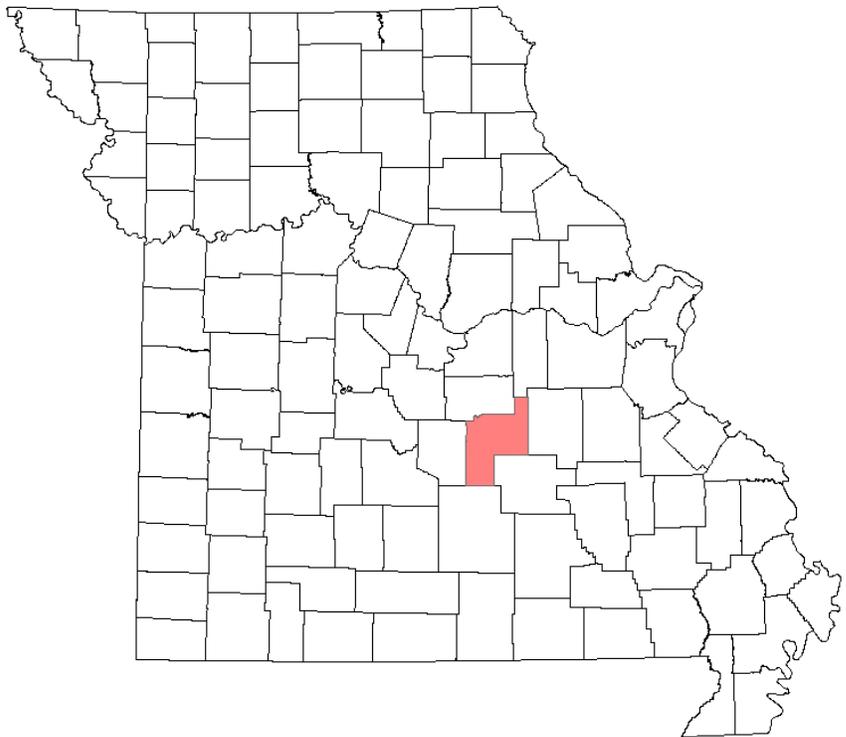


# *Phelps County Multi-Jurisdiction Natural Hazard Mitigation Plan*



Meramec Regional Planning Commission • August 2016



## CONTRIBUTORS

### Phelps County Hazard Mitigation Planning Committee

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

#### Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Organization
Della Bishop	City Clerk	City Admin.	Doolittle
Paul Smith	Mayor	City Admin.	Doolittle
Travis Gray	Superintendent	City Admin.	Doolittle
William S. Jones	Police Chief	Police Dept.	Doolittle
Everett Perkins	Superintendent Water	Water	Edgar Springs
Kody Lucas	Police Chief	Police Dept.	Edgar Springs
Paula James	City Administrator	City Admin.	Edgar Springs
Phil Scruggs	Mayor	City Admin.	Edgar Springs
	Electric Superintendent	Utilities	Newburg
Chrissy Crider	EMD	Emergency	Newburg
Danny Hamilton	Street Superintendent		Newburg
David Simpson	Water/Sewer Super.	Water/Sewer	Newburg
James Poucher	Mayor	City Admin.	Newburg
Kris Finch	Police Chief	Police Dept.	Newburg
Phillis Harris	City Clerk	City Admin.	Newburg
John Westerman		School District	Newburg R-II
Gary Hicks	Associate Commissioner	County	Phelps County
Larry Stratman	Associate Commissioner	County	Phelps County
Pamela Grow	Phelps County Clerk	County	Phelps County
Randy Verkamp	President Commissioner	County	Phelps County
Rick Lisenbe	Sheriff	Law Enforcement	Phelps County
Sandy North	EMD	County	Phelps County
Sherry Heavin	Superintendent	School District	Phelps County R-III
Brady Wilson	Director of Environmental Services	Environmental	Rolla
Carol Daniels	City Clerk	City Admin.	Rolla
John Butz	City Administrator	City Admin.	Rolla
John Petersen	Community Development Director		Rolla
Louis J. Magdits, IV	Mayor	City Admin.	Rolla
Rick Williams	Police Chief/EMD	Police Dept./Emergency	Rolla
Robert Williams	Fire Chief	Fire Dept.	Rolla
Rodney Bourne	Rolla Municipal Utilities GM	Utilities	Rolla
Scott Caron	Parks and Rec Director	Parks & Rec	Rolla
Steve Hargis	Public Works Director	Public Works	Rolla
Dr. Aaron Zalis	Superintendent	School District	Rolla 31
Bruce Parton	Fire Chief/EMD	Fire/Emergency	St. James
Clay Coffman	Parks & Rec Director	Parks & Rec	St. James

Name	Title	Department	Jurisdiction/Agency/Organization
Dennis Wilson	Mayor	City Admin.	St. James
Jeff Davis	Fire Chief	Fire Dept.	St. James
John Edgar	Street Supervisor		St. James
Linda Hanrahan		Ambulance	St. James
Mike Licklider	Utilities Superintendent	Utilities	St. James
Ron Jones	Police Chief	Police Dept.	St. James
Sarah Wheeler	City Clerk	City Admin.	St. James
Joy Tucker	Superintendent	School District	St. James R-I

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

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

### **Stakeholder Representatives**

Name	Title	Department	Agency/Organization
All Star Gas			All Star Gas
Dave N. Wakeman			AMEREN UE
Dave Griffith			American Red Cross
Philip Iman			American Red Cross
Cedar Knoll Home			Assisted Living
County Valley Home			Assisted Living
Parkside Assisted Living			Assisted Living
Jeff Faulkner			BNSF Railway
Administrator			Boys and Girls Town of Missouri
Chris Mueller			Centurytel
Charter Cable			Charter Cable
Kimberly Bonine			Columbia College
Tony Mallory			Crawford Electric Cooperative
Mary Larusi			Drury University
Christina Ayres			East Central College
Leo Pelek			Ferrellgas
Fidelity Communications			Fidelity Communications
Carmen Hartwell			Gascosage Electric Cooperative
Rosewood Residential Care			Home Health Care Services
Aaron Bradshaw			Intercounty Electric Cooperative
Lea's Haven			Intermediate Care Facility
Forest Supervisors Office			Mark Twain National Forest
Mary Gapsch			Metro Business College
MDC			Missouri Department of Conservation
Commanding Officer			Missouri National Guard

<b>Name</b>	<b>Title</b>	<b>Department</b>	<b>Agency/Organization</b>
David Wallen			Missouri Pipeline & Missouri Gas
Michele Bresnahan			Missouri Science & Technology
Missouri State Hwy Patrol			Missouri State Highway Patrol
Administrator			Missouri Veterans Home
Preston Kramer			MoDOT
Ferndale, Inc.			Nursing Home
St. James Nursing Center			Nursing Home
Gary Koegeboehn			NUSTAR Pipeline
Debbie Hallinar			PCRMC Medical Group, Inc.
Poe's Gas			Poe's Gas
Gary Fulks			Sho-Me Power Cooperative
Heritage Park Skilled Care			Skilled Care
Administrator			St. Johns Clinic
Tom Werdenhause			Three Rivers Electric Cooperative
Todd Preston			Verizon Wireless
Dr. Brad Frazier			Walmart Distribution Center
Gregory Stratman			Webster University/Rolla Metro

**TABLE OF CONTENTS**

**Executive Summary .....vii**

Contributors .....i

Table of Contents..... iv

Prerequisites..... ix

**1 Introduction and Planning Process .....1.1**

    1.1 Purpose.....1.1

    1.2 Background and Scope .....1.2

    1.3 Plan Organization .....1.2

    1.4 Planning Process.....1.4

        1.4.1 Multi-Jurisdictional Participation .....1.7

        1.4.2 The Planning Steps.....1.9

**2 Planning Area Profile and Capabilities .....2.1**

    2.1 Phelps County Planning Area Profile .....2.2

        2.1.2 Geography, Geology, and Topography .....2.4

        2.1.3 Climate.....2.9

        2.1.4 Population/Demographics .....2.9

        2.1.5 History.....2.13

        2.1.6 Occupations.....2.14

        2.1.7 Agriculture.....2.14

        2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area.....2.15

    2.2 Jurisdictional Profiles and Mitigation Capabilities .....2.15

        Unincorporated Phelps County .....2.15

        City of Doolittle.....2.19

        City of Edgar Springs .....2.22

        City of Newburg .....2.25

        City of Rolla .....2.28

City of St. James.....	2.31
Public School District Profiles and Mitigation Capabilities .....	2.40
Critical Facilities .....	2.45
<b>3 Risk Assessment .....</b>	<b>3.1</b>
3.1 Hazard Identification.....	3.4
3.1.1 Review of Existing Mitigation Plans.....	3.4
3.1.2 Review Disaster Declaration History .....	3.7
3.1.3 Research Additional Sources .....	3.9
3.1.4 Hazards Identified .....	3.11
3.1.5 Multi-Jurisdictional Risk Assessment.....	3.14
3.2 Assets at Risk.....	3.14
3.2.1 Total Exposure of Population and Structures .....	3.14
3.2.2 Critical and Essential Facilities and Infrastructure .....	3.16
3.2.3 Other Assets .....	3.19
3.3 Future Land Use and Development .....	3.23
3.4 Hazard Profiles, Vulnerability, and Problem Statements.....	3.26
3.4.1 Dam Failure .....	3.29
3.4.2 Drought.....	3.55
3.4.3 Earthquakes.....	3.68
3.4.4 Extreme Heat.....	3.82
3.4.5 Fires (Urban/Structural and Wild).....	3.90
3.4.6 Flooding (Flash and River) .....	3.98
3.4.7 Land Subsidence/Sinkholes .....	3.129
3.4.8 Thunderstorm/High Winds/Lightning/Hail .....	3.137
3.4.9 Tornado .....	3.154
3.4.10 Winter Weather/Snow/Ice/Severe Cold .....	3.166
<b>4 Mitigation Strategy.....</b>	<b>4.1</b>

4.1 Goals.....	4.1
4.2 Identification and Analysis of Mitigation Actions.....	4.2
4.3 Implementation of Mitigation Actions .....	4.3
<b>5 Plan Maintenance Process .....</b>	<b>5.1</b>
5.1 Monitoring, Evaluating, and Updating the Plan .....	5.1
5.1.1 Responsibility for Plan Maintenance .....	5.1
5.1.2 Plan Maintenance Schedule.....	5.2
5.1.3 Plan Maintenance Process.....	5.2
5.2 Incorporation into Existing Planning Mechanisms .....	5.3
5.3 Continued Public Involvement .....	5.6
<b>6 Appendix .....</b>	<b>6.1</b>
A: References.....	6.2
B: Planning Process .....	6.6
C: Completed/Deleted Mitigation Actions.....	6.35
D: Adoption Resolutions .....	6.40
E: Critical/Essential Facilities.....	6.50
F: MDC Wildfire Data Search .....	6.54

## 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 December 1, 2011. The original plan was approved in November 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
- Phelps Co. R-III School District
- Newburg R-II School District
- St. James R-I School District
- Rolla 31 School District

Phelps County and the jurisdictions listed above developed a multi-jurisdictional Hazard Mitigation Plan that was originally approved by FEMA in November 2014 with an update approved by FEMA on December 1, 2011 (expiration December 1, 2016). This current planning effort serves as an update (hereafter referred to as the 2016 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, with emphasis on changes that have occurred since the previously approved plan was adopted. The MPC determined that the planning area is vulnerable to several hazards that are identified, profiled and analyzed in this plan. Riverine and flash flooding, winter storms, severe thunderstorms/hail/lightening/high winds and tornadoes are among the hazards that historically have had a significant impact.

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

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

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

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

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

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

**Goal 6:** Secure resources for investment in hazard mitigation.

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

## 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 Co. R-III School District
- Rolla 31 School District

# Model Resolution

Resolution # \_\_\_\_\_

## Adopting the Phelps County Multi-Jurisdictional Local Hazard Mitigation Plan

**Whereas**, the (Name of 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 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

**Whereas**, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

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

**Whereas**, the (Name of Government/District) \_\_\_\_\_ fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

**Whereas**, the Missouri State Emergency Management Agency and the Federal Emergency Management Agency Region VII officials will review the “Phelps County Multi-Jurisdictional Local Hazard Mitigation Plan,” and approved it as to form and content; and

**Whereas**, the (Name of 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-Jurisdictional Local Hazard Mitigation Plan; and

**Whereas**, adoption by the governing body for the (Name of Government/District) \_\_\_\_\_ demonstrates the jurisdictions’ commitment to fulfilling the mitigation goals outlined in this Multi- Jurisdictional Local Hazard Mitigation Plan; and

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

**Now, therefore, be it resolved**, that the (Name of Government/District) \_\_\_\_\_ has adopted the “Phelps County Multi-Jurisdictional Local Hazard Mitigation Plan” as an official plan.

Date: \_\_\_\_\_

Certifying Official: \_\_\_\_\_

# 1 Introduction and Planning Process

---

<b>1 Introduction and Planning Process</b> .....	<b>1.1</b>
1.1 Purpose .....	1.1
1.2 Background and Scope .....	1.2
1.3 Plan Organization .....	1.2
1.4 Planning Process .....	1.4
1.4.1 Multi-Jurisdictional Participation .....	1.7
1.4.2 The Planning Steps .....	1.9

## 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. Those jurisdictions within Phelps County that do not adopt the 2016 plan will not be eligible for funding through these grant programs.

## 1.2 Background and Scope

---

The 2016 Phelps Hazard Mitigation Plan is an update of the original plan developed and approved in November 2004. The first update of the 2004 plan was approved by FEMA on December 1, 2011. 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 Co. 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.

**Table 1.1 Summary of 2016 Revisions to Plan**

Chapter	Summary of Revisions
Chapter 1 Introduction and Planning Process	Updated with 2015 information and reformatted to follow the model outline. Provided information on how the planning process followed the <i>Local Mitigation Planning Guidance (March 2013)</i> , the <i>Local Mitigation Plan Review Guide (October 1, 2011)</i> , and <i>Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013)</i> . Added information on RiskMAP
Chapter 2 Planning Area Profile and Capabilities	Updated with 2015 data and reformatted to follow the model outline.
Chapter 3 Risk Assessment	Updated with 2015 data and reformatted to follow the model outline.
Chapter 4 Mitigation Strategy	Updated with 2014 data and reformatted to follow the model outline, including substituting action item worksheets for the narrative used in the previous plan to provide required information for each action item.
Chapter 5 Plan Implementation and Maintenance	Updated with 2015 data and reformatted to follow the model outline.
Appendices	Updated with 2015 data and reformatted to follow the model outline.

## 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 2002 when the Missouri State Emergency Management Agency (SEMA) provided grant funds and contracted with the Meramec Regional Planning Commission (MRPC) to develop a hazard mitigation plan for the county. MRPC is a council of local governments in south central Missouri serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties. The initial plan was completed and approved in November 2004. An update was completed and approved in December 2011.

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

In October 2008, and again in September 2014, SEMA secured a grant to review and update the Phelps County Multi-Hazard Mitigation Plan and contracted with MRPC to facilitate the planning process for the plan update. MRPC staff has followed the most current planning guidance provided by FEMA for the purpose of insuring that the updated plan meets all of the requirements of the Disaster Mitigation Act as established by federal regulations.

The Phelps County Multi-Hazard Mitigation Plan was developed as the result of a collaborative effort among Phelps County, the cities of Doolittle, Edgar Springs, Newburg, Rolla, St. James, St. James R-I School District, Newburg R-II School District, Phelps Co. 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 MPC to collect and analyze information on hazards and disasters that have impacted the County as well as document mitigation activities that have occurred during the past five years.

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

The 2015 planning process began with a meeting held in conjunction with the Phelps County Commission meeting on March 10, 2015. MRPC staff provided an overview of the planning

process and review of the existing hazard mitigation plan. The group reviewed and discussed hazard mitigation goals and what progress had been made on hazard mitigation action items over the past four years. The second meeting was held on April 28, 2015. The MPC reviewed and updated the list of action items, making note of those that had been accomplished, those that were no longer applicable and adding a number of projects to the list. The group then reviewed the action items, applying the STAPLEE method (Social; Technical; Administrative; Political; Legal; Economic; Environmental) and applying cost benefit analysis to best determine priorities. A full description of the prioritization process is included in Chapter 4.

Staff met with county road and bridge staff on March 31<sup>st</sup>. County associate commissioners and staff provided a comprehensive list of completed mitigation projects as well as proposed new projects to be included in the plan update. Staff incorporated these action items and completed projects into the planning materials reviewed and prioritized by the MPC in April.

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

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

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

The MPC contributed to the planning process by:

- Attending and participating in meetings;
- Collecting data for the plan;
- Making decisions on plan content;
- Reviewing drafts of the plan document;
- Developing a list of needs:
- Prioritizing needs and potential mitigation projects; and
- Assisting with public participation and plan adoption

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

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

**Table 1.2 Jurisdictional Representatives Phelps County Mitigation Planning Committee**

<b>Name</b>	<b>Title</b>	<b>Department</b>	<b>Jurisdiction/Agency/ Organization</b>	<b>Direct Participation</b>	<b>Indirect Participation</b>
Paula James	City Admin.	City Admin.	Edgar Springs		X
Della Bishop	City Clerk	City Admin.	Doolittle		X
James Poucher	Mayor	City Admin.	Newburg		X
Phyllis Harris	City Clerk	City Admin.	Newburg		X
Lynne Reed	Superintendent	School District	Newburg R-II		X
Angela B. Rolufs	Director, Office of Sustainable Energy and Environmental Engagement	Corporate Relations	Missouri Science & Technology		X
Rob Stark			Missouri State Highway Patrol	X	
Gary Hicks	Associate Commissioner	County	Phelps County	X	
Larry Stratman	Associate Commissioner	County	Phelps County	X	
Pamela Grow	County Clerk	County	Phelps County	X	
Randy Verkamp	Presiding Commissioner	County	Phelps County	X	
John Fluhrer	Superintendent	School District	Phelps County R-III		X
Jeff Breen		Rolla City Fire & Rescue	Rolla	X	
Matt Griggs	EMD	Emergency	Rolla	X	
Vicki Cason		Rolla Municipal Utilities	Rolla	X	
Vicki Gorman	Director of Finance	School District	Rolla 31		X
Harold Selby	City Administrator	City Admin.	St. James		X
Joy Tucker	Superintendent	School District	St. James R-I		X

## 1.5 Multi-Jurisdictional Participation

---

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

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. 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
- Phelps Co. R-III School District
- Newburg R-II School District
- St. James R-I School District
- Rolla 31 School District
- All Star Gas
- AMEREN UE
- American Red Cross
- BNSF Railway
- Boys and Girls Town of Missouri
- Cedar Knoll Home
- Columbia College
- County Valley Home
- Crawford Electric Cooperative
- Drury University
- East Central College
- Ferndale, Inc.
- Ferrellgas
- Gascosage Electric Cooperative
- Heritage Park Skilled Care
- Intercounty Electric Cooperative
- Lea's Haven
- Mark Twain National Forest
- Metro Business College
- Missouri Department of Conservation
- Missouri National Guard
- Missouri Pipeline & Missouri Gas
- Missouri Science & Technology
- Missouri State Highway Patrol
- Missouri Veterans Home
- MoDOT
- NUSTAR Pipeline
- Parkside Assisted Living
- Phelps County Regional Medical Center
- Rosewood Residential Care
- Sho-Me Power Cooperative
- St. James Nursing Home
- Mercy Clinic
- Webster University/Rolla Metro

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, direct or indirect jurisdictional participation is required including formal adoption of the plan. Participation activities during the planning process include:

- Providing a representative to serve on the planning committee;
- Participating in at least one or more meetings of the planning committee;
- Providing data for plan development through surveys and/or interviews;
- Provide information on existing mitigation actions from the previous plan and/or provide additional mitigation actions for the plan;
- Remove actions from the previous plan that were not implemented because they were impractical, inappropriate, not cost effective or were otherwise not feasible;

- Identify goals and mitigation actions for the plan;
- Prioritize mitigation actions/projects for the plan;
- Review and comment on the draft plan document;
- Informing the public, local officials and other interested parties about the planning process and providing opportunities for them to comment on the plan;
- Provide in-kind match documentation; and
- Formally adopt the plan prior to submittal of the final draft to SEMA and FEMA for final approval.

Not all jurisdictions were able to attend the MPC meetings; however it was strongly encouraged during MRPC board meetings, and through mailings and press releases. Most communities and school districts in Phelps County are small and understaffed. It was not always feasible for representatives to travel to the meetings. Nevertheless, all jurisdictions met at least three of the participation criteria. The jurisdictions that participated in the process, as well as their level of participation in the process are shown in **Table 1.3**. Documentation of meetings, including sign-in sheets are included in **Appendix B: Planning Process**.

**Table 1.3 Jurisdictional Participation in the Planning Process**

Jurisdiction	Meeting #1	Meeting #2	Interviews	Data Collection Survey/Call	Update/Develop/Prioritize Mitigation Actions	Review/Comment on Plan
Phelps Co.	X		X	X	X	X
Doolittle				X	X	X
Edgar Springs			X	X	X	X
Newburg				X	X	X
Rolla	X	X		X	X	X
St. James	X			X	X	X
Phelps Co. R-III				X	X	X
Newburg R-II				X	X	X
St. James R-I				X	X	X
Rolla 31	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 Guidance (March 2013)*, the *Local Mitigation Plan Review Guide (October 1, 2011)*, and *Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013)*. The planning guides used for the initial plan development are no longer current and were not used in the update. The planning process has included organizing the county's resources, assessing the risks to the county, developing the mitigation plan and implementing the plan and monitoring the progress of plan implementation.

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

**Table 1.4 Phelps County Plan Update Process**

<b>Community Rating System (CRS) Planning Steps (Activity 510)</b>	<b>Local Mitigation Planning Handbook Tasks (44 CFR Part 201)</b>
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. Additionally, 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 publicized by the County and MRPC press release to allow additional interested parties to attend and participate.

At the first meeting on March 10, 2015, MRPC staff made introductions and provided an overview of hazard mitigation planning and 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 wrapped up the meeting by explaining the process that would be used to prioritize the action items at the next meeting – using both the STAPLEE method and analyzing the cost benefit.

On March 31, 2015, staff met with Phelps County Road & Bridge staff to go over county mitigation projects and action items in detail. The complete list of action items provided by the county was incorporated into the list developed at the March 10<sup>th</sup> meeting. The MPC reviewed and prioritized all of the action items at their April 28, 2015 meeting.

At the second meeting on April 28, 2015, the group reviewed the complete list of action items developed at both the March 10, 2015 meeting and the meeting held with the Phelps County Road & Bridge staff. MRPC provided an explanation of the prioritization process using both STAPLEE and cost benefit scoring. The MCP then provided input on prioritizing all of the action items. Staff took those recommendations and developed a matrix of the action items with the STAPLEE and cost benefit scores. This matrix was mailed out to all of the individuals and organizations on the mailing list for the MPC with a request for feedback. All suggestions for changes were incorporated into the plan. The group also reviewed the list of critical facilities in the plan and provided feedback on any changes or additions to that list. It was decided at this meeting that staff would mail out data collection surveys to each of the jurisdictions and begin working on the plan. Plan chapters would be shared with the MPC via mail, email and website. If necessary the group would meet again but no date was set.

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

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

**Table 1.5 Schedule of MPC Meetings**

Meeting	Topics	Date
Planning Meeting #1	Overview of mitigation planning & Phelps County plan; Discussion of goals & objectives; Discussion of changes to goals and action items; Discussion of natural hazard events of the last five years, any new data and any changes in mitigation needs	March 10, 2015
Planning Meeting #2	Review of action items & prioritization process; discussion and identification of critical facilities	April 28, 2015
Meeting with Road & Bridge staff	Road & Bridge staff came prepared with a list of mitigation projects that they wanted included in the plan document as well as a list of mitigation projects completed by the road department over the past five years for inclusion in the plan.	March 31, 2015

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

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

The MPC followed the same process for public involvement and input as was followed during the initial planning process. All MPC meetings were held at the Phelps County Courthouse and were held in conjunction with the weekly commission meeting. Public notices were placed at the courthouse and press releases were done prior to the meeting to make the public aware. Meetings were also posted on the MRPC webpage. The public was notified each time the plan or sections of the plan was presented for review and discussion. MPC members and public officials within the county as well as in surrounding counties were contacted, directed to the MRPC website ([www.meramecregion.org](http://www.meramecregion.org)) where a copy of the draft plan could be viewed or downloaded. The document was made available on the website on March 1, 2016. Hard copies of the final draft were placed at the Phelps County Courthouse and city hall buildings for Doolittle, Edgar Springs, Newburg, Rolla, and St. James. A hard copy of the draft could be obtained directly from MRPC by request. Members of the local media, both radio, newspaper and on-line were invited to attend planning meetings. Information was shared by these media outlets with the public on the planning process and where to find draft copies of the plan. Copies of public notices and press release are included in Appendix A: Planning Process.

No comments were received from the public.

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

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

Every effort was made to encourage input from organizations whose goals and interests interface with hazard mitigation in Phelps County. Jurisdictional representatives on the MPC were asked to share and solicit information from within and outside of their jurisdictions. A broad spectrum of entities other than the jurisdictions named in the plan, were invited to participate in the planning process.

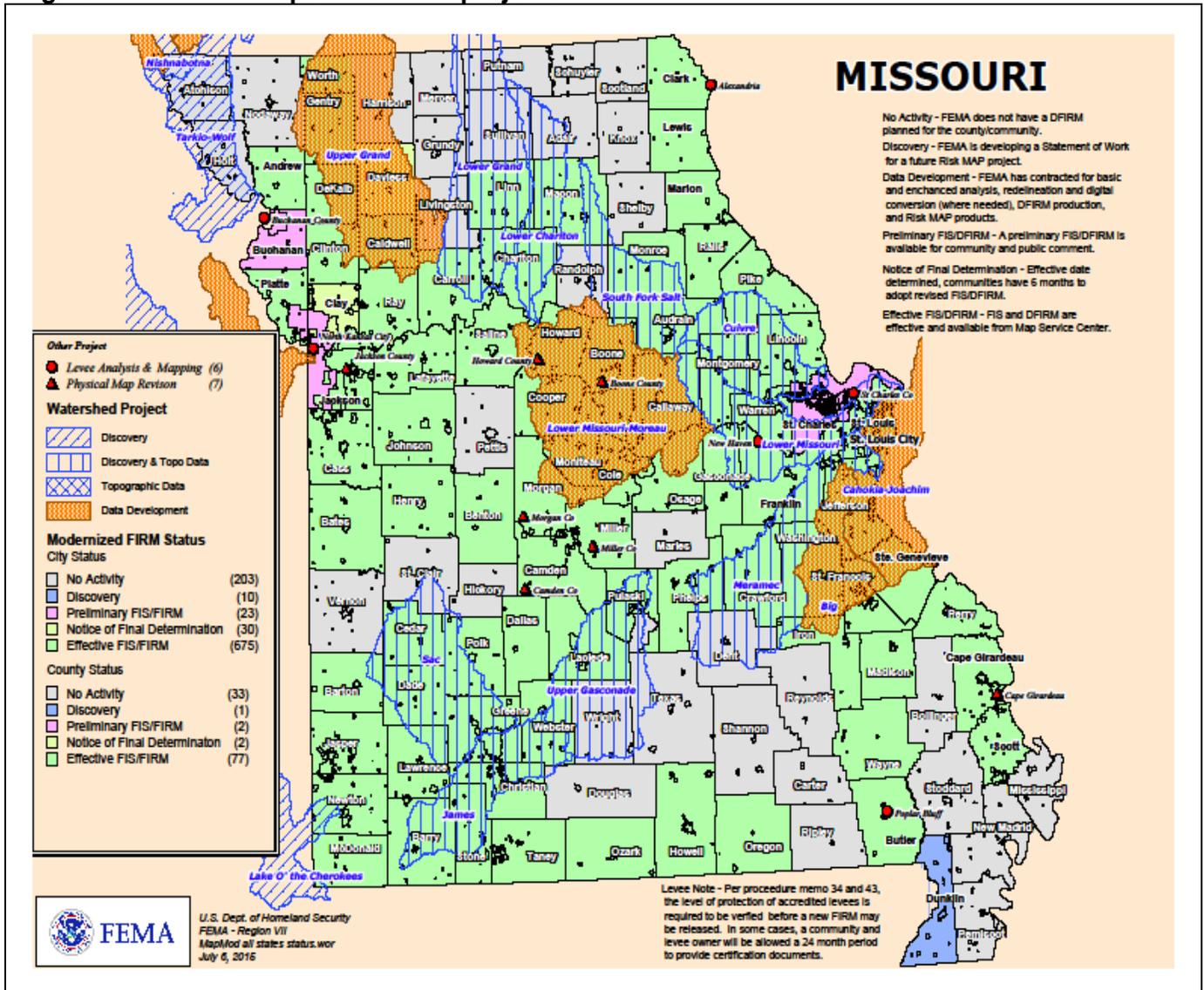
The survey provided to every jurisdiction asked how mitigation actions were being incorporated into other planning documents. The county road and bridge department had done a good job of incorporating mitigation projects into their regular maintenance program. Those projects have been incorporated into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

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

Phelps County is currently in the Discovery and Topo Data phase of the Risk MAP project. Once completed, Risk MAP will provide mitigation planning support in a variety of ways including helping in the assessment of risks and identifying action items to reduce vulnerability. In addition, this project will provide tools to improve the understanding of risk by local officials and the general public.

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

**Figure 1.1. Map of RiskMAP projects**



**Integration of Other Data, Reports, Studies and Plans**

The MPC researched available plans, studies, reports and technical information during development of the Update. The intent was to identify existing data and information, shared objectives and past and ongoing activities that would add to the Update. The goal was to identify the existing capabilities and planning mechanisms to implement the mitigation strategy. Phelps County is a rural area with the largest community’s population approximately 16,367. 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
- EOPs for the County and cities
- Crisis Plans for four of the five school districts

- Enacted building codes
- Stormwater management ordinances
- Comprehensive plans
- Economic development plans
- Capital improvement plans
- Infrastructure plans
- Floodplain management ordinances and flood Insurance Risk Maps (FIRMs)

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

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

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

The MPC reviewed the hazards that affected Phelps County at the first planning meeting on March 10, 2015 including discussions of any hazard events that occurred during the last five years and all of the hazards included in the Missouri Hazard Mitigation plan. A variety of sources were used to identify and profile hazards. These included U.S. Census data, GIS data, HAZUS, the Missouri Spatial Data Information Service (MSDIS), statewide datasets compiled by state and federal agencies, existing plans and reports, personal interviews with MPC members and the survey completed by each jurisdiction. Data was compiled and compared to the original plan document and updates made in the 2016 revision. Every effort was made to use the most current and best data available. Additional information on the risk assessment and the conclusions drawn from the available data can be found in Chapter 3.

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

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

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

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

## **Step 6: Set Goals (Handbook Task 6)**

The goals from the initial hazard mitigation plan were reviewed at the first planning meeting on March 5, 2015. Those goals are as follows:

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

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

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

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

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

**Goal 6:** Secure resources for investment in hazard mitigation.

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

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

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

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

Staff met separately with the Road and Bridge representatives on March 31, 2015 to thoroughly review their list of mitigation projects that had been completed as well as the list of projects that remained to be addressed.

As RiskMAP is still in the discovery phase in Phelps County, no projects have been identified through that process at this time.

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

STAPLEE stands for the following:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The MPC reviewed the final list of action items at the April 28, 2015 meeting and completed the prioritization process. The final list was then mailed out to all jurisdictions and members of the MPC for review and approval as everyone was not able to attend the meeting. Staff were directed by the MPC to take the finalized list after allowing time for comments, remove all action items that scored a 13 or below, and draft an action plan.

### **Step 9: Adopt the Plan (Handbook Task 8)**

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

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

At both planning meetings (March 10, 2015 and April 28, 2015) MRPC staff advised the MPC and participating jurisdictions of the importance of continuing to meet periodically to discuss implementation of the plan as well as monitoring and maintaining the plan into the future. Chapter 5 provides details on Phelps County's strategy for implementation, evaluation and revising the plan.

---

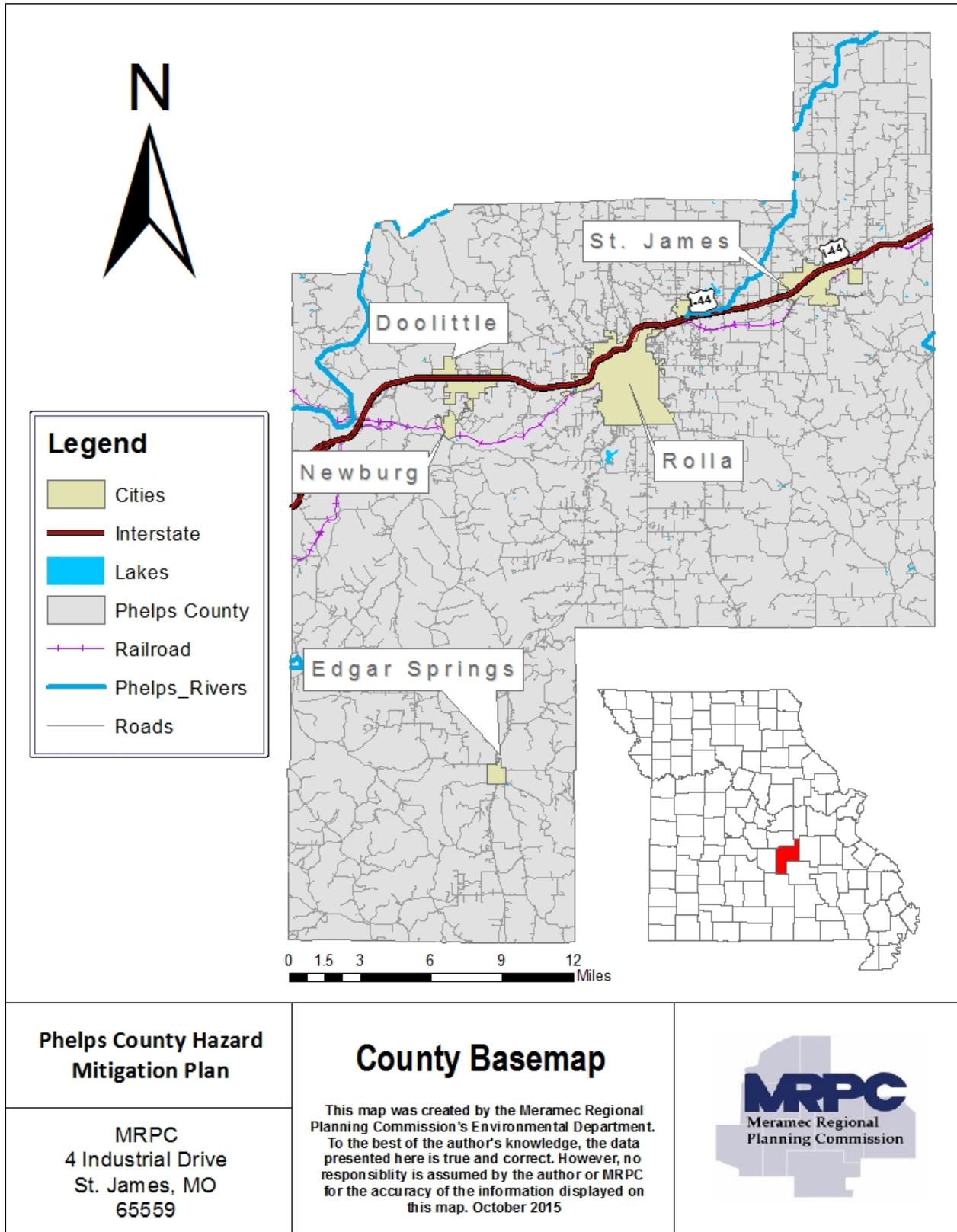
## 2 PLANNING AREA PROFILE AND CAPABILITIES

---

<b>2</b>	<b>PLANNING AREA PROFILE AND CAPABILITIES.....</b>	<b>2.1</b>
<b>2.1</b>	<i>Phelps County Planning Area Profile .....</i>	<i>2.2</i>
2.1.2	Geography, Geology and Topography.....	2.4
2.1.3	Climate .....	2.9
2.1.4	Population/Demographics .....	2.9
2.1.5	History .....	2.13
2.1.6	Occupations .....	2.14
2.1.7	Agriculture.....	2.14
2.1.8	FEMA Hazard Mitigation Assistance Grants in Planning Area .....	2.15
<b>2.2</b>	<i>Jurisdictional Profiles and Mitigation Capabilities.....</i>	<i>2.15</i>
2.2.1	Unincorporated Phelps County .....	2.15
2.2.2	City of Doolittle .....	2.19
2.2.3	City of Edgar Springs .....	2.22
2.2.4	City of Newburg .....	2.25
2.2.5	City of Rolla .....	2.28
2.2.6	City of St. James .....	2.31
2.2.7	Public School District Profiles and Mitigation Capabilities .....	2.40
2.2.8	Critical Facilities.....	2.45

## 2.1 Phelps County Planning Area Profile

Figure 2.1. Map of Phelps County



Phelps County has a population of approximately 45,091 according to the most recent census data<sup>1</sup>. **Table 2.1** illustrates the percentage population growth since 2000 as compared to the statewide and national population growth. The median household income and percentage growth since 2000, as compared to statewide and national figures can be found in **Table 2.2**. Furthermore, median house value percentage growth for Phelps County, Missouri, and the United States is provided in **Table 2.3**

**Table 2.1. Percent Population Growth for County, State, and Nation 2000 - 2014**

Demographic Region	Total Population		Change Over Period	
	2000	2014	Change	Percent
<b>Phelps County</b>	39,945	45,091	5,146	12.88
<b>Missouri</b>	5,607,285	6,063,589	456,304	8.14
<b>United States</b>	282,162,411	318,857,056	36,694,645	13.00

Source: Missouri Census Data Center, Population Trend Report Nov. 2015

**Table 2.2. Median Household Income and Percentage Growth for County, State, and Nation 1999 - 2014**

Demographic Region	Median Household Income (USD)		Change Over Period	
	1999	2014	Change	Percent
<b>United States</b>	\$41,994	\$53,046	\$11,052	26.31
<b>Missouri</b>	\$37,934	\$47,380	\$9,446	24.9
<b>Phelps County</b>	\$29,378	\$41,942	\$12,564	42.76

Source: U.S. Census Bureau, Census 2000 Summary File 3  
U.S. Census Bureau, 2010-2014 5-Year American Community Survey

**Table 2.3. Median House Value Percentage Growth for County, State, and Nation 2000 - 2014**

Demographic Region	Median House Value (USD)		Change Over Period	
	2000	2014	Change	Percent
<b>United States</b>	\$119,600	\$194,300	\$74,700	62.49
<b>Missouri</b>	\$89,900	\$147,400	\$57,500	63.96
<b>Phelps County</b>	\$74,800	\$126,600	\$51,800	69.25

Source: U.S. Census Bureau, Census 2000 Summary File 3  
U.S. Census Bureau, 2010-2014 5-Year American Community Survey

<sup>1</sup> U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

---

## 2.1.2 Geography, Geology and Topography

Phelps County has a total land area of 674 square miles. Additionally the County is comprised of 2.5 square miles of total water area. Incorporated jurisdictions within the County include Doolittle (1944), Edgar Springs (1970s), Newburg (1888), Rolla (1858), and St. James (1869).

The topography in Phelps County east of Rolla is generally rolling hills with steeper hills near the Meramec River. West of Rolla, the terrain is considerably rougher with steep, sloping valleys. In the southern portion of the county, the topography flattens to form a small platform around Edgar Springs. The maximum relief in the county is approximately 500 feet.

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

A drainage basin is the total area drained by a river and all of its tributaries. A watershed is the area drained by a single stream. During the last 100 years, stream channels in the Ozarks have become wider and shallower, and deep-water fish habitat has been lost. Historical data indicate that channel disturbances have resulted most directly from clearing of vegetation along stream channels, which decreases bank strength. Historical and stratigraphic data show that after 1830, Ozarks streams responded to land-use changes by depositing more gravel and less muddy sediment, compared to pre-settlement conditions. Because less muddy sediment is being deposited on flood plains, many stream banks now lack cohesive sediments, and, therefore, no longer support steep banks. Land use statistics indicate that the present trend in the rural Ozarks is toward increased populations of cattle and increased grazing density; this trend has the potential to continue the historical stream-channel disturbance by increasing storm-water runoff and sediment supply<sup>2</sup>.

Phelps County is located in two river basins: Gasconade and Meramec. The Gasconade River and its tributaries including the Big Piney River, Beaver Creek, Little Beaver Creek and Little Piney Creek drain parts of Phelps County. Included within this basin are 53 springs, with 28 of these located in Phelps County.

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.

Seven miles northeast of the town of Salem in Southeastern Missouri, a spring-fed brook called the Watery Fork merges with a larger wet-weather branch and becomes the source of the Meramec River. For many millions of years the Meramec has been carving its twisting, sometimes-tortuous 240-mile course into the solid rock of the Ozark Plateau, scouring its way through a deep, slowly widening valley, bordered by limestone bluffs and steep hills. It is joined along the way by innumerable springs, creeks, and four large tributaries, which transform the Meramec into a 100-yard to 200-yard wide floodplain stream at its confluence with the Mississippi River eighteen miles below St. Louis.

---

<sup>2</sup> U.S. Geological Survey Fact Sheet FS-027-96

---

Maramec Spring is the first of the four major contributors. It pours an average volume of 100 million gallons of cold clear water into the Meramec River per day, swelling the river to twice its size. It is interesting to note that the Dry Fork creek, which is about the same size as the Meramec River in that area, loses most of its volume underground to become a major contributor to Maramec Spring, and in a round-about way—a major contributor to the Upper Meramec. Over the next 30 miles, the inflows from many smaller branches turn the river into a prime stream. Then, from the right, the translucent waters of the second and largest of the headwater contributors, the Courtois-Huzzah creek, mingles with the Meramec, giving it the impression of a truly big river. Swirling on past Onondaga Cave (Leasburg), Meramec State Park (Sullivan), and the Meramec Caverns (Stanton)—all on the left—the Meramec receives the cloudy waters of the Bourbeuse River—its only major contributor from the west. As the darker waters flow on, the valley widens, and the river becomes a series of long, slow, wide pools, connected by short, fast, riffles. Around 25 miles below the Bourbeuse River confluence, the last major contributor, the Big River, flows into the Meramec from the right. Now, even wider and more sluggish, it enters the Mississippi floodplain, and wends its way another thirty miles before draining into the Mississippi. The name Meramec is of Algonquin Indian origin (probably the Fox tribe), and is widely thought to mean 'the good fish' or 'catfish', which were abundant in its waters. But, there is evidence that the river may get its name after a tribe of Indians called the Maroa, who once lived in Illinois across from the Meramec's mouth. Since the Algonquin syllable 'mec' or 'meg' stands for small river or stream, the names Meramec or Merameg (the river has been called Merameg in the past) could be derived from the Algonquin Maroamec, which means 'Little River of the Maroas'. The name of the Mississippi is also of Algonquin origin, derived from their term mesisi-piya, meaning Big River. Also, the title of this state Missouri is of Indian origin, meaning People of the Big Canoe or He of the Big Canoe.

Even in geological time, the Meramec is a very old river. It does not drain its northeastern section of the Ozark Plateau with the reckless abandon of a mountain stream. Instead, it meanders through the landscape in a countless succession of bends, riffles, and placid slow stretches, each of which is another small step in the Meramec's 800-foot decent from the Ozark Plateau to the Mississippi River<sup>3</sup>.

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

---

<sup>3</sup> Kammer, William Ray. "The Meramec River: Then and Now" 3<sup>rd</sup> edition.

---

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

Gasconade River watershed annual precipitation ranges from 40.35 to 42.67 inches with an annual mean of 41.66 inches. This precipitation and the local geology provides good base flow conditions and lower variability in stream flow throughout major portions of the watershed. Average runoff had greater extremes from the late 1970s to the present than during the 1960s to the late 1970s<sup>4</sup>.

