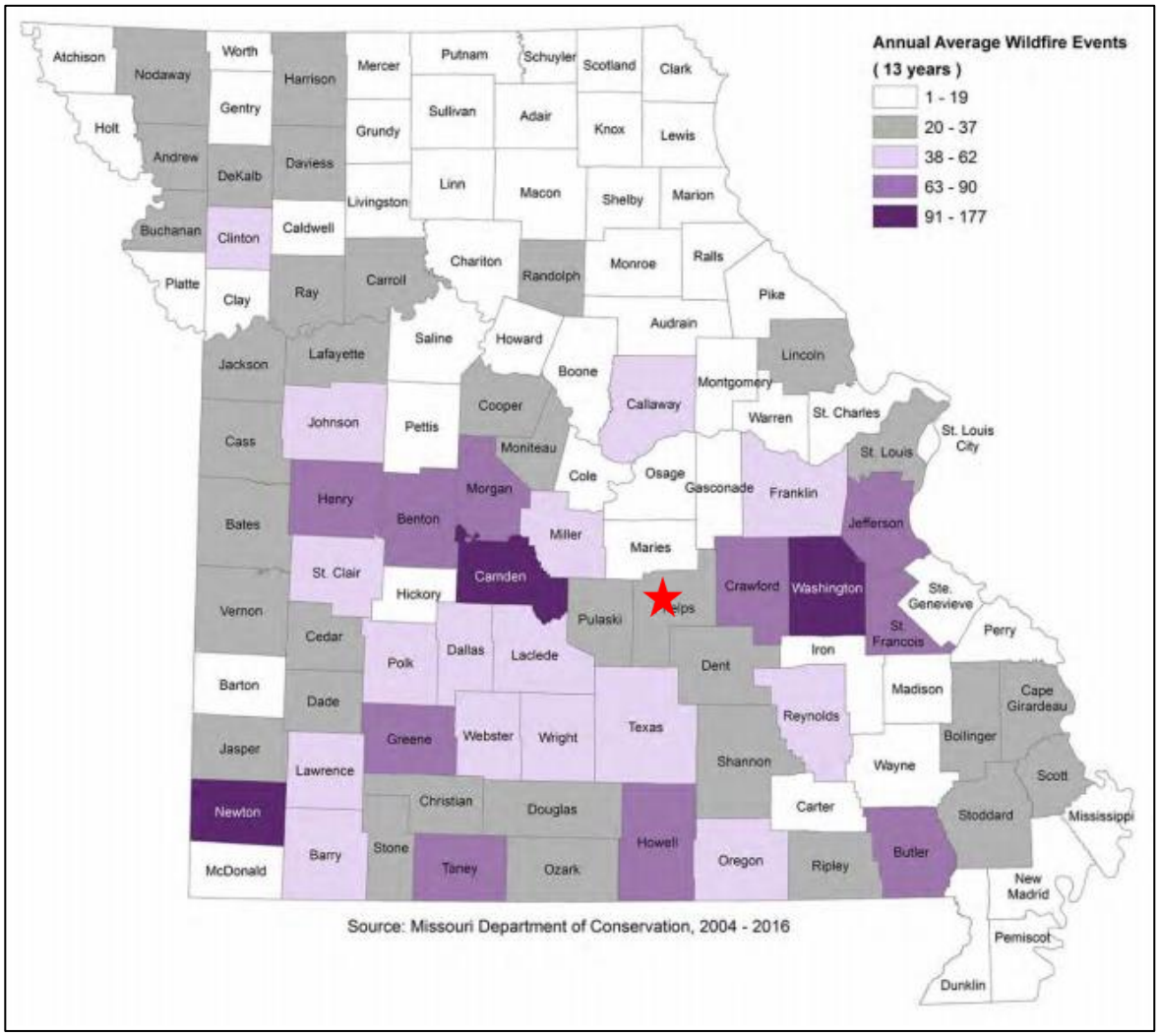
[33] 2018 Missouri Hazard Mitigation Plan

[34] Ibid

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.

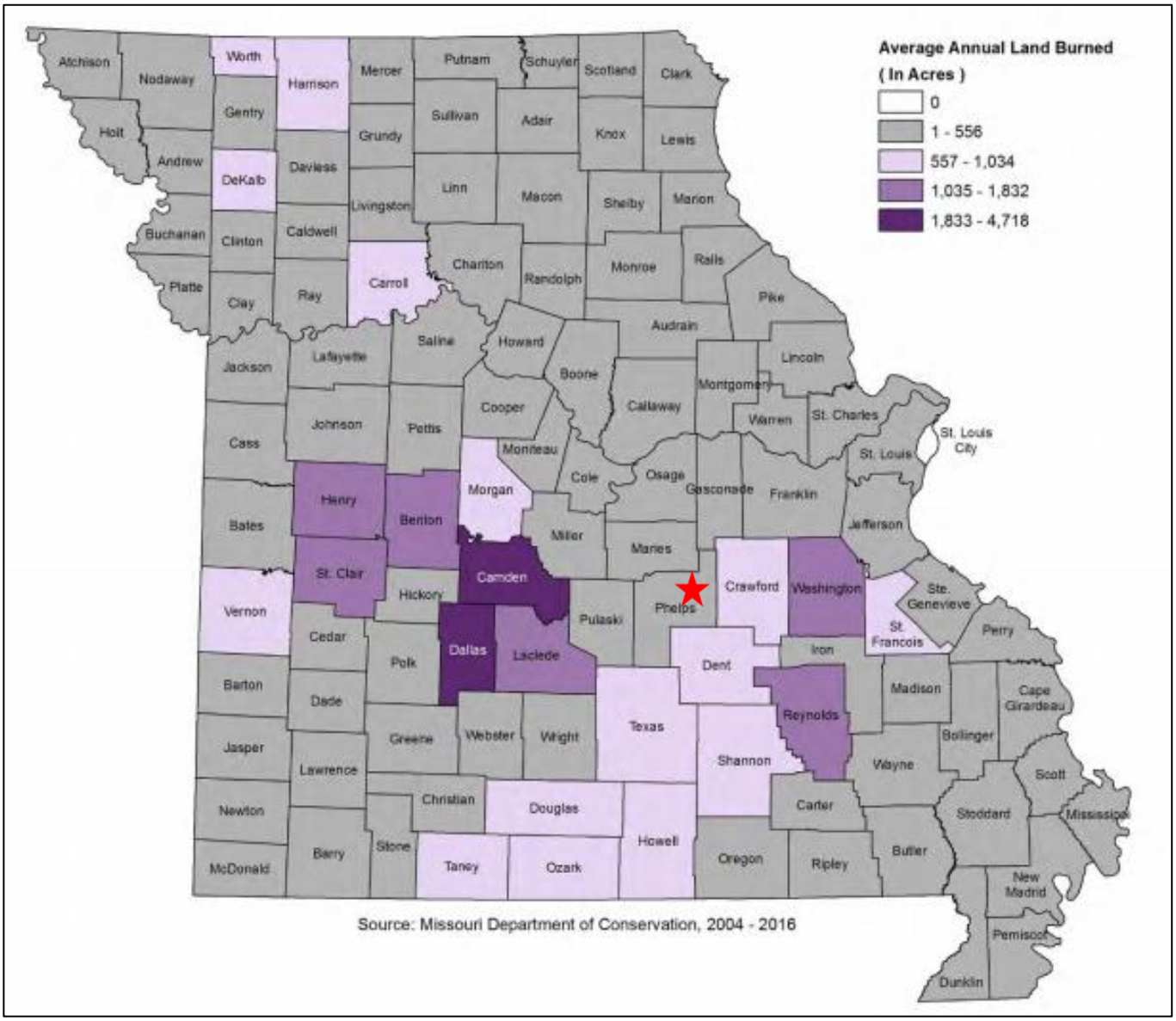
The results of that analysis, including estimated number of structures, value of structures and population are illustrated in **Table 3.42.** The total estimated number of structures vulnerable to wildfires is 9,426. The overall value of structures vulnerable to wildfire in Phelps County is estimated at $2,210,312,924. To further illustrate vulnerability in Phelps 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 3.47**. **Figure 3.48** shows the estimated value of structures in the WUI interface and intermix areas. **Figure 3.49** illustrates the number of people at risk to wildfire in the WUI interface and intermix areas.

Figure 3.45. Likelihood of Wildfire Events, 2004-2016



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

Figure 3.46. Average Annual Acreage Burned



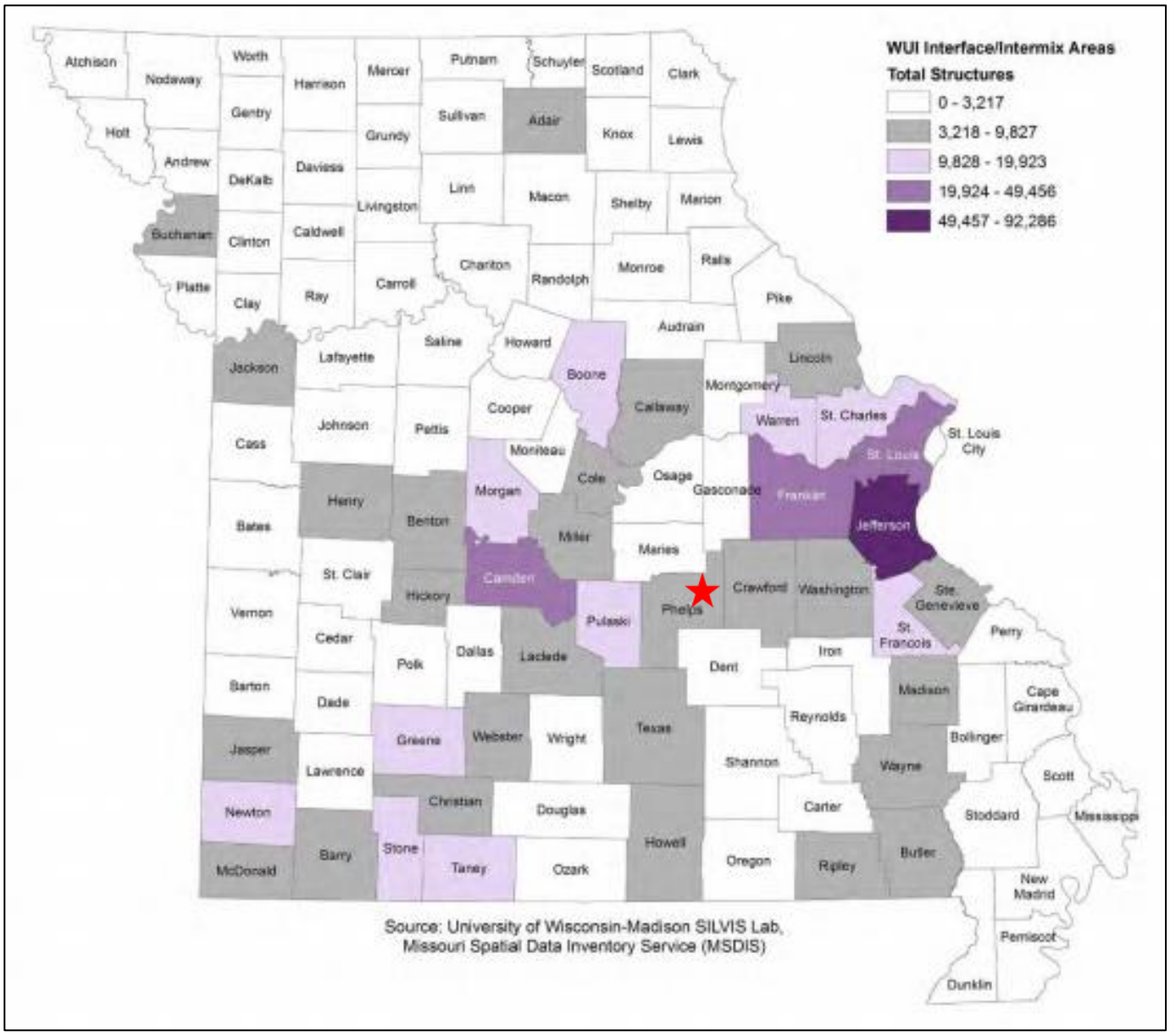
*Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Phelps County,*

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

Phelps County	Number of Structures	Value of Structures	Population
Agriculture	1,138	$215,457,023	
Commercial	397	$277,891,370	
Education	13	$26,415,740	
Government	25	$22,871,809	
Industrial	9	$5,535,996	
Residential	7,844	$1,662,140,987	
Totals	**9,426**	**$2,210,312,924**	**19,610**

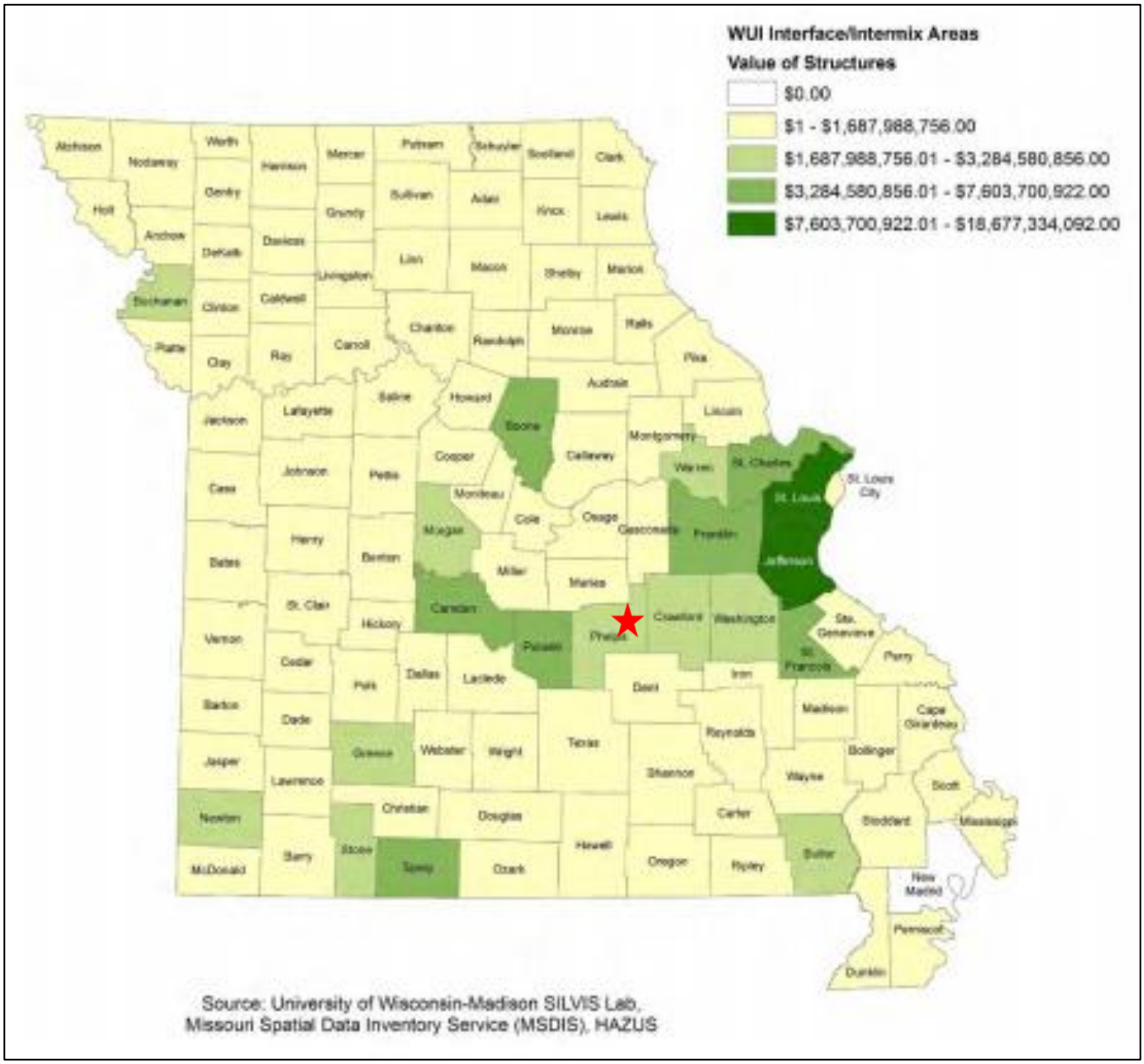
Source: 2018 Missouri State Hazard Mitigation Plan

Figure 3.47. Number of Structures in WUI Interface and Intermix Areas



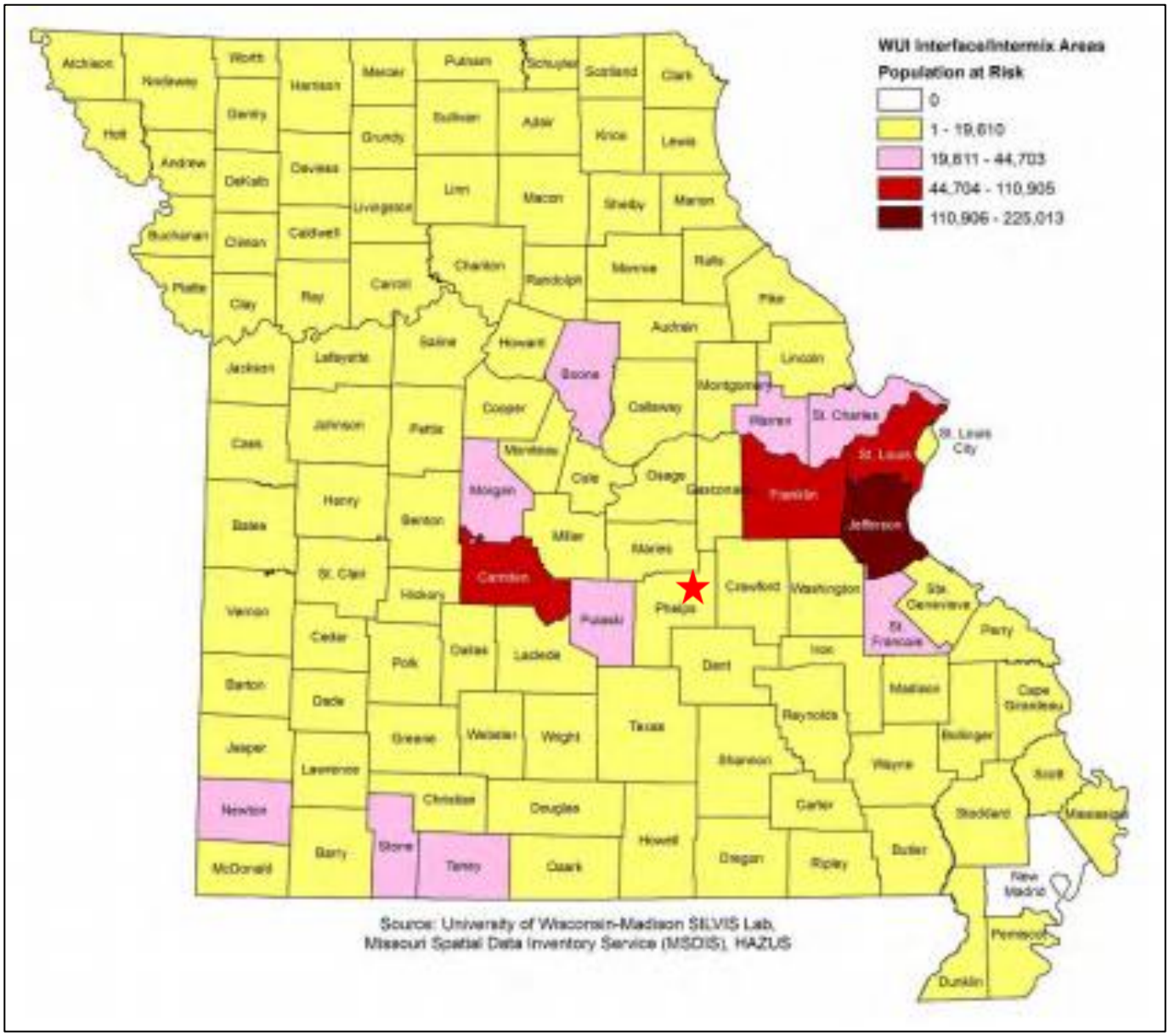
*Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Phelps County,*

Figure 3.48. Value of Structures in the WUI Interface and Intermix Areas



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

Figure 3.49. Population at Risk to Wildfire in WUI Interface and Intermix Areas



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

Potential Losses to Existing Development

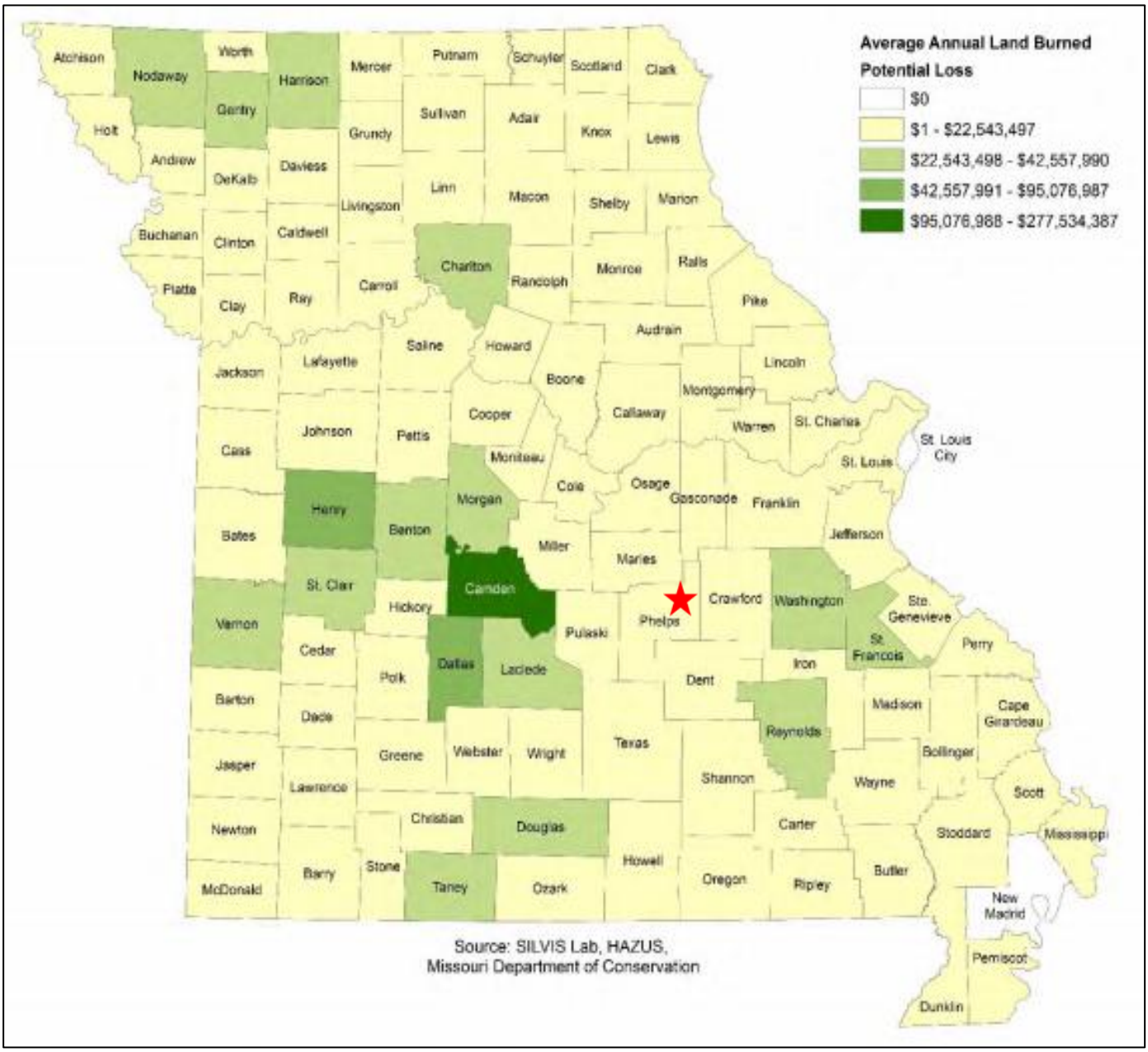
As there was not data available on Phelps County specific losses, data was used from the 2018 Missouri State Hazard Mitigation Plan. The factors considered for estimating potential losses due to wildfires were average acreage burned each year per county and the average value of structures per acre in the WU-Interface/Intermix areas. **Table 3.43** and **Figure 3.50** that follows provide the potential loss figures for Phelps County based on this methodology.

Table 3.43. Wildfire Potential Loss Estimates for Phelps County

Total WUI Acreage	Total Structure Value Within WUI	Average Value/Acre within WUI	Average Annual Acreage Burned	Potential Loss
81,168.38	$2,210,312,924	$27,231	271	$7,379,657

Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.50. Annualized Wildfire Damages



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

Impact of Previous and Future Development

Few future developments are anticipated in WUI areas, however due to lack of data, it is difficult to enumerate. Additionally, as previously mentioned, 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 Phelps County should have a low-medium adverse impact on the community, depending on the proximity to population centers. Nonetheless, homes, businesses, and schools located in unincorporated areas are at higher risk from wildfires due to proximity to woodland and more importantly, distance from fire services. All cities and school districts are in WUI areas, but are closer to fire services.

Problem Statement

An estimated 9,426 structures and 19,610 people are vulnerable to wildfires in Phelps 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 (Riverine and Flash)

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 in **Figure 3.51** is a map of Phelps County showing the floodplain boundaries. Following the county-wide map are FIRMs for Doolittle, Newburg, Edgar Springs, Rolla, and St. James (**Figure 3.52 through Figure 3.56**). Digital data for SFHAs is not available. **Figure 3.57** shows a map of the school districts in Phelps County with an overlay of the SFHA. Newburg R-II School District is the only district within the county that has school building located in the floodplain. **Figure 3.58** is a map showing the floodplain and the location of the Newburg R-11 school buildings in relation to the SFHA. **Table 3.44** shows Phelps County NCEI flood events by location between 1999 and 2019.

Figure 3.51. Map of Phelps County with Special Flood Hazard Areas.

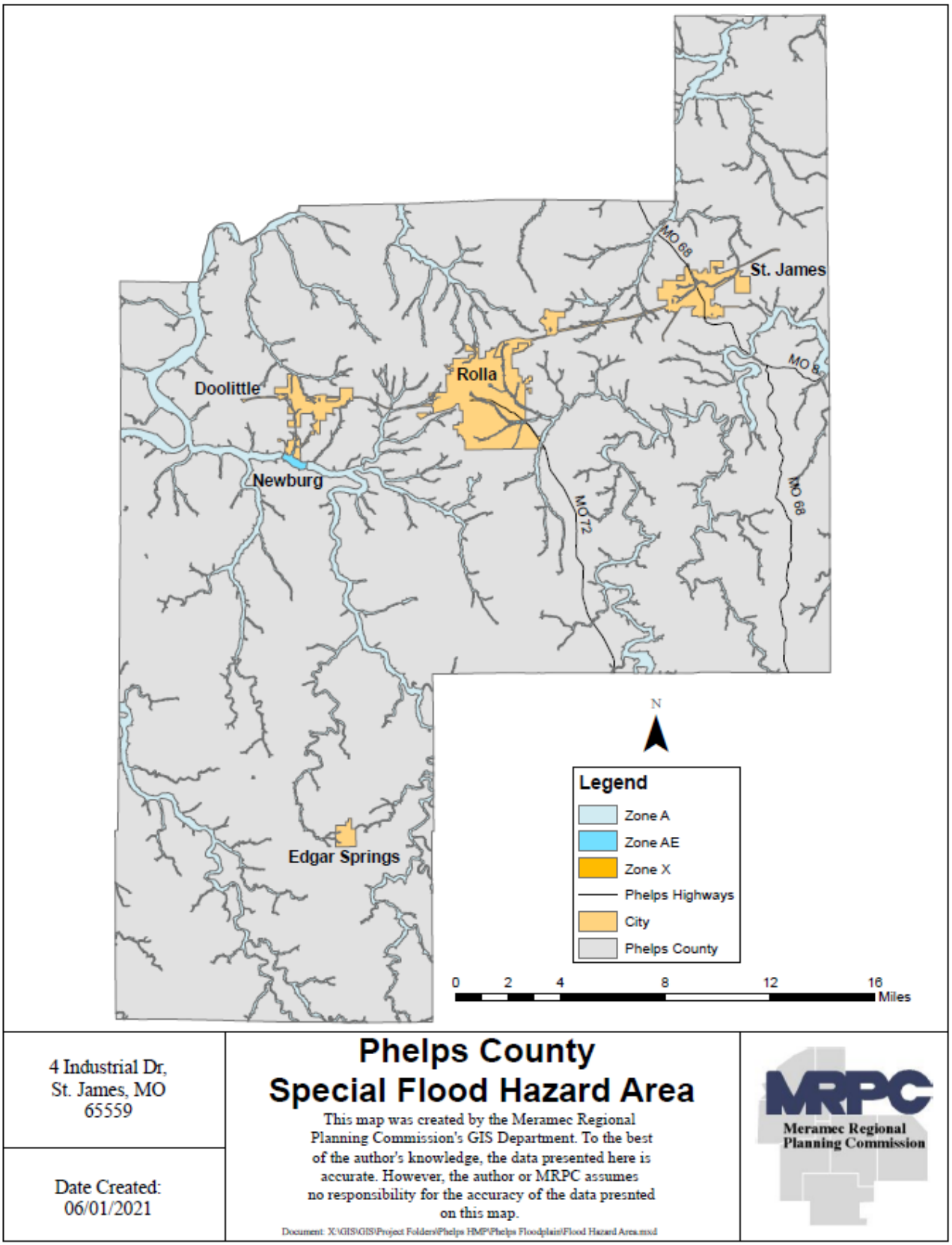


Figure 3.52. Doolittle and Newburg, Missouri Special Flood Hazard Areas (SFHAs)

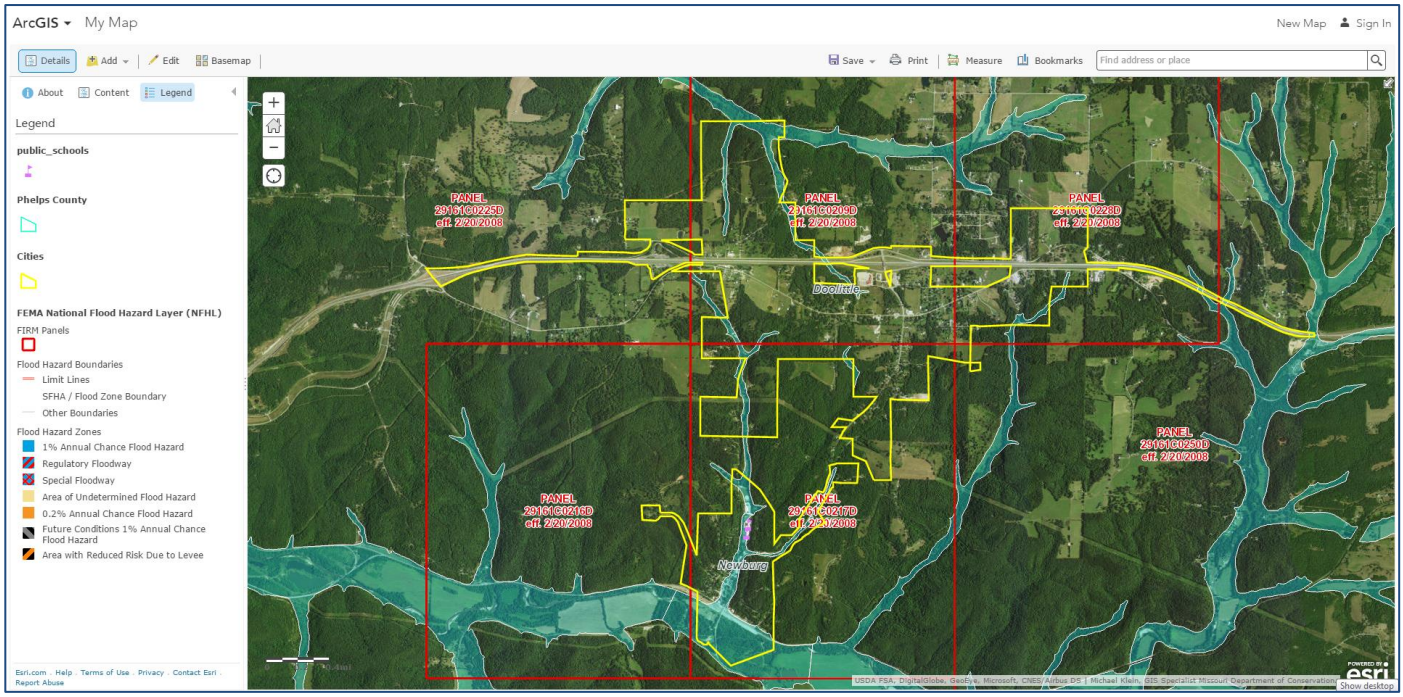


Figure 3.53. Edgar Springs, Missouri Special Flood Hazard Areas (SFHAs)

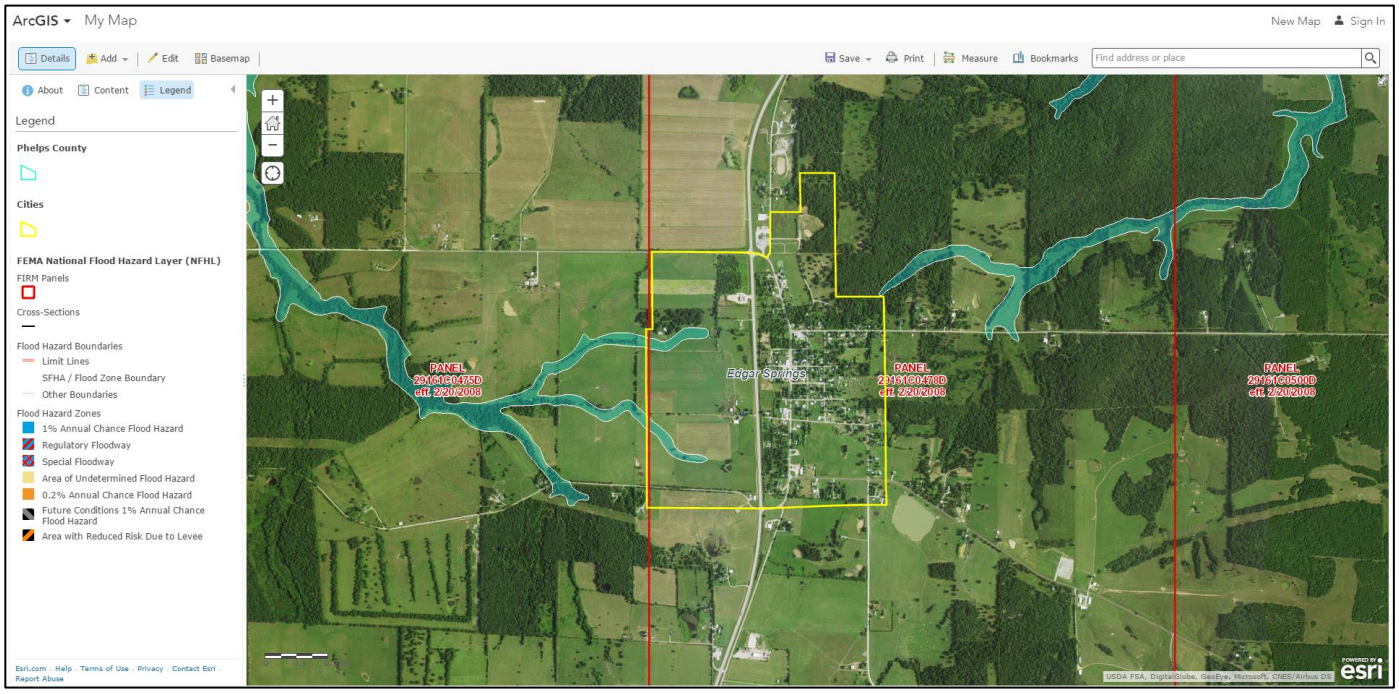


Figure 3.54. Rolla, Missouri Special Flood Hazard Areas (SFHAs)

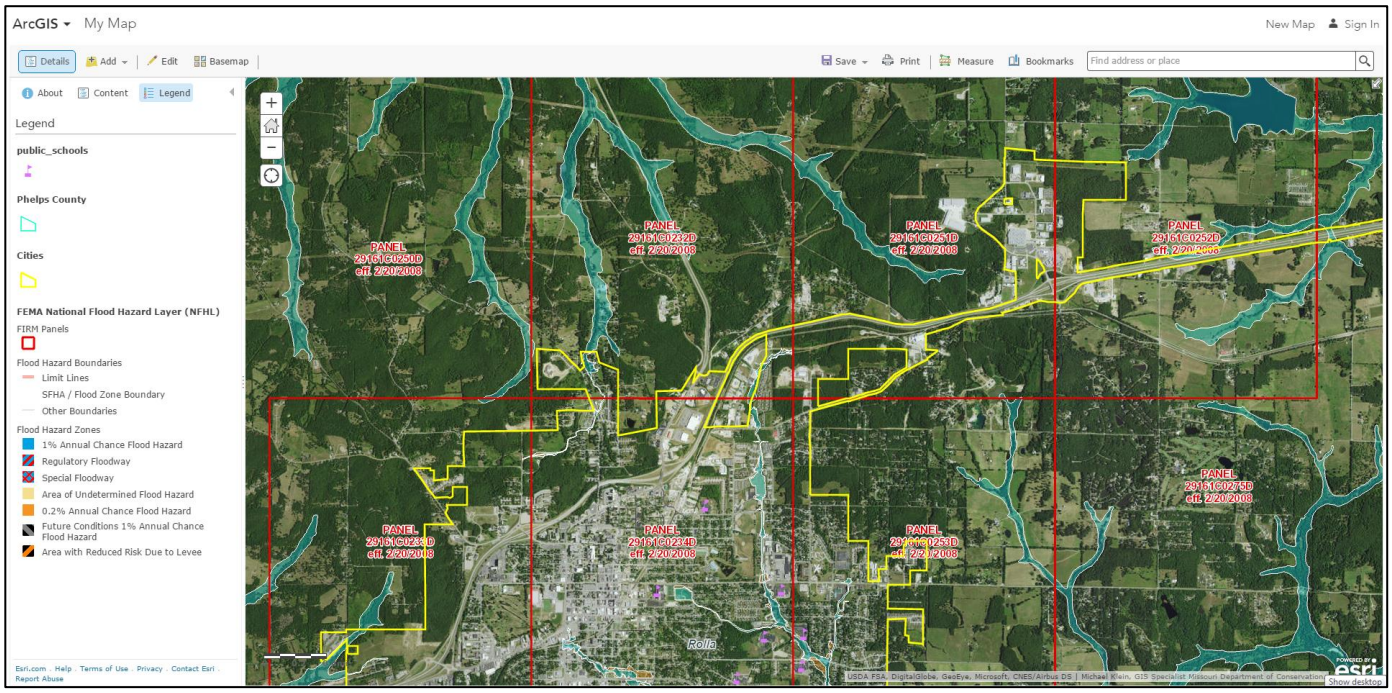


Figure 3.55. Rolla, Missouri Special Flood Hazard Areas (SFHAs) continued

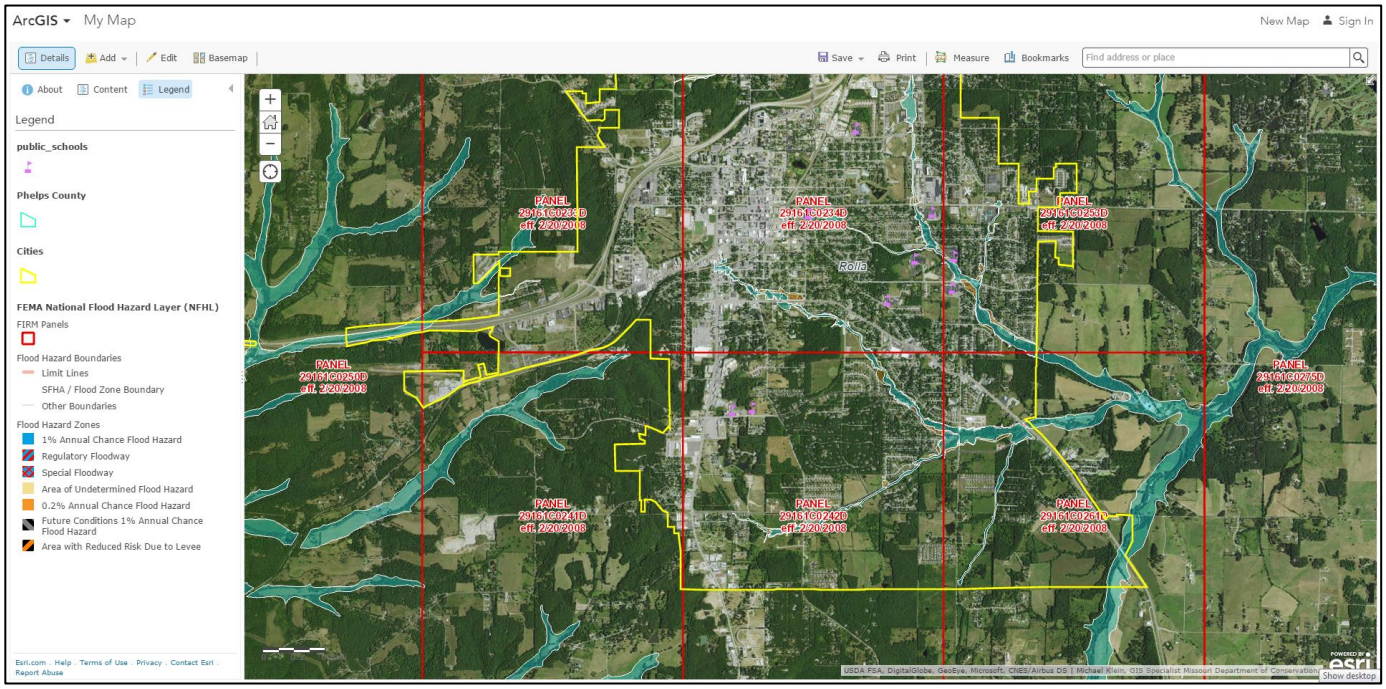


Figure 3.56. St. James, Missouri Special Flood Hazard Areas (SFHAs)

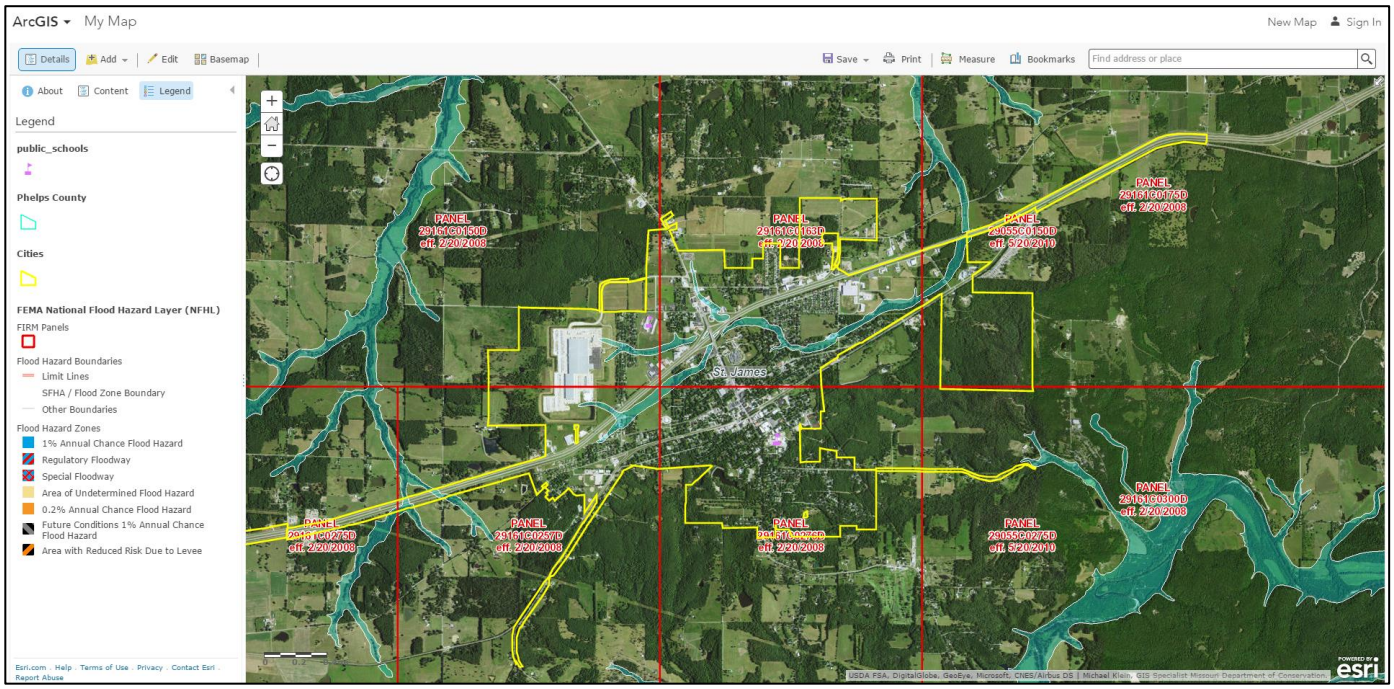


Figure 3.57. Phelps County School Districts and Special Flood Hazard Areas (SFHAs)

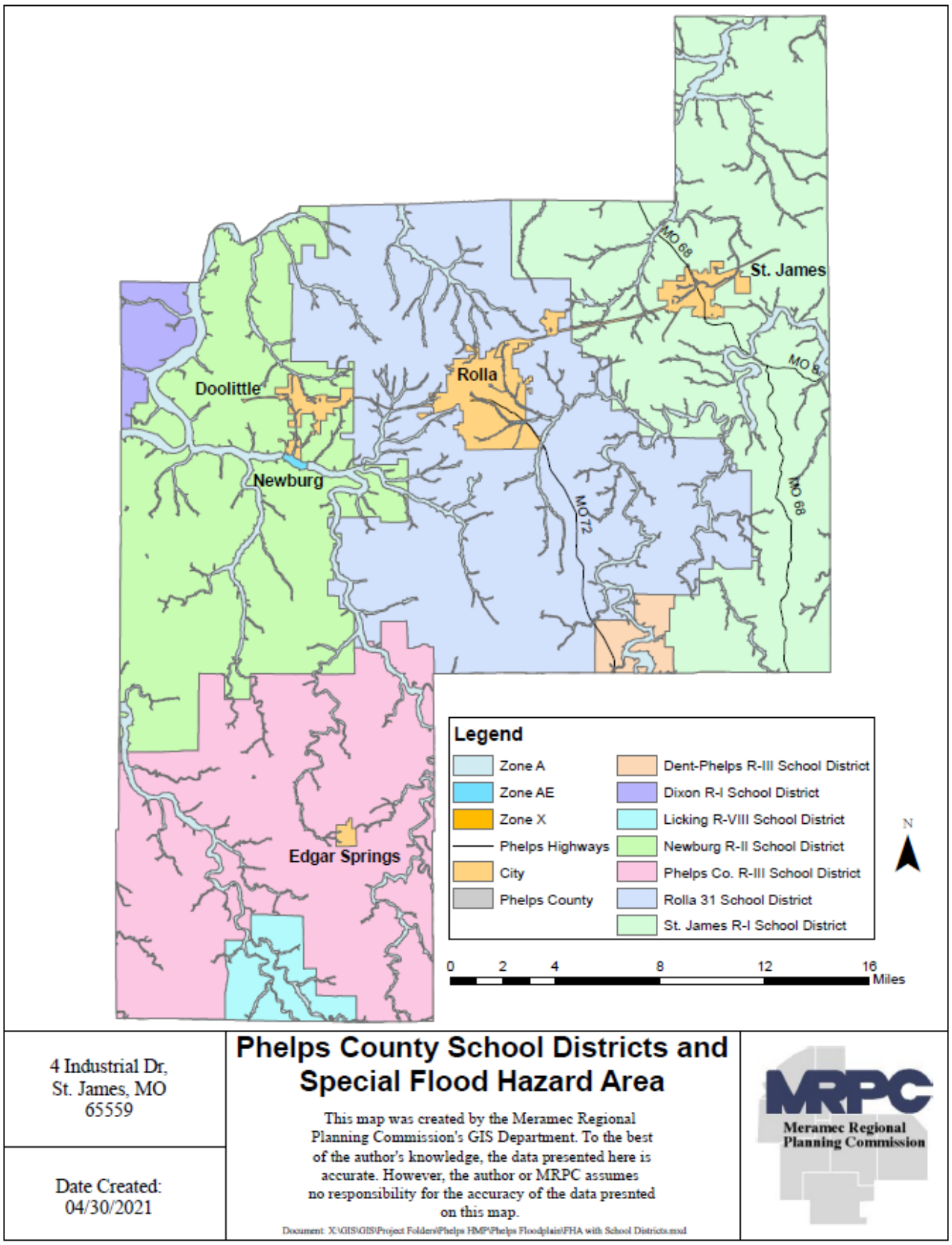


Figure 3.58. St. James, Missouri Special Flood Hazard Areas (SFHAs)

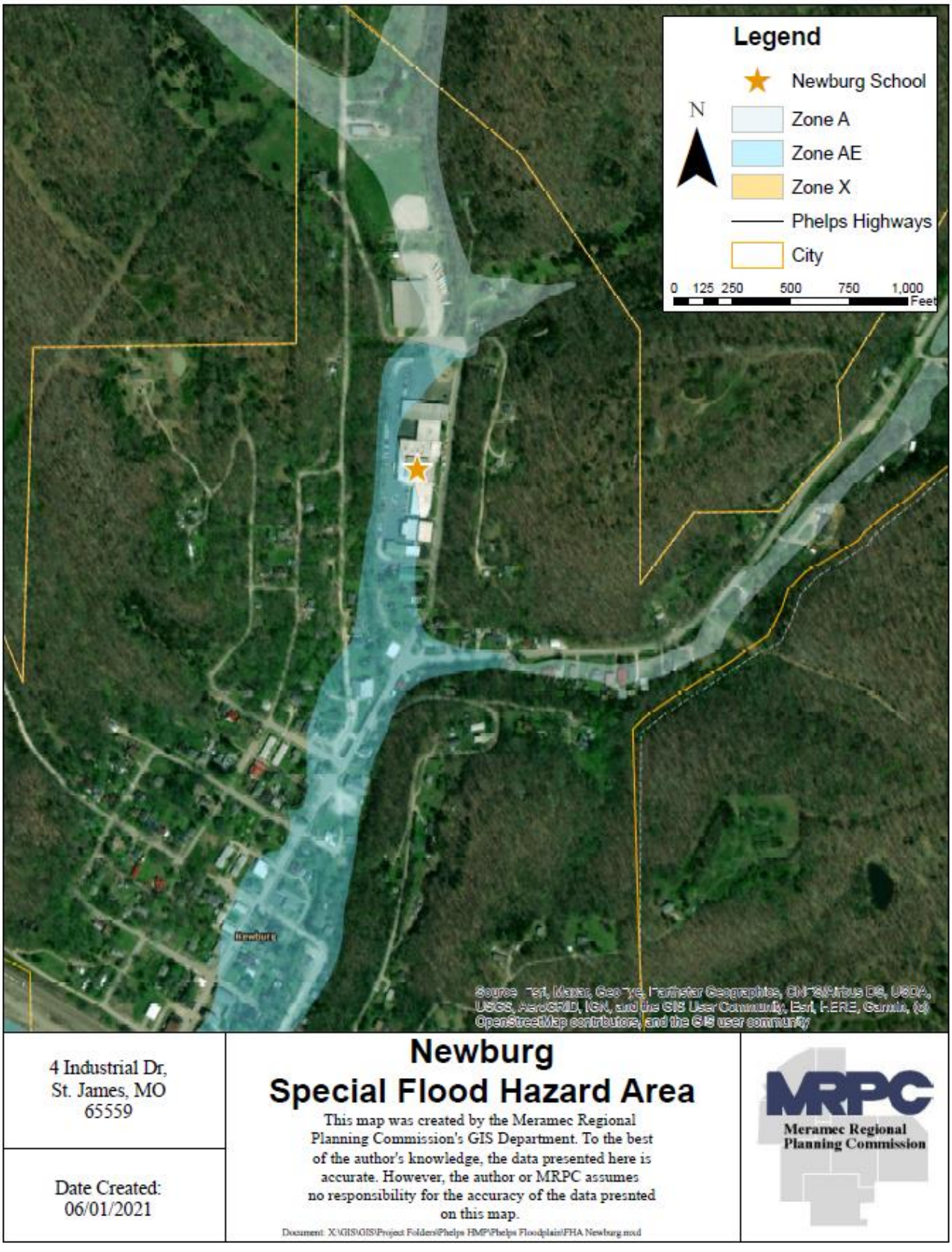


Table 3.44. Summary of Phelps County NCEI Flood Events by Location, 1999-2019

Location	# of Events
Phelps County	7
Bundy Junction	1
Dillon	3
Doolittle	7
Flat	2
Northwye	1
Powellville	2
Rolla	1
Rolla Downtown Airport	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, Rolla is the community most prone to flash flooding events. The city of Newburg and Northwye, an unincorporated area of the county, also have a high rate of flash flood events (both 7). **Table 3.45** provides information in regards to flash flood events between 1999 and 2019.