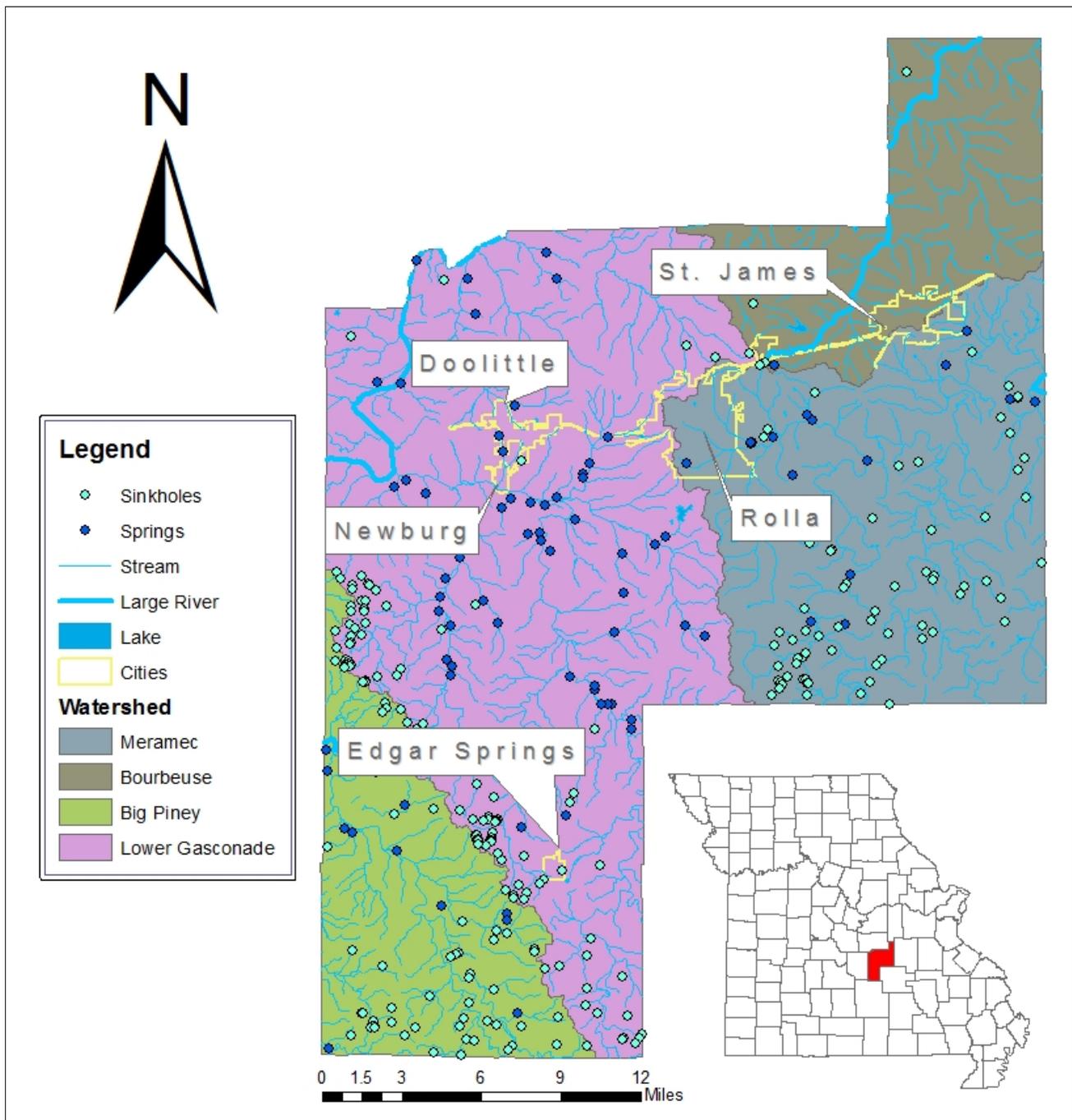
Phelps County has been a participant in the National Flood Insurance Program since February 1987. The City of Rolla has been a participant in the NFIP program since September 1977, St. James since July 1985, Newburg since April 1972, Doolittle since August 1984, and Edgar Springs since August 1984<sup>5</sup>. As part of its floodplain management plan, the county requires that houses be built one foot above base flood elevation. A permit must be granted by the floodplain administrator for any new construction inside the floodplain. County road crews or employees are expected to notify the flood plain administrator when they witness any new construction in the floodplain that has not been granted a construction permit. Phelps County contracts with the Meramec Regional Planning Commission to administer its floodplain management program.

---

<sup>4</sup> <http://www.conservation.state.mo.us/fish/watershed/gascon/contents/130cotxt.htm>

<sup>5</sup> NFIP Community Status Report

Figure 2.2. Phelps County Watershed/Water Resources



Phelps County Hazard Mitigation Plan

MRPC  
4 Industrial Drive  
St. James, MO  
65559

## Water Resources

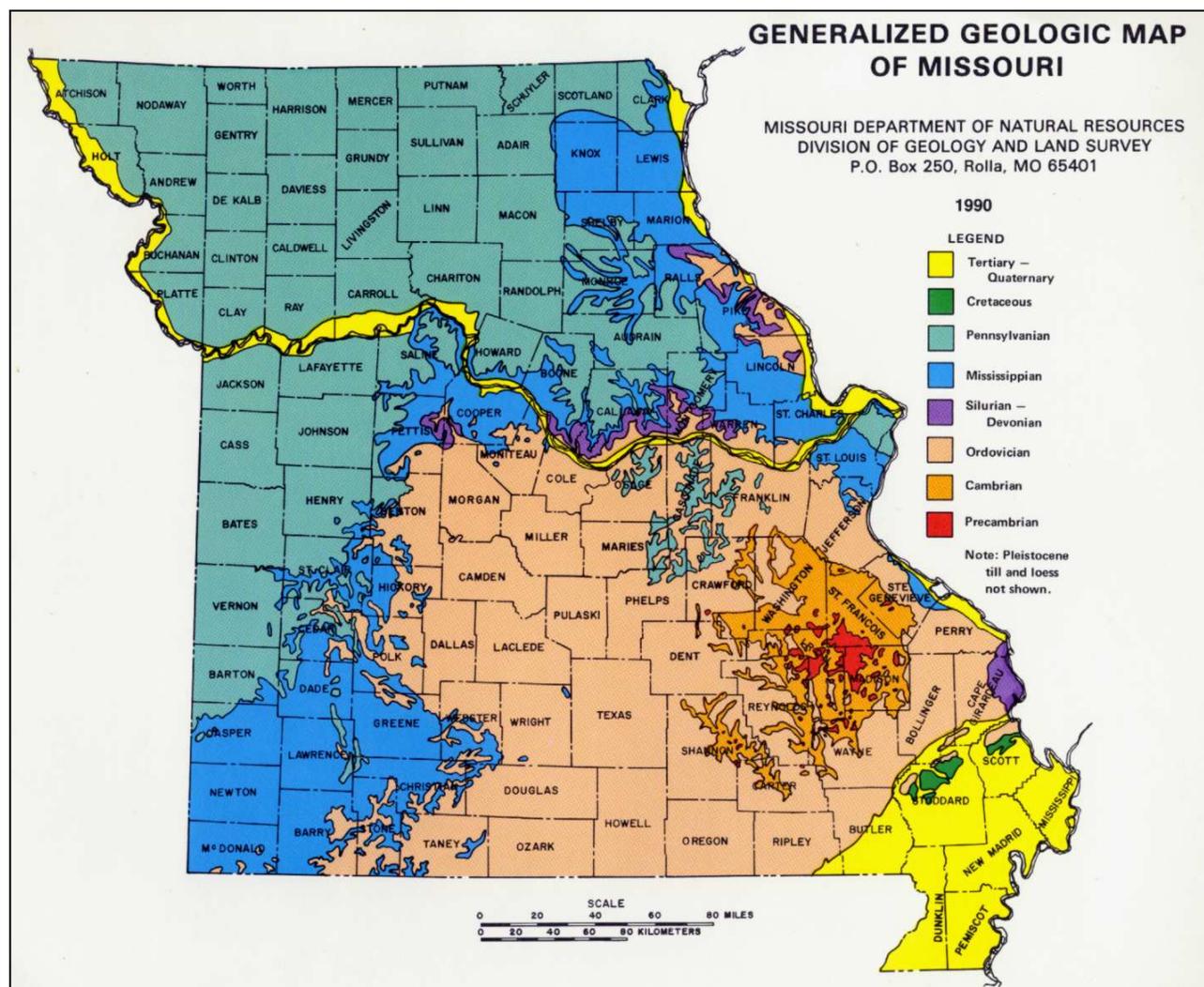
This map was created by the Meramec Regional Planning Commission's Environmental Department. To the best of the author's knowledge, the data presented here is true and correct. However, no responsibility is assumed by the author or MRPC for the accuracy of the information displayed on this map. October 2015



Phelps County is located in the Ozark soils which is an area of narrow, cherty limestone ridges that break sharply to steep side slopes of narrow valleys. Loess occurs in a thin mantle or is absent. Soils formed in the residuum from cherty limestone or dolomite range from deep to shallow and contain a high percentage of chert in most places. Some of the soils formed in a thin mantle of loess are on the ridges. Soils formed in loamy, sandy and cherty alluvium are in narrow bottom-land areas. These soils are found throughout all of Phelps County. The Ozarks soils include the Lebanon-Goss-Bardley-Peridge, Needleye-Viration-Wilderness, Gerald-Union-Goss, Lebanon-Hobson-Clarksville, Hobson-Coulstone-Clarksville, Captina-Clarksville-Hartville-Ashton-Cedargap-Nolin soil associations. The Hartville-Ashton-Cedargap-Nolin soils association is located along the Gasconade River<sup>6</sup>.

Soil makeup in Phelps County includes 53 percent Bender-Tonti-Poynor Association, 6 percent Alred Bardley Association, 11 percent Cedargap-Kaintuck-Razort Association, 5 percent Gatewood-Useful Association, 24 percent Union-Beemont-Gatewood Association, and 1 percent Rosati-Glensted Association.

**Figure 2.3. Generalized Geologic Map of Missouri**



<sup>6</sup> Ozark Rivers Solid Waste Management Plan, 2004.

### 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. Measurable precipitation 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 Rolla.

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 degrees. 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 2014 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 2000-2014 by Jurisdiction**

Jurisdiction	2000 Population	2014 Population	2000-2014 # Change	2000-2014 % Change
Unincorporated Phelps County	18,436	19,656	1,220	6.62
Doolittle	644	640	-4	-0.62
Edgar Springs	190	244	54	28.42
Newburg	484	559	75	15.50
Rolla	16,367	19,808	3,441	21.02
St. James	3,704	4,184	480	12.96

Source: U.S. Bureau of the Census, 2010-2014 5-Year American Community Survey Census 2000 Summary File 1 100-Percent Data

**Table 2.5** provides information in regards to the percent of individuals under the age of 5, and over 65 for the County, State, and Nation. In addition, average household size is illustrated in **Table 2.6** including figures for Phelps County, Missouri, and the U.S. In 2010 there were an estimated 16,669 households within the County<sup>7</sup>.

**Table 2.5. Percent of Individuals Under the Age of 5, and Over 65 for County, State, and Nation (2014)**

Location	% Under Age of 5	% Over Age of 65
Phelps County	5.9	14.3
Missouri	6.17	15.37
United States	6.23	14.5

Source: U.S. Census Bureau, 2010-2014 5-Year American Community Survey

**Table 2.6. 2014 Average Household Size for County, State, and Nation**

Location	Average Household Size
Phelps County	2.51
Missouri	2.48
United States	2.63

Source: \*U.S. Census Bureau, 2010-2014 American Community 5-Year Estimates

### Social Vulnerability Index (SoVI ®)

The University of South Carolina developed an index to evaluate and rank the ability to respond to, cope with, recover from, and adapt to disasters. The index synthesizes 30 socioeconomic variables which research literature suggests contribute to reduction in a community's ability to prepare for, respond to, and recover from hazards. SoVI ® data sources include primarily those from the United States Census Bureau. **Table 2.7** depicts the Social Vulnerability Index for Phelps County along with its national percentile.

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

State	County	SoVI Score (06 - 10)	National Percentile (06 - 10)
Missouri	Phelps County	-0.328615	44.96%

Source: [http://webra.cas.sc.edu/hvri/products/sovi2010\\_data.aspx](http://webra.cas.sc.edu/hvri/products/sovi2010_data.aspx)

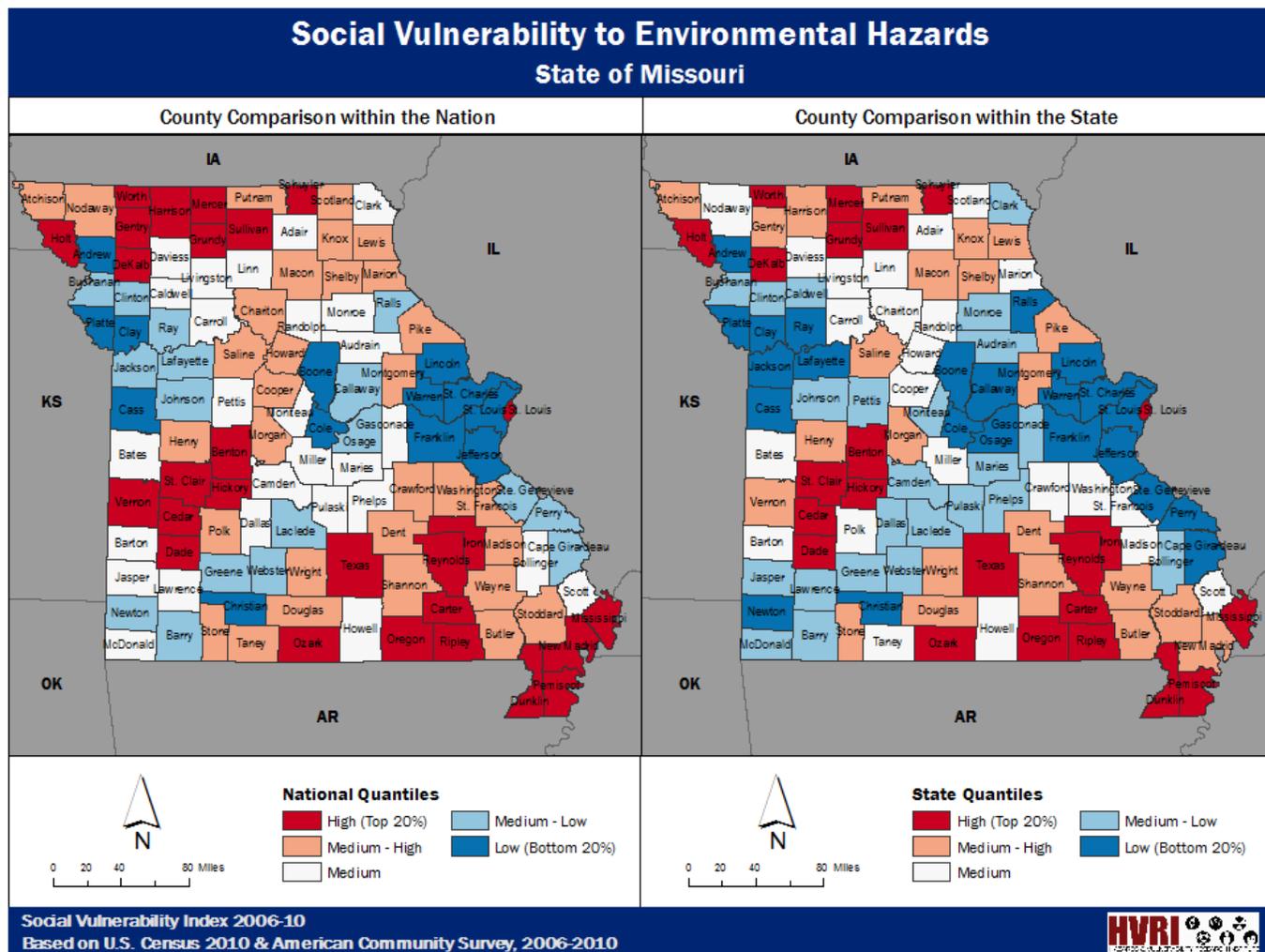
The analysis of 30 socioeconomic variables includes the standardization of data, and reduction of variables into a condensed set of statistically optimized components; positive component loadings (+) are linked with amplified vulnerability, and negative component loadings (-) are linked with diminished vulnerability. To simplify the metrics of the SoVI ® Score, a low number illustrates a county's resiliency to hazard events, and a high number illustrates a decrease in resiliency<sup>8</sup>.

<sup>7</sup> U.S. Census Bureau, 2009-2013 5-Year American Community Survey

<sup>8</sup> <http://webra.cas.sc.edu/hvri/products/sovifaq.aspx>

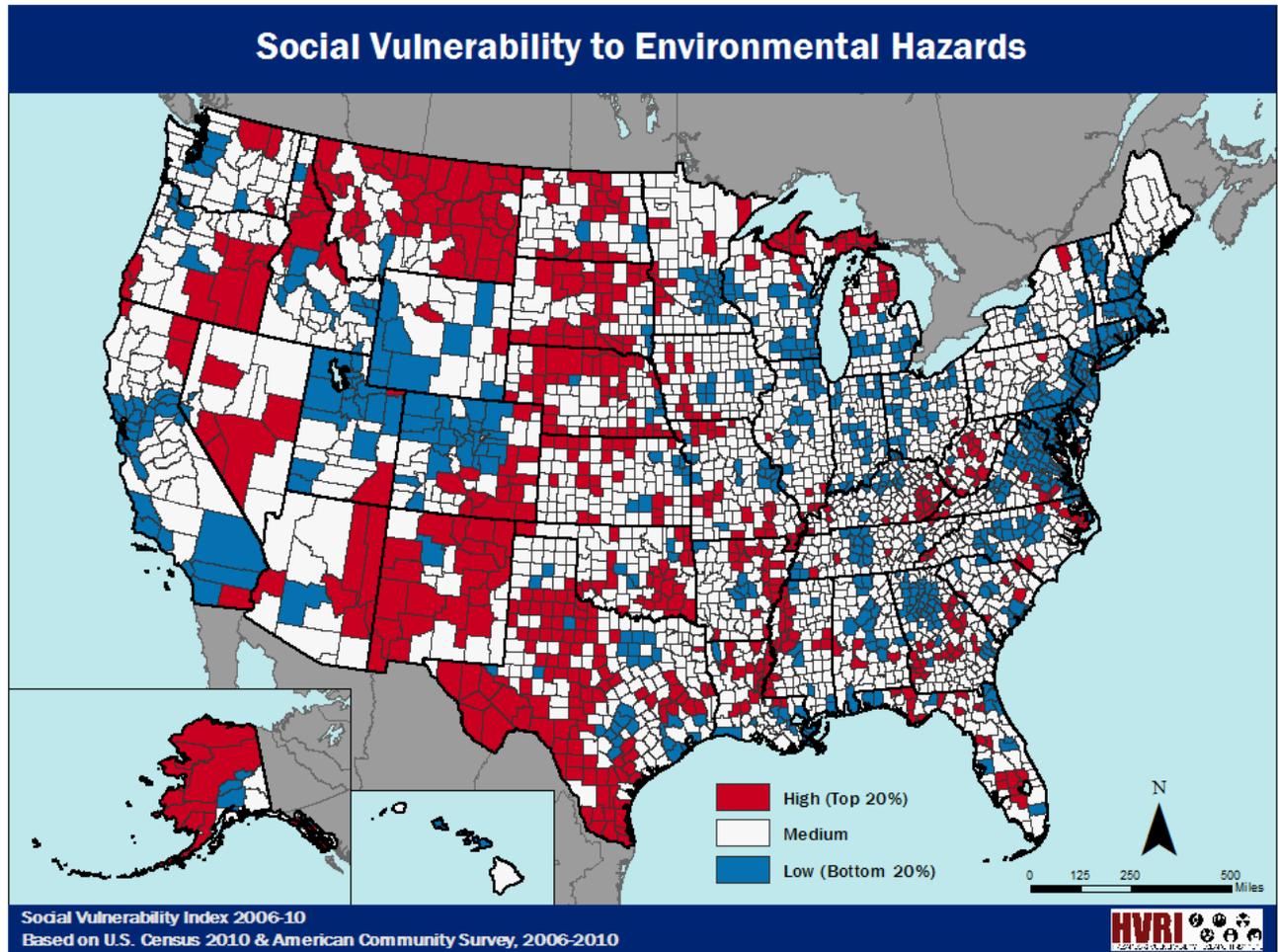
Figure 2.4 depicts Missouri's SoVI ® to environmental hazards between 2006 and 2010. Furthermore, Figure 2.5 depicts the Nation's SoVI ® to environmental hazards between 2006 and 2010.

Figure 2.4. 2006 – 2010 Missouri Social Vulnerability to Environmental Hazards (SoVI ®)



Source: [http://webra.cas.sc.edu/hvri/products/sovi2010\\_maps.aspx](http://webra.cas.sc.edu/hvri/products/sovi2010_maps.aspx)

Figure 2.5. 2006 – 2010 U.S. Social Vulnerability to Environmental Hazards (SoVI ®)



Source: <http://artsandsciences.sc.edu/geog/hvri/sovi-1>

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

Table 2.8. 2014 Unemployment, Poverty, Education, and Language Percentage Demographics, Phelps County, Missouri

Jurisdiction	Total in Labor Force	% of Population Unemployed	% of Families Below the Poverty Level	% of Population (High School graduate ages 18 and over)	% of Population (Bachelor's degree or higher ages 18 and over)	% of population (language spoken at home other than English)
Phelps County	20,500	8.1	11.4	51.8	35	5.7
Doolittle	315	11.1	6.5	62.5	6.9	0.8
Edgar Springs	112	17.9	5.3	50.6	9	0.0
Newburg	170	16.3	31.4	73.3	10	0.0
Rolla	8,490	7.4	10.9	40.2	40.7	10.9
St. James	1,808	6.8	12.7	98.8	16.7	1.9

Source: U.S. Census Bureau, 2010-2014 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 10<sup>th</sup>, 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."

## 2.1.6 Occupations

Table 2.9 provides occupation statistics for the incorporated jurisdictions and County as a whole.

**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	37.51	19.65	23.30	7.61	11.92
Doolittle	11.79	13.57	42.86	28.57	12.14
Edgar Springs	20.65	25	18.48	20.65	15.22
Newburg	19.42	15.83	46.76	5.76	12.23
Rolla	41.17	21.96	22.24	5.04	9.58
St. James	33	20.59	19.35	7.06	20

Source: U.S. Census, 2010-2014 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 2002 Census of Agriculture, the number of farms in the County was 824 encompassing 201,067 total acres<sup>9</sup>. In addition, the average farm was 244 acres. According to the 2012 Census of Agriculture, Phelps County had fallen to 718 farms encompassing 157,310 acres, with an average farm size of 219 acres<sup>10</sup>. Furthermore, there are only approximately 22 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 2012, 20,916 acres of cropland were harvested, with forage (hay, haylage, grass silage, and greenchop) being the top crop in the County. Moreover, 21,895 cattle and calves were raised<sup>11</sup>. The average sale per farm was \$16,321. Lastly, the total number of hired workers in the County was 592<sup>12</sup> individuals comprising 3.07%<sup>13</sup> of the total workforce.

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

<sup>9</sup> 2002 Census of Agriculture, USDA, National Agriculture Statistics Service

<sup>10</sup> Source: 2012 Census of Agriculture – County Data, USDA, National Agriculture Statistics Service

<sup>11</sup> 2012 Census of Agriculture, Missouri Farm Commodity Sales, USDA, National Agriculture Statistics Service

<sup>12</sup> [http://www.agcensus.usda.gov/Publications/2012/Full\\_Report/Volume\\_1\\_Chapter\\_2\\_County\\_Level/Missouri/st29\\_2\\_007\\_007.pdf](http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1_Chapter_2_County_Level/Missouri/st29_2_007_007.pdf)

<sup>13</sup> U.S. Census Bureau, 2008-2012 American Community Survey

---

## 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<sup>14</sup>. Previous FEMA HMA Grants issued in the planning area can be found in **Table 2.10**.

---

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

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	Not Approved	0
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
<b>Total</b>			<b>1,209,103</b>

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

---

## 2.2 Jurisdictional Profiles and Mitigation Capabilities

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

### 2.2.1 Unincorporated Phelps County

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 Tuesday and Thursday of each week.

The County government has the authority to administer county structures, infrastructure and finances as well as floodplain regulations. Third class counties do not have the authority to enforce building regulations. Other elected County officials include the county clerk, assessor, circuit clerk and recorder, collector, treasurer, prosecuting attorney, sheriff, county surveyor, public administrator and coroner.

Phelps County has staff resources in floodplain management, emergency management, and GIS.

---

<sup>14</sup> <https://www.fema.gov/media-library/assets/documents/103279>

The Meramec Regional Planning Commission, under contract with the County, coordinates the floodplain management program for the County. The County has a part-time emergency management director. The county has a 9-1-1 central dispatch center that includes enhanced 9-1-1. Additionally, ten outdoor warning sirens are spread across the County, which are activated by the dispatch center. A mass notification system is also utilized (Everbridge).

The County is also served by an Air Ambulance service stationed at the St. Johns Clinic in St. Robert which also serves Pulaski, Miller, Maries, Texas and Laclede counties.

### Existing Plans and Policies

Phelps County participates in the National Flood Insurance Program. The unincorporated areas of the County do not have building codes. The County has a local emergency operations plan (LEOP) that is administered and maintained by the Phelps County Office of Emergency Management.

### Other Mitigation Activities

The Office of Emergency Management, local fire departments, Sheriff’s Department 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 Ready-In-3 emergency preparedness, fire safety, fire prevention week, storm preparedness, disease prevention, heat wave preparedness and DARE (Drug Abuse Resistance Education). Phelps County has one designated public tornado shelter at Phelps County R-III which is in accordance with FEMA standards.

**Table 2.11. Demographic and Structure Risk Parameters For Unincorporated Phelps County**

Jurisdiction	Handicapped Citizens	Non-English Speaking Populations	% People Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Unincorporated Phelps County	3,490	7	11.4	1,133	3,093	780	1,778

Source: Source: U.S. Census Bureau, 2010-2014 5-Years American Community Survey, Note: % data includes Incorporated Phelps County

**Table 2.12. Unincorporated Phelps County Mitigation Capabilities**

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	No
County Emergency Operations Plan	Yes - 2006
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	No

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
County Mitigation Plan	Yes – last updated 2011
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes – CEDS – updated annually
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
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes
Subdivision Ordinance	Yes
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
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
<b>Program</b>	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant - Nondelegated	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	N/A
Economic Development Program	Yes
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	Yes – 2/20/2008
FEMA Flood Insurance Study (Detailed)	Yes – 2/20/2008
Evacuation Route Map	No
Critical Facilities Inventory	Yes

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Vulnerable Population Inventory	No
Land Use Map	No
<b>Staff/Department</b>	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	Yes
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
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 – regional Section 8 housing
Planning Consultant	No
Regional Planning Agencies	MRPC
Historic Preservation	No
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	Yes
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
<b>Local Funding Availability</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2015

## 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.

### 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. The Phelps County Ambulance Service accommodates the western, two-thirds of the county, including the City of Doolittle. There is also a Rural Fire 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.

Fiscal tools or resources that the City could potentially use to help fund mitigation activities include Community Development Block Grants, capital improvements project funding, taxes for specific purposes, fees for water, sewer, gas or electric services, debt through general obligation bonds, and debt through special tax bonds

### Existing Plans and Policies

Doolittle Rural Fire Department's ISO rating is nine. The city is included in the county LEOP.

**Table 2.13. Demographic and Structure Risk Parameters For Doolittle**

Jurisdiction	Handicapped Citizens	Non-English Speaking Populations	% People Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Doolittle	108	0	6.5	43	87	14	46

Source: Source: U.S. Census Bureau, 2010-2014 5-Years American Community Survey, Note: % data includes Incorporated Phelps County

**Table 2.14. 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

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	Yes – last updated 2011
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	No
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
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
<b>Program</b>	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant – Non-delegated	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	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)	1
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
<b>Staff/Department</b>	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Director	No
NFIP Floodplain Administrator	No
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	No
Planning Consultant	No
Regional Planning Agencies	MRPC
Historic Preservation	No
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	No
Salvation Army	No
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes
<b>Local Funding Availability</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	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, 2015

## 2.2.3 City of Edgar Springs

### Overview

Edgar Springs is located in the southern portion of Phelps County. As of the 2000 census, Edgar Springs is the closest town to the mean center of U.S. population, the theoretical center of the United States based on population. Edgar Springs is located on U.S. Highway 63. Edgar Springs is incorporated as a fourth class city with four aldermen and the mayor who make decisions regarding city issues. Other city personnel include a city clerk, city attorney, and a city superintendent.

### Technical and Fiscal Resources

Edgar Springs currently participates in the National Flood Insurance Program. Law enforcement in the community is provided by two police officers. The Edgar Springs rural fire department provides fire protection. 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.

Fiscal tools or resources that the City could potentially use to help fund mitigation activities include Community Development Block Grants, taxes for specific purposes, fees for water, sewer, gas or electric services, and debt through general obligation bonds.

### Existing Plans and Policies

The city is included in the county LEOP.

**Table 2.15. Demographic and Structure Risk Parameters For Edgar Springs**

Jurisdiction	Handicapped Citizens	Non-English Speaking Populations	% People Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Edgar Springs	62	0	5.3	29	43	30	19

Source: Source: U.S. Census Bureau, 2010-2014 5-Years American Community Survey, Note: % data includes Incorporated Phelps County

**Table 2.16. City of Edgar Springs Mitigation Capabilities**

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	Yes
Capital Improvement Plan	No
City Emergency Operations Plan	Yes
County Emergency Operations Plan	2006
Local Recovery Plan	No

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	Yes - 2011
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes – Regional - CEDS – updated annually
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
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	Yes
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	Yes
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
<b>Program</b>	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant - Nondelegated	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	-
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
<b>Staff/Department</b>	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Director	No
NFIP Floodplain Administrator	No
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	No
Planning Consultant	No
Regional Planning Agencies	MRPC
Historic Preservation	No
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	No
<b>Local Funding Availability</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Maybe
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	No
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2015

## 2.2.4 City of Newburg

### Overview

Newburg is located in the west central portion of Phelps County. Newburg was founded in the 1880s and was built with the intention of being a railroad town. Newburg is located off of I-44 on the banks of the Little Piney River. Newburg is incorporated as a fourth class city and has a four member board of aldermen and a mayor. The city employs a city clerk, attorney, police judge, collection, police chief, fire chief, water/sewer superintendent, and two part-time EMDs.

### Technical and Fiscal Resources

Newburg participates 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.

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 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 Newburg. The Newburg Fire Department provides fire protection. The city has two warning sirens which are controlled by the city police department, fire department, and city hall.

Fiscal tools or resources that the City could potentially use to help fund mitigation activities include taxes for specific purposes, fees for water, sewer, gas or electric services, debt through general obligation bonds, and debt through special tax bonds.

### Existing Plans and Policies

Newburg is a member of the National Flood Insurance Program. The fire department’s ISO rating is eight. The city is also part of the county LEOP.

### Other Mitigation Activities

The local fire department provides education/awareness programs and materials on a variety of subjects including Fire Safety Week and emergency preparedness.

**Table 2.17. Demographic and Structure Risk Parameters For Newburg**

Jurisdiction	Handicapped Citizens	Non-English Speaking Populations	% People Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Newburg	117	0	31.4	56	110	97	43

Source: Source: U.S. Census Bureau, 2010-2014 5-Years American Community Survey, Note: % data includes Incorporated Phelps County

**Table 2.18. City of Newburg Mitigation Capabilities**

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
<b>Planning Capabilities</b>	
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
Local Mitigation Plan	2010
County Mitigation Plan	2011
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	No
Transportation Plan	Regional
Land-use Plan	N/A
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	N/A
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	N/A
<b>Policies/Ordinance</b>	
Zoning Ordinance	No
Building Code	2000
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	Yes
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
<b>Program</b>	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant – Non-delegated	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	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

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

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

Source: Data Collection Questionnaire, 2015

## 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 incorporated as a third class city. The City of Rolla was founded by Edmund Bishop. In 1858, Rolla was officially founded. The Missouri University of Science and Technology was founded in 1870 (then known as the Missouri School of Mines and Metallurgy). Rolla is located on U.S. Interstate I-44, U.S. Highway 63, and was once a highlight of U.S. Route 66. There is 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 provides municipal services for water, sewage treatment, natural gas and electricity.

### 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.

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 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 local radio stations, KZNN, KTTR, and KMST Radio and the local Channel 6 cable television station. A mass notification system (Everbridge) is also used.

The City EOC is located at Rolla Police Department, with the Phelps County Regional Medical Center serving as a backup location. The community and city government has high speed

broadband internet capabilities at all city facilities.

### Existing Plans and Policies

Rolla has a Comprehensive Plan, Capital Improvement Plan, City Emergency Operations Plan, City Mitigation Plan, Economic Development Plan, Transportation Plan, Land-use Plan, Flood Mitigation Assistance Plan, and Watershed Plan. The City’s ISO rating is 3. The city is also part of the county LEOP.

### Other Mitigation Activities

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. Other programs provided by the City include environmental education, and natural resource conservation.

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.

**Table 2.19. Demographic and Structure Risk Parameters For Rolla**

Jurisdiction	Handicapped Citizens	Non-English Speaking Populations	% People Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Rolla	2,399	1,030	10.9	1,034	2,345	412	283

Source: Source: U.S. Census Bureau, 2010-2014 5-Years American Community Survey, Note: % data includes Incorporated Phelps County

**Table 2.20. City of Rolla Mitigation Capabilities**

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	1/17/2006
Builder's Plan	No
Capital Improvement Plan	2007
City Emergency Operations Plan	December, 2013
County Emergency Operations Plan	2006
Local Recovery Plan	No
County Recovery Plan	N/A
Local Mitigation Plan	2010
County Mitigation Plan	2011
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	2003
Transportation Plan	August, 2015
Land-use Plan	1/17/2006
Flood Mitigation Assistance (FMA) Plan	2004

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Watershed Plan	2003
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	Ordinance #3799
Building Code	Version: 2000 - IBC
Floodplain Ordinance	2004
Subdivision Ordinance	Ordinance #3799
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Site Plan Review Requirements	Yes - Limited
Historic Preservation Ordinance	Ordinance #3799
Landscape Ordinance	Yes
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
<b>Program</b>	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant – Non-delegated	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	10
ISO Fire Rating	3
Economic Development Program	Yes – Rolla Regional Economic Commission: Contract
Land Use Program	No
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
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (Local)	Yes
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	-
FEMA Flood Insurance Study (Detailed)	-
Evacuation Route Map	No
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	Yes
Land Use Map	Yes
<b>Staff/Department</b>	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	Yes
Engineer	Yes

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Development Planner	Yes
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	Yes
Hazardous Materials Expert	Yes
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	No
Sanitation Department	Yes
Transportation Department	No
Economic Development Department	No
Housing Department	Yes - Rolla Public Housing Authority
Planning Consultant	-
Regional Planning Agencies	MRPC
Historic Preservation	No
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	Yes
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
<b>Local Funding Availability</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	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	-
Ability to withhold spending in hazard prone areas	Yes

Source: Data Collection Questionnaire, 2015

## 2.2.6 City of St. James

### Overview

The City of St. James is located on the I-44 corridor in eastern Phelps County. In 1826, the Maramec Iron Works was founded by Thomas James of Chillicothe, MO. The City of St. James was established to accommodate the iron works. St. James was incorporated as a town in 1869. St. James experienced significant growth in the mid-20th century. Route 66 came through St. James, bringing the population up to about 3,000

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 provides municipal services for water, sewage treatment, electric and natural gas.

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.

### 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 St. James Ambulance District serves St. James and the eastern one-third portion of Phelps County. The city has three warning sirens which are controlled by the St. James Fire Department.

In addition to being served by Phelps County 9-1-1, the city has dispatch capability through the city police dispatch and fire department. The City EOC is located at the fire station, with the Tourist Center serving as a backup location and the St. James Middle School serving as a second backup location. The city government has high speed broadband internet capabilities at all city facilities.

Fiscal tools or resources that the City could potentially use to help fund mitigation activities include Community Development Block Grants, capital improvements project funding, taxes for specific purposes, fees for water, sewer, gas or electric services, debt through general obligation bonds, and debt through special tax bonds.

### Existing Plans and Policies

St. James is a member of the National Flood Insurance Program. The fire department's rural ISO rating is nine, while the city ISO rating is six. The city is also part of the county LEOP.

### Other Mitigation Activities

The local fire department provides education/awareness programs and materials on a variety of subjects including Fire Safety Week and emergency preparedness.

**Table 2.21. Demographic and Structure Risk Parameters For St. James**

Jurisdiction	Handicapped Citizens	Non-English Speaking Populations	% People Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
St. James	657	0	12.7	355	762	134	51

Source: Source: U.S. Census Bureau, 2010-2014 5-Years American Community Survey, Note: % data includes Incorporated Phelps County

**Table 2.22. City of St. James Mitigation Capabilities**

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
<b>Planning Capabilities</b>	
Comprehensive Plan	2012
Builder's Plan	N/A
Capital Improvement Plan	Yearly
City Emergency Operations Plan	No
County Emergency Operations Plan	2006
Local Recovery Plan	N/A
County Recovery Plan	N/A
Local Mitigation Plan	N/A
County Mitigation Plan	2011
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Regional
Transportation Plan	Regional
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	Yes
Building Code	BOCA
Floodplain Ordinance	Yes
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
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
<b>Program</b>	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant - Nondelegated	July 1985
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	Yes
National Weather Service (NWS) Storm Ready	Yes
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	No

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	No
Land Use Map	Yes
<b>Staff/Department</b>	
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	No
Emergency Response Team	No
Hazardous Materials Expert	Yes
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	No
Sanitation Department	Yes
Transportation Department	No
Economic Development Department	No
Housing Department	No
Planning Consultant	No
Regional Planning Agencies	MRPC
Historic Preservation	No
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	Yes
Salvation Army	No
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes
<b>Local Funding Availability</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
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

---

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2015

---

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

**Table 2.23. Mitigation Capabilities Summary Table**

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
<b>Planning Capabilities</b>						
Comprehensive Plan	No	No	No	No	1/17/2006	2012
Builder's Plan	No	No	Yes	No	No	N/A
Capital Improvement Plan	No	No	No	No	2007	Yearly
City Emergency Operations Plan	No	No	Yes	No	December, 2013	No
County Emergency Operations Plan	2006	2006	2006	2006	2006	2006
Local Recovery Plan	No	No	No	No	No	N/A
County Recovery Plan	No	No	No	No	No	N/A
Local Mitigation Plan	No	No	No	2010	2010	N/A
County Mitigation Plan	2011	2011	2011	2011	2011	2011
Local Mitigation Plan (PDM)	No	No	No	No	No	No
County Mitigation Plan (PDM)	No	No	No	No	No	No
Debris Management Plan	No	No	No	No	No	No
Economic Development Plan	Yes-Regional	Yes-Regional	Yes-Regional	Yes-Regional	2003	Yes-Regional
Transportation Plan	Regional	Regional	Regional	Regional	August, 2015	Regional
Land-use Plan	No	No	No	N/A	1/17/2006	No
Flood Mitigation Assistance (FMA) Plan	No	No	No	No	2004	No
Watershed Plan	No	No	No	No	2003	No
Firewise or other fire mitigation plan	No	No	No	N/A	No	No
School Mitigation Plan	No	No	No	No	No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No	No	No	N/A	No	No
<b>Policies/Ordinance</b>						
Zoning Ordinance	No	No	No	No	#3485	Yes
Building Code	No	No	No	2000	2000 – IBC	BOCA

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
Floodplain Ordinance	Yes	No	Yes	No	2004	Yes
Subdivision Ordinance	No	No	No	No	#3799	Yes
Tree Trimming Ordinance	No	No	No	No	No	Yes
Nuisance Ordinance	No	Yes	Yes	Yes	Yes	Yes
Storm Water Ordinance	No	Yes	No	No	Yes	Yes
Drainage Ordinance	No	No	Yes	Yes	Yes	Yes
Site Plan Review Requirements	No	No	No	No	Yes- Limited	Yes
Historic Preservation Ordinance	No	No	No	No	#3799	Yes
Landscape Ordinance	No	No	Yes	No	Yes	Yes
Wetlands and Riparian Areas Conservation Plan	No	No	No	No	No	No
<b>Program</b>						
Zoning/Land Use Restrictions	No	No	No	No	Yes	Yes
Codes Building Site/Design	No	No	No	Yes	Yes	Yes
National Flood Insurance Program (NFIP) Participant – Non-delegated	Yes	Yes	Yes	Yes	Yes	July 1985
NFIP Participant - Delegated	-	-	-	-	-	-
NFIP Community Rating System (CRS) Participating Community	No	No	No	No	No	No
Hazard Awareness Program	No	No	No	No	No	Yes
National Weather Service (NWS) Storm Ready	No	No	No	No	No	Yes
Building Code Effectiveness Grading (BCEGs)	No	No	-	No	10	No
ISO Fire Rating	N/A	9	-	8	3	6
Economic Development Program	Yes	No	No	No	Yes	Yes
Land Use Program	No	No	No	No	-	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	No
Tree Trimming Program	Yes	No	No	Yes	Yes	Yes

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
Engineering Studies for Streams (Local/County/Regional)	No	1	No	No	-	No
Mutual Aid Agreements	Yes	Yes	Yes	Yes	Yes	Yes
<b>Studies/Reports/Maps</b>						
Hazard Analysis/Risk Assessment (Local)	No	No	No	No	Yes	No
Hazard Analysis/Risk Assessment (County)	Yes	Yes	Yes	Yes	Yes	Yes
Flood Insurance Maps	No	No	No	No	No	No
FEMA Flood Insurance Study (Detailed)	No	No	No	No	No	No
Evacuation Route Map	No	No	No	No	No	No
Critical Facilities Inventory	Yes	No	No	No	Yes	Yes
Vulnerable Population Inventory	No	No	No	No	Yes	No
Land Use Map	No	No	No	No	Yes	Yes
<b>Staff/Department</b>						
Building Code Official	No	No	No	Yes	Yes	Yes
Building Inspector	No	No	No	No	Yes	Yes
Mapping Specialist (GIS)	Yes	No	No	No	Yes	Yes
Engineer	No	No	No	No	Yes	Yes
Development Planner	No	No	No	No	Yes	Yes
Public Works Official	Yes	No	No	Yes	Yes	Yes
Emergency Management Coordinator	Yes	No	No	Yes	Yes	Yes
NFIP Floodplain Administrator	Yes	No	No	Yes	Yes	Yes
Bomb and/or Arson Squad	No	No	No	No	No	No
Emergency Response Team	Yes	No	No	Yes	Yes	No
Hazardous Materials Expert	No	No	No	No	Yes	Yes
Local Emergency Planning Committee	MREPC	MREPC	MREPC	MREPC	MREPC	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	No	No

CAPABILITIES	Unincorporated Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James
Economic Development Department	No	No	No	No	No	No
Housing Department	Yes	No	No	No	No	No
Planning Consultant	No	No	No	No	-	No
Regional Planning Agencies	MRPC	MRPC	MRPC	MRPC	MRPC	MRPC
Historic Preservation	No	No	No	No	No	No
<b>Non-Governmental Organizations (NGOs)</b>						
American Red Cross	Yes	No	No	No	Yes	Yes
Salvation Army	Yes	No	No	No	Yes	No
Veterans Groups	Yes	Yes	No	No	Yes	Yes
Environmental Organization	Yes	No	No	No	Yes	No
Homeowner Associations	Yes	No	No	No	Yes	No
Neighborhood Associations	Yes	No	No	No	Yes	No
Chamber of Commerce	Yes	No	No	No	Yes	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes	No	No	Yes	Yes
<b>Financial Resources</b>						
Apply for Community Development Block Grants	Yes	Yes	Yes	No	Yes	Yes
Fund projects through Capital Improvements funding	Yes	Yes	Maybe	No	Yes	Yes
Authority to levy taxes for specific purposes	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	No	No	No	No	Yes	No
Incur dept through general obligation bonds	Yes	Yes	Yes	Yes	Yes	Yes
Incur debt through special tax bonds	Yes	Yes	No	Yes	?	Yes
Incur debt through private activities	No	No	No	No	Yes	No
Withhold spending in hazard prone areas	No	No	No	No	Yes	No

Source: Data Collection Questionnaires, 2015

---

## **2.2.7 Public School District Profiles and Mitigation Capabilities**

The following school districts are participating jurisdictions in this plan: Phelps County R-III (Edgar Springs), Newburg R-II, Rolla 31, and St. James R-I. 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 schools in the district participating in this plan have NOAA all hazard radios on site to provide early warning of hazard events. In addition, each school has fire alarms and a public address system capable of providing specific instructions in the event of an emergency. All of the Phelps County school districts all have automated phone message systems used to contact parents for normal school announcements. These automated phone message systems could also be utilized to provide emergency information regarding the schools.