Table 3.45. Phelps County NCEI Flash Flood Events by Location, 1999-2019

Location	# of Events
Phelps County - Countywide	3
North Portion (county)	1
Craddock	1
Dillon	2
Doolittle	5
Edgar Springs	2
Flag Springs	1
Flat	3
Jerome	1
Newburg	7
Northwye	7
Powellville	2
Rolla	11
Rosati	3
Royal	1
St. James	2
Stoney Dell	1
Sugartree	2
Vida	2
Yancy Mills	1
Zion Hill	1

Source: National Centers for Environmental Information

Strength/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 1999 and 2019, there were 2 recorded flood-related crop insurance claims with total losses of $14,942 due to flooding within Phelps County[35]. **Table 3.46** shows crop losses for the period 1999 through 2019 (years with no losses are not shown).

Table 3.46. Recorded USDA Crop Insurance Losses (Flood) for Phelps County 1999 – 2019

2013	2015
$9,625.50	$5,316.50

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 Phelps County.

Table 3.47. NFIP Participation in Phelps County

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	Regular-Emergency Program Entry Date
290727	Doolittle	Y	02/20/08	08/24/84
290851A	Edgar Springs	Y	NSFHA	08/24/84
295268	Newburg	Y	02/20/08	04/28/72
290285	Rolla	Y	02/20/08	09/30/77

[35] http://www.rma.usda.gov/data/cause.html

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	Regular-Emergency Program Entry Date
290661	St. James	Y	02/20/08 (M)	07/03/85
290824	Phelps County	Y	02/20/08 (M)	02/01/87

Source: NFIP Community Status Book, 09/02/2020; BureauNet, https://www.fema.gov/flood-insurance/work-with-nfip/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 08/12/2020

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Newburg	10	$935,700	5	$105,348.97
Rolla	54	$13,750,200	78	$1,201,212.63
St. James	6	$509,300	2	$655.40
Phelps County	60	$9,980,700	212	$8,820,235.34

*Source: NFIP Community Status Book, [08/12/2020]; BureauNet, https://protect2.fireeye.com/url?k=8a472659-d6065a76-8a45ea93-0cc47a6d17a8-4f92b28e814f9424&u=http://bsa.nfipstat.femxa.gov/reports/reports.html; *Closed Losses are those flood insurance claims that resulted in payment.*

Phelps County has the highest number of policies, losses and total payments with $8,820,235.34 compared to Rolla's $1,201,212.63.

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 Phelps County was held in December 2018 and flood study review meetings were held in November of 2019 and February of 2020.

Repetitive Loss/Severe Repetitive Loss Properties

Repetitive Loss Properties (RL) are those properties with at least two flood insurance payments of $1,000 or more in a 10-year period.

According to SEMA, as of 4/30/18, there are 37 repetitive loss properties in unincorporated Phelps County that have had 119 losses with total payments of $6,853,239. The city of Newburg has one repetitive loss property which has had two losses with total payments of $88,764. The city of Rolla has ten repetitive loss properties which have had 31 losses with total payments of $1,127,870. According to SEMA, jurisdictions included in the planning area have a combined total of 48 repetitive loss properties. Four properties have been mitigated, leaving 44 un-mitigated repetitive loss properties.

Table 3.49. Repetitive Loss Properties in Phelps County*

Jurisdiction	# of Properties	# Mitigated	Building Payments	Content Payments	Total Payments	Average Payment	# of Losses
Phelps County	37	4	$755,802.52	$42,349.57	$798,152.09	$61,396.31	13

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.

There is one Severe Repetitive Loss property in Phelps County. The property has not been mitigated, and the total amount of $239,938.18 has been paid over four NFIP claims. (See below for explanation of data limitations.)

*Due to federal restrictions on data sharing, the state was unable to provide full Repetitive Loss data or current Severe Repetitive Loss data. The Property Type was not available for Repetitive Loss properties and the Severe Repetitive Loss data, which was obtained from the 2018 MO State Hazard Mitigation Plan, does not specify if the properties are mitigated or non-mitigated.

Previous Occurrences

Table 3.50 provides information regarding Presidential Flooding Disaster Declarations between 1999 and 2019 for Phelps County.

Table 3.50. Phelps County Presidential Flooding Disaster Declarations 1999 to 2019

Declaration No.	Date	State	Incident Description
DR-1463	05/06/2003	Missouri	Severe Storms, Tornadoes, and Flooding
DR-1631	03/16/2006	Missouri	Severe Storms, Tornadoes, and Flooding
DR-1676	01/15/2007	Missouri	Severe Winter Storms, Flooding
DR-1742	02/05/2008	Missouri	Severe Storms, Tornadoes, and Flooding
DR-1749	03/19/2008	Missouri	Severe Storms, and Flooding
DR-1847	06/19/2009	Missouri	Severe Storms, Tornadoes, and Flooding
DR-1980	5/9/2011	Missouri	Severe Storms, Tornadoes, Flooding
DR-4130	09/06/2013	Missouri	Severe Storms, Straight-line Winds, Tornadoes, and Flooding
DR-4144	10/08/2013	Missouri	Severe Storms, Straight-line Winds, and Flooding
EM-3374	12/22/2015	Missouri	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding
DR-4250	01/21/2016	Missouri	Heavy Rains, Widespread Flash Flooding, and Flooding
DR-4317	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 3.51** and **Table 3.52** provide this information. Additionally, narratives available for each event are included.

Table 3.51. NCEI Phelps County Riverine Flood Events Summary, 1999 to 2019

Year	# of Events	# of Deaths	# of Injuries	Property Damages ($)	Crop Damages ($)
2002	6	0	0	110K	0
2005	1	0	0	0	0
2008	2	0	0	0	0
2009	1	0	0	0	0
2010	4	0	0	0	0
2013	2	0	0	0	0
2015	6	0	0	0	0
2017	1	0	0	0	0
2018	3	0	0	0	0
Total	**26**	**0**	**0**	**110K**	**0**

Source: NCEI, data accessed [09/04/2020]

Narratives on flood events:

1. **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.

2. **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.

3. **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 Phelps 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.

4. **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.

5. **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.

6. **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.

7. **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 Phelps County, numerous roads and low lying areas were inundated and impassable by motorists countywide.

8. **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.

9. **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 Phelps County. Numerous low water crossings across the county flooded. A section of County Road 511 at its intersection with Clifty Creek had three feet of fast moving water over the road.

10. **10/29/2009:** Showers and thunderstorms produced flooding across Southwest Missouri wth isolated wind damage in Neosho. Several low water crossings were reported flooded across Phelps County.

11. **04/02/2010-04/03/2010:** Strong to severe thunderstorms, associated with a cold front, pushed across southeast Kansas and into Missouri. The storms initially produced severe wind gusts up to 75 mph in Kansas, then produced flooding rains across portions of central Missouri.

12. **05/14/2010:** Severe thunderstorms associated with a cold pool from an upper level low developed during the early morning hours of May 13th. The storms produced hail, winds up to 60 mph, flooding and three confirmed tornadoes. Heavy rainfall from the storms on the 13th produced flooding across portions of the region as storms developed and moved across a stationary front across the Missouri Ozarks. Several rounds of storms producing heavy rainfall continues the flooding across the region lasting into the 15th before flood waters receded.

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 Phelps River to flood over a low water crossing which a motorist attempted to drive across.

14. **03/17/2013:** A slow moving front help developed strong to severe thunderstorms which produced several reports of marginal severe hail. Heavy rainfall over some areas produced localized flooding across the Missouri Ozarks.

15. **11/17/2015:** A slow moving storm system produced several rounds of heavy rainfall which led

to flooding across the Missouri Ozarks.

16. **04/26/2017:** Severe storms hit the Missouri Ozarks.

17. **02/24/2018:** Heavy rainfall over several days caused minor flooding across the Missouri Ozarks. Between four and eight inches of rainfall fell over the course of about a week.

18. **03/27/2018:** Several rounds of thunderstorms caused heavy rainfall and minor flooding.

Table 3.52. NCEI Phelps County Flash Flood Events Summary, 1999 to 2019

Year	# of Events	# of Deaths	# of Injuries	Property Damages ($)	Crop Damages ($)
2000	1	0	0	0	0
2002	5	0	1	30K	0
2003	1	0	0	0	0
2005	1	0	0	0	0
2006	2	0	0	0	0
2007	3	0	0	0	0
2008	12	0	0	8K	0
2009	7	0	0	10K	0
2010	5	0	0	0	0
2011	2	0	0	250K	0
2012	2	0	0	50K	0
2013	10	0	0	1M	0
2014	1	0	0	0	0
2015	3	0	0	0	0
2017	1	0	0	0	0
2018	1	0	0	0	0
2019	2	0	0	0	0
Total	**59**	**0**	**1**	**5.118M**	**0**

Source: NCEI, data accessed [09/04/2020]

Narratives on flash flood events:

1. **08/03/2000:** An estimated three to four inches of rain fell in the southern portions of Rolla, causing numerous streets to flood.

2. **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 air mass 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 to 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. Approximately two major roads and 14 bridges were either damaged or completely washed out in northern Pulaski county where the highest rainfall totals occurred. In Rolla, Missouri two feet of water was flowing over some city streets. In St. James, cars were reported washed off the roadway into area creeks and streams. The flooding also trapped one man and three children on a low water bridge west of Doolittle. Another man was swept downstream as his

car went into a flooded ditch near Rolla. No serious injuries were reported. The flash flooding also drove some residents of Beaver Manor near Rolla from their homes. Around the Beaver Manor subdivision, propane gas tanks were lifted from their anchored positions and chain-link fences and boats were wash nearly a mile downstream along Beaver Creek. About 20 homes sustained damage in Phelps County. In Miller County, both the Big Tavern Creek, and Little Tavern Creek flooded causing considerable damage to roads and bridges, especially near St. Elizabeth where the Creeks cross Highway 52. The roads had chunks of concrete shattered and missing from the bridge's floor. Near Iberia, an unofficial report of eight inches of rain fell in less than one hour. Fences were also flattened by rushing water in a few places. One creek crossing had debris caught up in trees a good five or six feet above ground.

3. **05/07/2002:** 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 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. A 17 year old female died after being swept off a low water crossing on Beaver Creek six miles north of Mountain Grove, or along the Wright/Texas County border. More specific county information along with all monetary damages will be included in the flood narrative listed on May 9th.

4. **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.

5. **05/16/2002:** This was the third major flood event to occur within a 10 day period. Some communities reported over a foot of rain since the beginning of May. This area of excessive rainfall fell over mostly southern Missouri, south of Interstate 44 from the night of May 16, through the morning May 17th. Over an inch of rain fell over a broad area of southern Missouri, with bands of three to six inches from Joplin to Carthage, Powell to Cassville, Ozark to Mansfield, and from Licking to Ankers in northern Shannon County. Even though there were three days of dry weather, runoff was not complete from the previous flooding event, therefore, flash flooding developed quickly.

6. **08/20/2002:** Four inches of rain fell in less than 3 hours over portions of northern Dent County and southern Phelps County. Locally five to seven inches fell near Boss in east central Dent County. Local law enforcement officers reported Highway 32 east of Salem flooded with nearly 12 inches of water flowing over the road at one point. One of the officer's car nearly floated away due to the extremely high water level as he drove down the highway, however, he was able to get out with no injuries. Numerous low water crossings also flooded across the area with several roads closed.

7. **07/12/2003:** Emergency management officials observed a foot of water crossing several low water bridges near the city of Rolla making them impassable.

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 Phelps County, numerous roads and low lying areas were inundated and impassable by motorists countywide.

9. **05/10/2006:** Excessive rainfall caused widespread flooding across Phelps County. Numerous low water crossings became impassable along with low lying areas near several county roads. Sections of county roads 8070, 3330, 7530, 3520, 8410, and 5180 became flooded and impassable. Sections of Highways CC and Y also became impassable during the height of the event.

10. **05/29/2006:** Excessive rainfall caused flash flooding within the city of Rolla. Several roads became impassable to motorists.

11. **03/30/2007:** Heavy thunderstorms produced flooding rains near the town of Rolla. Flooding occurred on portions of county Highways E, YY, and BB which caused the roadways to become impassable to motorists. Portions of Highway 63 in Rolla were covered with as much as two and a half feet of water making the road impassable to motorists.

12. **05/10/2007**: Heavy thunderstorms caused flooding over Highway 63 near its intersection with Highway H.

13. **09/07/2007:** A creek in St. James flooded out of its banks. Multiple low water crossings across Phelps County also experienced flash flooding.

14. **01/07/2008**: Excessive rainfall caused numerous low water crossings to experience flash flooding west of Rolla.

15. **02/05/2008**: Numerous roads became impassable from flash flooding on the eastern edge of Rolla.

16. **02/17/2008:** Specific locations across Phelps County that experienced flash flooding included a section of Highway O south of Rolla, a section of Highway A north of Rolla, a section of Highway E north of Rolla, the intersection of Highway 63 and Highway CC, a section of Highway O at its intersection with Jones Creek, and a section of Highway C one mile north of its intersection with Interstate 44.

17. **03/18/2008:** Four to nine inches of rain fell over Phelps County. Major flooding occurred along rivers and creeks. Record flooding occurred along the Gasconade River near Jerome and Newburg. Damage to county roads and bridges was common. The southern portion of Phelps County received the greatest rainfall.

18. **03/31/2008:** Saturated antecedent conditions existed prior to this period of excessive rainfall. Some regional locations experienced record rainfall totals from February and March. One to three inches of rain fell across the county causing widespread flash flooding of low water crossings, county roads, and low lying areas near creeks and rivers. Ultimately, all locations that typically flood during periods of excessive rainfall were flooded.

19. **04/10/2008:** On average, one inch of rain fell over Phelps County. A few low water crossings

flooded, along with a section of Highway AA near its intersection with Highway P.

a. One to two inches of rain fell over Phelps County. All low areas that typically flood during periods of excessive rainfall were flooded.

20. **06/06/2008:** Flash flooding occurred over numerous streets in the city of Rolla. Flooding also occurred along a few small streams and creeks near the community of Edgar Springs.
    a. City streets and creeks near and within the community of Edgar Springs experienced flash flooding.

21. **08/28/2008:** Numerous city streets in Rolla experienced flash flooding from a training cluster of thunderstorms. A section of Highway BB near St. James also experienced flash flooding.

22. **09/14/2008:** Two to four inches of rain fell over Phelps County resulting in flooding of small streams, creeks, and one main stem river. A few specific locations that flooded included a section of Highway E northwest of Rolla, a section of Highway Y, a section of Highway P, and several streets in the community of Newburg.

23. **12/27/2008:** Urban flooding in Rolla led to water running in a few homes.

24. **05/27/2009:** Excessive rain cause flooding across portions of Phelps County. Two to six inches of rainfall caused several county roads and low water crossings to become impassable to motorists. The community of St. James and surrounding areas was impacted the most. A section of Highway 68 near St. James had over a foot of water running over the road.

25. **10/29/2009:** Route J near the Big Piney River was closed due to flooding.
    a. Highway E was closed due to flooding.
    b. Route E north of the junction of Route HH was closed due to flooding.
    c. Numerous streets were flooded and impassable in Newburg.

26. **10/30/2009:** Homes were evacuated along Beaver Creek due to flooding.

27. **03/25/2010:** Low water crossings were flooded.

28. **05/12/2010:** The low water crossing on County Road 5220, south of Rolla, was flooded to an unknown depth and impassable.

29. **07/19/2010:** Very heavy rainfall from slow moving thunderstorms flooded the Maramec Spring Campground in eastern Phelps County. The flooding forced an evacuation of the campground at 445 am.
    a. Water, a foot and a half deep, was flowing over road to the campground in Maramec Spring State Park.

30. **07/29/2010:** Heavy rainfall from thunderstorms produced street flooding in Rolla at 10th Street and Forum Drive. One to two feet of water was flowing over the roadway.

31. **04/24/2011:** Route J was closed due to flooding. The total cost estimate for flooding damages for Phelps County for this entire episode has been included. This includes roads, bridges, and structures which were affected.

32. **05/01/2011:** Emergency manager reported several low water crossings flooded in Phelps County.

33. **03/15/2012:** Highway C was closed due to flooding.
    a. Water flooded out homes causing evacuations to be conducted. Highway D was closed due to flooding.

34. **04/10/2013**: Water was over the roadway along Highway E, at Wild Cat Creek.

35. **08/07/2013:** High water was over the roadway at State Highway T.
    a. Several streets in Rolla were flooded with a foot or more of water. One car stalled in the flood water. One low water bridge was flooded and impassable.
    b. This storm report will include the total estimated damage for the flooding event. The Little Piney Creek rose two feet in one hour and flooded portions of the town of Newburg. Up to two hundred residents in Newburg had to be evacuated. Several businesses and homes were flooded. There were several low water crossings and roadways that had damage due to flood waters.
    c. County Road 3000 at the Little Dry Fork had approximately two to three feet of rushing water over the bridge and was impassable.
    d. Highway P west of the Highway T intersection had high water and was impassable.
    e. A bridge was washed out by the First Baptist Church.
    f. Several buildings along Front Street and 1st Street in downtown Newburg were flooded. The police chief reported moderate to severe street damage due to rushing water.
    g. The Missouri Department of Transportation closed Interstate 44 near mile marker 172 near the Phelps and Pulaski County line. High water from the Gasconade River overflowing its banks was flowing onto the interstate.
    h. Meramec Spring Park was flooded including the campgrounds which had been evacuated prior to flash flooding.

36. **04/03/2014:** Several roads were reported closed around the county due to flooding.

37. **07/02/2015**: Route J was closed one mile north of Route M at the Big Piney River.

38. **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.

39. **08/29/2018:** August 28-30 Showers and storms developed ahead of a cold front that moved from eastern Kansas into central and southern Missouri on the 28th and 29th, with additional storm Images show rainfall accumulations development on the 30th as the front shifted back to the north of the Ozarks. The heaviest rainfall occurred during the morning and afternoon of the 30th, as a mesoscale convective system that developed near Wichita during the early morning of the 30th moved slowly eastward into southeast Kansas and southwest Missouri. Repeated development of storms over the region led to rainfall accumulations in excess of four inches over portions of Stone, Christian, Cherokee and Bourbon Counties. Numerous reports of flash flooding were received in these areas.

40. **07/17/2019:** Heavy rains from an isolated thunderstorm produced localized flooding.

41. **08/13/2019:** Storms developed along an outflow boundary from central Missouri into southeast Kansas just after midnight and moved across central Missouri through the early morning hours. Damaging wind gusts and flash flooding occurred where isolated rainfall

amounts exceeded two inches over central Missouri.

Probability of Future Occurrence

From the data obtained from the NCEI [36], there were 26 riverine flood events (**Table 3.51)** over a period of 21 years. This information was utilized to determine the annual average percent probability of riverine flooding (**Table 3.53**). The probability of riverine flooding in Phelps County per year is 100 percent (26 events/21 years x 100) with an average of 1.2 events per year. Furthermore, data was obtained for flash flooding within the county. Phelps County endured 59 flash flooding events (**Table 3.52**) over a 21 year period. The probability of flash flooding in Phelps County per year is 100% (59 events/21 years x 100) with an average of 2.8 events per year (**Table 3.54**).

Table 3.53. Annual Average % Probability of Riverine Flooding in Phelps County

Location	Annual Avg. % P	Avg. Number of Events
Phelps County	100%	1.2

*P = probability; see page 3.24 for definition.

Table 3.54. Annual Average % Probability of Flash Flooding in Phelps County

Location	Annual Avg. % P	Avg. Number of Events
Phelps County	100%	2.8

*P = probability; see page 3.24 for definition.

Changing Future Conditions Considerations

As discussed in the 2018 Missouri Hazard Mitigation Plan, there is a high probability that total rainfall from heavy rainfalls will increase in the 21st century across the globe. As the number of heavy rain events increase, more flooding can be expected.[37] Increased development – more roofs and paved areas - can also increase run-off and exacerbate flooding and stormwater issues. These changes will likely result in an increased frequency and severity of floods in Phelps County. This change is already being seen in the last 20 years, with heavy rainfall events becoming more severe and occurring more often and severe flooding occurring more frequently. Flood levels on the Gasconade River broke records three times in the past six years. Homes that were elevated several feet above base flood elevation flooded in Jerome.

If rainfall frequency and intensity continue to increase as expected, this will put additional stress on natural hydrological systems and community stormwater systems. Higher groundwater levels can result in more intensive flooding if the ground is already saturated and flood waters typically recede more slowly when groundwater levels are high.[38] Other considerations include planning for more expansive stormwater capacity, better drainage and erosion control.[39]

[36] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI
[37] 2018 Missouri State Hazard Mitigation Plan
[38] Ibid.
[39] Ibid.

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 a well as present a health hazard.

For the vulnerability analysis of flooding for Phelps 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. Phelps County does have digital FIRMS, the regulatory special flood hazard area was utilized. Next, depth grids were generated using cross sections from the FIRM database and/or hydraulic models in combination with the terrain elevation data from which the DFIRM was derived.

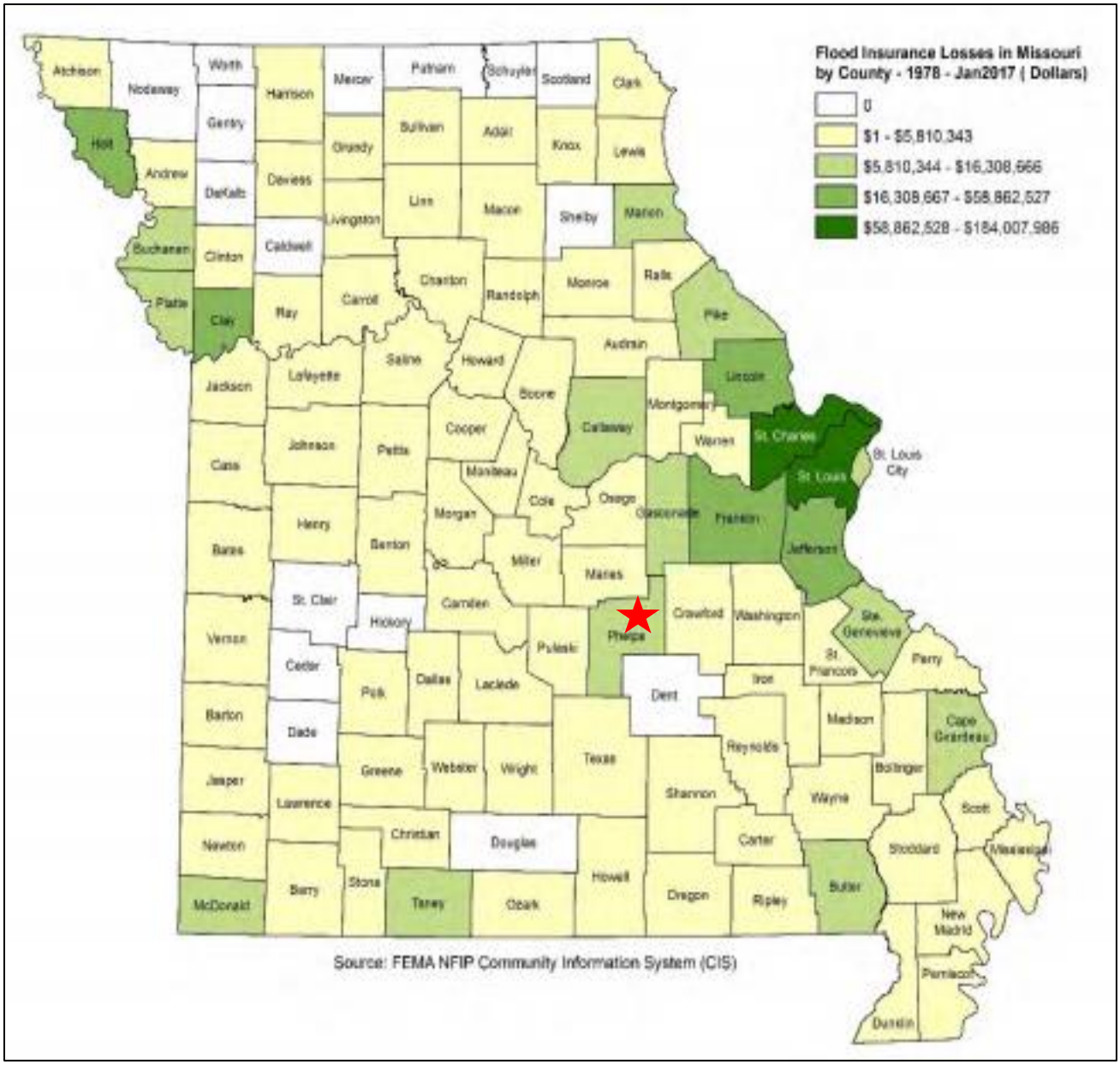
This method was preferred of the three methods, along with RiskMAP flood risk datasets.

In addition to the DFIRM, 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

Figure 3.59 depicts the amount of flood insurance losses in Missouri by county for the period 1978-January 2017. Phelps County falls in the $5,810,344 - $16,308,666 range of payments.

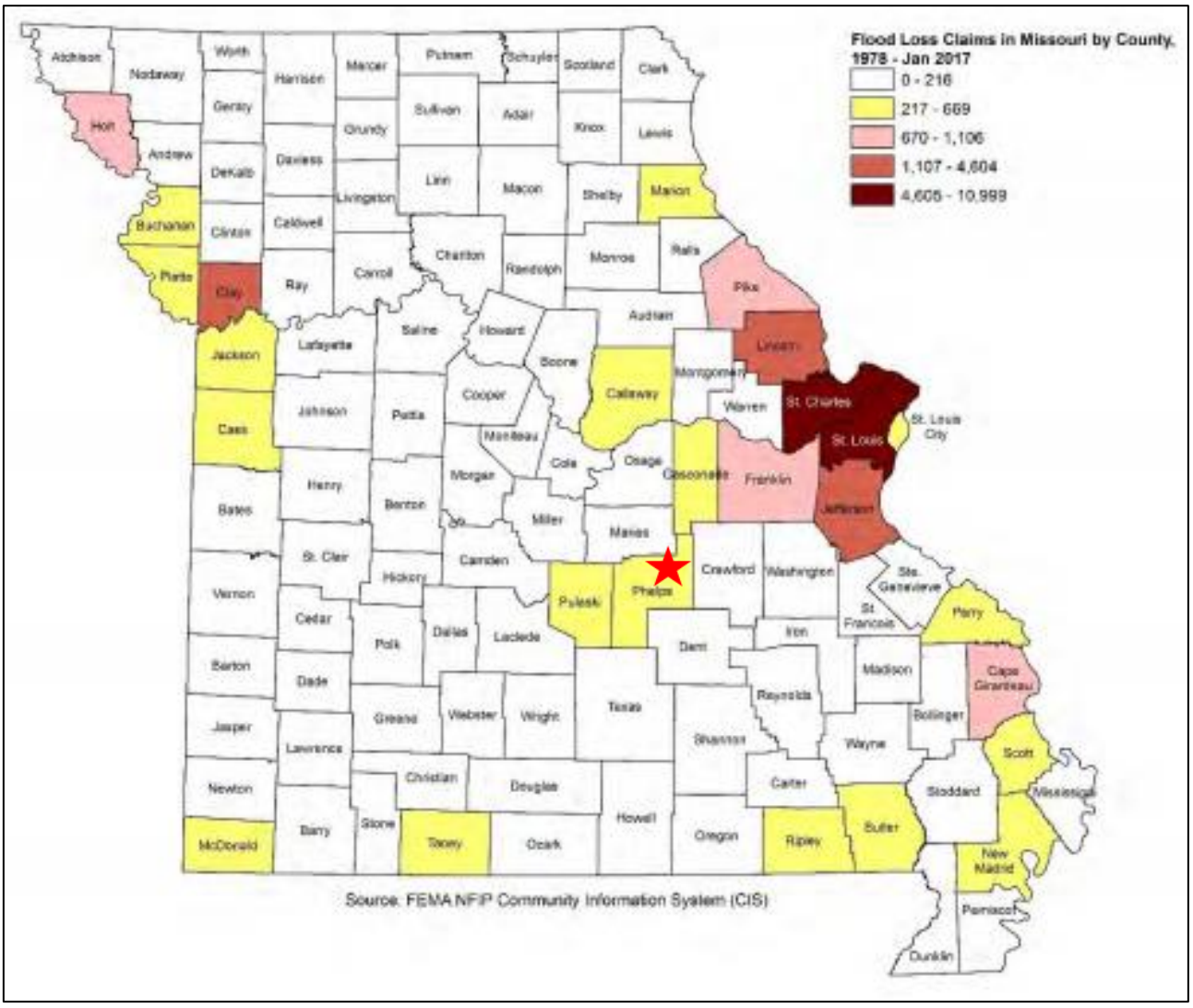
Figure 3.59. Map of Funds Paid Historically for Flood Insurance Losses in Missouri by County 1978 - January 2017



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

Figure 3.60 illustrates the number of flood loss claims made in Missouri during the same time period. Phelps County had 217 - 669 claims during that timeframe.

Figure 3.60. Flood Loss Claims in Missouri by County, 1978 – January 2017



*Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Phelps 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 3.55** provides information regarding total direct building loss and income loss to Phelps County. **Table 3.56** provides information on exposure of buildings. According to the Missouri Spatial Data Information Service (MSDIS) there are 239 residential structures at risk of flood. Hazus shows the number of buildings exposed to flood damage at 30, with 9 potentially substantially damaged in a one percent annual chance of a flood.

Table 3.55. Total Direct Building Loss and Income Loss to Phelps 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
$4,743,488,000	$21,988,000	$14,622,000	$189,000	$36,799,000	$79,000	$36,878,000	0.46

Source: 2018 Missouri State Hazard Mitigation Plan

Table 3.56. Phelps County Structures Exposure

# MSDIS Residential Structures Exposed	# Hazus Buildings Exposed	# Substantially Damaged
239	30	9

Source: 2018 Missouri State Hazard Mitigation Plan

This same analysis indicates that 835 people would be displaced in Phelps County and 203 would need to be sheltered in the event of a major flood.

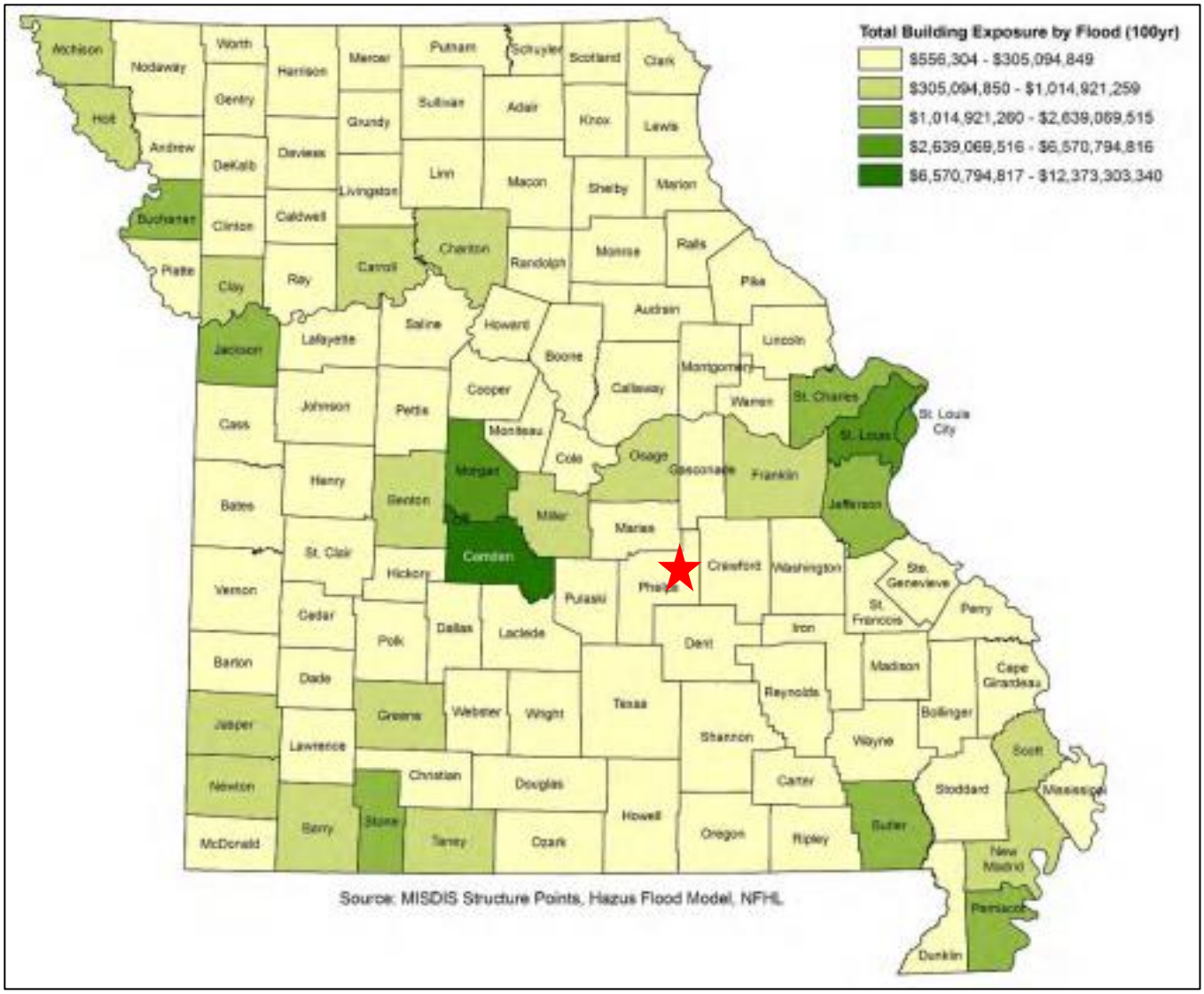
Table 3.57 presents the results of the primary indicators for Phelps County – residential, agricultural, commercial, education, government and industrial. This table illustrates the number of affected structures and estimated losses. **Figure 3.61** shows the building exposure for the Hazus Base-Flood Scenario. Figure 3.58 illustrates the building impacted ratio for a 100-year flood.

Table 3.57. Phelps 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
239	$211,900	119	$189,330	30	$699,978	2	$2,031,980	5	$914,872	0	$0	602	$4,048,060

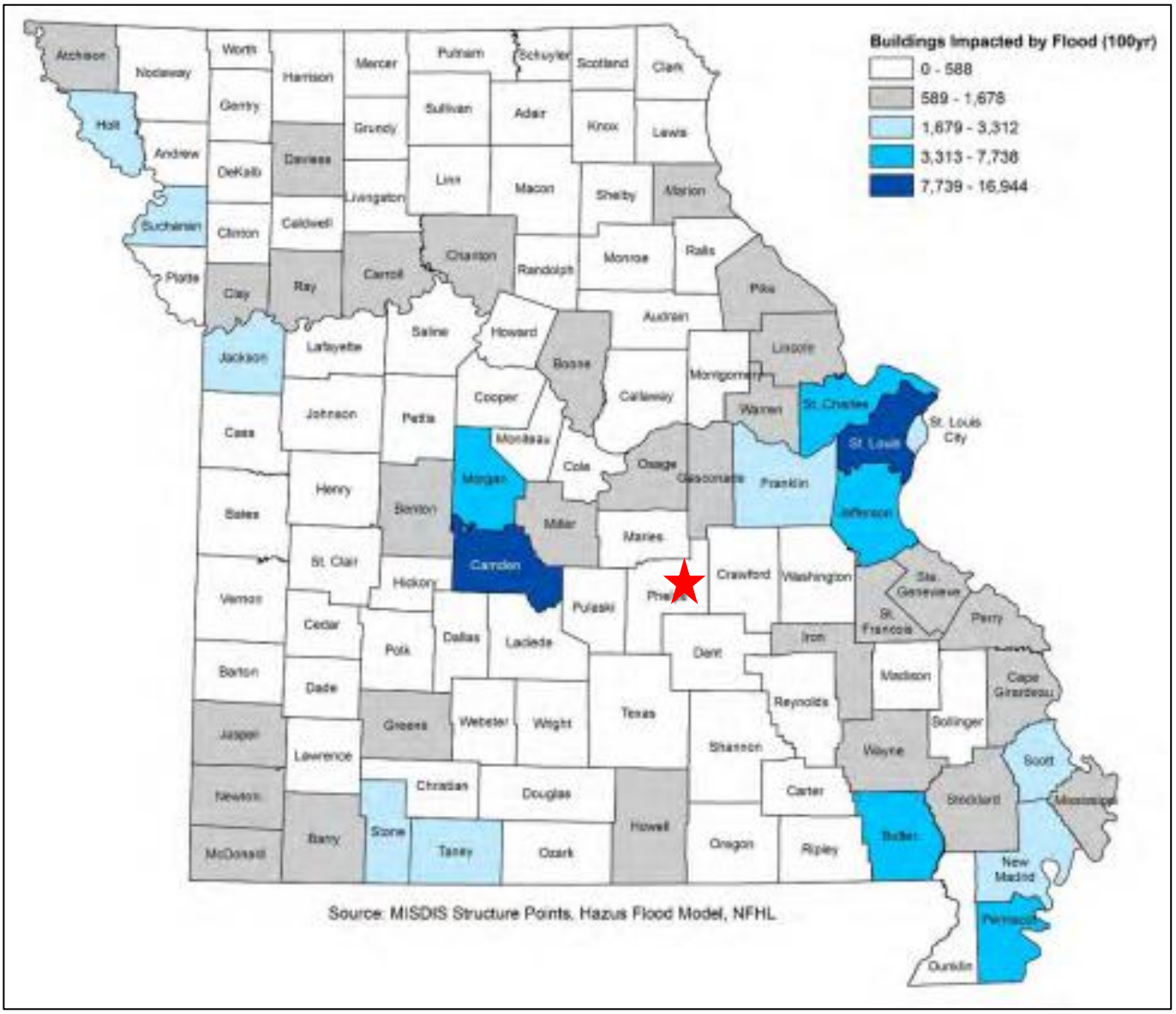
Source: 2018 Missouri State Hazard Mitigation Plan

Figure 3.61. Hazus Countywide Base-Flood Scenarios: Building Exposure



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

Figure 3.62. Hazus Countywide Base-Flood Scenarios: Building Impacted Ratio



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

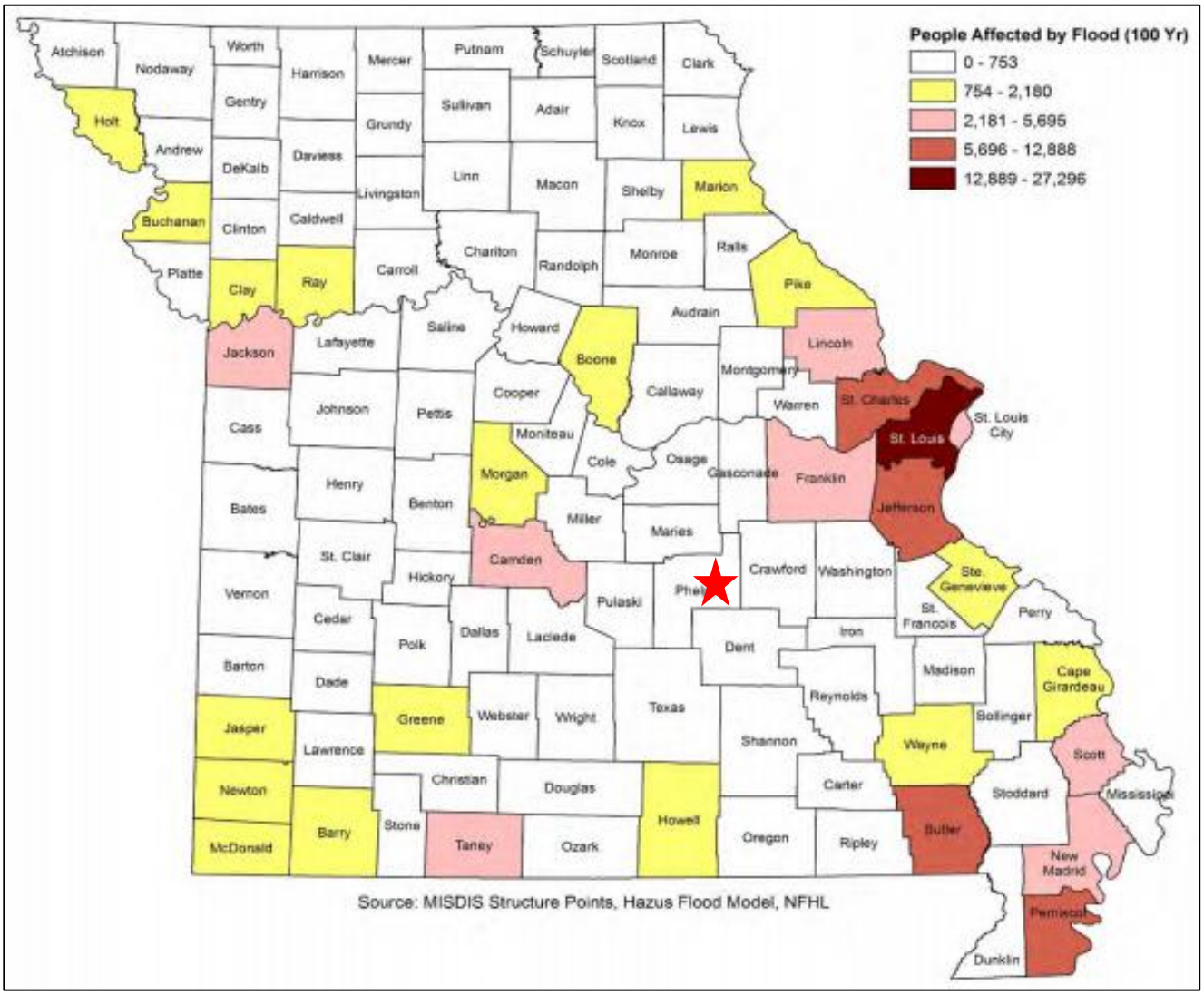
Lastly, the State determined the estimated number of displaced households and need for shelters within Phelps County in the event of a 100 year flood. **Table 3.58** and **Figure 3.63** illustrate this information.

Table 3.58. Estimated Displaced People and Shelter Needs for Phelps County

County	Displaced People	Displaced Population Requiring Shelter
Phelps	835	203

Source: 2018 Missouri State Hazard Mitigation Plan

Figure 3.63. HAZUS Countywide Base-Flood Scenarios: Displaced People



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

Potential Losses to Existing Development

Every jurisdiction in the county contains a portion of the 100 Year Floodplain. According to the HAZUS model, Phelps County has a building loss ratio of 0.46 percent for countywide base-flood scenarios. However, the unprecedented flooding in 2013 suggests that future flood events could cause significant disruption in the county. The August 2013 flash flood caused significant damages to property ($1,000,000). The statewide average building loss ratio is 1.40 which makes Phelps County's ratio in the low range. Additionally, the county has 37 repetitive loss properties, Rolla has 10 repetitive loss properties, and Newburg has one repetitive loss property. With the annual average probability for flooding at 95 percent and 100 percent for flash floods, Phelps 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. Both school buildings in the city of Newburg and two wastewater treatment facilities in unincorporated Phelps County, owned and operated by the public water supply districts, are in the SFHA.

Impact of Previous and Future Development

Impact of future development is correlated to floodplain management and regulations set forth by the county and jurisdictions. Future development within low-lying areas near rivers and streams, or where interior drainage systems are not adequate to provide drainage during heavy rainfall events should 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 unincorporated Phelps County and the city of Rolla. Since 1999 there have been 85 incidents of flooding or flash flooding in Phelps County; 11 incidents in and around Rolla; and seven incidents in and around Newburg and Northwye (**Table 3.51**). Out of the county's 48 repetitive loss properties, four have been mitigated (**Table 3.48**).

Those areas at greatest risk to riverine flooding are those populated areas along the Gasconade River and its tributaries. A tributary to the Little Piney Creek runs through Newburg, which increases the vulnerability to flooding.

Due to the rural nature of Phelps 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. The following roads Highways will be threatened in future floods and include A, D, E, H, O, P, T, Y, AA, BB, CC, EE, and YY. Furthermore, Route C and M will be threatened along with numerous low water crossings. County roads 3000, 3040, 3220, 3520, 5180, 5520, 8070, 8280, and 8410 will be threatened.

A small portion of the Cities of Doolittle, Newburg, Edgar Springs, Rolla and St. James reside in a SFHA. Additionally, the Newburg R-II School District has two school buildings located within an identified Special Flood Hazard Area.

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

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.

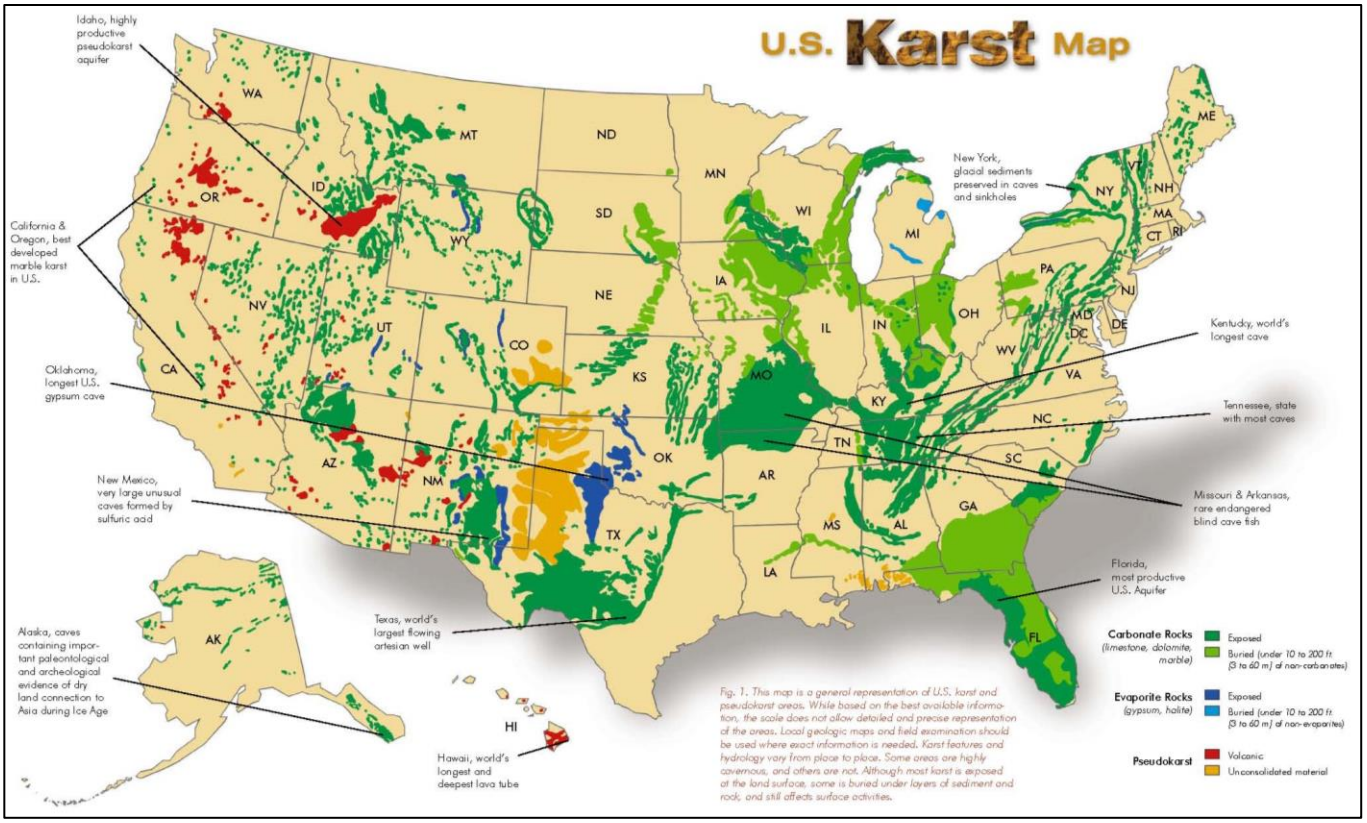
According to the U.S. Geological Survey (USGS), the most damage from sinkholes tends to occur in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. Fifty-nine percent of Missouri is underlain by thick, carbonate rock that makes Missouri vulnerable to sinkholes. Sinkholes

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

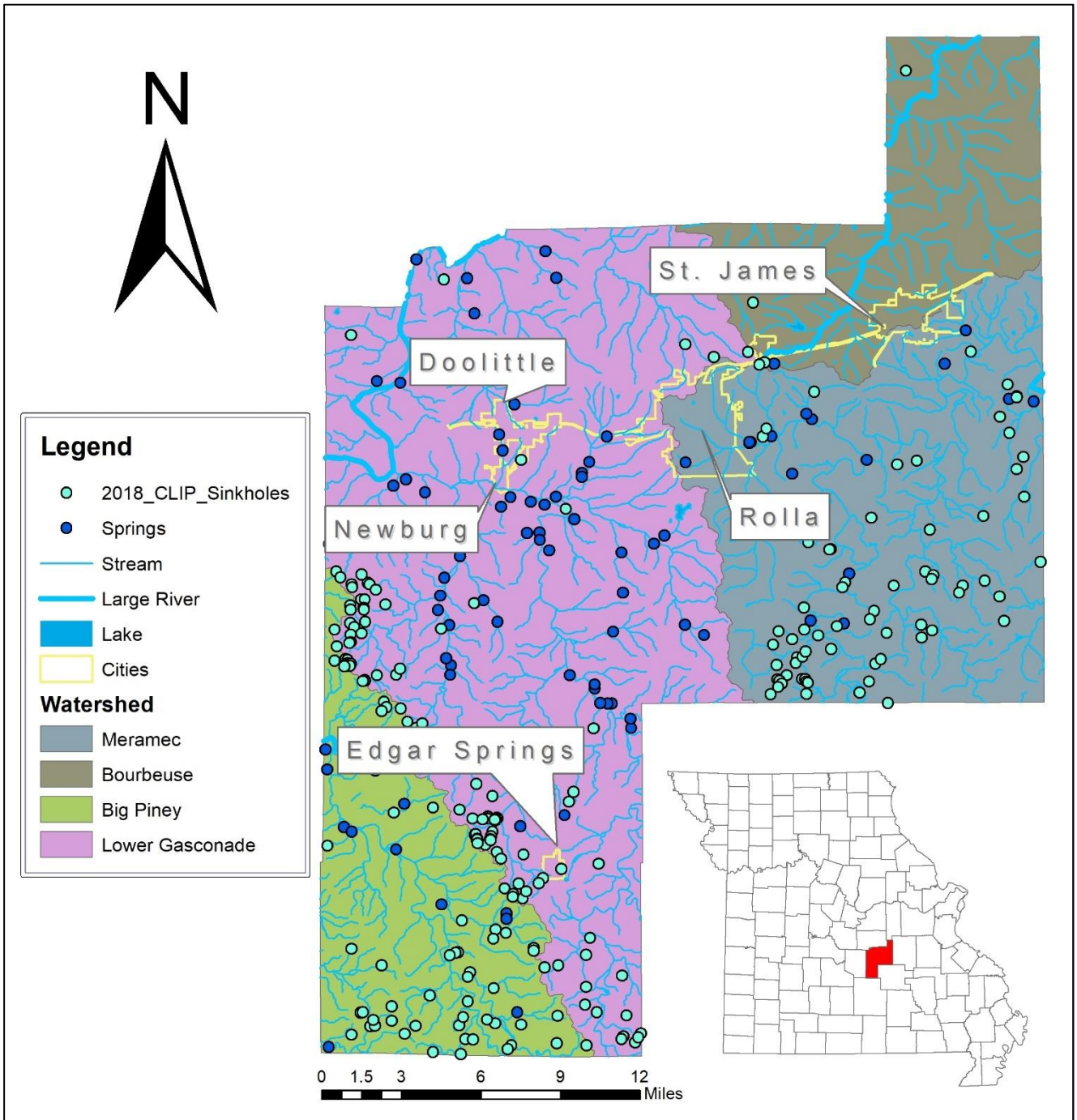
Figure 3.64 depicts karst topography across the United States. Missouri's karst topography is comprised of carbonate rocks such as limestone, dolomite, and marble. Variability in areas prone to sinkholes does not differ greatly across the county. According to the 2018 Missouri State Hazard Mitigation Plan there are 212 sinkholes that have been recorded within Phelps County (**Figure 3.65**). In addition, the Plan states that there are 372 mines in Phelps County - as shown in **Figure 3.67**. According to the Missouri Department of Natural Resources, Phelps 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 3.64. U.S. Karst Map