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

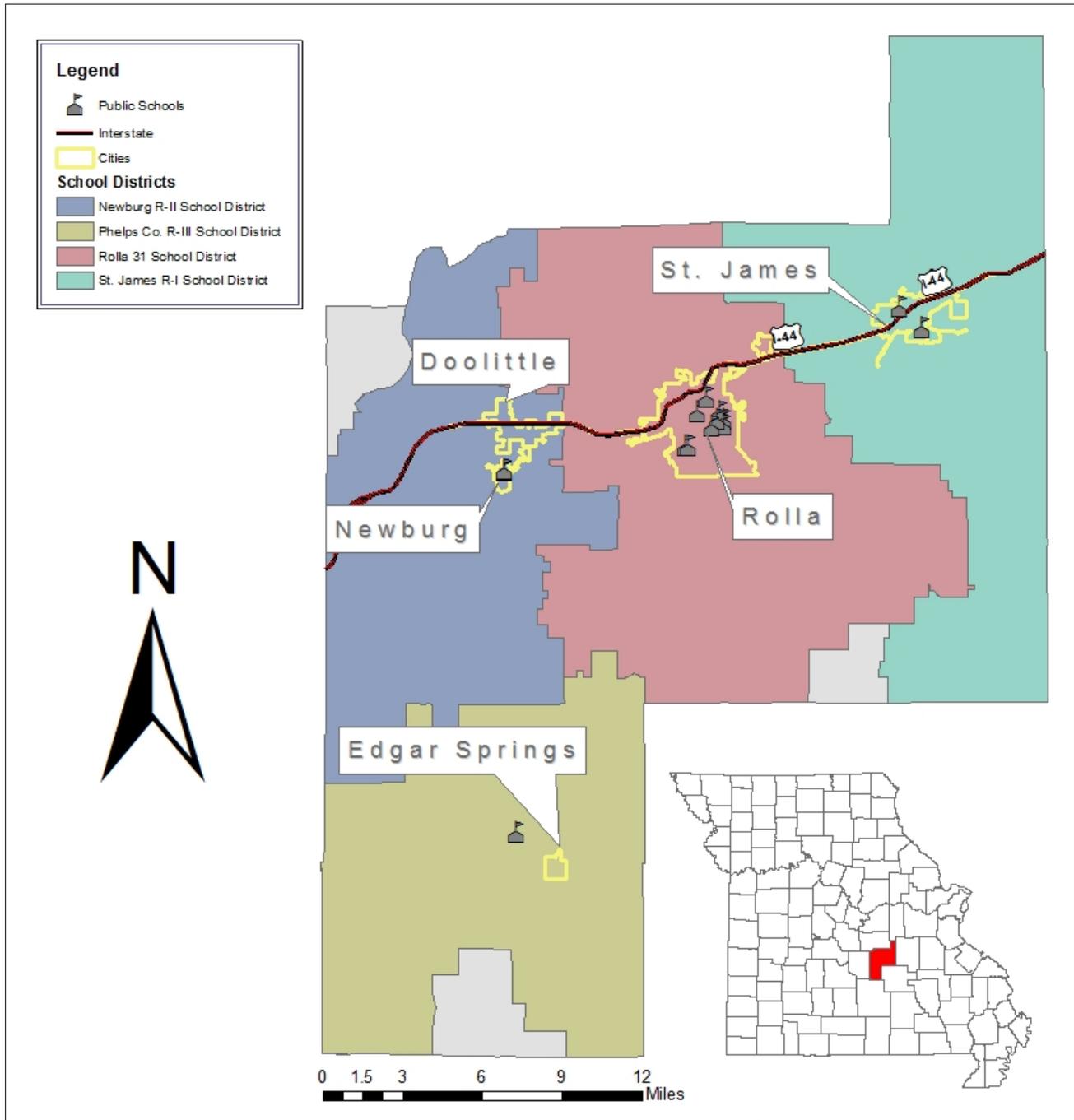
### **Existing Plans and Policies**

All school districts have an emergency management plan and weapons policy

### **Other Mitigation Activities**

All schools participating in the plan conduct regular fire, earthquake and tornado drills and tornado drills on a quarterly basis or semi-annual basis. However, Phelps County R-III is the only district to have a designated safe area for tornados – which is in accordance with FEMA standards.

**Figure 2.6. Phelps County School Districts**



**Phelps County Hazard Mitigation Plan**

MRPC  
4 Industrial Drive  
St. James, MO  
65559

## School Districts

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 responsibility is assumed by the author or MRPC for the accuracy of the information displayed on this map. October 2015



**Table 2.24. School District Buildings and Enrollment Data, 2015**

<b>District Name</b>	<b>Building Name</b>	<b>Building</b>
Phelps Co. R-III School District (Edgar Springs)		
	Phelps County Elementary	193
Newburg R-II School District		
	Newburg Elementary (K-4)	209
	Newburg Middle (5-8)/Senior High School (9-12)	213
St. James R-I School District		
	Lucy Wortham James Elementary School	782
	St. James Middle School (6-8)	418
	John F. Hodge High School (9-12)	538
Rolla 31		
	Harry S. Truman Elementary (K-4)	574
	Mark Twain Elementary (K-4)	593
	John B. Wyman Elementary (K-4)	522
	Rolla Middle School (5-7)	854
	Rolla Junior High (8-9)	636
	Rolla High School (10-12)	910

Source: <http://mcads.dese.mo.gov/quickfacts/Pages/District-and-School-Information.aspx>

**Table 2.25. Summary of Mitigation Capabilities- Phelps Co. R-III, Newburg R-II, St. James R-I, Rolla 31**

Capability	Phelps Co. R-III	Newburg R-II	St. James R-I	Rolla 31
<b>Planning Elements</b>				
Master Plan/Date	No	No	12/13/2013	2007
Capital Improvement	No	No	Ongoing	2015
School Emergency Plan/Date	Yes	Yes	Yes	2015
Weapons Policy/Date	Yes	Yes	Yes	2015
<b>Personnel Resources</b>				
Full-Time Building Official (Principle)	Yes	Yes	Yes	Yes
Emergency Manager	Yes	No	Yes	Yes
Grant Writer	No	No	No	No
Public Information Officer	Yes	Yes	Yes	Yes
<b>Financial Resources</b>				
Capital Improvements Project Funding	No	No	Yes	-
Local Funds	Yes	No	Yes	Yes
General Obligation	Yes	No	Yes	Yes
Special Tax Bonds	Yes	No	Yes	No
Private Activities/Donations	Yes	No	Yes	Yes
State and Federal Funds/Grants	Yes	No	Yes	Yes
<b>Other</b>				
Public Education Programs	-	-	-	-
Privately or Self-Insured?	Self-Insured	MUSIC	MUSIC	Self-Insured
Fire Evacuation Training	8/21/2015	10/07/2016	Yes	Annually

Tornado Sheltering Exercises	Spring, 201	Yes	Yes	Annually
Public Address/Emergency Alert System	Intercom	Yes	Yes	Yes
NOAA Weather Radios	Yes	Yes	Yes	Yes
Lock-Down Security Training	Not scheduled	08/17/2016	Yes	Annually
Mitigation Programs	Yes	No	No	Yes
Tornado Shelter/Safe-room	Yes	No	No	No
Campus Police	Yes	No	No	Resource Officer

Source: Data Collection Questionnaires, 2015

## 2.2.8 Critical Facilities

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

**Table 2.26. Phelps County Critical Facilities by Type and Jurisdiction**

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>Emergency Facilities</b>						
	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.	203 N. Louise	St. James	MO	65559
<b>Fire Department Facilities</b>						
	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
	Newburg	Newburg Volunteer FD	260 Water St.	Newburg	MO	65550
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
<b>Law Enforcement Facilities</b>						
	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
<b>Law Enforcement Facilities</b>						
	Rolla	University Police, MO S&T	1870 Miner Cir.	Rolla	MO	65401
MO000245	St. James	St. James City Police	200 N. Bourbeuse St.	St. James	MO	65559
<b>Medical Facilities</b>						
	Phelps County	Phelps Cnty. Reg. Medical Center	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	416 S. Bishop Ave.	Rolla	MO	65401
	Rolla	Pcrmc Medical Group, Inc.	1050 W. Tenth St.	Rolla	MO	65401
	Rolla	St. John's Hospital - Lebanon, Outpatient Surgery Center	1605 Martin Springs Dr.	Rolla	MO	65401
	Rolla	St. John's Clinic - Rolla Family Medicine	1605 Martin Springs Dr., Ste. 230	Rolla	MO	65401
	Rolla	St. John's Clinic - Rolla Pediatrics	1605 Martin Springs Dr., Ste. 250	Rolla	MO	65401
	St. James	Forest City Family Practice	1000 N. Jefferson	St. James	MO	65559
	St. James	St. John's Clinic	107 W Eldon St.	St. James	MO	65559
<b>School Facilities</b>						
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.	104 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
MO001525	Rolla	Rolla Lutheran School	807 W. 11th St.	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

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>School Facilities</b>						
MO000931	St. James	St. James Middle	1 Tiger Dr.	St. James	MO	65559
MO001627	St. James	Boys Town of Missouri, Inc.	13160 CR. 3610	St. James	MO	65559
MO002151	St. James	St. James High	101 E. Scioto	St. James	MO	65559
<b>Childcare Facilities</b>						
	Rolla	Mickelson, Kristina Lynn	11075 Woodale Dr.	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	Creative Kids Learning Center	1412 Heller St.	Rolla	MO	65401
	Rolla	Campbell, Peggy Joe	1608 Spencer St.	Rolla	MO	65401
	Rolla	Presbyterian Preschool	919 E. Tenth St.	Rolla	MO	65401
	Rolla	First Baptist Church Child Care Center	801 N. Cedar St.	Rolla	MO	65401
	Rolla	Rosey Cozey Cottage Daycare, LLC	601 E 5th 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	Deb's Babies & Tots	204 N. Cedar St.	Rolla	MO	65401
	Rolla	Ahearn, Katie	806 Cambridge Dr.	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	Hope Preschool and Child Care Center	102 N Rucker	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	Creative Play Learning Center on Morgan's Mountain	19410 CR. 3620	St. James	MO	65559
	St. James	Mel Carnahan Family Learning Cntr. Of Phelps County	220 E. Scioto St.	St. James	MO	65559
	St. James	The Kiddie Korral	116 N. Seymour St.	St. James	MO	65559
	St. James	Wools, Mary Beth	319 N. Seymour St.	St. James	MO	65559
	St. James	Perona, Loretta Sue	323 Winter Dr.	St. James	MO	65559

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>Childcare Facilities</b>						
	St. James	Ms. Deannas Preschool All Day Program	200 W. Hardy St.	St. James	MO	65559
	St. James	St. John Lutheran Early Childhood Cntr.	229 W. James Blvd.	St. James	MO	65559
	St. James	St. James Head Start Center	1518 Lola Ln.	St. James	MO	65559
<b>Nursing Homes</b>						
	Rolla	Choices For People Adult Day Care	1815 Forum 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	Heritage Park Skilled Care	1200 McCutchen Dr.	Rolla	MO	65401
	Rolla	Meramec Sunrise Assisted Living Facility	803 E. 12th St.	Rolla	MO	65401
	Rolla	Rolla Manor Care Center	1800 White Columns Dr.	Rolla	MO	65401
	St. James	Golden 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

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

**Table 2.27. Phelps County Colleges/Universities**

<b>College/University</b>	<b>Location</b>	<b>Description</b>
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
East Central College	500 Forum Drive Rolla, MO 65401	Main campus in Union, MO Bachelor degrees
Webster University	1103 Kingshighway Rolla, MO 65401	Main campus in St. Louis, MO Bachelor and Masters degrees
Metro Business College	Hwy 72 Rolla, MO 65401	Main campus in Jefferson City, Mo Associate degrees
Columbia College	Hwy 63 N. Rolla, MO 65401	Main campus in Columbia, MO Bachelor degrees

## 3 RISK ASSESSMENT

<b>3.1 Hazard Identification</b> .....	<b>3.4</b>
3.1.1 <i>Review of Existing Mitigation Plans</i> .....	3.4
3.1.2 <i>Review Disaster Declaration History</i> .....	3.7
3.1.3 <i>Research Additional Sources</i> .....	3.9
3.1.4 <i>Hazards Identified</i> .....	3.11
3.1.5 <i>Multi-Jurisdictional Risk Assessment</i> .....	3.14
<b>3.2 Assets at Risk</b> .....	<b>3.14</b>
3.2.1 <i>Total Exposure of Population and Structures</i> .....	3.14
Unincorporated County and Incorporated Cities .....	3.14
3.2.2 <i>Critical and Essential Facilities and Infrastructure</i> .....	3.16
3.2.3 <i>Other Assets</i> .....	3.19
<b>3.3 Future Land Use and Development</b> .....	<b>3.23</b>
<b>3.4 Hazard Profiles, Vulnerability, and Problem Statements</b> .....	<b>3.26</b>
Hazard Profiles .....	3.26
Vulnerability Assessments.....	3.27
Problem Statements .....	3.28
3.4.1 <i>Dam Failure</i> .....	3.29
Hazard Profile .....	3.29
Vulnerability.....	3.48
Problem Statement.....	3.54
3.4.2 <i>Drought</i> .....	3.55
Hazard Profile .....	3.55
Vulnerability.....	3.63
Problem Statement.....	3.67
3.4.3 <i>Earthquakes</i> .....	3.68
Hazard Profile .....	3.68
Vulnerability.....	3.74
Problem Statement.....	3.81
3.4.4 <i>Extreme Heat</i> .....	3.82
Hazard Profile .....	3.82
Vulnerability.....	3.87
Problem Statement.....	3.89
3.4.5 <i>Fires (Urban/Structural and Wild)</i> .....	3.90
Hazard Profile .....	3.90
Vulnerability.....	3.95
Problem Statement.....	3.97

---

3.4.6	<i>Flooding (Flash and River)</i> .....	3.98
	Profile .....	3.98
	Vulnerability.....	3.120
	Problem Statement.....	3.128
3.4.7	<i>Land Subsidence/Sinkholes</i> .....	3.129
	Hazard Profile .....	3.129
	Due to the lack of data for previous sinkhole events in Phelps County, a probability could not be calculated. .....	3.135
	Vulnerability.....	3.135
	Problem Statement.....	3.136
3.4.8	<i>Thunderstorm/High Winds/Lightning/Hail</i> .....	3.137
	Hazard Profile .....	3.137
	Vulnerability.....	3.146
	Problem Statement.....	3.153
3.4.9	<i>Tornado</i> .....	3.154
	Hazard Profile .....	3.154
	Vulnerability.....	3.160
	Problem Statement.....	3.165
3.4.10	<i>Winter Weather/Snow/Ice/Severe Cold</i> .....	3.166
	Hazard Profile .....	3.166
	Vulnerability.....	3.172
	Problem Statement.....	3.177

---

A

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

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

This chapter is divided into four main parts:

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

---

## 3.1 Hazard Identification

---

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

The primary phase in the development of a hazard mitigation plan is to identify specific hazards which may impact the planning area. To initiate this process, the Hazard Mitigation Planning Committee (HMPC) reviewed a list of natural hazards provided by the Federal Emergency Management Agency (FEMA). From that list, the HMPC selected pertinent natural hazards of concern that have the potential to impact 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 Heat
- Fires (Urban/Structural and Wild)
- Flooding
- Land Subsidence/Sinkholes
- Thunderstorm/High Winds/Lightning/Hail
- Tornado
- Severe Winter Weather

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

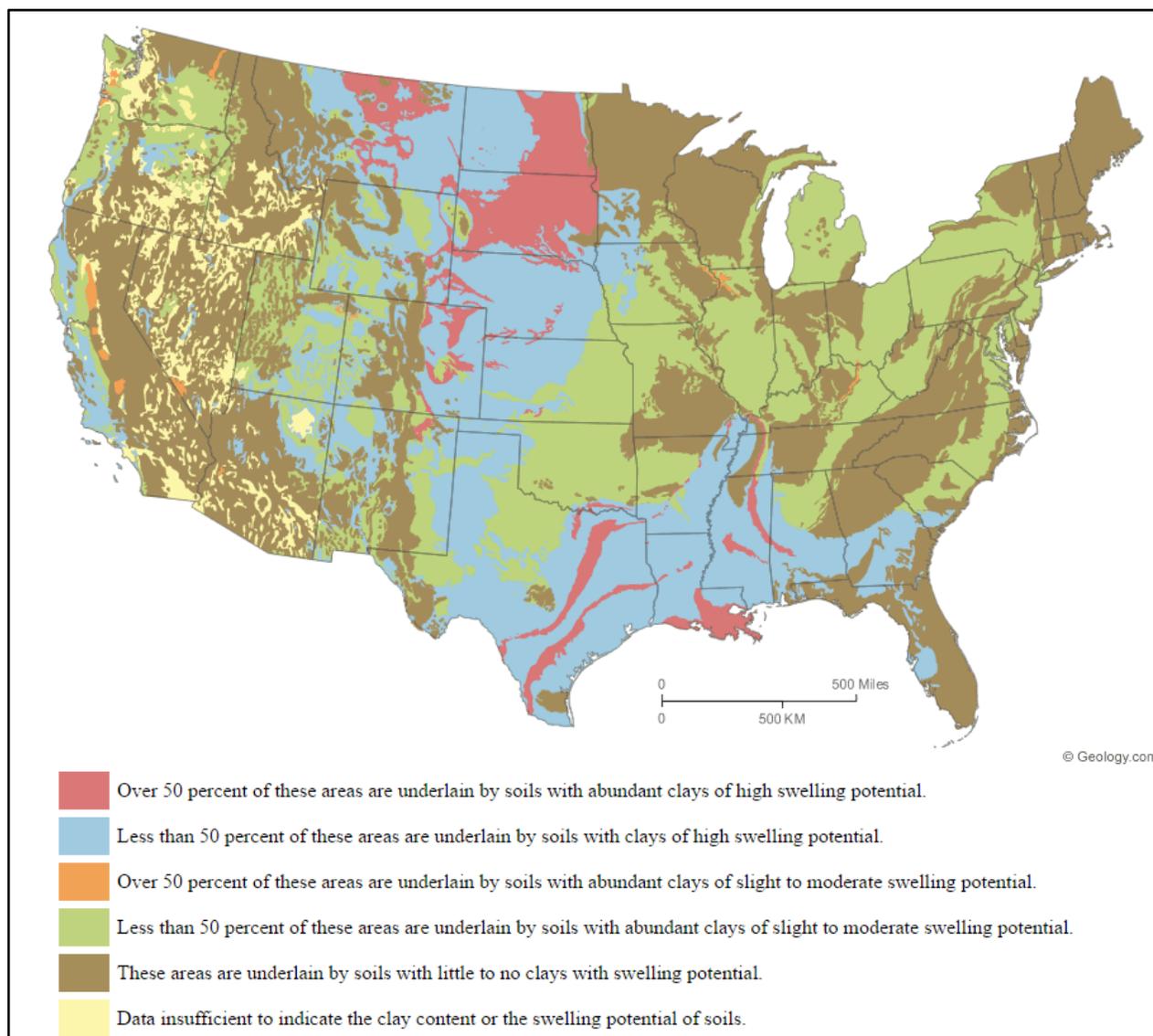
**Table 3.1. Table 3.1 Hazards Not Profiled in the Plan**

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

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

<sup>2</sup> <http://nld.usace.army.mil/egis/f?p=471:1:>

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



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

### 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 initiated when the local government's response and recovery capabilities have been exhausted. In this type of situation, the state may declare a disaster and provide resources from the state level. If the disaster is so great that state resources are also overwhelmed, a federal disaster may be declared in order to allow for federal assistance.

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

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

Missouri has been especially hard hit by natural disasters in the recent past. The state has had 66 federally declared disasters since 1957. Of those, 36 have occurred between 2000 and 2015. All of these disasters have been weather related – severe wind and rain storms, tornadoes, flooding, hail, ice storms and winter storms. **Table 3.2** lists the federal disaster declarations for Phelps County from 1990 through 2015.

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

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
EM-3232	Hurricane Katrina Evacuation	Declaration Date: September 10, 2005 Incident Period: August 29, 2005 to October 01, 2005	PA

<b>Disaster Number</b>	<b>Description</b>	<b>Declaration Date Incident Period</b>	<b>Individual Assistance (IA) Public Assistance (PA)</b>
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

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

---

### 3.1.3 Research Additional Sources

---

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

- Missouri Hazard Mitigation Plans (2010 and 2013)
- Previously approved planning area Hazard Mitigation Plan (12/1/2011)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources (MDNR)
- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- National Agricultural Statistics Service (Agriculture production/losses)
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Environmental Protection Agency
- Flood Insurance Administration
- Hazards US (HAZUS)
- Missouri Department of Transportation
- Missouri Division of Fire Marshal Safety
- Missouri Public Service Commission
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC);
- Pipeline and Hazardous Materials Safety Administration
- County and local Comprehensive Plans to the extent available
- County Emergency Management
- County Flood Insurance Rate Map, FEMA
- Flood Insurance Study, FEMA
- SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin
- U.S. Army Corps of Engineers
- U.S. Department of Transportation
- United States Geological Survey (USGS)
- Various articles and publications available on the internet (sources are cited in the body of the Plan)

Remarkably, the only centralized source of data for many of the weather-related hazards is the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC). Although it is usually the best and most current source, there are limitations to the data which should be noted. The NCDC documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. In addition, it is a partial record of other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occurs in connection with another event. Some information appearing in the NCDC may be

---

provided by or gathered from sources outside the National Weather Service (NWS), such as the media, law enforcement and/or other government agencies, private companies, individuals, etc. An effort is made to use the best available information but because of time and resource constraints, information from these sources may be unverified by the NWS. Those using information from NCDC should be cautious as the NWS does not guarantee the accuracy or validity of the information.

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

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

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

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

### 3.1.4 Hazards Identified

**Table 3.3** lists the hazards that significantly impact each jurisdiction within the planning area and were chosen for further analysis in alphabetical order. However, not all hazards impact every jurisdiction such as dam failure. “X” indicates the jurisdiction is impacted by the hazard, and a “-” indicates the hazard is not applicable to that jurisdiction. As 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 3.4** depicts a summary of natural hazard profiles and severity ratings by participating jurisdictions.

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

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme 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

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

		Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James	Phelps Co. R-III	Newburg R-II
Dam Failure	P	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Drought	P	19.58%	19.58%	19.58%	19.58%	19.58%	19.58%	19.58%	19.58%
	V	L	L	L	L	L	L	L	L
Earthquake	P	1%	1%	1%	1%	1%	1%	1%	1%
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Extreme Heat	P	69.23%	69.23%	69.23%	69.23%	69.23%	69.23%	69.23%	69.23%
	V	L	L	L	L	L	L	L	L
Fires (Urban/Structural and Wild)	P	100%	100%	100%	100%	100%	100%	100%	100%
	V	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Flooding	P	85%	85%	85%	85%	85%	85%	85%	85%
	V	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M
Land Subsidence/Sinkholes	P	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Thunderstorm: *Heavy Rain/High Winds/Lightning/Hail	P	35%	35%	35%	35%	35%	35%	35%	35%
	V	M	M	M	M	M	M	M	M
Tornado	P	40.90%	40.90%	40.90%	40.90%	40.90%	40.90%	40.90%	40.90%
	V	H	H	H	H	H	H	H	H

		Phelps County	Doolittle	Edgar Springs	Newburg	Rolla	St. James	Phelps Co. R-III	Newburg R-II
<b>Severe Winter Weather/Snow/Ice/Severe Cold</b>	<b>P</b>	81.82%	81.82%	81.82%	81.82%	81.82%	81.82%	81.82%	81.82%
	<b>V</b>	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M
<b>Vulnerability Rating Key: L = Low, L-M = Low-Medium, M = Medium, M-H = Medium – High, H = High, NDA = No Data Avail.</b>									
<b>*indicates hazard utilized for probability.</b>									

---

### 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 are widespread in the county, but more localized in their effects. Areas of urbanization include Doolittle, Edgar Springs, Newburg, Rolla, and St. James. These urbanized areas have more assets at a greater density, and therefore have greater vulnerability to weather-related hazards. Rural areas include agricultural assets (livestock/crops) that are also vulnerable to damages. Differences among jurisdictions for each hazard will be discussed in greater detail in the vulnerability section of each hazard.

## 3.2 Assets at Risk

---

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

### 3.2.1 Total Exposure of Population and Structures

---

#### Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2010 Census Bureau data. Building counts and building exposure values are based on parcel data provided by the State of Missouri Geographic Information Systems (GIS) database which can be found at the following website, [http://sema.dps.mo.gov/programs/mitigation\\_management.php](http://sema.dps.mo.gov/programs/mitigation_management.php). Contents exposure values were calculated by factoring a multiplier to the building exposure values based on usage type. The multipliers were derived from the HAZUS MH 2.1 and are defined below in **Table 3.5**. Land values have been purposely excluded from consideration because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Another reason for excluding land values is that state and federal disaster assistance programs generally do not address loss of land (other than crop insurance). It should be noted that the total valuation of buildings is based on county assessors' data which may not be current. In addition, government-owned properties are usually taxed differently or not at all, and so may not be an accurate representation of true value. Note that public school district assets and special districts assets are included in the total exposure tables assets by community and county.

**Table 3.5** shows the total population, building count, estimated value of buildings, estimated value of contents and estimated total exposure to parcels for the unincorporated county and each incorporated city. For multi-county communities, the population and building data may include data on assets located outside the planning area. **Table 3.6** that follows provides the building value exposures for the county and each city in the planning area broken down by usage type. Finally, **Table 3.7** provides the building count total for the county and each city in the planning area broken out by building usage types (residential, commercial, industrial, and agricultural).

**Table 3.5. Maximum Population and Building Exposure by Jurisdiction-**

Jurisdiction	2014 Population	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Doolittle	640	364	231,650	-	-
Edgar Springs	244	114	98,000	-	-
Newburg	559	359	314,015	-	-
Rolla	19,808	7,358	30,652,270.76	-	-
St. James	4,184	1,909	5,221,932.22	-	-
Unincorporated Phelps County	19,656	8,945	19,126,400	-	-
<b>Total</b>	45,091	19,049	55,644,267.98	-	1,916,886,000

Sources: U.S. Census Bureau, 2010-2014 5-Year American Community Survey, 2011 Phelps County Hazard Mitigation Plan (HAZUS-MH)

**Table 3.6. Building Values/Exposure by Usage Type**

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Total
Doolittle	-	-	-	-	-
Edgar Springs	-	-	-	-	-
Newburg	-	-	-	-	-
Rolla	-	-	-	-	-
St. James	-	-	-	-	-
Unincorporated Phelps County	\$1,570,360,000	\$241,122,000	\$35,220,000	\$4,444,000	\$1,851,146,000
<b>Totals</b>	-	-	-	-	-

Source: 2011 Phelps County Hazard Mitigation Plan

**Table 3.7. Building Counts by Usage Type**

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Total
Doolittle	350	7	3	0	360
Edgar Springs	103	7	2	0	112
Newburg	351	2	0	0	353
Rolla	6,650	498	85	13	7,246
St. James	1,749	107	19	9	1,884
Unincorporated Phelps County	8,339	368	134	67	8,908
<b>Totals</b>	17,542	989	243	89	18,863

Source: 2011 Phelps County Hazard Mitigation Plan (HAZUS-MH)

Even though schools and special districts' total assets are included in the tables above, additional discussion is needed, based on the data that is available from the districts' completion of the Data Collection Questionnaire and district maintained websites. The number of enrolled students at the participating public school districts is provided in **Table 3.8** below. Additional information includes the number of buildings, building values (building exposure) and contents value (contents exposure). These numbers will represent the total enrollment and building count for the public school districts regardless of the county in which they are located.

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

Public School District	Enrollment	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Phelps Co. R-III	193	1	-	-	*16,981,511
Newburg R-II	422	7	13,002,675	2,867,275	15,869,950
St. James R-I	1,738	20	50,798,006	8,122,167	58,920,173
Rolla 31	4,298	14	113,013,190	17,326,278	130,339,468

Source: <http://mcds.dese.mo.gov/quickfacts/Pages/District-and-School-Information.aspx>, The Building Exposure, Contents Exposure, and Total Exposure amounts come from the completed Data Collection Questionnaires from Public School Districts.

\*Assessed valuation for district.

### 3.2.2 Critical and Essential Facilities and Infrastructure

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

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

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

- 2011 Phelps County Hazard Mitigation Plan

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

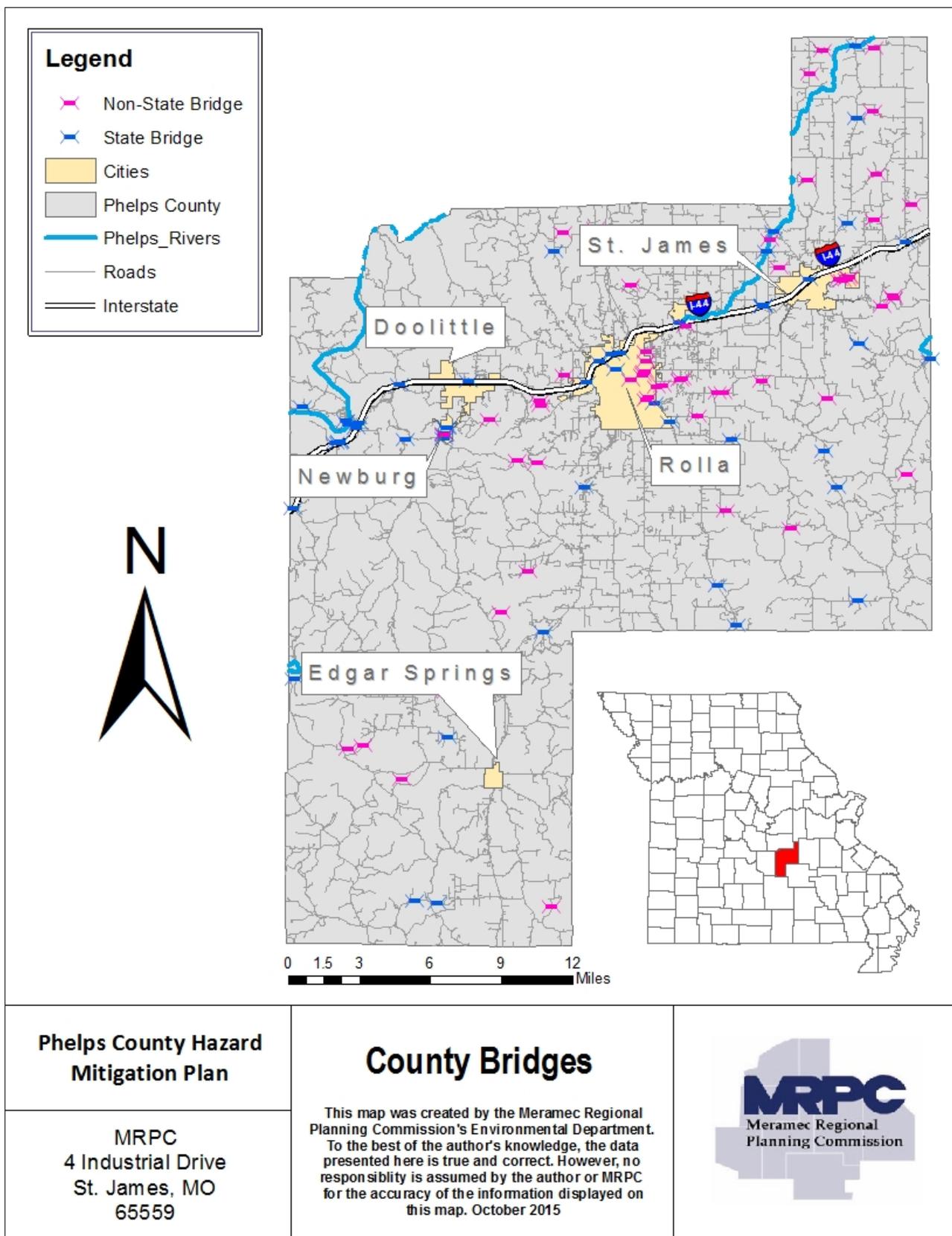
	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Highway Bridge	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	Total	
Unincorp. Phelps County	-	-	-	-	-	1	-	1	-	-	46	-	-	-	-	1	1	1	-	-	-	-	-	-	51
Doolittle	-	-	-	-	-	-	1	1	-	-	2	-	-	-	-	1	1	-	-	-	-	-	1	-	7
Edgar Springs	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	1	1	-	5	1	-	4	1	16	
Newburg	-	-	-	-	-	-	1	1	-	1	5	-	-	-	-	1	1	1	1	2	-	2	1	17	
Rolla	1	1	19	-	1	-	3	1	-	-	13	9	1	-	6	3	1	1	13	12	-	66	1	152	
St. James	-	-	8	-	-	-	1	1	-	2	2	2	-	-	4	1	1	1	3	4	-	11	1	42	
<b>Totals</b>	1	1	27	-	1	1	7	6	-	>4	68	11	1	-	10	8	>6	4	22	19	-	84	>4		

Source: Data Collection Questionnaires; HAZUS, etc..

According to the National Bridge Inventory there are a total of 155 bridges in Phelps County<sup>3</sup>. **Figure 3.2** shows the locations of State regulated bridges and non-State bridges in the planning area along with scour critical bridges. Scour critical refers to one of the database elements in the National Bridge Inventory. This element is quantified using a “scour index”, which is a number indicating the vulnerability of a bridge to scour during a flood. Bridges with a scour index between 1 and 3 are considered “scour critical”, or a bridge with a foundation determined to be unstable for the observed or evaluated scour condition. Nonetheless, there are no scour critical bridges within the County.

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

**Figure 3.2. Phelps County Bridges**



Source: MSDIS, 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 County A**

Common Name	Scientific Name	Status
<b>Fish</b>		
Crystal Darter	<i>Crystallaria asprella</i>	Endangered (S)
<b>Mammal</b>		
Gray bat	<i>Myotis grisescens</i>	Endangered (F) (S)
Indiana bat	<i>Myotis sodalis</i>	Endangered (F)
Northern long-eared bat	<i>Myotis septentrionalis</i>	Threatened (F)
Plains Spotted Skunk	<i>Spilogale putorius interrupta</i>	Endangered (S)
<b>Insect</b>		
Hine's emerald dragonfly	<i>Somatochlora hineana</i>	Endangered (F) (S)
<b>Mollusk</b>		
Spectaclecase	<i>Cumberlandia monodonta</i>	Endangered (F)
Snuffbox	<i>Epioblasma triquetra</i>	Endangered (F) (S)
<b>Plant</b>		
Running buffalo clover	<i>Trifolium stolonifereum</i>	Endangered (F) (S)
<b>Salamander</b>		
Eastern Hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>	Endangered (S)

Note: S = State, F = Federal

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

MDC Missouri Natural Heritage Program Search

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

**Table 3.11. Parks in Phelps County**

Area Name	Address	City
Beaver Creek CA	From Rolla, Take Hwy 63 S. 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 10 <sup>th</sup> 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. 16 <sup>th</sup> St. to Schuman Park Lake	Rolla
Rosati Towersite	From Rosati, take Rte. KK southwest 0.50 mile	Near Rosati
The James Foundation (Scioto Lake)	Off Hwy 8 in St. James Park	St. James
Woods (Woodson K) Mem CA	Southeast of St. James on Hwy 8	Near St. James

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

**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 5 <sup>th</sup> 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: [www.infosports.com](http://www.infosports.com), 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
Meramec Iron works District	7 mi. S of St. James on MO 8	St. James	4/16/69
Gourd Creek Cave Archaeological	Address Restricted	-	7/29/69
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	3 <sup>rd</sup> and Main Streets	Rolla	1/7/93
Phelps County Jail	Park St. between 2 <sup>nd</sup> and 3 <sup>rd</sup>	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.

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

Employer Name	Product or Service	Employees
Bloomsdale Excavating	Excavation Contractors	150
Boys & Girls Town of Missouri	Educational institution	450
Brewer Science, Inc.	Specialty chemicals for electronics, lab equipment, etc.	300
Can Tex, Inc.	Plastic pipe	100
City of Rolla	City	300
Country Mart	Grocer	100
Lowe's Home Center	Hardware, lumber, building materials	150
Missouri University of Sci. and Technology	University	1,000
Ozark Health Services	Office of physicians	240
Phelps County Regional Medical Center	Hospital	1,670
Phelps County Schools	Schools	486
Wal-Mart	Dept. Store	420
Wal-Mart Distribution Center	Warehousing and storage of merchandise	1,175

Source: Data Collection Questionnaires; local Economic Development Commissions, Meramec Region Disaster and Economic Recovery and Resiliency Strategy

Agriculture does not play a significant role in Phelps County in terms of employment. The Agribusiness Employment Location Quotient for the County is lower than 1.0; meaning that there is a low share of agribusiness industries employment to its share of total national employment<sup>4</sup>. In addition, there were 592 hired farm laborers<sup>5</sup>, comprising 3.07%<sup>6</sup> of the total workforce in 2012.

<sup>4</sup> [http://www.missourieconomy.org/pdfs/missouri\\_farms\\_and\\_agribusiness.pdf](http://www.missourieconomy.org/pdfs/missouri_farms_and_agribusiness.pdf);

<sup>5</sup> [http://www.agcensus.usda.gov/Publications/2012/Full\\_Report/Volume\\_1,\\_Chapter\\_2\\_County\\_Level/Missouri/](http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Missouri/)

<sup>6</sup> U.S. Census Bureau, 2008-2012 American Community Survey

### 3.3 Future Land Use and Development

Table 3.15 provides population growth statistics for Phelps County.

**Table 3.15. County Population Growth, 2000-2014**

Jurisdiction	Total Population 2000	Total population 2014	2000-2014 # Change	2000-2014 % Change
Unincorporated Phelps County	18,436	19,656	1,220	6.62
Doolittle	644	640	-4	-0.62
Edgar Springs	190	244	54	28.42
Newburg	484	559	75	15.50
Rolla	16,367	19,808	3,441	21.02
St. James	3,704	4,184	480	12.96

Source: U.S. Bureau of the Census, 2010-2014 5-Year American Community Survey  
Census 2000 Summary File 1 100-Percent Data

Typically population growth or decline is generally accompanied by an increase or decrease in the number of housing units. Table 3.16 provides the change in numbers of housing units in the planning area from 2000-2014.

**Table 3.16. Change in Housing Units, 2000-2014**

Jurisdiction	Housing Units 2014	Housing Units 2000	2000-2013 # Change	2000-2013 % change
Unincorporated Phelps County	8,934	8,011	923	11.52
Doolittle	250	284	-34	-11.97
Edgar Springs	102	100	2	2
Newburg	359	256	103	40.23
Rolla	8,351	7,221	1,130	15.64
St. James	1,666	1,629	37	2.27

Source: U.S. Census Bureau, 2010-2014 5-Year American Community Survey  
U.S. Bureau of the Census, Census 2000 Summary File 1

Since the last update of the Phelps County Hazard Mitigation Plan (2011), jurisdictions reported residential, commercial, and industrial developments. Rolla reported a significant increase in multi-family dwellings (multi-story buildings). Mercy medical group developed a new medical facility, Price Chopper was developed, MS&T is currently constructing a dormitory-type building for student housing, and Phelps County Regional Medical Center is presently constructing a new Cancer Center. Additionally, an assisted-living care facility with 100 beds has been constructed. St. James, Newburg, and Doolittle did not report development since 2011. Phelps County reported family dwelling/subdivision development. Edgar Springs reported the development of a Dollar General store.

Jurisdictions also reported anticipated future developments within the next 5 years (2016-2021). Rolla anticipates a large assisted living care facility, a retail development project on 150 acres north of the Kingshighway/I-44 exchange (West Side Market Place), a new animal shelter on the corner of 18<sup>th</sup> and Sharp Road, and a new airport terminal building. Furthermore, additions to transportation infrastructure include the extension of Hwy 7 to the west; connectivity to I-44, improvements to Kingshighway, and new road access to West Side Market Place. St. James anticipates infrastructure development (pipes and sidewalks). Phelps County anticipates development in Edgar Springs and Public Water/Sewer District #1. Newburg and Doolittle do not anticipate development between 2016 and 2021.

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.

### **School District's Future Development**

For school districts Rolla 31 reported additions at the Junior High, High School, and Middle School. The St. James R-I School District reported additions to the high school and the development of an elementary school. Phelps County R-III reported the completion of a FEMA building. Lastly, Newburg R-II did not report development since the last plan update.

Rolla 31 school district anticipates additions to the high school, including classrooms and an administrative office. St. James R-I anticipates the development of a preschool and performing arts center. Phelps County R-III and Newburg R-II do not anticipate development between 2016 and 2021.

For student enrollment Rolla 31 anticipates a 2% decrease, St. James R-I does not anticipate change in enrollment, Phelps County R-III anticipates a 3% increase, and Newburg R-II reported a decrease in average daily attendance.

### **Socioeconomic Profile**

The University of Missouri Extension developed a Social and Economic Profile for Phelps County. Population trend data suggests that Phelps County will increase by 2,544 individuals within the next 5 to 15 years<sup>7</sup>. Furthermore, business incentives are available in the County including the Enhanced Enterprise Zone Program; which provides tax credits to new or expanding businesses within the Enterprise Zone. MissouriWorks is another program for qualified job creators which enable the retention of withholding tax or tax credits that can be transferrable, refundable and/or saleable. In addition, sales tax exemptions exist for qualified manufacturers. Moreover, industrial infrastructure grants are available up to \$2 million or \$20,000 per job created. Lastly, businesses that create eight or more jobs may qualify for land at no cost at the St. James industrial park<sup>8</sup>. **Figure 3.3** displays socioeconomic data for Phelps County compared to the State of Missouri.

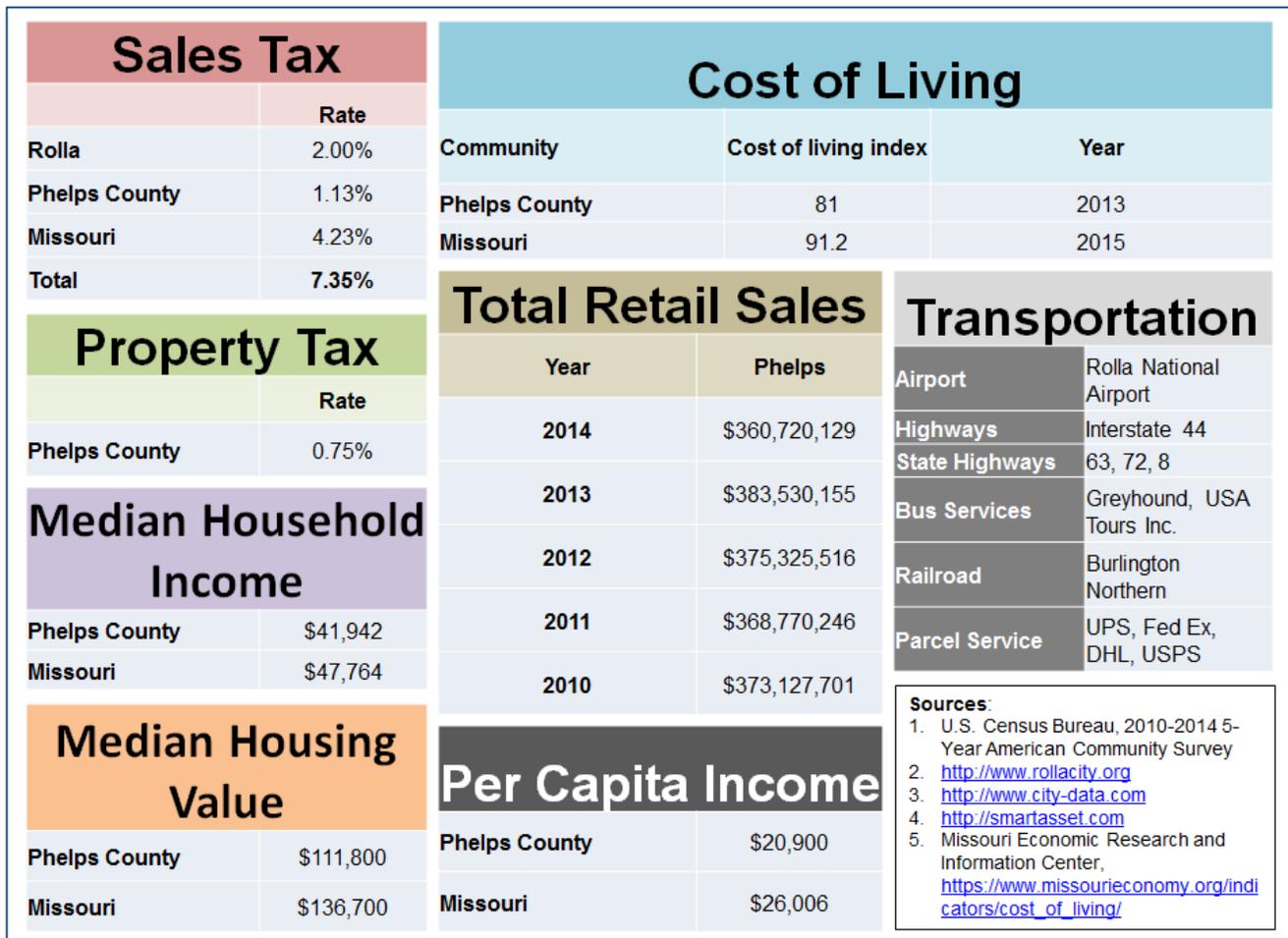
---

<sup>7</sup> UM Extension Social and Economic Profile <http://mcdc2.missouri.edu/cgi-bin/broker? PROGRAM=websas.cntypage.sas& SERVICE=appdev& debug=0&county=29161>

<sup>8</sup> [http://rollaecondev.org/index.php/site\\_selection/taxes\\_incentives](http://rollaecondev.org/index.php/site_selection/taxes_incentives)

Figure 3.3.