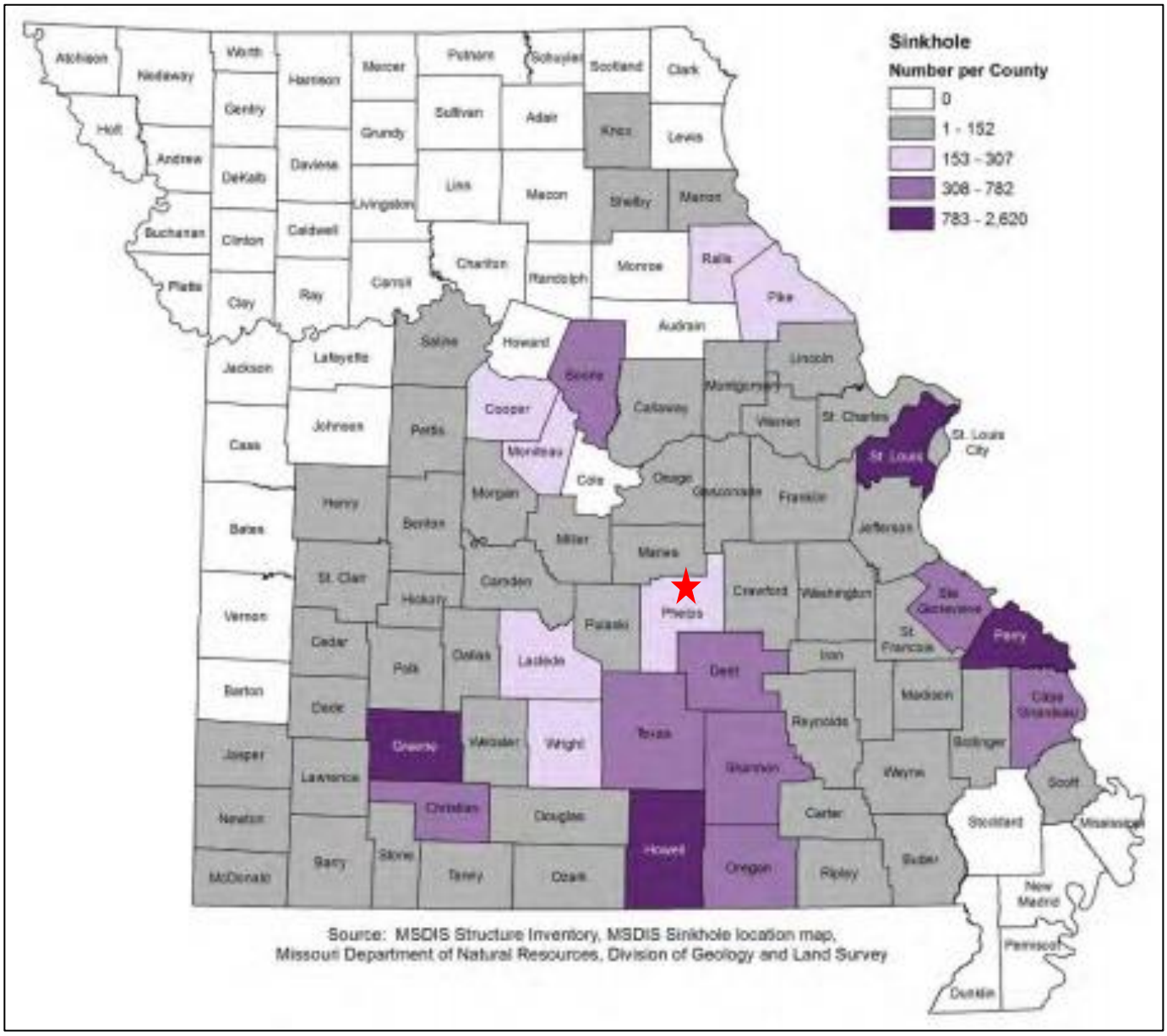
Source: http://www.northeastern.edu/protect/wp-content/uploads/US_KarstMap.jpg

Figure 3.65. Phelps County Watershed/Water Resources



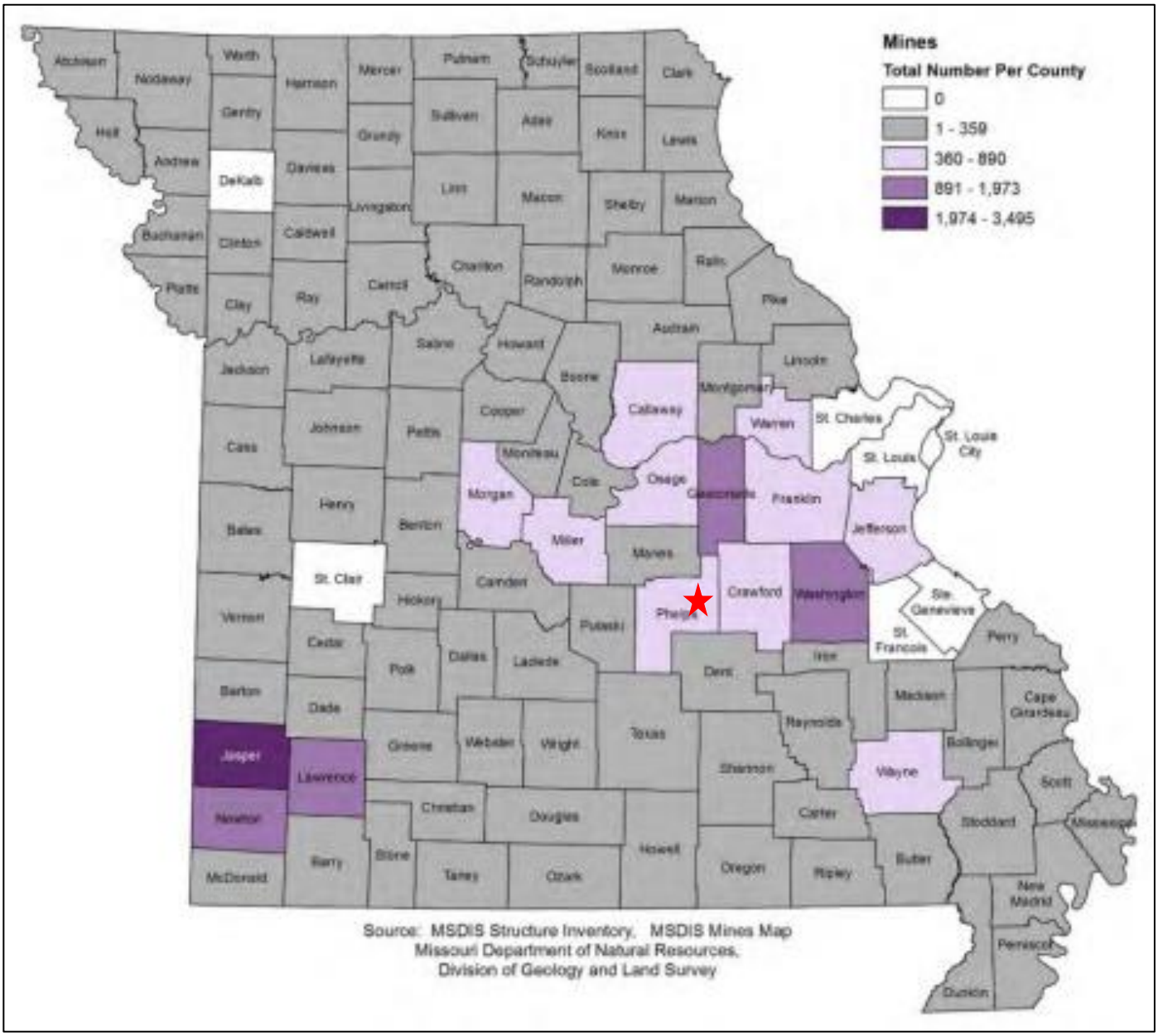
Phelps County Hazard Mitigation Plan	**Water Resources**	
MRPC 4 Industrial Drive St. James, MO 65559	**This map was created by the Meramec Regional Planning Commission's Environmental Department. To the best of the author's knowledge, the data presented here is true and correct. However, no responsiblity is assumed by the author or MRPC for the accuracy of the information displayed on this map. March 2021**	MRPC

Figure 3.66. Sinkholes Counts per County



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

Figure 3.67. Mines Counts Per County



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

Strength/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.[40]

[40] 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 numerous sinkholes and sinkhole areas in Phelps County, incidents have occurred in other counties in southern Missouri, there is no recorded incident of death due to sinkholes in the County. Based on the map of sinkholes in Phelps County, some of the communities may be more vulnerable to this hazard than the unincorporated parts of the county due to population density and the likelihood of future development. Edgar Springs and Newburg have sinkholes within their boundaries, and there are several known sinkholes near, but not within the borders of Rolla. Doolittle and St. James appear to lie further outside the zone of sinkhole occurrences.

Probability of Future Occurrence

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

Changing Future Conditions Considerations

The Missouri State Hazard Mitigation Plan states that an increase in droughts and extreme weather such as torrential rain and flooding, can result in an increase in sinkholes. Heavy rains often expose or contribute to the development of sinkholes, and periods of drought, with drops in groundwater, can also result in the development of sinkholes. It is expected that future development, coupled with climate change and its corresponding extreme weather events will result in an increase in sinkhole issues in Phelps County.

Vulnerability

Vulnerability Overview

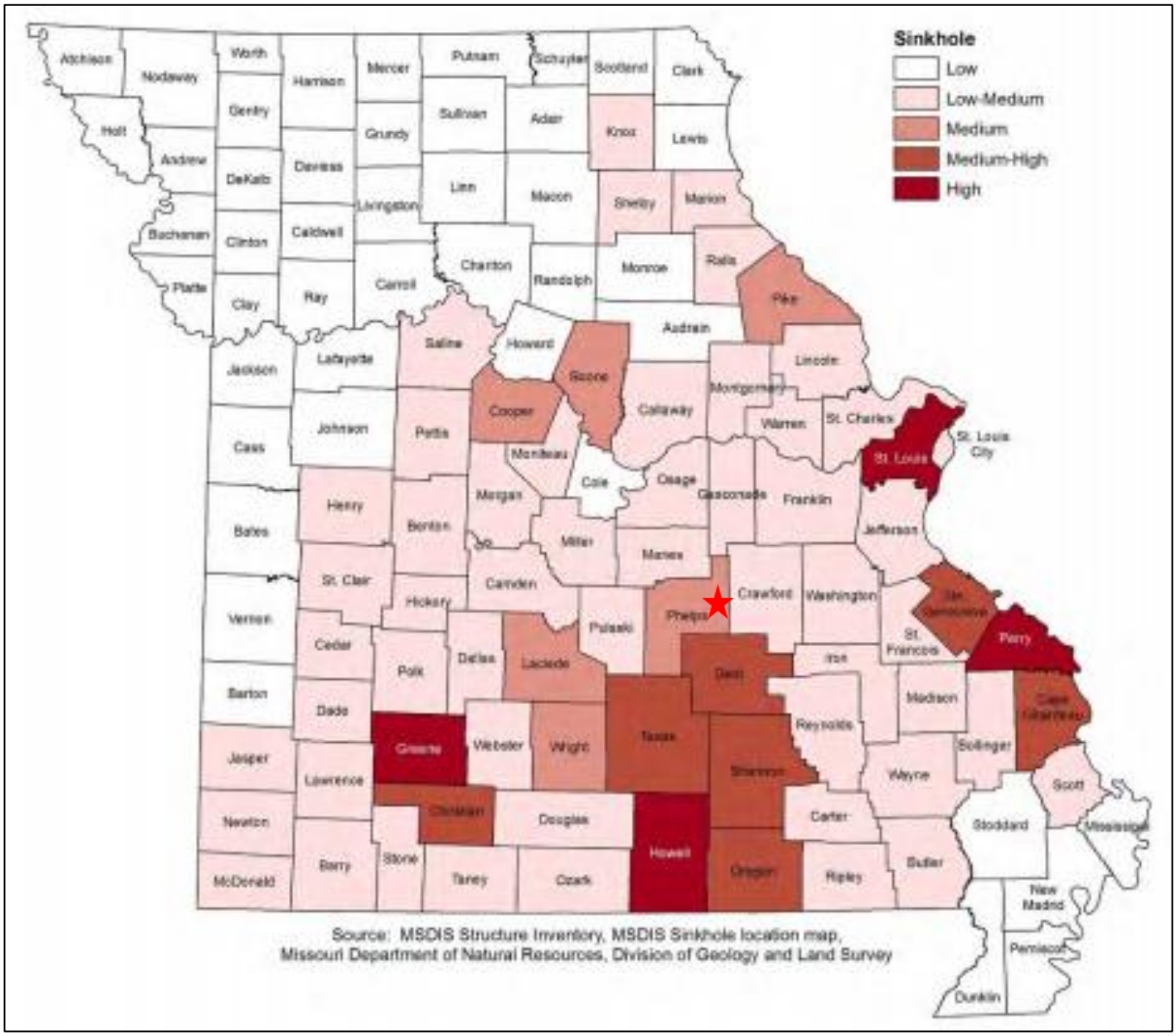
Unfortunately, no statistics are available for the number of subsurface locations that may potentially collapse in the future, forming a sinkhole. According to the state plan, if a county has 201-400 sinkholes, the risk is considered 3 - medium. For mines, the state plan calculates that Phelps County's risk is also rated as 3 – medium. See **Table 3.59**. **Figure 3.68** and **Figure 3.69** further illustrate the sinkhole and mining rating values respectively.

Table 3.59. Sinkhole/Mine Rating Values for Phelps 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+

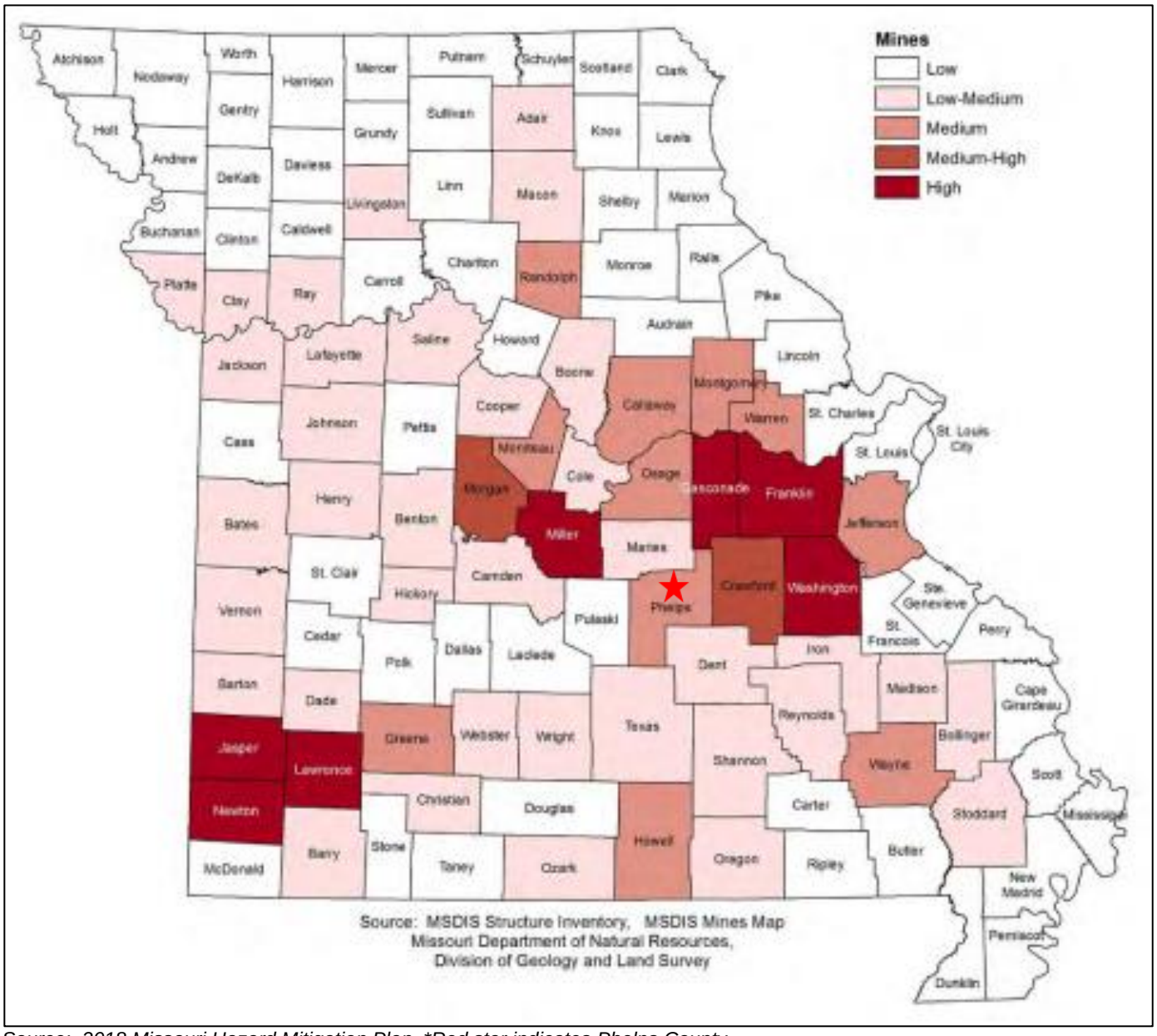
Source: 2018 Missouri Hazard Mitigation Plan, Yellow highlight shows values for Phelps County

Figure 3.68. Sinkhole Rating Value by County



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

Figure 3.69. Mine Rating Value By County



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

Potential Losses to Existing Development

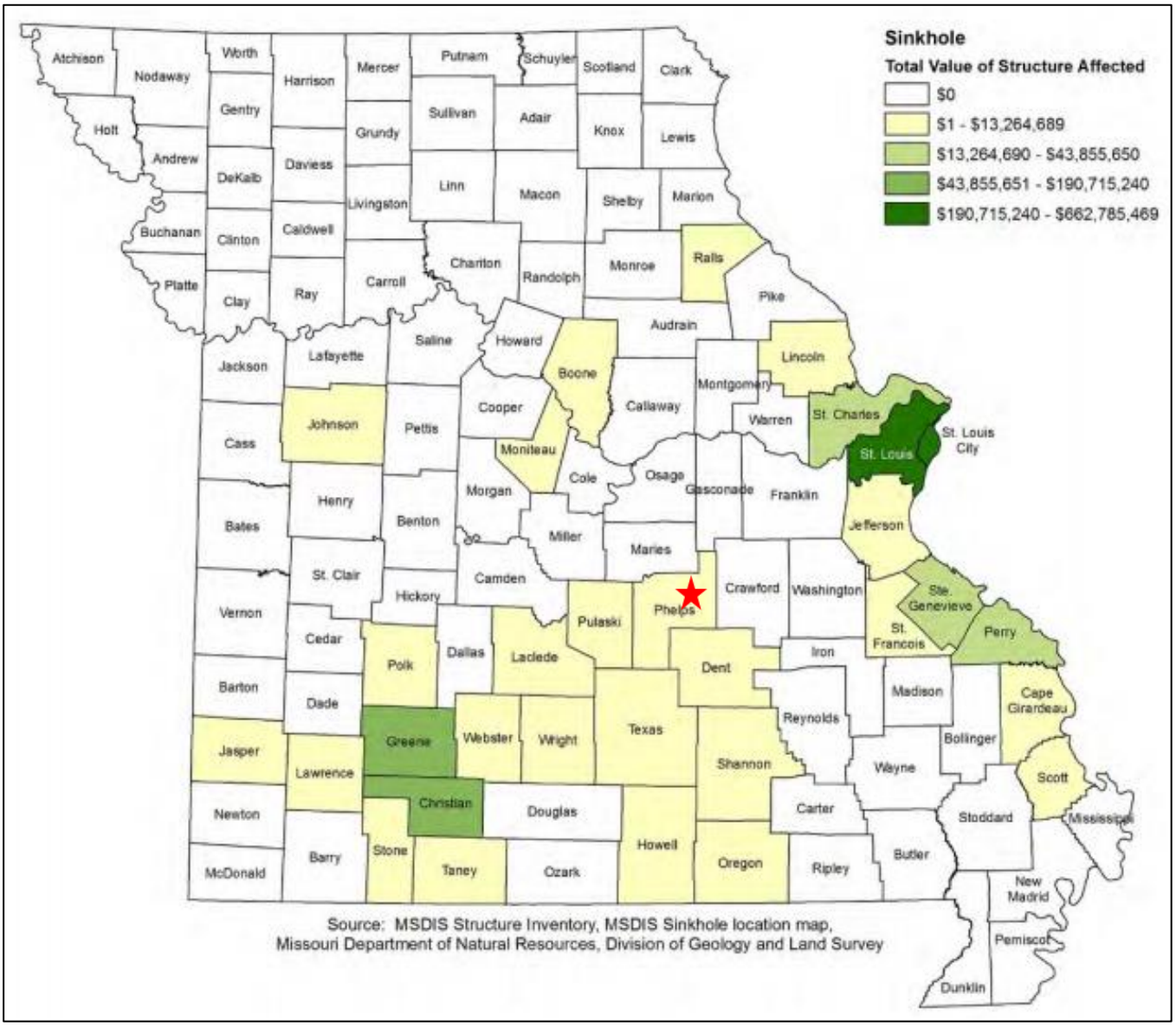
The most likely type of damage to occur in conjunction with a sinkhole collapse is property damage related to foundation disturbance. Signs include cracks in interior and exterior walls; doors and windows that no longer sit square or open and close properly; depressions forming in the yard; cracks in the street, sidewalk, foundation or driveway; and turbidity in local well water. All of these can be early indicators that a sinkhole is forming in the vicinity[41]. 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

[41] http://sinkhole.org/commonsigns.php

been no dramatic incidents like this in Phelps County.

The 2018 Missouri Hazard Mitigation Plan devised a method of estimating potential losses using GIS data. **Figure 3.70** shows the ranking of structures that could potentially be impacted by sinkholes by county. This map shows that Phelps County has $1 -13,264,689 total value of structures affected.

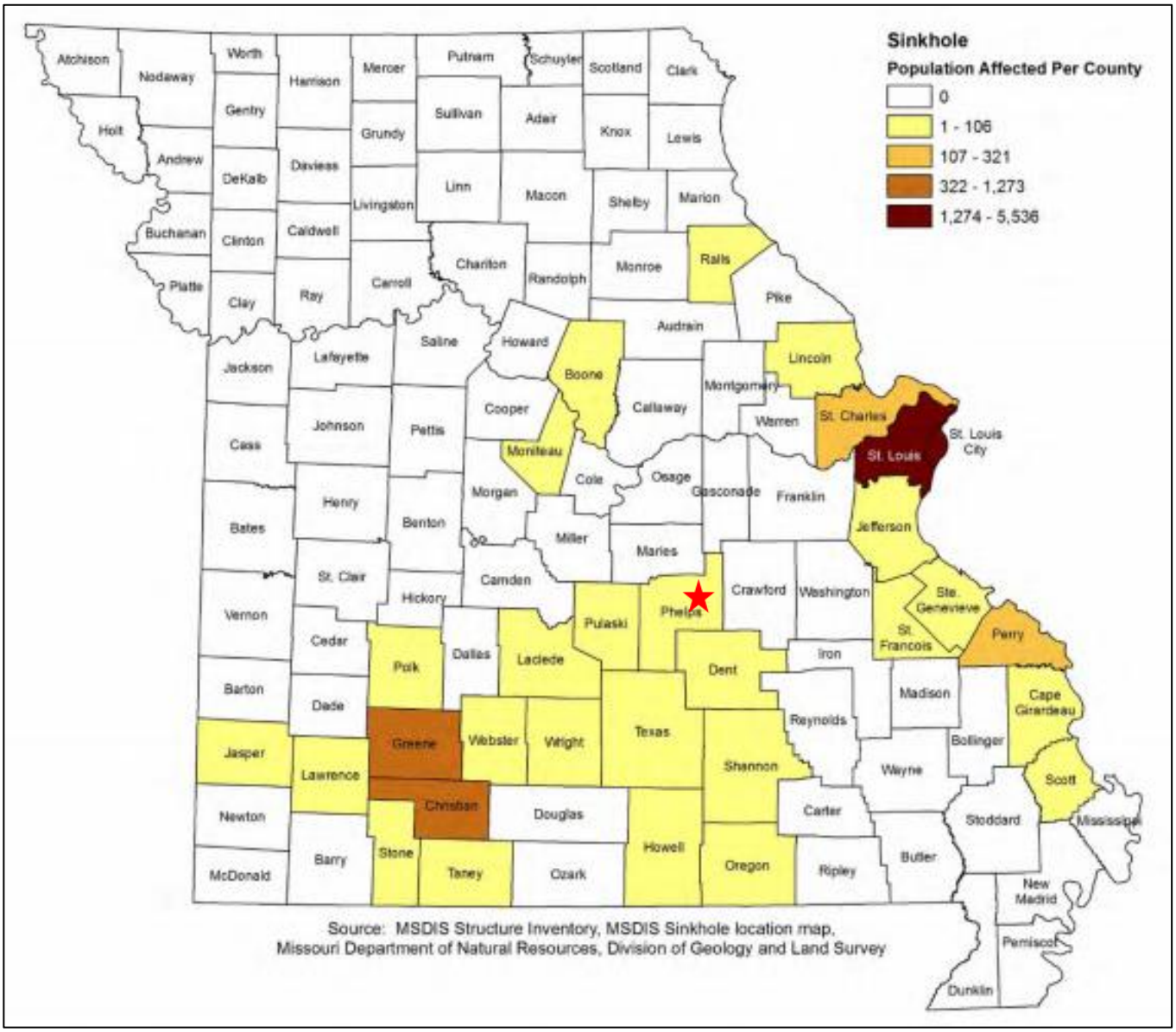
Figure 3.70. Ranking of Structures Potentially Impacted by Sinkholes by County



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

Figure 3.71 shows the population potentially impacted by sinkholes and again, Phelps County shows that one to 106 people with be affected by sinkholes.

Figure 3.71. Ranking of Population Potentially Impacted by Sinkholes by County



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

Impact of Previous and Future Development

Previous and 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, Phelps County's risk in regards to these hazards is moderately low.

Hazard Summary by Jurisdiction

According to the state plan, Phelps 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. The jurisdictions most likely to be impacted by sinkholes are Edgar Springs, Newburg, and Rolla. The other jurisdictions, both cities and school districts, are located in areas of the county

where the concentration of sinkholes is much lower.

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 Severe Thunderstorms Including High Winds, Hail, and Lightning

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.

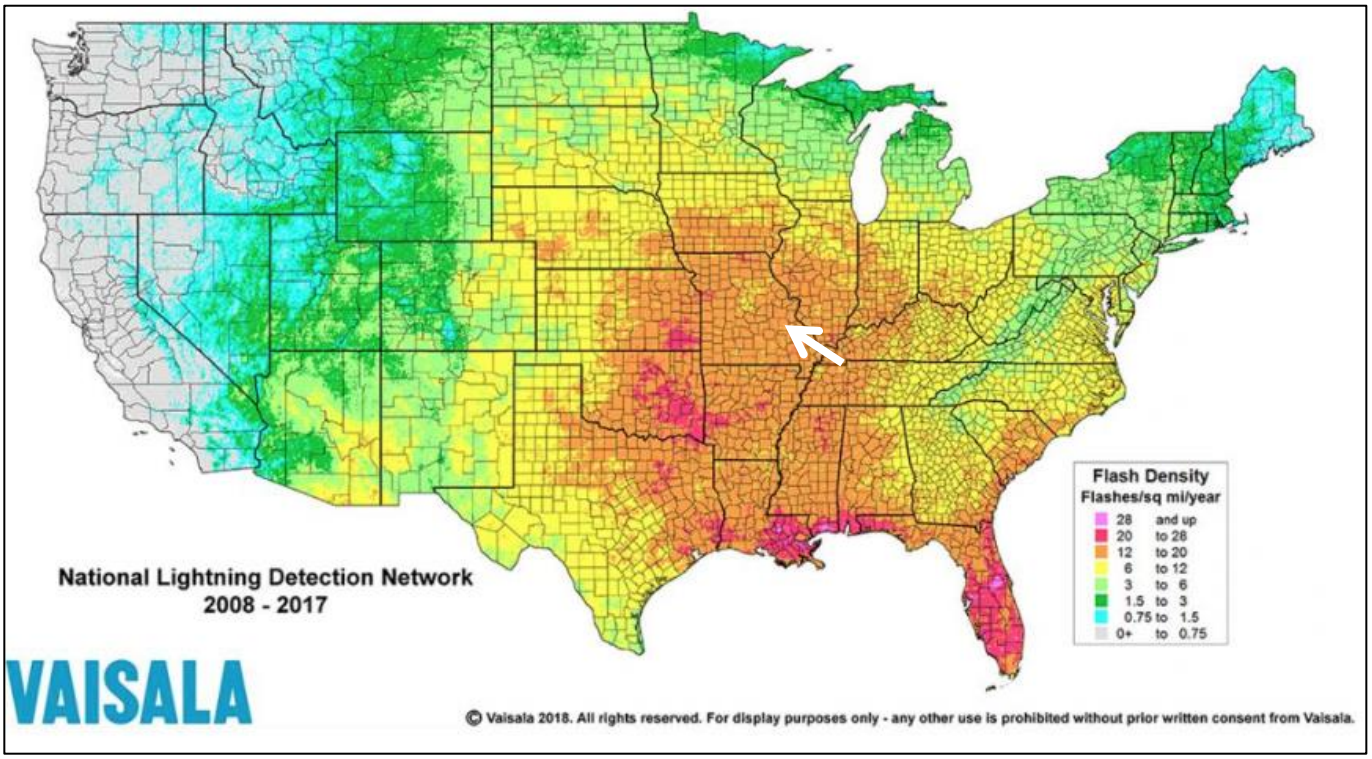
At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 miles per hour, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest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

Geographic Location

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

Figure 3.72 depicts the location and frequency of lightning in Missouri. Additionally, the map indicates that the flash density of Phelps County ranges between 12 and 20 flashes per square kilometer per year.

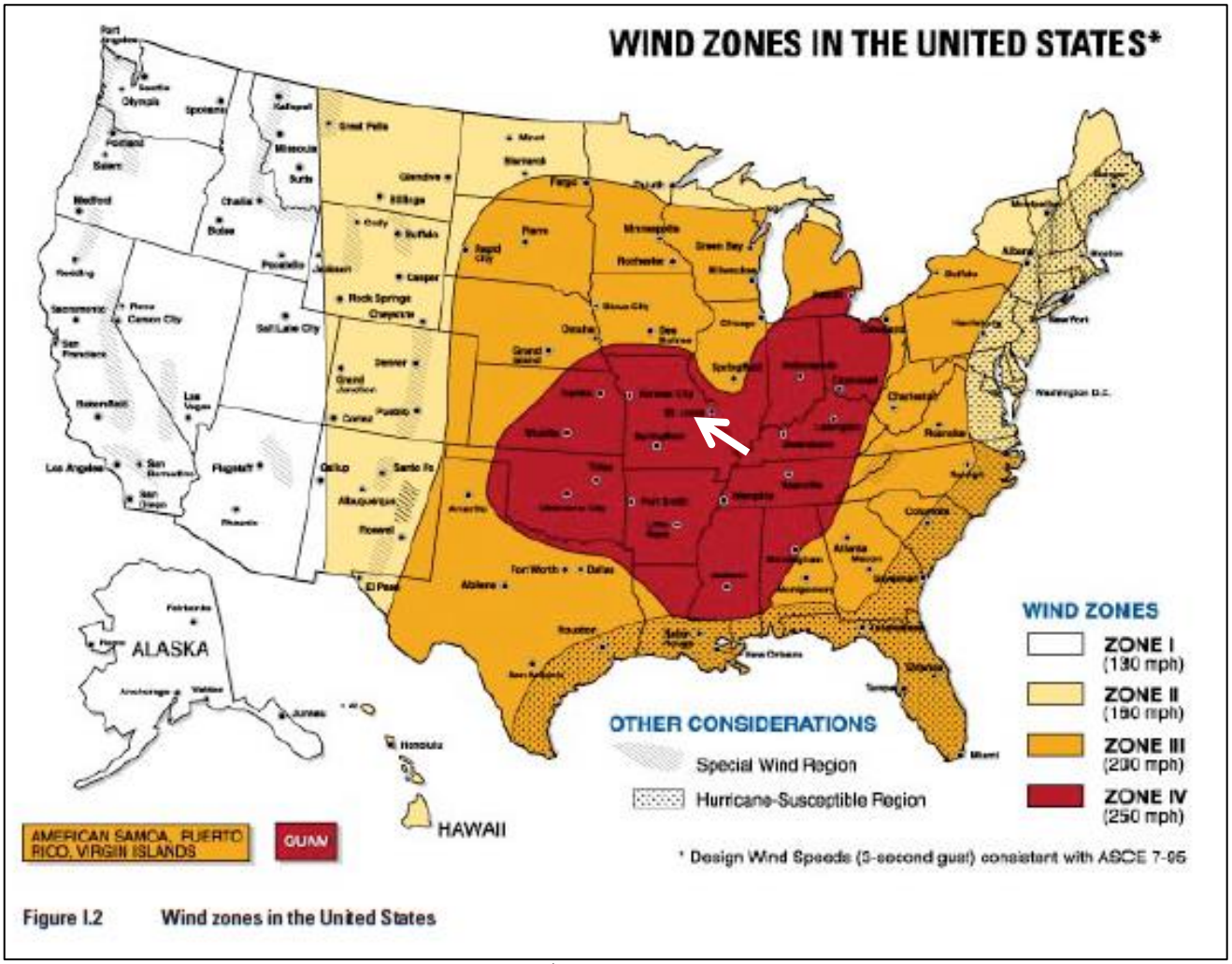
Figure 3.72. Location and Frequency of Lightning in Missouri



Source: National Weather Service,
http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN .aspx
** Phelps 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 3.73**).

Figure 3.73. 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
**Phelps County is indicated by a white arrow.*

Strength/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 3.60** below describes typical damage impacts of the various sizes of hail.

Table 3.60. Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5 - 9	0.2 - 0.4	Pea	No damage
Potentially Damaging	10 - 15	0.4 - 0.6	Mothball	Slight general damage to plants, crops
Significant	16 - 20	0.6 - 0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	21 - 30	0.8 - 1.2	Walnut	Severe damage to fruit and crops, damage to glass, 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 1999 and 2019, there were zero recorded crop insurance claims for Thunderstorms, lightning, high wind, and hail in Phelps 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.

Previous Occurrences

Due to the lack of available parameters, heavy rain is utilized in the place of thunderstorms in **Table 3.61**. Moreover, thunderstorm wind and strong wind was included with high winds in **Table 3.62** . NCEI data was obtained for lightning, and hail events between 1999 and 2019 as well (**Table 3.63** and **3.64).** 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 3.61. NCEI Phelps County Heavy Rain Events Summary, 1999 to 2019

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Rainfall (Inch)
2009	1	0	0	0	3.20
2013	5	0	0	0	5.24
2014	1	0	0	0	2.70
2015	3	0	0	0	5.92
2016	1	0	0	0	1.74
2018	7	0	0	0	4.25
2019	3	0	0	0	3.07

Source: NCEI, data accessed [09/08/2020]

Table 3.62. NCEI Phelps County High Wind Events Summary, 1999 to 2019 (Thunderstorm)

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
1999	2	0	0	10K	-
2000	3	0	0	11K	-
2001	3	0	0	120K	-
2002	3	0	0	25K	52
2003	2	0	0	-	65
2004	3	0	0	-	60
2005	5	0	0	10K	55
2006	4	0	0	-	60

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
2007	3	0	0	10K	60
2008	7	0	0	90K	65
2009	4	0	0	116K	70
2010	2	0	0	-	52
2011	6	0	0	90K	61
2012	4	0	0	-	52
2013	1	0	0	-	52
2014	2	0	0	11K	55
2016	7	0	0	70K	61
2017	3	0	0	7K	52
2018	2	0	0	6K	52
2019	10	0	0	30K	56
Total	**70**	**0**	**0**	**606K**	**-**

Source: NCEI, data accessed [09/08/2020]

Table 3.63. NCEI Phelps County Lightning Events Summary, 1999 to 2019

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damage
2001	1	0	0	150K	0
2002	1	0	0	50K	0
2010	1	0	0	5K	0
2013	1	0	0	2K	0
2016	1	0	0	25K	0
Total	**6**	**0**	**0**	**232K**	**0**

Source: NCEI, data accessed [09/08/2020]

Table 3.64. NCEI Phelps County Hail Events Summary, 1999 to 2019

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
1999	1	0	0	0	0.75
2000	1	0	0	0	1.00
2001	2	0	0	0	1.75
2002	5	0	0	0	1.00
2003	13	0	0	0	2.75
2004	4	0	0	0	0.88
2005	1	0	0	0	1.75
2006	5	0	0	0	4.25
2007	4	0	0	0	1.75

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
2008	8	0	0	0	2.75
2009	2	0	0	0	1.00
2010	1	0	0	0	1.00
2011	6	0	0	0	1.00
2012	3	0	0	0	1.75
2013	2	0	0	0	1.25
2014	1	0	0	0	1.75
2016	7	0	0	0	1.25
2017	3	0	0	0	1
2018	6	0	0	0	1.75
2019	4	0	0	0	1
Total	**79**	**0**	**0**	**0**	**-**

Source: NCEI, data accessed [09/08/2020]

Agriculture is an important piece of the economy for Phelps County. The tables below (**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 1999 and 2019 a total of 5 insurance claims were paid out for damages due to excessive moisture, precipitation. The total claims paid for this cause were $30,277.

For the time period 1999-2019, there were no crop insurance claims made for wind and excessive wind damage.

Table 3.65. Crop Insurance Claims Paid In Phelps County from Excessive Moisture/ Precipitation/Rain 1999-2019

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2003	All Other Crops	Excessive Moisture/Precipitation/Rain	$1012.00
2013	All Other Crops	Excessive Moisture/Precipitation/Rain	$9,625.50
2015	All Other Crops	Excessive Moisture/Precipitation/Rain	$19,639.50
Total	**5**	-	**$30,277.00**

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 [42], annual average percent probabilities were calculated for heavy rainfall, high winds, lightning, and hail. Heavy rainfall has a 100 percent annual average percent probability of occurrence (21 events/21 years x 100) with an average of 1 event per year (**Table 3.66**). Heavy rainfall events can be found in **Table 3.61**.

[42] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI

The annual average percent probability for high winds within the county is 100 percent (76 event/21 years * 100) with an average 3.62 events per year (**Table 3.67).** High wind events can be found in **Table 3.62.**

Lightning events have a 24 percent annual average percent probability of occurrence (5 events/21 years x 100) **Table 3.68.** Lightning events can be found in **Table 3.63**.

Lastly, the annual average percent probability of hail occurrence is 100 percent (61 events/21 years x 100) with an average of 3.8 events per year (**Table 3.69**). Hail events can be found in **Table 3.64**.

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

Location	Annual Avg. % P	Avg. # of Events
Phelps County	100%	1.00

*P = probability; see page 3.24 for definition.

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

Location	Annual Avg. % P	Avg. # of Events
Phelps County	100%	3.62

*P = probability; see page 3.24 for definition.

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

Location	Annual Avg. % P
Phelps County	24%

*P = probability; see page 3.24 for definition.

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

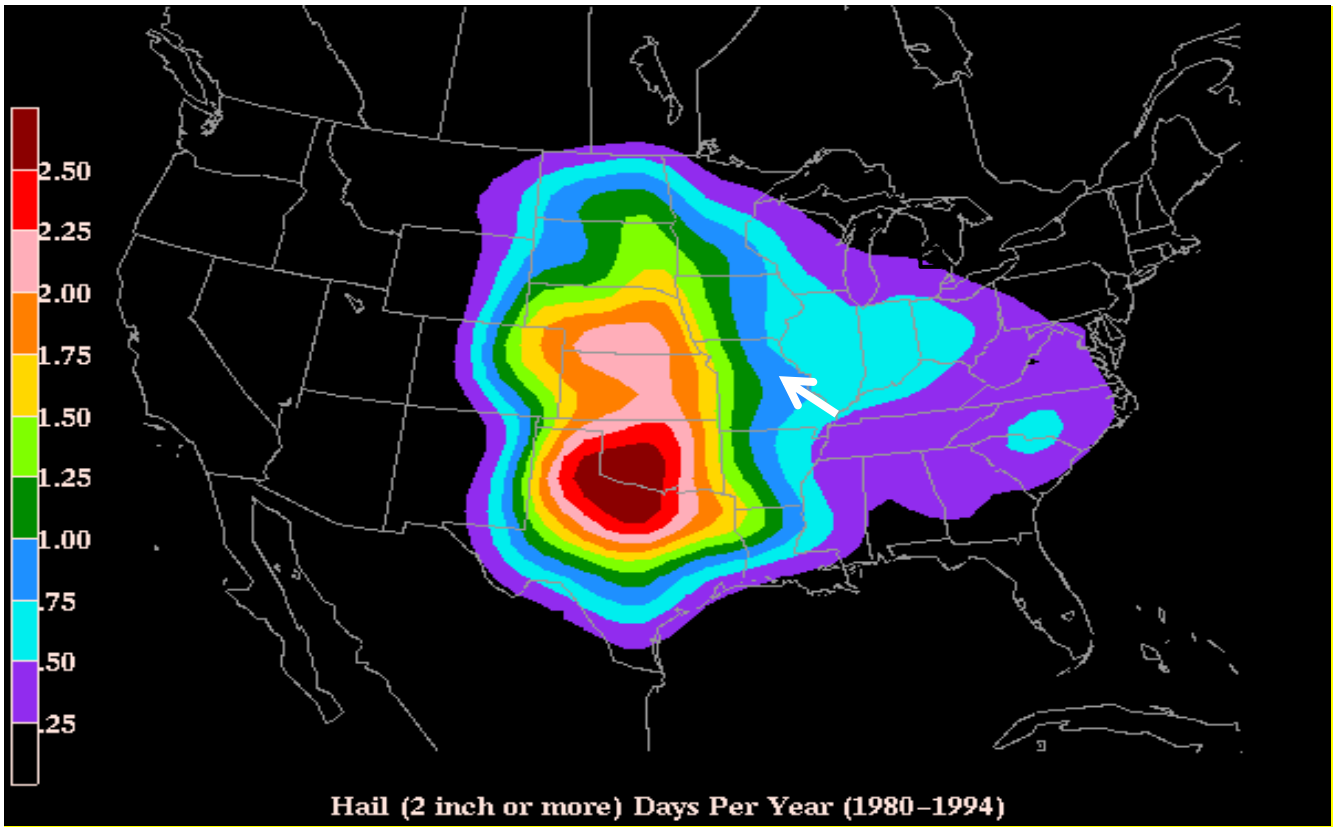
Location	Annual Avg. % P	Avg. # of Events
Phelps County	100%	3.8

*P = probability; see page 3.24 for definition.

Figure 3.74 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 Phelps County is identified with a white arrow.

Figure 3.74. 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 Phelps County*

Changing Future Conditions Considerations

Analysis by NASA's Earth Observatory theorizes that the warming surface of the earth, particularly the oceans, puts more moisture into the air through evaporation and could increase potential storm energy. The presence of warm, moist air near the surface is the key component for summer storms called "convective available potential energy" or CAPE. With an increase in CAPE, there is greater potential for cumulus clouds to form and develop into storm systems. The same study provides a counter theory that the warming of the Arctic could result in less wind shear in the mid-latitudes, making powerful storms less likely.[43]

Temperatures are predicted to rise and those rising temperatures could help create atmospheric conditions that are conducive to the development of thunderstorms and tornados in Phelps County. Jurisdictions should consider building certified tornado saferooms, improving warning systems, strengthening building codes, reinforcing utilities and other vulnerable infrastructure and increasing public information on storm safety and mitigation activities.[44]

[43] 2018 Missouri State Hazard Mitigation Plan
[44] Ibid.

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. [45]

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 Phelps County plan which is 1999-2019), HAZUS Building Exposure Value data, housing density and mobile home data from the U.S. Census (2015 ACS), and the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina.[46]

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

[45] http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx and http://www.lightningsafety.noaa.gov/ Potential Losses to Existing Development

[46] 2018 Missouri Hazard Mitigation Plan

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.

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, Phelps County has total building exposure to severe thunderstorms of $4,743,488,000. **Table 3.72** shows housing density, building exposure, SOVI and mobile home data for Phelps County. The county's building exposure and housing density rating is medium-low, while the percent of mobile homes in the county is rated as medium at 10.2 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. Phelps 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
$4,743,488,000	2	29.35	1	Medium-Low	2	10.2	3

Source: 2018 Missouri Hazard Mitigation Plan

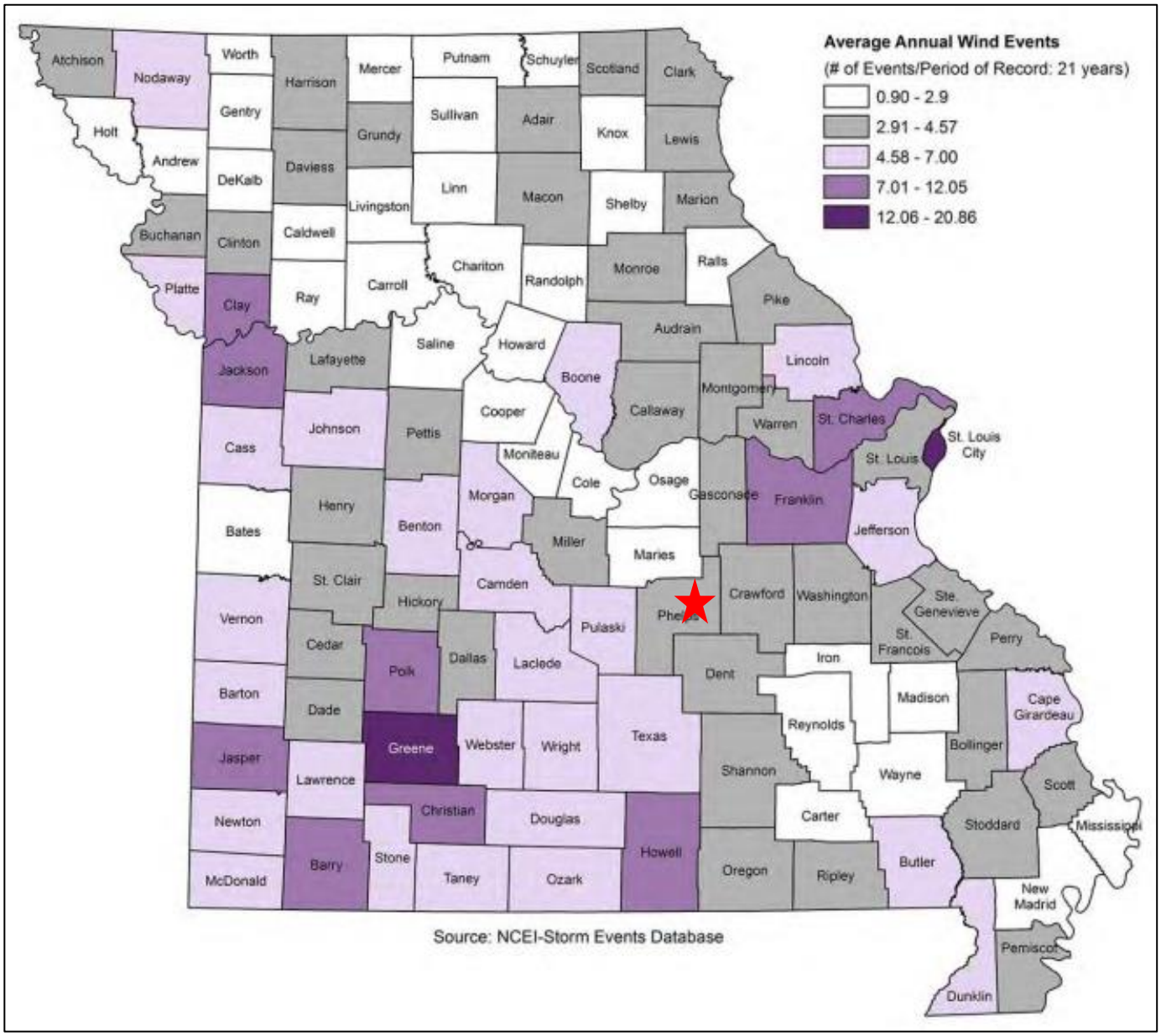
Table 3.73. Number of High Wind, Hail and Lightning Events, Likelihood of Occurrence and Associated Ratings for Phelps County

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
90	4.286	2	123	5.857	3	5	0.238	3

Source: 2018 Missouri Hazard Mitigation Plan

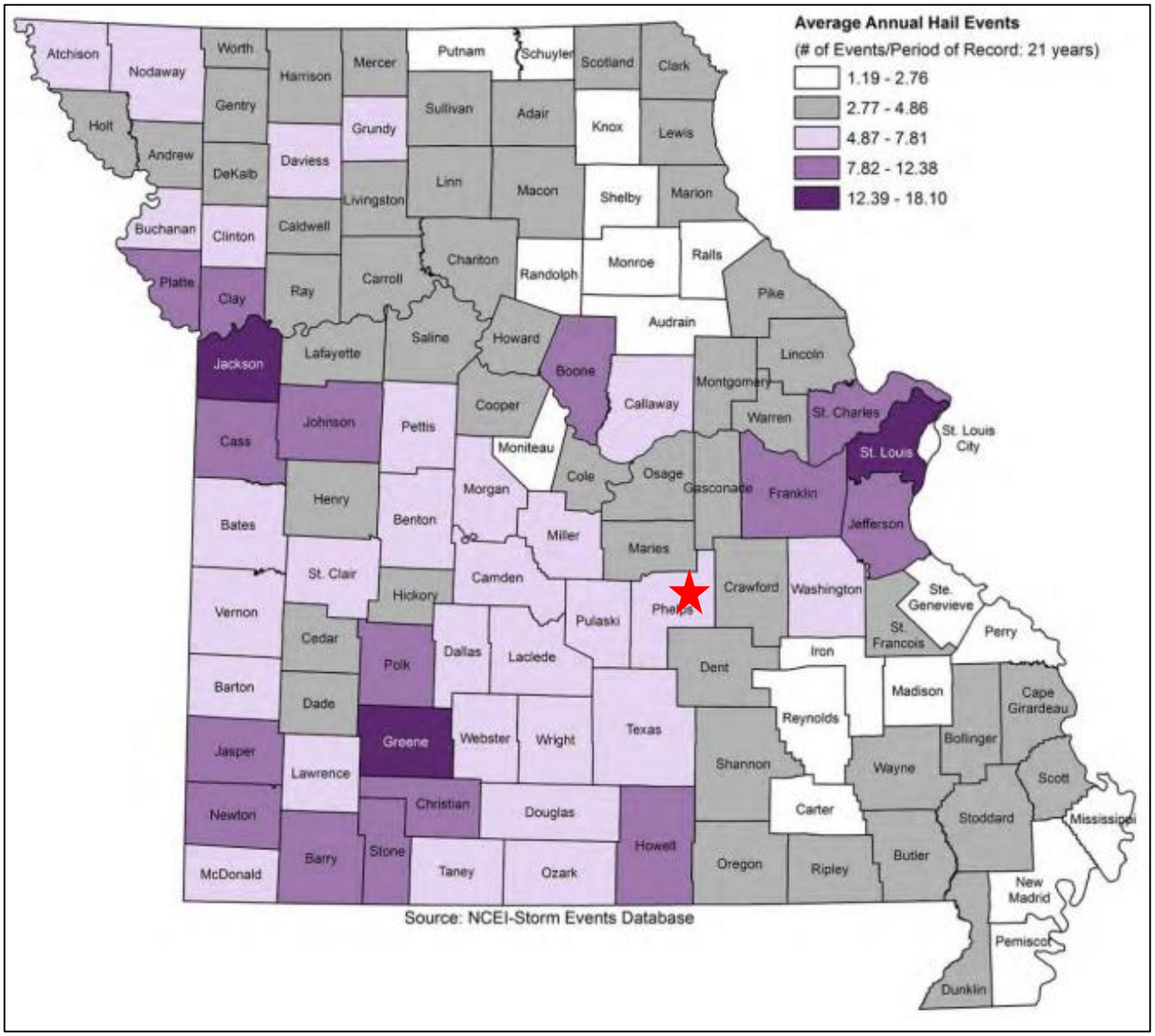
Figure 3.75 through **Figure 3.77** have been pulled from the 2018 Missouri Hazard Mitigation Plan and further depict the average annual likelihood of occurrence of high winds, hail, and lightning events in Missouri.

Figure 3.75. Average Annual High Wind Events (40 MPH and Higher)



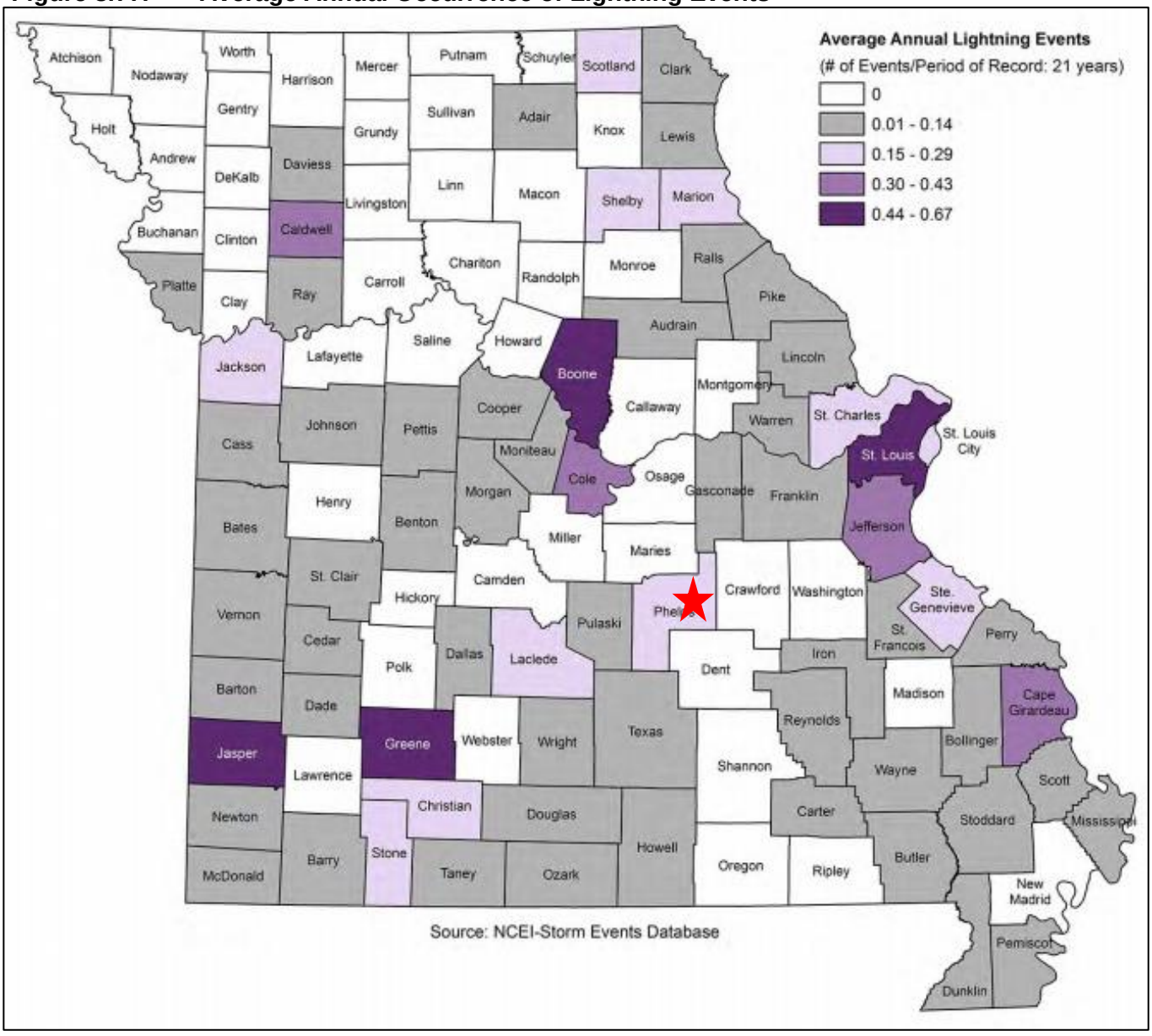
*Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Phelps County*

Figure 3.76. Average Annual Occurrence of Damaging Hail Events



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

Figure 3.77. Average Annual Occurrence of Lightning Events



*Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Phelps 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 Phelps 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
$28,381	1	$0	1	$11,048	4

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 3.78** that follows provides the mapped results of this analysis by county[47].

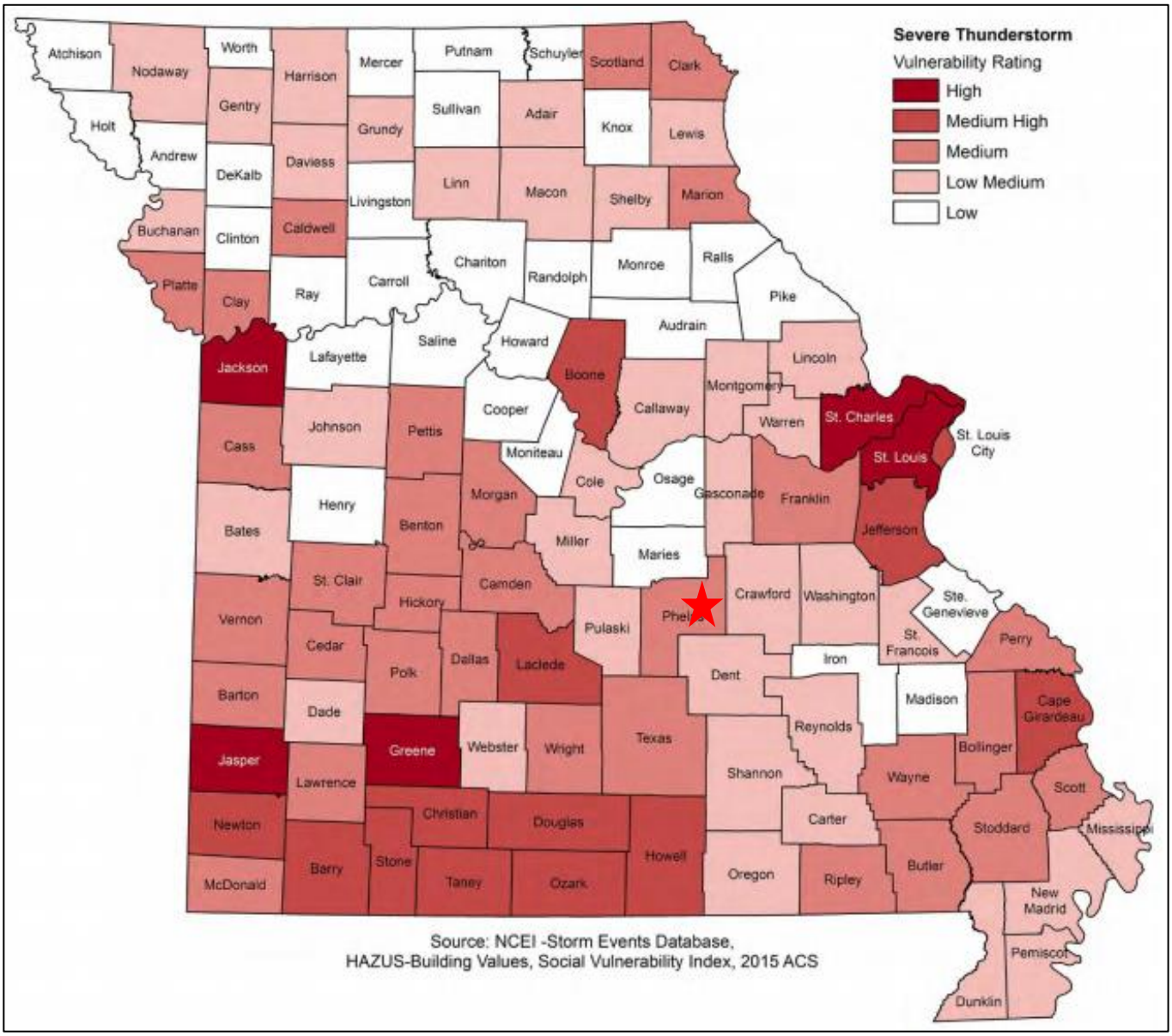
Table 3.75. Severe Thunderstorm Vulnerability Rating for Phelps County

Total Sum of All Factor Ratings	Overall Vulnerability Rating for Thunderstorms	Overall Vulnerability Rating for Thunderstorms Description
22	3	Medium

Source: 2018 Missouri State Hazard Mitigation Plan

[47] 2018 Missouri State Hazard Mitigation Plan

Figure 3.78. Vulnerability Summary for Severe Thunderstorms



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

Potential Losses to Existing Development

According to the NCEI Phelps County experienced approximately $838,000 in property damages from severe thunderstorms between 1999 and 2019. This is an average of $39,904.76 in losses due to this hazard per year. Most of the property damage caused by storms is covered by private insurance and data is not available. In addition, most damage from severe thunderstorms occurs to vehicles, roofs, siding, and windows. However, there is a variety of impacts from severe thunderstorms. Moreover, secondary effects from hazards, falling trees and debris, can cause destruction within the planning area.

Previous and Future Development

Population trends from 2010 to 2019 for Phelps County indicate that the population in unincorporated areas has fallen by an estimated 3.3 percent. The city of Doolittle's population has increased by a 7.9 percent and Newburg has fallen by 9.3. The city of Edgar Springs has fallen by a significant 42.2 percent. Rolla has increased by 5.4 percent and St. James has decreased by 2.2. Overall the county has increased its population by 11.7 percent. It is difficult to determine future impacts, however, anticipated development in each jurisdiction will result in increased exposure. Likewise, increased development of residential structures will increase jurisdiction's vulnerability to damages from severe thunderstorms/ high winds/lightning/hail.

Hazard Summary by Jurisdiction

Although thunderstorms/high winds/lightning/hail events are area-wide, there are demographics indicating higher losses in one jurisdiction as compared to another. Jurisdictions with high percentages of housing built before 1939 are more prone to damages from severe thunderstorms. The jurisdictions with the highest percent of houses build before 1939 include the city of Newburg (43.1%) and Edgar Springs (22.3%). Additionally, Doolittle 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 181 thunderstorm and wind events in Phelps County since 1999, with over $838,000.00 in property and crop damages reported. Early warnings are possibly the best hope for residents when severe weather strikes. Cities that do not already possess warning systems – whether that is storm sirens or automated email/text/phone call systems - should plan to invest in such a system. Additional public awareness also includes coverage by local media sources. Storm shelters are another important means of mitigating the effects of severe thunderstorms. A community-wide shelter program should be adopted for residents who may not have adequate shelter in their homes. Residents should also be encouraged to build their own storm shelters to prepare for emergencies. Local governments should encourage residents to purchase weather radios to ensure that everyone has sufficient access to information in times of severe weather.

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,** Severe Thunderstorms Including High Winds, Hail, and Lightning.

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

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

Strength/Magnitude/Extent

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

Tornado magnitude is classified according to the EF- Scale (or the Enhanced Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (**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%**	Light. 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%**	Moderate. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	**111-135**	**10.7%**	Considerable. 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%**	Severe. 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%**	Devastating. Well-constructed houses and whole frame houses completely levelled; cars thrown and small missiles generated.
EF5	**>200**	**<0.1%**	Explosive. 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 1999 to 2019 in the planning area.

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

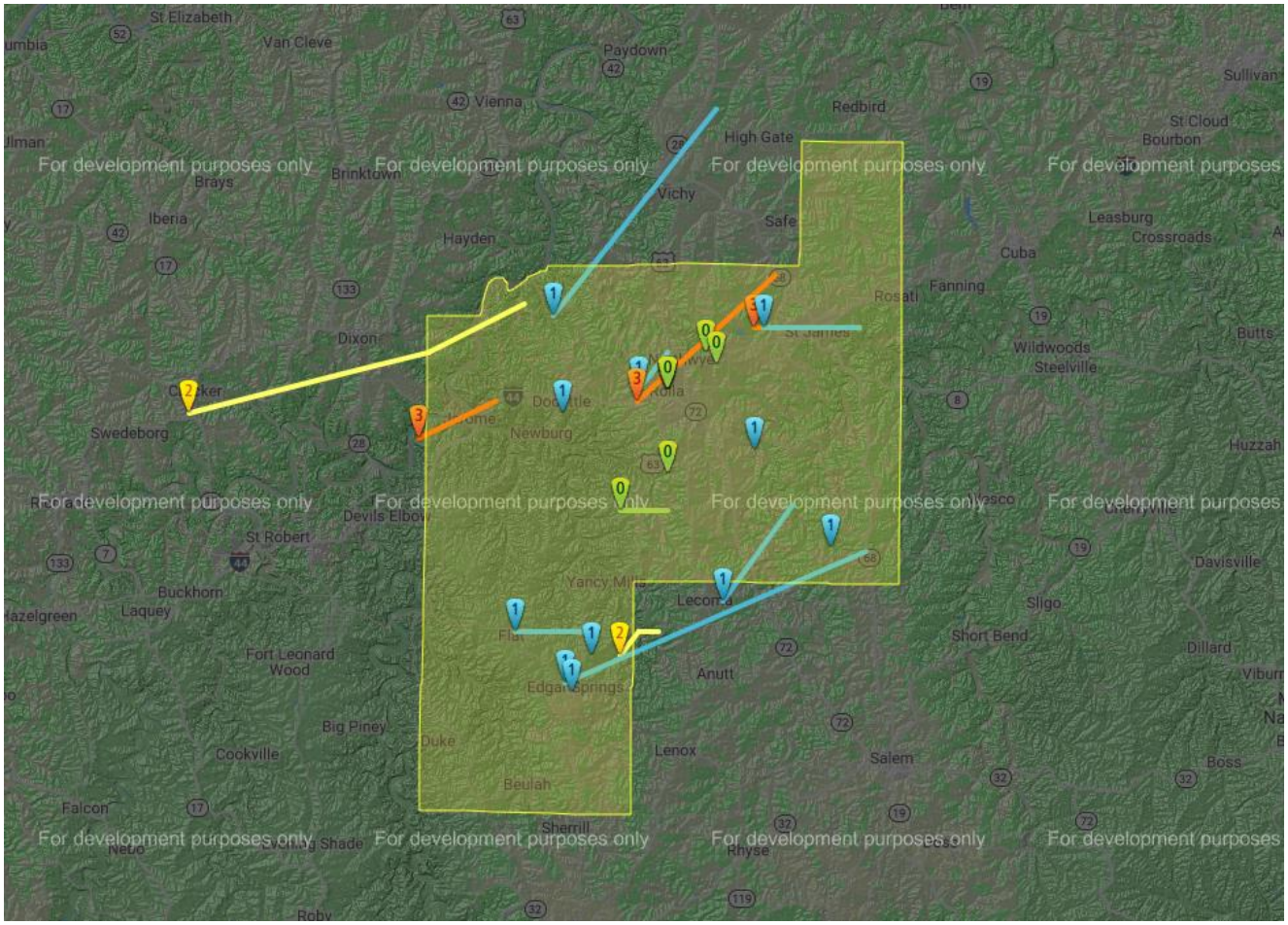
Table 3.78. Recorded Tornadoes in Phelps County, 1999 – 2019

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
06/01/1999	4W St. James	3E St. James	7	300	F3	0	0	$3,500K	-
06/01/1999	37.75/91.85	5E Flat	5	400	F1	0	0	$100K	-
06/01/1999	4NE Edgar SPGS	5NE Edgar SPGS	1	250	F2	0	0	$175K	-
05/04/2003	5S Rolla	5S Rolla	.2	30	F0	0	0	0	0
05/06/2003	37.95/-91.76667	Rolla	.2	20	F0	0	0	0	0
03/11/2006	37.85/-91.81667	Vida	3	25	F0	0	0	-	-
09/22/2006	3W St. James	3W St. James	8	350	F1	0	2	$1,500K	-
08/24/2007	OSE Dillion	0SE Dillion	1	75	EF0	0	0	$10K	0
01/07/2008	2NNW Powellville	2N Bundy Jct	4.67	400	EF3	0	0	$110K	0
01/07/2008	4N Doolittle	7SW Rolla Vichy ARPT	3.77	100	EF1	0	0	$5K	0
12/31/2010	2ENE Rolla Downtown ARPT	3WNW Flag SPGS	11	500	EF3	2	0	$1,000K	0
12/31/2010	5W Seaton	2WSW Austria	5.55	440	EF1	0	0	$50K	0
02/29/2012	1NW Edgar SPGS	4SSE Yancy Mills	4	75	EF1	0	0	0	0
02/29/2012	2WSW Seaton	1SW Winkler	5	75	EF1	0	0	0	0
04/30/2019	Beulah	Beulah	.4	50	EF0	0	0	0	0
04/30/2019	Sugartree	Sugartree	.59	75	EF0	0	0	$25K	0
04/30/2019	Craddock	Edgar Springs	5.08	75	EF0	0	0	0	0
05/21/2019	Freeman's Store	Edgar Springs	5.87	800	EF1	0	0	0	0
-	**Total**	**-**	**71.33**	**4,040**	**-**	**2**	**2**	**$6,475K**	**0**

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

Figure 3.79 depicts historic tornado paths across Phelps County.

Figure 3.79. Phelps County Map of Historic Tornado Paths (1950 – 2017)



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

According to the USDA Risk Management Agency's record, there were no insurance payments in Phelps County for crop damages as a result of tornadoes between 1999 and 2019.

Probability of Future Occurrence

From the data obtained from the NCEI[48], an annual average percent probability was calculated for tornadoes within Phelps County (**Table 3.79).** There is a 52.4 percent annual average probability of a tornado occurrence (11 events/21 years x 100). Tornado events can be found in **Table 3.78**. In addition, **Figure 3.80,** obtained from the 2018 Missouri State Hazard Mitigation Plan, also illustrates tornado probabilities across the United States and further shows Phelps County's average probability of 21-40 percent.

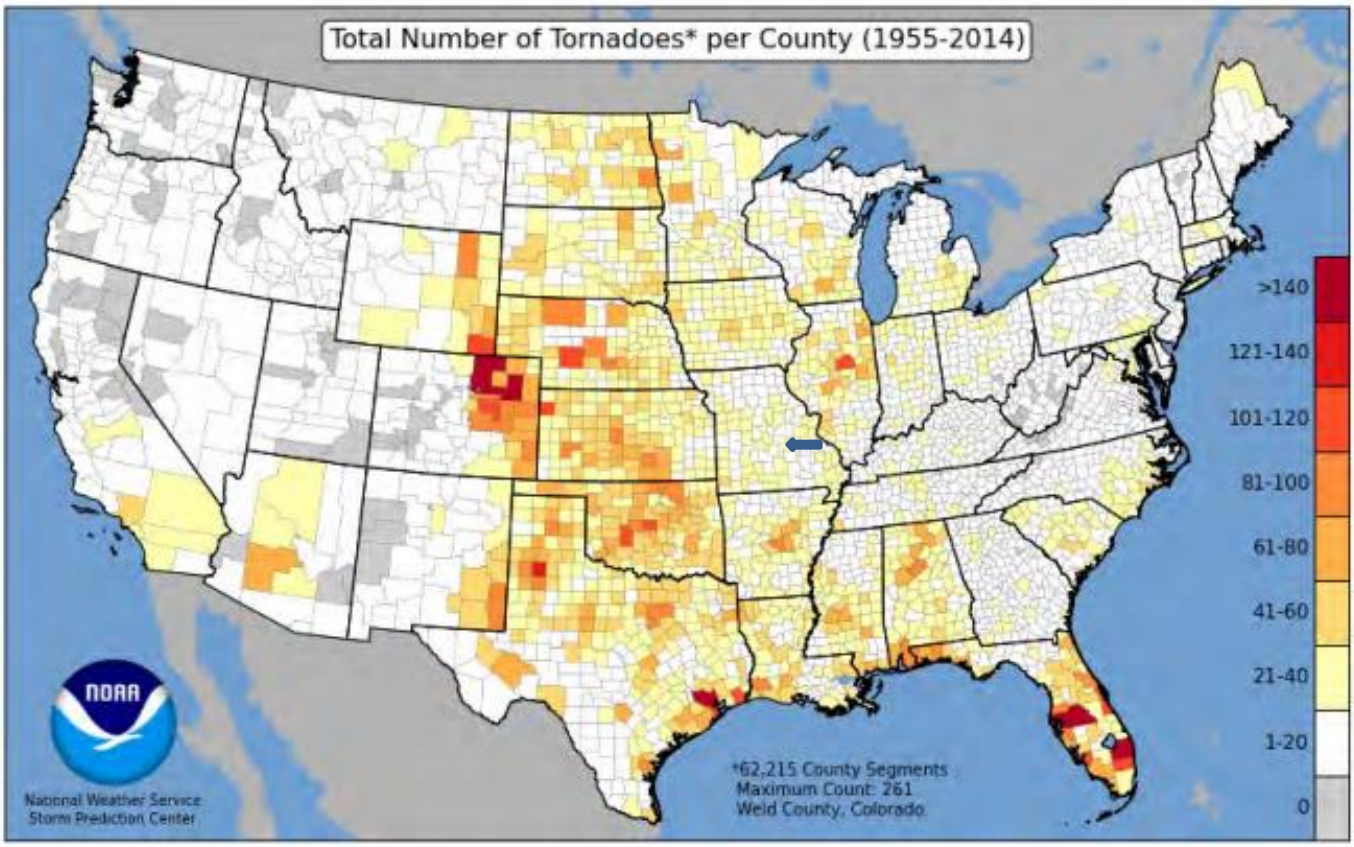
[48] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI

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

Location	Annual Avg. % P
Phelps County	52%

*P = probability; see page 3.24 for definition.

Figure 3.80. Tornado Activity in the United States



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

Changing Future Conditions Considerations

There is still not enough data to know how the frequency and severity of tornadoes will change in a warming world. Research suggests that changes in heat and moisture content in the atmosphere could play a role in making tornado outbreaks more frequent and more severe in the U.S. The research concluded that the number of days with large tornado outbreaks have been increasing for the past 70 years and that densely concentrated tornado outbreaks are increasing as well.[49]

[49] 2018 Missouri Hazard Mitigation Plan

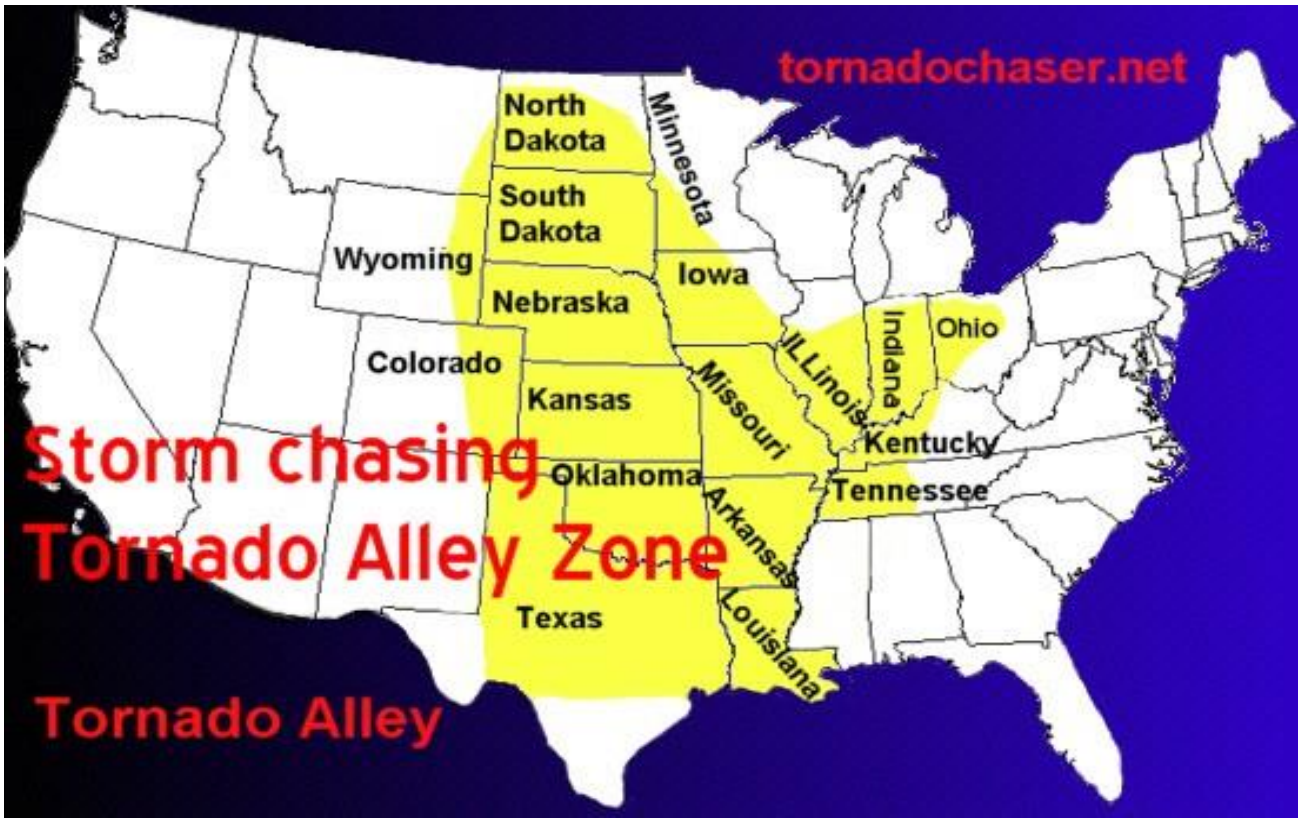
Vulnerability

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.[50] Phelps County resides in a region of the United States that has a high frequency of dangerous and destructive tornadoes. This region seen in **Figure 3.81** 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 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 3.81. Tornado Alley in the U.S.[iii]



Source: *http://www.tornadochaser.net/tornalley.html*

[50] 2018 Missouri Hazard Mitigation Plan

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 Phelps County that is used to determine overall vulnerability.

Table 3.82. Building Exposure, Population Density, SOVI and Mobile Home Data for Phelps County

Total Building Exposure (Hazus)	Exposure Rating	Population Density	Population Rating	SOVI Ranking	SOVI Rating	Percent Mobile Homes	Mobile Home Rating
$4,743,488,000	2	66.68	1	Medium-Low	2	10.2	3

Source: 2018 Missouri Hazard Mitigation Plan

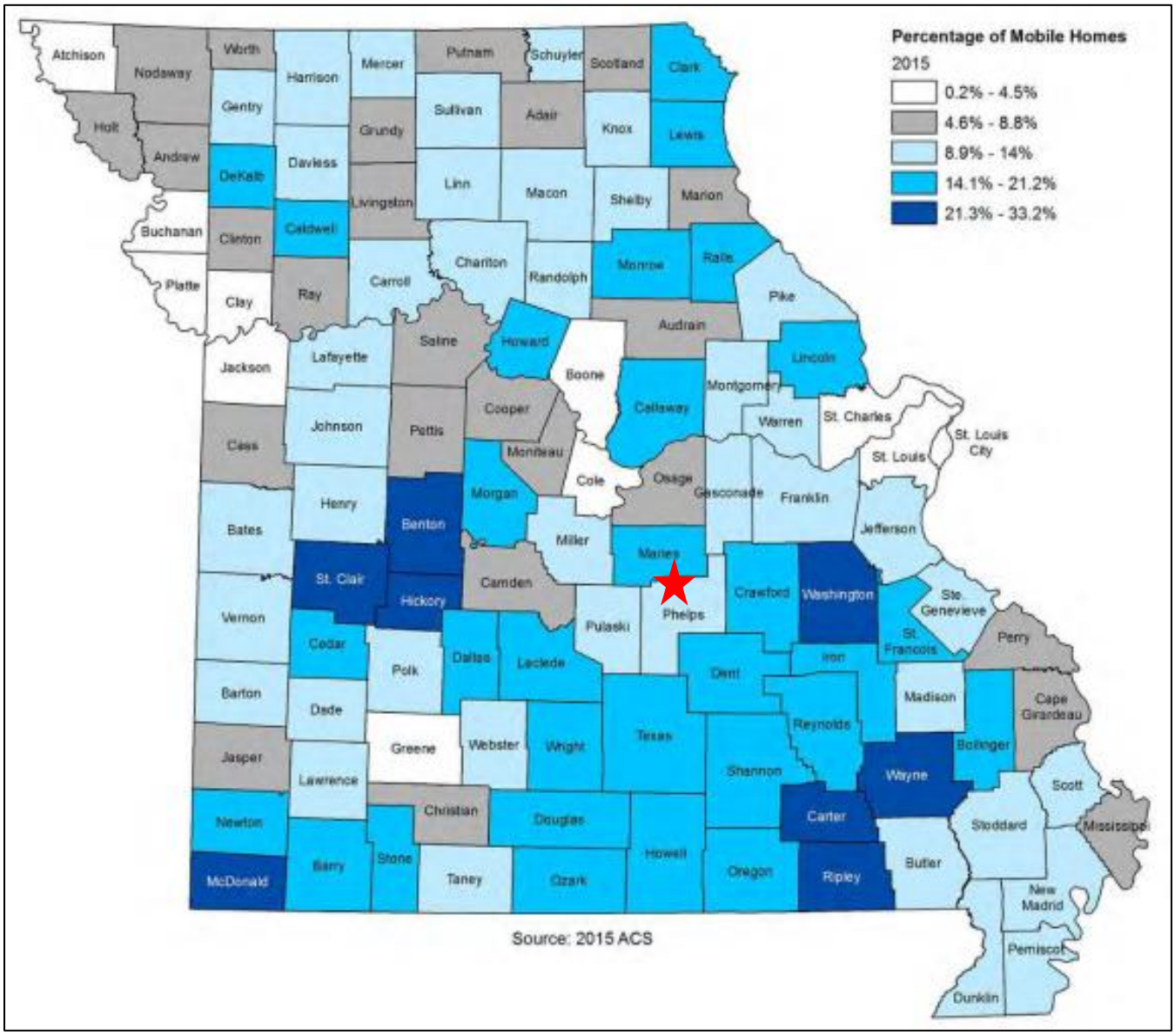
Table 3.83 provides additional data, obtained from the National Centers for Environmental Information to complete the overall vulnerability analysis and the total overall vulnerability rating for tornadoes. **Figure 3.82** shows the percent of mobile homes per county throughout the state with Phelps County determined to have medium mobile home density at 8.9 percent to 14 percent. **Figure 3.83** provides the average annual occurrence of tornadoes in Missouri and illustrates that Phelps County falls into the medium quadrant for historical events – 31 to 40 percentile. Finally, **Figure 3.84** 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 Phelps 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
25	0.373	3	$138,922	1	12	Low-Medium

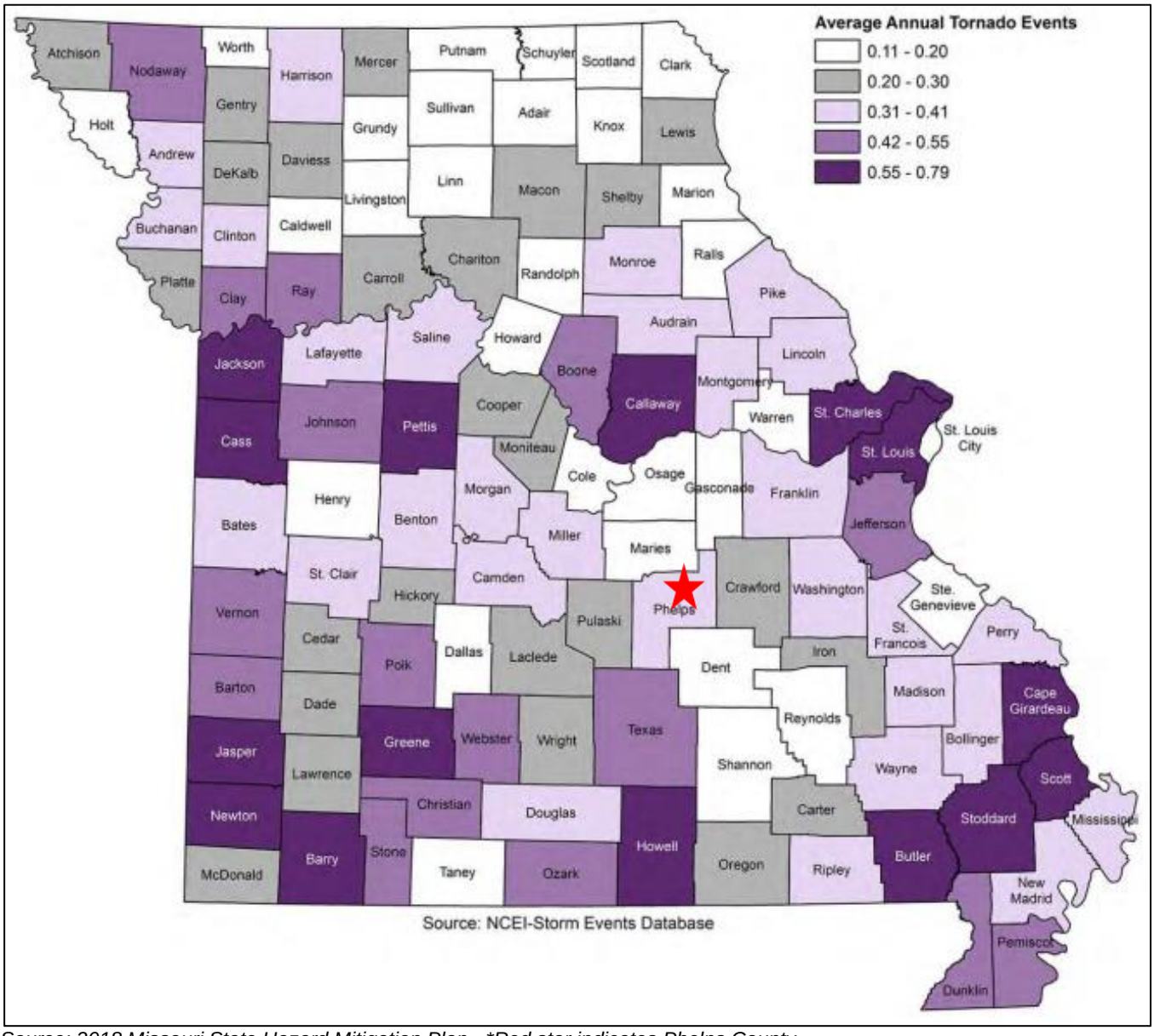
Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.82. Missouri – Percent of Mobile Homes Per County



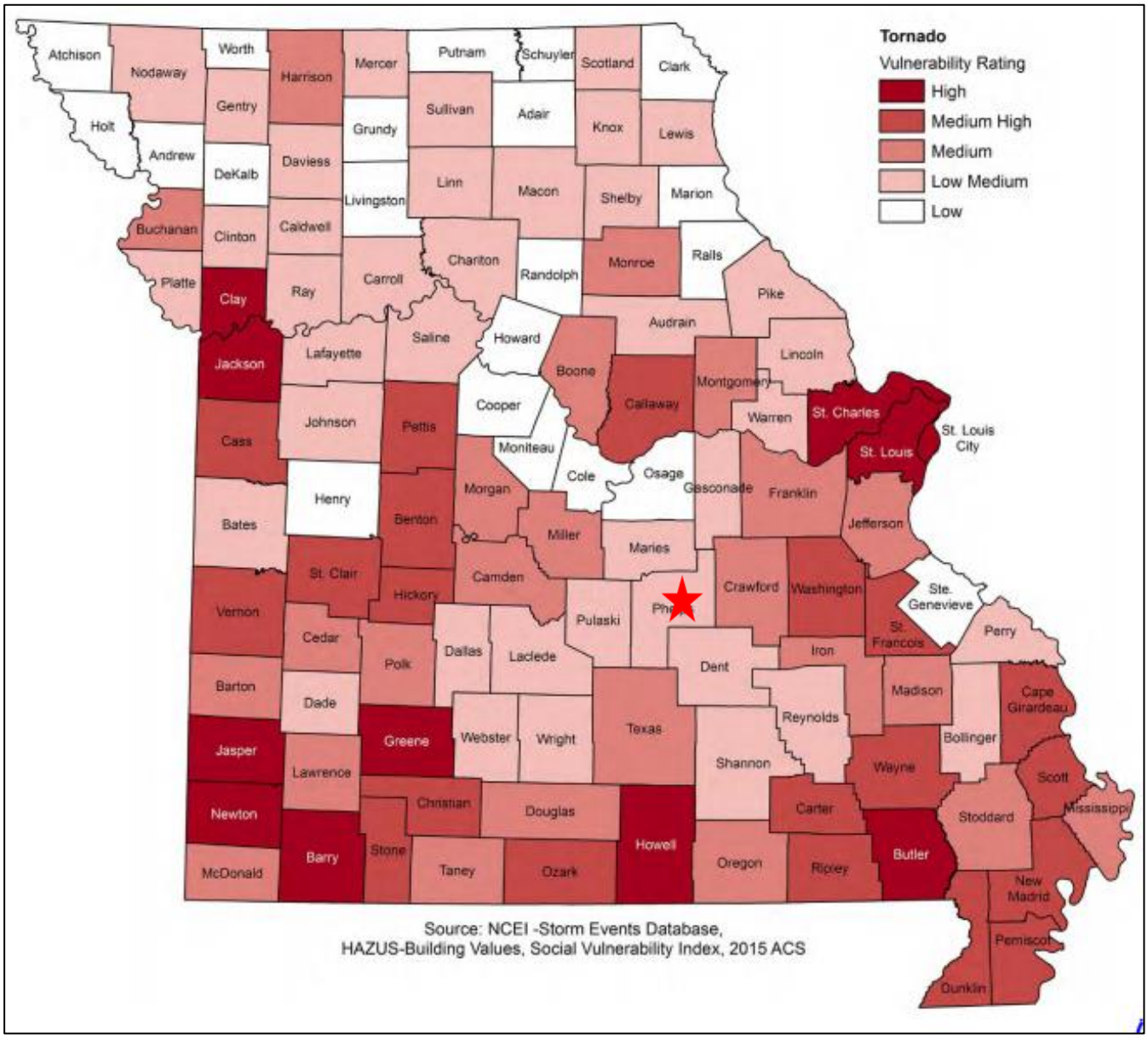
*Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Phelps County*

Figure 3.83. Average Annual Occurrence for Tornadoes



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

Figure 3.84. Overall Vulnerability to Tornadoes



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

Potential Losses to Existing Development

There has been a total of $6,475,000 in damage due to tornadoes within Phelps County in the previous 21 years. With this information we can estimate that each year there will be approximately $308,333.33 in loss to existing development. Additionally, the largest recorded tornado in the planning area has been an EF3. Utilizing this information, we can infer that there is potential for another tornado of equivalence.

Impact of Previous and Future Development

As populations and development increases across the county, the vulnerability will increase as well. In order to protect jurisdictions from increased tornado vulnerabilities future analysis, training, and

implementation should be considered at the planning, engineering, and architectural design stages.

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 Newburg would have higher vulnerability due to 43 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 Phelps County and its jurisdictions. From the information provided in **Table 3.84,** Doolittle, with 70 mobile homes – 23.8 percent of housing in the count, is most vulnerable to losses due to the number of mobile homes residing within the jurisdiction.

Table 3.84. Percentage of Mobile Homes in Phelps County, 2019

Jurisdiction	Number of Mobile Homes	Percentage of Mobile Homes*
Unincorporated Phelps County	1,480	17.1
Doolittle	70	23.8
Edgar Springs	14	13.6
Newburg	12	3.9
Rolla	228	2.5
St. James	10	0.5

Source: U.S. Census Bureau, 2015-2019 5-Year American Community Survey
**Number of mobile homes per jurisdiction/total occupied housing units per jurisdiction*
***Total housing units for all jurisdictions = 20,287*

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 Severe Winter Weather

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.

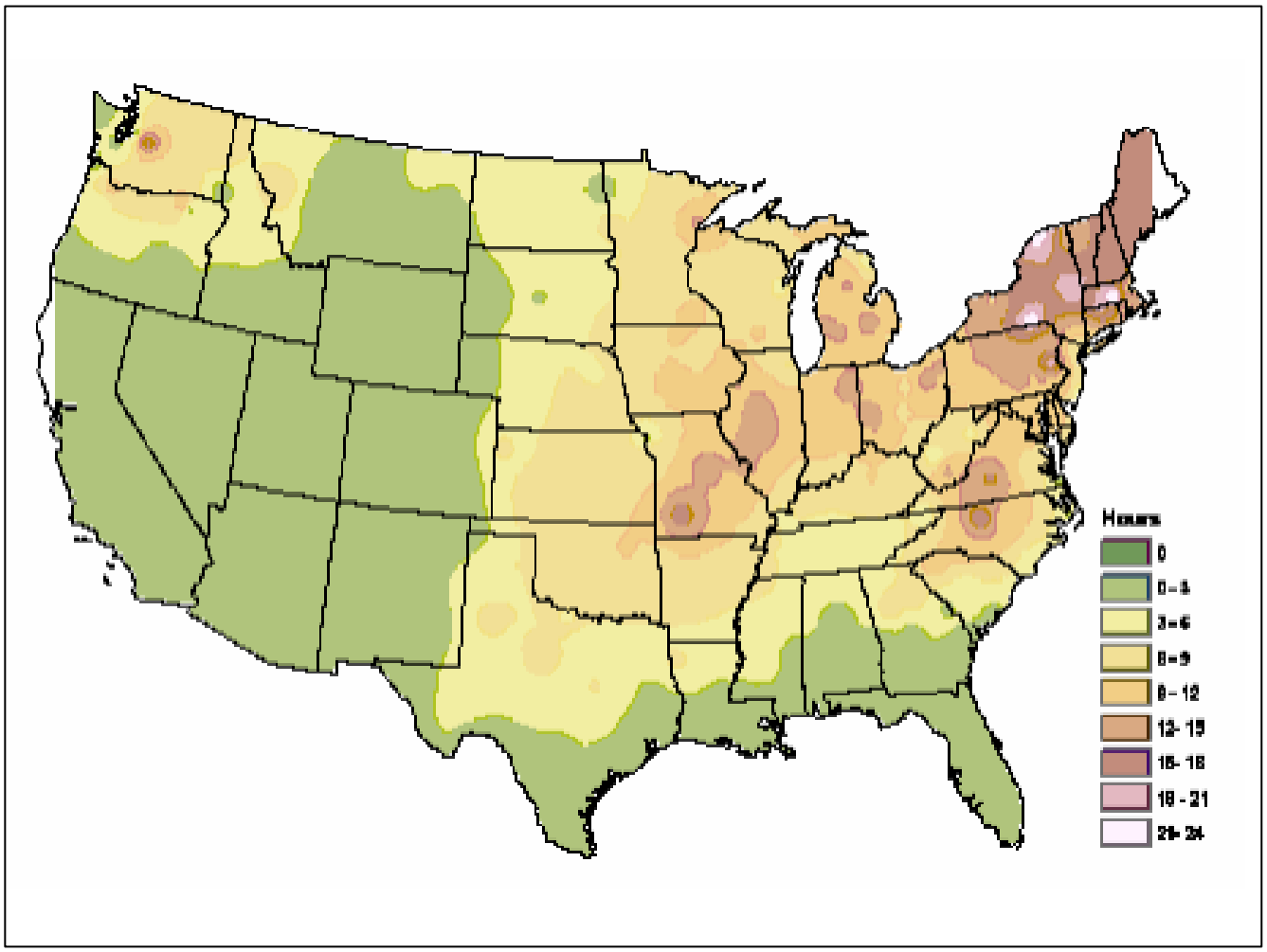
- **Blizzard**—Winds of 35 miles per hour or more with snow and blowing snow reducing visibility to less than ¼ mile for at least three hours.
- **Blowing Snow**—Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls**—Brief, 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. Phelps 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. Phelps County is vulnerable to heavy snow, ice, extreme cold temperatures and freezing rain.

Figure 3.85 illustrates statewide average number of hours per year with freezing rain. Phelps County receives approximately 9 to 12 hours.

Figure 3.85. 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 3.86** below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

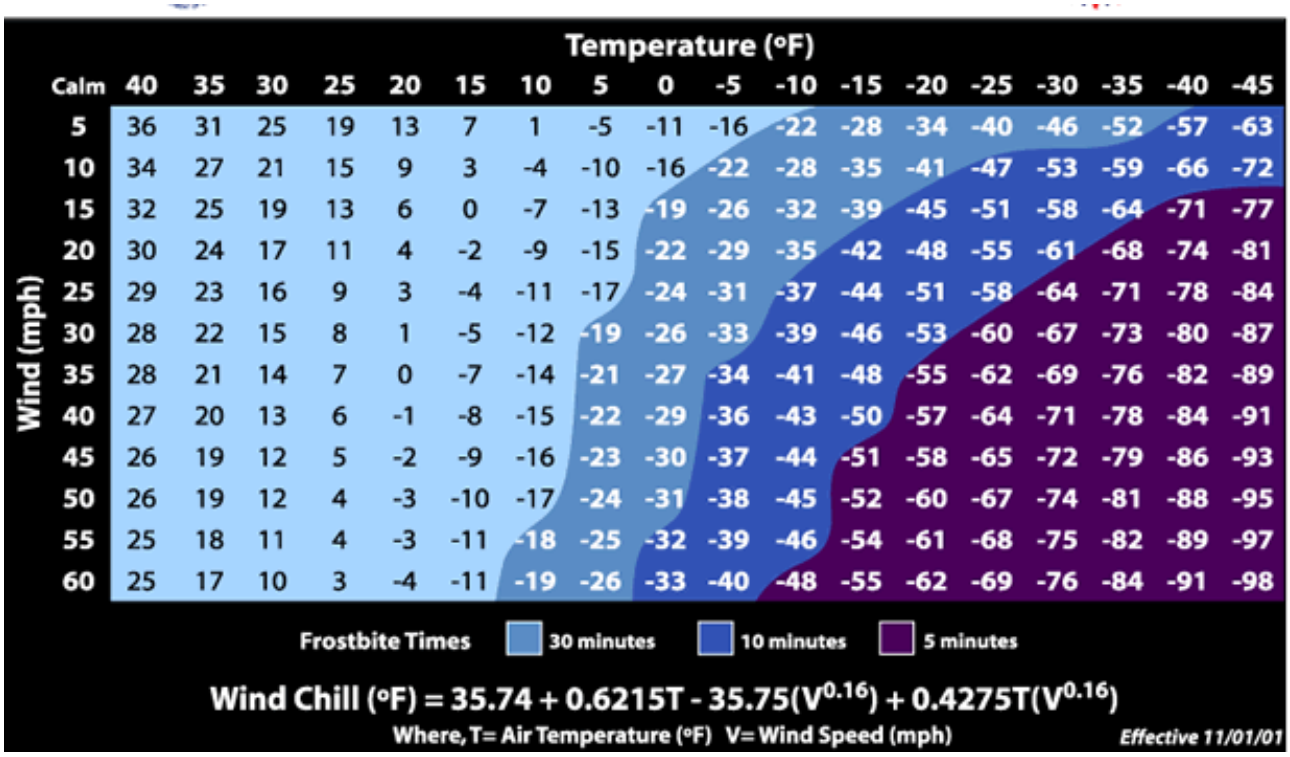
Winter storms, cold, frost, and freeze all can influence or negatively impact crop production. However, data obtained from the USDA's Risk Management Agency for insured crop losses indicates that there were three claims paid in Phelps County between 1999 and 2019 for severe winter weather.

Table 3.85. Crop Insurance Claims Paid in Phelps County from Winter Weather 1999-2019

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2007	All Other Crops	Freeze	$23,993.00
2018	All Other Crops	Cold Wet Weather	$1,659.00
Total	**3**		**$25,652.00**

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

Figure 3.86. 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 1999 and 2019 **(Table 3.86**). 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 3.86. NCEI Phelps County Winter Weather Events Summary, 1999 - 2019

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Winter Storm	01/01/1999	0	$50K	0
Extreme Cold/Wind Chill	12/12/2000	0	0	0
Ice Storm	12/15/2000	0	0	0
Extreme Cold/Wind Chill	01/01/2001	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
Ice Storm	01/25/2004	0	0	0

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Winter Storm	02/05/2004	0	0	0
Winter Storm	11/30/2006	0	$300K	0
Ice Storm	01/12/2007	0	$5M	0
Winter Storm	01/20/2007	0	0	0
Ice Storm	04/07/2007	0	0	$4.36M
Ice Storm	12/10/2007	0	$10K	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
Winter Storm	02/20/2015	0	0	0
Winter Storm	02/28/2015	0	0	0
Ice Storm	01/13/2017	0	0	0
Winter Storm	01/11/2019	0	0	0
Winter Weather	02/15/2019	0	0	0
Winter Weather	12/16/2019	0	0	0
Total	**29**	**0**	**$5.31M**	**$4.36M**

Source: NCEI, data accessed [09/14/2020]

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:** Abnormally cold air moved into the Ozarks by the middle of December as the main jet stream carved out a deep trough of low pressure over the eastern 2/3's of the nation. This pattern continued through the early part of January. The combination of deep snow cover and an abnormally strong arctic air mass kept temperatures 10 to 20 degrees below normal. The severe cold caused numerous water mains to brake, roof leakage, and hazardous roadways due to ice and snow.

   In addition, hay supplies rapidly decreased as persistent ice and snow covered fields. Snow cover and cold conditions also made it difficult for farmers and ranchers to feed their animals,

which had an adverse affect on livestock and newly born calves. Several calves died due to the severe stress of the cold and low supply of hay, especially in southwest Missouri.

3. **12/15/2000**: Light freezing rain produced ice accumulations of one quarter to one half inch over a broad area of central and south central Missouri. The icing caused numerous accidents and several large pileups on I-44 between Lebanon and Rolla. Due to significant ice accumulations near Tuscumbia, a tree fell onto a power line, causing power outages to a few hundred people on the western side of town.

4. **01/01/2001:** Abnormally cold temperatures continued from December into early January with readings 10 to 20 degrees below normal. Snow and ice covered fields and highways provided problems to drivers, farmers and ranchers. Temperatures managed to rise well above freezing by the end of the first week of January, allowing these problems to lessen.

5. **02/21/2001:** Sleet, freezing rain and embedded thunderstorms caused ice accumulations from one quarter, up to two inches in some places across southwest, central and south central Missouri. The heaviest ice accumulations occurred along and north of Highway 60, and along the I-44 corridor.

6. **03/02/2002:** A late winter storm brought a variety of winter weather across southeast Kansas and portions of southwest, west central and central Missouri, during the morning and afternoon hours of March 2nd.

7. **12/24/2002:** The second of a series of winter storms to affect the Missouri Ozarks during the cool season of 2002-2003, brought significant snow accumulations to the region. The heaviest accumulation amounts were observed in a 60 mile wide band. This area is along and 30 miles north and south of a line extending from Cassville to Salem Missouri, where accumulations ranged from 12 to 16 inches. Areas to the north and south of this band, received total accumulations of five to eight inches. Numerous vehicle accidents occurred, however, no property damages were directly correlated with the heavy snow.

8. **02/23/2003:** A major winter storm tracked across the region, providing a six to twelve inch snow band along the Interstate 44 corridor. The heaviest amounts were observed in far southwest areas of Missouri where 12 inch amounts were measured near Joplin and Neosho. Springfield recorded 7.6 inches and 6 inch amounts were common up towards Rolla. Other than several vehicle accidents, no major property damage was noted.

9. **01/25/2004:** A strong upper level storm system approached southern and central Missouri during the overnight hours of January 24th. Low level temperature fields assumed a structure conducive for significant accumulations of freezing rain. Accumulations ranged from less than a quarter of an inch from Joplin to West Plains, and up to an inch near the Houston and Salem areas. Numerous vehicle accidents were observed, however, no significant monetary losses can be directly related to the ice.

10. **02/05/2004:** A Strong storm system developed across the central and southern Rockies. Tremendous amounts of moisture and lift moved into the Missouri Ozarks from the afternoon of the 4th and into the 5th. A mid-level band of warmer air adverted in from the south causing snow to change to sleet and freezing rain at times. A mixture of freezing rain, sleet, and snow accumulations of one to eight inches were observed across the entire Ozarks region. The heaviest amounts were located along the Arkansas and Missouri border where a 50 mile wide band of seven to eight inches of accumulation occurred. One to three inches of the mixed frozen precipitation occurred along the interstate 44 corridor, however, another heavier band

developed across the Osage Plains of west central Missouri where four to six inches of accumulation occurred.

11. **11/30/2006**: A major winter storm caused a combination of freezing rain, sleet, and heavy snow to fall over sections of southwest and central Missouri. The frozen precipitation began on the 30th; the precipitation type was freezing rain and sleet, with ice accumulations up to four inches in some areas. The second wave of precipitation occurred overnight causing large amount of snow to accumulate over the ice. Storm total accumulations ranging from 13 to 17 inches occurred from the Lake of the Ozarks Region, over to Vernon and Cedar counties. Meanwhile other areas north of the Interstate 44 corridor experienced storm totals ranging from seven to 12 inches. The combination of the ice and snow weighted down all exposed objects. As a matter of fact, some areas experienced disaster as many roofs on businesses, barns, outbuildings, and schools collapsed due to the weight of the accumulated precipitation. On Lake of the Ozarks and Pomme De Terre Lake, numerous docks collapsed destroying a large number of boats and causing many of them to sink.

12. **01/12/2007**: Significant tree and power line damage occurred from ice accumulations of one and a half inches.

13. **01/20/2007:** A fast moving storm system brought several forms of precipitation to extreme southeast Kansas and the Missouri Ozarks. The combination of rain, freezing rain, sleet, and snow were observed in numerous counties. For areas along and north of a line from McCune, Kansas to Eldon, Missouri, mainly snow fell with accumulations ranging from five to seven inches. Elsewhere, sleet and freezing rain accumulations ranged from one quarter of an inch to around an inch.

14. **12/10/2007:** Ice accumulations ranging from one quarter of an inch to three quarters of an inch occurred across the entire county. Some areas experienced power outages as trees and power lines were damaged.

15. **02/11/2008:** Sleet accumulations of one to two inches with minor accumulations of freezing rain were observed.