Phelps County Socioeconomic Profile



### 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.

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

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

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

## **Vulnerability Assessments**

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

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

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

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

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

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

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

The vulnerability assessments in the 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:** (including types and numbers, of buildings, critical facilities, etc.)

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

**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:

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

#### **Hazard Profile**

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

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

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

Information in regard to 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](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 NID, there are 30 dams located in Phelps County; including high (12), significant (1), and low (17) NID hazard class dams. The Department of Natural Resources recognizes 29 dams within the planning area; including Class 1 (4), Class 2 (8), and Class 3 (17) dams (**Table 3.19**). There are four dams 20 feet or less in height; ten dams 25 feet or less in height; nine dams 30 feet or less in height; three dams 35 feet or less in height; two dams 44 feet in height; one dam 48 feet in height; and one dam 79 feet in height. Furthermore, four dams within the planning area are regulated including Brays Lake Dam, Lake Scioto Dam, Walnut Glenn Lake Dam, and William E. Towell Dam. None of the dams are owned or operated by the United States Army Corps of Engineers (USACE). Some dams are privately owned while others are publicly owned, such as the William E Towell Dam (Missouri Department of Conservation). **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**

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

Source: Missouri Department of Natural Resources, Water Resources Program

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

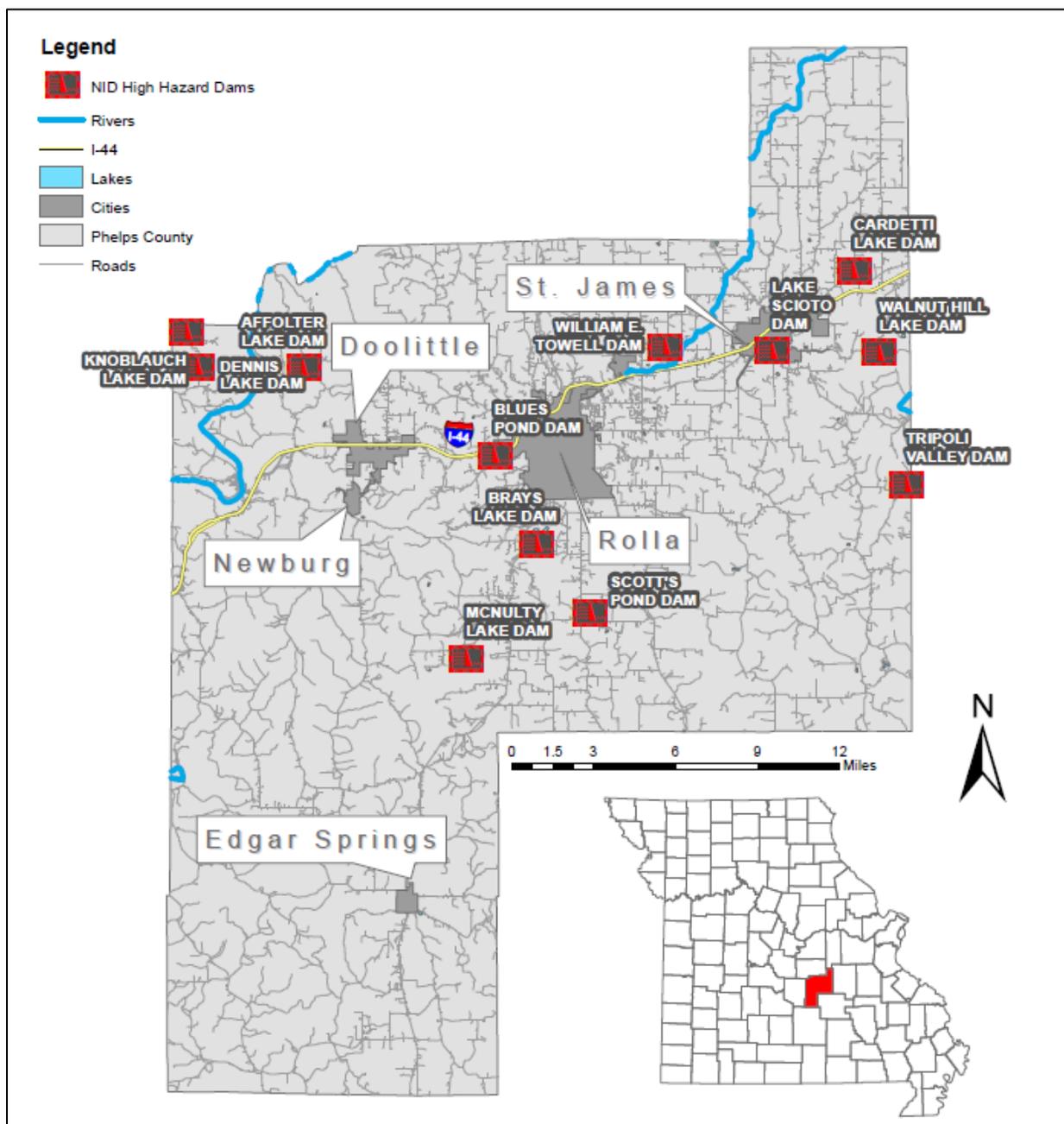
Dam Name	NID Height (Ft)	NID Storage	Last Inspection Date	River	State Regulated	Dam Owner
Affolter Lake Dam	30	32	-	TR-Tick Creek	N	Everett Affolter
Blues Pond Dam	23	98	5/22/1980	TR-Little Beaver Creek	N	M Renick & J Brenneisen
Brays Lake Dam	79	3,636	9/13/2010	Abbott Branch-Beaver Creek	Y	Warren Dean
Cardetti Lake Dam	25	187	-	TR-Clear Creek	N	Joseph Cardetti
Dennis Lake Dam	25	80	-	Mungy Branch	N	Phillip Dennis
Knoblauch Lake Dam	25	241	-	TR-Duncan Creek	N	John Knoblauch
Lake Scioto Dam	44	216	2/23/2010	TR-Luther Branch Creek	Y	James Foundation
McNulty Lake Dam	34	491	1/10/1993	Grouro Creek	N	Terry McNulty
Scott's Pond Dam	21	202	-	TR-Little Dry Fork River	N	James J Scott
Tripoli Valley Dam	26	83	9/6/1978	TR-Meramec River	N	Clara Sooter
Walnut Hill Lake Dam	20	86	-	TR-Dry Fork River	N	Ambrose N LeBeau
William E Towell Dam	48	2,490	10/11/2011	Trib of Boubeuse River	Y	MO Dept. of Conservation

Sources: National Inventory of Dams, [http://nid.usace.army.mil/cm\\_apex/f?p=838:12](http://nid.usace.army.mil/cm_apex/f?p=838:12).

**Figure 3.3** 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 vulnerable to losses. Fortunately, there are no areas of assembly in dam inundation zones.

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 3.4** to **Figure 3.7**). No other dam inundation maps were available. For the remaining NID High Hazard Dams in the County, shapefiles including 100 year flood data and Phelps County Dam locations were utilized to depict dam locations in relation to nearby streams; areas of low elevation in which water will follow during the occurrence of dam failure (**Figure 3.8** to **Figure 3.15**).

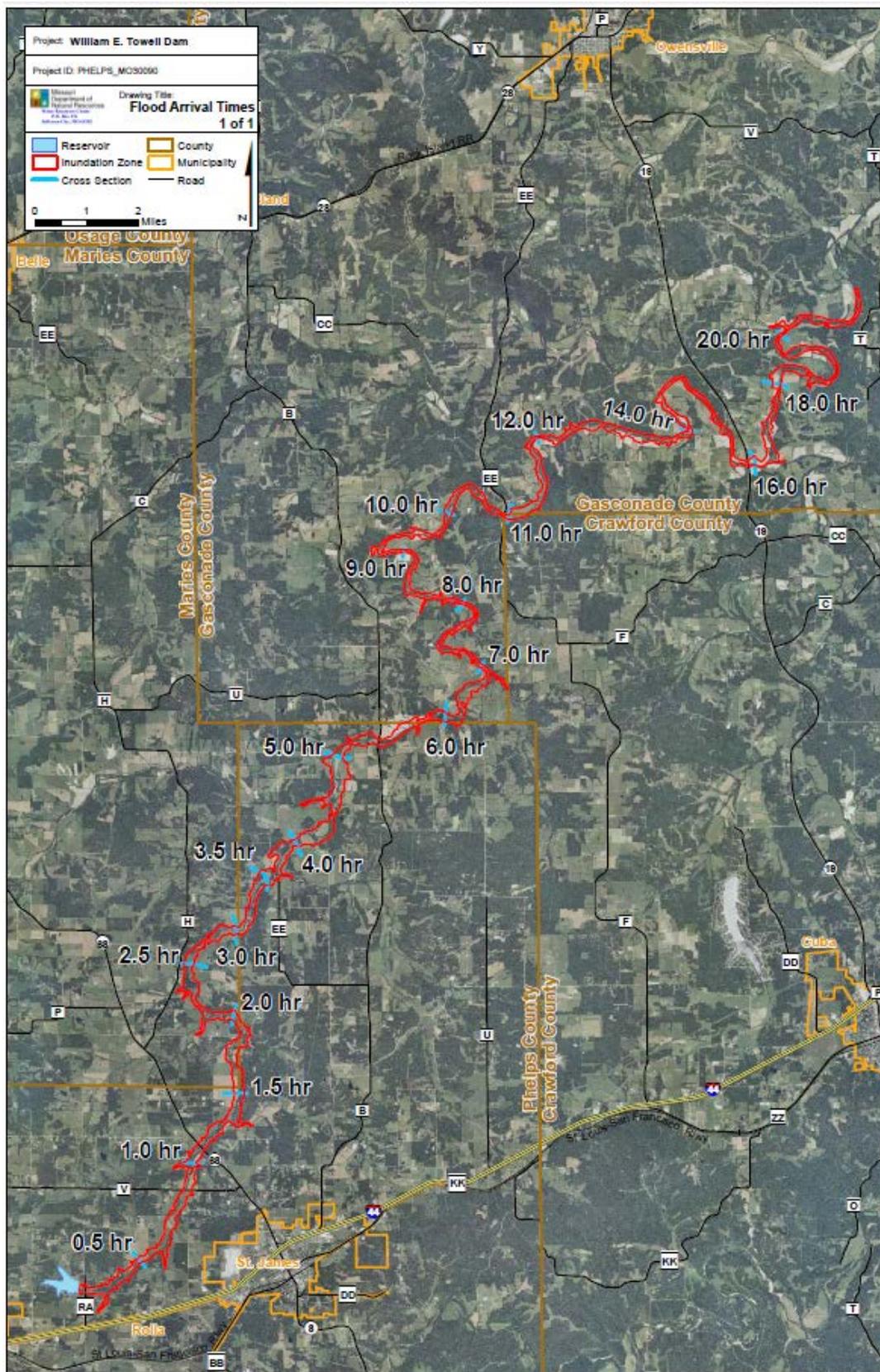
**Figure 3.3. NID High Hazard Dam Locations in Phelps County**



<p><b>Phelps County Hazard Mitigation Plan</b></p>	<p align="center"><b>County Dams</b></p> <p>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 responsibility is assumed by the author or MRPC for the accuracy of the information displayed on this map. October 2015</p>	
<p align="center">MRPC 4 Industrial Drive St. James, MO 65559</p>		

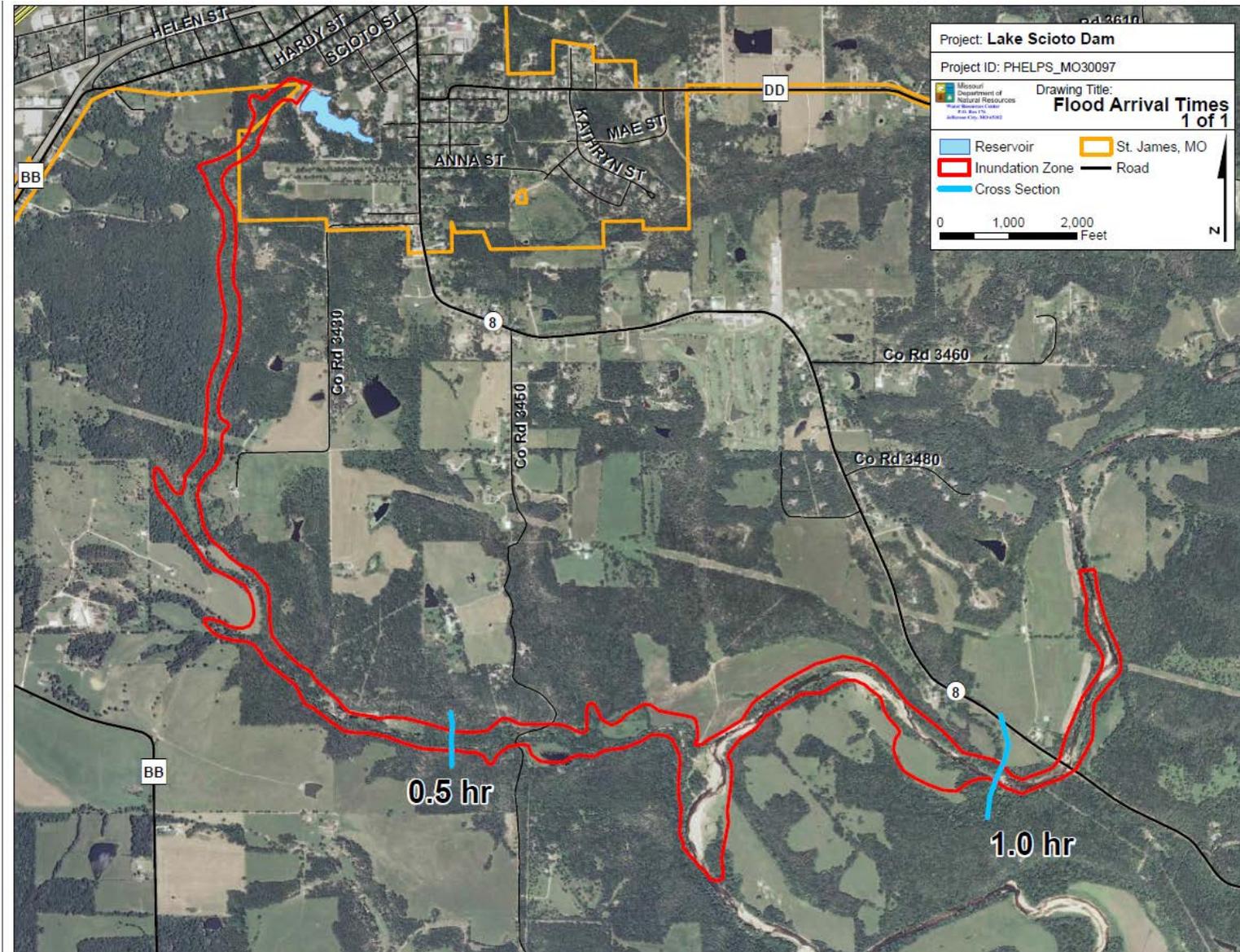
Source: MSDIS, MRPC

Figure 3.4. William E. Towell Dam Inundation Zone



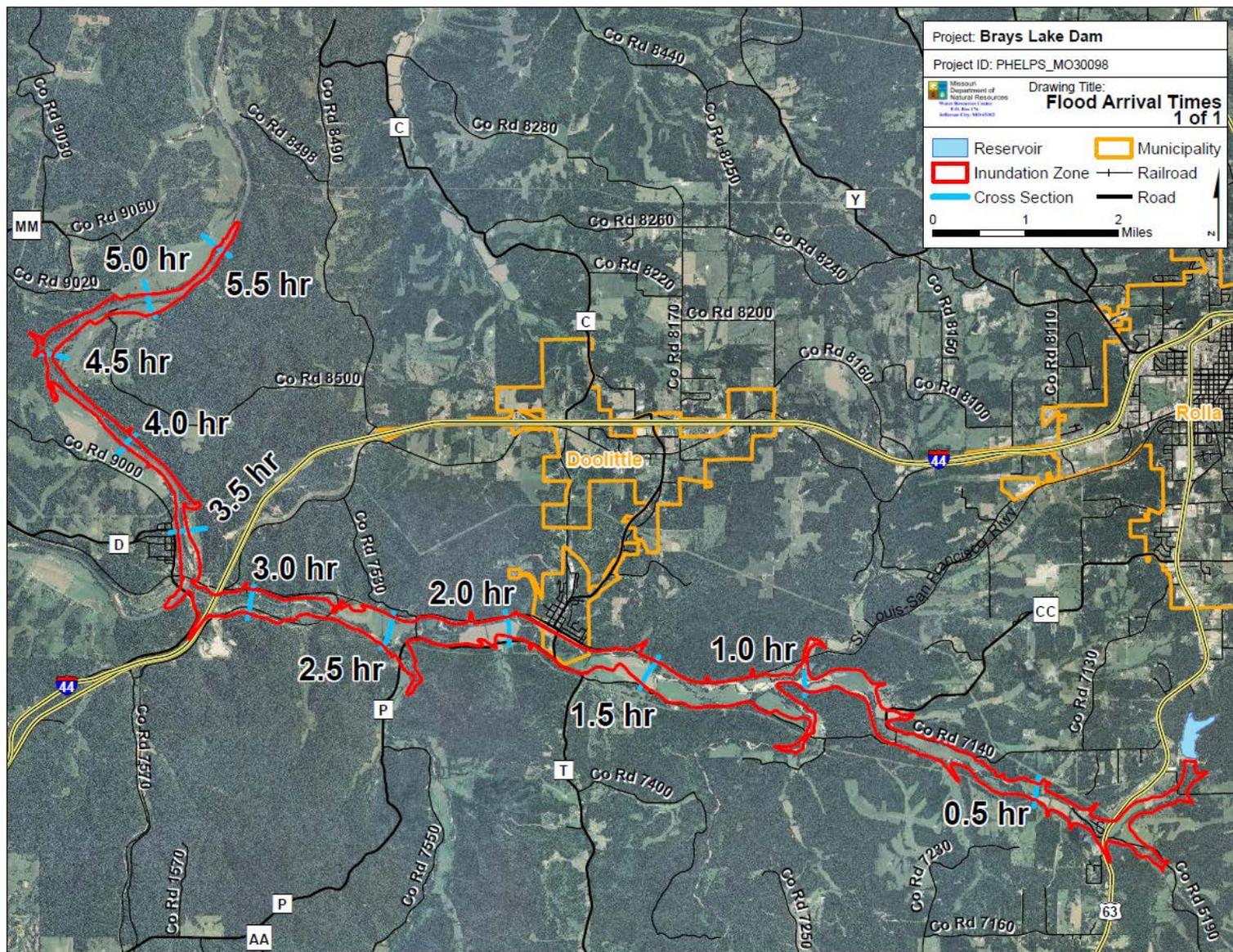
Source: MDNR

Figure 3.5. Lake Scioto Dam Inundation Zone



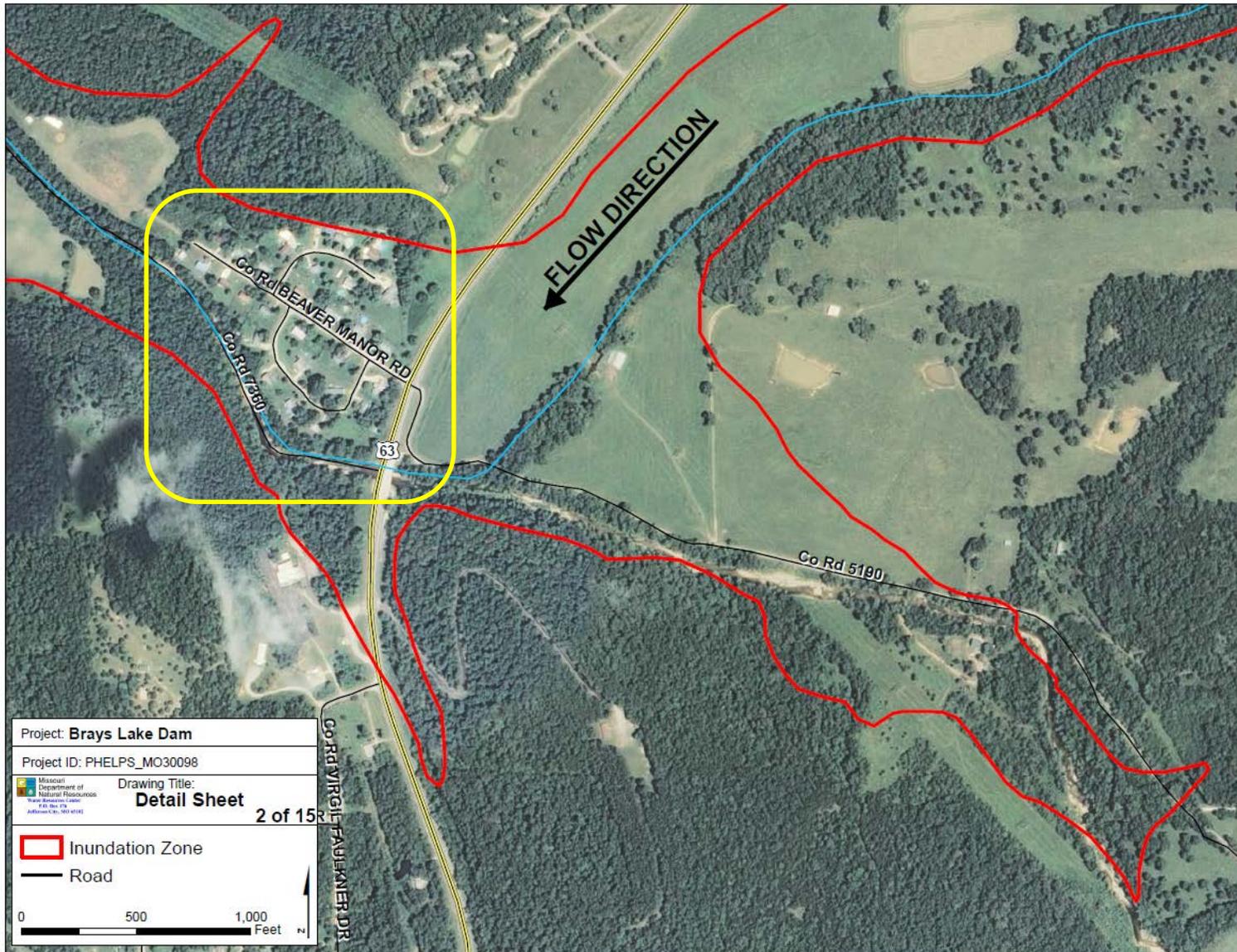
Source: MDNR

Figure 3.6. Brays Lake Dam Inundation Zone



Source: MDNR

Figure 3.7. Brays Lake Dam Inundation Zone Continued

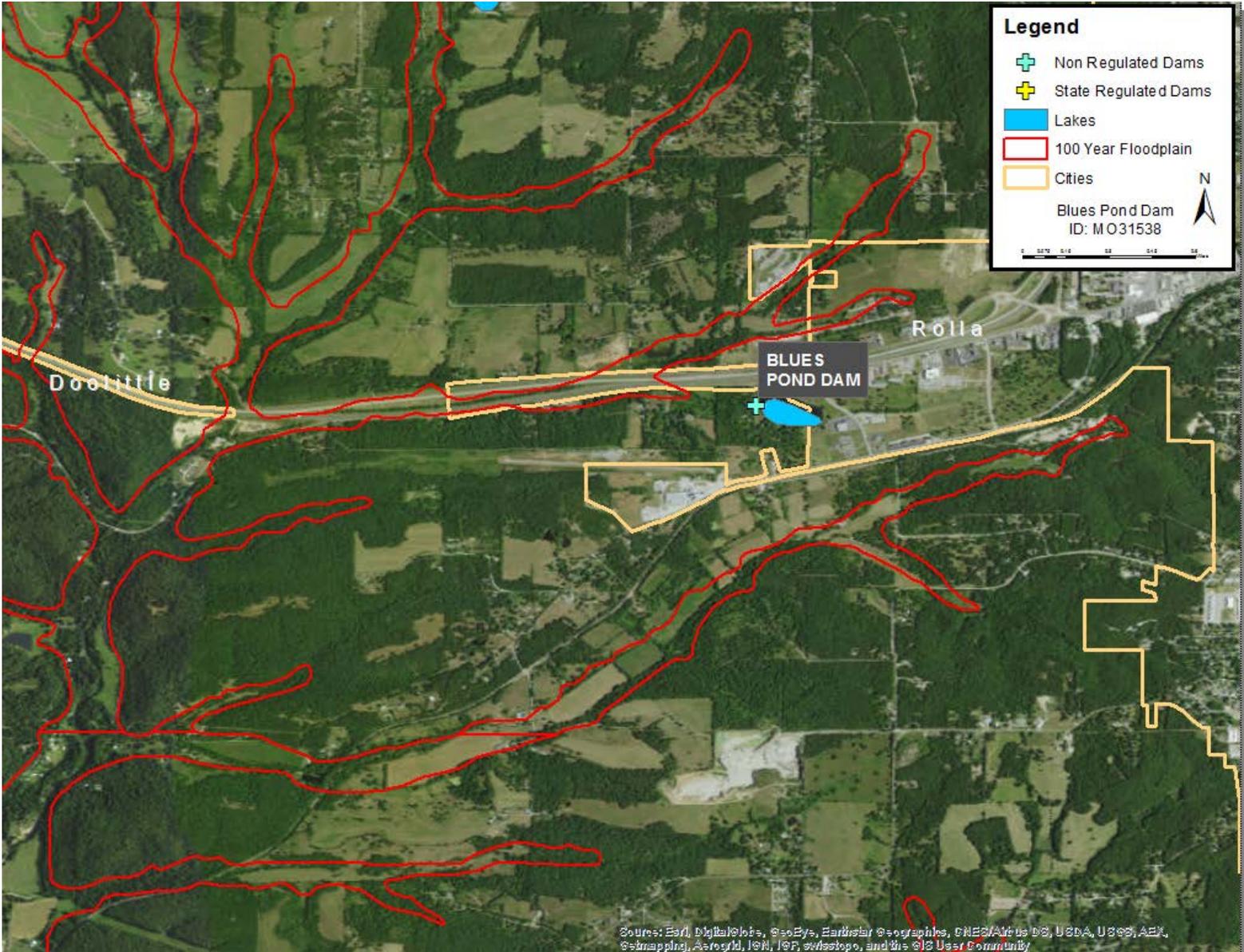


Source: MDNR

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

Figure 3.8.

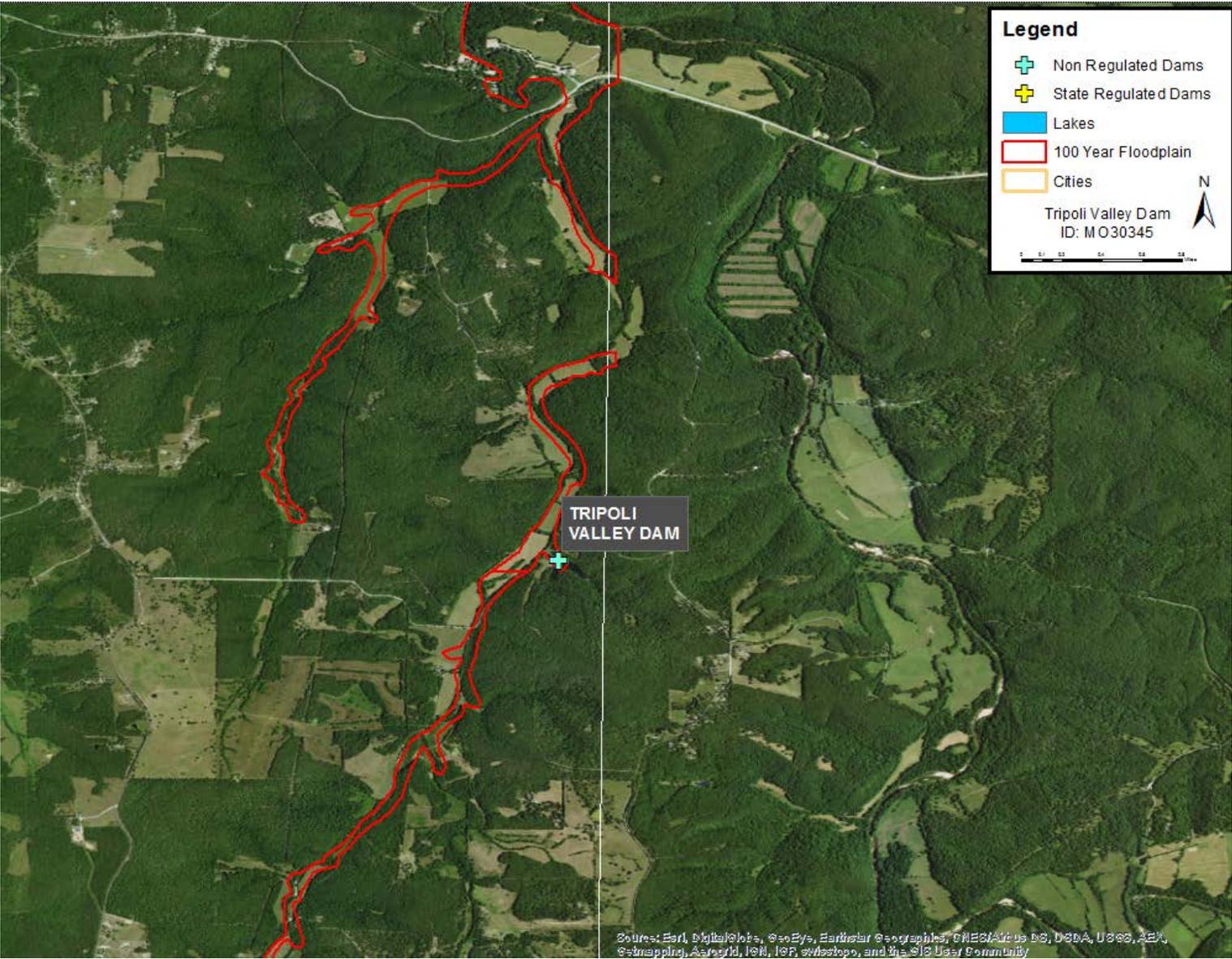
Blues Pond Dam



Source: MSDIS, MRPC

Figure 3.9.

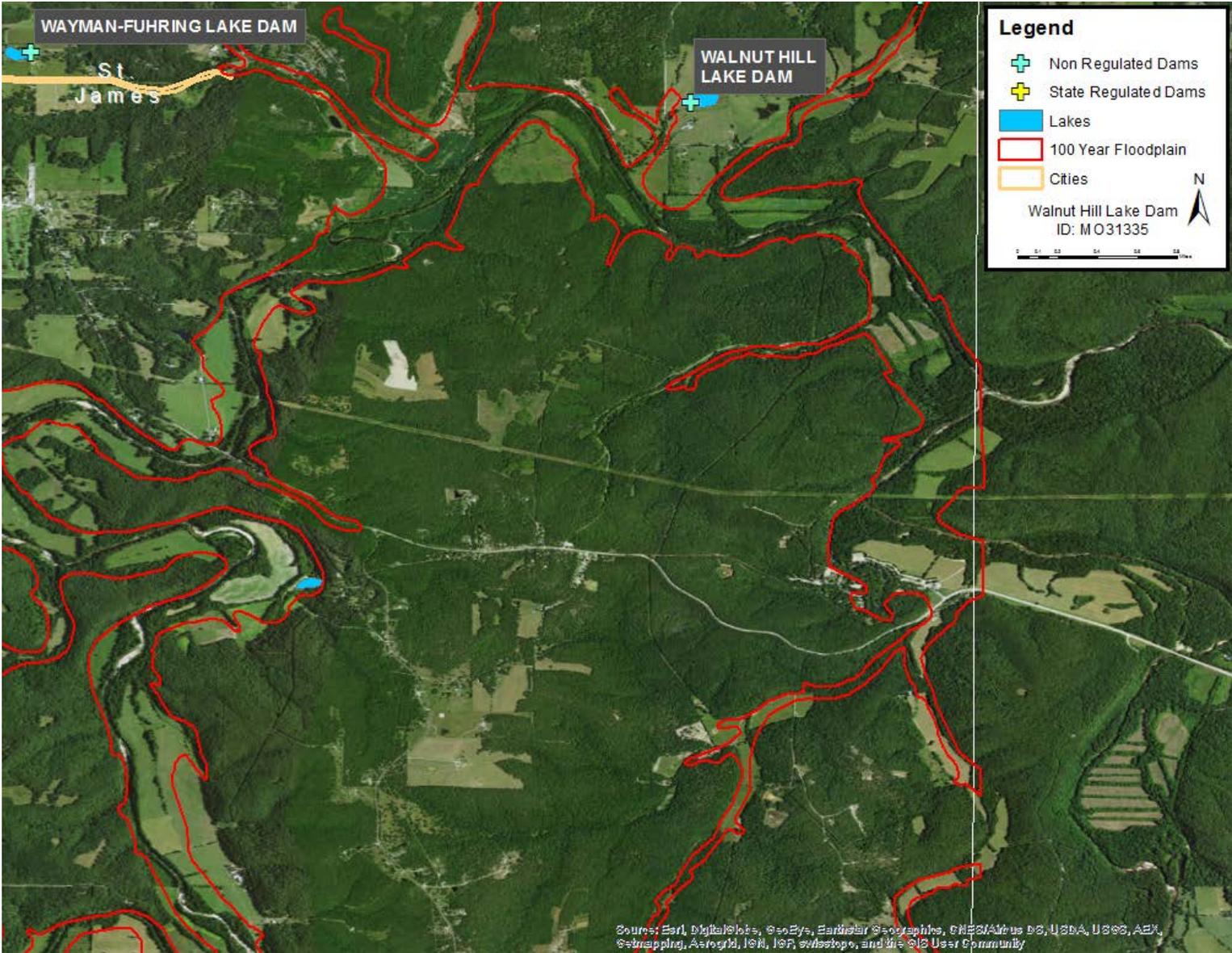
Tripoli Valley Dam



Source: MSDIS, MRPC

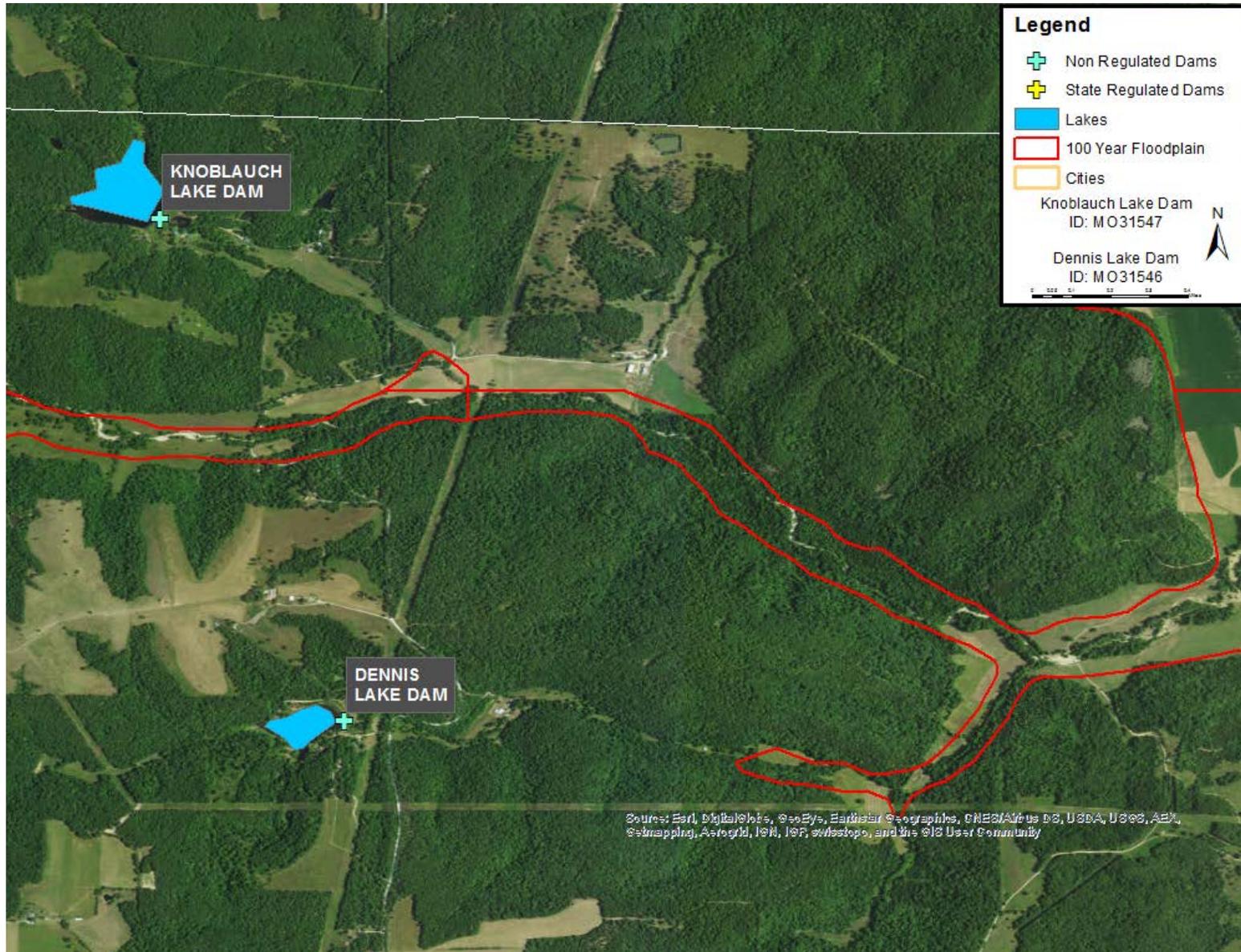
Figure 3.10.

Walnut Hill Lake Dam



Source: MSDIS, MRPC

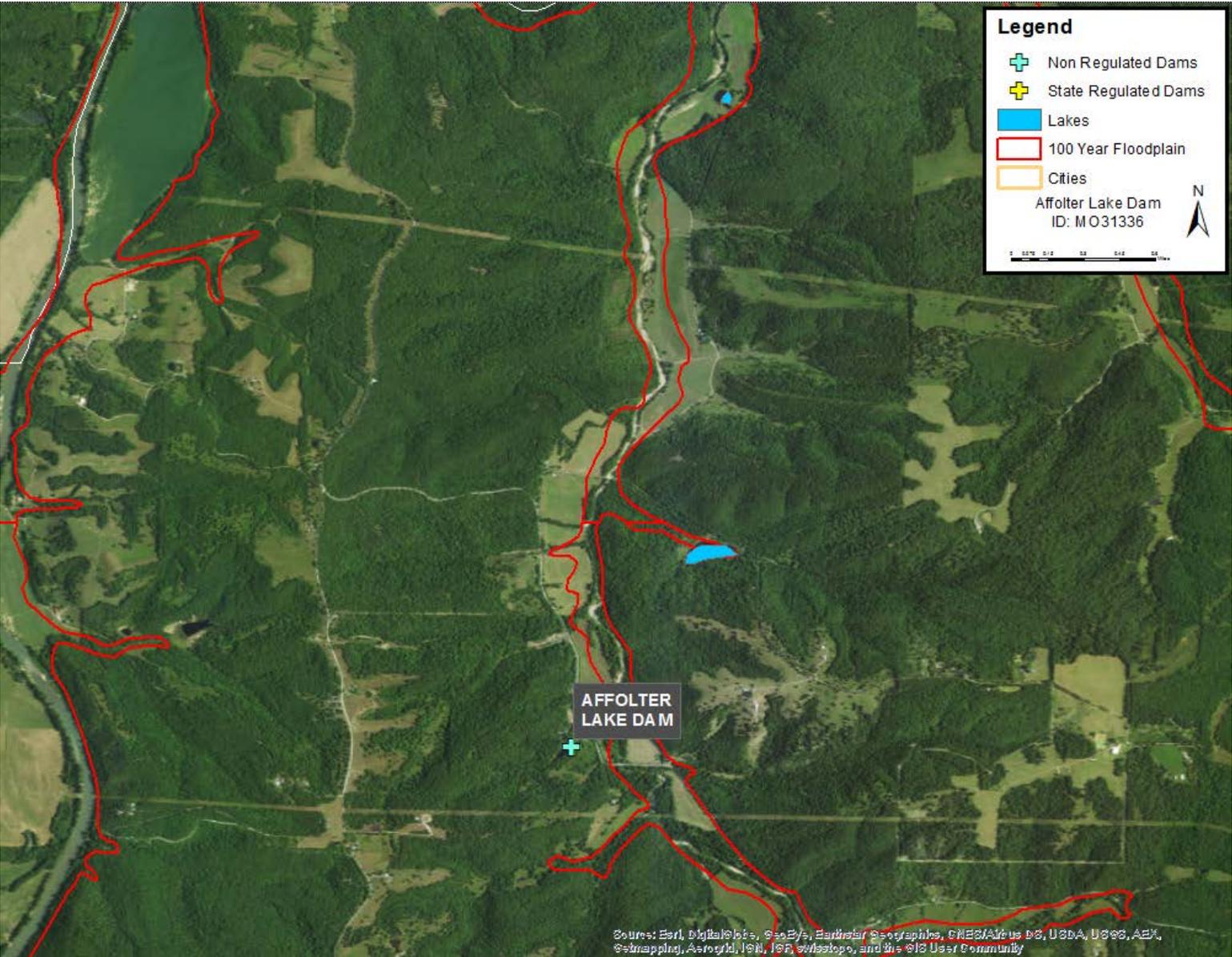
Figure 3.11. Knoblauch Lake Dam and Dennis Lake Dam



Source: MSDIS, MRPC

Figure 3.12.

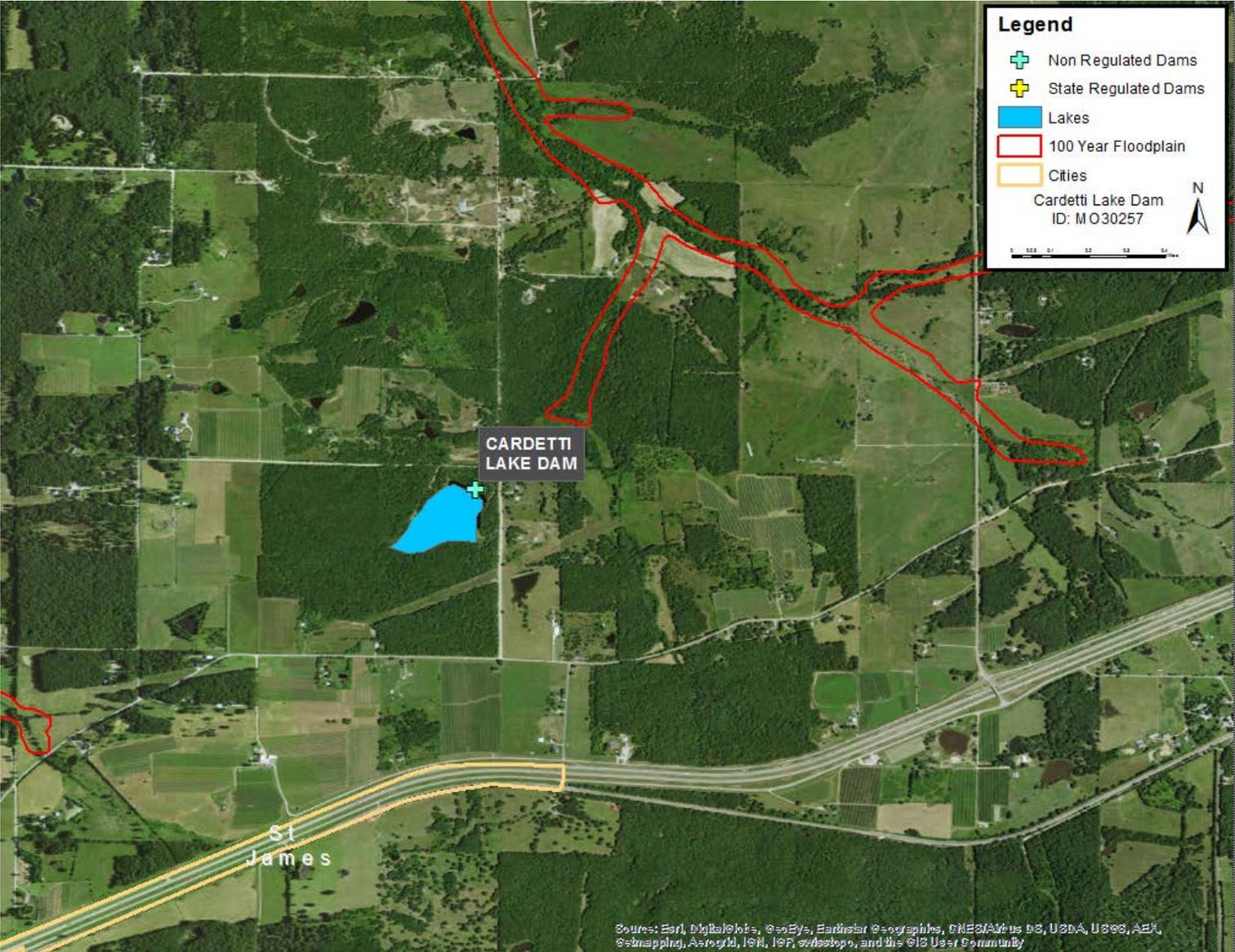
Affolter Lake Dam



Source: MSDIS, MRPC

Figure 3.13.

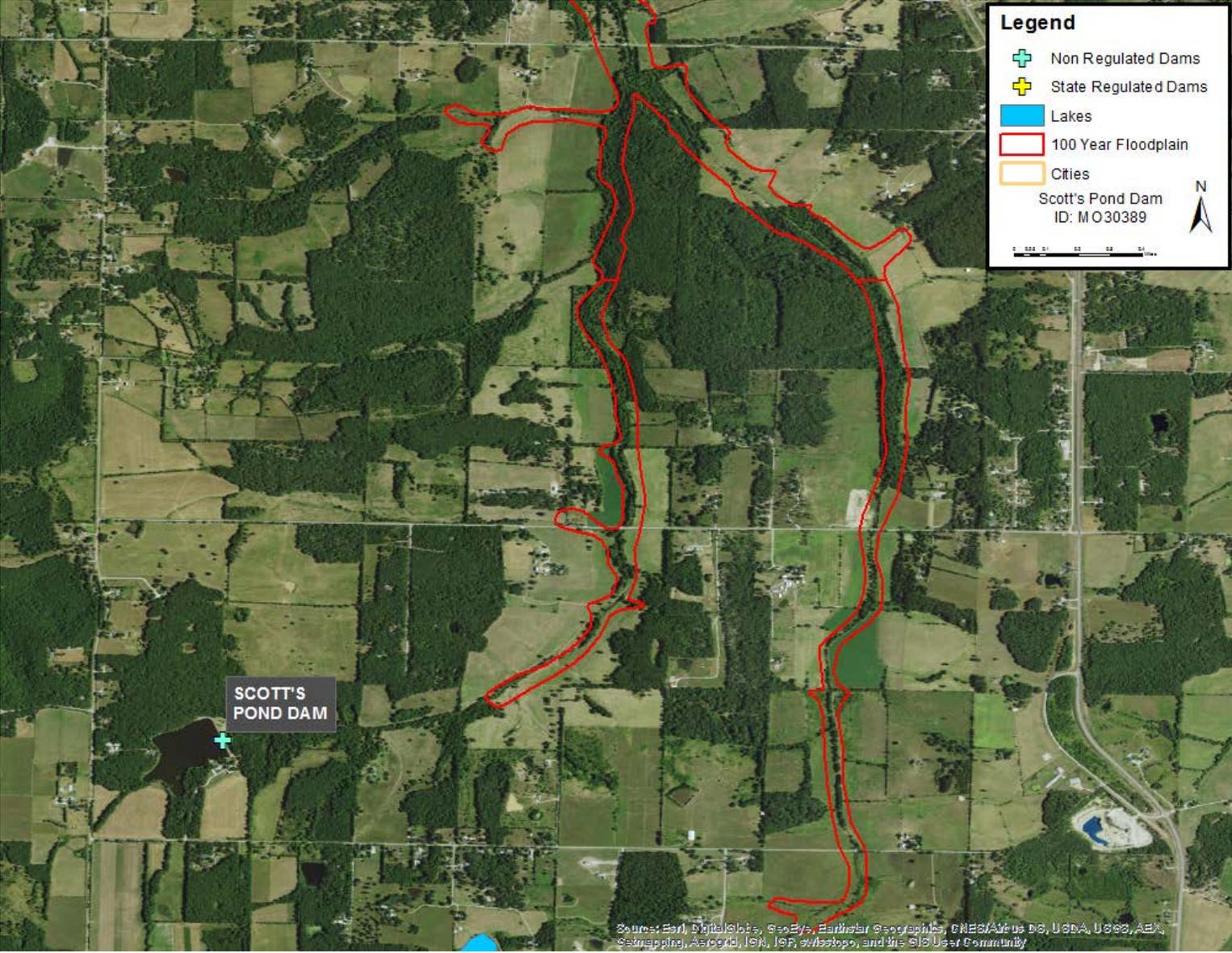
Cardetti Lake Dam



Source: MSDIS, MRPC

Figure 3.14.

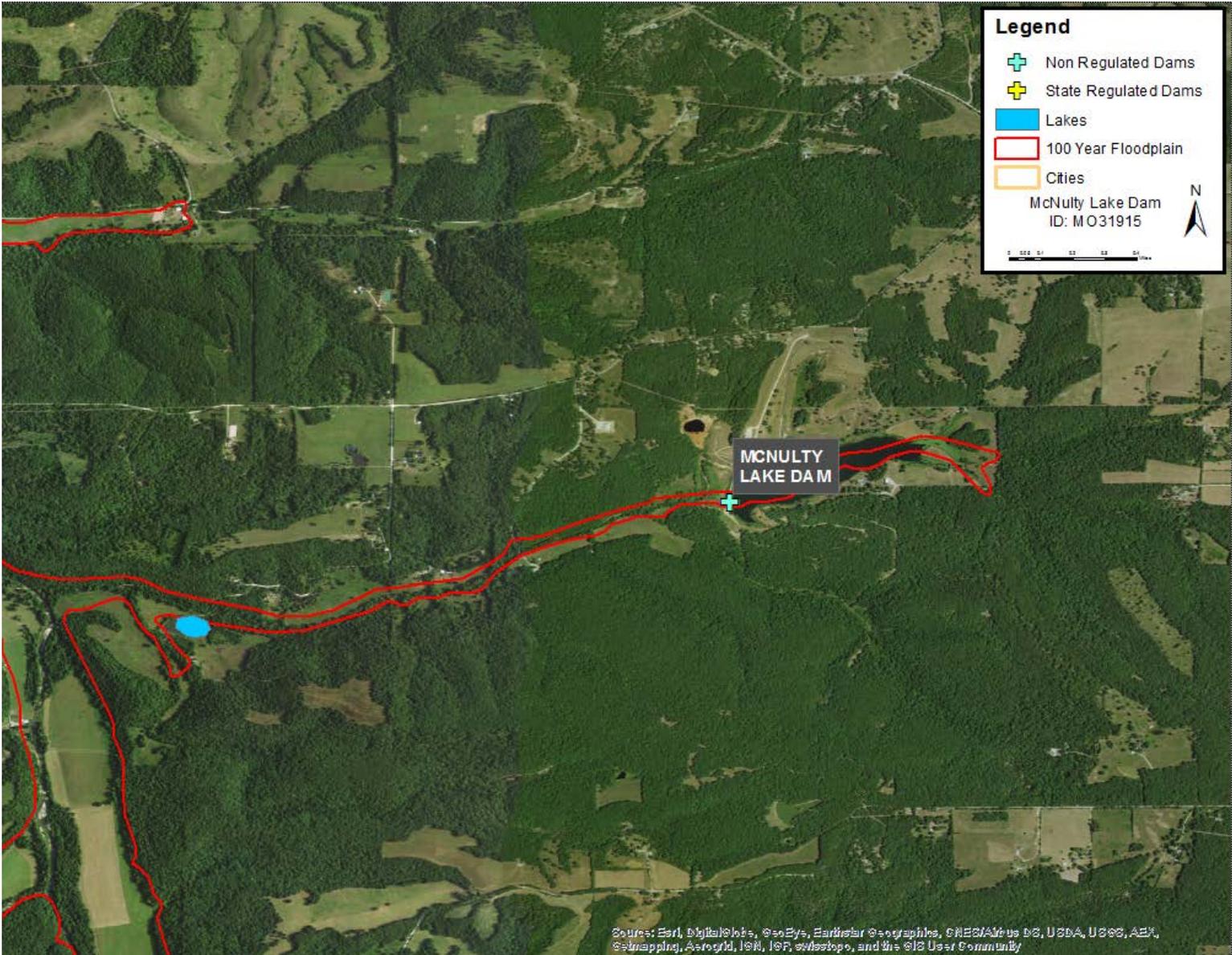
Scott's Pond Dam



Source: MSDIS, MRPC

Figure 3.15.

McNulty Lake Dam

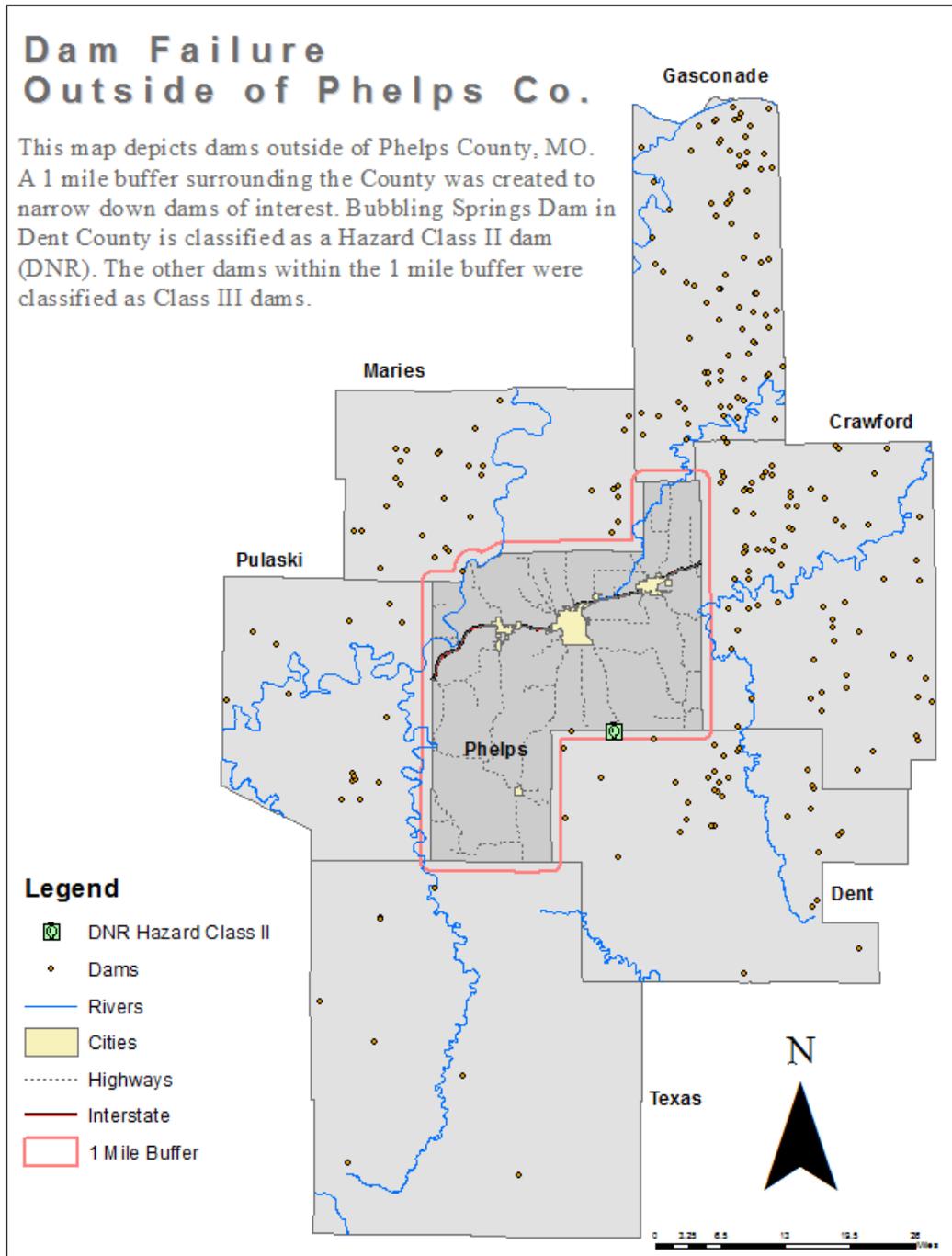


Source: MSDIS, MRPC

### Upstream Dams Outside the Planning Area

According to the Missouri Department of Natural Resources' Dam and Reservoir Safety Program, there are no regulated high hazard dams that would flow into Phelps County from surrounding counties during a failure event. **Figure 3.16** depicts dams outside of Phelps County. All but one dam within a 1 mile buffer is classified as a Class III dam. Bubbling Springs Dam in Dent County is the only dam classified as a Class II Dam.

**Figure 3.16. Upstream Dams Outside Phelps County**



Source: MSDIS, MRPC

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

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

There have been at least 27 recorded dam failures in 20 Missouri counties in the last 100 years. Fortunately, only one drowning has been associated with a dam failure in the state<sup>9</sup>. The problem of unsafe dams in Missouri was underscored by dam failures at Lawrenceton in 1968, Washington County in 1975, Fredricktown in 1977, and a near failure in Franklin County in 1979. A severe rainstorm and flash flooding in October 1998 compromised about a dozen small, unregulated dams in the Kansas City area. But perhaps the most spectacular and widely publicized dam failure in recent years was the failure of the Taum Sauk Hydroelectric Power Plant Reservoir atop Profitt Mountain in Reynolds County, MO.

In the early morning hours of December 14, 2005, a combination of human and mechanical error in the pump station resulted in the reservoir being overfilled. The manmade dam around the reservoir failed and dumped over a billion gallons of water down the side of Profitt Mountain, into and through Johnson's Shut-Ins State Park and into the East Fork of the Black River. The massive wall of water scoured a channel down the side of the mountain that was over 6000 feet wide and 7,000 feet long that carried a mix of trees, rebar, concrete, boulders and sand downhill and into the park<sup>10</sup>. The deluge destroyed Johnson's Shut-Ins State Park facilities, including the campground, and deposited sediment, boulders and debris into the park. The flood of debris diverted the East Fork of the Black River into an older channel and turned the river chocolate brown. Fortunately the breach occurred in mid-winter. Five people were injured when the park superintendent's home was swept away by the flood, but all were rescued and eventually recovered. Had it been summer, and the campground filled with park visitors, the death toll could have been very high<sup>11</sup>. This catastrophe has focused the public's attention on the dangers of dam failures and the need to adequately monitor dams to protect the vulnerable.

Despite the significance of the immediate damage done by the Taum Sauk Reservoir dam failure, the incident also highlights the long-term environmental and economic impacts of an event of this magnitude. Four years later, the toll of the flooding and sediment on aquatic life in the park and Black River 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<sup>12</sup>. Overall, many of Missouri's smaller dams are becoming a greater hazard as they continue to age and deteriorate. While hundreds of them need to be rehabilitated, lack of available funding and often questions of ownership loom as obstacles difficult to overcome<sup>13</sup>.

---

<sup>9</sup> United States Geological Survey Fact Sheet 131-02. October 2002

<sup>10</sup> United States Geological Survey. Damage Evaluation of the Taum Sauk Reservoir Failure using LiDAR.

[http://mccgsc.usgs.gov/publications/t\\_sauk\\_failure.pdf](http://mccgsc.usgs.gov/publications/t_sauk_failure.pdf)

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

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

<sup>13</sup> United States Geological Survey Fact Sheet 131-02. October 2002

The only incidents involving dams in Phelps County include Brays Lake Dam and McNulty Lake Dam on May 13, 1991<sup>14</sup>.

**Event Description**

**McNulty Lake Dam:** On May 13, 1991, 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:** On May 13, 1991, 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, probability of future occurrence is not possible<sup>15</sup>. In addition, true dam failure within the County has not occurred according to available data. **Table 3.4** depicts dam failure probability as no data available (NDA).

**Vulnerability**

**Vulnerability Overview**

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for the vulnerability analysis of dam failure for Phelps County. Of the 29 dams located within the County, 12 are considered high hazard, and 3 of the dams are State regulated. There are however data limitations in regards to dams unregulated by the State of Missouri due to height requirements. These limitations hinder vulnerability analysis; nonetheless, failure potential still exists. **Table 3.21** provides vulnerability analysis data for the failure of State-regulated dams in Missouri.

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

County	Class 1	Class 2	Class 3	Total	Estimated # of Buildings Vulnerable	Average Exposure Value per Structure (\$)	Estimated Total Potential Building Exposure (\$)	Estimated Total Population Exposure	Estimated Building Losses (\$)
Phelps	2	1	0	3	25	99,375	4,060,822	121	2,030,411

Source: 2013 Missouri State Hazard Mitigation Plan

<sup>14</sup> [http://www.npdp.standord.edu/dam\\_incidents](http://www.npdp.standord.edu/dam_incidents)

<sup>15</sup> 2013 Missouri State Hazard Mitigation Plan

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

- Class 1 dams, the number of structures in the inundation area was estimated to be 10 buildings since this is the minimum threshold for a dam being considered a class 1 dam.
- Class 2 dams, the number of structures in the inundation area was estimated to be 5 buildings. This is the mid-range of buildings in the inundation area for a dam to be considered a class 2 dam.
- Class 3 dams, the number of structures in the inundation area was estimated to be 0 buildings since class 3 dams do not have any structures within their inundation area.

According to the 2013 Missouri State Hazard Mitigation Plan, there is an estimated 101-200 buildings vulnerable to failure of State-regulated dams (**Figure 3.17**). Furthermore, the state quantified potential loss estimates in terms of property damages. To execute the analysis, the following assumptions were utilized.

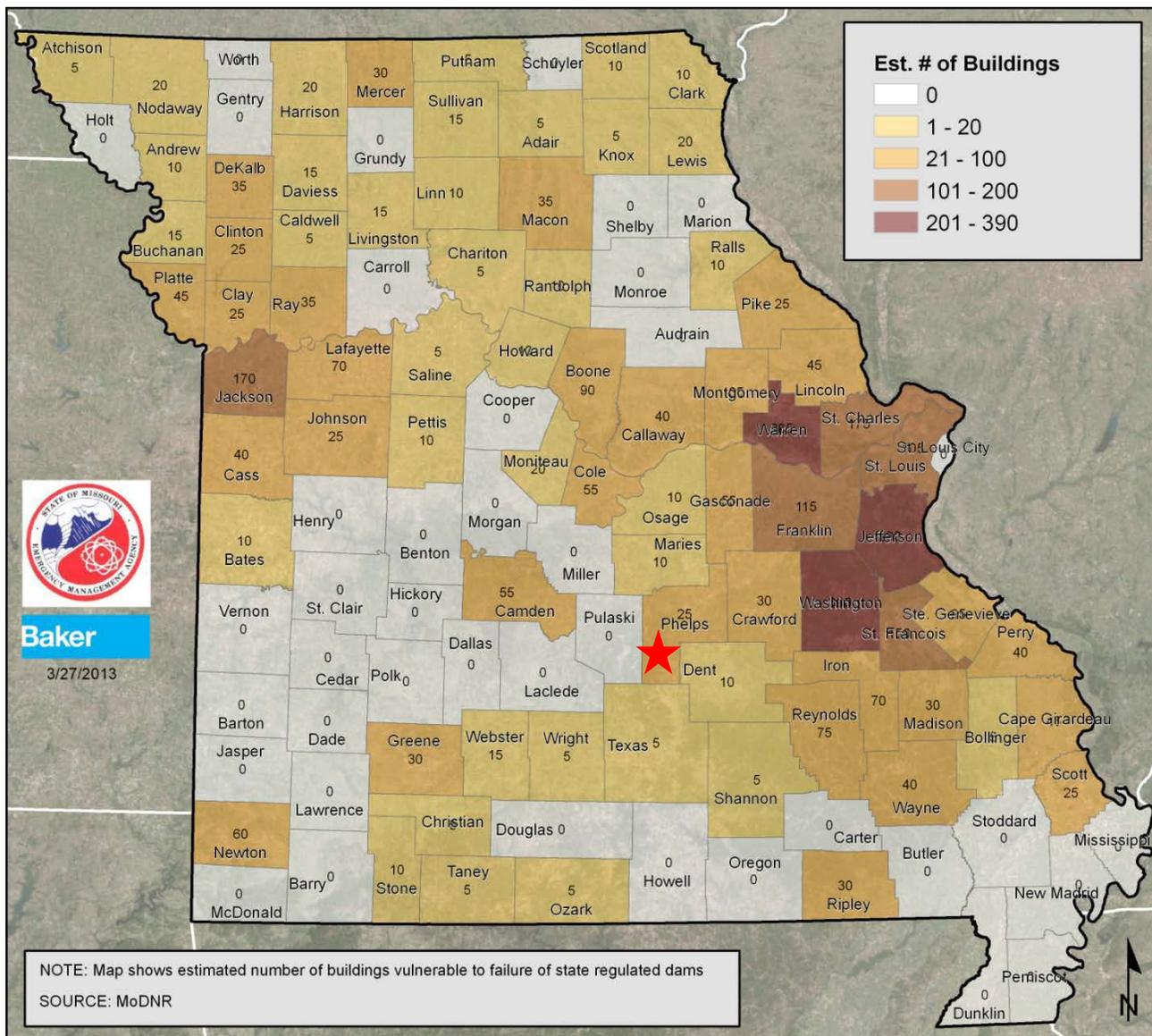
- Average values for residential structures were obtained for each county from HAZUS-MH MR4. Residential structures were chosen as the most prevalent structure-type downstream of dams. Although certainly other building types are present, the numbers and values are not known.
- The estimated structure loss was estimated to be at 50 percent of the value of the structure. Actual losses will vary based on the depth of inundation.
- For population exposure, United States Census blockgroups were intersected with available State regulated dam inundation areas to identify the vulnerable population for each county<sup>16</sup>.

**Figure 3.18** and **Figure 3.19** depict the total estimated building losses and population exposure by county, respectively. The estimated building losses from failure of State-regulated dams are \$2 – \$5 million. The estimated population exposure to failure of State-regulated dams ranges between 1 and 130.

---

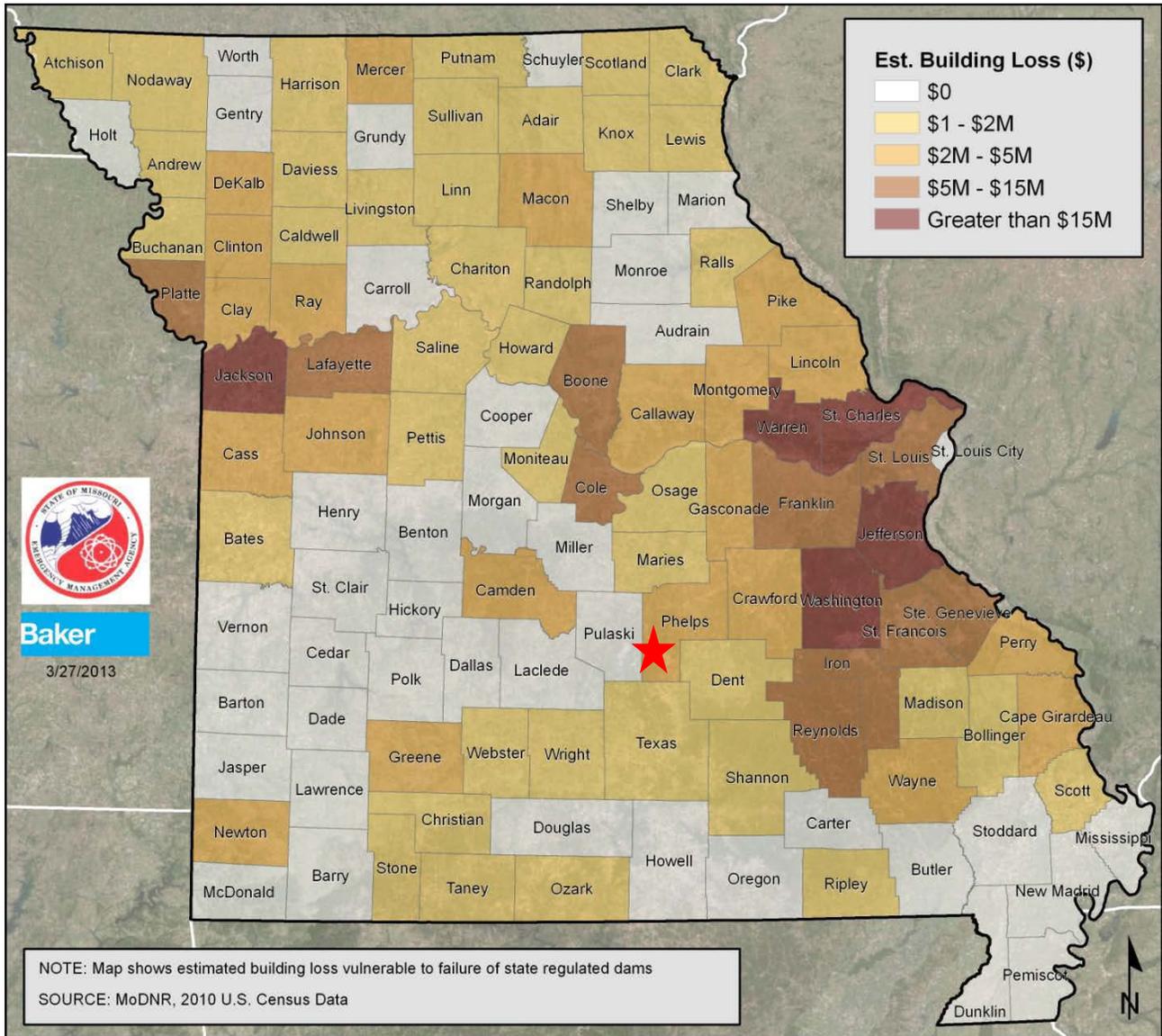
<sup>16</sup> 2013 Missouri State Hazard Mitigation Plan

**Figure 3.17. Estimated Number of Buildings Vulnerable to Failure of State-regulated Dams**



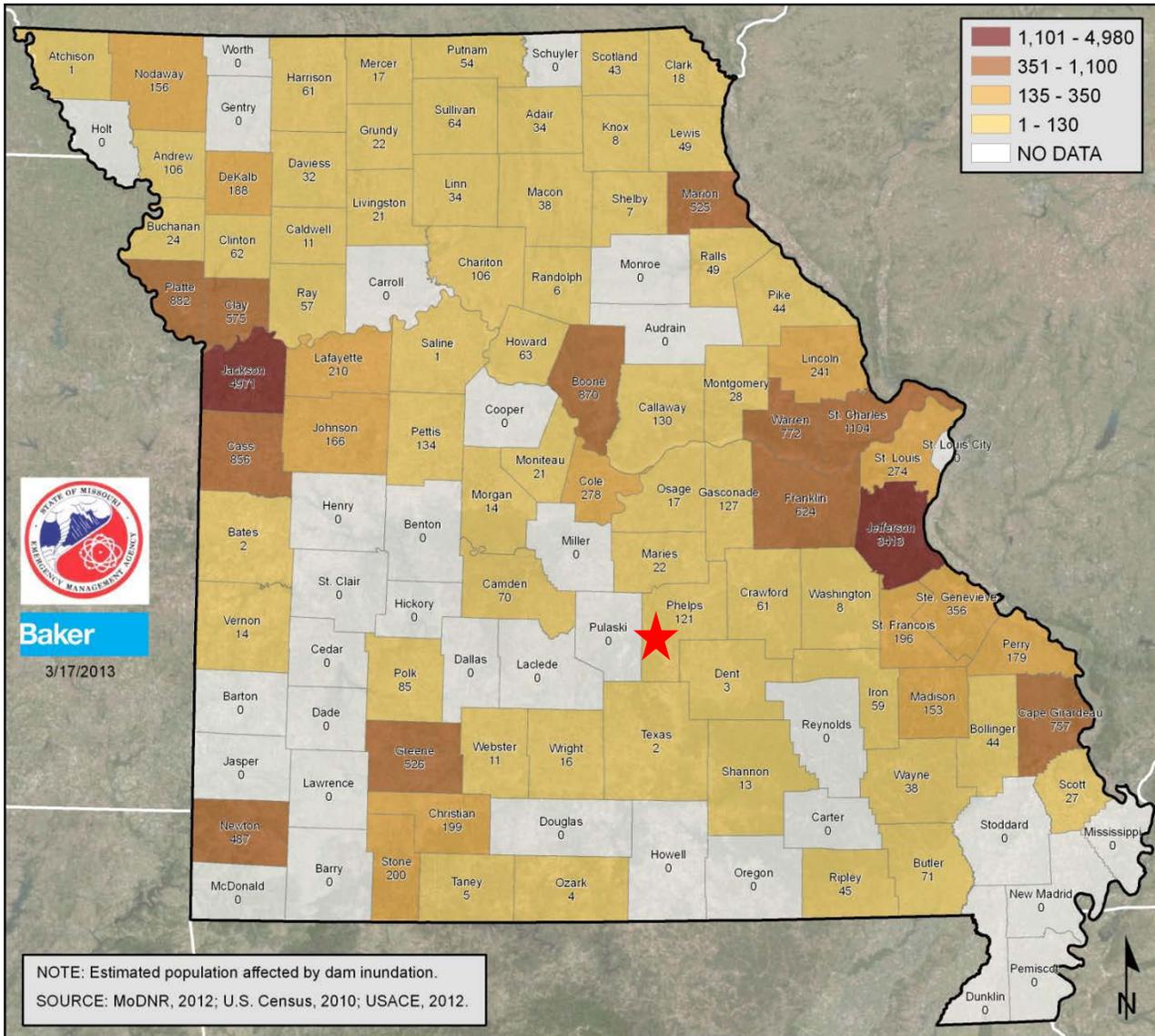
Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.18. Estimated Building Losses from Failure of State-regulated Dams**



Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.19. Estimated Population Exposure to Failure of State-regulated Dams**



Source: 2013 Missouri State Hazard Mitigation Plan

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

During the event of failure, William E. Towell Dam (Figure 3.4) would experience serious loss to road infrastructure downstream of the dam. Lake Scioto Dam (Figure 3.5) failure severity would be limited; primarily impacting road infrastructure. However, if Brays Lake Dam (Figure 3.6) was breached, serious loss to road infrastructure, residential structures, and human life is probable; specifically, impacting the subdivision on Beaver Manor Road (Figure 3.7). During the event of failure, water would reach the subdivision in approximately 15 minutes<sup>17</sup>.

**William E. Towell Dam Downstream Crossings**

- Rte. RA

<sup>17</sup> Missouri Department of Natural Resources

- 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 3.8**). During the event of the Tripoli Valley Dam failure, 10 or more permanent dwellings could experience serious loss (**Figure 3.9**). In addition, the Knoblauch Lake Dam (**Figure 3.11**), Cardetti Lake Dam (**Figure 3.13**), and McNulty Lake Dam (**Figure 3.15**) failure, could impact residential structures; along with road infrastructure. The remaining dams, Walnut Hill Lake Dam (**Figure 3.9**), Dennis Lake Dam (**Figure 3.11**), Affolter Lake Dam (**Figure 3.11**), and Scotts Pond Dam (**Figure 3.14**) 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**

- 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

### ***Impact of Future Development***

Future development within the County that has potential to be influenced by dam failure includes any areas downstream of a dam within the 100 Year Floodplain; including the anticipated Westside Marketplace in Rolla. From the data available, proposed office, industrial/commercial, and highway commercial space will be located downstream of Blues Pond Dam (Class 1). Further investigation of the dam failures impacts on future development should be conducted by the City of Rolla.

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

Variations in vulnerability across the planning area depend upon multiple variables. Nonetheless, Phelps County school districts and special districts do not have assets located in dam breach inundation areas.

### **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 land owners how to properly inspect their dams, and develop emergency action plans would be advantageous.

## 3.4.2 Drought

---

Some specific sources for this hazard are:

- Maps of effects of drought, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln; <http://www.drought.unl.edu/>.
- Historical drought impacts, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln; at <http://droughtreporter.unl.edu/> .
- Recorded low precipitation, NOAA Regional Climate Center, (<http://www.hprcc.unl.edu>).
- Water shortages, Missouri's Drought Response Plan, Missouri Department of Natural Resources, <http://dnr.mo.gov/pubs/WR69.pdf>
- Populations served by groundwater by county, USGS-NWIS, <http://maps.waterdata.usgs.gov/mapper/index.html>
- Census of Agriculture, [http://www.agcensus.usda.gov/Publications/2012/Full\\_Report/Volume\\_1,\\_Chapter\\_2\\_County\\_Level/Missouri/and\\_](http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Missouri/and_)  
[http://www.agcensus.usda.gov/Publications/2012/Online\\_Resources/County\\_Profiles/Missouri/](http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/)
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- Natural Resources Defense Council, <http://www.nrdc.org/globalWarming/watersustainability/>

### **Hazard Profile**

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

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

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

- Socioeconomic drought refers to when physical water shortage begins to affect people<sup>18</sup>.

### **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. Furthermore, in 2010 25,709 individuals within the County were served by groundwater<sup>19</sup>. However, rural residences with individual wells will likely be affected. Approximately 36.47% of the surface 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<sup>20</sup>.

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

The National Drought Monitor Center at the University of Nebraska at Lincoln summarized the potential severity of drought as follows. Drought can create economic impacts on agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to losses in yields in crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and disease to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn place both human and wildlife populations at higher levels of risk. Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Finally, while drought is rarely a direct cause of death, the associated heat, dust and stress can all contribute to increased mortality<sup>21</sup>.

**Figure 3.20** depicts a U.S. Drought Monitor map of Missouri on September 15, 2015. 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).

---

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

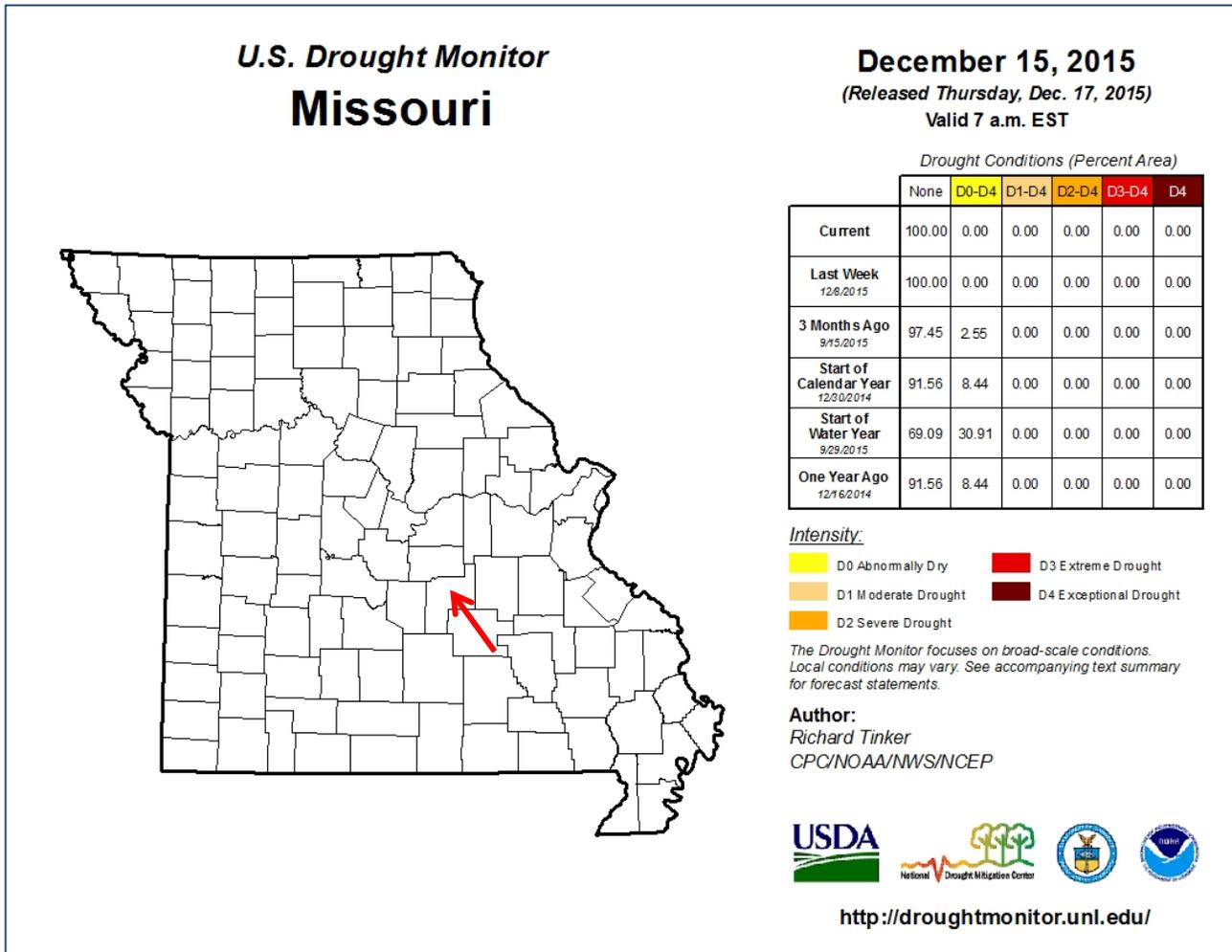
<sup>19</sup> <http://waterdata.usgs.gov/mo/nwis/wu>

<sup>20</sup> [http://www.agcensus.usda.gov/Publications/2012/Online\\_Resources/County\\_Profiles/Missouri/cp29161.pdf](http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/cp29161.pdf)

<sup>21</sup> Ibid

Figure 3.20.

U.S. Drought Monitor Map of Missouri on December 15, 2015



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

Table 3.22 details crop losses between 1998 and 2012 for Phelps County. Additionally, Figure 3.21 illustrates RMA crop indemnities for 2015 across the United States. Phelps County fell in the range of \$1 to \$500,000 in crop indemnities.

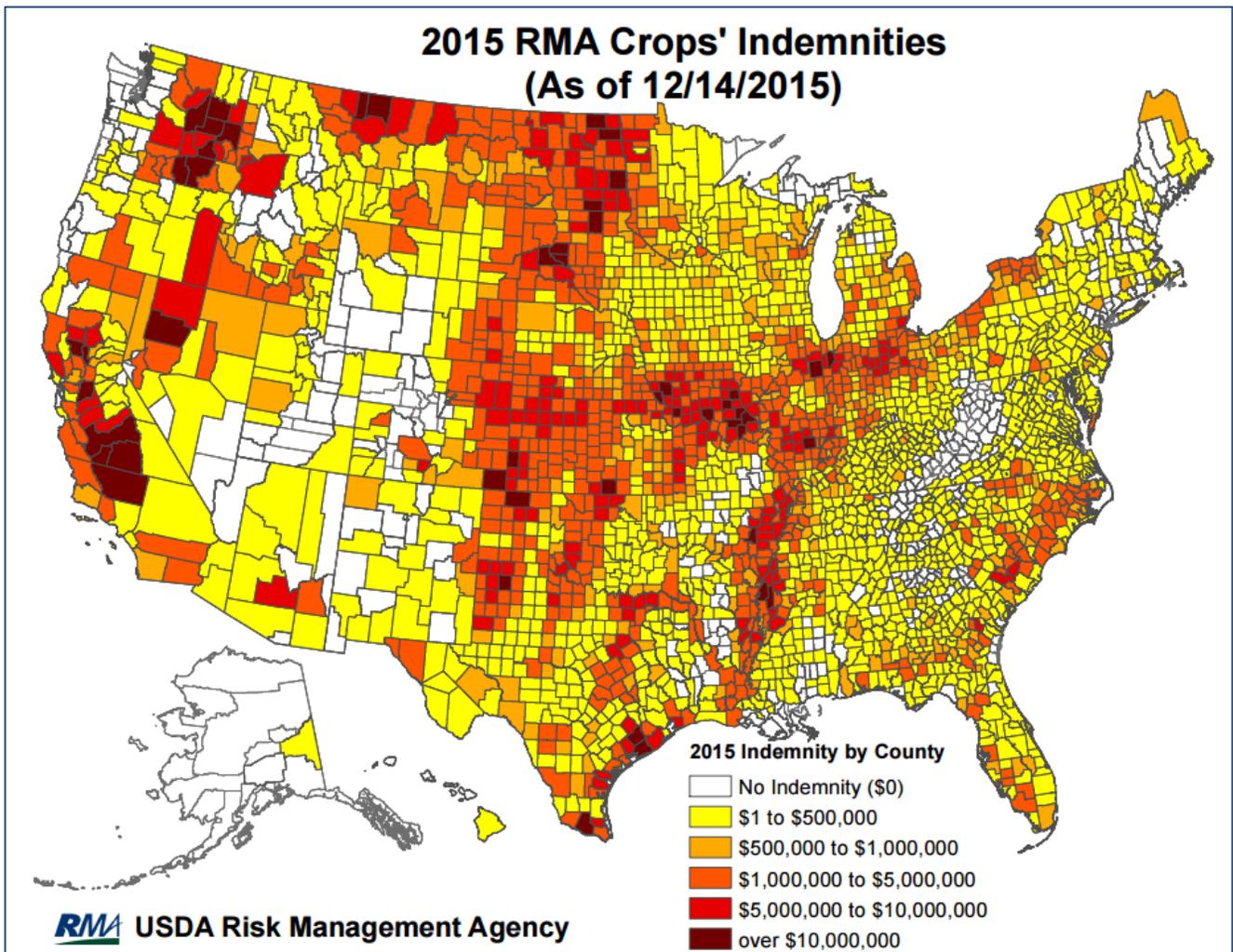
Table 3.22. Phelps County Crop Losses 1998 – 2012 (USDA Risk Management Agency)

Total Crop Insurance Paid for Drought Damage 1998-2012	Crop Claims Ratio Rating	Annualized Crop Insurance Claims/Drought Damage	Crop Exposure (2007 Census of Agriculture)	Annual Crop Claims Ration	Crop Loss Ratio Rating
\$4,352	1	\$290	\$1,510,000	0.02%	1

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

Figure 3.21.

2015 RMA Crop Indemnities for the United States



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

According to the USDA's Risk Management Agency, between the years of 1995 and 2014, there were no crop insurance payments in Phelps County relating to drought.