16. **02/21/2008:** Sleet accumulations of one half to one and a half inches were observed.

17. **01/26/2009:** A significant accumulation of a 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 3 to 5 inches of sleet and snow.

18. **02/28/2009:** Heavy snow with accumulations of four to seven inches.

19. **02/01/2011:** A major winter storm produced heavy snow and blizzard conditions at times across southwest Missouri. Heavy snow accumulations of 2 to 6 inches were observed. Significant accumulations of sleet preceded the snow with accumulations up to 3 inches. Freezing rain accumulated up to one tenth of an inch. Northwest winds of 20 to 40 mph resulted in significant drifts and visibilities less than one quarter mile. Travel was extremely treacherous with some roads impassable.

20. **02/21/2013:** A winter storm brought a mix of freezing rain and sleet accompanied by thunder. Sleet accumulations ranged from one to two inches with freezing rain accumulations ranging from a trace to one tenth of an inch.

21. **01/05/2014:** Heavy snow with accumulations of 8 to 12 inches.

22. **03/02/2014:** Sleet accumulations around 1/2 inch with snow accumulations of 1 to 3 inches.

23. **02/20/2015:** Winter storm brought significant amounts of freezing rain to portions of southern Missouri with ice accretion up to around one quarter of an inch.

24. **02/28/2015:** Winter storm brought significant snowfall with total snow accumulations of 4 to 6 inches.

25. **01/13/2017:** A significant ice storm impacted the Missouri Ozarks with sporadic power outages and some tree damage.

26. **01/11/2019:** A winter storm that started as rain as it moved into central and southern Missouri, then turned to a wintry mix of sleet, freezing rain and snow before changing over to all snow in some areas. Heavy snow fell across central Missouri with accumulations between 6 and 12 inches. Portions of south-central Missouri saw significant ice accumulations that resulted in power outages and numerous trees and limbs down. As the precipitation was winding down, areas of freezing drizzle persisted through the overnight hours of January 12.

27. **02/15/2019:** A winter storm brought 3 to 5 inches of snow to portions of central Missouri, while freezing rain brought ice accumulations of one to two tenths of an inch along the Highway 60 corridor. There were a number of accidents across southern and central Missouri, including a 50 car pileup on Highway 54. The Southwest District of the Missouri Department of Transportation spread 5000 tons of salt at a cost of nearly $500,000.

28. **12/16/2019:** A couple of rounds of mixed wintry precipitation impacted southwest and central Missouri. Round 1 occurred December 15 and round 2 December 16. Storm totals snows were generally 2 to 3 inches of snow from Lebanon to Rolla, Missouri. A few locations also reported a glaze to 1/10 of an inch of ice.

Phelps County has been included in two federal disaster declarations for winter weather since 2007.[51]

Probability of Future Occurrence

From the data obtained from the NCEI [52], annual average percent probabilities were calculated for winter weather within Phelps County (**Table 3.87)**. There were 29 recorded events (**Table 3.86**) over a 21 year period. There is 100 percent annual average probability of winter weather occurrence (29 events/21 years)**,** with an average of 1.38 events per year.

Changing Future Conditions Considerations

There are both positive and negative indirect impacts from warming temperatures. Shorter winter seasons and fewer days of extreme cold may result in changes in the distribution of native plant and wildlife. The stress of climate change may cause some native species to become endangered or extinct if that species cannot adapt to changing conditions. There may also be an increase in pests and undesirable non-native species. Warmer winter conditions will result in a deduction of ice lake cover and warmer water temperatures – which can lead to harmful blooms of algae and bacteria. Increased temperatures could also

[51] https://www.fema.gov/data-visualization-summary-disaster-declarations-and-grants
[52] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI

mean increased rainfall in winter months that could increase the risk and severity of spring floods.[53]

Table 3.87. Annual Average % Probability of Winter Weather in Phelps County

Location	Annual Avg. % P	Avg. # of Events
Phelps County	100%	1.38

*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 Phelps County. Various data sources were utilized for statistical analysis including the following:

- National Centers for Environmental Information (NCEI) storm event data (1999 to December 31, 2019)
- 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

[53] 2018 Missouri State Hazard Mitigation Plan

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 3.88 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 3.89**. The housing density, building exposure and SOVI data for Phelps County can be found in **Table 3.90**.

Table 3.88. 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 3.89. 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 3.90. Housing Density, Building Exposure and SOVI Data for Phelps County

Total Building Exposure (Hazus)	Building Exposure Rating	Housing Density	Housing Density Rating	SOVI Ranking	SOVI Rating
$4,743,488,000	2	29.35	1	Medium-Low	2

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.91 provides the last piece of the data gathered from NCEI to complete the overall vulnerability analysis and the total overall vulnerability rating for severe winter weather. The total number of winter weather events includes blizzard, heavy snow, ice storm winter storm and winter weather events. The likelihood of occurrence is 1.38 or 100 percent per year. The total annualized property loss is $259,286, 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 3.91. Additional Statistical Data Compiled for Vulnerability Analysis for Phelps County

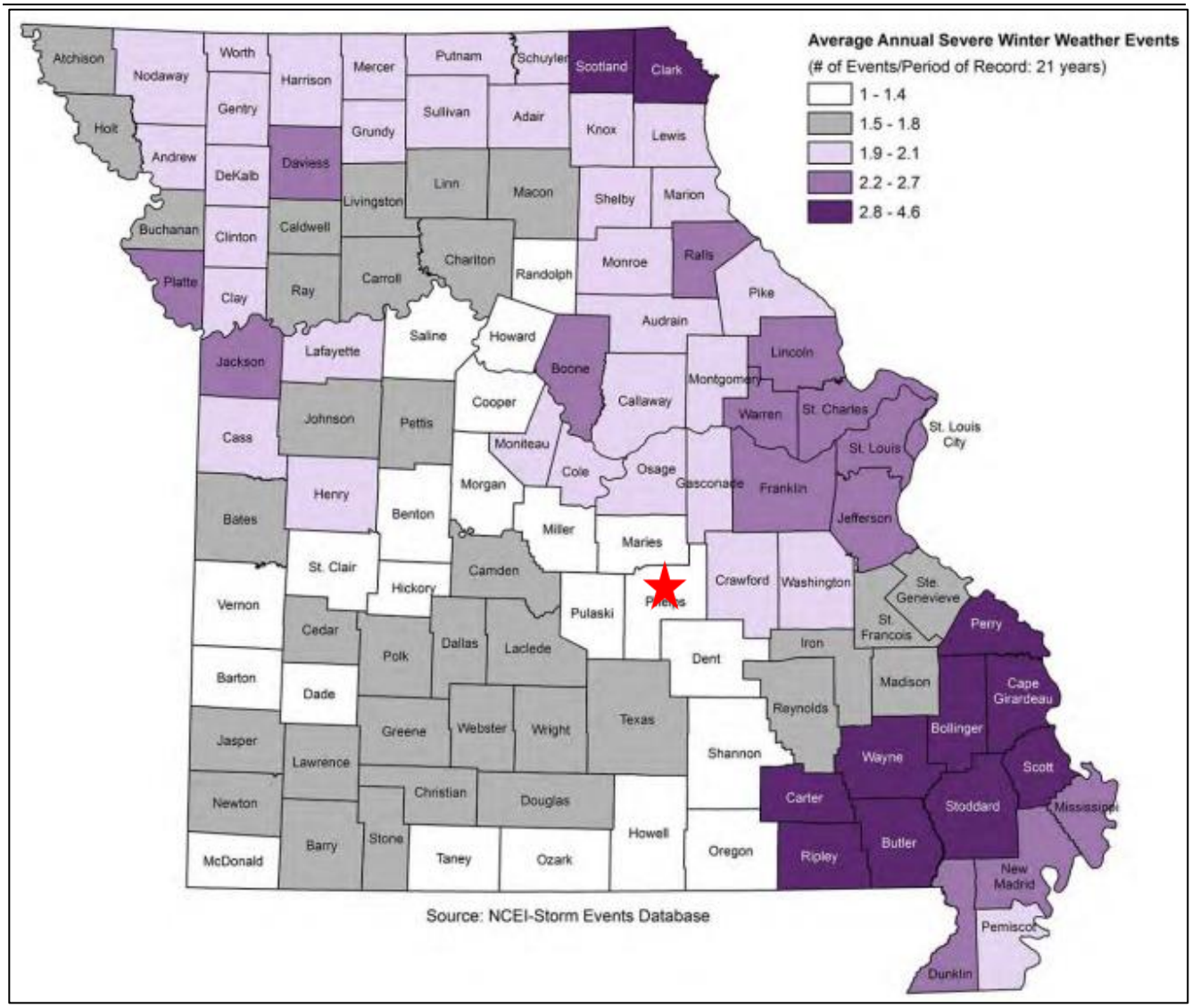
Total number of Winter Weather Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating	Overall Vulnerability Rating	Overall Vulnerability Rating Description
27	1.2857	1	$259,286	2	8	Low

Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.87 illustrates the average annual occurrence of severe winter weather statewide. Phelps County falls into the Low category of 1 to 1.4 events per year.

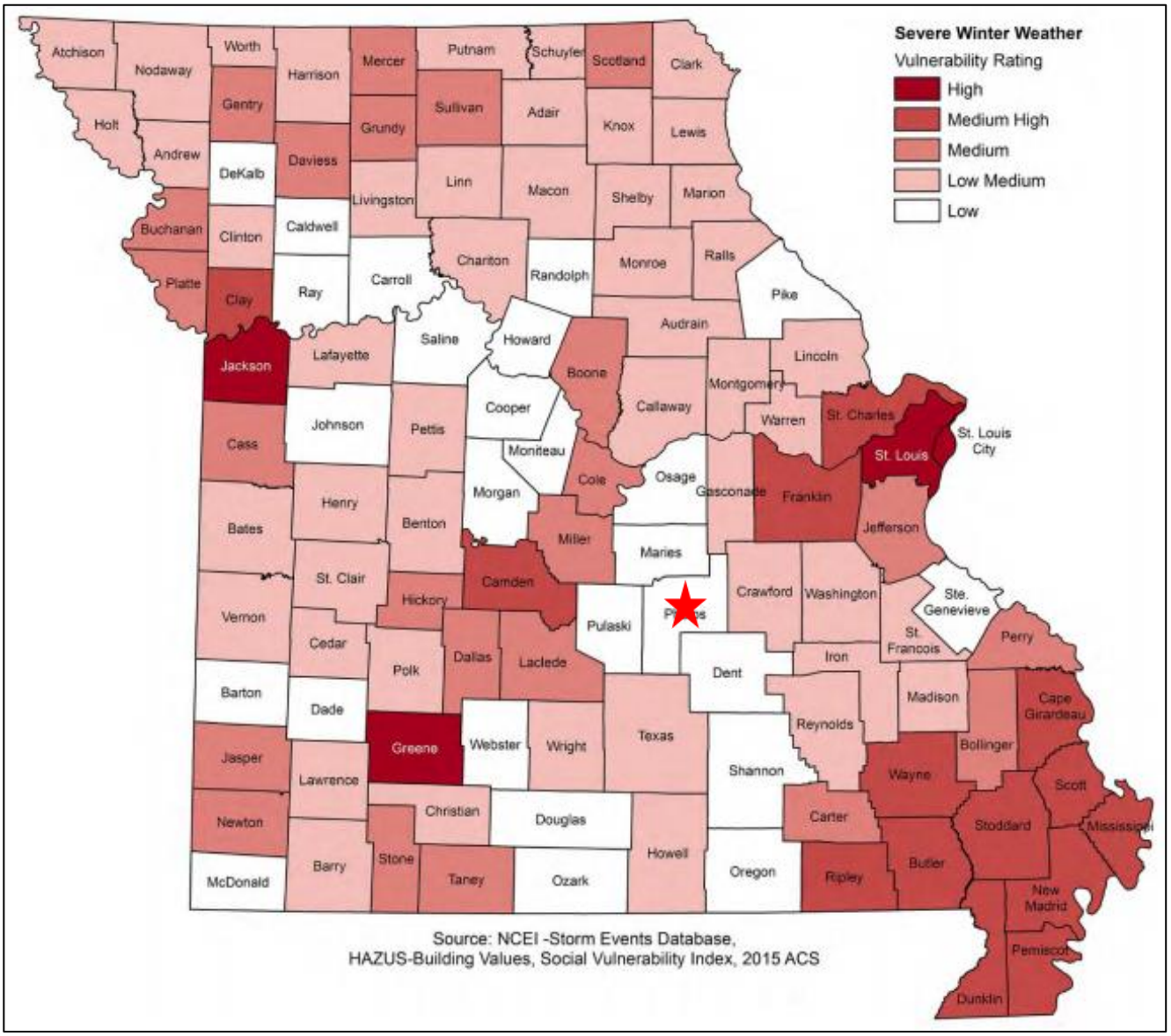
Figure 3.88 provides an illustration of the vulnerability summary of all Missouri counties for severe winter weather. Again, Phelps County falls into the Low rating for overall vulnerability.

Figure 3.87. Average Annual Occurrence of Severe Winter Weather Events



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

Figure 3.88. Vulnerability Summary for Severe Winter Weather



*Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Phelps 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, Phelps County can expect annual property losses of $259,286 due to severe winter storms.

Impact of Previous and Future Development

Data for future development for the planning area is sparse. However, winter weather will affect the county as a whole. Any future development is at risk to damages and increased exposure. In

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. Doolittle 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, Phelps 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.

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 Phelps County's existing hazard mitigation plan originally approved by FEMA on May 23, 2005 and updated and approved by FEMA on June 25, 2011 and five years later on August 11, 2016. Therefore, the goals from the updated 2016 Phelps 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 2018 State Hazard Mitigation Plan goals were reviewed. As the existing goals were broad, still applicable, and supported the 2018 State Hazard Mitigation Plan goals, the MPC saw no reason to make any changes. The Phelps 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 have been no deaths 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 11 completed actions, five deleted actions, 11 actions that were combined with other, similar actions, and 27 continuing actions.

Table 4.1 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)
1.1.2 Promote development of emergency plans by businesses and public entities.	Public entities in the county have emergency plans in place. The MPC did not feel that promoting the development of emergency plans to business entities met the SMART criteria and was not a high priority and chose to remove that part of the action item from the plan.
1.1.5 Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.	All school districts agree that this is currently implemented and is embedded in district's policy and procedures and requirements from the Missouri Department of Elementary and Secondary Education.
1.1.6 Schools need to continue to conduct emergency preparedness exercises on a regular basis.	All school districts agree that this is currently implemented and is embedded in district's policy and procedures and requirements from the Missouri Department of Elementary and Secondary Education.
1.1.7 Regularly review and update school emergency plans.	All school districts agree that this is currently implemented and is embedded in district's policy and procedures and requirements from the Missouri Department of Elementary and Secondary Education.
1.2.3 Continue to partner with local radio stations to ensure that appropriate warning of impending disasters is provided to all residents of impending disasters.	County and city EMDs state that this has been implemented and is embedded in policy and procedure.
3.1.1 Distribute SEMA brochures on natural disasters, preparedness and NFIP at public facilities and events.	Local emergency response agencies stated that this action item has been implemented and is embedded in policy and procedure.
3.1.3 Encourage and promote weather spotter classes throughout the county.	Local EMDs stated that this action item has been implemented and is embedded in policy and procedure. Classes are held regularly.
4.1.2 Continue to encourage joint training (and drills) between agencies, public and private entities (including schools/businesses).	Joint drills and trainings are regularly held in the county and cities. Rolla Fire & Rescue regularly does drills working with multiple agencies including Missouri University of Science & Technology, state agencies, etc. Region I SEMA conducts joint exercises annually. The Pipeline Association of Missouri also does joint exercises and trainings in the county and region. This action item has been completed and is embedded in policy and procedures.

Completed Actions	Completion Details (date, amount, funding source)
4.1.4 Maintain updated mutual aid agreements between emergency response agencies inside and outside the region.	This action item has been completed. Fire mutual aid agreements are in place throughout the state. Emergency Medical Services and the hospitals also have mutual aid agreements in place. Mutual aid agreements are also in place between cities for utility emergency assistance and with Missouri Public Utility Association for all utilities.
5.1.4 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	EMDs and emergency response agencies stated that this had been completed.
6.3.1 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.	The MPC agreed that this was accomplished through the hazard mitigation planning process and documented in the plan.
Deleted Actions	**Reason for Deletion**
1.1.3 Provide information to citizens on individual mitigation activities such as building personal shelters and assuring that propane tanks are appropriately tied down.	Combined with 1.1.1.
1.1.4 Continue to educate residents about precautions that should be taken during threats of natural disasters such as heat waves and severe weather.	Combined with 1.1.1.
1.2.4 & 2.3.3 Monitor developments in data availability concerning the impact of disasters such as dam failure, tornados, sinkholes, land subsidence and wildfire upon Phelps County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	Identical action items that have been removed due to SEMA reviewer stating that they do not meet SMART criteria. These action items were added at the request of SEMA/FEMA during a previous update. The MPC also determined these were not high priorities.
2.1.1 Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.	Upon review, due to not meeting the SMART criteria and falling to a low priority – this action item was deleted.
2.1.2 Continue to encourage business to develop and implement emergency plans.	The MPC determined that promoting the development of emergency plans to business entities did not meet the SMART criteria, was not a high priority and chose to remove the action item from the plan.
2.3.1 Encourage minimum standards for building codes in all cities.	The MPC determined that this action item did not meet the SMART criteria, was not a high priority and chose to remove it from the plan.
2.3.2 Encourage local governments to develop and implement regulations for securing hazardous materials tanks and mobile homes to reduce hazards during storms and flooding.	The MPC determined that this action item did not meet the SMART criteria, was not a high priority and chose to remove the action item from the plan.
3.1.2 Distribute regular press releases from county and city EMD offices concerning hazards, where they strike, frequency, preparedness and how to mitigate.	Combined with 1.1.1.

Deleted Actions	Reason for Deletion
3.2.1 Encourage local residents to purchase weather radios through press releases and brochures	Combined with 1.1.1.
3.3.2 Distribute press releases by cities/county regarding adopted mitigation measures to keep public abreast of changes and/or new regulations.	Combined with 1.1.1.
4.2.1 Encourage meetings between EMD, city/county and SEMA to familiarize officials with mitigation planning ad implementation and budgeting for mitigation projects.	Duplicate of 3.2.2.
4.2.2 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.	Combined with 3.3.1.
5.1.2 Encourage communities to budget for enhanced warning systems.	Combined with 1.2.1.
5.1.3 Encourage all communities to develop stormwater management plans in all new development – both residential and commercial properties.	Combined with 2.2.2.
5.2.3 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.	Combined with 1.3.5.
6.1.1 Work with SEMA Region I coordinator to learn about new mitigation funding opportunities.	The MPC agreed that this was being accomplished through other agencies and was no longer a high priority.
6.2.2 Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.	Combined with 1.1.1.

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

In addition to the STAPLEE and Benefit/Cost analysis, the committee was also asked to consider **SMART** – **S**pecific, **M**easurable, **A**chievable, **R**elevant, **T**ime-bound, per FEMA. All action items were reviewed with these criteria in mind. 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 Table 4.3.

Jurisdictional Floodplain Management Programs

Phelps County and the cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James 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 halls of each community and the county's flood maps can be obtained from the floodplain coordinator – MRPC. Furthermore, floodplain maps can be found online through FEMA's website https://msc.fema.gov/portal.

Table 4.2. Jurisdictional Floodplain Ordinance Adoption Date

Community Name	Ordinance Adoption Date
Phelps County	02/01/1987 Revised 03/17/16
Doolittle	01/08/2008
Edgar Springs	08/24/84
Newburg	04/03/1987
Rolla	09/30/77 Revised 04/01/2002
St. James	07/03/85 Revised 03/14/2016

Source: FEMA's Community Status Book Report[1]; NSFHA (SEMA)

[1] www.fema.gov/cis/mo.html

Table 4.3 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	Maintain a hazard mitigation public awareness program to include: benefits of hazard mitigation planning and projects; personal emergency preparedness; participation in emergency notification systems where available; information on individual hazard mitigation projects such as tying down hazardous materials tanks; how to shut off utilities; precautions to take during threatening weather events; etc.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.1.8	Encourage the construction of tornado safe rooms in every school that does not have one.	3	3	3	3	3	2	3	20	IC, EMCC	3	-3	0	20	H
1.2.1	Continue to encourage cities to budget for and 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	Purchase weather radios for those schools that do not have them to insure advanced warning about threatening weather.	3	3	3	3	3	3	3	21	IC ,LF, EMCC	6	-1	5	26	H
1.3.1	Continue to implement 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
1.3.2	Continue to examine 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	Establish designated shelters for residents to be used during tornado threats, as cooling centers during extreme heat or power outages and/or as shelters during other disasters.	3	3	3	3	3	3	3	21	IC, LF, EMCC	6	-1	5	26	H
1.3.4	Facilities that house vulnerable populations such as disabled and elderly should review alternative locations for sheltering residents and MOUs with “sister” facilities.	3	2	2	3	3	2	3	18	IC, EMCC	4	-1	3	21	H
1.3.5	Continue to work to increase availability (if necessary construction) of certified storm shelters for individual families and large groups, including near large employment centers and schools.	3	3	3	3	3	1	3	19	IC, EMCC	4	-5	-1	18	M

Table 4.3 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
2.1.3	Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.	3	3	3	3	3	2	3	20	LF, EMCC	4	-3	1	21	H
2.2.1	Educate residents, realtors and contractors about the dangers of floodplain development and the benefits of the NFIP.	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
2.2.2	Encourage development of storm water management plans in those jurisdictions that do not currently have them and in all new residential and commercial development.	3	2	2	2	3	2	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
2.2.3	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
2.2.4	Continue to look at ways to reduce vulnerabilities in the Beaver Creek area and along the Gasconade River including elevations and buyouts	2	2	2	2	3	2	3	15	IC, PD, EMCC	6	-5	1	16	M
3.1.4	Educate staff and parents on school safety protocols.	3	3	3	3	3	3	3	21	IC, LF, EMCC	6	-1	5	26	H
3.2.2	Encourage meetings of EMD, city/county officials & SEMA to familiarize officials with mitigation planning, implementation & 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
3.4.3	Encourage the development of a county-wide CERT and/or VOAD program and educate the public on how they can benefit from these types of programs.	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

Table 4.3 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
4.1.3	Pool different agency resources to achieve widespread mitigation planning results.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
5.1.1	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	29	H
5.2.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.	3	2	2	2	3	2	3	17	PD, EMCC	4	-3	1	18	M
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.	2	2	2	1	2	1	3	13	PD, EMCC	4	-1	3	16	M
6.1.2	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
6.1.4	Encourage local jurisdictions to budget for mitigation projects.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-5	3	23	H
6.2.1	Encourage cities and counties to implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.	2	1	1	1	2	2	2	11	IC, PD, LF, EMCC	8	-5	3	14	M

Phelps County

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

Action 1.1.1: Maintain a hazard mitigation public awareness program to include: purchasing weather radios, benefits of hazard mitigation planning and projects; personal emergency preparedness; participation in emergency notification systems where available; information on individual hazard mitigation projects such as tying down hazardous materials tanks; how to shut off utilities; precautions to take during threatening weather events; etc.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Residents are not always prepared to manage on their own for 72 hours following an event. This action item will improve individual household preparedness and increase knowledge of mitigation activities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	Personal Preparedness Education/Awareness programs
Action or Project Description:	County EMD and local emergency response agencies will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations.
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 - $3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	1 – 5 years - Ongoing
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 in progress
Report of Progress	Many emergency response agencies, the Health Dept. and the county EMD promote individual household preparedness & provide Ready in 3 brochures. SEMA distributes press releases periodically on personal preparedness. A more focused and coordinated effort would help to achieve comprehensive coverage in the county.

Action 1.2.1: Budget for and obtain early warning systems and improved communications systems.

Action Worksheet	
Name of Jurisdiction:	Phelps 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:	Need to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Phelps 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, County Commission
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, County Budget
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	An outdoor warning siren has been installed in Jerome – an unincorporated area of Phelps County. In addition, the county has a phone-based warning system – Everbridge – which can provide alerts to residents who sign up for it by text, cell phone, email and landline phone. This program could benefit from a more focused campaign to encourage residents to sign up for Everbridge.

Action 1.3.1: Continue to implement tree trimming and dead tree removal programs by utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with power outages from trees interfering with power lines and/or blocking roads
Hazard(s) Addressed:	Tornadoes, severe winter weather, severe thunderstorm/high winds/lightning/hail
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Tree trimming and dead tree removal.
Action or Project Description:	Continue to implement tree trimming and dead tree removal.
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, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission
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
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Phelps County has an aggressive tree trimming program in place along county-maintained roadways and contracts for the service.

Action 1.3.2: Continue to examine road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and inadequate road/bridge structures and impacts on residents and their property.
Hazard(s) Addressed:	Flood, Earthquake
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Improve drainage and reduce flooding through road and bridge improvements.
Action or Project Description:	Continue to examine road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$12,500
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 Commission, 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, LEOP, floodplain ordinance, road and bridge budget, county road and bridge specifications
Progress Report	
Action Status	Continuing - in progress
Report of Progress	Phelps County has completed the following projects in the past five years to reduce impacts from flooding: CR 3040 low water crossing – the county is moving forward with plans to replace the culverts to reduce flooding; flood prone bridge on CR 3330 was closed to traffic; and flood prone bridge on CR7530 was closed to traffic. Whenever possible, the county sizes up culverts when replacing them. The county also has specifications for roads and bridges if subdivisions are constructed and the developer wants the county to take over maintenance. The county maintains a list of high priority projects that will be completed as funding becomes available.

Action 1.3.3: Establish designated shelters for residents to be used during tornado threats, as cooling centers during extreme heat or power outages and/or as shelters during other disasters.

Action Worksheet	
Name of Jurisdiction:	Phelps 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:	26 –High Priority
Timeline for Completion:	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, LEOPs
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Shelters have been established in each community but as needs change it may be necessary to adjust the list of shelters or increase the number of facilities that can be used for sheltering.

Action 1.3.4: Facilities that house vulnerable populations such as disabled and elderly should review alternative locations for sheltering residents and MOUs with "sister" facilities.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for large groups such as hospitals, nursing homes and group homes.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Establish alternative shelters for facilities that house disabled and elderly populations such as hospitals, nursing homes and group homes.
Action or Project Description:	Continue to work to increase communications between facilities that house vulnerable populations and with local EMDs and agencies responsible for sheltering.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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, county health department
Action/Project Priority:	21 –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,
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Phelps Health, the county hospital, has MOUs in place with other hospitals. However, good data on what private nursing and group homes have for emergency plans and MOUs does not currently exist. This action item would benefit from a focused effort to gather that data and assist these private institutions with establishing alternative sheltering plans.

Action 1.3.5: Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for individual families and large groups.
Hazard(s) Addressed:	Tornados, severe storms
Action or Project	
Action/Project Number:	1.3.5
Name of Action or Project:	Increase the availability of storm shelters
Action or Project Description:	Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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:	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:	Hazard Mitigation Plan, LEOP,
Progress Report	
Action Status	Continuing – in progress
Report of Progress	A FEMA certified tornado shelter has been constructed at the Phelps County R-III schools. Tacony Manufacturing in St. James has a certified tornado shelter designated for all occupants of the St. James Industrial Park.

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

Action 2.1.3: Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.3
Name of Action or Project:	Acquisition and installation of microgrids and backup generators for critical infrastructure.
Action or Project Description:	Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$25,500 – $100,000
Benefits:	Losses avoided by implementing this action include loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission
Action/Project Priority:	21 –High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, County Budget, Hazard Mitigation Plan, Critical Facility Budgets
Progress Report	
Action Status	Revised – in progress
Report of Progress	The Phelps County Courthouse and Sheriff's Department building have generators in place. The Phelps Health county hospital also has generators in place.

Action 2.2.1: Educate residents, realtors and contractors on the dangers of floodplain development and the benefits of the NFIP.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities of property located 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, realtors and contractors 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:	$5,000-$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/coordinator, 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 ordinance, LEOP, economic development plan, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Information, brochures, etc. on floodplain development and the NFIP are available through the floodplain coordinator and periodically supplied to the courthouse for distribution. Phelps County also has floodplain information available on-line. A series of three press releases on floodplain management are distributed to area news media annually. This a program that requires on-going activity as people move in and out of the county/cities. The county is currently going through the RiskMap process. As new floodplain maps are finalized, the county will be contacting all the people affected by the floodplain map changes.

Action 2.2.2: Encourage development of storm water management plans in those jurisdictions that do not currently have them and in all new residential and commercial development.

Action Worksheet	
Name of Jurisdiction:	Phelps 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:	2.2.2
Name of Action or Project:	Encourage local governments to require contractor storm water management plans in all new development – both residential and commercial properties.
Action or Project Description:	Encourage the development of stormwater management plans for all new development through the adoption of ordinances or other local government regulations and encourage the county to review and strengthen any subdivision ordinances to incorporate mitigation measures for stormwater management.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$5,000-$25,000
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, local planners
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:	Hazard Mitigation Plan, builder's plans, transportation plans
Progress Report	
Action Status	Continuing - Not Started
Report of Progress	There has been no progress in this area in Phelps County.

Action 2.2.3: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Phelps 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:	2.2.3
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/Coordinator, Phelps 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 management ordinances, builder's plans, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	The county is a member of the NFIP and works to ensure compliance with the county floodplain management ordinance. Education/awareness materials are widely distributed to make the public aware of what is required. Damage assessment inspections are conducted following flood events and homeowners notified of the requirements. The program could benefit from additional inspections of floodplain areas and additional more focused education efforts with builders, insurers, banks and residents.

Action 2.2.4: Continue to look at ways to reduce vulnerabilities in the Beaver Creek area and along the Gasconade River – including elevations and buyouts.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding in flood prone areas such as Beaver Creek and Gasconade River
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.2.4
Name of Action or Project:	Floodplain management compliance enforcement
Action or Project Description:	Continue to look at ways to reduce vulnerabilities in the Beaver Creek and Gasconade River areas including elevations and buyouts of flood prone properties.
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:	County EMD, Floodplain Manager, County Commission
Action/Project Priority:	16 – Medium Priority
Timeline for Completion:	On-going
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:	LEOP, Hazard Mitigation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Phelps County has purchased four properties in the Jerome area on the Gasconade River and is still attempting to purchase an additional property if funding is available. Floodplain coordinator staff mail out letters and distribute press releases outlining floodplain ordinance requirements on an annual basis. Following flood events, floodplain management staff conduct damage assessments and provide brochures and information on floodplain ordinance requirements and potential grant programs that can help homeowners reach compliance. This is an on-going endeavor and could benefit from additional inspections of floodplain areas and additional education/awareness activities for builders and residents.

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:	Phelps 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:	26 - H
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 Phelps 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:	Phelps 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 and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	$3,500 - $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:	LEOP, Hazard Mitigation 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 Phelps 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 3.4.3: Encourage the development of a county-wide CERT and/or VOAD program and educate the public on how they can benefit from these types of programs.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of information on and need for CERT and/or COAD/VOAD programs to help communities prepare for and plan for disasters.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.4.3
Name of Action or Project:	Promote the development of CERT, COAD and VOAD
Action or Project Description:	Encourage the development of a county-wide CERT and/or VOAD program and educate the public on how they can benefit from these types of programs.
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 - $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
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	CERT trainings have been held in Phelps County at least once a year for the past five years. Phelps Health, the county hospital, has a CERT team in place.

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:	Phelps 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:	$500 - $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 Commission, County EMD
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, County Budget
Progress Report	
Action Status	Continuing – in progress
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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues. When the Hwy 63 bridge over Beaver Creek was replaced, planning discussions included MoDOT, Phelps County, Missouri Dept. of Conservation, Missouri Department of Natural Resources and the Corps of Engineers.

Action 4.1.3: Pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Phelps 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:	$1,000 - $4,000
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, Floodplain Manager/Coordinator
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 Ordinance, 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 county currently works with landowners to cost-share the installation of culverts. The city of Rolla, Phelps County, MoDOT, Federal Highway Administration all worked together to develop the incident by-pass route for I-44 and were able to secure a CDBG grant to fund the project. Rolla did the engineering, MoDOT made accommodations and FHA gave up right-of-way to get the project completed.

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

Action 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. The Phelps County Road & Bridge Dept. has incorporated mitigation activities into their regular maintenance program. Mitigation actions are part of the county LEOP. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
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 ordinance, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – progress
Report of Progress	Phelps County is currently working on a floodplain buyout of properties in the Jerome and Sporthaven areas on the Gasconade River. Four properties have been purchased with potential to purchase one more. The entire project has been funded through state and federal grants.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.2: Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Roads and bridges in need of upgrades.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	6.1.2
Name of Action or Project:	Structuring grant proposals to meet mitigation needs.
Action or Project Description:	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$3,500 -$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Engineer, County Commission, Local Planners, Local Grant Writers
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, County Budget, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Phelps County's policy is to try to incorporate upgrades into all road and bridge projects to reduce vulnerabilities. This is an activity that would benefit from raising awareness of mitigation concerns and remedies. As more local officials become aware of the importance of mitigation and realize that grant applications can provide opportunities for funding those actions, this activity will become more integrated into local planning.

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:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with state/local/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$2,500 - $9.500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission, 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, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects.
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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, County Commission
Action/Project Priority:	23 - H
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, CEDs, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Encourage cities and counties to develop and implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

Action Worksheet	
Name of Jurisdiction:	Phelps County
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Encourage local mitigation cost-share programs.
Action or Project Description:	Encourage cities and counties to develop and implement 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:	$5,000 - $500,000
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, County Engineers, MPC
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	5 – 10 years to implement and then 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	In some situations the county will install a culvert if the individual property owner pays for the culvert in order to insure that installation is done correctly and the culvert is sized appropriately. This is a program that could benefit from more organized guidelines and focused efforts if additional funding could be secured.

Doolittle

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

Action 1.1.1: Maintain a hazard mitigation public awareness program to include: benefits of hazard mitigation planning and projects; personal emergency preparedness; participation in emergency notification systems where available; information on individual hazard mitigation projects such as tying down hazardous materials tanks; how to shut off utilities; precautions to take during threatening weather events; etc.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Residents are not always prepared to manage on their own for 72 hours following an event. This action item will improve individual household preparedness and increase knowledge of mitigation activities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	Personal Preparedness Education/Awareness programs
Action or Project Description:	City EMD and local emergency response agencies will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations.
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 - $3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	1 – 5 years - Ongoing
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)
Progress Report	
Action Status	Continuing in progress
Report of Progress	Many emergency response agencies promote individual household preparedness & provide Ready in 3 brochures. SEMA distributes press releases periodically on personal preparedness. A more focused and coordinated effort would help to achieve comprehensive coverage in the city.

Action 1.2.1: Budget for and obtain early warning systems and improved communications systems.

Action Worksheet	
Name of Jurisdiction:	Doolittle
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:	Need to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Doolittle.
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
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, LEOP, City Budget
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Doolittle has one outdoor warning siren. The county has a phone-based warning system – Everbridge – which can provide alerts to residents who sign up for it by text, cell phone, email and landline phone and is available to all residents of the county. This program could benefit from a more focused campaign to encourage residents to sign up for Everbridge.

Action 1.3.1: Continue to implement tree trimming and dead tree removal programs by utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with power outages from trees interfering with power lines and/or blocking roads
Hazard(s) Addressed:	Tornadoes, severe winter weather, severe thunderstorm/high winds/lightning/hail
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Tree trimming and dead tree removal.
Action or Project Description:	Continue to implement tree trimming and dead tree removal.
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, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Public Works, Mayor, Board of Aldermen
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
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Doolittle does not have a city operated tree trimming program. The electric coop that provides power for the community does tree trimming as needed for power lines.

Action 1.3.3: Establish designated shelters for residents to be used during tornado threats, as cooling centers during extreme heat or power outages and/or as shelters during other disasters.

Action Worksheet	
Name of Jurisdiction:	Doolittle
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:	26 –High Priority
Timeline for Completion:	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, LEOP
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

Action 1.3.4: Facilities that house vulnerable populations such as disabled and elderly should review alternative locations for sheltering residents and MOUs with "sister" facilities.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for large groups such as hospitals, nursing homes and group homes.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Establish alternative shelters for facilities that house disabled and elderly populations such as hospitals, nursing homes and group homes.
Action or Project Description:	Continue to work to increase communications between facilities that house vulnerable populations and with local EMDs and agencies responsible for sheltering.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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, county health department
Action/Project Priority:	21 –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
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Data on what private nursing and group homes have for emergency plans and MOUs does not currently exist. This action item would benefit from a focused effort to gather that data and assist these private institutions with establishing alternative sheltering plans.

Action 1.3.5: Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for individual families and large groups.
Hazard(s) Addressed:	Tornados, severe storms
Action or Project	
Action/Project Number:	1.3.5
Name of Action or Project:	Increase the availability of storm shelters
Action or Project Description:	Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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:	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:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

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

Action 2.1.3: Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.3
Name of Action or Project:	Acquisition and installation of microgrids and backup generators for critical infrastructure.
Action or Project Description:	Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$25,500 – $80,000
Benefits:	Losses avoided by implementing this action include 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
Action/Project Priority:	21 –High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, City Budget, Hazard Mitigation Plan, Critical Facility Budgets
Progress Report	
Action Status	Revised – in progress
Report of Progress	The city of Doolittle has one portable generator. The Doolittle Fire Department has two portable generators and a fixed generator at the fire house.

Action 2.2.1: Educate residents, realtors and contractors on the dangers of floodplain development and the benefits of the NFIP.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities of property located 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, realtors and contractors 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:	$5,000-$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, 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 ordinance, LEOP, CEDS, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing - no progress
Report of Progress	

Action 2.2.2: Encourage development of storm water management plans in those jurisdictions that do not currently have them and in all new residential and commercial development.

Action Worksheet	
Name of Jurisdiction:	Doolittle
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 local governments to require contractor storm water management plans in all new development – both residential and commercial properties.
Action or Project Description:	Encourage the development of stormwater management plans for all new development through the adoption of ordinances or other local government regulations and encourage the county to review and strengthen any subdivision ordinances to incorporate mitigation measures for stormwater management.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$5,000-$25,000
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, local planners
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:	Hazard Mitigation Plan, regional transportation plan
Progress Report	
Action Status	Revised – in progress
Report of Progress	The city of Doolittle has storm water ordinances in place but could benefit from reviewing and strengthening those ordinances.

Action 2.2.3: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Doolittle
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:	2.2.3
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, 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 management ordinances, builder's plans, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	The city is a member of the NFIP and works to insure compliance with the city floodplain management ordinance. The ordinance requires a permit for any development in the floodplain. The program would benefit from more focused education efforts with builders, insurers, banks and residents.

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:	Doolittle
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:	City EMD, Mayor, Board of Aldermen, SEMA Area Coordinator
Action/Project Priority:	26 - H
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 Phelps 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:	Doolittle
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 and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	$3,500 - $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, 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 Phelps 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.

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:	Doolittle
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:	$500 - $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:	Mayor, Board of Aldermen, City EMD
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, County Budget
Progress Report	
Action Status	Continuing – in progress
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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Doolittle
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:	$1,000 - $4,000
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, 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 Ordinance, LEOP, City Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. Doolittle 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 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the LEOP. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, 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 ordinance, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Doolittle has not had any requests from property owners for a buyout.

Action 5.2.2: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Floodplain Manager/ Coordinator
Action/Project Priority:	16 - 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, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Doolittle does not currently have zoning or land use ordinances.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.2: Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Roads and bridges in need of upgrades.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	6.1.2
Name of Action or Project:	Structuring grant proposals to meet mitigation needs.
Action or Project Description:	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$3,500 -$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City Engineer, Mayor, Board of Aldermen, Local Planners, Local Grant Writers
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, City Budget, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing no progress
Report of Progress	The city has not had any grant projects for roads and bridges in the past five years. This is an activity that would benefit from raising awareness of mitigation concerns and remedies. As more local officials become aware of the importance of mitigation and realize that grant applications can provide opportunities for funding those actions, this activity will become more integrated into local planning.

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:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with state/local/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$2,500 - $9.500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, 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, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS) and regional transportation plan. As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects.
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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, Mayor, Board of Aldermen
Action/Project Priority:	23 - H
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, CEDs, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Encourage cities and counties to develop and implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

Action Worksheet	
Name of Jurisdiction:	Doolittle
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Encourage local mitigation cost-share programs.
Action or Project Description:	Encourage cities and counties to develop and implement 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:	$5,000 - $500,000
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, Local Planners, City Engineer, MPC
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	5 – 10 years to implement and then 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 no progress
Report of Progress	The city does not currently have any cost-share programs in place.

Edgar Springs

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

Action 1.1.1: Maintain a hazard mitigation public awareness program to include: benefits of hazard mitigation planning and projects; personal emergency preparedness; participation in emergency notification systems where available; information on individual hazard mitigation projects such as tying down hazardous materials tanks; how to shut off utilities; precautions to take during threatening weather events; etc.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Residents are not always prepared to manage on their own for 72 hours following an event. This action item will improve individual household preparedness and increase knowledge of mitigation activities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	Personal Preparedness Education/Awareness programs
Action or Project Description:	City EMD and local emergency response agencies will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations.
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 - $3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	1 – 5 years - Ongoing
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)
Progress Report	
Action Status	Continuing in progress
Report of Progress	Many emergency response agencies promote individual household preparedness & provide Ready in 3 brochures. SEMA distributes press releases periodically on personal preparedness. A more focused and coordinated effort would help to achieve comprehensive coverage in the city.

Action 1.2.1: Budget for and obtain early warning systems and improved communications systems.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
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:	Need to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Edgar Springs.
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
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, LEOP, City Budget
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Edgar Springs has one outdoor warning siren. The county has a phone-based warning system – Everbridge – which can provide alerts to residents who sign up for it by text, cell phone, email and landline phone and is available to all residents of the county. This program could benefit from a more focused campaign to encourage residents to sign up for Everbridge.

Action 1.3.1: Continue to implement tree trimming and dead tree removal programs by utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with power outages from trees interfering with power lines and/or blocking roads
Hazard(s) Addressed:	Tornadoes, severe winter weather, severe thunderstorm/high winds/lightning/hail
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Tree trimming and dead tree removal.
Action or Project Description:	Continue to implement tree trimming and dead tree removal.
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, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Public Works, Mayor, Board of Aldermen
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
Progress Report	
Action Status	Continuing in progress
Report of Progress	Edgar Springs does not have a city operated tree trimming program. The electric coop that provides power for the community does tree trimming as needed for power lines.

Action 1.3.3: Establish designated shelters for residents to be used during tornado threats, as cooling centers during extreme heat or power outages and/or as shelters during other disasters.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
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:	26 –High Priority
Timeline for Completion:	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, LEOP
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

Action 1.3.4: Facilities that house vulnerable populations such as disabled and elderly should review alternative locations for sheltering residents and MOUs with "sister" facilities.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for large groups such as hospitals, nursing homes and group homes.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Establish alternative shelters for facilities that house disabled and elderly populations such as hospitals, nursing homes and group homes.
Action or Project Description:	Continue to work to increase communications between facilities that house vulnerable populations and with local EMDs and agencies responsible for sheltering.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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, county health department
Action/Project Priority:	21 –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
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Data on what private nursing and group homes have for emergency plans and MOUs does not currently exist. This action item would benefit from a focused effort to gather that data and assist these private institutions with establishing alternative sheltering plans.

Action 1.3.5: Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for individual families and large groups.
Hazard(s) Addressed:	Tornados, severe storms
Action or Project	
Action/Project Number:	1.3.5
Name of Action or Project:	Increase the availability of storm shelters
Action or Project Description:	Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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:	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:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

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

Action 2.1.3: Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.3
Name of Action or Project:	Acquisition and installation of microgrids and backup generators for critical infrastructure.
Action or Project Description:	Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$25,500 – $80,000
Benefits:	Losses avoided by implementing this action include 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
Action/Project Priority:	21 –High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, City Budget, Hazard Mitigation Plan, Critical Facility Budgets
Progress Report	
Action Status	Revised – in progress
Report of Progress	The city of Edgar Springs has one fixed generator at the sewer plant.

Action 2.2.1: Educate residents, realtors and contractors on the dangers of floodplain development and the benefits of the NFIP.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities of property located 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, realtors and contractors 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:	$5,000-$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, 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 ordinance, LEOP, CEDS, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing - no progress
Report of Progress	

Action 2.2.2: Encourage development of storm water management plans in those jurisdictions that do not currently have them and in all new residential and commercial development.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
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 local governments to require contractor storm water management plans in all new development – both residential and commercial properties.
Action or Project Description:	Encourage the development of stormwater management plans for all new development through the adoption of ordinances or other local government regulations and encourage the county to review and strengthen any subdivision ordinances to incorporate mitigation measures for stormwater management.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$5,000-$25,000
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, local planners
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:	Hazard Mitigation Plan, regional transportation plan
Progress Report	
Action Status	Revised – no progress
Report of Progress	

Action 2.2.3: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
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:	2.2.3
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, 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 management ordinances, builder's plans, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	The city is a member of the NFIP and works to insure compliance with the city floodplain management ordinance. The ordinance requires a permit for any development in the floodplain. The program would benefit from more focused education efforts with builders, insurers, banks and residents.

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:	Edgar Springs
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:	City EMD, Mayor, Board of Aldermen, SEMA Area Coordinator
Action/Project Priority:	26 - H
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 Phelps 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:	Edgar Springs
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 and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	$3,500 - $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, 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. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

Action 4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
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:	$500 - $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:	Mayor, Board of Aldermen, City EMD
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, County Budget
Progress Report	
Action Status	Continuing – in progress
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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
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:	$1,000 - $4,000
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, 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 Ordinance, LEOP, City Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. Edgar Springs 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 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the LEOP. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, 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 ordinance, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Edgar Springs has not had any requests from property owners for a buyout.

Action 5.2.2: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Floodplain Manager/ Coordinator
Action/Project Priority:	16 - 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, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Edgar Springs does not currently have zoning or land use ordinances.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.2: Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Roads and bridges in need of upgrades.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	6.1.2
Name of Action or Project:	Structuring grant proposals to meet mitigation needs.
Action or Project Description:	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$3,500 -$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City Engineer, Mayor, Board of Aldermen, Local Planners, Local Grant Writers
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, City Budget, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing no progress
Report of Progress	The city has not had any grant projects for roads and bridges in the past five years. This is an activity that would benefit from raising awareness of mitigation concerns and remedies. As more local officials become aware of the importance of mitigation and realize that grant applications can provide opportunities for funding those actions, this activity will become more integrated into local planning.

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:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with state/local/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$2,500 - $9.500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, 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, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS) and regional transportation plan. As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects.
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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, Mayor, Board of Aldermen
Action/Project Priority:	23 - H
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, CEDs, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Encourage cities and counties to develop and implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

Action Worksheet	
Name of Jurisdiction:	Edgar Springs
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Encourage local mitigation cost-share programs.
Action or Project Description:	Encourage cities and counties to develop and implement 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:	$5,000 - $500,000
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, Local Planners, City Engineer, MPC
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	5 – 10 years to implement and then 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 no progress
Report of Progress	The city does not currently have any cost-share programs in place.

Newburg

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

Action 1.1.1: Maintain a hazard mitigation public awareness program to include: benefits of hazard mitigation planning and projects; personal emergency preparedness; participation in emergency notification systems where available; information on individual hazard mitigation projects such as tying down hazardous materials tanks; how to shut off utilities; precautions to take during threatening weather events; etc.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Residents are not always prepared to manage on their own for 72 hours following an event. This action item will improve individual household preparedness and increase knowledge of mitigation activities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	Personal Preparedness Education/Awareness programs
Action or Project Description:	City EMD and local emergency response agencies will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations.
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 - $3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	1 – 5 years - Ongoing
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)
Progress Report	
Action Status	Continuing in progress
Report of Progress	Many emergency response agencies promote individual household preparedness & provide Ready in 3 brochures. SEMA distributes press releases periodically on personal preparedness. A more focused and coordinated effort would help to achieve comprehensive coverage in the county.

Action 1.2.1: Budget for and obtain early warning systems and improved communications systems.

Action Worksheet	
Name of Jurisdiction:	Newburg
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:	Need to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Newburg.
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
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, LEOP, City Budget
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Newburg has two outdoor warning sirens. The county has a phone-based warning system – Everbridge – which can provide alerts to residents who sign up for it by text, cell phone, email and landline phone and is available to all residents of the county. This program could benefit from a more focused campaign to encourage residents to sign up for Everbridge.

Action 1.3.1: Continue to implement tree trimming and dead tree removal programs by utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with power outages from trees interfering with power lines and/or blocking roads
Hazard(s) Addressed:	Tornadoes, severe winter weather, severe thunderstorm/high winds/lightning/hail
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Tree trimming and dead tree removal.
Action or Project Description:	Continue to implement tree trimming and dead tree removal.
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, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Public Works, Mayor, Board of Aldermen
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
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Newburg does not have a city operated tree trimming program. The electric coop that provides power for the community does tree trimming as needed for power lines.

Action 1.3.3: Establish designated shelters for residents to be used during tornado threats, as cooling centers during extreme heat or power outages and/or as shelters during other disasters.

Action Worksheet	
Name of Jurisdiction:	Newburg
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:	26 –High Priority
Timeline for Completion:	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, LEOP
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

Action 1.3.4: Facilities that house vulnerable populations such as disabled and elderly should review alternative locations for sheltering residents and MOUs with "sister" facilities.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for large groups such as hospitals, nursing homes and group homes.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Establish alternative shelters for facilities that house disabled and elderly populations such as hospitals, nursing homes and group homes.
Action or Project Description:	Continue to work to increase communications between facilities that house vulnerable populations and with local EMDs and agencies responsible for sheltering.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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, county health department
Action/Project Priority:	21 –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
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Data on what private nursing and group homes have for emergency plans and MOUs does not currently exist. This action item would benefit from a focused effort to gather that data and assist these private institutions with establishing alternative sheltering plans.

Action 1.3.5: Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for individual families and large groups.
Hazard(s) Addressed:	Tornados, severe storms
Action or Project	
Action/Project Number:	1.3.5
Name of Action or Project:	Increase the availability of storm shelters
Action or Project Description:	Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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:	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:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

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

Action 2.1.3: Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.3
Name of Action or Project:	Acquisition and installation of microgrids and backup generators for critical infrastructure.
Action or Project Description:	Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$25,500 – $80,000
Benefits:	Losses avoided by implementing this action include 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
Action/Project Priority:	21 –High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, City Budget, Hazard Mitigation Plan, Critical Facility Budgets
Progress Report	
Action Status	Revised – no progress
Report of Progress	

Action 2.2.1: Educate residents, realtors and contractors on the dangers of floodplain development and the benefits of the NFIP.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities of property located 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, realtors and contractors 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:	$5,000-$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, 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 ordinance, LEOP, CEDS, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing - no progress
Report of Progress	

Action 2.2.2: Encourage development of storm water management plans in those jurisdictions that do not currently have them and in all new residential and commercial development.

Action Worksheet	
Name of Jurisdiction:	Newburg
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 local governments to require contractor storm water management plans in all new development – both residential and commercial properties.
Action or Project Description:	Encourage the development of stormwater management plans for all new development through the adoption of ordinances or other local government regulations and encourage the county to review and strengthen any subdivision ordinances to incorporate mitigation measures for stormwater management.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$5,000-$25,000
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, local planners
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:	Hazard Mitigation Plan, regional transportation plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

Action 2.2.3: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Newburg
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:	2.2.3
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, 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 management ordinances, builder's plans, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	The city is a member of the NFIP and works to insure compliance with the city floodplain management ordinance. The ordinance requires a permit for any development in the floodplain. The program would benefit from more focused education efforts with builders, insurers, banks and residents.

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:	Newburg
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:	City EMD, Mayor, Board of Aldermen, SEMA Area Coordinator
Action/Project Priority:	26 - H
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 Phelps 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:	Newburg
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 and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	$3,500 - $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, 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. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

Action 4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.

Action Worksheet	
Name of Jurisdiction:	Newburg
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:	$500 - $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:	Mayor, Board of Aldermen, City EMD
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, County Budget
Progress Report	
Action Status	Continuing – in progress
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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Newburg
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:	$1,000 - $4,000
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, 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 Ordinance, LEOP, City Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. Newburg indicated 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 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the LEOP. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, 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 ordinance, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Newburg has not had any requests from property owners for a buyout.

Action 5.2.2: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, Board of Aldermen, Floodplain Manager/ Coordinator
Action/Project Priority:	16 - 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, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Newburg does not currently have zoning or land use ordinances.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.2: Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Roads and bridges in need of upgrades.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	6.1.2
Name of Action or Project:	Structuring grant proposals to meet mitigation needs.
Action or Project Description:	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$3,500 -$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City Engineer, Mayor, Board of Aldermen, Local Planners, Local Grant Writers
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, City Budget, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing no progress
Report of Progress	The city has not had any grant projects for roads and bridges in the past five years. This is an activity that would benefit from raising awareness of mitigation concerns and remedies. As more local officials become aware of the importance of mitigation and realize that grant applications can provide opportunities for funding those actions, this activity will become more integrated into local planning.