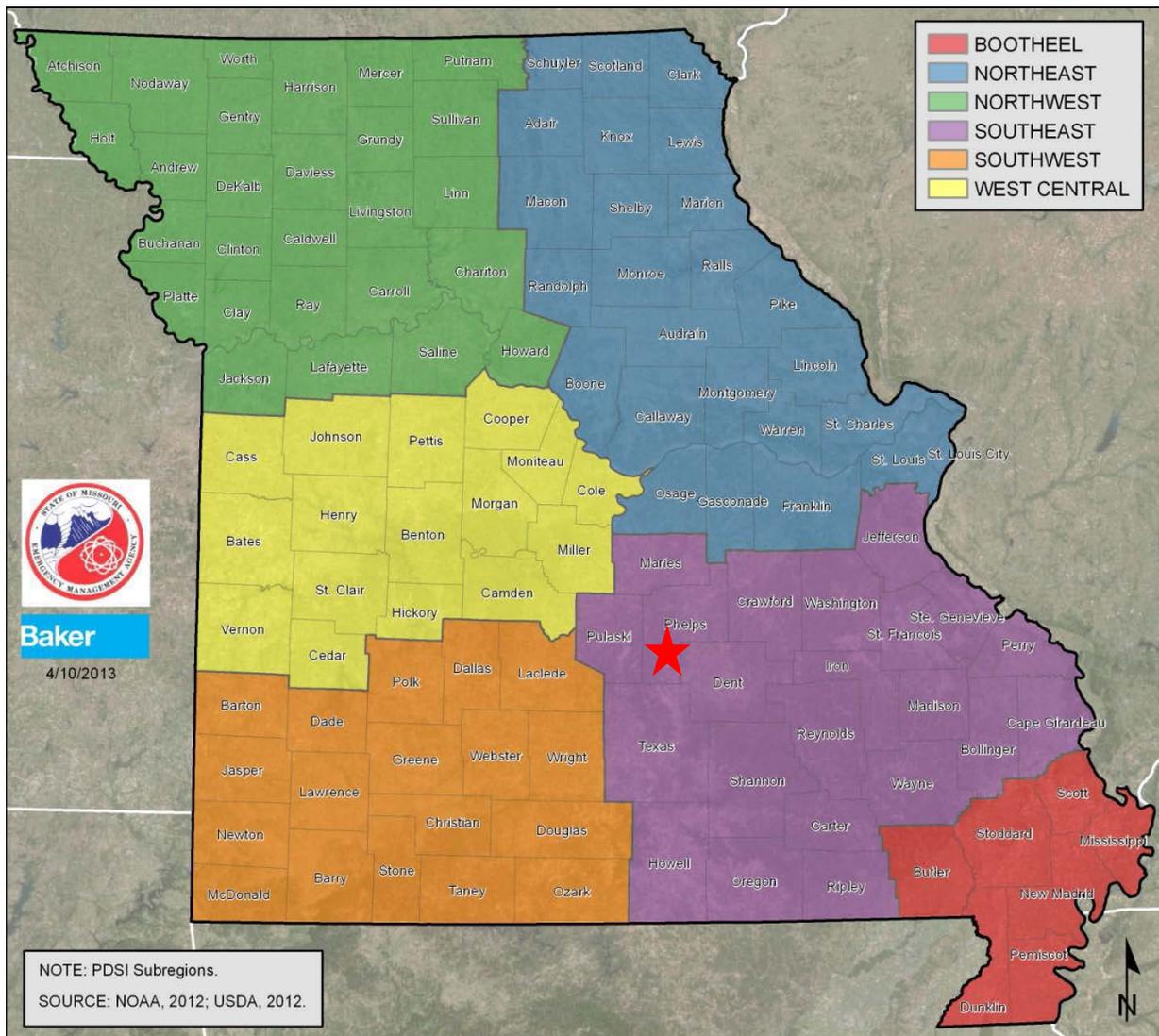
The Palmer Drought Indices measure dryness based on recent precipitation and temperature. The indices are based on a "supply-and-demand model" of soil moisture. Calculation of supply is relatively straightforward, using temperature and the amount of moisture in the soil. However demand is more complicated 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 3.22** illustrates the Palmer Drought Severity Index sub-regions of Missouri. Phelps County is categorized under the Southeast sub-region.

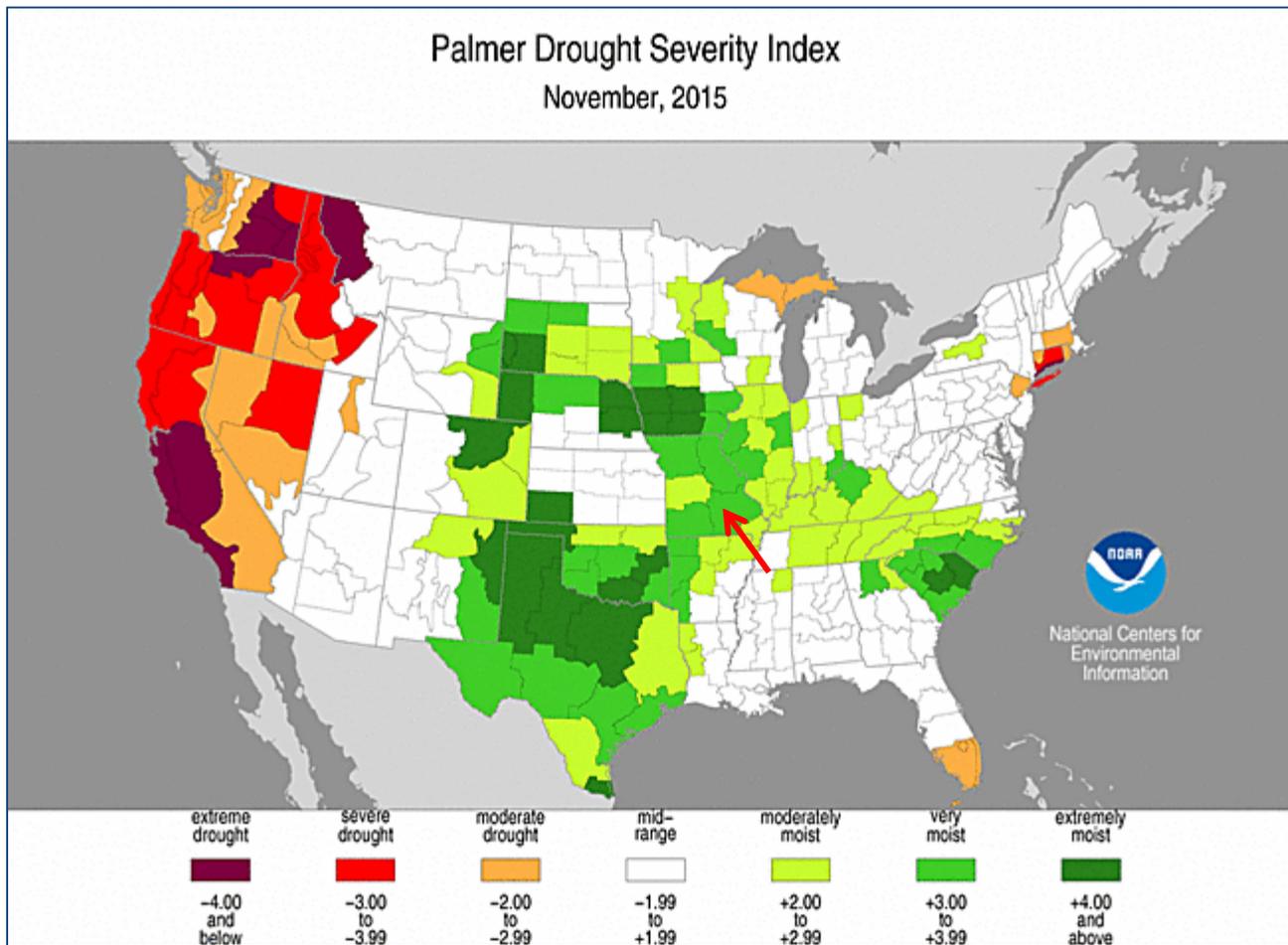
**Figure 3.22. Palmer Drought Severity Index: Missouri Sub-regions**



Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.23** is an example of the Palmer Modified Drought Index for the United States on November, 2015.

**Figure 3.23. Palmer Modified Drought Index National Map November, 2015**



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

Data was collected from the Missouri Department of Natural Resources (2015 Census of Missouri Public Water Systems) to determine water source by jurisdiction. Doolittle, Edgar Springs, Newburg, Rolla, and St. James all 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. 2015 Water Source by Jurisdiction**

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

Source: Missouri Dept. of Natural Resources, 2015 Census of Missouri Public Water Systems

**Previous Occurrences**

**Table 3.24** offers Palmer Z Index short-term data for Phelps County between 2010 and 2015. This information exemplifies drought conditions on a monthly basis for each sub-region within the United States.

**Table 3.24. Palmer Z Index Short-Term Conditions for Phelps County, MO 2010 - 2015**

Month	Year					
	2010	2011	2012	2013	2014	2015
January	Extremely moist	Mid-range	Mid-range	Mid-range	Moderately moist	Mid-range
February	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range
March	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range	Mid-range
April	Mid-range	Very moist	Mid-range	Mid-range	Mid-range	Mid-range
May	Mid-range	Very moist	Moderate drought	Mid-range	Mid-range	Mid-range
June	Mid-range	Mid-range	Moderate drought	Mid-range	Mid-range	Mid-range
July	Mid-range	Mid-range	Severe drought	Mid-range	Mid-range	Moderately moist
August	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Very moist
September	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Moderately moist
October	Mid-range	Mid-range	Moderate drought	Moderately moist	Mid-range	Mid-range
November	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	Very moist
December	Mid-range	Mid-range	Severe drought	Moderately moist	Mid-range	x

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

**Probability of Future Occurrence**

To calculate the probability of future occurrence of drought in Phelps County, historical climate data was analyzed. There were 47 months of recorded drought (**Table 3.25**) over a 20 year span (September, 1994 to November, 2015). The number of months in drought (47) was divided by the total number of months (240) 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 Z Index Drought Records Phelps County, MO 1994 - 2015

Month	Year											
	January	February	March	April	May	June	July	August	September	October	November	December
1994												
1995											x	
1996		x										
1997												
1998					x							
1999							x		x	x	x	
2000			x	x	x					x		
2001			x	x								
2002											x	
2003	x		x									
2004		x							x			
2005			x		x	x				x		x
2006		x				x						
2007			x					x			x	
2008												
2009												
2010				x		x		x		x		x
2011	x						x			x		
2012			x	x	x	x	x	x			x	x
2013												
2014		x	x									
2015										x		

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

\*x indicates drought

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

Location	Annual Avg. % P of Drought
Phelps County	19.58%

Source: NOAA National Centers for Environmental Information, Historical Palmer Drought Indices  
\*P = probability; see page 3.24 for definition.

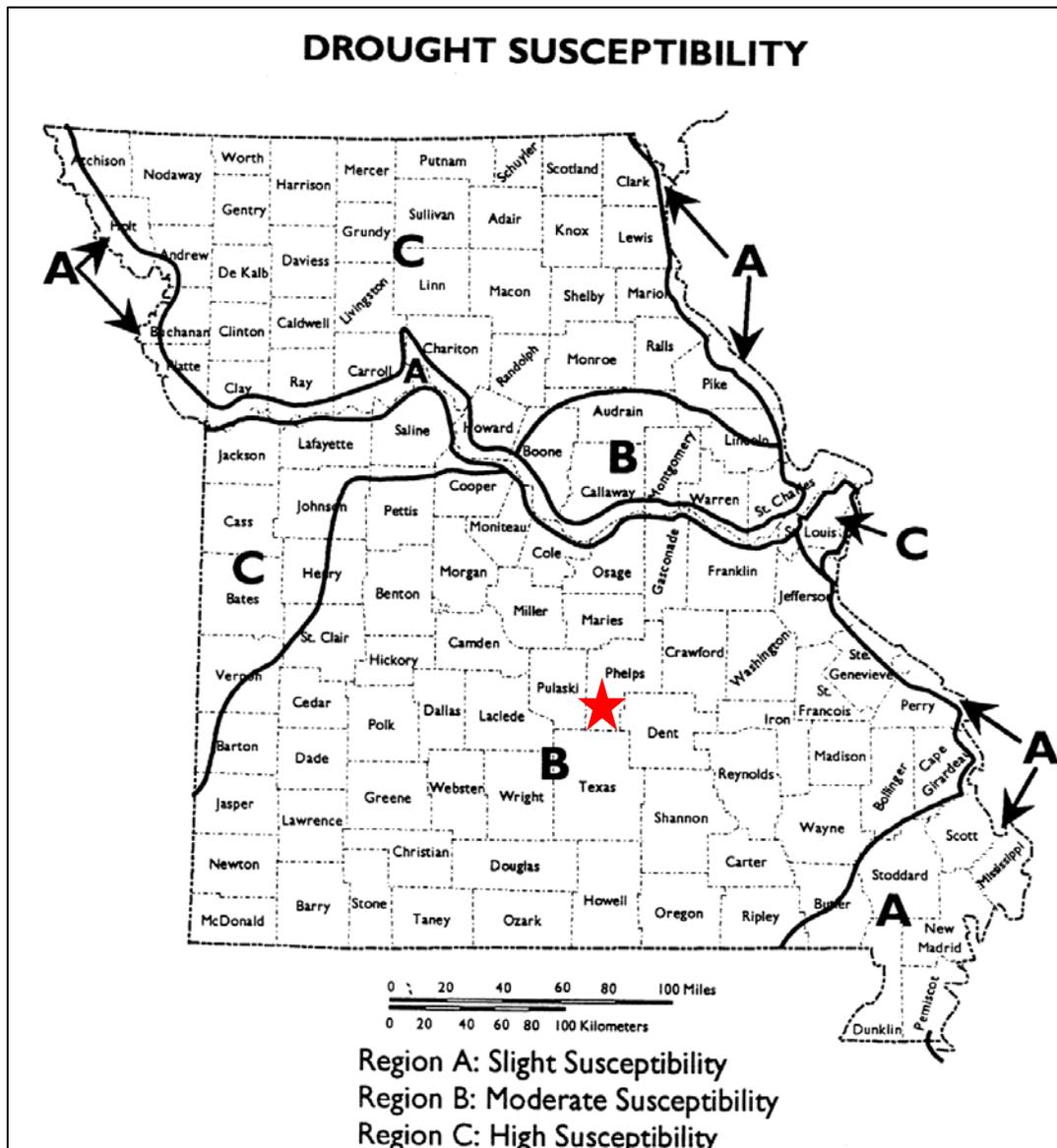
## **Vulnerability**

### ***Vulnerability Overview***

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for the drought vulnerability analysis. **Table 3.27** depicts the ranges for drought vulnerability factor ratings created by SEMA. The array ranges between 1 (low) and 5 (high). The factors considered include crop loss ratio rating and annualized crop claims paid. These two factors were utilized as agricultural losses data is readily available; thus making them the best factors to determine drought vulnerability throughout the State. Phelps County is determined as having a low vulnerability to crop loss (**Table 3.28**) as a result of a drought. Additionally, SEMA has divided the State into 3 regions in regards to drought susceptibility (**Figure 3.24**). 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<sup>22</sup>.

<sup>22</sup> 2013 Missouri State Hazard Mitigation Plan

Figure 3.24. Drought Susceptibility in Missouri



Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.27. Ranges for Drought Vulnerability Factor Ratings

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

Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.28. Vulnerability of Phelps County to Drought**

County	Total Crop Insurance Paid for Drought Damage 1998 - 2012	Crop Claims Ratio Rating	Annualized Crop Insurance Claims/Drought Damage	Crop Exposure (2007 Census of Agriculture)	Annual Crop Claims Ratio	Crop Loss Ratio Rating
Phelps	\$4,352	1	\$290	\$1,510,000	0.02%	1

Source: 2013 Missouri State Hazard Mitigation Plan

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

Drought is not limited to a hazard that affects just agriculture, but can extend to encompass the nation's whole economy. Its impact can adversely affect a small town's water supply, the corner grocery store, commodity markets, or tourism. Additionally, extreme droughts have the ability to damage roads, water mains, and building foundations. On average, drought costs the U.S. economy about \$7 billion to \$9 billion a year, according to the National Drought Mitigation Center. Moreover, drought prone regions are also prone to increased fire hazards<sup>23</sup>.

### ***Impact of Future Development***

Impacts of drought on future development within Phelps County would be negligible. Population trend analysis from the University of Missouri Extension suggests that Phelps County will increase by approximately 2,544 individuals within the next 5 to 15 years<sup>24</sup>. Moreover, with an increasing population, water use and demand would be expected to increase as well; potentially straining the water supply systems. St. James is anticipated to develop new infrastructure (pipes), and Phelps County anticipates upgrades to Public Water/Sewer District #1 within the next 5 years. Long term drought could expose vulnerabilities during construction/upgrades of water distribution and sewer infrastructures. Furthermore, row crops are not suitable for the topography within the County. The major agricultural commodity for the County is livestock. Future increase in livestock production within the County may be adversely impacted in the event of a severe or long term drought.

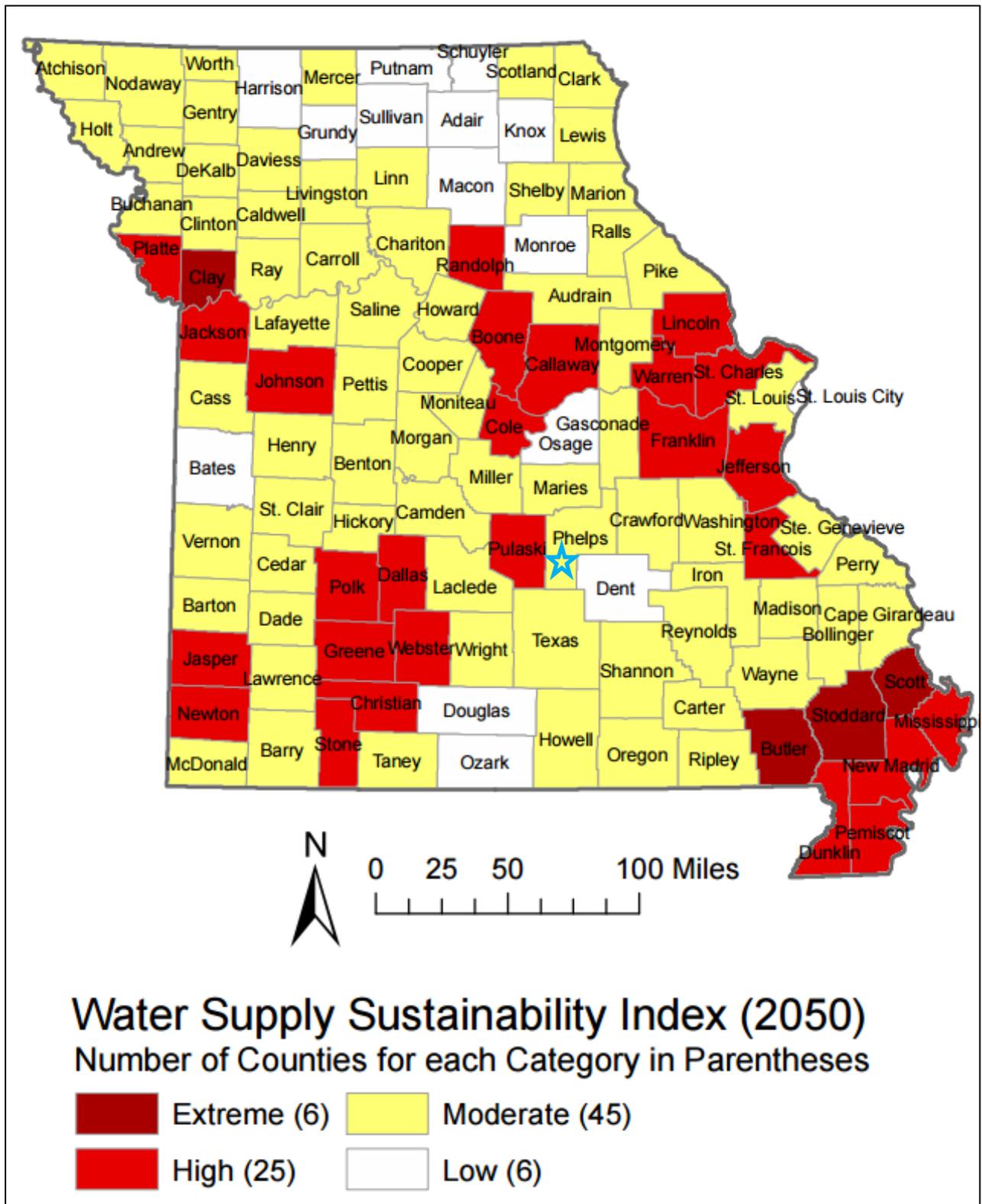
### ***Impact of Climate Change***

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 3.25**) by the year 2050.

<sup>23</sup> 2015 Boone County Hazard Mitigation Plan

<sup>24</sup> UM Extension Social and Economic Profile <http://mcdc2.missouri.edu/cgi-bin/broker? PROGRAM=websas.cntypage.sas& SERVICE=appdev& debug=0&county=29161>

Figure 3.25. Water Supply Sustainability Index (2050) with Climate Change Impacts



Source: Natural Resources Defense Council (NRDC), Climate Change, Water, and Risk

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

The variations between jurisdictions are non-existent to minimal. At least 3 jurisdictions within Phelps County utilize ground/well water as their municipal water source. In cities, the drought conditions would be the same as those experienced in rural areas, but the magnitude would be different with only lawns and local gardens impacted. Long term drought, spanning months at a time, could negatively impact the amount of potable drinking water available to the various jurisdictions within the county. In an event of long term drought various jurisdictions may be required to impose restrictions on water use.

### **Problem Statement**

In summary, drought within Phelps County is considered low risk, as of now. However, climate change predictions suggest increased risks by the year 2050. Phelps County does not have a strong agricultural economy compared to other counties throughout Missouri. However, drought would impact commodities, specifically livestock. Potential impacts to local economies and infrastructures are foreseeable in the event of a long term drought.

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

### 3.4.3 Earthquakes

---

Some specific sources for this hazard are:

- U.S. Seismic Hazard Map, United States Geological Survey, [http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014\\_lq.jpg](http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lq.jpg);
- 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone map, <http://www.igsb.uiowa.edu/Browse/quakes/quakes.htm>;
- Probability of magnitude 5.0 or greater within 100 Years, United States Geological Survey, <https://geohazards.usgs.gov/eqprob/2009/index.php>

#### **Hazard Profile**

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

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

The closest fault to 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<sup>25</sup>.

##### ***Geographic Location***

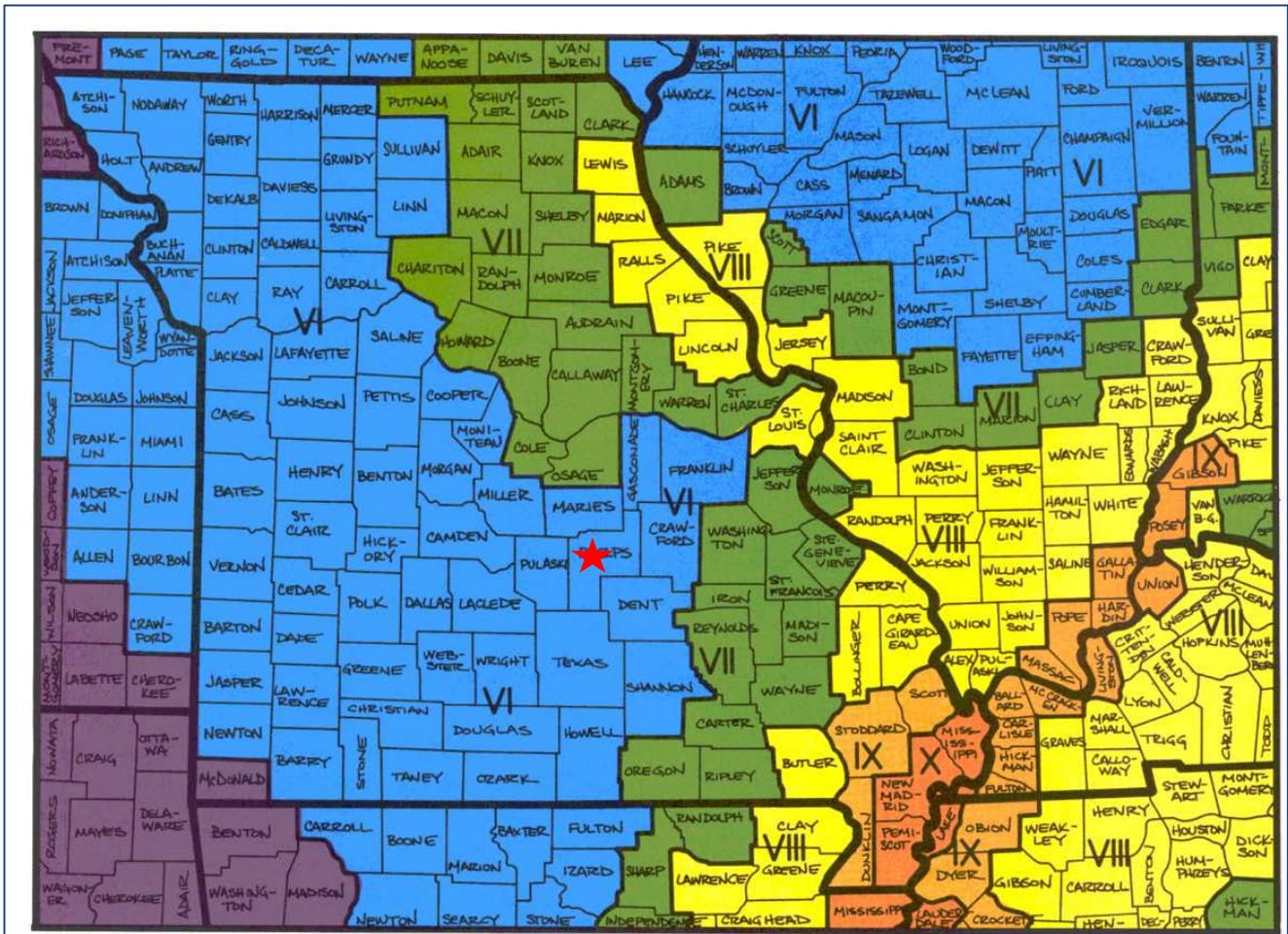
There are eight earthquake source zones in the Central United States, one of which is located within the state of Missouri—the New Madrid Fault. Other seismic zones, because of their close proximity, also affect Missourians. These are the Wabash Valley Fault, Illinois Basin, and the Nemaha Uplift. The 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 3.26** 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, 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 3.27**). 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. Earthquake intensities will not vary across the planning area, which is the case for most Missouri counties. **Figure 3.27** and **Table 3.29** further define Richter Scale intensities.

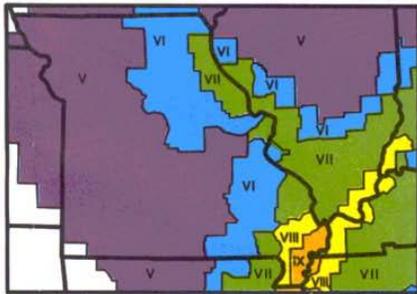
---

<sup>25</sup> Missouri Department of Natural Resources, Facts about the New Madrid Seismic Zone

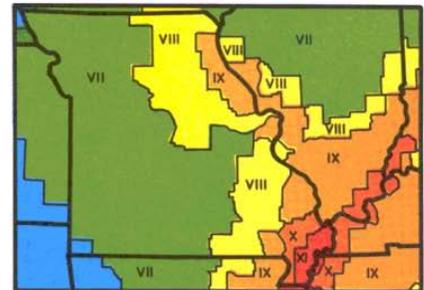
**Figure 3.26. Impact Zones for Earthquake Along the New Madrid Fault**



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



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

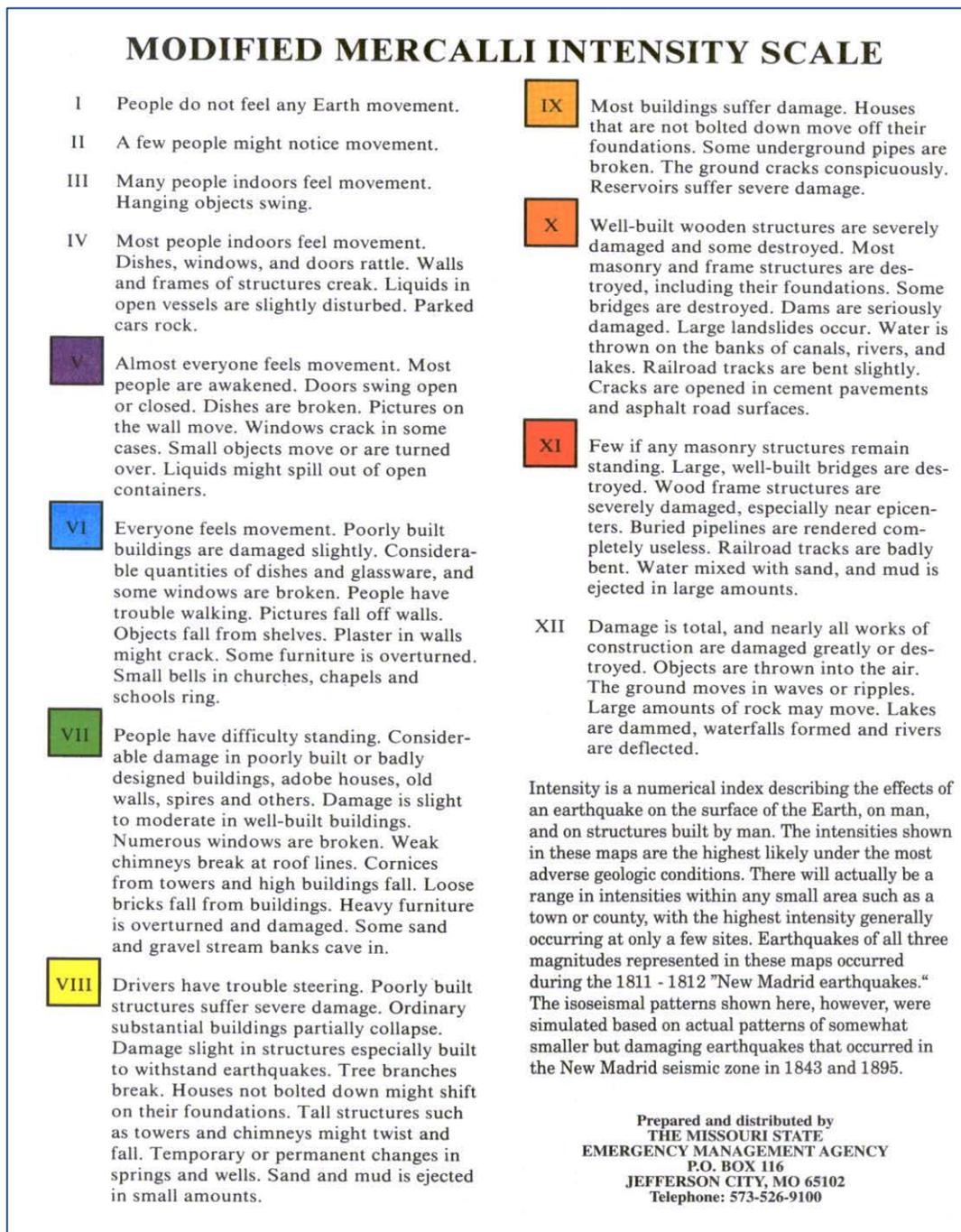


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 8.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

Source: [http://sema.dps.mo.gov/docs/programs/Planning,%20Disaster%20&%20Recovery/State%20of%20Missouri%20Hazard%20Analysis/2012-State-Hazard-Analysis/Annex\\_F\\_Earthquakes.pdf](http://sema.dps.mo.gov/docs/programs/Planning,%20Disaster%20&%20Recovery/State%20of%20Missouri%20Hazard%20Analysis/2012-State-Hazard-Analysis/Annex_F_Earthquakes.pdf)

Figure 3.27.

## Projected Earthquake Intensities

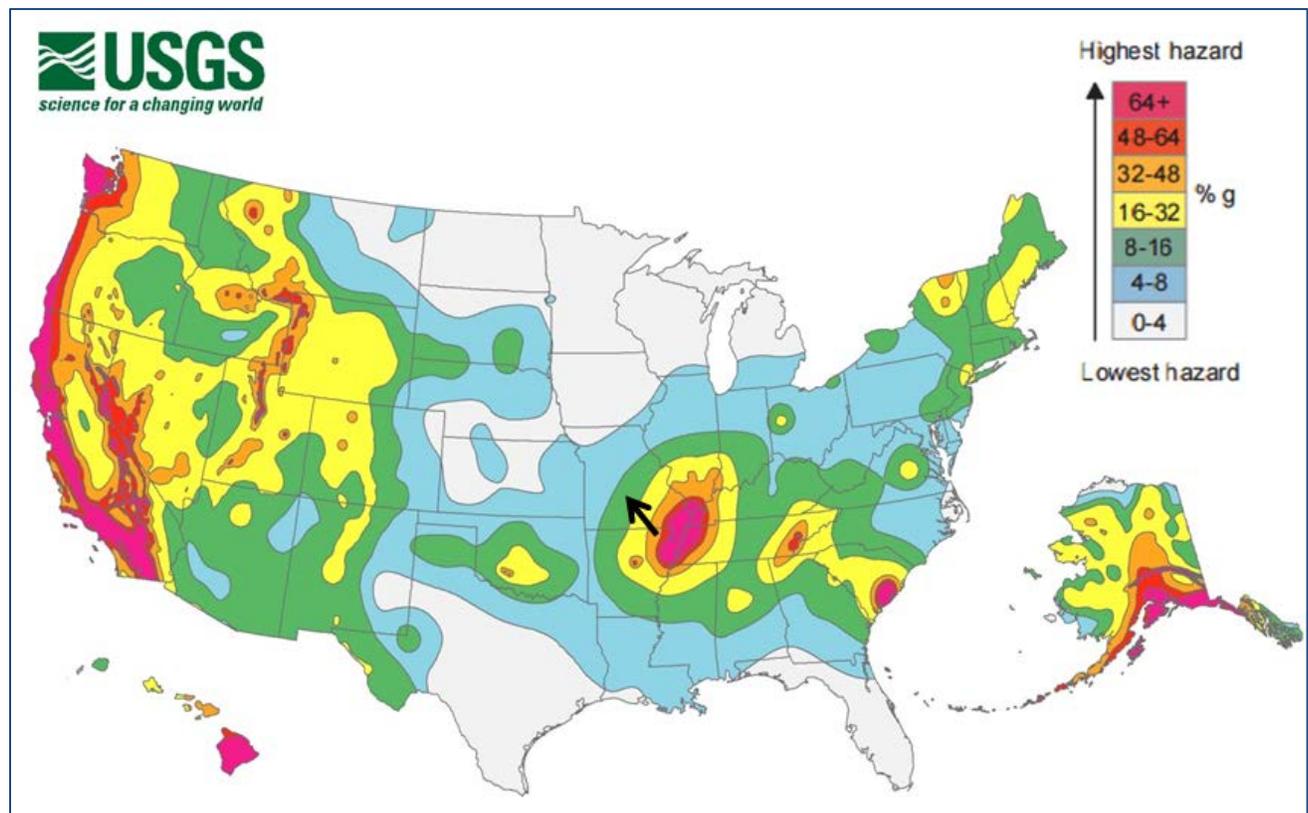


**Table 3.29. Richter Scale of Earthquake Magnitude**

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 3.28** illustrates the seismicity in the United States. A black arrow 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 8-16% g.

**Figure 3.28. United States Seismic Hazard Map**



Source: USGS, [http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014\\_lg.jpg](http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lg.jpg)

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

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

### ***Richter Magnitude Scale***

The Richter Magnitude Scale was developed in 1935 as a device to compare the size of earthquakes. The magnitude of an earthquake is measured using a logarithm of the maximum extent of waves recorded by seismographs. Adjustments are made to reflect the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. Each whole number increase in magnitude represents a tenfold increase in measured amplitude; an estimate of energy. For example, comparing a 5.3 and a 6.3 earthquake shows that a 6.3 earthquake is ten times bigger than a magnitude 5.3 earthquake on a seismogram, but is 31.622 times stronger (energy release)<sup>26</sup>.

### ***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

---

<sup>26</sup> 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.<sup>i</sup>

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

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<sup>27</sup>.

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

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

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

The University of Memphis has fundamentally estimated this 4% objective has a 25% to 40% chance of occurrence. If we apply these percentages to the annualized figure of 4%, the result is the overall annualized percentages. At the 25% level, the likelihood of an earthquake happening in a given year is 1.0% (4% x 25%). At the 40% level, the likelihood of an earthquake happening in a given year is 1.6% (4% x 40%)<sup>28</sup>. For the purpose of this plan, the 1.0% probability of an earthquake occurring in a given year will be utilized.

## **Vulnerability**

### ***Vulnerability Overview***

SEMA utilized Hazus 2.1 to analyze vulnerability and estimate losses to earthquakes. Hazus is a program developed by FEMA which is a nationally applicable standardized methodology that encompasses models for assessing potential losses from earthquakes, floods, and hurricanes. Geographic Information Systems (GIS) is utilized to assess physical, economic, and social impacts of disasters<sup>29</sup>. For the vulnerability analysis, an annualized loss scenario for each county was analyzed. Secondly, statistics from an event with a 2% probability of exceedance in 50 years was analyzed, suggesting outcomes of a worst case scenario.

---

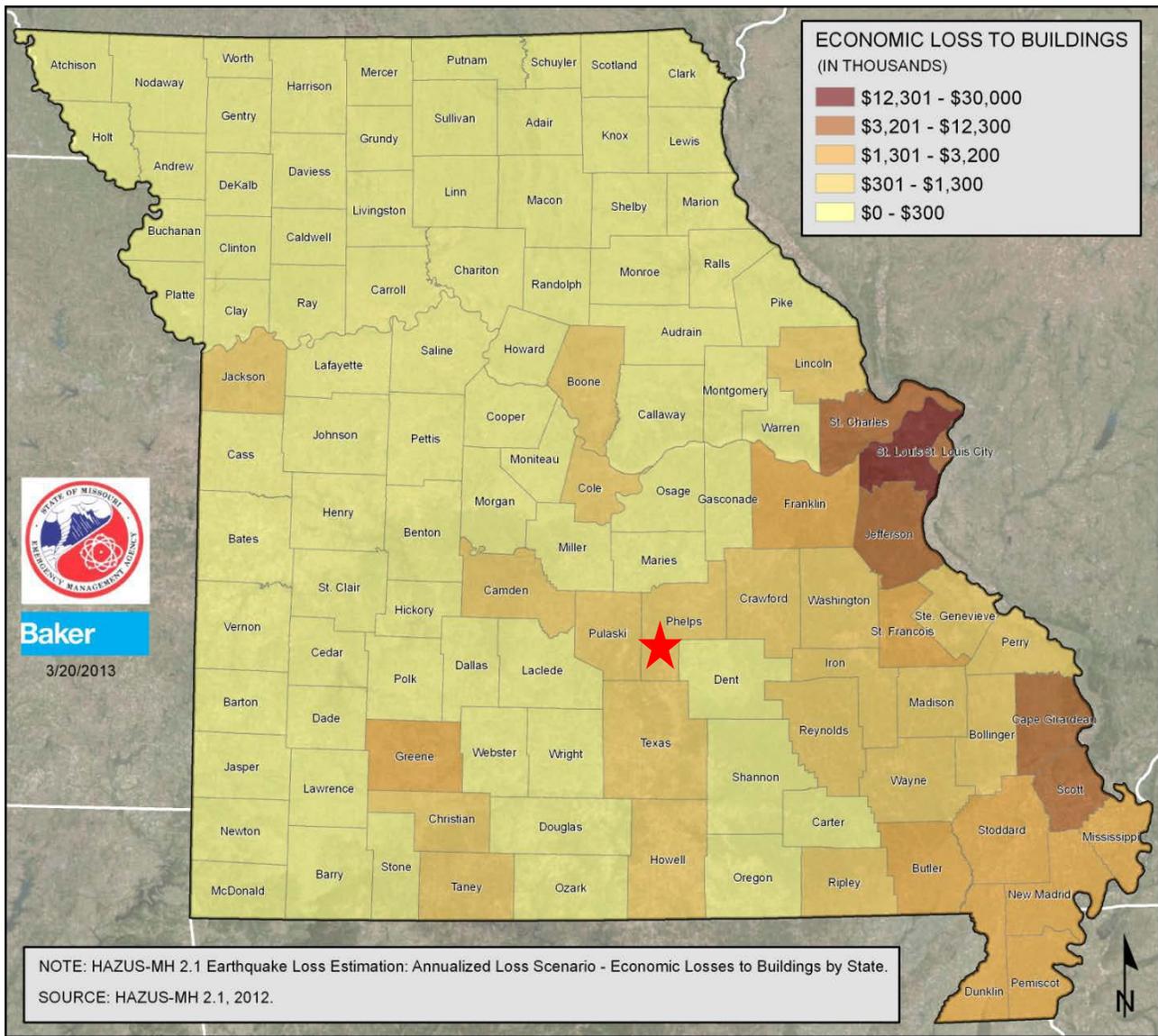
<sup>27</sup> Missouri State Hazard Mitigation Plan May 2007

<sup>28</sup> SEMA

<sup>29</sup> [www.fema.gov/hazus](http://www.fema.gov/hazus)

Annualized loss is the maximum potential annual dollar loss resulting from eight return periods (100, 200, 500, 750, 1,000, 1,500, 2,000, and 2,500 years) averaged on a 'per year' basis<sup>30</sup>. The Hazus earthquake loss estimation is depicted in **Figure 3.29** and **Table 3.30**. Phelps County's buildings are suggested to lose between \$301 and \$1,300 in any one year; thus ranking the County as having the 32<sup>st</sup> highest expected loss in the state. This loss ratio indicates impacts on local economies in the event of an earthquake, and the difficulty for jurisdictions to recover from said event.

**Figure 3.29. Hazus Earthquake Loss Estimation: Annualized Loss Scenario –Total Economic Losses to Buildings.**



Source: 2013 Missouri State Hazard Mitigation Plan

<sup>30</sup> 2013 Missouri State Hazard Mitigation Plan

**Table 3.30. Hazus Earthquake Loss Estimation: Annualized Loss Scenario**

Location	Building Loss Total (\$)*	Loss Ratio %**	Income Loss Total (\$)*	Total Economic Loss to Buildings (\$)*	Loss Ratio Rank
Phelps	520	0.01	174	649	32

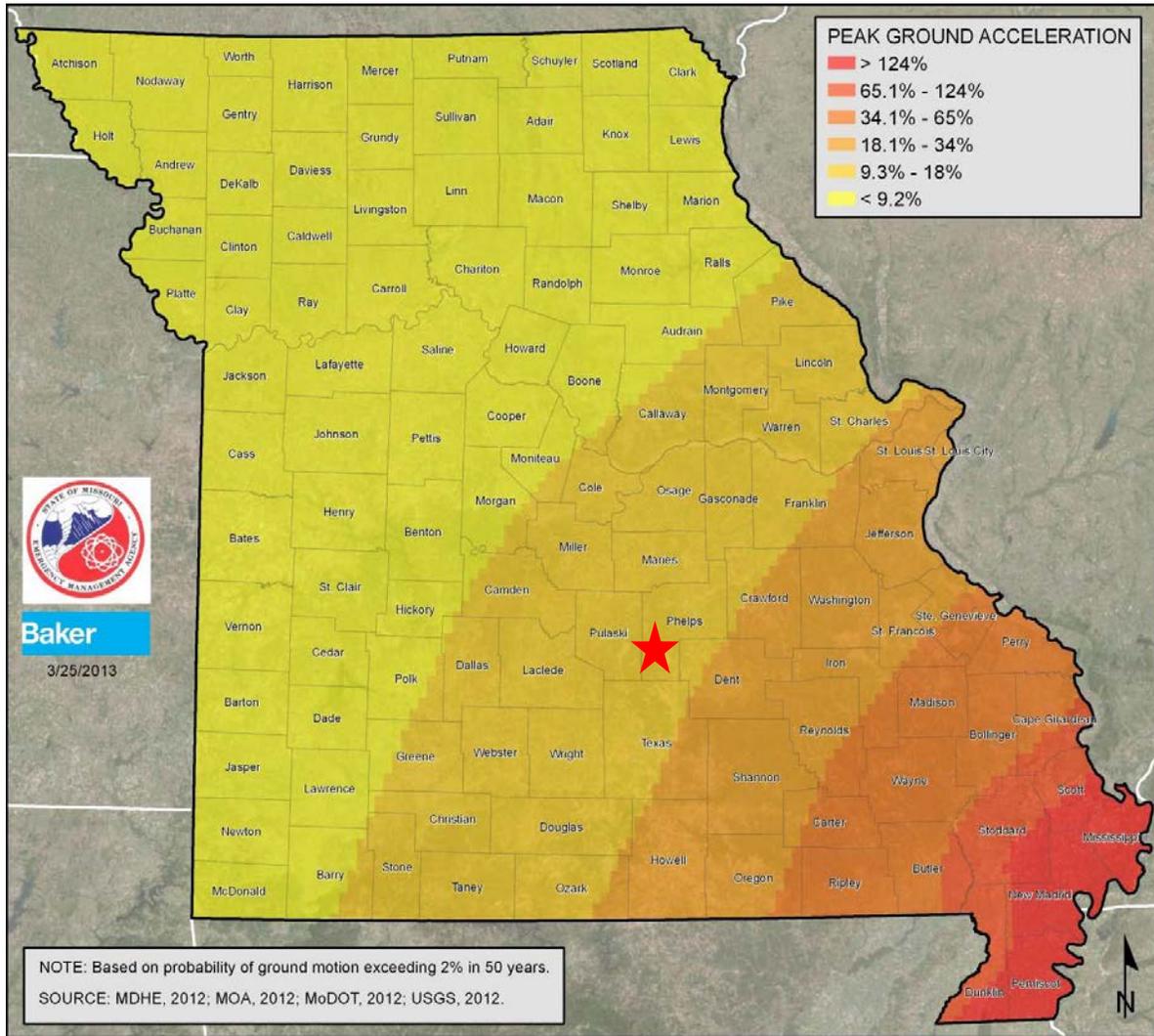
Source: Hazus 2.1

\*All \$values are in thousands

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

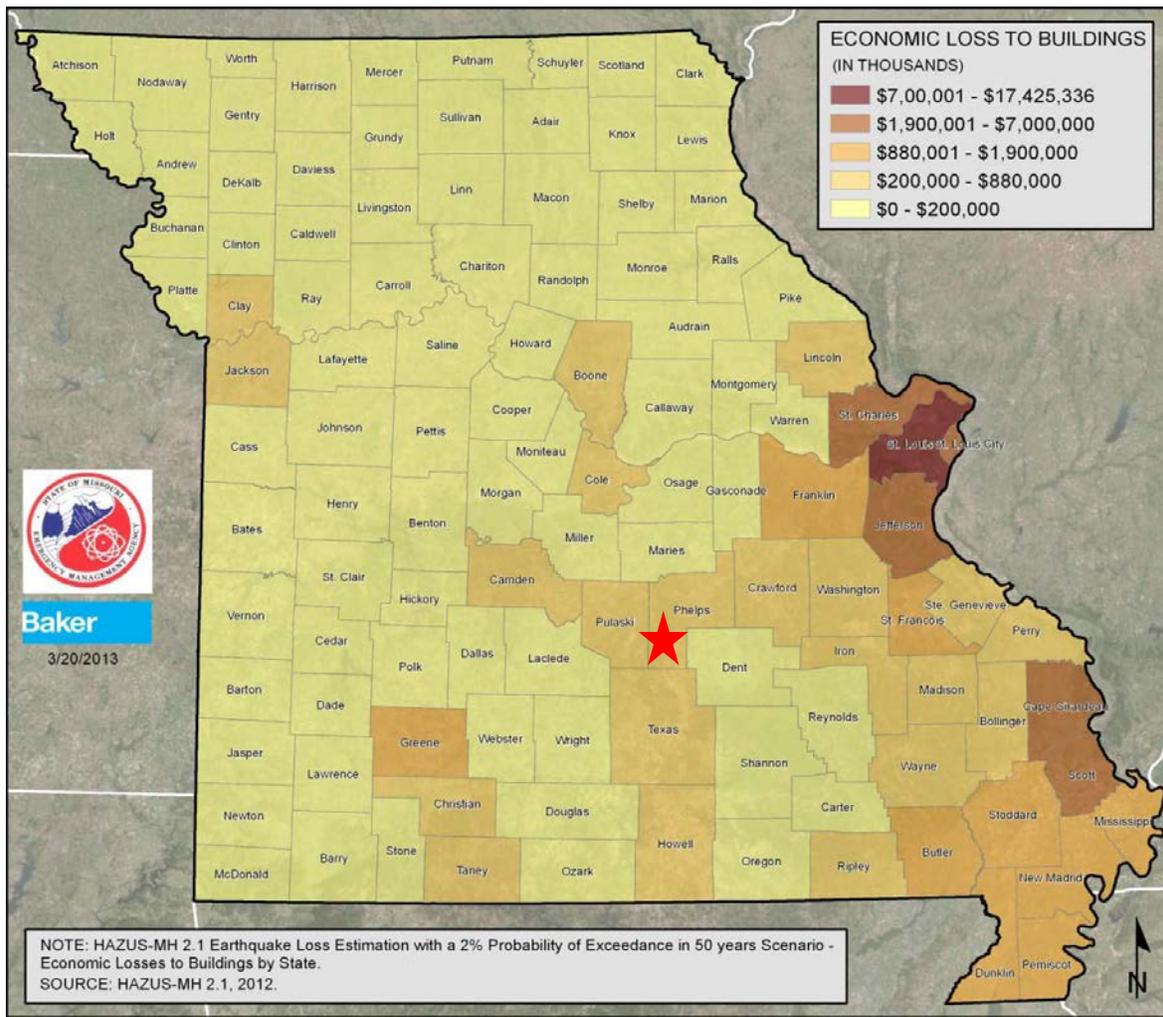
Likewise, SEMA developed a second scenario which incorporated a 2% probability of exceedance in 50 years. This model was to demonstrate a worst case scenario. **Figure 3.30** provides estimates of peak ground acceleration and spectral acceleration (ground shaking potential) at intervals of 0.3 and 1.0 seconds, respectively. These acceleration events have a 2% probability of exceedance in the next 50 years. A 7.7 magnitude earthquake was utilized in this scenario, which is typically utilized for New Madrid fault planning scenarios in Missouri. Phelps County is estimated to have peak ground acceleration between 9.3 and 18%. Furthermore, **Figure 3.31** illustrates total economic loss to buildings including content and inventory loss, and wage/income loss in the event of the modeled earthquake. Phelps County is anticipated to lose between \$200,000 and \$880,000 in a 50 year scenario. Moreover, in the same event the County is estimated to experience between 3.1% and 7% loss (damage) of the total building inventory (**Figure 3.32**). **Table 3.31** further exemplifies the County's loss ratio.

**Figure 3.30. Hazus Earthquake 2% Probability of Exceedance in 50 Years – Ground Shaking Potential**



Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.31. Hazus Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Total Economic Loss to Buildings**



Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.31. Hazus-MH Earthquake Loss Estimation: 2% Probability of Exceedance in 50 Years Scenario Results Building Impacts by County, Ranked by Highest Building Losses**

County	Structural Damage (\$)*	Non-Structural Damage (\$)*	Contents Damage and Inventory Loss (\$) *	Loss Ratio (%) **	Income Loss (\$)*	Total Economic Loss to Buildings (\$)***	Loss Ratio Rank
Phelps	63,722	205,571	72,687	6.29	114,888	456,868	31

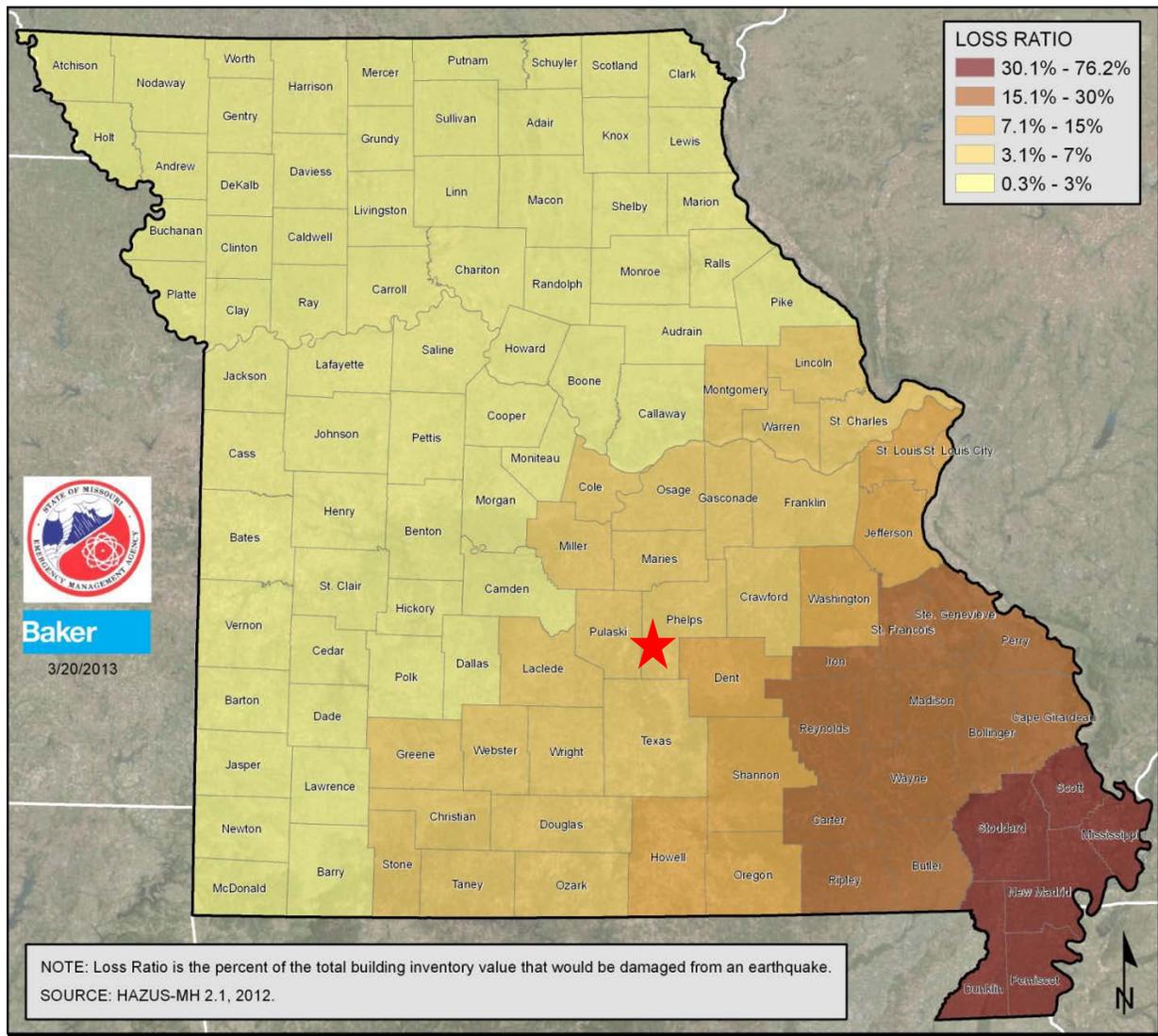
Source: 2013 Missouri State Hazard Mitigation Plan, Hazus 2.1

\*All \$ values are in thousands

\*\*Loss ratio is the sum of structural and nonstructural damage divided by the entire building inventory value within a county  
 \*\*\*Total economic loss to buildings includes inventory loss, relocation loss, capital-related loss, wages loss, and rental income loss

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

**Figure 3.32. Hazus Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Loss Ratio**



Source: 2013 Missouri State Hazard Mitigation Plan

In terms of social impacts for the same earthquake event, **Table 3.32** defines casualty severity, displaced households, and short-term shelter needs that are utilized in **Table 3.33**. During this scenario, Phelps County is estimated to have 100 injuries requiring medical attention without hospitalization, 21 injuries requiring hospitalization, 2 life threatening injuries, and 5 deaths. Moreover, 244 individuals are expected to become displaced from their homes, along with 167 individuals requiring short-term shelter needs.

**Table 3.32. Casualty Severity, Displaced Households, and Short-Term Shelter Needs**

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

Source: Hazus 2.1

**Table 3.33. Social Impact Estimates by County from the 2% Probability of Exceedance in 50 Years Scenario 2 a.m. Time of Occurrence**

County	MMI Zone	Level 1	Level 2	Level 3	Level 4	Total	Displaced Households	Short-Term Shelter Needs
Phelps	VII	100	21	2	5	128	244	167

Source: 2013 Missouri State Hazard Mitigation Plan

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

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

### ***Impact of Future Development***

Future development will not increase the risk of an earthquake, rather contributing to the overall exposure of damaged property. As new development arises, minimum standards of building codes should be established in all jurisdictions to decrease the potential damage/loss should an earthquake occur.

The Revised Statutes of MO, Section 160.451 require that: The governing body of each school district which can be expected to experience an intensity of ground shaking equivalent to a Modified Mercalli Intensity of VII or above from an earthquake occurring along the New Madrid Fault with a potential magnitude of 7.6 on the Richter Scale shall establish an earthquake emergency procedure system in every school building under its jurisdiction<sup>31</sup>.

<sup>31</sup> 2015 Boone County Hazard Mitigation Plan

### **Hazard Summary by Jurisdiction**

Since earthquake intensity is not likely to vary greatly throughout the planning area, the risk will be the same throughout. Phelps County is not near the New Madrid Shock Zone, but it will most likely endure mild secondary effects from the earthquake, such as fire, structure damage, utility disruption, environmental impacts, and economic disruptions/losses. However, damages could differ if there are structural variations in the planning area's built environment. For example, if one community has a higher percentage of residences built prior to 1939 than the other participants, that community is likely to experience higher damages. **Table 3.34** depicts the percent of residences built prior to 1939 in Phelps County. Edgar Springs (29.4%) and Newburg (27.0%) have the most residences susceptible to damage in the event of an earthquake. If a major earthquake should occur, Phelps County would likely be deeply impacted by the number of refugees traveling through the area seeking safety and assistance.

**Table 3.34. Percent of Phelps County Residences Built Prior to 1939**

<b>Jurisdiction</b>	<b>% of Residences built prior to 1939</b>
<b>Doolittle</b>	5.6
<b>Edgar Springs</b>	29.4
<b>Newburg</b>	27.0
<b>Rolla</b>	4.9
<b>St. James</b>	8.0
<b>Unincorporated Phelps</b>	7.5

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5 – Year Estimates

### **Problem Statement**

In the event of a 7.7 magnitude earthquake (worst case scenario), Phelps County is estimated to have 100 injuries requiring medical attention without hospitalization, 21 injuries requiring hospitalization, 2 life threatening injuries, and 5 deaths. Moreover, 244 individuals are expected to become displaced from their homes, along with 167 individuals requiring short-term shelter needs. Additionally, the County is expected to encounter \$200,000 to \$800,000 in total economic losses to buildings. Moreover, Edgar Springs and Newburg are particularly at risk due to the percent of residences built prior to 1939.

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

## 3.4.4 Extreme Heat

---

### **Hazard Profile**

Some specific sources for this hazard are:

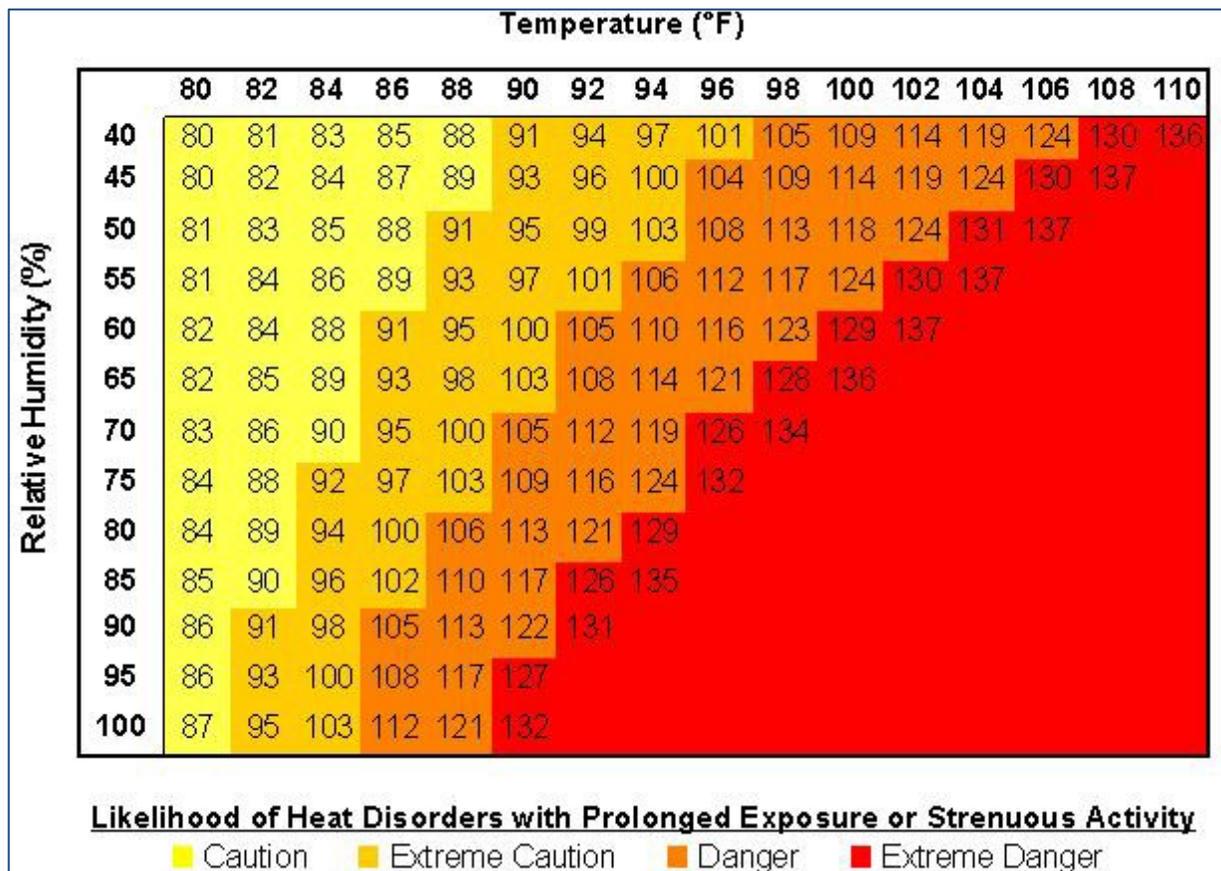
- National Climatic Data Center, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>
- Heat Index Chart & typical health impacts from heat, National Weather Service; National Weather Service Heat Index Program, [www.weather.gov/os/heat/index.shtml](http://www.weather.gov/os/heat/index.shtml)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

### ***Hazard Description***

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. The remainder of this section profiles extreme heat. Extreme cold events are profiled in combination with Winter Storm in **Section 3.4.10**. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. These high temperatures generally occur from June through September, but are most prevalent in the months of July and August. Regional reports indicate all of Missouri is subject to heat wave during the summer months. Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index chart shown in **Figure 3.33** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

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

**Figure 3.33. Heat Index (HI) Chart**



Source: National Weather Service (NWS)

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

### **Geographic Location**

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

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

Extreme heat can cause stress to crops and animals. According to USDA Risk Management Agency, losses to insurable crops during the 10-year time period from 1998 to 2012 were \$0. 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 1988-2011, there were 3,496 fatalities in the U.S. attributed to summer heat. This translates to an annual national average of 146 deaths. During the same period, 2000 and 2013, 1-3 deaths were recorded in the planning area, according to the Bureau of Environmental Epidemiology. 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 3.35** lists typical symptoms and health impacts due to exposure to extreme heat.

**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](http://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***

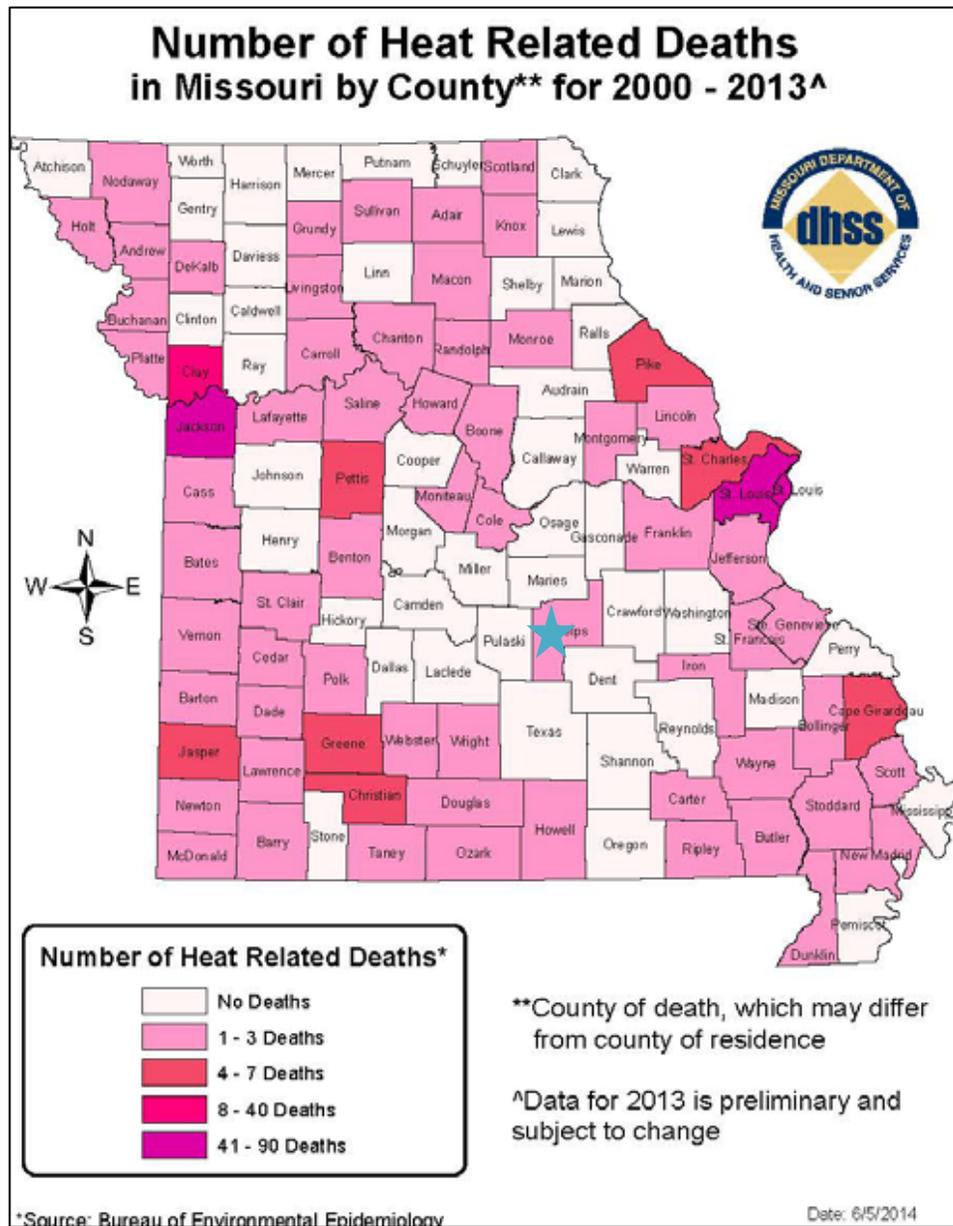
**Table 3.36** provides data in relation to record heat events between 1999 and 2012 in Phelps County. Maximum heat index values and temperatures are shown for each extreme temperature event. Fortunately, there were zero recorded injuries and fatalities during this time. In addition, **Figure 3.34** illustrates heat related deaths by county in Missouri between 2000 and 2013.

**Table 3.36. Phelps County Recorded Heat Events 1999 – 2012**

<b>Month, Year</b>	<b># of Event Days</b>	<b>Consecutive Days</b>	<b>Fatalities</b>	<b>Injuries</b>	<b>Temperature (F°)</b>	<b>Heat Index Values (F°)</b>	<b>Max Temperature (F°)</b>
<b>07/23/1999</b>	9	x	0	0	95+	105-115	115
<b>08/01/1999</b>	8	x	0	0	95	100+	100+
<b>08/27/2000</b>	5	x	0	0	100+	100-110	110
<b>09/01/2000</b>	4	3	0	0	100	x	100
<b>07/17/2001</b>	15	x	0	0	100+	100-110	110
<b>08/01/2001</b>	9	9	0	0	x	100-110	110
<b>06/01/2012</b>	30	12	0	0	100+	x	100+
<b>07/01/2012</b>	31	12	0	0	106	x	106
<b>08/01/2012</b>	31	x	0	0	106	x	106
<b>Total</b>	<b>142</b>	<b>36+</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>

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

Figure 3.34. Heat Related Deaths in Missouri 2000 - 2013



**Probability of Future Occurrence**

Table 3.37 illustrates the annual average percent probability of extreme heat in Phelps County. The County’s likelihood of enduring an extreme heat event per year is 69.23% (9 events/13 years x 100 = 69.23%). Extreme heat events can be found in Table 3.36.

Table 3.37. Annual Average % Probability of Extreme Heat in Phelps County

Location	Annual Avg. % P of Extreme Heat
Phelps County	69.23%

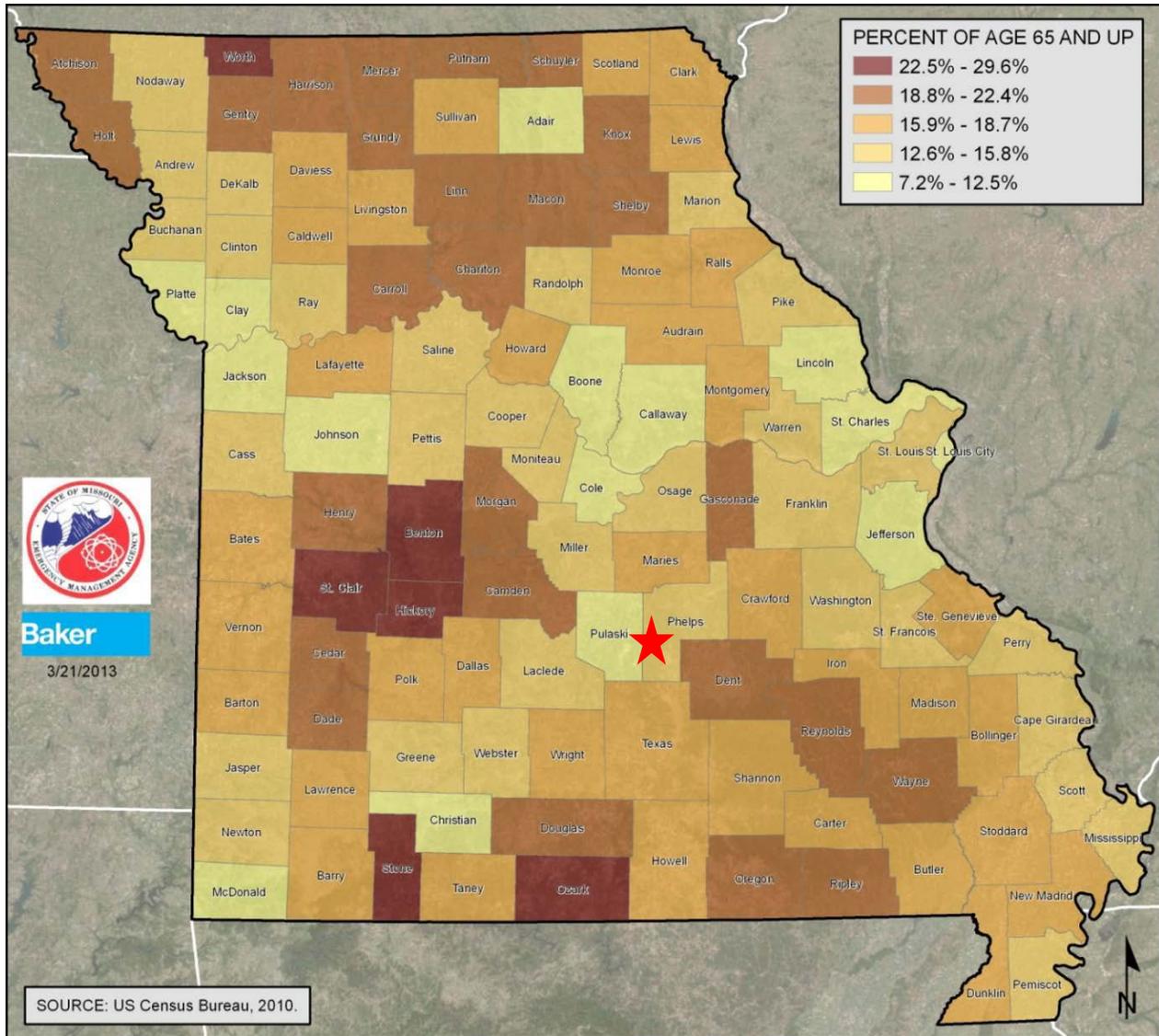
\*P = probability; see page 3.24 for definition.

# Vulnerability

## Vulnerability Overview

Phelps County, along with the rest of the state of Missouri is vulnerable to extreme heat. However, those jurisdictions with higher percentages of individuals below the age of 5, and above the age of 65 tend to be more at risk (**Table 3.38**). **Figure 3.35** depicts the distribution of the elderly population across Missouri. In 2010, 12.6 to 15.8% of the County was comprised of individuals ages 65 and up.

**Figure 3.35. Distribution of Elderly Population**



Source: 2013 Missouri State Hazard Mitigation Plan

## Potential Losses to Existing Development

During extreme heat events structural, road, and electrical infrastructure are vulnerable to damages. Depending upon temperatures and duration of extreme heat, losses will vary. Between the 1995 and 2014 there were no recorded crop insurance payments in Phelps County due to extreme heat events.

### ***Impact of Future Development***

Population trends from 2000 to 2014 for Phelps County and various jurisdictions indicate that 5 out of 6 jurisdictions were growing. These jurisdictions include Unincorporated Phelps County, Edgar Springs, Newburg, Rolla, and St. James. Population growth can result in increased age groups that are more susceptible to extreme heat. Additionally, as populations increase, so does the strain on each jurisdiction's electricity infrastructure. Local government and the City Emergency Management Director should take extreme heat in consideration while electrical upgrades are underway.

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

Those at greatest risk for heat-related illness and deaths include children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. To determine jurisdictions within the planning area with populations more vulnerable to extreme heat, demographic data was obtained from the 2010-2014 census on population percentages in each jurisdiction comprised of those under age 5 and over age 65. Data was not available for overweight individuals and those on medications vulnerable to extreme heat. **Table 3.38** 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, 2010-2014 Census Data**

<b>Jurisdiction</b>	<b>Population Under 5 Years</b>	<b>Population 65 Years and over</b>
Phelps County	5.9%	14.3%
Doolittle	6.7%	13.6%
Edgar Springs	11.9%	17.6%
Newburg	10%	19.7%
Rolla	5.2%	11.8%
St. James	8.5%	18.2%

Source: U.S. Census Bureau, 2010-2014 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 were not available.

## **Problem Statement**

In summary, the risks of extreme heat can impact the health/lives of citizens within the County, specifically the young and elderly. Two jurisdictions are more vulnerable to extreme heat due to their demographics.

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

### 3.4.5 Fires (Urban/Structural and Wild)

---

The specific sources for this hazard are:

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

#### **Hazard Profile**

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

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

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

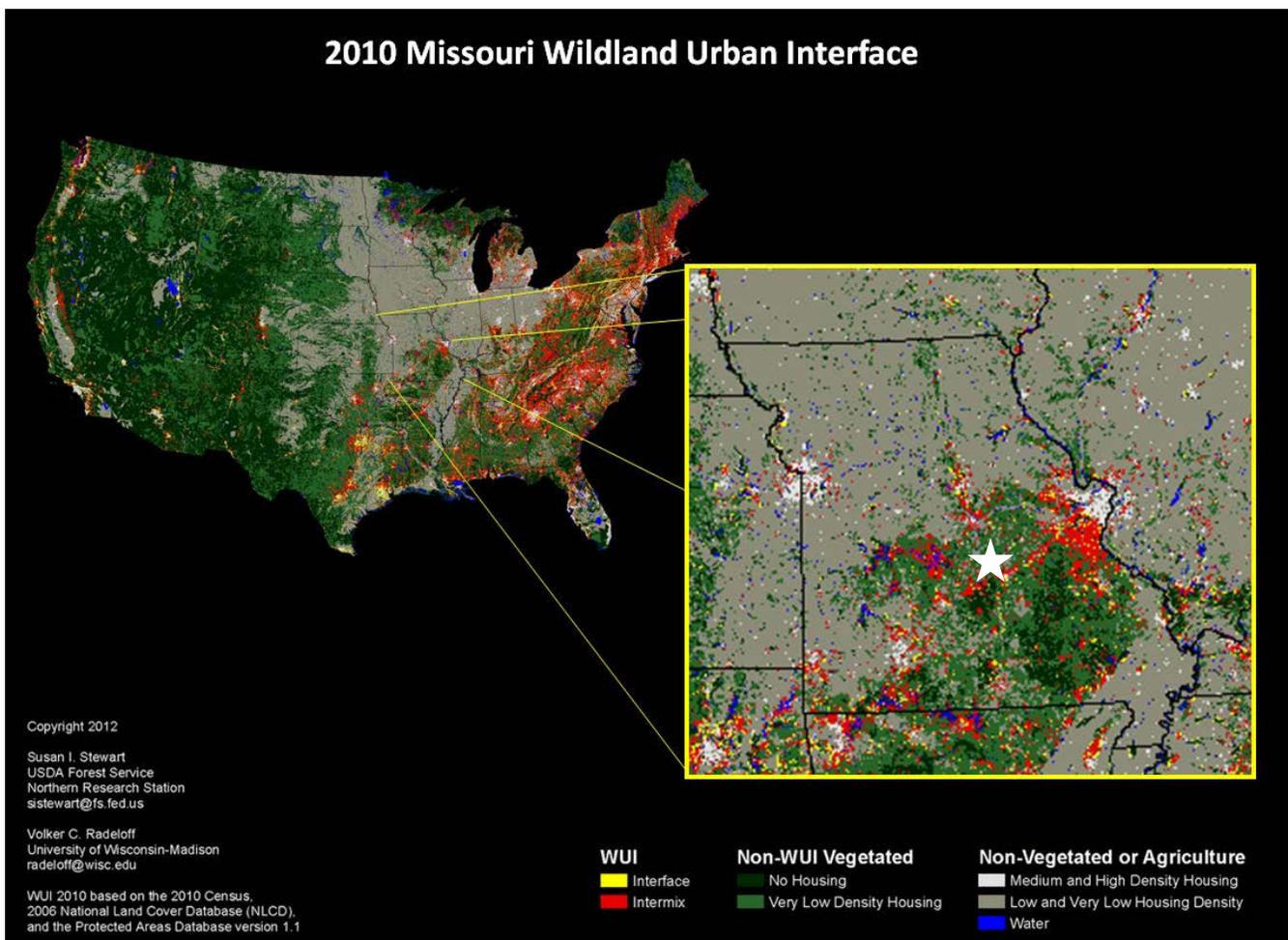
The Forestry Division of the Missouri Department of Conservation (MDC) is responsible for protecting privately owned and state-owned forests and grasslands from wildfires. To accomplish this task, eight forestry regions have been established in Missouri for fire suppression. The Forestry Division works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

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

## Geographic Location

The risk of structural fire does not vary widely across the planning area. However, damages due to wildfires are expected to be higher in communities with more wildland–urban interface (WUI) areas. WUI refers to the zone of transition between unoccupied land and human development and needs to be defined in the plan. Within the WUI, there are two specific areas identified: 1) Interface and 2) Intermix. The interface areas are those areas that abut wildland vegetation and the Intermix areas are those areas that intermingle with wildland areas (**Figure 3.36**). To determine specific WUI areas and variations, data was obtained from ArcGIS, Streets and SILVIS (**Figure 3.37**). According to the WUI area map of Phelps County, each jurisdiction resides in a WUI area.

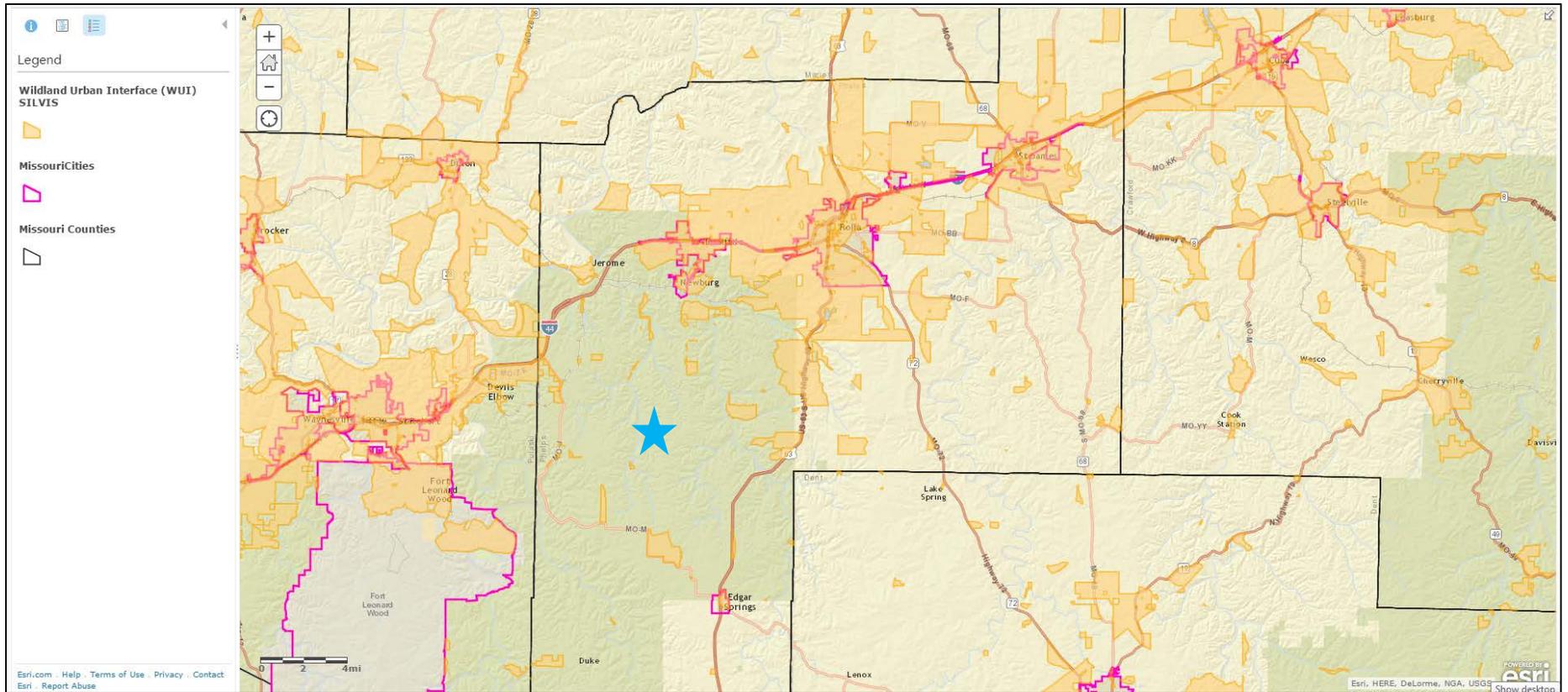
**Figure 3.36. 2010 Missouri Wildland Urban Interface (WUI)**



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

Note: White star roughly estimates Phelps County's location

**Figure 3.37. Phelps County Wildlife Urban Interface**



Source: ArcGIS, Streets

Note: A blue star resides within Phelps County's boundaries

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

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

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

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

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

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

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

### ***Previous Occurrences***

Between 2004 and 2008 there was an estimated 201 annual average of urban/structural fires in Phelps County. Additionally, the average annual property loss was \$1,020,777. Total deaths and injuries reported totaled 26 and 135, respectively<sup>32</sup>.

Between 2002 and 2015, wildfires consumed 6,147.45 acres in Phelps County<sup>33</sup>. **Table 3.39** provides data in regards to general damage reports for wildfires in Phelps County during the same timeline.

---

<sup>32</sup> 2013 Missouri State Hazard Mitigation Plan

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

---

**Table 3.39. 2002 – 2015 Wildfire General Damage Report**

Building Type	Damaged	Threatened	Destroyed
Residential	2	133	3
Out Buildings	6	53	11
Commercial	0	2	1

Source:<http://mdc4.mdc.mo.gov/applications/FireReporting/Report.aspx>

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<sup>34</sup> (**Appendix: F**), 406 wildfire events occurred in Phelps County between 2002 and 2015. This information was utilized to determine the annual average percent probabilities of wildfires. Since multiple occurrences are anticipated per year (406 events/13 years), the probability of wildfires per year is 100% with an average of 31.23 events per year (**Table 3.40**).

According to the 2013 Missouri State Hazard Mitigation Plan, the probability of structural/urban fires in Phelps County per year is 100% with an average of 201 structural fires annually<sup>35</sup> (**Table 3.41**).

---

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

Location	Annual Avg. % P	Avg. Number of Events
Phelps County	100%	31.23

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

---

**Table 3.41. Annual Average Percentage Probability of Structural/Urban Fires in Phelps County**

Location	Annual Avg. % P	Avg. Number of Events
Phelps County	100%	201

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

---

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

<sup>35</sup> 2013 Missouri State Hazard Mitigation Plan

## Vulnerability

### *Vulnerability Overview*

Data was collected from the National Fire Incident Reporting System (NFIRS) between 2009 and 2012. The data was analyzed to delineate overall statewide vulnerability for urban/structural fires in Phelps County. Unfortunately, 61 percent of fire departments in the State of Missouri reported occurrences to NFIRS. **Table 3.42** depicts the ranges for urban/structure fire vulnerability ratings. Furthermore, **Table 3.43** illustrates vulnerability analysis utilizing statistical data for urban/structural fires for Phelps County between 2004 and 2008<sup>36</sup>.

**Table 3.42. Ranges for Urban/Structure Fire Vulnerability Factor Ratings**

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

Source: 2013 Missouri State Hazard Mitigation Plan

<sup>36</sup> 2013 Missouri State Hazard Mitigation Plan

**Table 3.43. Statistical Data and Factor Ratings for Urban/Structure Fire Vulnerability (2004 to 2008)**

County	Housing Units /sq. mi.	Housing Density Rating	Annual # Average	Likelihood Rating	Total Building Exposure (\$)	Building Exposure Rating	Average Annual Property Loss (\$)	Annual Property Loss Ratio	Property Loss Ratio Rating	Total Deaths/Injuries	Death/Injury Factor	Death/Injury Factor Rating	Death/Injury/# of Fires Factor	Death/Injury/# of Fires Factor Rating	Average of Factors	Overall Vulnerability Rating	
Phelps	29.1	1	201	3	4,283,040,000	4	1,020,777	0.000238	2	26	135	187	5	0.93	5	3.4	4

Source: 2013 Missouri State Hazard Mitigation Plan, US Census, 2010

For wildfires, data was obtained from the Missouri Department of Conservation (MDC). **Table 3.44** depicts the ranges for wildfire vulnerability factor ratings, including the two factors considered; likelihood and annualized acres burned. **Table 3.45** illustrates the statistical data and factor ratings for wildfire vulnerability. The data collected from MDC included wildfire reported between 2004 and 2012. The overall vulnerability of wildfires in Phelps County is medium (3).

**Table 3.44. Ranges for Wildfire Vulnerability Factor Ratings**

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

Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.45. Statistical Data and Factor Ratings for Wildfire Vulnerability**

County	Wildfires 2004 -2012	Average Annual # of Wildfires	Likelihood Rating 1-5	Acres Burned	Average Annual Acres Burned	Average Acres Burned Rating	Total Buildings Damaged	Overall Vulnerability
Phelps	312	34.7	2	3,268.90	363	3	6	3

Source: 2013 Missouri State Hazard Mitigation Plan

***Potential Losses to Existing Development***

Due to numerous variables, there is no reliable or accurate way to approximate costs associated with structural or wildfire events. Additionally, no information was available for historic losses, which would enable the estimation of future losses. However with annual average percent probabilities for structural/urban and wildfires at 100 percent, losses to existing developments are expected.