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:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with state/local/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$2,500 - $9.500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, 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, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS) and regional transportation plan. As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects.
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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, Mayor, Board of Aldermen
Action/Project Priority:	23 - H
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, CEDs, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Encourage cities and counties to develop and implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

Action Worksheet	
Name of Jurisdiction:	Newburg
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Encourage local mitigation cost-share programs.
Action or Project Description:	Encourage cities and counties to develop and implement 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:	$5,000 - $500,000
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, Local Planners, City Engineer, MPC
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	5 – 10 years to implement and then 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 no progress
Report of Progress	The city does not currently have any cost-share programs in place.

Rolla

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

Action 1.1.1: Maintain a hazard mitigation public awareness program to include: benefits of hazard mitigation planning and projects; personal emergency preparedness; participation in emergency notification systems where available; information on individual hazard mitigation projects such as tying down hazardous materials tanks; how to shut off utilities; precautions to take during threatening weather events; etc.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Residents are not always prepared to manage on their own for 72 hours following an event. This action item will improve individual household preparedness and increase knowledge of mitigation activities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	Personal Preparedness Education/Awareness programs
Action or Project Description:	City EMD and local emergency response agencies will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations.
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 - $3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	1 – 5 years - Ongoing
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)
Progress Report	
Action Status	Continuing in progress
Report of Progress	Many emergency response agencies promote individual household preparedness & provide Ready in 3 brochures. SEMA distributes press releases periodically on personal preparedness. A more focused and coordinated effort would help to achieve comprehensive coverage in the county.

Action 1.2.1: Budget for and obtain early warning systems and improved communications systems.

Action Worksheet	
Name of Jurisdiction:	Rolla
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:	Need to budget for enhanced warning and communications systems to improve early warning capabilities for residents in Rolla.
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, City Council
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, LEOP, City Budget
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	Rolla has ten outdoor warning sirens. The county has a phone-based warning system – Everbridge – which can provide alerts to residents who sign up for it by text, cell phone, email and landline phone and is available to all residents of the county. Missouri University of Science and Technology used RAVE – a phone/text/email system. This program could benefit from a more focused campaign to encourage residents to sign up for Everbridge.

Action 1.3.1: Continue to implement tree trimming and dead tree removal programs by utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with power outages from trees interfering with power lines and/or blocking roads
Hazard(s) Addressed:	Tornadoes, severe winter weather, severe thunderstorm/high winds/lightning/hail
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Tree trimming and dead tree removal.
Action or Project Description:	Continue to implement tree trimming and dead tree removal.
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, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Public Works, Mayor, City Council, Rolla Municipal Utilities.
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
Progress Report	
Action Status	Continuing– ongoing
Report of Progress	Rolla has an aggressive tree trimming and dead tree removal program in place.

Action 1.3.3: Establish designated shelters for residents to be used during tornado threats, as cooling centers during extreme heat or power outages and/or as shelters during other disasters.

Action Worksheet	
Name of Jurisdiction:	Rolla
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:	26 –High Priority
Timeline for Completion:	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, LEOP
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The city EMD does have some shelters designated – mostly in local churches - but they are not FEMA certified for tornados.

Action 1.3.4: Facilities that house vulnerable populations such as disabled and elderly should review alternative locations for sheltering residents and MOUs with "sister" facilities.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for large groups such as hospitals, nursing homes and group homes.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Establish alternative shelters for facilities that house disabled and elderly populations such as hospitals, nursing homes and group homes.
Action or Project Description:	Continue to work to increase communications between facilities that house vulnerable populations and with local EMDs and agencies responsible for sheltering.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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, county health department
Action/Project Priority:	21 –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
Progress Report	
Action Status	Continuing – no progress
Report of Progress	Data on what private nursing and group homes have for emergency plans and MOUs does not currently exist. The city does have a list of facilities with vulnerable populations. This action item would benefit from a focused effort to gather that data and assist these private institutions with establishing alternative sheltering plans.

Action 1.3.5: Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for individual families and large groups.
Hazard(s) Addressed:	Tornados, severe storms
Action or Project	
Action/Project Number:	1.3.5
Name of Action or Project:	Increase the availability of storm shelters
Action or Project Description:	Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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:	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:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

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

Action 2.1.3: Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.3
Name of Action or Project:	Acquisition and installation of microgrids and backup generators for critical infrastructure.
Action or Project Description:	Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$25,500 – $80,000
Benefits:	Losses avoided by implementing this action include loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, City Council, Public Works
Action/Project Priority:	21 –High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, City Budget, Hazard Mitigation Plan, Critical Facility Budgets
Progress Report	
Action Status	Revised – in progress
Report of Progress	Phelps Health Hospital has three fixed generators. Rolla city hall, Rolla Municipal Utilities, and Rolla Municipal Utilities Service Center all have generator backup. There are 17 additional fixed generators for critical infrastructure through out the city. The Centre, Fire Station 1 & 2, Rolla Police Department, and Cedar Street Baptist Church (shelter) all have generators.

Action 2.2.1: Educate residents, realtors and contractors on the dangers of floodplain development and the benefits of the NFIP.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities of property located 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, realtors and contractors 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:	$5,000-$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, Mayor, City Council
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 ordinance, LEOP, CEDS, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing - in progress
Report of Progress	The city has a robust education program on floodplain management, with information posted on the city website and information available through City Hall and the city floodplain manager.

Action 2.2.2: Encourage development of storm water management plans in those jurisdictions that do not currently have them and in all new residential and commercial development.

Action Worksheet	
Name of Jurisdiction:	Rolla
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 local governments to require contractor storm water management plans in all new development – both residential and commercial properties.
Action or Project Description:	Encourage the development of stormwater management plans for all new development through the adoption of ordinances or other local government regulations and encourage the county to review and strengthen any subdivision ordinances to incorporate mitigation measures for stormwater management.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$5,000-$25,000
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, City Council, local planners
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:	Hazard Mitigation Plan, regional transportation plan, stormwater plan, stormwater ordinance.
Progress Report	
Action Status	Continuing – on-going
Report of Progress	Rolla has stormwater and drainage ordinances in place. There is also a stormwater management plan that is over 10 years old. The city just had an Integrated Management Plan (IMP) approved by both MDNR and EPA that also addresses stormwater.

Action 2.2.3: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Rolla
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:	2.2.3
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, Mayor, City Council
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 management ordinances, builder's plans, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	The city is a member of the NFIP and works to ensure compliance with the city floodplain management ordinance. The ordinance requires a permit for any development in the floodplain. The program might benefit from more focused education efforts with builders, insurers, banks and residents.

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:	Rolla
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:	City EMD, Mayor, City Council, SEMA Area Coordinator
Action/Project Priority:	26 - H
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 Phelps 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:	Rolla
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 and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	$3,500 - $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, 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. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

Action 4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.

Action Worksheet	
Name of Jurisdiction:	Rolla
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:	$500 - $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:	Mayor, City Council, City EMD
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, County Budget
Progress Report	
Action Status	Continuing – in progress
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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Rolla
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:	$1,000 - $4,000
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, City Council, 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 Ordinance, LEOP, City Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	In the last five years, Rolla worked with Phelps County, MoDOT, Federal Highway Administration on the North Outer Road Incident By-Pass Route for I-44, which was funded through a CDBG grant. Rolla did the engineering for the project; MoDOT made accommodations; and the FHA gave up right-of-way to get the project completed.

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

Action 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the LEOP. Rolla reports that hazard mitigation has been incorporated into the Comprehensive Plan, Capital Improvement Plan, Rolla Regional Economic Commission Economic Development Plan, and Integrated Management Plan. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, City Council, 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 ordinance, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing
Report of Progress	Rolla has not done a buyout in the last five years but would certainly consider doing so if the need arises. The community has done a significant amount of work on stormwater management to reduce flooding in the community.

Action 5.2.2: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, City Council, Floodplain Manager/ Coordinator
Action/Project Priority:	16 - 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, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	To date, Rolla has not rezoned any floodplain properties into open space.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.2: Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Roads and bridges in need of upgrades.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	6.1.2
Name of Action or Project:	Structuring grant proposals to meet mitigation needs.
Action or Project Description:	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$3,500 -$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City Engineer, Mayor, City Council, Local Planners, Local Grant Writers
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, City Budget, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The city has extensively integrated hazard mitigation into its plans and planning processes. Road and bridge projects are reviewed and designed to mitigate any on-going hazard problems. As more local officials become aware of the importance of mitigation and realize that grant applications can provide opportunities for funding those actions, this activity will become more integrated into local planning.

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:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with state/local/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$2,500 - $9.500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, City Council, 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, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS) and regional transportation plan. Two major developments – Ridgeview extension of Highway 72 and the West Side Development have been completed in the last five years. In both cases, stormwater accommodations to mitigate to reduce run-off occurred before construction began. Both projects conformed to State and Federal regulations. As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects.
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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, Mayor, City Council
Action/Project Priority:	23 - H
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, CEDs, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Rolla has incorporated hazard mitigation goals into its capital improvement plan and includes mitigation projects in its annual budget.As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Encourage cities and counties to develop and implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

Action Worksheet	
Name of Jurisdiction:	Rolla
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Encourage local mitigation cost-share programs.
Action or Project Description:	Encourage cities and counties to develop and implement 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:	$5,000 - $500,000
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, City Council, Local Planners, City Engineer, MPC
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	5 – 10 years to implement and then on-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	The city works with developers to cost-share some projects that deal with stormwater run-off. In some cases the city will participate in installation of culverts to ensure the project is completed properly and to city standards.

St. James

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

Action 1.1.1: Maintain a hazard mitigation public awareness program to include: benefits of hazard mitigation planning and projects; personal emergency preparedness; participation in emergency notification systems where available; information on individual hazard mitigation projects such as tying down hazardous materials tanks; how to shut off utilities; precautions to take during threatening weather events; etc.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Residents are not always prepared to manage on their own for 72 hours following an event. This action item will improve individual household preparedness and increase knowledge of mitigation activities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	Personal Preparedness Education/Awareness programs
Action or Project Description:	City EMD and local emergency response agencies will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations.
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 - $3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD
Action/Project Priority:	27 – High Priority
Timeline for Completion:	1 – 5 years - Ongoing
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)
Progress Report	
Action Status	Continuing in progress
Report of Progress	Many emergency response agencies promote individual household preparedness & provide Ready in 3 brochures. SEMA distributes press releases periodically on personal preparedness. A more focused and coordinated effort would help to achieve comprehensive coverage in the county.

Action 1.2.1: Budget for and obtain early warning systems and improved communications systems.

Action Worksheet	
Name of Jurisdiction:	St. James
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:	Need to budget for enhanced warning and communications systems to improve early warning capabilities for residents in St. James.
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, City Council
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, LEOP, City Budget
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	St. James has three outdoor warning sirens. The county has a phone-based warning system – Everbridge – which can provide alerts to residents who sign up for it by text, cell phone, email and landline phone and is available to all residents of the county. This program could benefit from a more focused campaign to encourage residents to sign up for Everbridge.

Action 1.3.1: Continue to implement tree trimming and dead tree removal programs by utility companies and local government.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with power outages from trees interfering with power lines and/or blocking roads
Hazard(s) Addressed:	Tornadoes, severe winter weather, severe thunderstorm/high winds/lightning/hail
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Tree trimming and dead tree removal.
Action or Project Description:	Continue to implement tree trimming and dead tree removal.
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, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Public Works, Mayor, City Council
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
Progress Report	
Action Status	Continuing– ongoing
Report of Progress	St. James contracts with a private company that does tree trimming around overhead lines and removes trees that are considered a hazard.

Action 1.3.3: Establish designated shelters for residents to be used during tornado threats, as cooling centers during extreme heat or power outages and/or as shelters during other disasters.

Action Worksheet	
Name of Jurisdiction:	St. James
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:	26 –High Priority
Timeline for Completion:	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, LEOP
Progress Report	
Action Status	Continuing –in progress
Report of Progress	St. James reported that it had no designated shelters or certified tornado safe rooms. However, in the past several churches have served as temporary shelters for the community. There is a FEMA certified tornado shelter located in the Tacony Manufacturing building in the city's industrial park. This action would benefit from the development of MOUs between the city and these entities to formalize sheltering options.

Action 1.3.4: Facilities that house vulnerable populations such as disabled and elderly should review alternative locations for sheltering residents and MOUs with "sister" facilities.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for large groups such as hospitals, nursing homes and group homes.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.3.4
Name of Action or Project:	Establish alternative shelters for facilities that house disabled and elderly populations such as hospitals, nursing homes and group homes.
Action or Project Description:	Continue to work to increase communications between facilities that house vulnerable populations and with local EMDs and agencies responsible for sheltering.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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, county health department
Action/Project Priority:	21 –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
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The city participated in a pilot project in the last five years to identify vulnerable populations in the community and get them signed up with Everbridge. Data on what private nursing and group homes have for emergency plans and MOUs does not currently exist. This action item would benefit from a focused effort to gather that data and assist these private institutions with establishing alternative sheltering plans.

Action 1.3.5: Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with nonexistent/unavailable shelters for individual families and large groups.
Hazard(s) Addressed:	Tornados, severe storms
Action or Project	
Action/Project Number:	1.3.5
Name of Action or Project:	Increase the availability of storm shelters
Action or Project Description:	Increase availability (if necessary, construction) of storm shelters for individual families and large groups, including near large employment centers and schools.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,000
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:	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:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	Continuing – in progress
Report of Progress	There is a certified tornado saferoom located in the St. James industrial park in the Tacony Manufacturing building. Tacony has informed businesses in the industrial park that their employees can shelter there during a tornado warning. However, there is no MOU or agreement with the city for Tacony to open the shelter for the general public. The building is adjacent to a large residential area. This action would benefit from a focused effort to formalize an agreement for sheltering between the city and Tacony.

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

Action 2.1.3: Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.3
Name of Action or Project:	Acquisition and installation of microgrids and backup generators for critical infrastructure.
Action or Project Description:	Encourage the installation of small renewable energy microgrids (solar, wind) and backup generators for critical infrastructure such as water/sewer systems and emergency services.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$25,500 – $80,000
Benefits:	Losses avoided by implementing this action include loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, City Council, Public Works
Action/Project Priority:	21 –High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, City Budget, Hazard Mitigation Plan, Critical Facility Budgets
Progress Report	
Action Status	Revised – in progress
Report of Progress	St. James has three portable generators and one fixed generator.

Action 2.2.1: Educate residents, realtors and contractors on the dangers of floodplain development and the benefits of the NFIP.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities of property located 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, realtors and contractors 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:	$5,000-$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, Mayor, City Council
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 ordinance, LEOP, CEDS, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – on going
Report of Progress	The city has floodplain brochures available at city hall.

Action 2.2.2: Encourage development of storm water management plans in those jurisdictions that do not currently have them and in all new residential and commercial development.

Action Worksheet	
Name of Jurisdiction:	St. James
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 local governments to require contractor storm water management plans in all new development – both residential and commercial properties.
Action or Project Description:	Encourage the development of stormwater management plans for all new development through the adoption of ordinances or other local government regulations and encourage the county to review and strengthen any subdivision ordinances to incorporate mitigation measures for stormwater management.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$5,000-$25,000
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, City Council, local planners
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:	Hazard Mitigation Plan, regional transportation plan
Progress Report	
Action Status	Continuing – in progress
Report of Progress	St. James has storm water and drainage ordinances in place but could benefit from reviewing and strengthening those ordinances.

Action 2.2.3: Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	St. James
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:	2.2.3
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, Mayor, City Council
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 management ordinances, builder's plans, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	The city is a member of the NFIP and works to insure compliance with the city floodplain management ordinance. The ordinance requires a permit for any development in the floodplain. The program could benefit from more focused education efforts with builders, insurers, banks and residents.

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:	St. James
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:	City EMD, Mayor, City Council, SEMA Area Coordinator
Action/Project Priority:	26 - H
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 Phelps 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:	St. James
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 and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
Applicable Goal Statement:	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
Estimated Cost:	$3,500 - $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, 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. Mitigation actions are part of the LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

Action 4.1.1: Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.

Action Worksheet	
Name of Jurisdiction:	St. James
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:	$500 - $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:	Mayor, City Council, City EMD
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP, County Budget
Progress Report	
Action Status	Continuing – in progress
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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together to discuss mitigation issues.

Action 4.1.3: Pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	St. James
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:	$1,000 - $4,000
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, City Council, 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 Ordinance, LEOP, City Budget
Progress Report	
Action Status	Continuing – on-going
Report of Progress	This is an on-going activity. St. James 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 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the LEOP. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Action 5.2.1: Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, City Council, 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 ordinance, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – in progress
Report of Progress	St. James has not had any requests from property owners for a buyout. The city does not issue building permits for structures located in the floodplain.

Action 5.2.2: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.2.1
Name of Action or Project:	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:	$3,500 - $500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City EMD, Mayor, City Council, Floodplain Manager/ Coordinator
Action/Project Priority:	16 - 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, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.2: Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Roads and bridges in need of upgrades.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	6.1.2
Name of Action or Project:	Structuring grant proposals to meet mitigation needs.
Action or Project Description:	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$3,500 -$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City Engineer, Mayor, City Council, Local Planners, Local Grant Writers
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, City Budget, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing - no progress
Report of Progress	The city has not had any grant projects for roads and bridges in the past five years. This is an activity that would benefit from raising awareness of mitigation concerns and remedies. As more local officials become aware of the importance of mitigation and realize that grant applications can provide opportunities for funding those actions, this activity will become more integrated into local planning.

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:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with state/local/federal agencies to integrate mitigation into economic and community development projects.
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$2,500 - $9.500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor and City Council, 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, CEDS, Transportation Plan
Progress Report	
Action Status	Continuing in progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS) and regional transportation plan. As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects.
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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, Mayor, City Council
Action/Project Priority:	23 - H
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, CEDs, LEOP
Progress Report	
Action Status	Continuing in Progress
Report of Progress	The city is working to improve the city's water infrastructure – installing connecting lines between wells to make the system more resilient. The city is also replacing aging electric infrastructure and has implemented a policy of installing underground secondary electric for new construction. As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

Action 6.2.1: Encourage cities and counties to develop and implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

Action Worksheet	
Name of Jurisdiction:	St. James
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigation projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.2.1
Name of Action or Project:	Encourage local mitigation cost-share programs.
Action or Project Description:	Encourage cities and counties to develop and implement 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:	$5,000 - $500,000
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, City Council, Local Planners, City Engineer, MPC
Action/Project Priority:	14 – Medium Priority
Timeline for Completion:	5 – 10 years to implement and then on-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing -in progress
Report of Progress	The city will install a culvert purchased by a resident to ensure proper installation.

St. James R-I

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

Action 1.1.8: Construct certified tornado safe rooms in every school that does not have one.

Action Worksheet	
Name of Jurisdiction:	St. James R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with insufficient storm shelters and tornado safe rooms in schools that do not have them.
Hazard(s) Addressed:	Tornado, Severe Weather
Action or Project	
Action/Project Number:	1.1.8
Name of Action or Project:	Expansion of storm shelter availability and construction of certified tornado safe rooms.
Action or Project Description:	Construct certified tornado safe rooms to improve the safety for students and staff.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	20 –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, School Emergency Plan, School Budget
Progress Report	
Action Status	Continuing – updated - no progress
Report of Progress	

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 3.1.4: Educate staff and parents on school safety protocols.

Action Worksheet	
Name of Jurisdiction:	St. James R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with staff and parents not having adequate knowledge of school safety protocols.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.1.4
Name of Action or Project:	Educate staff and parents on school safety protocols.
Action or Project Description:	Actively engage staff and parents in relation to school safety protocols during natural hazard event.
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:	$500 - $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:	Superintendent, School Board, Local Planners, 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:	LEOP, Hazard Mitigation Plan, School Budget, School Emergency Plan
Progress Report	
Action Status	Continuing – On-going
Report of Progress	School districts currently do education with staff and parents on school emergency procedures, but all agreed that they wanted this action item to remain in the plan for the purpose of improving those efforts.

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:	St. James R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into other community plans and emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Review hazard mitigation plan, merge with other community planning and coordinate and integrate activities with emergency plans and procedures.
Action or Project Description:	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.
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:	$3,500 - $4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	21 – 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, School Emergency Plan,
Progress Report	
Action Status	Continuing – on-going
Report of Progress	The district continues to work to incorporate hazard mitigation actions into school plans and procedures. Some work has been done with the update of the school emergency plan.

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:	St. James 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, LEOP, School Emergency Plan, 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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together – including school districts - to discuss mitigation issues.

Action 4.1.3: Whenever possible, pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	St. James 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 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	St. James R-I
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The school is working to incorporate hazard mitigation into more of the schools plans and planning processes. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	St. James R-I
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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 Board, Superintendent, MPC
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, District Budget
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and are working toward budgeting for mitigation activities.

Newburg R-II

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

Action 1.1.8: Construct certified tornado safe rooms in every school that does not have one.

Action Worksheet	
Name of Jurisdiction:	Newburg R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with insufficient storm shelters and tornado safe rooms in schools that do not have them.
Hazard(s) Addressed:	Tornado, Severe Weather
Action or Project	
Action/Project Number:	1.1.8
Name of Action or Project:	Expansion of storm shelter availability and construction of certified tornado safe rooms.
Action or Project Description:	Construct certified tornado safe rooms to improve the safety for students and staff.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	20 –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, School Emergency Plan, School Budget
Progress Report	
Action Status	Continuing – updated - no progress
Report of Progress	

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 3.1.4: Educate staff and parents on school safety protocols.

Action Worksheet	
Name of Jurisdiction:	Newburg R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with staff and parents not having adequate knowledge of school safety protocols.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.1.4
Name of Action or Project:	Educate staff and parents on school safety protocols.
Action or Project Description:	Actively engage staff and parents in relation to school safety protocols during natural hazard event.
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:	$500 - $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:	Superintendent, School Board, Local Planners, 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:	LEOP, Hazard Mitigation Plan, School Budget, School Emergency Plan
Progress Report	
Action Status	Continuing – On-going
Report of Progress	School districts currently do education with staff and parents on school emergency procedures, but all agreed that they wanted this action item to remain in the plan for the purpose of improving those efforts.

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:	Newburg R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into other community plans and emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Review hazard mitigation plan, merge with other community planning and coordinate and integrate activities with emergency plans and procedures.
Action or Project Description:	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.
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:	$3,500 - $4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	21 – 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, School Emergency Plan,
Progress Report	
Action Status	Continuing – on-going
Report of Progress	The district continues to work to incorporate hazard mitigation actions into school plans and procedures. Some work has been done with the update of the school emergency plan.

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:	Newburg 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, LEOP, School Emergency Plan, 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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together – including school districts - to discuss mitigation issues.

Action 4.1.3: Whenever possible, pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Newburg 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, 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 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	Newburg R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The school district is working to incorporate hazard mitigation into more of the schools plans and planning processes. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Newburg R-II
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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 Board, Superintendent, MPC
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, District Budget
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and are working toward budgeting for mitigation activities.

Phelps County R-III

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

Action 1.2.2: Purchase weather radios for those schools that do not have them to insure advanced warning about threatening weather.

Action Worksheet	
Name of Jurisdiction:	Phelps County R-III
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the school not having access to National Weather Service warnings during weather events.
Hazard(s) Addressed:	Flooding, Severe Winter Weather, Tornado, High Winds, Thunderstorms
Action or Project	
Action/Project Number:	1.2.2
Name of Action or Project:	Purchase weather radios for all schools.
Action or Project Description:	Purchase weather radios for all schools.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$50 - $100
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:	Superintendent
Action/Project Priority:	26 – High Priority
Timeline for Completion:	2022
Potential Fund Sources:	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, School Budget, School Emergency Plan
Progress Report	
Action Status	Continuing
Report of Progress	Phelps R-III has had weather radios in the past but does not currently have an operating radio. All other school districts in the region reported having functioning weather radios.

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 3.1.4: Educate staff and parents on school safety protocols.

Action Worksheet	
Name of Jurisdiction:	Phelps County R-III
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with staff and parents not having adequate knowledge of school safety protocols.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.1.4
Name of Action or Project:	Educate staff and parents on school safety protocols.
Action or Project Description:	Actively engage staff and parents in relation to school safety protocols during natural hazard event.
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:	$500 - $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:	Superintendent, School Board, Local Planners, 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:	LEOP, Hazard Mitigation Plan, School Budget, School Emergency Plan
Progress Report	
Action Status	Continuing – On-going
Report of Progress	School districts currently do education with staff and parents on school emergency procedures, but all agreed that they wanted this action item to remain in the plan for the purpose of improving those efforts.

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:	Phelps County R-III
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into other community plans and emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Review hazard mitigation plan, merge with other community planning and coordinate and integrate activities with emergency plans and procedures.
Action or Project Description:	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.
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:	$3,500 - $4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	21 – 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, School Emergency Plan,
Progress Report	
Action Status	Continuing – on-going
Report of Progress	The district continues to work to incorporate hazard mitigation actions into school plans and procedures. Some work has been done with the update of the school emergency plan.

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:	Phelps County R-III
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, LEOP, School Emergency Plan, 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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together – including school districts - to discuss mitigation issues.

Action 4.1.3: Whenever possible, pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Phelps County R-III
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 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	Phelps County R-III
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The school is working to incorporate hazard mitigation into more of the schools plans and planning processes. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Phelps County R-III
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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 Board, Superintendent, MPC
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, District Budget
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and are working toward budgeting for mitigation activities.

Rolla 31

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

Action 1.1.8: Construct certified tornado safe rooms in every school that does not have one.

Action Worksheet	
Name of Jurisdiction:	Rolla 31
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with insufficient storm shelters and tornado safe rooms in schools that do not have them.
Hazard(s) Addressed:	Tornado, Severe Weather
Action or Project	
Action/Project Number:	1.1.8
Name of Action or Project:	Expansion of storm shelter availability and construction of certified tornado safe rooms.
Action or Project Description:	Construct certified tornado safe rooms to improve the safety for students and staff.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	20 –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, School Emergency Plan, School Budget
Progress Report	
Action Status	Continuing – updated - no progress
Report of Progress	

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 3.1.4: Educate staff and parents on school safety protocols.

Action Worksheet	
Name of Jurisdiction:	Rolla 31
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with staff and parents not having adequate knowledge of school safety protocols.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.1.4
Name of Action or Project:	Educate staff and parents on school safety protocols.
Action or Project Description:	Actively engage staff and parents in relation to school safety protocols during natural hazard event.
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:	$500 - $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:	Superintendent, School Board, Local Planners, 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:	LEOP, Hazard Mitigation Plan, School Budget, School Emergency Plan
Progress Report	
Action Status	Continuing – On-going
Report of Progress	School districts currently do education with staff and parents on school emergency procedures, but all agreed that they wanted this action item to remain in the plan for the purpose of improving those efforts.

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:	Rolla 31
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into other community plans and emergency operations plans and procedures.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	3.3.1
Name of Action or Project:	Review hazard mitigation plan, merge with other community planning and coordinate and integrate activities with emergency plans and procedures.
Action or Project Description:	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.
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:	$3,500 - $4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendent, School Board
Action/Project Priority:	21 – 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, School Emergency Plan,
Progress Report	
Action Status	Continuing – on-going
Report of Progress	The district continues to work to incorporate hazard mitigation actions into school plans and procedures. Some work has been done with the update of the school emergency plan.

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:	Rolla 31
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, LEOP, School Emergency Plan, 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 Phelps County. This program could benefit from a more coordinated, focused effort to bring different agencies together – including school districts - to discuss mitigation issues.

Action 4.1.3: Whenever possible, pool different agency resources to achieve widespread mitigation results.

Action Worksheet	
Name of Jurisdiction:	Rolla 31
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 5.1.1: Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	Rolla 31
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not incorporating hazard mitigation in the long-term planning and development of activities by each jurisdiction.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Incorporating hazard mitigation into all long-range planning and development activities
Action or Project Description:	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
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:	$2,500 - $25,000
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:	29 – 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, economic development plan, transportation plan, floodplain ordinance
Progress Report	
Action Status	Continuing – in progress
Report of Progress	The school is working to incorporate hazard mitigation into more of the schools plans and planning processes. As more officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

Goal 6: Secure resources for investment in hazard mitigation.

Action 6.1.4: Encourage local jurisdictions to budget for mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Rolla 31
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Encourage local jurisdictions to budget for mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $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 Board, Superintendent, MPC
Action/Project Priority:	23 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, District Budget
Progress Report	
Action Status	Continuing in progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and are working toward budgeting for mitigation activities.

5 PLAN MAINTENANCE PROCESS

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 Phelps 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 Phelps 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 Phelps 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 Phelps 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 Phelps 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;
- Phelps 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 Phelps County Emergency Management Director (EMD) will provide the updated Mitigation Strategy with current status of each mitigation action to the County (Boards of Supervisors or Commissions) as well as all Mayors, City Clerks, and School District Superintendents. The EMD will request that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms.

Table 5.1 below lists the planning mechanisms by jurisdiction into which the Hazard Mitigation Plan will be integrated.

Table 5.1 Planning Mechanisms Identified for Integration of Hazard Mitigation Plan

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
Unincorporated Phelps County	County Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Comprehensive Economic Development Strategy Construction/Road & Bridge Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	County Commission and road and bridge supervisors incorporating hazard mitigation projects into budgets and future road and bridge improvements. EMD will review LEOP again and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Doolittle	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 will work toward incorporating hazard mitigation projects into city budget where possible and future public works improvements. EMD will review LEOP again and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Edgar Springs	Emergency Operations Plan (part of county)	Hazard Mitigation action items were incorporated	Mayor, Aldermen and public works department

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
	County Mitigation Plan Regional Transportation Plan Comprehensive Economic Development Strategy Public Works Construction Budget	into the regional CEDS and Regional Transportation Plan by MRPC. City EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	will work toward incorporating hazard mitigation projects into city budget where possible and future public works improvements. EMD will review LEOP again and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Newburg	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 again and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Rolla	City Emergency Operations Plan County LEOP County Mitigation Plan Local Mitigation Plan Comprehensive Plan Economic Development Plan Transportation Plan Land-Use Plan Flood Mitigation Assistance (FMA) Plan Watershed Plan Zoning Ordinance Building Code Floodplain Ordinance Subdivision Ordinance	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, city council and public works department will work toward incorporating hazard mitigation projects into city budget where possible and future public works improvements. The comprehensive plan, FMA plan, storm water ordinance, drainage ordinance and capital improvement plan will also be reviewed and any applicable hazard mitigation activities added to those documents. EMD

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
	Nuisance Ordinance Storm Water Ordinance Drainage Ordinance Site Plan Review Requirements Historic Preservation Ordinance Landscaping Ordinance Capital Improvement Plan Regional Transportation Plan Comprehensive Economic Development Strategy Public Works Construction Budget		will review LEOP again and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
St. James	Emergency Operations Plan (part of county) County Mitigation Plan Regional Transportation Plan Comprehensive 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, city council 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.
St. James R-I	School Emergency Plan District Budget	School board and superintendent reviewed district emergency plan and district budget to see where hazard mitigation actions could be incorporated.	School board and superintendent will review School Emergency Plan and district budget to update applicable areas with revised action items list. Superintendent will work toward including the certified tornado safe room(s) into the district budget.
Newburg R-II	School Emergency Plan District Budget	School board and superintendent reviewed district emergency plan	School board and superintendent will review School Emergency Plan and

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
		and district budget to see where hazard mitigation actions could be incorporated.	district budget to update applicable areas with revised action items list. Superintendent will work toward including the certified tornado safe room(s) into the district budget.
Phelps County R-III	School Emergency Plan District Budget	School board and superintendent reviewed district emergency plan and district budget to see where hazard mitigation actions could be incorporated.	School board and superintendent will review School Emergency Plan and district budget to update applicable areas with revised action items list. Superintendent will work toward including the certified tornado safe room(s) into the district budget.
Rolla 31	School Emergency Plan District Budget	School board and superintendent reviewed district emergency plan and district budget to see where hazard mitigation actions could be incorporated.	School board and superintendent will review School Emergency Plan and district budget to update applicable areas with revised action items list. Superintendent will work toward including the certified tornado safe room(s) into the district budget.

Source: Jurisdiction surveys 2020

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

A: References

1. 2018 Missouri State Hazard Mitigation Plan, https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018pdf
2. Missouri Hazard Mitigation Viewer, http://bit.ly/MoHazardMitigationPlanViewer2018
3. U.S. Dept. of Commerce, United States Census Bureau, https://data.census.gov/cedsci/
4. USGS, National Geologic Map Database, https://ngmdb.usgs.gov/Prodesc/proddesc_10014.htm
5. USACE, National Levee Database, https://levees.sec.usace.army.mil/#/
6. FEMA, Disaster Information, https://www.fema.gov/disasters
7. Missouri Department of Elementary & Secondary Education, https://ogi.oa.mo.gov/DESE/schoolSearch/index.html
8. USDOT, Bridges & Structures, https://www.fhwa.dot.gov/bridge/nbi/no10/county.cfm
9. USFWS, Midwest Region Endangered Species, https://www.fws.gov/midwest/Endangered/lists/missouri-cty.html
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B: Planning Process

HMPC Mailing list

Pam Gross

Randy Verkamp
Presiding Commissioner
200 N. Main Street
Rolla, MO 65401

Gary Hicks
Associate Commissioner
200 N. Main Street
Rolla, MO 65401

Larry Stratman
Associate Commissioner
200 N. Main Street
Rolla, MO 65401

Rick Lisenbe
Sheriff
200 N. Main Street
Rolla, MO 65401

Corporal Mike Kirn
Phelps County EMD
200 N. Main Street
Rolla, MO 65401

Louis J. Magdits, IV
Rolla Mayor
P.O. Box 979
Rolla, MO 65401

John Butz
City Administrator
P.O. Box 979
Rolla,MO 65401

Steve Flowers
Community Development Director
P.O. Box 979
Rolla, MO 65401

Sean Fagan
Chief of Police
P.O. Box 979
Rolla, MO 65401

Ron Smith
FireChief
P.O. Box 979
Rolla, MO 65401

Steve Hargis
Public Works Director
P.O. Box 979
Rolla, MO 65401

Rodney Bourne
Rolla Municipal Utilities GM
P.O. Box 979
Rolla, MO 65401

Floyd Jernigan
Parks & Recreation Director
P.O. Box 979
Rolla, MO 65401

Brady Wilson
Director of Environ. Serv.
P.O. Box 979
Rolla, MO 65401

Brad Woods
Rolla EMD
P.O. Box 979
Rolla, MO 65401

Billy Martin
Doolittle Mayor
380 Eisenhower
Doolittle, MO 65401

Vincent Giancolone
Police Chief
380 Eisenhower
Doolittle, MO 65401

Superintendent
380 Eisenhower
Doolittle, MO 65401

David Simpson
Water/Sewer Superintendent
P.O. Drawer K
Newburg, MO 65550

John Maxwell

Electric Superintendent Bldg Inspector

P.O. Drawer K
Newburg, MO 65550

Street Superintendent
P.O. Drawer K
Newburg, MO 65550

Newburg EMD
P.O. Drawer K
Newburg, MO 65550

Rick Krawiecki
St. James Mayor
100 S. Jefferson
St. James, MO 65559

Ron Jones
Police Chief
100 S. Jefferson
St. James, MO 65559

William Keith Gallion
Edgar Springs Mayor
P.O. Box 13
Edgar Springs, MO 65462

Joe Hohner
Chief of Police
P.O. Box 13
Edgar Springs, MO 65462

Everett Perkins
Superintendent Water
P.O. Box 13
Edgar Springs, MO 65462

James Poucher
Newburg Mayor
P.O. Drawer K
Newburg, MO 65550

Phyllis Harris
Newburg City Clerk

Kris Finch
Police Chief
P.O. Drawer K
Newburg, MO 65550

John M. Douglas II
Fire Chief/EMD
149-199 Matlock Drive
St. James, MO 65559

Chuck Hitch
Electric Supervisor
100 S. Jefferson
St. James, MO 65559

Danny Scheel
Street Supervisor
100 S. Jefferson
St. James, MO 65559

Dr. ~~Lynn Reed~~ Randy Cotter, Supt.
Newburg R-II
P.O. Box C
Newburg, MO 65550

John Richards
Sho-Me Power Cooperative
P.O. Box D
Marshfield, MO 65706

Fidelity Communications
64 North Clark St.
Sullivan, MO 63080

Dr. Greg Edwards
Webster University
1103 Kingshighway
Rolla, MO 65401

Christina Ayres
East Central College
500 Forum Drive
Rolla, MO 65401

Administrator
Missouri Veterans Home
620 N. Jefferson St.
St. James, MO 65559

Chris Mueller
Centurytel
P.O. Box 158
St. James, MO 65559

Lyle Thomas
Public Works Director
100 S. Jefferson
St. James, MO 65559

John Cutsinger
Parks & Recreation Director
100 S. Jefferson
St. James, MO 65559

John Fluhrer, Supt.
Phelps County R-III
17790 State Route M
Edgar Springs, MO 65462

Charter Cable
12405 Powers Court Drive
St. Louis, MO 63131

Carmen Hartwell
Gascosage Electric Cooperative
P.O. Box G
Dixon, MO 65459

Kerstin Ellis
Drury University
1034 S. Bishop Ave
Rolla, MO 65401

Cory Elfrink
Columbia College
500 Blue's Lake Parkway
Rolla, MO 65401

Cedar Knoll Home
13635 State Rt. V
St. James, MO 65559

Dave Griffith
American Red
431 E. McCarty
Jefferson City, MO 65101

Administrator
1605 Martin Springs Drive
Rolla, Mo 65401

Merlyn Johnson
St. James R-1
122 East Scioto Street
St. James, MO 65559

Dr. Aaron Zalis, Supt.
Rolla 31
500A Forum Drive
Rolla, MO 65401

Verizon Wireless
2110 N. Bishop Ave.
Rolla, MO 65401

Tony Mallory
Crawford Electric Cooperative
P.O. Box 10
Bourbon, MO 65441

Mary Gapsch
Metro Business College
1202 East Highway 72
Rolla, MO 65401

Debbie Hallinar
PCRMC Medical Group, Inc.
1050 W. Tenth St.
Rolla, MO 65401

County Valley Home
15750 County Rd. 2430
St. James, MO 65559

Aaron Bradshaw
Intercounty Electric Cooperative
P.O. Box 209
Licking, MO 65542

Michelle Bresnahan
Missouri Science & Technology
108 Campus Support Facility
Rolla, MO 65409

Ferndale, Inc
15650 County Rd. 2430
St. James, MO 65559

Parkside Assisted Living
1700 E. l0th Street Rolla,
MO 65401

Rosewood Residential Care
10880 Hanley Dr.
Rolla, MO 65401

Captain Eddie Blaylock
Missouri State Highway Patrol
P.O. Box 128
Rolla, MO 65401

Carol Daniels
City Clerk
P.O. Box 979
Rolla, MO 65402

Forest Supervisors Office
Mark Twain National Forest
401 Fairgrounds Rd.
Rolla, MO 65401

Poe's Gas
P.O. Box 28
Rolla, MO 65401

Commanding Officer
MONG Amory
201 Fairgrounds Rd
Rolla, MO 65401

Pamela Grow
Phelps County Clerk
200 N. Main Street
Rolla, MO 65401

Heritage Park Skilled Care
1200 McDutchen Rd
Rolla, MO 65401

Presbyterian Manor
1200 Homelife Plaza
Rolla, MO 65401

St. James Nursing Center
P.O. Box 69
St. James, MO 65559

Jeff Faulkner
BNSF Railway
508 E. Main St
Cuba, MO 65453

James Baalman
Ferrellgas
602 E. 18th Street
Rolla, MO 65401

Missouri Department of Conservation
12655 State Rt.Y
Rolla, MO 65401

General Manager
Walmart Distribution Center
1100 Matlock Dr.
St. James, MO 65559

Della Bishop
City Clerk
380 Eisenhower
Doolittle, MO 65401

Sarah Wheeler
City Clerk
100 S. Jefferson
St. James, MO 65559

American Red Cross
431 E. McCarty
Jefferson City, MO 65101

Lea's Haven
803 E. 12th Street
Rolla, MO 65401

Rolla Manor Care
1800 White Columns Dr.
Rolla, MO 65401

Administrator
Boys & Girls Town of Missouri
P.O. Box 189
St. James, MO 65559

All Star Gas
12055 County Rd. 3110
Rolla, MO 65401

Bryan Lambeth
St. James Ambulance
P.O. Box 296
St. James, MO 65559

Preston Kramer
MoDOT
17855 Hwy B
St. James, MO 65559

MoGas Pipeline LLC
329 Joesephville Road
Wentzville, MO 63385

Rachel Lucas
City Administrator
P.O. Box 13
Edgar Springs

Phillis Harris
City Clerk
P.O. Drawer K
Newburg, MO 65550

NUSTAR Pipeline
7340 W. 21st N, Ste. 200
Wichita, KS 67205

MEMORANDUM

TO: Phelps County Hazard Mitigation Planning Committee
FROM: Tammy Snodgrass, MRPC Environmental Programs Manager/Assistant Director
DATE: January 16, 2020
SUBJECT: Hazard mitigation planning meeting January 30, 2020

The Meramec Regional Planning Commission (MRPC) has been contracted by Phelps County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Phelps County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Phelps County. We need your help to successfully complete this project.

The county must submit the first draft of an updated hazard mitigation plan to SEMA and FEMA by April 12, 2021 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 meeting of the Phelps County hazard mitigation planning committee is scheduled for Thursday, January 30 at 10:00 a.m. in the multi-purpose room 149 on the first floor of the Phelps County courthouse located at 200 North Main Street, Rolla, 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

As the county, each city and school district are required to participate in the planning process and will be asked to formally approve and adopt the Phelps County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from road and bridge, local planners, emergency management offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups.

Thank you for your assistance in addressing hazard mitigation for Phelps County. If you have any questions, contact me at (573) 265-2993, extension 104 or via e-mail: tsnodgrass@merameregion.org. I look forward to seeing you at the meeting.

TS

Phelps County
Multi-Jurisdictional Hazard Mitigation Plan Update
Planning Meeting

Thursday, January 30, 2020 ~ 10:00 a.m.
Multi-Purpose Room (149), Phelps County Courthouse

AGENDA

I. Welcome/Introductions – Tammy Snodgrass, Assistant Director, Meramec Regional Planning Commission

II. Hazard Mitigation Planning Purpose

III. Grant Programs Linked to Approved Plan

IV. Planning Tasks / Multi-jurisdictional Approach

V. Participation Requirements

VI. Public Involvement

VII. Data Collection Questionnaires

VIII. Discussion of Hazards

IX. Critical Facilities

X. Next Steps in the Planning Process

XI. Set Next Meeting Date(s)

NOTICE OF PUBLIC MEETING

Date and time of posting: **January 30, 2020 at 10:00 a.m.**
Notice is hereby given that the **Phelps County Hazard Mitigation Planning Committee** will meet at 10:00 a.m. on **Thursday, January 30, 2020** at the Phelps County Courthouse, multi-purpose room 149, located at 200 Main Street, Rolla, Mo. 65401

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Hazard Mitigation Planning Purpose
- Grant Programs Linked to Approved Plan
- Planning Tasks/Multi-Jurisdictional Approach
- Participation Requirements
- Public Involvement
- Data Collection Questionnaires
- Discussion of Hazards
- Critical Facilities
- Next Steps in the Planning Process
- Setting of Date and Time for Next Meeting
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Tamara Snodgrass
#4 Industrial Drive
St. James, MO 65559
(573) 265-2993
tsnodgrass@meramecregion.org

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.

Phelps County Hazard Mitigation Plan Review Meeting
January 30, 2020 ~ 10:00 a.m.

Name	Representing	Email Address	Phone #	Address
Wendy Squires	Phelps Health	WSquires@phelpshealth.org	573-458-7720	1000 West 10th St Rolla MO 65401
William Gallion	Edgar Springs City	edgarSpringsmo@ychoo.com	573435-6334	555 Broadway St PO Box 13 Edgar Springs Mo. 65534
Melissa Klott	Edgar Springs Rural Fire protection Dist.	Missi Klott@gmail.com	573-202-4457	150 Broadway St Edgar Springs Mo. 65462
Brad Woods	City of Rolla EMD	Bwoods@Rollacity.org	573-578-6340	1490 E. 10th Rolla, Mo 65401
Lyle D. Thomas	City of St James	lthomas@stjamesmo.org	573-265-7011	100 S. Jefferson St. James
STEVE Hawes	City of Rolla	shawes@rollacity.org	573-426-6973	901 N. Elm Rolla Mo 65401
Michelle Bresnahan	Missouri S&T	mem@mst.edu	573-341-4240	1201 N. State St. Rolla, Mo. 65401
EDDIE BLAYLOCK	MSHP-TROOP I	edwin.blaylock@mshp.dps.mo.gov	314-724-4275	1301 NAGOGAMI RD. WEST. ROLLA MO. 65401
STEVE DAVIS	MSHP-TROOP I	STEVE.DAVIS@MSHP.DPS.MO.GOV	573-368-2345	TROOP I H.Q. P.O. Box 128 ROLLA, MO. 65402

Name	Representing	Email Address	Phone #	Address
John Cutsinger	St. James Parks Dept	jcutsinger@stjamesmo.org	573-263-9140	100 S. Jefferson St James Mo 65559
Doug Roberts	S&T University Police	robertsdp@mst.edu	573-341-4345	1101 N. State St G-10 Rolla, MO 65409
Cari Rastine	Sho-Me Power	crastine@shomepower.com	417-859-2615	PO Box D Marshfield, MO 65706
Ron Jaes	St. James Police	rJones@stjpolice.us	573-263-5172	200 N. Bamford St. James MO 65559
Gary W. Hicks	Phelps County Commission	gary.hicks@phelpscounty.org	573-202-2928	200 North Main Rolla
Chad Davis	Rolla Municipal Utilities	cdavis@rollamunicipalutilities.org	573-364-2195	102 West 6th Rolla MO 65402
Ron Smith	City of Rolla Fire+Rescue	rsmith@rollacity.org	573-364-3989	1490 East 10th Rolla MO 65401
Mike Klein	Phelps Co EM	mike.klein@phelpscountysheriffs.org	573-201-3208	500 W. 2nd St Rolla MO

For immediate release
April 22, 2020

For more information, contact
Tammy Snodgrass at (573) 265-2993

Public input being accepted on Phelps County Hazard Mitigation Plan until May 15

PHELPS COUNTY—Public input is being accepted until May 15, 2020, on the Phelps County Hazard Mitigation Plan. The public survey is available on Meramec Regional Planning Commission's website at http://www.meramecregion.org/surveys/.

The federal government requires all states and local governments to have hazard mitigation plans approved by the Federal Emergency Management Administration (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.

One of the key components of a hazard mitigation plan is public input during the planning process. The planning committee, comprised of representatives from the Phelps County Commission, the incorporated cities, emergency response agencies, utility providers and public school districts, will be evaluating information on the hazards that impact each jurisdiction within Phelps County.

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. Gasconade County Presiding Commissioner Larry Miskel serves as chairman of the board. A professional staff of 34 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 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.

3/13/2020

Dear Phelps County Hazard Mitigation Planning Committee Members:

Here is my first stab at editing the action items that were shared out at the January 30th meeting. Please see how I marked up the document below. I was able to reduce the list down from 58 to 45, and if we add all the items marked in gray – that will reduce it by seven more to 38. I really want folks to look this over closely and make sure I'm not removing something that needs to stay in the plan. At the same time, I want you to look at the items and let me know if some that I've left in the plan have been accomplished or if progress has been made on them.

I have gone through the existing list and highlighted the ones I think can be removed in gray. These may be good activities, but (in my opinion) they do not rise to the level of being included in the plan; would not be an activity that hazard mitigation grant funds would be requested for; or are an on-going activity that is already imbedded in local policy and procedure.

Action items that are repetitive or can be combined are marked in aqua, with notes on what I did in red italic.

The action items that I believe the county has achieved, that can be taken off the list, I have highlighted in green.

Revisions to action items are marked in blue.

We will be going over this list in depth at the March 26th meeting. Please come prepared to discuss and share your thoughts.

Thank you for your assistance and time. I've attached an in-kind match form for you to use as well.

Tammy Snodgrass
Meramec Regional Planning Commission
(573) 265-2993
tsnodgrass@meramecregion.org

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
1.1.1	Maintain a hazard mitigation public awareness program to include: benefits of hazard mitigation planning and projects; personal emergency preparedness; participation in emergency notification systems where available; information on individual hazard mitigation projects such as tying down hazardous materials tanks; how to shut off utilities; precautions to take during threatening weather events; etc. *Combined 1.1.1, 1.1.3, 1.1.4, 1.2.2, 3.1.2, 3.2.1, 3.3.2, 6.2.2*	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.1.2	Promote development of emergency plans by businesses and public entities.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.1.5	Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.Are they already doing this?	3	3	3	3	3	3	3	21	IC, PD, LF EMCC	8	-1	7	28	H
1.1.6	Schools need to continue to conduct emergency preparedness exercises on a regular basis. Completed	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.1.7	Regularly review and update school emergency plans - Completed	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.1.8	Encourage the designation of storm shelters and the construction of tornado safe rooms in every school that does not have one.	3	3	3	3	3	1	3	19	IC, EMCC	4	-5	-1	18	H
1.2.1	Continue to encourage cities to budget for and obtain early warning systems and improved communications systems. *Combined with 5.1.2*	3	3	2	3	3	1	3	18	IC, PD, LF, EMCC	8	-3	5	23	H

1.2.3	Continue to partner with local radio stations to ensure that appropriate warning of impending disasters is provided to all residents of impending disasters. Complete part of policy and procedure.	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 disasters such as dam failure, tornados, sinkholes, land subsidence and wildfire upon Phelps County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning. *Combined with 2.3.3,*	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.3.1	Continue to encourage tree trimming and dead tree removal programs by utility companies and local government. County is working on bid specs for tree trimming and tree removal services. RMU has a tree trimming program in place for Rolla. Coops do trimming. Telecommunications/cable do not do any trimming. Rolla public works does dangerous tree issues. St. James contracts with a company to trim trees around power lines and trees that are considered a hazard.	3	3	3	3	3	2	2	19	IC, PD, LF, EMCC	8	-3	5	24	H
1.3.2	Continue to examine road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property. Ongoing – CR 7050 across Little Beaver Creek – to improve water flow and reduced flooding that was occurring due to previous dam like water crossing. Old bridge did not accommodate emergency vehicles – major improvement. 100 culverts improved per year. Improve flows of wet weather creeks, clean out ditches routinely to improve stormwater flow.	3	3	2	3	3	2	2	18	IC, PD, LF, EMCC	8	-1	7	25	H

Figure 4.4 Prioritization of Mitigation Actions

3 = Def YES **1 = Prob NO**

2 = Maybe YES **0 = Def NO**

Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority

1.3.3	Establish designated shelters for residents to be used during tornado threats, as cooling centers during extreme heat or power outages and/or as shelters during other disasters.	3	3	3	3	3	3	3	21	IC, LF, EMCC	6	-1	5	26	H
1.3.4	Facilities that house vulnerable populations such as disabled and elderly should review alternative locations for sheltering residents and MOUs with "sister" facilities.	3	2	2	3	3	2	3	18	IC, EMCC	4	-1	3	21	H
1.3.5	Continue to work to increase availability (if necessary construction) of certified storm shelters for individual families and large groups, including near large employment centers and schools. *Combined 5.2.3*	3	3	3	3	3	1	3	19	IC, EMCC	4	-5	-1	18	M
2.1.1	Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant. OK – remove.	3	2	2	3	3	1	3	17	IC, PD, LF, EMCC	8	-5	3	20	H
2.1.2	Continue to encourage businesses and public entities to develop and implement emergency plans. OK – remove.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-3	5	26	H
2.1.3	Encourage the installation of backup generators for critical infrastructure such as water systems and emergency services. Rolla Fire has generators for their facilities. City of Rolla at city hall, Courthouse/Sheriff, emergency shelter in Rolla has generator, MHP, Phelps Health Hospital, St. James Fire, St. James Ambulance, Rolla Police,	3	3	3	3	3	2	3	20	LF, EMCC	4	-3	1	21	H
2.2.1	Educate residents, realtors and contractors about the dangers of floodplain development and the benefits of the NFIP. MRPC does press releases every year and distributes a brochure. Rolla has a review of what is built in the floodplain. St. James has brochures available at city hall.	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
2.2.2	Encourage development of storm water management plans in those jurisdictions that do not currently have them and in all new residential and commercial development. *Combined 5.1.3 County requires subdivisions in unincorporated areas to have a stormwater accommodation plan. Rolla requires a stormwater plan from developers as well.*	3	2	2	2	3	2	3	18	IC, PD, LF, EMCC	8	-3	5	23	H
2.2.3	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.	2	3	3	2	3	2	3	18	IC, PD, LF, EMCC	8	-3	5	23	H

2.2.4	Continue to look at ways to reduce vulnerabilities in the Beaver Creek area and along the Gasconade River including elevations and buyouts. Made major accommodations with new culverts, new bridge to improve stormwater. See earlier **make this statement more general to apply to any area for buyouts elevations**.	2	2	2	2	3	2	3	15	IC, PD, EMCC	6	-5	1	16	M
2.3.1	Encourage minimum standards for building codes in all cities all jurisdictions where they currently don't exist?? Gary will get back to me on this one.	2	3	2	2	3	3	3	18	IC, PD, LF, EMCC	8	-1	7	26	H
2.3.2	Encourage local governments to develop and implement regulations for securing hazardous materials tanks and mobile homes to reduce hazards during storms and flooding. Is this and the one above even achievable? Make it a Medium priority? L, P, A? On both of these – send out to jurisdictions without the standards – do they want to include or drop?	2	2	2	2	3	3	3	17	IC, PD, LF, EMCC	8	-3	5	22	H

Figure 4.4 Prioritization of Hazard 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
3.1.1	Distribute SEMA brochures on natural disasters, preparedness and NFIP at public facilities and events. - Completed	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
3.1.3	Encourage and promote weather spotter classes throughout the county. – Completed still offered through SEMA.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
3.1.4	Educate staff and parents on school safety protocols.	3	3	3	3	3	3	3	21	IC, LF, EMCC	6	-1	5	26	H

3.2.2	Encourage meetings of EMD, city/county officials & SEMA to familiarize officials with mitigation planning, implementation & budgeting for mitigation projects. – Leave in – discuss what has been done.	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. *Combined with 4.2.2 – or has this been accomplished?* Has been done to some degree – continuing.	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H
3.4.3	Encourage the development of a county-wide CERT and/or VOAD program and educate the public on how they can benefit from these types of programs. MRPC does CERT training once per year. Phelps Health has one at the hospital	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. Leave in - Continuing – MoDOT, County, MDC, MDNR, Corps on the Beaver Creek bridge.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
4.1.2	Continue to encourage joint training (and drills) between agencies, public and private entities (including schools/businesses). Rolla Fire does regular drills working with multiple agencies, MS&T, state agencies – regularly – Achieved. Brett Hendrix also does them. PAM also does annual exercises. COMPLETED.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
4.1.3	Pool different agency resources to achieve widespread mitigation planning results. Ongoing. Airport – FAA, city of Rolla corporate agreement. North Outer Road – Incident by-pass route for I-44 – city, county, MoDot, Fed. HWY Admin. through a CDBG grant. City did engineering. MoDOT made accommodations, Fed. Hwy gave up right-of-way for the project.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
4.1.4	Maintain updated mutual aid agreements between emergency response agencies inside and outside the region.COMPLETED – Fire mutual aid. EMS mutual aid. Mutual aid agreement between Waynesville and St. James and Mo Public Utility Assoc for all utilities.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
4.2.1	Encourage meetings between EMD, city/county & SEMA to familiarize officials with mitigation planning & implementation and budgeting for mitigation projects.REPEAT	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H

5.1.1	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction. Progress – NFIP is most important in Phelps Co. MRPC planning activities.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	29	H
5.1.2	Encourage communities to budget for enhanced warning systems. Progres: County has Everbridge – available to everyone including cities. Storm sirens in Rolla, Jerome, Doolittle, Newburg, Edgar Springs, St. James.	3	2	2	3	3	2	3	18	IC, LF EMCC	6	-3	3	21	H
5.1.4	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures. – Completed is done to the extent that it can be done.	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
5.2.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area. *Progress made buyouts in Phelps County.*	1	2	2	1	2	1	3	12	PD, EMCC	4	-5	-1	11	L
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.	2	2	2	1	2	1	3	13	PD, EMCC	4	-1	3	16	M
6.1.1	Work with SEMA Region I coordinator to learn about new mitigation funding opportunities. OK to drop off.	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. Use Beaver Creek as an example. All road and bridge improvements are done with consideration for mitigation.	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. Progress – with CDBG in Rolla Ridgeview extension. West Side Development – stormwater accommodations to mitigate for less run off than occurred before construction. Had to conform to state and federal regulations.	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.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-5	3	23	H
6.2.1	Encourage cities and counties to implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole. Progress – St. James will install culverts purchased by homeowners. If it benefits the city they have done some tree removal.	2	1	1	1	2	2	2	11	IC, PD, LF, EMCC	8	-5	3	14	M
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property. – Accomplished in plan	3	3	2	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H

MEMORANDUM

TO: Phelps County Hazard Mitigation Planning Committee
FROM: Tammy Snodgrass, MRPC Environmental Programs Manager/Assistant Director
DATE: March 13, 2020
SUBJECT: Hazard mitigation planning meeting March 26, 2020

The next meeting of the Phelps County hazard mitigation planning committee is scheduled for Thursday, March 26, at 10:00 a.m. in the Sky Room of the Phelps County Courthouse located at 200 North Main Street, Rolla, Mo. The focus of this meeting will be to review pieces of the draft risk assessment for the county and review existing action items and determine what changes need to be made. A copy of a revised list of action items is attached for your review. 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. If you have data on damages from natural events that have occurred in the last five years, or information on hazard mitigation projects that have been accomplished in the past five years, please bring this and any other pertinent data with you to the meeting.

The Meramec Regional Planning Commission (MRPC) has been contracted by Phelps County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Phelps County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Phelps County. We need your help to successfully complete this project. If your jurisdiction has not completed and returned the data collection questionnaire, please do so at your earliest convenience.

The county must submit the first draft of an updated hazard mitigation plan to SEMA and FEMA by April 12, 2021 in order to continue to be eligible for some hazard mitigation grants, so it is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

As the county, each city and school district are required to participate in the planning process and will be asked to formally approve and adopt the Phelps County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from road and bridge, local planners, emergency management offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups.

Thank you for your assistance in addressing hazard mitigation for Phelps County. If you have any questions, contact me at (573) 265-2993, extension 104 or via e-mail: tsnodgrass@merameregion.org. I look forward to seeing you at the meeting.

TS

MEMORANDUM

TO: Phelps County Hazard Mitigation Planning Committee
FROM: Tammy Snodgrass, MRPC Environmental Programs Manager/Assistant Director
DATE: March 16, 2020
SUBJECT: Hazard mitigation planning meeting March 26, 2020 - **POSTPONED**

I am writing to let you know that the Phelps County hazard mitigation planning committee meeting scheduled for Thursday, March 26, at 10:00 a.m. is being postponed. In light of the pandemic national emergency and the call for social distancing, it seems prudent to postpone meetings for a few weeks to help reduce the spread of COVID-19. As we do not know how long this health crisis will last, I would ask that those stakeholders and jurisdiction who are interested in continuing to provide input on the plan **to please provide me with your email**. I have email for the people who attended the first planning meeting, as well as at least one email for each jurisdiction, but please do not assume that have your direct email. Send your email contact information to tsnodgrass@meramecregion.org . This will allow me to contact you directly in a much more timely fashion and allow me to email you documents for review.

At this time I need feedback on the action items – which are enclosed. The focus of this meeting was to review pieces of the draft risk assessment for the county and review existing action items and determine what changes need to be made. I still need that feedback. In addition, I need the group to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. Mitigation activities do not have to be limited to what is on the action item list. If you are aware of any activities that would qualify as mitigation, we should include that in the plan to show progress. 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. If you have data on damages from natural events that have occurred in the last five years, or information on hazard mitigation projects that have been accomplished in the past five years, please send this and any other pertinent data to me at your earliest convenience – certainly no later than March 27th.

Other critical issues: If your jurisdiction has not completed and returned the data collection questionnaire, please get that to me no later than March 27th. If you need help completing the questionnaire, give me a call. I'll be happy to walk through it with you.

As the county, each city and school district are required to participate in the planning process and will be asked to formally approve and adopt the Phelps County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from road and bridge, local planners, emergency management

offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups.

Thank you for your assistance in addressing hazard mitigation for Phelps County. If you have any questions, contact me at (573) 265-2993, extension 104 or via e-mail: tsnodgrass@merameregion.org. I look forward to seeing you at the meeting.

TS

Phelps County
Multi-Jurisdictional Hazard Mitigation Plan Update
Planning Meeting Via Zoom and Conference Call

Thursday, June 25, 2020 ~ 1:30 p.m.

Zoom: https://us02web.zoom.us/j/84031689172?pwd=eGl1NnYxT0xmLzhJODg2VloxMW00dz09

Call in: 1-(312) 626-6799 ~ Meeting ID: 840 3168 9172 ~ Password: 247537

AGENDA

I. Welcome/Introductions – Tammy Snodgrass, Assistant Director, Meramec Regional Planning Commission

II. Brief Review

III. Public Survey Update

IV. Participation Requirements/Status

V. Plan Update Format

VI. Sample Results of Countywide Risk Assessment Update

VII. Discuss Mitigation Action Updates – *(Which have been accomplished or had progress made; which are no longer high priority; which can be combined or eliminated)*

VIII. Next Steps

IX. Set Next Meeting Date(s)

NOTICE OF PUBLIC MEETING

Date and time of posting: **June 22, 2020 at 11:30 a.m.**
Notice is hereby given that the **Phelps County Hazard Mitigation Planning Committee** will meet at 1:30 p.m. on **Thursday, June 25, 2020** via Zoom and conference call. Instructions for joining the meeting:

Zoom:
https://us02web.zoom.us/j/84031689172?pwd=eGl1NnYxT0xmLzhJODg2VloxMW00dz09
Call in: 1-(312) 626-6799 ~ Meeting ID: 840 3168 9172 ~ Password: 247537

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Brief Review
- Public Survey Update
- Participation Requirements
- Plan Update Format
- Sample Results of Countywide Risk Assessment Update
- Discuss Mitigation Action Updates
- Next Steps
- Setting of Date and Time for Next Meeting
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Tamara Snodgrass
#4 Industrial Drive
St. James, MO 65559
(573) 265-2993
tsnodgrass@meramecregion.org

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.

Phelps County Hazard Mitigation Plan Review Meeting
June 25, 2020 ~ 1:30 p.m.

Name	Representing	Email Address	Phone #	Address
✓ Lyle Thomas	St. James			
Lt. Davis MO Hwy Patrol	MHP			
Gary Hicks	Phelps County			
Ron Smith	Rolla			
✓ Chad Davis	RMU			
✓ Wendy Squires	Phelps Health			
Tammy Snodgrass	MRPC			

For immediate release

July 9, 2020

For more information, contact
Tammy Snodgrass at (573) 265-2993

Public input being accepted on Phelps County Hazard Mitigation Plan until July 31

PHELPS COUNTY—Public input is being accepted until July 31, 2020, on the Phelps County Hazard Mitigation Plan. The public survey is available on Meramec Regional Planning Commission's website at http://www.meramecregion.org/surveys/.

The federal government requires all states and local governments to have hazard mitigation plans approved by the Federal Emergency Management Administration (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.

One of the key components of a hazard mitigation plan is public input during the planning process. The planning committee, comprised of representatives from the Phelps County Commission, the incorporated cities, emergency response agencies, utility providers and public school districts, will be evaluating information on the hazards that impact each jurisdiction within Phelps County.

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. Gasconade County Presiding Commissioner Larry Miskel serves as chairman of the board. A professional staff of 34 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 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.

Tammy Snodgrass

Subject:	Tammy's Phelps Hazmit Zoom Meeting
Location:	https://us02web.zoom.us/j/86136458108?pwd=QmUyKzhYSTdxTTVwOFpRL0VPajVrUT09
Start:	Tue 10/27/2020 1:00 PM
End:	Tue 10/27/2020 3:00 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	Tammy Snodgrass
Required Attendees:	Brad Woods; Brian Lambeth/St. James Ambulance; 'Butz, John'; Cari Rostine; Chad Davis; City of Newburg; Della Bishop (cityofdoolittle@yahoo.com); Doug Roberts; Dr. Aaron Zalis, Supt.; Dr. Randy Caffey; Eddie Blaylock; Edgar Springs Police; Gary Hicks ; James Poucher; Jim Fleming; John Fluhrer, Supt.; Josh Cahill; Larry Stratman; Louis Magdits; lthomas@stjamesmo.org; Melissa Klott; Merlyn Johnson, Supt.; Michelle Bresnahan; Mike Kirn; Pam.grow@phelpscounty.org; Randy Verkamp; Ron Jones; ron smith; Sarah Wheeler; Steve Davis; Steve Flowers; Supt. Lynne Reed (lynne.reed@salemr80.org); Wendy Squires - PCRMC (wsquires@phelpshealth.org); Kathryn Hawes; Tammy Snodgrass
zmMeetingNum:	86136458108

Tammy Snodgrass is inviting you to a scheduled Zoom meeting. PLEASE NOTE – TIME IS 1:00 P.M.

Join Zoom Meeting
https://us02web.zoom.us/j/86136458108?pwd=QmUyKzhYSTdxTTVwOFpRL0VPajVrUT09

Meeting ID: 861 3645 8108
Passcode: 899804
One tap mobile
+13126266799,,86136458108#,,,,,,0#,,899804# US (Chicago)
+19292056099,,86136458108#,,,,,,0#,,899804# US (New York)

Dial by your location
- +1 312 626 6799 US (Chicago)
- +1 929 205 6099 US (New York)
- +1 301 715 8592 US (Germantown)
- +1 346 248 7799 US (Houston)
- +1 669 900 6833 US (San Jose)
- +1 253 215 8782 US (Tacoma)

Meeting ID: 861 3645 8108
Passcode: 899804
Find your local number: https://us02web.zoom.us/u/kxHZVaKpM

Phelps County
Multi-Jurisdictional Hazard Mitigation Plan Update
Planning Meeting Via Zoom and Conference Call

Tuesday, October 27, 2020 ~ 1:00 p.m.

Zoom:
https://us02web.zoom.us/j/86136458108?pwd=QmUyKzhYSTdxTTVwOFpRL0VPajVrUT09
Call in: 1-(312) 626-6799 ~ Meeting ID: 861 3645 8108 ~ Password: 899804

AGENDA

I. Welcome/Introductions – Tammy Snodgrass, Assistant Director, Meramec Regional Planning Commission

II. Brief Review

III. Public Survey Update

IV. Participation Requirements/Status

V. Review and Discussion on Draft Chapters

VI. Plan Maintenance

VII. Adoption Process

VIII. Next Steps

IX. Adjourn

NOTICE OF PUBLIC MEETING

Date and time of posting: **October 21, 2020 at 11:30 a.m.**
Notice is hereby given that the **Phelps County Hazard Mitigation Planning Committee** will meet at 1:00 p.m. on **Tuesday, October 27, 2020** via Zoom and conference call. Instructions for joining the meeting:

Zoom:
https://us02web.zoom.us/j/86136458108?pwd=QmUyKzhYSTdxTTVwOFpRL0VPajVrUT09
Call in: 1-(312) 626-6799 ~ Meeting ID: 861 3645 8108 ~ Password: 899804

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Brief Review
- Public Survey Update
- Participation Requirements
- Review and Discussion on Draft Chapters
- Plan Maintenance
- Adoption Process
- Next Steps
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Tamara Snodgrass
#4 Industrial Drive
St. James, MO 65559
(573) 265-2993
tsnodgrass@meramecregion.org

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.

Phelps County Hazard Mitigation Plan Review Meeting
October 27, 2020 ~ 1:00 p.m.

Name	Representing	Email Address	Phone #	Address
Lyle Thomas	St James			
Gary Hicks	Phelps Co.			
Wendy Squires	Phelps Health			
Chief Ron Jones	St. James			
Josh Cahill	St. James R-I Schools			
Craig Hounsom	Rolla 31 Schools			
Michelle Bresnahan	MS+T			
Kathryn Hawes	MRPC			
Tammy Snodgrass	MRPC			

Name	Representing	Email Address	Phone #	Address
Merlyn Johnson	St. James R-I Schools			
Eddie Blaylock	MSHP			
Chad Davis	RMU			
Ron Smith	Rolla Fire & Rescue			
Doug Roberts	MS&T Police			

For immediate release
March 9, 2021

For more information, contact
Tammy Snodgrass at (573) 265-2993

Public comment being accepted on Phelps County Hazard Mitigation Plan until March 26

PHELPS COUNTY—Public comment is being accepted until March 26, 2021, on the Phelps County Hazard Mitigation Plan. The plan update is available for review on Meramec Regional Planning Commission's website, http://www.meramecregion.org/publications/. The 2021 plan update is located under the Hazard Mitigation Plans by County along with the county's approved 2016 plan. A hard copy of the plan is also available at the Phelps County Courthouse in the county clerk's office.

The purpose of the plan is to reduce or eliminate long-term risk to people and property from natural hazards. It is required that the county have this plan in place in order to be eligible for several Federal Emergency Management Agency grant programs.

Several entities participated in the planning process to update the plan, including Phelps County, the cities of Doolittle, Edgar Springs, Newburg, Rolla, and St. James, as well as St. James R-I, Newburg R-II, Phelps County R-III, and Rolla 31 School Districts, Sho-Me Power, Missouri S&T, Phelps Health, Edgar Springs Rural Fire Protection District, Missouri State Highway Patrol and SEMA.

The Meramec Regional Planning Commission (MRPC) facilitated focus group meetings and assisted these entities in developing the plan. Following a public comment period, a final draft will be created and sent to FEMA and SEMA for review and approval.

If you need assistance locating the plan or have questions, please contact Tammy Snodgrass at MRPC at 573-265-2993 or by email at tsnodgrass@meramecregion.org.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. Gasconade County Presiding Commissioner Larry Miskel serves as chairman of the board. A professional staff of 34 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/*.

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Mailing list for surrounding jurisdictions:

Mayor Debby Green
City of Gasconade
493 Oak St.
Gasconade, MO 65061-3005

Mayor Bruce Cox
City of Hermann
1902 Jefferson St.
Hermann, MO 65041

Mayor Melissa Strope
City of Morrison
632 Hwy. 100
Morrison, MO 65061-1005

Mayor John Kamler
City of Owensville
107 W. Sears
Owensville, MO 65066

Mayor Shannon Grus
City of Rosebud
P.O. Box 199
Rosebud, MO 63091

Dr. Chuck Garner, Supt.
Gasconade County R-II
P.O. Box 536
Owensville, MO 65066

Mayor Lee Medlock
City of Bland
P.O. Box 40
Bland, MO 65014

Pres. Commissioner Larry Miskel
Gasconade County Commission
119 E. First St.
Hermann, MO 65041

Dr. Kimberly Hawk, Supt.
Plato R-V
P.O. Box A
Plato, MO 65552

Dana Buschmann, Supt.
Raymondville R-VIII
P.O. Box 10
Raymondville, MO 65555

David Russell, Supt.
Success R-VI
10341 Highway 17
Success, MO 65570

Dr. Rick Stark, Supt.
Summersville R-II
P.O. Box 198
Summersville, MO 65571

Mayor Donnie Wells
City of Cabool
528 Spruce St
Cabool, MO 65689

Presiding Com. Scott Long
Texas County
210 North Grand Ave, Ste301
Houston, MO 65483

Mayor Willy Walker
City of Houston
601 S Grand Ave
Houston, MO 65483

Mayor Keith Cantrell
City of Licking
P.O. Box 89
Licking, MO 65542

Mayor Marilyn Howell
City of Summersville
195 Rogers Ave
Summersville, MO 65571

Dr. Scott Smith, Supt.
Gasconade County R-I
170 Blue Pride Drive
Hermann, MO 65041

Dr. Allen Moss, Supt.
Houston R-I
423 W Pine
Houston, MO 65483

Dr. Karl Janson, Supt.
Cabool R-IV
725 Main Street
Cabool, MO 65689

Christina Wright, Supt.
Licking R-VIII
125 College Ave
Licking, MO 65542

Dr. Kyle Gibbs, Supt.
Crawford Co R-1
1444 Old Hwy 66
Bourbon, MO 65441

Jon Earnhart, Supt.
Crawford Co R-II
1 Wildcat Pride Dr
Cuba, MO 65453

Mike Whittaker, Supt.
Steelville R-III
P.O. Box 339
Steelville, MO 65565

Mayor David Lafferty
City of Bourbon
P.O. Box 164
Bourbon, MO 65441

Mayor, Cody Leathers
City of Cuba
P.O. Box K
Cuba, MO 65453

Mayor Terry Beckham
City of Steelville
P.O. Box M
Steelville, MO 65565

Presiding Comm Leo Sanders
Crawford County
P.O. Box AS
Steelville, MO 65565

Pres. Commissioner Gene Newkirk
Pulaski County Commission
301 Historic 66 East
Waynesville, MO 65583

Mayor Glen Smith
City of Crocker
P.O. Box 116
Crocker, MO 65452

Mayor Mike Null
City of Dixon
P.O. Box 177
Dixon, MO 65459

Mayor Dana Tanner
City of Richland
P.O. Box 798
Richland, MO 65556

Mayor Dr. George Lauritson
City of St. Robert
194 Eastlawn Ave. #A
St. Robert, MO 65584

Mayor Jerry Brown
City of Waynesville
100 Tremont Center
Waynesville, MO 65583

Doug Jacobson, Supt.
Swedeborg R-III
17507 Hwy T
Richland, MO 65556

Brian Lee, Supt.
Richland R-IV
714 E. Jefferson
Richland, MO 65556

Michael Mayle, 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

Dr. Lenice Basham, Supt.
Maries County R-II
P.O. Box 819
Belle, MO 65013

Mark Parker, Supt.
Maries County R-I
P.O. Box 218
Vienna, MO 65582

Mayor T.C. James
City of Vienna
P.O. Box 196
Vienna, MO 65582

Mayor Steve Vogt
City of Belle
P.O. Drawer 813
Belle, MO 65013

Presiding Com. Vic Stratman
Maries County Courthouse
P.O. Box 205
Vienna, MO 65582

Presiding Com. Darrell Skiles
Dent County Courthouse
400 N. Main
Salem, MO 65560

Mayor Brad Nash
City of Salem
400 N. Iron St.
Salem, MO 65560

Luann Jadwin
Oak Hill R-I
6200 S. Hwy 19
Salem, MO 65560

Kevin Prugh
Green Forest R-II
6111 Hwy F
Salem, MO 65560

Mrs. Brooker
Dent-Phelps R-III
27870 Hwy C
Salem, MO 65560

Jeff Dodson
Northwoods R-IV
3734 N. Hwy 19
Salem, MO 65560

Lynn Reed
Salem R-80
1409 W. Rolla Rd.
Salem, MO 65560

Melissa Nash
Bunker R-III
P.O. Box 365
Bunker, MO 63629

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

Phelps County
Hazard
Mitigation Plan is
Ready for Review!

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

Phelps County
Hazard
Mitigation Plan is
Ready for Review!

3/2/21

Attention Members of the Pulaski County Hazard Mitigation Planning Committee and neighboring jurisdictions:

The first draft of the Phelps County Hazard Mitigation Plan is now available for review on the MRPC website – http://www.meramecregion.org/publications/. A hard copy of the draft document is being mailed to the Phelps County Courthouse for public viewing as well. Please take some time to review the planning document, especially sections that have specifics regarding your jurisdiction. We have submitted a draft to SEMA for review, but they are allowing us some time for public input. Please notify us no later than **March 26, 2021** with any recommended changes or corrections. Contact Tammy Snodgrass at (573) 265-2993 or via email at tsnodgrass@meramecregion.org.

3/2/21

Attention Members of the Pulaski County Hazard Mitigation Planning Committee and neighboring jurisdictions:

The first draft of the Phelps County Hazard Mitigation Plan is now available for review on the MRPC website – http://www.meramecregion.org/publications/. A hard copy of the draft document is being mailed to the Phelps County Courthouse for public viewing as well. Please take some time to review the planning document, especially sections that have specifics regarding your jurisdiction. We have submitted a draft to SEMA for review, but they are allowing us some time for public input. Please notify us no later than **March 26, 2021** with any recommended changes or corrections. Contact Tammy Snodgrass at (573) 265-2993 or via email at tsnodgrass@meramecregion.org.

C: Public Survey

Public Survey: Phelps 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 Phelps County, the incorporated cities, and the public school districts is currently developing an update to the comprehensive Phelps 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 Phelps 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.

- ❑ Unincorporated Phelps County
- ❑ City of Doolittle
- ❑ City of City of Edgar Springs
- ❑ City of Newburg
- ❑ City of Rolla
- ❑ City of St. James
- ❑ St. James R-I School District
- ❑ Newburg R-II School District
- ❑ Phelps County R-III School District
- ❑ Rolla 31 School District

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 <u>EACH</u> hazard 1 through 4 as follows:**

1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

____ Flooding (Flash and River)
____ Earthquake
____ Severe Thunderstorms
____ Tornadoes
____ Land Subsidence / Sinkholes
____ Severe Winter Weather
____ Dam Failure
____ Drought
____ Wildfire
____ Extreme Temperatures

3. Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). **Please rate <u>EACH</u> hazard 1 through 4 as follows:**

1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

____ Flooding (Flash and River)
____ Earthquake
____ Severe Thunderstorms
____ Tornadoes
____ Land Subsidence / Sinkholes
____ Severe Winter Weather
____ Dam Failure
____ Drought
____ Wildfire
____ Extreme Temperatures

4. FEMA Hazard Mitigation Assistance Grants are administered by the State Emergency Management Agency. Listed below are some types of projects considered.

Please check all those that could benefit your jurisdiction, in your opinion:

- ❑ Flood-prone Property Acquisition & Structure Demolition /Relocation
- ❑ Flood-Prone Structure Elevation
- ❑ Dry Floodproofing of Historical Residential Structures and/or Non-residential Structures
- ❑ Minor Localized Flood Reduction Projects (storm water management or localized flood control projects)
- ❑ Structural Retrofitting of Existing Buildings to Add a Tornado Safe Room
- ❑ Storm Sirens
- ❑ Early Warning Systems such as phone/text alerts
- ❑ Retrofitting of Existing Buildings, and Facilities from Wind Damage.
- ❑ New Tornado Safe Room Construction
- ❑ Electrical Utilities Infrastructure Retrofit
- ❑ Soil Erosion Stabilization
- ❑ Wildfire Mitigation
- ❑ Other (please specify)

_____

5. Please comment on any other issues that the Phelps 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
Meramec Regional Planning Commission
4 Industrial Drive ~ St. James, MO 65559
Phone: 573-265-2993, ext. 104 ~ FAX: 573-265-3550
tsnodgrass@meramecregion.org

On-line surveys will be automatically sent.

Phelps County Public Survey Results

Number of responses: 14

Responses came from following jurisdictions:

- City of St. James - 1

Hazards rated from Unlikely (1) to Highly Likely (4) to occur:

Flooding (flash and riverine) average score: 2.07

Tornadoes average score: 2.92

Dam Failure average score: 1.14

Wildfire average score: 2.28

Earthquake average score: 1.64

Land Subsident/Sinkholes average score: 1.92

Drought average score: 2.35

Extreme Temperatures average score: 2.92

Severe Thunderstorms average score: 3.42

Severe Winter Weather average score: 3.14

Hazard rated from Negligible (1) to Catastrophic (4):

Flooding (flash and riverine) average score: 1.85

Tornadoes average score: 3.00

Dam Failure average score: 1.21

Wildfire average score: 2.21

Earthquake average score: 2.21

Land Subsident/Sinkholes average score: 1.78

Drought average score: 2.14

Extreme Temperatures average score: 2.78

Severe Thunderstorms average score: 2.85

Severe Winter Weather average score: 2.92

Check all those types of projects that you believe could benefit your jurisdiction:

Flood-prone Property Acquisition & Structure Demolition /Relocation 6

Flood-Prone Structure Elevation 2

Dry Floodproofing of Historical Residential Structures and/or Non-residential Structures 0

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 9

Storm Sirens 9

Early Warning Systems such as phone/text alerts 9

Retrofitting of Existing Buildings, and Facilities from Wind Damage. 3

New Tornado Safe Room Construction 8

Electrical Utilities Infrastructure Retrofit 8

Soil Erosion Stabilization 4

Wildfire Mitigation 2

Other (please specify) 0

Comments: See Below

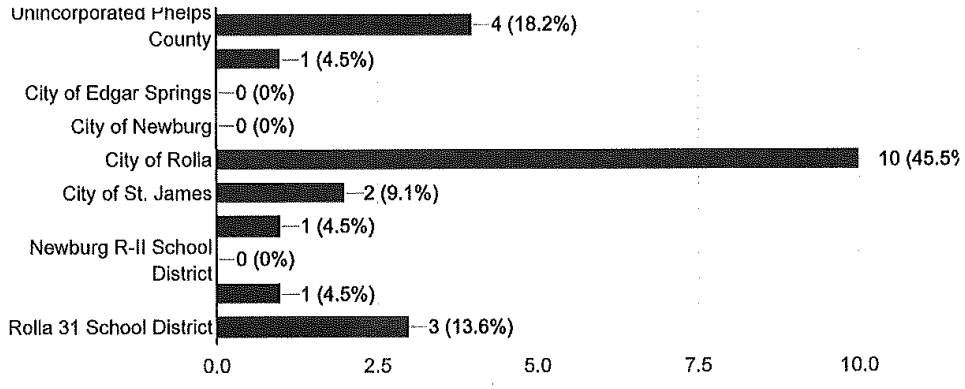
Public Survey: Phelps County Multi-jurisdictional Hazard Mitigation Plan

22 responses

Publish analytics

Please select your jurisdiction from the list. You may only select one jurisdiction for each survey completed. If you belong to more than one jurisdiction in this list, please complete multiple surveys.

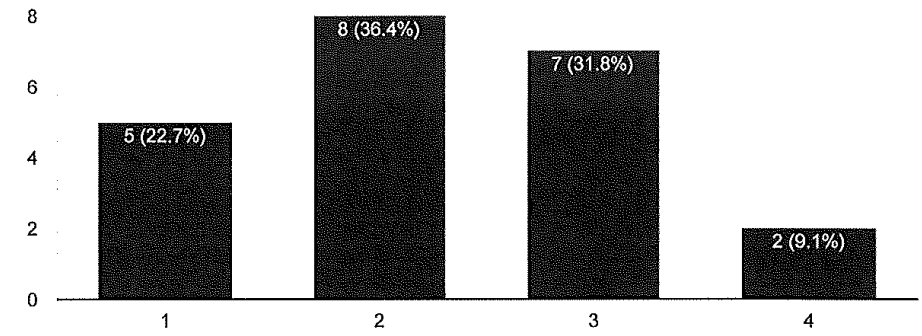
22 responses



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

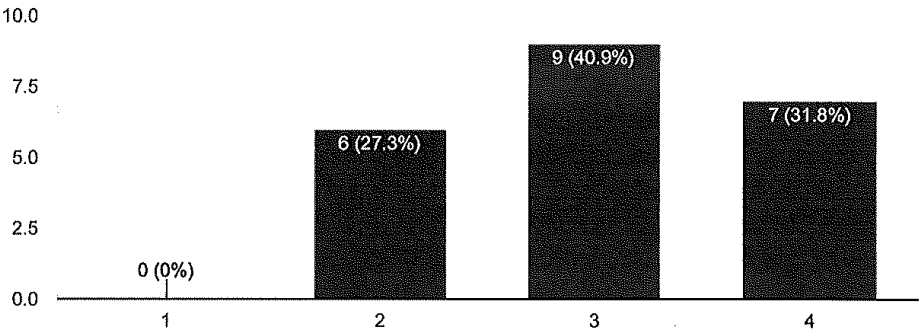
Flooding (Flash and River)

22 responses



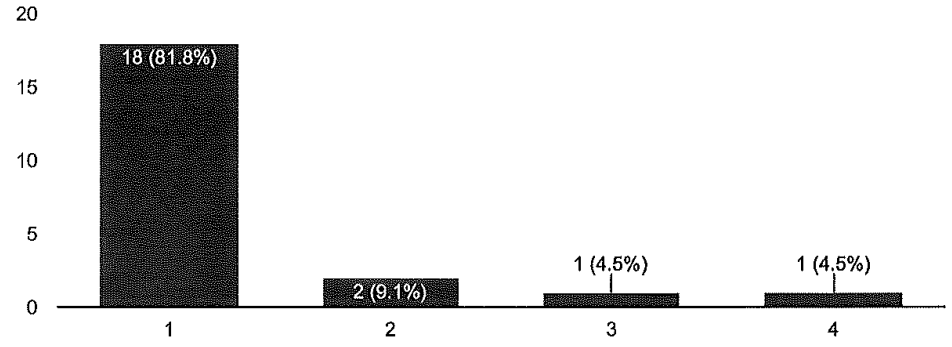
Tornadoes

22 responses



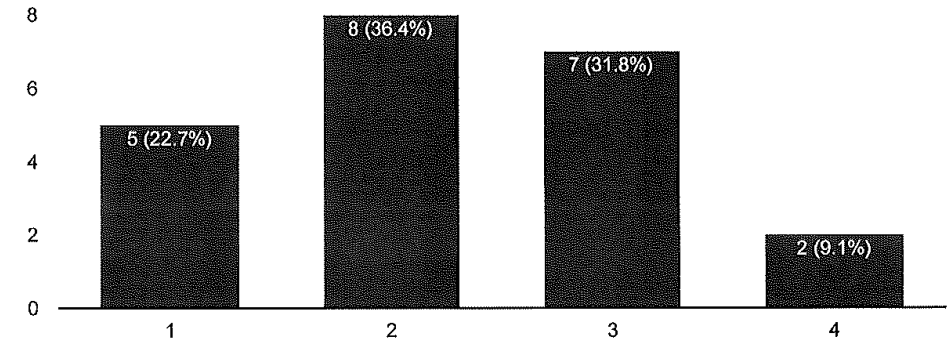
Dam Failure

22 responses



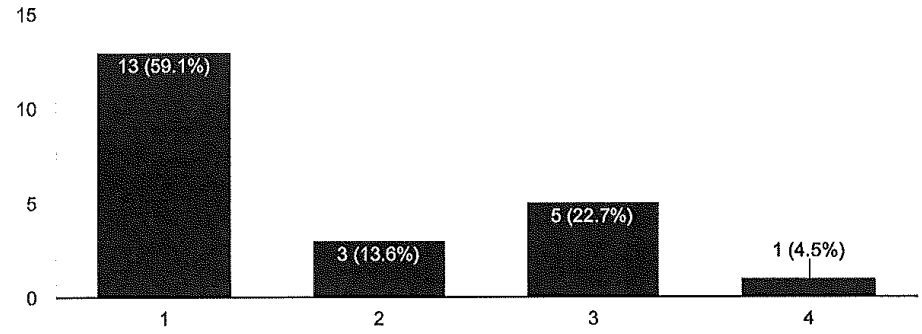
Wildfire

22 responses



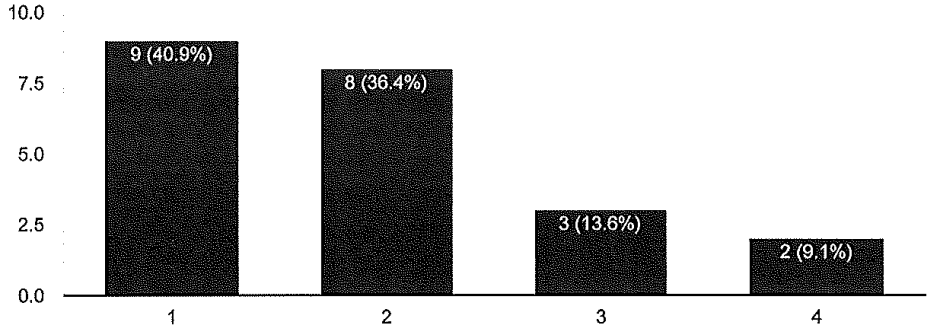
Earthquake

22 responses



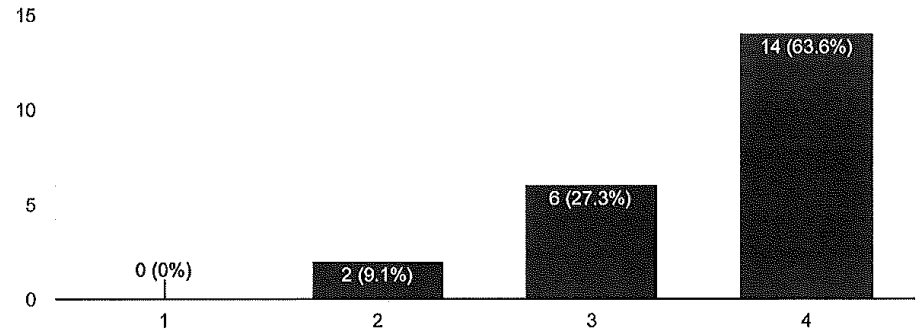
Land Subsidence/ Sinkholes

22 responses



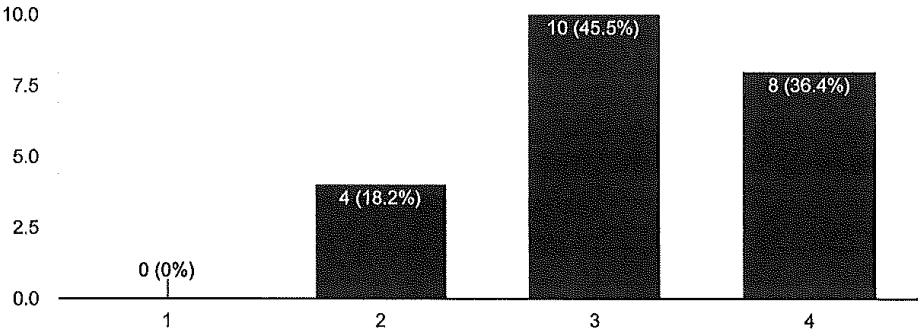
Severe Thunderstorms

22 responses



Severe Winter Weather

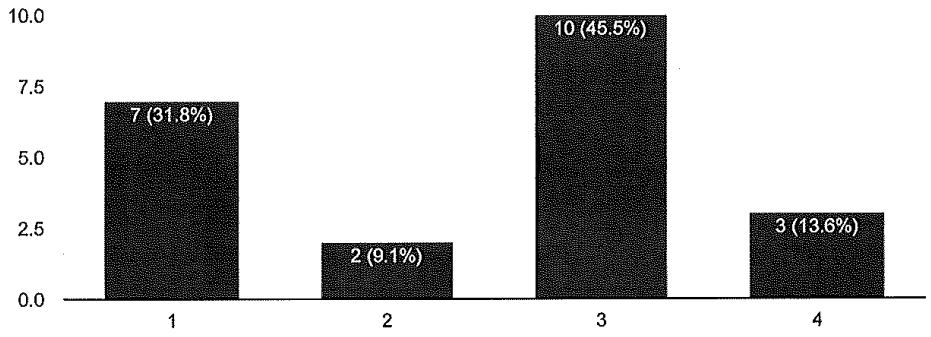
22 responses



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

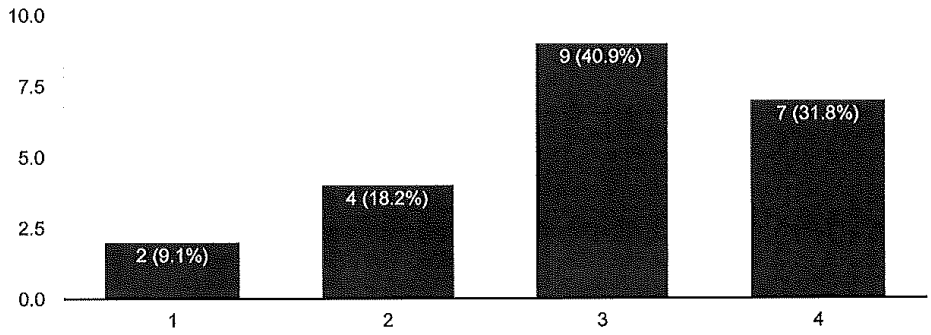
Drought

22 responses



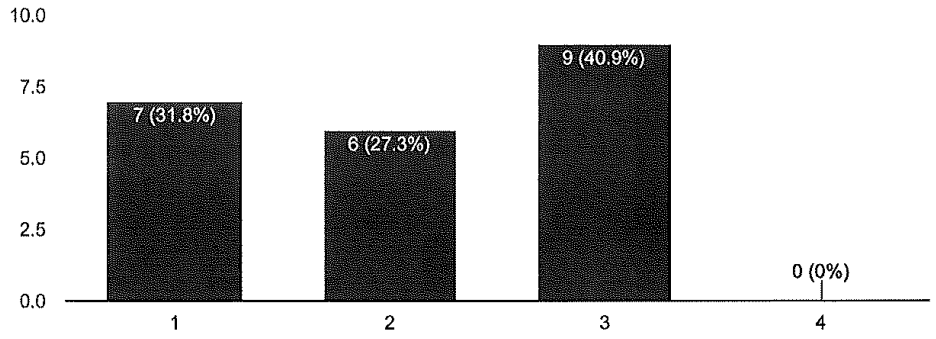
Extreme Temperatures

22 responses



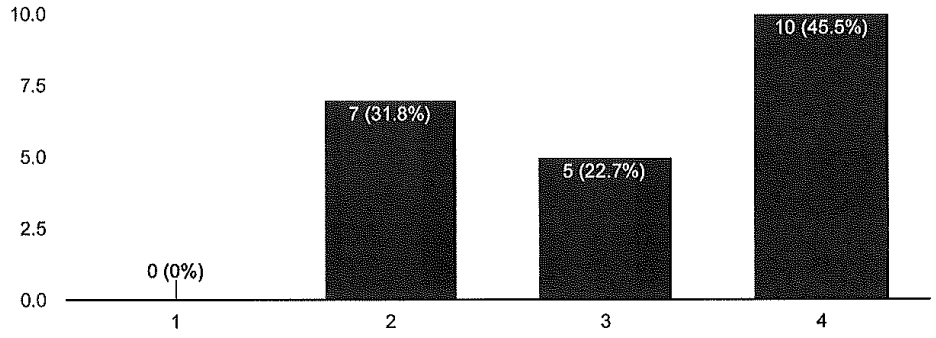
Flooding (Flash and River)

22 responses



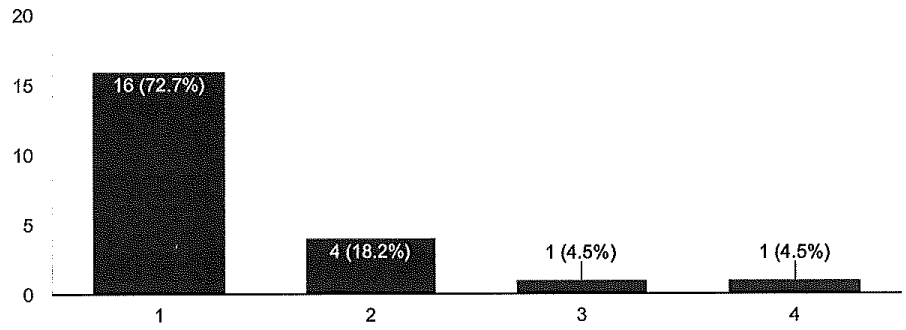
Tornadoes

22 responses



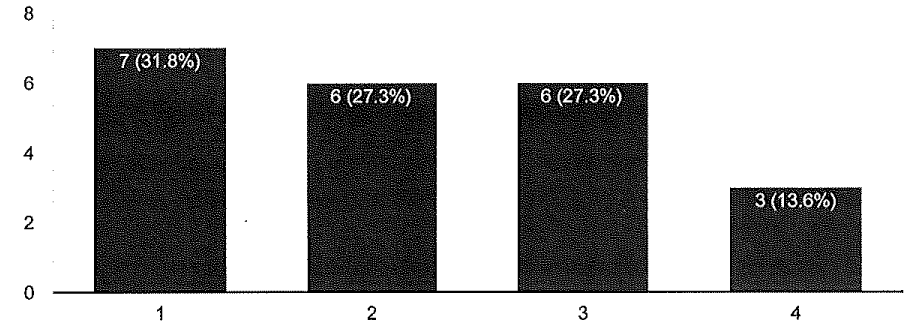
Dam Failure

22 responses



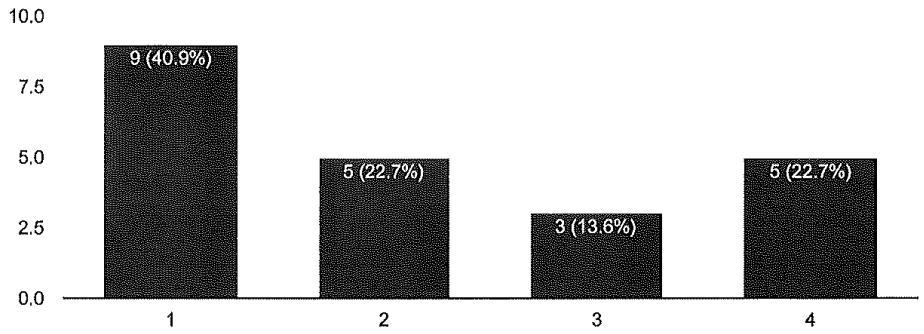
Wildfire

22 responses



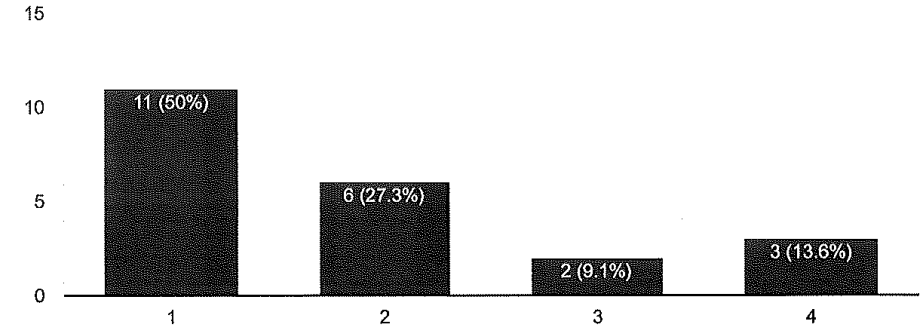
Earthquake

22 responses



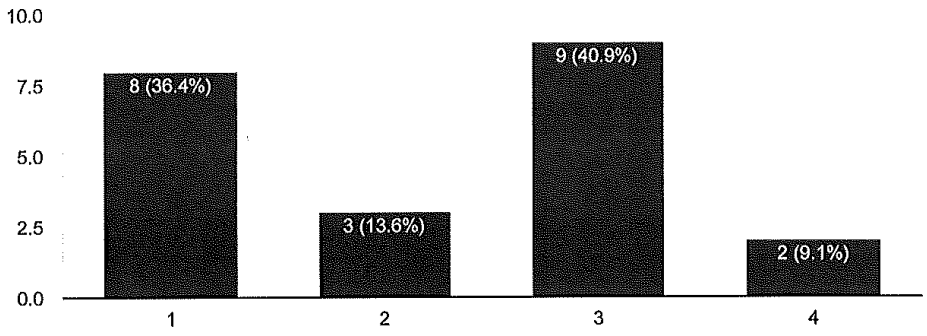
Land Subsidence/Sinkholes

22 responses



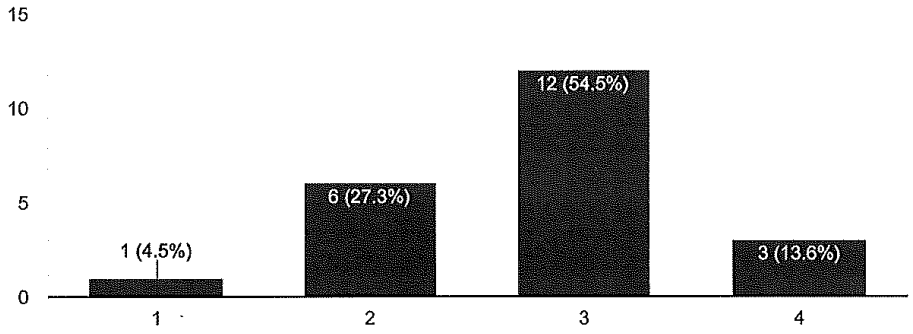
Drought

22 responses



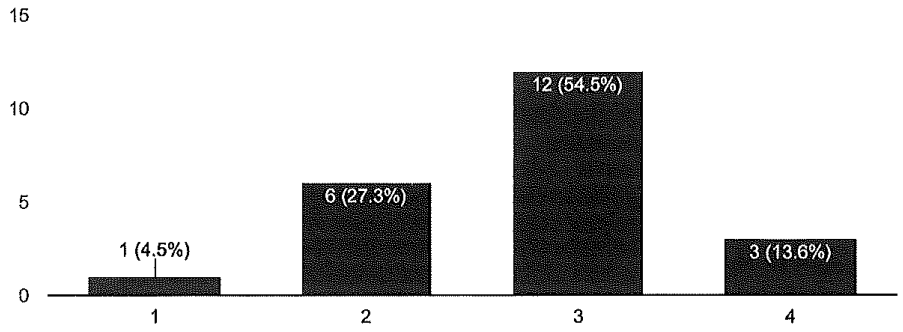
Extreme Temperatures

22 responses



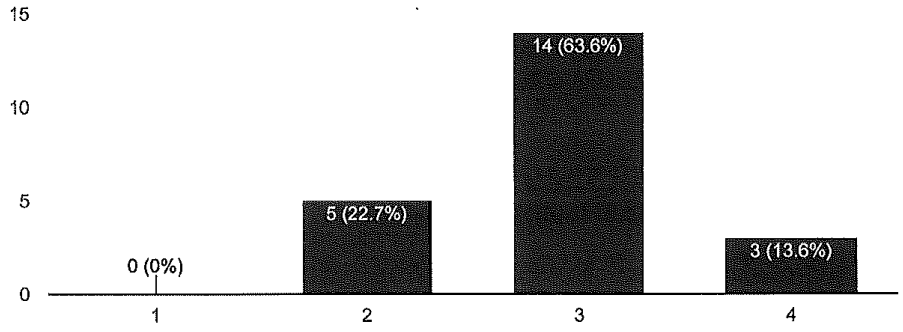
Severe Thunderstorms

22 responses



Severe Winter Weather

22 responses



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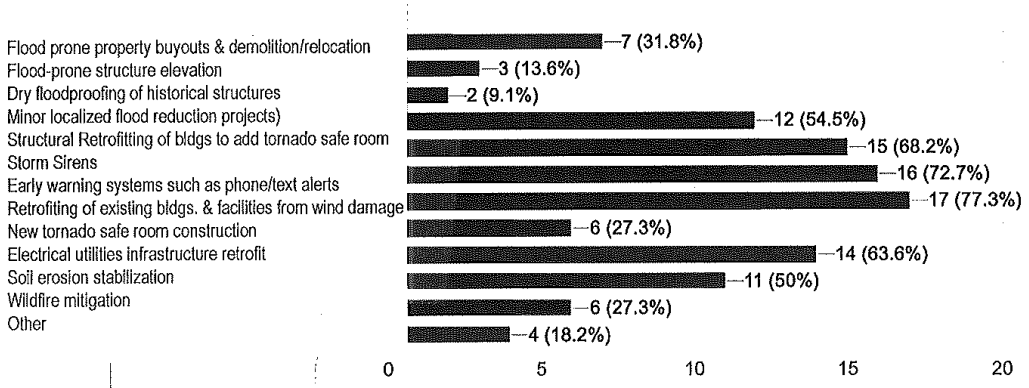
22 responses



Please comment on any other issues that the Phelps County Hazard Mitigation Planning Committee should consider in developing a strategy to reduce future losses caused by hazard events.

1 response

There needs to be a storm shelter in Richland MO!

For questions or more information:

D: Adoption Resolutions

RESOLUTION NO. 2021-3-9(1)

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

WHEREAS, Phelps 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, Phelps 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 Phelps County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

WHEREAS, Phelps County Commission desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Phelps County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of Phelps 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 Phelps County Commission adopts the Phelps 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: March 9, 2021

Witness — Date: March 18, 2021

RESOLUTION NO. 2021 - 1
A RESOLUTION TO ADOPT THE PHELPS COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the City of Doolittle 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 Doolittle 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 Phelps 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 Doolittle desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Phelps County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the City of Doolittle 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 Doolittle adopts the Phelps 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.

Doug Smith, Mayor, Certifying Official — 3-16-21 Date

Della Bishop-Baggett, Clerk Witness — 3-16-21 Date

MAR 12 2021

RESOLUTION NO. 276

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

WHEREAS, the City of Newburg 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 Newburg 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 Phelps 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 Newburg desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Phelps County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the City of Newburg 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 Newburg adopts the Phelps 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: 3-10-21

Witness: Phyllis Harris — Date: 3-10-21

RESOLUTION NO. 1986

A RESOLUTION ADOPTING THE PHELPS COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the City of Rolla 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 Rolla 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 Phelps 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 Rolla desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Phelps County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the City of Rolla 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 Council of the City of Rolla adopts the Phelps 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.

PASSED BY THE CITY COUNCIL OF THE CITY OF ROLLA, MISSOURI AND APPROVED BY THE MAYOR THIS 15TH DAY OF MARCH 2021.

APPROVED:

Mayor

ATTEST:

Lorri M. Thurman

City Clerk

APPROVED AS TO FORM:

City Counselor

RESOLUTION NO. 21-314

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

WHEREAS, the City of St. James 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 St. James 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 Phelps 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 St. James desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Phelps County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the City of St. James 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 St. James adopts the Phelps 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	3-18-2021 Date
Witness	3-18-2021 Date

RESOLUTION NO. _____

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

WHEREAS, St. James 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, St. James 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 Phelps County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

WHEREAS, St. James 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 Phelps County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of St. James 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 St. James R-I School District adopts the Phelps 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.

Marilyn Johnson — 3/24/21

Certifying Official — Date

Amy Johnson — 3/24/21

Witness — Date

RESOLUTION NO. _____

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

WHEREAS, Newburg 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, Newburg 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 Phelps County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

WHEREAS, Newburg 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 Phelps County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of Newburg 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 Newburg R-II School District adopts the Phelps 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: 03/04/2021

Witness — Date: 03/04/2021

RESOLUTION NO. _____

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

WHEREAS, Phelps County R-III 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, Phelps County R-III 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 Phelps County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

WHEREAS, Phelps County R-III School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Phelps County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of Phelps County R-III 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 Phelps County R-III School District adopts the Phelps 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.

John Hutto — Certifying Official

4/8/21 — Date

Debra K. Brown — Witness

4-8-2021 — Date

RESOLUTION NO. _____

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

WHEREAS, Rolla 31 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, Rolla 31 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 Phelps County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

WHEREAS, Rolla 31 School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Phelps County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of Rolla 31 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 Rolla 31 School District adopts the Phelps 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.

James H. Packard — Certifying Official

3/18/21 — Date

Myra Ragan — Witness

3/18/2021 — 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 Phelps County Critical Facilities by Type and Jurisdiction

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Emergency Facilities						
	Phelps County	Phelps County Ambulance Dist.	504 18th St.	Rolla	MO	65401
	Rolla	Rolla Emergency Mgmt. & Cntrl. Comm.	1007 N Elm St.	Rolla	MO	65401
	St. James	St. James Ambulance Dist.	103 N. Louise	St. James	MO	65559
Fire Department Facilities						
	Doolittle	Doolittle Rural Fire Prot. Dist.1	281 Bouman St.	Doolittle	MO	65550
	Doolittle	Doolittle Rural Fire Prot. Dist.2	11845 Main St.	Jerome	MO	65529
	Duke	Duke Rural Fire Dist.	30003 CR 6630	Duke	MO	65461
	Edgar Springs	Edgar Springs Rural FD	1150 Broadway	Edgar Springs	MO	65462
MO000569	Rolla	Rolla Fire and Rescue #1	1490 E. 10th St.	Rolla	MO	65401
	Rolla	Rolla Fire and Rescue #2	400 W. 4th St.	Rolla	MO	65401
	Rolla	Rolla Rural Fire Prot. Dist. 1	1575 E. Lions Club Dr.	Rolla	MO	65401

	Rolla	Rolla Rural Fire Prot. Dist. 2	18953 S. Hwy. 63	Rolla	MO	65401
	Rolla	Rolla Rural Fire Prot. Dist. 3	10830 Private Dr. 2074	Rolla	MO	65401
	St. James	St. James Fire Prot. Dist. 1	300 E. Eldon St.	St. James	MO	65559
	St. James	St. James Fire Prot. Dist. 2	15995 S. Hwy. 68	St. James	MO	65559
Law Enforcement Facilities						
	Doolittle	Doolittle Police Dept.	380 Eisenhower St.	Doolittle	MO	65401
	Edgar Springs	Edgar Springs Police Dept.	555 Broadway	Edgar Springs	MO	65462
	State	Missouri Hwy. Patrol Troop I	1301 Nagogami Rd	Rolla	MO	65401
MO000351	Newburg	Newburg Police Dept.	30 W. 2nd St.	Newburg	MO	65550
MO000377	Phelps County	Phelps County Sheriff	500 W 2nd St.	Rolla	MO	65550
MO000047	Rolla	Rolla Police Dept.	1007 N Elm St.	Rolla	MO	65401
Law Enforcement Facilities						
	Rolla	University Police, MO S&T	1201 N. State St.	Rolla	MO	65401
MO000245	St. James	St. James City Police	200 N. Bourbeuse St.	St. James	MO	65559
Medical Facilities						
	Phelps County	Phelps Health	1000 West 10th St.	Rolla	MO	65401
	Phelps County	Phelps-Maries Health Dept.	200 N. Main, Suite G51	Rolla	MO	65401
	Rolla	Rolla Dialysis	1503 E. 10th St.	Rolla	MO	65401

	Rolla	Physician Surgery Center, LLC	1500 Hwy. 72 E.	Rolla	MO	65401
	Rolla	Rolla Family Clinic	1060 S. Bishop Ave.	Rolla	MO	65401
	Rolla	Phelps Health Medical Group, Inc.	1050 W. Tenth St.	Rolla	MO	65401
	Rolla	Mercy Clinic	1605 Martin Springs Dr., Ste. 230	Rolla	MO	65401
	St. James	Phelps Health Medical Group	1000 N. Jefferson	St. James	MO	65559
	St. James	Mercy Clinic Family Medicine	107 W. Eldon St.	St. James	MO	65559
School Facilities						
MO000937	Edgar Springs	Phelps Co. Elem.	17790 State Rte. M	Edgar Springs	MO	65462
MO000935	Newburg	Newburg Elem.	701 Wolf Pride Dr.	Newburg	MO	65550
MO000936	Newburg	Newburg High	701 Wolf Pride Dr.	Newburg	MO	65550
MO000108	Rolla	B W Robinson State School	300 Lanning Ln.	Rolla	MO	65401
MO000932	Rolla	Rolla Technical Inst.	1304 E. 10th St.	Rolla	MO	65401
MO000933	Rolla	Harry S. Truman Elem.	1001 E. 18th St.	Rolla	MO	65401
MO000934	Rolla	Rolla Sr. High	900 Bulldog Run	Rolla	MO	65401
MO001524	Rolla	Rolla Seventh-Day Adventist Sch.	814 Hwy. O	Rolla	MO	65401
MO001628	Rolla	St. Patrick Elem. School	19 St. Patrick Ln.	Rolla	MO	65401
MO002256	Rolla	Col. John B. Wyman Elem.	402 Lanning Ln.	Rolla	MO	65401

MO002257	Rolla	Rolla Jr. High	1360 Soest Rd.	Rolla	MO	65401
MO002258	Rolla	Mark Twain Elem.	1100 Mark Twain Dr.	Rolla	MO	65401
MO002259	Rolla	Rolla Middle	1111 Soest Rd.	Rolla	MO	65401
MO002260	Rolla	Rolla Technical Cntr.	500 Forum Dr.	Rolla	MO	65401
MO000930	St. James	Lucy Wortham James Elem.	314 S. Jefferson	St. James	MO	65559
MO000931	St. James	St. James Middle	1 Tiger Dr.	St. James	MO	65559
MO002151	St. James	St. James High	101 E. Scioto	St. James	MO	65559
	St. James	Tiger Cubs 1	220 E. Scioto	St. James	MO	65559
	St. James	Tiger Cubs 2	316 S. Jefferson	St. James	MO	65559
	St. James	Alternative High School	224 E. Scioto	St. James	MO	65559
Childcare Facilities						
	Rolla	Mickelson, Kristina Lynn	11075 Woodale Dr.	Rolla	MO	65401
	Rolla	Marrero, Carmen	13550 County Rd 8100	Rolla	MO	65401
	Rolla	Rolla Head Start Center	1811 E. 10th St.	Rolla	MO	65401
	Rolla	Stepping Stones Child Care Center	814 B Highway O	Rolla	MO	65401
	Rolla	Greentree Child Care and Learning Cntr.	800 Greentree Rd.	Rolla	MO	65401
	Rolla	Christian Life Center Child Development Center	305 E. 1st St.	Rolla	MO	65401

	Rolla	First Presbyterian Preschool	919 E. Tenth St.	Rolla	MO	65401
	Rolla	All Gods Children Day Care	400 Olive St.	Rolla	MO	65401
	Rolla	Kiddie Korner Learning Center & Preschool	302 N. Olive St.	Rolla	MO	65401
	Rolla	Salem Avenue Baptist Church Day Care	1501 Hwy. 72 E.	Rolla	MO	65401
	Rolla	Wands, Debbie	207 Christy Dr.	Rolla	MO	65401
	Rolla	Giesler, Pamela Lynn	307 Williams Rd.	Rolla	MO	65401
	Rolla	First United Methodist Church Preschool	804 Main St.	Rolla	MO	65401
	Rolla	Tender Hearts Preschool Academy, LLC	11697 CR. 8030	Rolla	MO	65401
	St. James	Perona, Loretta Sue	323 Winter Dr.	St. James	MO	65559
	St. James	St. John Lutheran Hand in Hand Preschool	221 W. James Blvd.	St. James	MO	65559
	St. James	St. James Head Start Center	1518 Lola Ln.	St. James	MO	65559
Nursing Homes						
	Rolla	Choices For People Adult Day Care	1815 Forum Dr.	Rolla	MO	65401
	Rolla	Oak Pointe of Rolla	1000 E. Lions Club Dr.	Rolla	MO	65401
	Rolla	Rosewood Residential Care	13450 CR. 7040	Rolla	MO	65401

	Rolla	Parkside - Assisted Living by Americare	1700 E. 10th St.	Rolla	MO	65401
	Rolla	Rolla Presbyterian Manor	1200 Homelife Plaza	Rolla	MO	65401
	St. James	St. James Living Center	415 Sidney St.	St. James	MO	65559
	St. James	Cedar Knoll Home	13635 State Rte. V	St. James	MO	65559
	St. James	Ferndale, Inc.	15677 CR. 2430	St. James	MO	65559
	St. James	Country Valley Home	15750 CR. 2430	St. James	MO	65559
	St. James	Missouri Veterans Home	620 N. Jefferson	St. James	MO	65559

Source: 2020 Data Collection Questionnaires, Missouri DHSS

https://healthapps.dhss.mo.gov/childcaresearch/, https://healthapps.dhss.mo.gov/showmeltc/default.aspx

F: MDC Wildfire Data Search

View	Discovered Date	County	Station	Cause	Acres Burned
2002-00005-001327	11/08/2002	Phelps	MDC REPORTING REGION - OZARK	Equipment	40
2002-08108-000805	07/23/2002	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	3
2002-08108-000806	08/07/2002	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	7
2002-08108-000810	10/24/2002	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	2
2003-00005-001456	03/26/2003	Phelps	MDC REPORTING REGION - OZARK	Debris	
2003-00005-001475	03/27/2003	Phelps	MDC REPORTING REGION - OZARK	Miscellaneous	30
2003-00005-001519	04/01/2003	Phelps	MDC REPORTING REGION - OZARK	Miscellaneous	1
2003-00005-001544	04/14/2003	Phelps	MDC REPORTING REGION - OZARK	Railroad	1
2003-08104-004156	08/17/2003	Phelps	Duke Rural Fire Department	Unknown	2
2003-08108-000812	02/02/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	2
2003-08108-000815	03/15/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	1
2003-08108-000817	03/23/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	1
2003-08108-000819	03/24/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	5
2003-08108-000822	03/27/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	30
2003-08108-000825	04/01/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Unknown	
2003-08108-000827	04/12/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	2
2003-08108-000831	04/12/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	1
2003-08108-004152	11/12/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	0.5
2003-08108-004153	08/21/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	1
2003-08108-004154	08/20/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Debris	5
2003-08108-004155	08/15/2003	Phelps	Edgar Springs Rural Fire Protection Dist	Unknown	2
2004-00001-004150	03/19/2004	Phelps	MDC REPORTING REGION - CENTRAL	Debris	3
2004-00001-005811	04/05/2004	Phelps	MDC REPORTING REGION - CENTRAL	Miscellaneous	2
2004-08102-005720	02/16/2004	Phelps	Rolla Rural Fire Protection District	Debris	

2004-08102-005721	02/22/2004	Phelps	Rolla Rural Fire Protection District	Debris	0.5
2004-08102-005722	02/26/2004	Phelps	Rolla Rural Fire Protection District	Campfire	
2004-08102-005723	02/28/2004	Phelps	Rolla Rural Fire Protection District	Debris	5
2004-08102-005724	02/28/2004	Phelps	Rolla Rural Fire Protection District	Debris	5
2004-08102-005725	02/28/2004	Phelps	Rolla Rural Fire Protection District	Debris	5
2004-08102-005726	02/28/2004	Phelps	Rolla Rural Fire Protection District	Debris	1
2004-08102-005727	03/01/2004	Phelps	Rolla Rural Fire Protection District	Unknown	2
2004-08102-005728	03/01/2004	Phelps	Rolla Rural Fire Protection District	Debris	5
2004-08102-005729	03/08/2004	Phelps	Rolla Rural Fire Protection District	Debris	1
2004-08102-005730	03/10/2004	Phelps	Rolla Rural Fire Protection District	Debris	2
2004-08102-005731	03/11/2004	Phelps	Rolla Rural Fire Protection District	Debris	4
2004-08102-005732	03/11/2004	Phelps	Rolla Rural Fire Protection District	Debris	4
2004-08102-005733	03/12/2004	Phelps	Rolla Rural Fire Protection District	Debris	4
2004-08102-005734	03/12/2004	Phelps	Rolla Rural Fire Protection District	Debris	
2004-08102-005735	03/12/2004	Phelps	Rolla Rural Fire Protection District	Debris	1
2004-08102-005736	03/19/2004	Phelps	Rolla Rural Fire Protection District	Debris	3
2004-08102-005737	03/19/2004	Phelps	Rolla Rural Fire Protection District	Debris	3
2004-08102-005738	03/19/2004	Phelps	Rolla Rural Fire Protection District	Debris	3
2004-08102-005739	03/22/2004	Phelps	Rolla Rural Fire Protection District	Debris	1
2004-08102-005740	04/04/2004	Phelps	Rolla Rural Fire Protection District	Debris	1
2004-08102-005741	04/08/2004	Phelps	Rolla Rural Fire Protection District	Unknown	5
2004-08102-005742	04/14/2004	Phelps	Rolla Rural Fire Protection District	Debris	0.3
2004-08102-005743	04/15/2004	Phelps	Rolla Rural Fire Protection District	Unknown	1
2004-08102-005744	04/18/2004	Phelps	Rolla Rural Fire Protection District	Debris	4
2004-08102-005745	04/19/2004	Phelps	Rolla Rural Fire Protection District	Unknown	1
2004-08102-006060	11/08/2004	Phelps	Rolla Rural Fire Protection District	Debris	2
2004-08102-006061	10/24/2004	Phelps	Rolla Rural Fire Protection District	Unknown	5
2004-08102-006473	12/31/2004	Phelps	Rolla Rural Fire Protection District	Debris	1
2004-08102-006474	12/30/2004	Phelps	Rolla Rural Fire Protection District	Unknown	1

2004-08102-006475	12/30/2004	Phelps	Rolla Rural Fire Protection District	Unknown	1
2004-08102-009975	12/22/2004	Phelps	Rolla Rural Fire Protection District	Debris	1
2004-08104-005903	04/04/2004	Phelps	Duke Rural Fire Department	Debris	5
2004-08104-005904	03/01/2004	Phelps	Duke Rural Fire Department	Miscellaneous	0.01
2004-08104-005905	03/13/2004	Phelps	Duke Rural Fire Department	Debris	0.01
2004-08104-006022	10/02/2004	Phelps	Duke Rural Fire Department	Debris	1
2004-08104-006793	12/30/2004	Phelps	Duke Rural Fire Department	Arson	8
2004-08104-006794	10/24/2004	Phelps	Duke Rural Fire Department	Debris	1
2004-08110-004162	01/15/2004	Phelps	St. James Fire Protection District	Debris	1
2004-08110-004163	01/14/2004	Phelps	St. James Fire Protection District	Debris	0.25
2004-08110-004164	01/11/2004	Phelps	St. James Fire Protection District	Debris	0.75
2004-08110-004165	02/17/2004	Phelps	St. James Fire Protection District	Debris	0.25
2004-08110-004166	02/22/2004	Phelps	St. James Fire Protection District	Debris	0.75
2004-08110-004167	02/27/2004	Phelps	St. James Fire Protection District	Debris	0.25
2004-08110-004168	02/27/2004	Phelps	St. James Fire Protection District	Debris	
2004-08110-004169	02/27/2004	Phelps	St. James Fire Protection District	Miscellaneous	0.25
2004-08110-004170	02/28/2004	Phelps	St. James Fire Protection District	Debris	3
2004-08110-004171	03/02/2004	Phelps	St. James Fire Protection District	Debris	0.5
2004-08110-004172	03/02/2004	Phelps	St. James Fire Protection District	Debris	2
2004-08110-004176	03/08/2004	Phelps	St. James Fire Protection District	Unknown	1.5
2004-08110-004178	03/08/2004	Phelps	St. James Fire Protection District	Debris	
2004-08110-004180	03/19/2004	Phelps	St. James Fire Protection District	Debris	2
2004-08110-004182	03/19/2004	Phelps	St. James Fire Protection District	Debris	0.5
2004-08110-004184	03/25/2004	Phelps	St. James Fire Protection District	Railroad	0.25
2004-08110-006468	12/04/2004	Phelps	St. James Fire Protection District	Debris	1
2004-08110-006469	12/25/2004	Phelps	St. James Fire Protection District	Debris	0.5
2004-08110-006470	12/28/2004	Phelps	St. James Fire Protection District	Debris	3
2004-08110-006471	12/28/2004	Phelps	St. James Fire Protection District	Debris	3
2004-76409-005454	02/29/2004	Phelps	SALEM FORESTRY	Arson	8

2005-07030-009000	04/03/2005	Phelps	Middletown Community Fire Protection District	Arson	4
2005-07030-009001	03/29/2005	Phelps	Middletown Community Fire Protection District	Debris	60
2005-08100-007062	03/31/2005	Phelps	ROLLA FORESTRY	Debris	99
2005-08100-007063	03/29/2005	Phelps	ROLLA FORESTRY	Arson	50
2005-08100-007064	03/30/2005	Phelps	ROLLA FORESTRY	Debris	450
2005-08100-008108	03/29/2005	Phelps	ROLLA FORESTRY	Debris	3
2005-08100-008170	03/18/2005	Phelps	ROLLA FORESTRY	Miscellaneous	23
2005-08100-009840	11/12/2005	Phelps	ROLLA FORESTRY	Arson	23
2005-08100-009841	11/12/2005	Phelps	ROLLA FORESTRY	Arson	6
2005-08102-006472	01/20/2005	Phelps	Rolla Rural Fire Protection District	Debris	2
2005-08102-006884	04/18/2005	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2005-08102-006885	03/02/2005	Phelps	Rolla Rural Fire Protection District	Debris	10
2005-08102-006886	02/15/2005	Phelps	Rolla Rural Fire Protection District	Unknown	5
2005-08102-006887	02/26/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.4
2005-08102-006888	02/26/2005	Phelps	Rolla Rural Fire Protection District	Debris	2
2005-08102-006889	03/06/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	7
2005-08102-006890	03/05/2005	Phelps	Rolla Rural Fire Protection District	Not Reported	0.5
2005-08102-006891	03/06/2005	Phelps	Rolla Rural Fire Protection District	Debris	5
2005-08102-006892	03/08/2005	Phelps	Rolla Rural Fire Protection District	Debris	2
2005-08102-006893	03/12/2005	Phelps	Rolla Rural Fire Protection District	Debris	2
2005-08102-006894	03/12/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	10
2005-08102-006912	03/12/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1
2005-08102-006913	03/12/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.5
2005-08102-006914	03/12/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	3
2005-08102-006915	03/12/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1
2005-08102-006916	03/13/2005	Phelps	Rolla Rural Fire Protection District	Debris	1
2005-08102-008109	03/14/2005	Phelps	Rolla Rural Fire Protection District	Unknown	3

2005-08102-008110	03/29/2005	Phelps	Rolla Rural Fire Protection District	Debris	10
2005-08102-008111	03/29/2005	Phelps	Rolla Rural Fire Protection District	Unknown	30
2005-08102-008112	03/30/2005	Phelps	Rolla Rural Fire Protection District	Unknown	500
2005-08102-008113	04/03/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	8
2005-08102-009972	11/12/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	10
2005-08102-009973	11/19/2005	Phelps	Rolla Rural Fire Protection District	Debris	0.5
2005-08102-009974	11/23/2005	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1
2005-08110-006784	01/25/2005	Phelps	St. James Fire Protection District	Debris	6
2005-08110-006785	01/25/2005	Phelps	St. James Fire Protection District	Debris	0.25
2005-08110-006786	02/05/2005	Phelps	St. James Fire Protection District	Debris	0.25
2005-08110-006787	02/15/2005	Phelps	St. James Fire Protection District	Debris	3
2005-08110-006788	02/15/2005	Phelps	St. James Fire Protection District	Miscellaneous	15
2005-08110-006789	02/18/2005	Phelps	St. James Fire Protection District	Unknown	0.25
2005-08110-006790	02/20/2005	Phelps	St. James Fire Protection District	Miscellaneous	0.25
2005-08110-006791	02/26/2005	Phelps	St. James Fire Protection District	Debris	3
2005-08110-006792	02/27/2005	Phelps	St. James Fire Protection District	Debris	2
2005-08110-008114	03/02/2005	Phelps	St. James Fire Protection District	Debris	2
2005-08110-008116	03/11/2005	Phelps	St. James Fire Protection District	Arson	0.25
2005-08110-008117	03/11/2005	Phelps	St. James Fire Protection District	Arson	0.25
2005-08110-008118	03/11/2005	Phelps	St. James Fire Protection District	Arson	0.25
2005-08110-008119	03/12/2005	Phelps	St. James Fire Protection District	Debris	1
2005-08110-008120	03/12/2005	Phelps	St. James Fire Protection District	Debris	2
2005-08110-008121	03/12/2005	Phelps	St. James Fire Protection District	Debris	3
2005-08110-008123	03/17/2005	Phelps	St. James Fire Protection District	Debris	0.25
2005-08110-008124	03/17/2005	Phelps	St. James Fire Protection District	Debris	2
2005-08110-008125	03/18/2005	Phelps	St. James Fire Protection District	Debris	35
2005-08110-008126	03/20/2005	Phelps	St. James Fire Protection District	Debris	0.5
2005-08110-008127	03/29/2005	Phelps	St. James Fire Protection District	Debris	8
2005-08110-008128	03/29/2005	Phelps	St. James Fire Protection District	Debris	8

2005-08110-008130	03/30/2005	Phelps	St. James Fire Protection District	Unknown	0.5
2005-08110-008131	03/31/2005	Phelps	St. James Fire Protection District	Unknown	0.25
2005-08518-008139	01/24/2005	Phelps	Dixon Rural Fire Protection District	Not Reported	0.1
2005-08518-008174	04/03/2005	Phelps	Dixon Rural Fire Protection District	Debris	2
2006-06313-025463	07/29/2006	Phelps	Vichy Volunteer Fire Protection Assoc	Unknown	0.05
2006-06313-025464	08/08/2006	Phelps	Vichy Volunteer Fire Protection Assoc	Unknown	200
2006-08100-025094	08/08/2006	Phelps	ROLLA FORESTRY	Lightning	89
2006-08102-011339	01/25/2006	Phelps	Rolla Rural Fire Protection District	Unknown	2
2006-08102-011341	01/25/2006	Phelps	Rolla Rural Fire Protection District	Unknown	2
2006-08102-011342	01/26/2006	Phelps	Rolla Rural Fire Protection District	Debris	10
2006-08102-011343	01/18/2006	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1
2006-08102-011344	02/23/2006	Phelps	Rolla Rural Fire Protection District	Equipment	1
2006-08102-011345	02/14/2006	Phelps	Rolla Rural Fire Protection District	Debris	2
2006-08102-011346	02/14/2006	Phelps	Rolla Rural Fire Protection District	Debris	1
2006-08102-011348	02/19/2006	Phelps	Rolla Rural Fire Protection District	Unknown	1
2006-08102-012759	03/26/2006	Phelps	Rolla Rural Fire Protection District	Debris	1
2006-08102-012766	03/26/2006	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.75
2006-08102-012767	03/23/2006	Phelps	Rolla Rural Fire Protection District	Debris	1
2006-08102-012768	03/19/2006	Phelps	Rolla Rural Fire Protection District	Unknown	0.1
2006-08102-012769	03/07/2006	Phelps	Rolla Rural Fire Protection District	Unknown	2
2006-08102-023851	06/02/2006	Phelps	Rolla Rural Fire Protection District	Debris	1
2006-08102-023852	03/16/2006	Phelps	Rolla Rural Fire Protection District	Debris	1
2006-08102-023853	04/04/2006	Phelps	Rolla Rural Fire Protection District	Unknown	1
2006-08102-024324	07/02/2006	Phelps	Rolla Rural Fire Protection District	Unknown	1
2006-08102-024326	07/02/2006	Phelps	Rolla Rural Fire Protection District	Unknown	1
2006-08102-025455	08/05/2006	Phelps	Rolla Rural Fire Protection District	Debris	0.05
2006-08102-026522	11/21/2006	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.25
2006-08102-026553	07/09/2006	Phelps	Rolla Rural Fire Protection District	Unknown	0.1
2006-08102-026554	04/01/2006	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.5

2006-08102-026555	02/23/2006	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.25
2006-08102-026556	04/13/2006	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.2
2006-08110-011328	01/15/2006	Phelps	St. James Fire Protection District	Miscellaneous	0.1
2006-08110-011330	01/15/2006	Phelps	St. James Fire Protection District	Debris	1
2006-08110-011334	01/19/2006	Phelps	St. James Fire Protection District	Not Reported	0.5
2006-08110-011336	01/27/2006	Phelps	St. James Fire Protection District	Debris	1.5
2006-08110-023854	02/14/2006	Phelps	St. James Fire Protection District	Debris	0.5
2006-08110-023857	02/23/2006	Phelps	St. James Fire Protection District	Debris	2
2006-08110-023858	02/24/2006	Phelps	St. James Fire Protection District	Debris	1
2006-08110-023859	02/27/2006	Phelps	St. James Fire Protection District	Unknown	0.5
2006-08110-023860	03/14/2006	Phelps	St. James Fire Protection District	Debris	0.25
2006-08110-023862	03/26/2006	Phelps	St. James Fire Protection District	Debris	3
2006-08110-023863	03/30/2006	Phelps	St. James Fire Protection District	Debris	1
2006-08110-023864	03/31/2006	Phelps	St. James Fire Protection District	Debris	3
2007-08100-027833	02/23/2007	Phelps	ROLLA FORESTRY	Debris	50
2007-08100-027958	03/05/2007	Phelps	ROLLA FORESTRY	Not Reported	75
2007-08100-031419	08/15/2007	Phelps	ROLLA FORESTRY	Debris	20
2007-08110-029971	01/26/2007	Phelps	St. James Fire Protection District	Unknown	4
2007-08110-029972	02/10/2007	Phelps	St. James Fire Protection District	Unknown	0.5
2007-08110-029973	02/23/2007	Phelps	St. James Fire Protection District	Unknown	2
2007-08110-029974	03/04/2007	Phelps	St. James Fire Protection District	Unknown	0.25
2007-08110-029975	03/06/2007	Phelps	St. James Fire Protection District	Debris	0.5
2007-08110-029976	03/10/2007	Phelps	St. James Fire Protection District	Debris	1.5
2007-08110-029977	03/10/2007	Phelps	St. James Fire Protection District	Debris	2
2007-08110-029978	03/11/2007	Phelps	St. James Fire Protection District	Campfire	0.5
2007-08110-029980	03/21/2007	Phelps	St. James Fire Protection District	Debris	0.5
2007-08110-029981	04/09/2007	Phelps	St. James Fire Protection District	Debris	0.25
2007-08110-029982	04/19/2007	Phelps	St. James Fire Protection District	Debris	0.5
2007-08110-029983	04/20/2007	Phelps	St. James Fire Protection District	Debris	0.25

2007-08110-029984	04/22/2007	Phelps	St. James Fire Protection District	Debris	0.5
2008-02811-034179	03/02/2008	Phelps	Cuba Fire Department	Not Reported	320
2008-02813-034395	03/02/2008	Phelps	Steelville Fire Protection District	Unknown	700
2008-02813-034398	03/12/2008	Phelps	Steelville Fire Protection District	Unknown	100
2008-08100-033608	03/02/2008	Phelps	ROLLA FORESTRY	Debris	22
2008-08100-033609	03/02/2008	Phelps	ROLLA FORESTRY	Miscellaneous	120
2008-08100-033731	03/13/2008	Phelps	ROLLA FORESTRY	Debris	2
2008-08100-034095	03/25/2008	Phelps	ROLLA FORESTRY	Arson	110
2008-08102-034291	01/03/2008	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.5
2008-08102-034292	01/04/2008	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2008-08102-034293	01/07/2008	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.5
2008-08102-034355	01/20/2008	Phelps	Rolla Rural Fire Protection District	Campfire	25
2009-02811-040300	03/23/2009	Phelps	Cuba Fire Department	Unknown	78
2009-08100-038250	03/09/2009	Phelps	ROLLA FORESTRY	Railroad	0.25
2009-08100-038600	03/16/2009	Phelps	ROLLA FORESTRY	Debris	25
2009-08100-038912	03/23/2009	Phelps	ROLLA FORESTRY	Debris	8
2009-08100-038914	03/23/2009	Phelps	ROLLA FORESTRY	Smoking	80
2009-08102-039157	01/17/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039158	01/22/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	2
2009-08102-039159	01/22/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	7
2009-08102-039160	02/10/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039161	01/09/2009	Phelps	Rolla Rural Fire Protection District	Unknown	2
2009-08102-039162	03/14/2009	Phelps	Rolla Rural Fire Protection District	Unknown	3
2009-08102-039163	01/09/2009	Phelps	Rolla Rural Fire Protection District	Unknown	30
2009-08102-039164	01/21/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039165	02/22/2009	Phelps	Rolla Rural Fire Protection District	Unknown	5
2009-08102-039228	01/22/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	12
2009-08102-039229	03/17/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	10
2009-08102-039230	03/23/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1

2009-08102-039231	03/26/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1
2009-08102-039232	03/23/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	5
2009-08102-039234	02/25/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	5
2009-08102-039235	03/22/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	4
2009-08102-039247	02/23/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	2
2009-08102-039248	03/23/2009	Phelps	Rolla Rural Fire Protection District	Unknown	2
2009-08102-039249	03/23/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039251	03/17/2009	Phelps	Rolla Rural Fire Protection District	Unknown	3
2009-08102-039252	02/25/2009	Phelps	Rolla Rural Fire Protection District	Unknown	2
2009-08102-039253	03/14/2009	Phelps	Rolla Rural Fire Protection District	Arson	1
2009-08102-039254	03/14/2009	Phelps	Rolla Rural Fire Protection District	Arson	1
2009-08102-039255	03/17/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039256	03/17/2009	Phelps	Rolla Rural Fire Protection District	Unknown	2
2009-08102-039257	03/20/2009	Phelps	Rolla Rural Fire Protection District	Unknown	2
2009-08102-039258	03/22/2009	Phelps	Rolla Rural Fire Protection District	Unknown	15
2009-08102-039260	03/16/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039261	03/05/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039262	03/05/2009	Phelps	Rolla Rural Fire Protection District	Unknown	3
2009-08102-039264	03/06/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039265	03/09/2009	Phelps	Rolla Rural Fire Protection District	Railroad	1
2009-08102-039266	03/10/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039267	03/04/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039268	02/25/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039269	02/25/2009	Phelps	Rolla Rural Fire Protection District	Arson	1
2009-08102-039270	01/13/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039271	03/30/2009	Phelps	Rolla Rural Fire Protection District	Unknown	1
2009-08102-039366	01/22/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	3
2009-08102-039367	02/16/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	2
2009-08102-039368	01/02/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1

2009-08102-039369	02/16/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1
2009-08102-039370	02/16/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	15
2009-08102-039371	03/20/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1
2009-08102-039372	03/22/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	10
2009-08102-039373	01/22/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	5
2009-08102-039374	03/30/2009	Phelps	Rolla Rural Fire Protection District	Miscellaneous	2
2009-08104-039652	03/30/2009	Phelps	Duke Rural Fire Department	Arson	8
2009-08104-039654	04/03/2009	Phelps	Duke Rural Fire Department	Arson	0.5
2009-08104-039657	04/04/2009	Phelps	Duke Rural Fire Department	Arson	0.8
2009-08104-039658	04/04/2009	Phelps	Duke Rural Fire Department	Arson	0.5
2009-08104-039659	04/07/2009	Phelps	Duke Rural Fire Department	Unknown	1
2009-08104-039660	04/08/2009	Phelps	Duke Rural Fire Department	Unknown	0.5
2009-08104-039661	04/08/2009	Phelps	Duke Rural Fire Department	Unknown	50
2009-08104-039662	04/08/2009	Phelps	Duke Rural Fire Department	Unknown	2
2009-08104-039663	04/08/2009	Phelps	Duke Rural Fire Department	Arson	0.8
2009-08104-039664	04/08/2009	Phelps	Duke Rural Fire Department	Arson	0.8
2009-08104-039764	03/30/2009	Phelps	Duke Rural Fire Department	Arson	8
2009-08104-039765	04/15/2009	Phelps	Duke Rural Fire Department	Arson	4
2009-08104-039793	04/16/2009	Phelps	Duke Rural Fire Department	Arson	4
2010-08101-044424	02/20/2010	Phelps	Doolittle Rural Fire Protection District	Debris	2
2010-08101-044736	03/10/2010	Phelps	Doolittle Rural Fire Protection District	Miscellaneous	2
2010-08101-045059	03/22/2010	Phelps	Doolittle Rural Fire Protection District	Miscellaneous	2
2010-08101-045396	04/09/2010	Phelps	Doolittle Rural Fire Protection District	Debris	0.5
2010-08101-045398	03/06/2010	Phelps	Doolittle Rural Fire Protection District	Debris	20
2010-08101-045412	03/06/2010	Phelps	Doolittle Rural Fire Protection District	Debris	75
2010-08101-045413	03/07/2010	Phelps	Doolittle Rural Fire Protection District	Debris	40
2010-08101-045487	04/12/2010	Phelps	Doolittle Rural Fire Protection District	Debris	2
2010-08101-045609	04/19/2010	Phelps	Doolittle Rural Fire Protection District	Unknown	0.3
2010-08101-046754	07/01/2010	Phelps	Doolittle Rural Fire Protection District	Lightning	0.22

2010-08101-047222	07/28/2010	Phelps	Doolittle Rural Fire Protection District	Debris	0.1
2010-08101-049167	10/18/2010	Phelps	Doolittle Rural Fire Protection District	Debris	0.1
2010-08101-049201	10/28/2010	Phelps	Doolittle Rural Fire Protection District	Unknown	10
2010-08101-049202	10/20/2010	Phelps	Doolittle Rural Fire Protection District	Unknown	0.1
2010-08101-049400	11/06/2010	Phelps	Doolittle Rural Fire Protection District	Unknown	3
2010-08101-049582	11/08/2010	Phelps	Doolittle Rural Fire Protection District	Unknown	2.5
2010-08518-052782	10/30/2010	Phelps	Dixon Rural Fire Protection District	Debris	1
2010-08518-052803	10/31/2010	Phelps	Dixon Rural Fire Protection District	Smoking	0.1
2011-02811-056592	04/16/2011	Phelps	Cuba Fire Department	Unknown	20
2011-08101-054818	03/04/2011	Phelps	Doolittle Rural Fire Protection District	Unknown	0.5
2011-08101-054826	03/03/2011	Phelps	Doolittle Rural Fire Protection District	Debris	5
2011-08101-054827	03/03/2011	Phelps	Doolittle Rural Fire Protection District	Debris	1
2011-08101-054828	02/17/2011	Phelps	Doolittle Rural Fire Protection District	Debris	7
2011-08101-054981	01/30/2011	Phelps	Doolittle Rural Fire Protection District	Unknown	0.5
2011-08101-055236	03/12/2011	Phelps	Doolittle Rural Fire Protection District	Debris	5
2011-08101-055237	03/12/2011	Phelps	Doolittle Rural Fire Protection District	Debris	1
2011-08101-055248	03/19/2011	Phelps	Doolittle Rural Fire Protection District	Debris	1
2011-08101-055337	03/19/2011	Phelps	Doolittle Rural Fire Protection District	Debris	1
2011-08101-055338	03/23/2011	Phelps	Doolittle Rural Fire Protection District	Unknown	3
2011-08101-055421	03/24/2011	Phelps	Doolittle Rural Fire Protection District	Unknown	5
2011-08101-056163	04/03/2011	Phelps	Doolittle Rural Fire Protection District	Unknown	30
2011-08101-056327	04/08/2011	Phelps	Doolittle Rural Fire Protection District	Debris	0.01
2011-08101-056551	04/17/2011	Phelps	Doolittle Rural Fire Protection District	Debris	0.2
2011-08101-058761	07/27/2011	Phelps	Doolittle Rural Fire Protection District	Debris	0.5
2011-08102-065288	12/30/2011	Phelps	Rolla Rural Fire Protection District	Debris	1.5
2011-08518-056321	04/09/2011	Phelps	Dixon Rural Fire Protection District	Debris	0.5
2012-02811-073885	06/28/2012	Phelps	Cuba Fire Department	Unknown	40
2012-02811-079271	08/21/2012	Phelps	Cuba Fire Department	Unknown	30
2012-03322-073699	06/08/2012	Phelps	Lenox Rural Fire Department	Debris	100

2012-08102-065289	01/05/2012	Phelps	Rolla Rural Fire Protection District	Debris	30
2012-08102-065342	01/06/2012	Phelps	Rolla Rural Fire Protection District	Debris	2
2012-08102-065343	01/06/2012	Phelps	Rolla Rural Fire Protection District	Debris	2
2012-08102-065344	01/07/2012	Phelps	Rolla Rural Fire Protection District	Debris	2
2012-08102-065345	01/07/2012	Phelps	Rolla Rural Fire Protection District	Debris	3
2012-08102-065626	01/06/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08102-065627	01/07/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08102-065647	01/06/2012	Phelps	Rolla Rural Fire Protection District	Debris	4
2012-08102-065648	01/09/2012	Phelps	Rolla Rural Fire Protection District	Debris	2.5
2012-08102-066047	01/05/2012	Phelps	Rolla Rural Fire Protection District	Miscellaneous	5
2012-08102-066508	01/25/2012	Phelps	Rolla Rural Fire Protection District	Miscellaneous	2
2012-08102-066509	01/29/2012	Phelps	Rolla Rural Fire Protection District	Unknown	1
2012-08102-066510	02/02/2012	Phelps	Rolla Rural Fire Protection District	Unknown	1
2012-08102-066525	02/02/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08102-066526	01/29/2012	Phelps	Rolla Rural Fire Protection District	Unknown	3
2012-08102-066661	02/02/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08102-066662	02/02/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08102-067482	02/19/2012	Phelps	Rolla Rural Fire Protection District	Debris	5
2012-08102-067483	02/20/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08102-067501	02/20/2012	Phelps	Rolla Rural Fire Protection District	Equipment	10
2012-08102-067643	02/20/2012	Phelps	Rolla Rural Fire Protection District	Unknown	4
2012-08102-068281	02/27/2012	Phelps	Rolla Rural Fire Protection District	Debris	5
2012-08102-068282	02/27/2012	Phelps	Rolla Rural Fire Protection District	Debris	5
2012-08102-068283	02/28/2012	Phelps	Rolla Rural Fire Protection District	Debris	3
2012-08102-068301	02/28/2012	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2012-08102-068302	02/28/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08102-068303	03/01/2012	Phelps	Rolla Rural Fire Protection District	Debris	0.5
2012-08102-068652	03/13/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08102-068802	03/06/2012	Phelps	Rolla Rural Fire Protection District	Debris	2

2012-08102-068803	03/06/2012	Phelps	Rolla Rural Fire Protection District	Debris	1000
2012-08102-069781	03/04/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08102-069782	03/10/2012	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2012-08102-069961	03/19/2012	Phelps	Rolla Rural Fire Protection District	Debris	1
2012-08518-067063	01/24/2012	Phelps	Dixon Rural Fire Protection District	Debris	20
2012-08518-071027	03/01/2012	Phelps	Dixon Rural Fire Protection District	Debris	2
2012-08518-071070	04/25/2012	Phelps	Dixon Rural Fire Protection District	Debris	25
2012-08518-074261	05/22/2012	Phelps	Dixon Rural Fire Protection District	Debris	1
2012-08518-074302	07/14/2012	Phelps	Dixon Rural Fire Protection District	Debris	10
2012-10714-069799	03/07/2012	Phelps	Licking Fire Dept.	Unknown	25
2012-10714-069841	03/06/2012	Phelps	Licking Fire Dept.	Unknown	100
2012-10714-073450	06/08/2012	Phelps	Licking Fire Dept.	Unknown	100
2012-10714-076641	08/16/2012	Phelps	Licking Fire Dept.	Unknown	60
2012-76409-068038	03/06/2012	Phelps	SALEM FORESTRY	Arson	12
2013-02811-090211	04/06/2013	Phelps	Cuba Fire Department	Debris	5
2013-08102-086343	04/17/2013	Phelps	Rolla Rural Fire Protection District	Unknown	2
2014-00008-095683	03/15/2014	Phelps	MDC REPORTING REGION - ST. LOUIS	Debris	10
2014-02811-106551	03/13/2014	Phelps	Cuba Fire Department	Debris	15
2014-02813-095223	03/11/2014	Phelps	Steelville Fire Protection District	Unknown	5
2014-03322-096137	03/15/2014	Phelps	Lenox Rural Fire Department	Debris	22
2014-06313-111592	03/28/2014	Phelps	Vichy Volunteer Fire Protection Assoc	Miscellaneous	21
2014-08102-095061	01/01/2014	Phelps	Rolla Rural Fire Protection District	Miscellaneous	3
2014-08102-095114	01/14/2014	Phelps	Rolla Rural Fire Protection District	Unknown	5
2014-08102-095115	01/20/2014	Phelps	Rolla Rural Fire Protection District	Unknown	3
2014-08102-095116	01/26/2014	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2014-08102-095119	01/29/2014	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2014-08102-095120	01/29/2014	Phelps	Rolla Rural Fire Protection District	Unknown	2
2014-08102-095121	02/11/2014	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2014-08102-095122	02/19/2014	Phelps	Rolla Rural Fire Protection District	Unknown	0.25

2014-08102-095123	02/22/2014	Phelps	Rolla Rural Fire Protection District	Unknown	3
2014-08102-095124	02/24/2014	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2014-08102-095125	02/27/2014	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2014-08102-095126	03/01/2014	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2014-08102-095127	03/05/2014	Phelps	Rolla Rural Fire Protection District	Debris	0.25
2014-08102-095128	03/06/2014	Phelps	Rolla Rural Fire Protection District	Unknown	0.5
2014-08102-095139	03/05/2014	Phelps	Rolla Rural Fire Protection District	Miscellaneous	4
2014-08518-095060	03/07/2014	Phelps	Dixon Rural Fire Protection District	Debris	2
2015-03322-122295	03/31/2015	Phelps	Lenox Rural Fire Department	Debris	5
2015-08102-128992	01/09/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-128993	02/07/2015	Phelps	Rolla Rural Fire Protection District	Miscellaneous	5
2015-08102-128994	02/08/2015	Phelps	Rolla Rural Fire Protection District	Equipment	1
2015-08102-128995	02/27/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-128996	03/07/2015	Phelps	Rolla Rural Fire Protection District	Unknown	20
2015-08102-128997	03/15/2015	Phelps	Rolla Rural Fire Protection District	Not Reported	2
2015-08102-128998	03/15/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-128999	03/15/2015	Phelps	Rolla Rural Fire Protection District	Unknown	2
2015-08102-129000	03/15/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-129001	03/23/2015	Phelps	Rolla Rural Fire Protection District	Unknown	2
2015-08102-129002	03/23/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-129003	03/28/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-129019	03/30/2015	Phelps	Rolla Rural Fire Protection District	Unknown	30
2015-08102-129020	03/30/2015	Phelps	Rolla Rural Fire Protection District	Unknown	5
2015-08102-129021	03/30/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-129022	03/31/2015	Phelps	Rolla Rural Fire Protection District	Debris	2
2015-08102-129023	03/31/2015	Phelps	Rolla Rural Fire Protection District	Unknown	20
2015-08102-129024	04/01/2015	Phelps	Rolla Rural Fire Protection District	Debris	5
2015-08102-129026	04/12/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-129027	04/12/2015	Phelps	Rolla Rural Fire Protection District	Debris	30

2015-08102-129028	05/03/2015	Phelps	Rolla Rural Fire Protection District	Unknown	1
2015-08102-129029	06/27/2015	Phelps	Rolla Rural Fire Protection District	Unknown	1
2015-08102-129031	08/08/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-129032	08/11/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2015-08102-129033	10/01/2015	Phelps	Rolla Rural Fire Protection District	Debris	1
2016-01500-131971	10/17/2016	Phelps	CAMDENTON FORESTRY	Campfire	198.62
2016-03322-135518	04/03/2016	Phelps	Lenox Rural Fire Department	Unknown	40
2016-03322-135520	04/03/2016	Phelps	Lenox Rural Fire Department	Unknown	40
2016-06313-141131	01/16/2016	Phelps	Vichy Volunteer Fire Protection Assoc	Miscellaneous	2
2016-10714-132617	12/20/2015	Phelps	Licking Fire Dept.	Unknown	2
2016-10714-133949	02/29/2016	Phelps	Licking Fire Dept.	Debris	25
2017-02811-145753	02/15/2017	Phelps	Cuba Fire Department	Debris	10
2017-03322-149311	04/04/2017	Phelps	Lenox Rural Fire Department	Not Reported	1
2017-06313-164921	11/27/2017	Phelps	Vichy Volunteer Fire Protection Assoc	Miscellaneous	17
2019-00000-178224	04/30/2018	Phelps	MDC Forestry	Debris	30.51
2019-08102-178592	04/07/2019	Phelps	Rolla Rural Fire Protection District	Unknown	2.05
2019-08102-178606	04/10/2019	Phelps	Rolla Rural Fire Protection District	Unknown	17.85
2019-08102-178607	03/22/2019	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.05
2019-08102-178613	12/05/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.02
2019-08102-178621	04/22/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.03
2019-08102-178623	04/21/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.58
2019-08102-178629	04/07/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	3.46
2019-08102-178630	04/09/2018	Phelps	Rolla Rural Fire Protection District	Not Reported	0.66
2019-08102-178631	04/10/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.01
2019-08102-178632	03/23/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	
2019-08102-178638	03/22/2018	Phelps	Rolla Rural Fire Protection District	Unknown	
2019-08102-178639	03/14/2018	Phelps	Rolla Rural Fire Protection District	Debris	1.94
2019-08102-178640	03/14/2018	Phelps	Rolla Rural Fire Protection District	Unknown	2.63
2019-08102-178641	03/14/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.02

2019-08102-178648	04/25/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.2
2019-08102-178649	02/25/2019	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.16
2019-08102-178674	08/10/2018	Phelps	Rolla Rural Fire Protection District	Debris	
2019-08102-178675	08/09/2018	Phelps	Rolla Rural Fire Protection District	Debris	0.11
2019-08102-178688	08/17/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.01
2019-08102-178691	08/08/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.07
2019-08102-178698	07/09/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.89
2019-08102-178699	07/09/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.01
2019-08102-178700	04/24/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.66
2019-08102-178701	03/04/2018	Phelps	Rolla Rural Fire Protection District	Smoking	0.23
2019-08102-178702	03/04/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.25
2019-08102-178703	03/04/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.14
2019-08102-178704	03/03/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	4.52
2019-08102-178711	02/27/2018	Phelps	Rolla Rural Fire Protection District	Unknown	12.82
2019-08102-178712	02/27/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.92
2019-08102-178713	02/15/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.17
2019-08102-178714	02/15/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.01
2019-08102-178715	02/09/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	7.84
2019-08102-178721	02/03/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1.92
2019-08102-178726	02/01/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1.19
2019-08102-178727	02/01/2018	Phelps	Rolla Rural Fire Protection District	Unknown	2.72
2019-08102-178728	02/01/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.93
2019-08102-178729	01/03/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.13
2019-08102-178730	01/06/2018	Phelps	Rolla Rural Fire Protection District	Unknown	8.59
2019-08102-178731	01/06/2018	Phelps	Rolla Rural Fire Protection District	Unknown	1.05
2019-08102-178732	03/03/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1.13
2019-08102-178735	03/03/2018	Phelps	Rolla Rural Fire Protection District	Unknown	5.92
2019-08102-178736	01/29/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	
2019-08102-178737	01/28/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.33

2019-08102-178738	01/28/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.01
2019-08102-178741	01/28/2018	Phelps	Rolla Rural Fire Protection District	Miscellaneous	1.69
2019-08102-178744	01/26/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.27
2019-08102-178745	01/25/2018	Phelps	Rolla Rural Fire Protection District	Unknown	10.04
2019-08102-178746	01/25/2018	Phelps	Rolla Rural Fire Protection District	Unknown	0.97
2019-08102-178747	12/04/2017	Phelps	Rolla Rural Fire Protection District	Miscellaneous	4.87
2019-08102-178749	12/02/2017	Phelps	Rolla Rural Fire Protection District	Unknown	6.33
2019-08102-178758	12/02/2017	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.19
2019-08102-178759	11/29/2017	Phelps	Rolla Rural Fire Protection District	Unknown	1.47
2019-08102-178760	11/21/2017	Phelps	Rolla Rural Fire Protection District	Unknown	0.24
2019-08102-178761	11/20/2017	Phelps	Rolla Rural Fire Protection District	Unknown	0.08
2019-08102-178763	11/05/2017	Phelps	Rolla Rural Fire Protection District	Unknown	0.03
2019-08102-178768	11/24/2017	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.3
2019-08102-178773	11/23/2017	Phelps	Rolla Rural Fire Protection District	Miscellaneous	2.25
2019-08102-178774	11/23/2017	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.38
2019-08102-178775	11/02/2017	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.07
2019-08102-178776	11/01/2017	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.01
2019-08102-178790	07/28/2017	Phelps	Rolla Rural Fire Protection District	Debris	5.61
2019-08102-178791	09/15/2017	Phelps	Rolla Rural Fire Protection District	Unknown	0.03
2019-08102-178792	09/23/2017	Phelps	Rolla Rural Fire Protection District	Debris	4.23
2019-08102-178793	06/28/2017	Phelps	Rolla Rural Fire Protection District	Fireworks	0.02
2019-08102-178794	06/26/2017	Phelps	Rolla Rural Fire Protection District	Unknown	0.05
2019-08102-178795	04/14/2017	Phelps	Rolla Rural Fire Protection District	Debris	4.03
2019-08102-178796	04/13/2017	Phelps	Rolla Rural Fire Protection District	Debris	0.02
2019-08102-178804	04/08/2017	Phelps	Rolla Rural Fire Protection District	Debris	1.45
2019-08102-178805	04/08/2017	Phelps	Rolla Rural Fire Protection District	Debris	0.02
2019-08102-178809	03/24/2017	Phelps	Rolla Rural Fire Protection District	Unknown	5.72
2019-08102-178810	03/24/2017	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.27
2019-08102-178811	03/23/2017	Phelps	Rolla Rural Fire Protection District	Power line	0.17

2019-08102-178812	03/23/2017	Phelps	Rolla Rural Fire Protection District	Unknown	1.34
2019-08102-178813	03/18/2017	Phelps	Rolla Rural Fire Protection District	Equipment	3.02
2019-08102-178814	03/16/2017	Phelps	Rolla Rural Fire Protection District	Debris	0.07
2019-08102-178815	03/16/2017	Phelps	Rolla Rural Fire Protection District	Debris	0.7
2019-08102-178816	03/16/2017	Phelps	Rolla Rural Fire Protection District	Debris	0.1
2019-08102-178817	03/04/2017	Phelps	Rolla Rural Fire Protection District	Miscellaneous	0.46
2019-08102-178818	11/27/2017	Phelps	Rolla Rural Fire Protection District	Debris	0.32
2019-08102-179467	09/16/2019	Phelps	Rolla Rural Fire Protection District	Unknown	
2019-08102-179599	12/04/2019	Phelps	Rolla Rural Fire Protection District	Equipment	0.16
2019-08102-179600	12/09/2019	Phelps	Rolla Rural Fire Protection District	Unknown	0.52
2019-08102-179601	12/11/2019	Phelps	Rolla Rural Fire Protection District	Unknown	0.17
2019-08102-179602	12/12/2019	Phelps	Rolla Rural Fire Protection District	Unknown	7.96
2019-08102-179603	12/12/2019	Phelps	Rolla Rural Fire Protection District	Unknown	0.02
2019-08110-178381	03/26/2019	Phelps	St. James Fire Protection District	Unknown	
2019-08110-178383	03/21/2019	Phelps	St. James Fire Protection District	Debris	0.03
2019-08110-179509	11/20/2019	Phelps	St. James Fire Protection District	Debris	1.52
2019-08110-179510	11/20/2019	Phelps	St. James Fire Protection District	Debris	0.02
2019-08110-179573	12/11/2019	Phelps	St. James Fire Protection District	Miscellaneous	6.64

Source: Missouri Department of Conservation, Fire Report Search, https://mdc12.mdc.mo.gov/Applications/MDCFireReporting/Home/FireReportSearch