***Impact of Future Development***

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

***Hazard Summary by Jurisdiction***

As long as drought conditions are not seriously inflamed, future wildfires in Phelps County should have a negligible adverse impact on the community, as it would affect a small percentage of the population. Nonetheless, homes and businesses located in unincorporated areas are at higher risk from wildfires due to proximity to woodland and distance from fire services. Variations in both structural/urban and wildfires are not able to be determined at this time due to lack of data. However, both fire types are expected to occur on an annual basis across the County.

**Problem Statement**

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

### 3.4.6 Flooding (Flash and River)

---

Some specific sources for this hazard are:

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

#### **Profile**

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

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

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

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

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

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

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

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

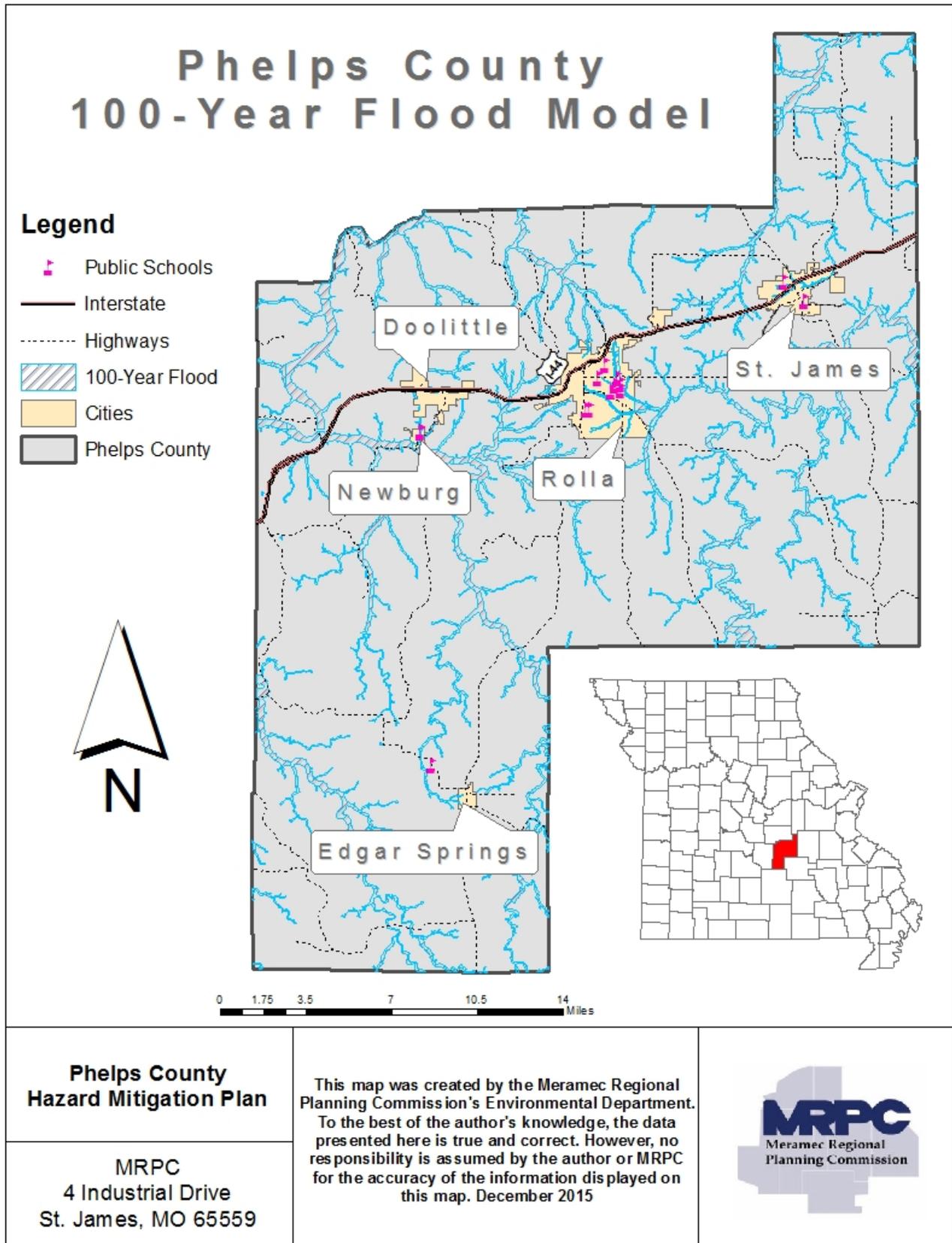
In certain areas, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. This combined with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

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

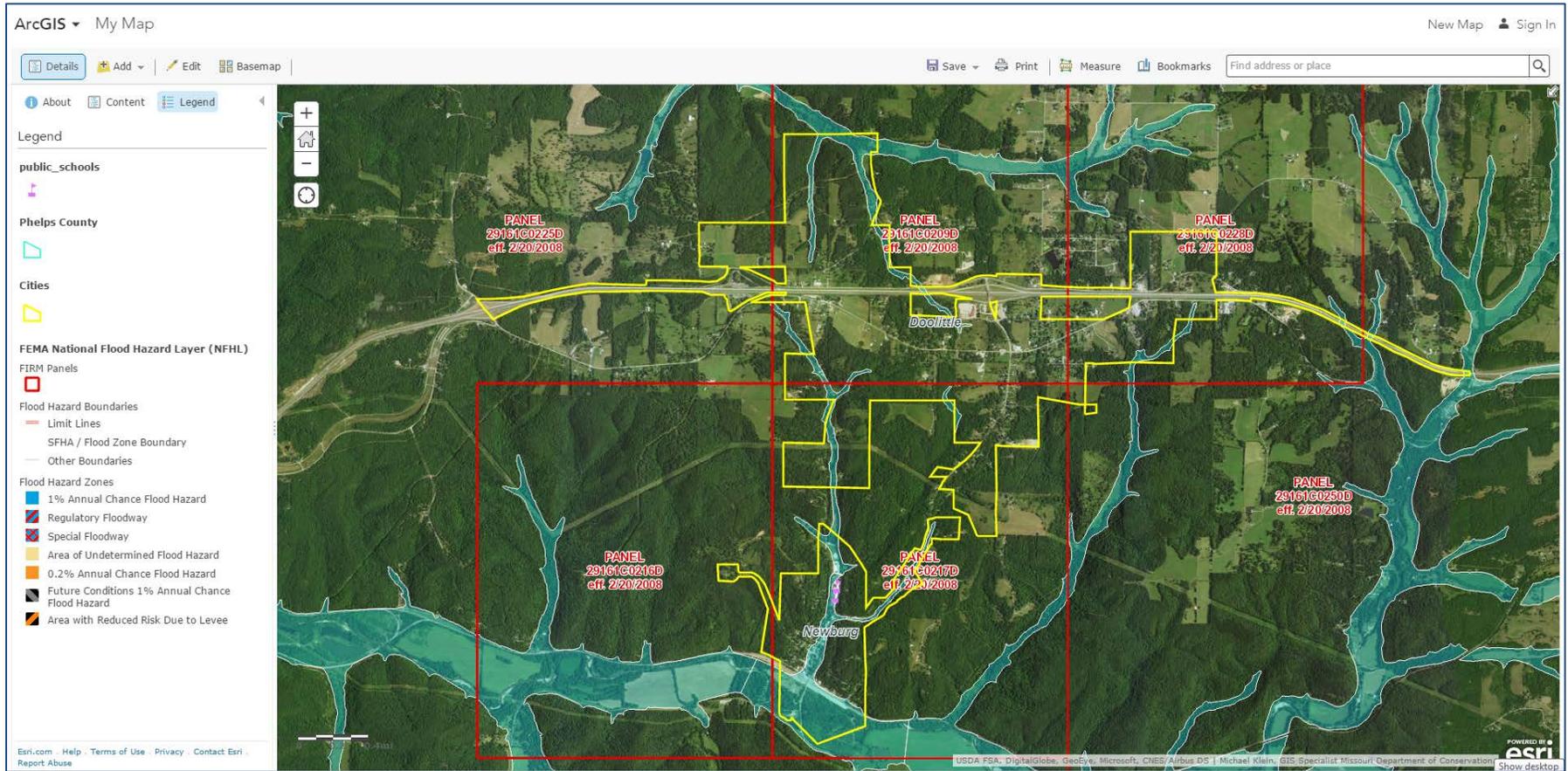
### ***Geographic Location***

**Figure 3.38** depicts Phelps County and the 100-Year Flood Model. Riverine flooding is most likely to occur in SFHAs. Below are SFHA's for all participating jurisdictions except unincorporated Phelps County (**Figure 3.38** to **Figure 3.43**). Included in the maps are public schools within each jurisdiction. **Table 3.46** shows Phelps County NCDL flood events by location between 1995 and 2015.

Figure 3.38. Phelps County 100-Year Flood Model

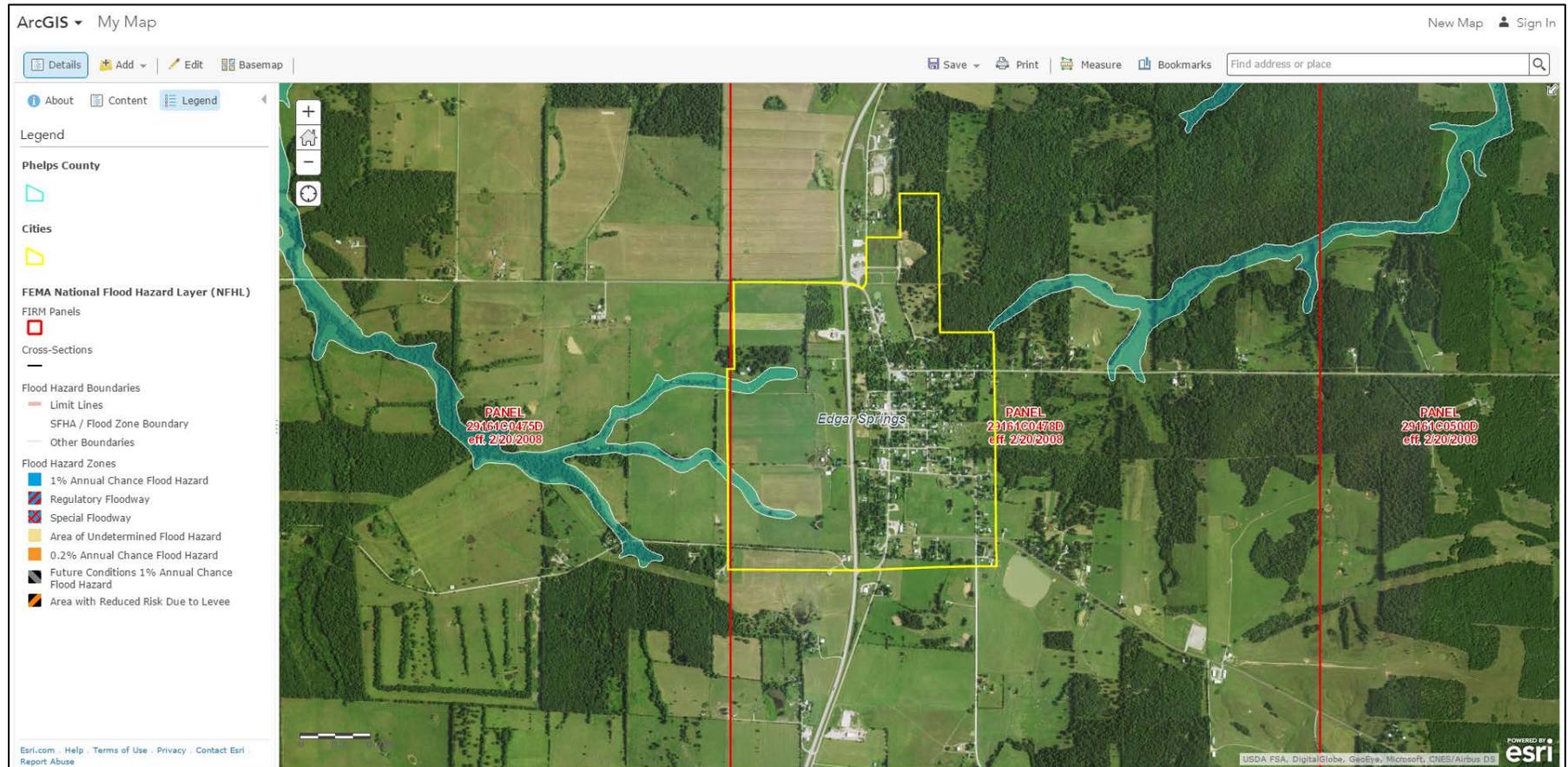


**Figure 3.39. Doolittle and Newburg, Missouri Special Flood Hazard Areas (SFHAs)**



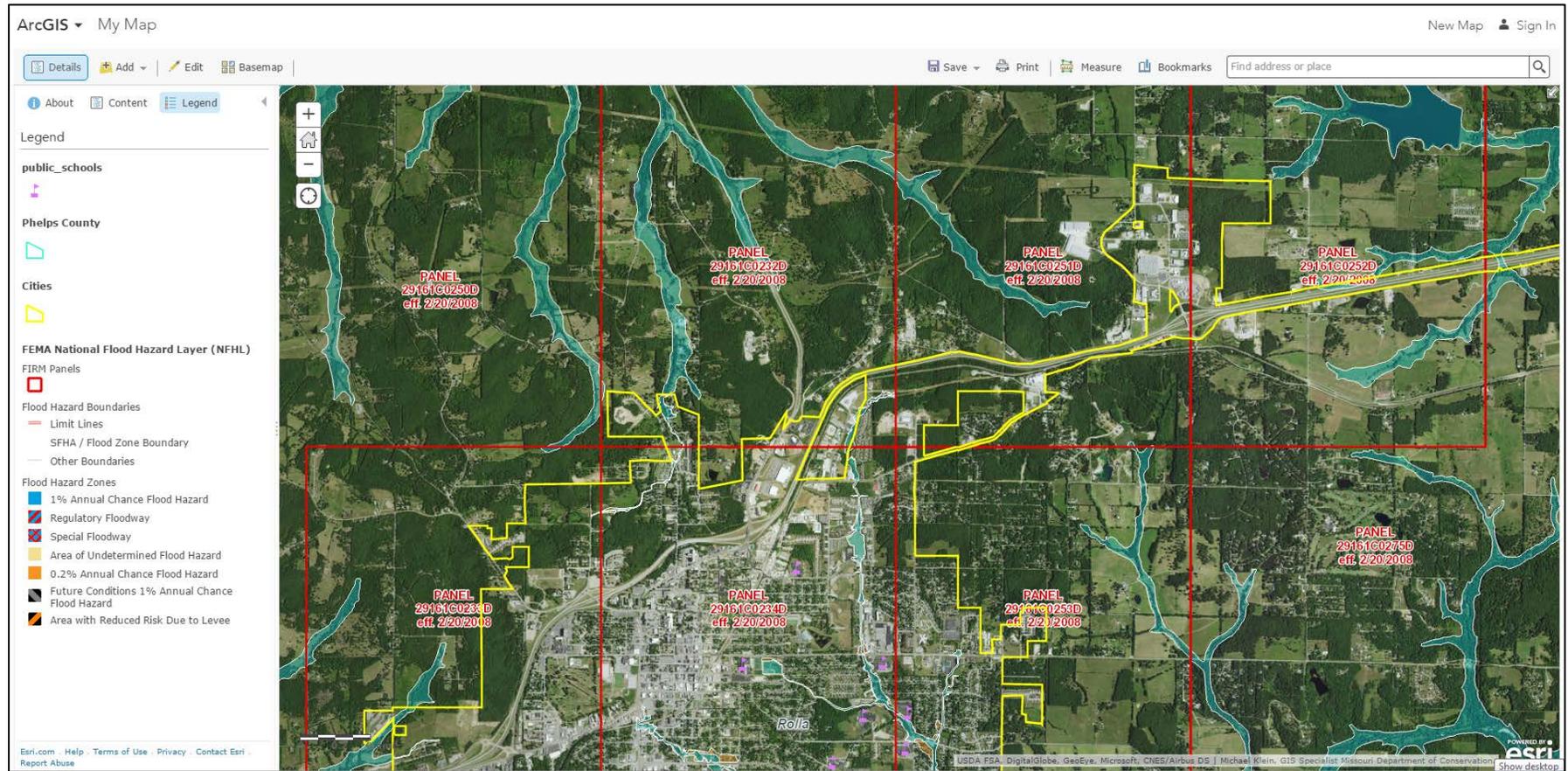
Source: ESRI's ArcGIS, Streets

**Figure 3.40. Edgar Springs, Missouri Special Flood Hazard Areas (SFHAs)**



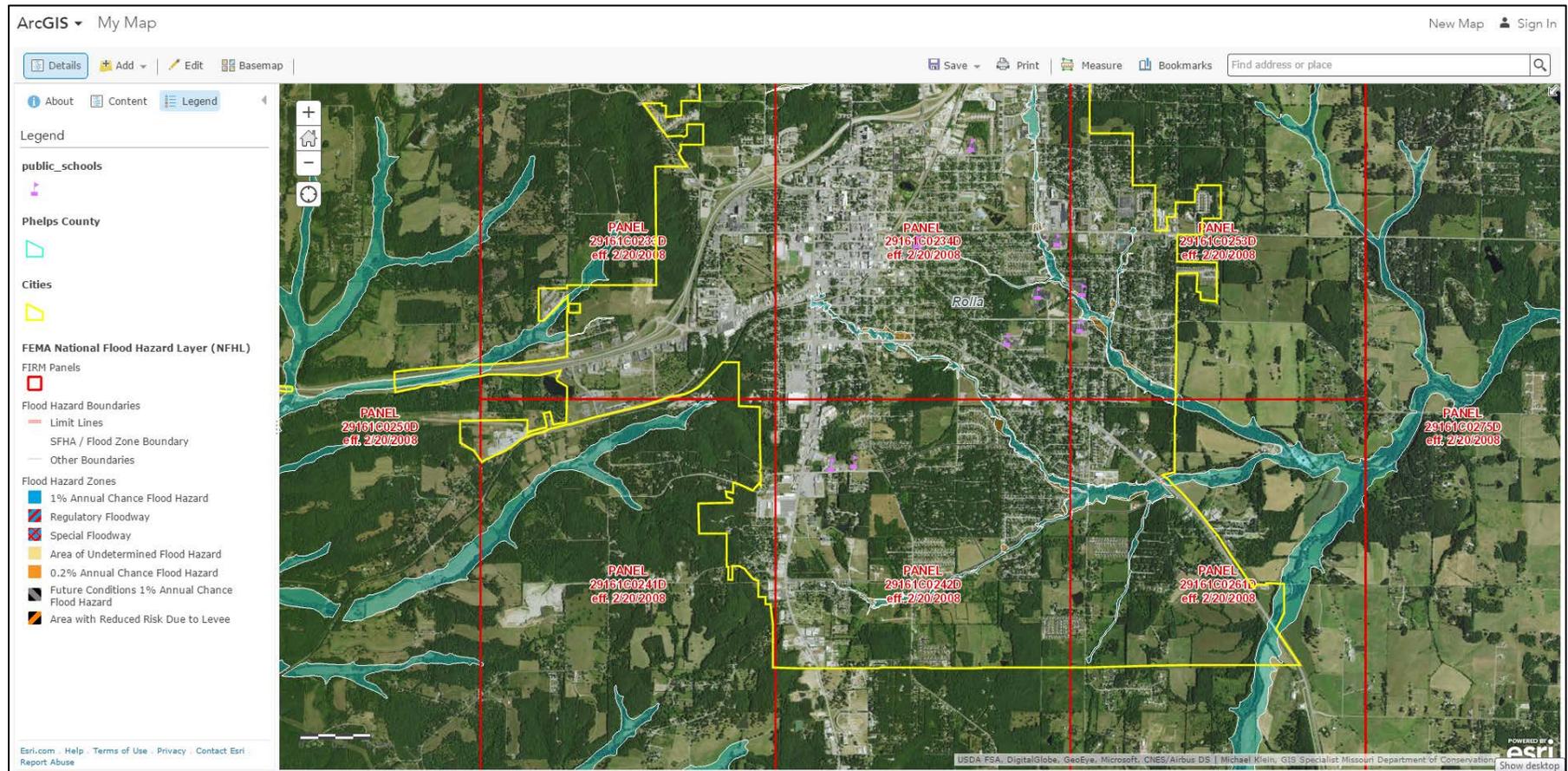
Source: ESRI's ArcGIS, Streets

Figure 3.41. Rolla, Missouri Special Flood Hazard Areas (SFHAs)



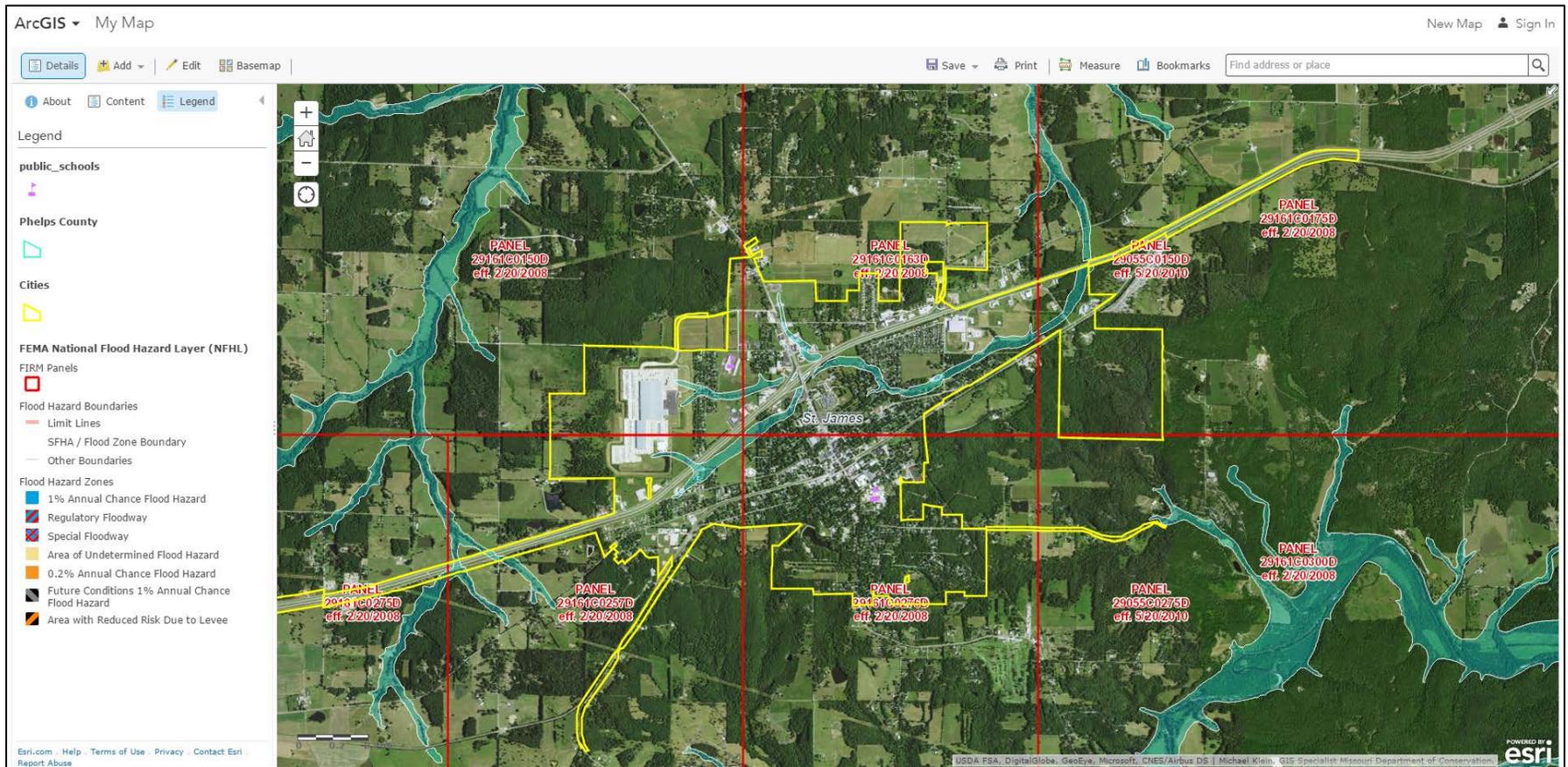
Source: ESRI's ArcGIS, Streets

Figure 3.42. Rolla, Missouri Special Flood Hazard Areas (SFHAs) Continued



Source: ESRI's ArcGIS, Streets

Figure 3.43. St. James, Missouri Special Flood Hazard Areas (SFHAs)



Source: ESRI's ArcGIS, Streets

**Table 3.46. Phelps County NCDL Flood Events by Location, 1995-2015**

Location	# of Events
Unincorporated County	12
-Unincorporated County (unspecified)- 8 flood events	
-Unincorporated County (Dillon)- 3 flood events	
-Unincorporated County (Powellville)- 1 flood events	
Doolittle	5
-Doolittle (unspecified)- 5 flood events	

Source: National Climatic Data Center

Flash flooding occurs in SFHAs and locations in the planning area that are low-lying. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. After review of NCDL data, Unincorporated Phelps County and Doolittle are the most prone jurisdictions to flash flooding events. **Table 3.47** provides information in regards to flash flood events between 1995 and 2015.

**Table 3.47. Phelps County NCDL Flash Flood Events by Location, 1995-2015**

Location	# of Events
Unincorporated County	29
-Unincorporated County (unspecified)- 6 flood events	
-Unincorporated County (Dillion)- 2 flood events	
-Unincorporated County (Flag Springs)- 1 flood events	
-Unincorporated County (Flat)- 2 flood events	
-Unincorporated County (Jerome)- 1 flood events	
-Unincorporated County (Northwye)- 5 flood events	
-Unincorporated County (Powellville)- 2 flood events	
-Unincorporated County (Rosati)- 3 flood events	
-Unincorporated County (Royal)- 1 flood events	
-Unincorporated County (Stoney Dell)- 1 flood events	
-Unincorporated County (Sugartree)- 2 flood events	
-Unincorporated County (Vida)- 2 flood events	
-Unincorporated County (Zion Hill)- 1 flood events	
Doolittle	5
-Doolittle (unspecified)- 5 flood events	
Edgar Springs	2
-Edgar Springs (unspecified)- 2 flood events	
Newburg	6
-City C (unspecified)- 6 flood events	
Rolla	12
-City B (unspecified)- 12 flood events	
St. James	2
-City B (unspecified)- 2 flood events	

Source: National Climatic Data Center

**Severity/Magnitude/Extent**

Missouri has a long and active history of flooding over the past century, according to the 2010 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 1995 and 2014, there was 1 recorded crop insurance claim for flooding within Phelps County.

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

**Table 3.48** lists jurisdictions within the planning area that participate in NFIP. In addition, **Table 3.49** provides the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction.

**Table 3.48. NFIP Participation in Phelps County**

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	Regular-Emergency Program Entry Date
290727	Doolittle, City of	Y	02/20/08	08/24/84
290851	Edgar Springs, City of	Y	(NSFHA)	08/24/84
295268	Newburg, City of	Y	02/20/08	04/28/72
290824	Phelps County	Y	02/20/08(M)	02/01/87
290285	Rolla, City of	Y	02/20/08	09/30/77
290661	St. James, City of	Y	02/20/08(M)	07/03/85

Source: NFIP Community Status Book, 9/26/2013; BureauNet, <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book>; M= No elevation determined – all Zone A, C, and X; NSFHA = No Special Flood Hazard Area; E=Emergency Program

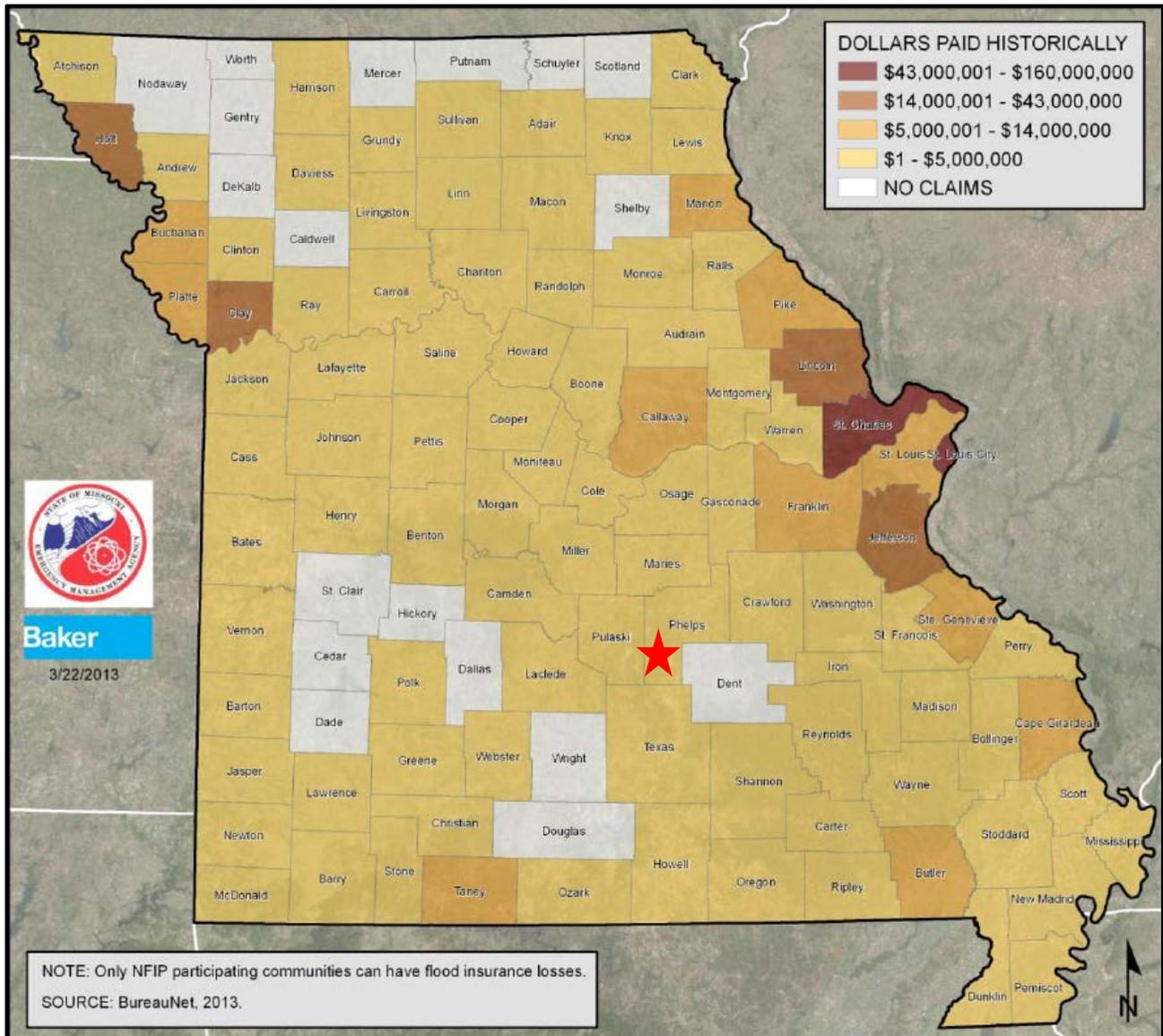
**Table 3.49. NFIP Policy and Claim Statistics as of [01/07/2016]**

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Doolittle	1	\$74,000.00	-	-
Newburg	12	\$779,300.00	4	\$105,348.97
Phelps County*	64	\$8,727,800.00	133	\$4,360,310.75
Rolla	68	\$11,180,900.00	55	\$932,463.37
St. James	7	\$851,500.00	1	\$655.40

Source: NFIP Community Status Book, [01/07/2016]; BureauNet, <http://bsa.nfipstat.fema.gov/reports/reports.html>; \*Closed Losses are those flood insurance claims that resulted in payment.

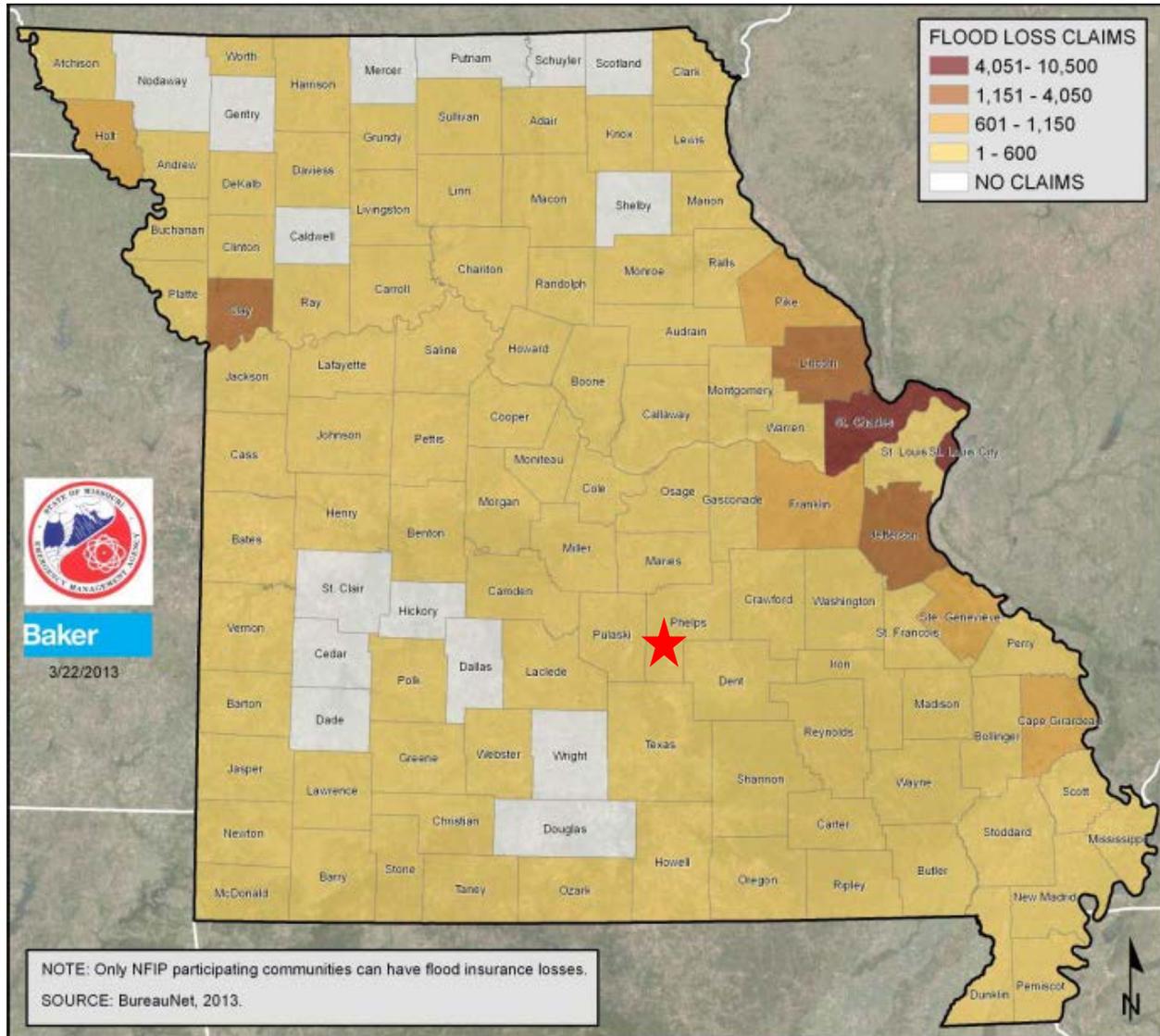
The following figures depict the dollars paid historically for flood insurance losses in Missouri by County from 1978 to Jan. 2013 (**Figure 3.44**), and historical flood loss claims in Missouri by County, 1979 to Jan. 2013 (**Figure 3.45**).

**Figure 3.44. Dollars Paid Historically for Flood Insurance Losses in Missouri by County, 1978 to Jan. 2013**



Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.45. Historical Flood Loss Claims in Missouri by County, 1978 to Jan. 2013**

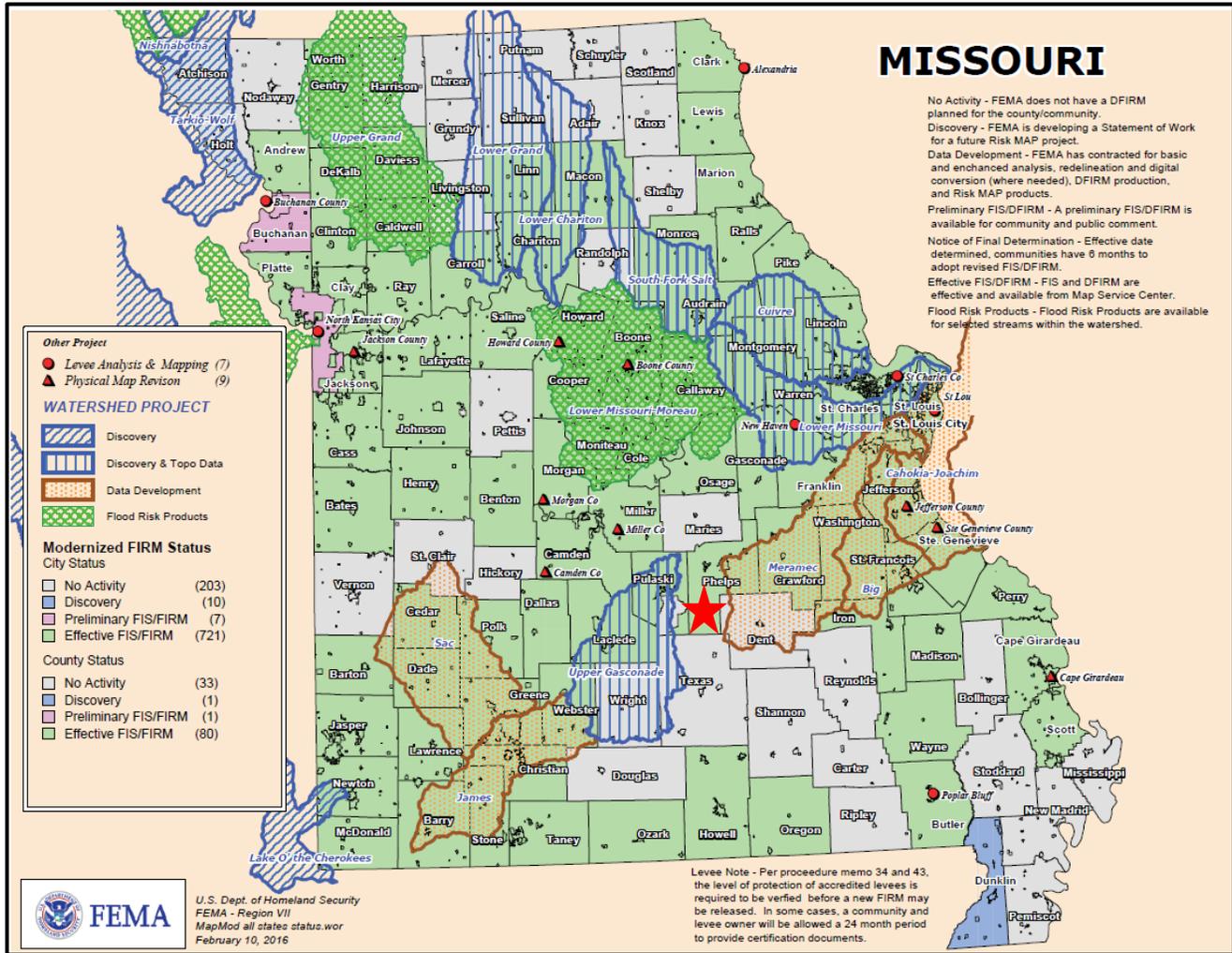


Source: 2013 Missouri State Hazard Mitigation Plan

**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 eastern half of Phelps County is in the data development stage; however, this part of the county is not yet in the Flood Risk Product Stage. **Figure 3.46** below depicts various watershed projects and FIRM statuses for Missouri.

**Figure 3.46. RiskMAP 2015**



Source: SEMA, 2016

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

Repetitive Loss Properties are those properties with at least two flood insurance payments of \$5,000 or more in a 10-year period. According to the Flood Insurance Administration, jurisdictions included in the planning area have a combined total of 37 repetitive loss properties (1 in Newburg, 26 in Phelps Co., and 10 in Rolla) with 87 losses (2 in Newburg, 61 in Phelps Co., and 24 in Rolla) as of 11/30/2015. Of those properties there are 36 Non-Mitigated properties with 84 losses, which 28 properties are residential and 9 commercial. There is one mitigated property (Phelps Co.) with 3 losses which is residential.

Total payments were \$54,230.29 with building payments of \$52,248.00, along with \$1,982.29 in content payments. The average payment was \$18,076.76. Non-mitigated properties included total payments of \$3,727,592.70 with building payments of \$3,299,456.33, along with \$428,136.37 in content payments. The average payment was \$42,529.50.

According to the FEMA Repetitive Loss list there are 6 properties and all are validated. Severe Repetitive Loss (SRL): A SRL property is defined it as a single family property (consisting of one-to-four residences) that is covered under flood insurance by the NFIP; and has (1) incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding \$5,000 and with cumulative amounts of such claims payments exceeding \$20,000; or (2) for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. According to FEMA there is 1 validated and 3 pending SRL properties in Phelps County.

**Previous Occurrences**

**Table 3.50** provides information regarding Presidential Flooding Disaster Declarations between 1993 and 2015 for Phelps County.

**Table 3.50. Phelps County Presidential Flooding Disaster Declarations 1993 to 2015**

Declaration No.	Date	Missouri	Incident Description
995	7/9/1993	Missouri	Flooding, Severe Storm
1023	04/21/1994	Missouri	Severe Storms, Flooding, Tornadoes
1463	05/06/2003	Missouri	Severe Storms, Tornadoes, and Flooding
1631	03/16/2006	Missouri	Severe Storms, Tornadoes, and Flooding
1676	01/15/2007	Missouri	Severe Winter Storms, Flooding
1742	02/05/2008	Missouri	Severe Storms, Tornadoes, and Flooding
1749	03/19/2008	Missouri	Severe Storms, and Flooding
1847	06/19/2009	Missouri	Severe Storms, Tornadoes, and Flooding
1980	5/9/2011	Missouri	Severe Storms, Tornadoes, Flooding
4144	9/6/2013	Missouri	Severe Storms, Straight-line Winds, Flooding

FEMA, Disaster Declarations for Missouri, Flooding

Data was obtained from the NCDC in regards to 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. NCDC Phelps County Flash Flood Events Summary, 1995 to 2015**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
1997	1	0	0	0	0
1998	2	0	0	0	0
2000	1	0	0	0	0
2002	5	0	1	\$300,000	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	\$8,000	0
2009	7	0	0	\$10,000	0
2010	5	0	0	0	0
2011	2	0	0	\$250,000	0
2012	2	0	0	\$50,000	0
2013	10	0	0	\$1,000,000	0
2014	1	0	0	0	0
2015	1	0	0	0	0

Source: NCDC, data accessed [01/05/16]

#### Narratives on flood events:

1. **05/17/1997:** Rainfall of up to 3 inches caused widespread street flooding in Rolla.
2. **03/17/1998:** Over an inch of rain resulted in flooding of county roads along creeks to the southwest of Rolla. Mill, Corn, and Little Piney creeks were most affected.
3. **03/19/1998:** Heavy rain falling on saturated ground resulted in flooding of numerous low water crossings in the county. Highway Y, 5 miles north of Rolla, and Highway T, just north of Flat, was closed. Parts of Route C between Newburg and the Gasconade River were also closed.
4. **08/03/2000:** An estimated three to four inches of rain fell in the southern portions of Rolla, causing numerous streets to flood.
5. **04/19/2002:** A complex of strong to severe thunderstorms developed over the southwestern portions of the Lake of the Ozarks region during the afternoon and early evening of April 19<sup>th</sup> 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.

6. **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.
7. **05/12/2002:** Another in a series of thunderstorm complexes moved across the area producing excessive rainfall on the already saturated soils. Most of the heavy rainfall began across central Missouri Sunday morning May 12th, and then produced another round of torrential rainfall Sunday evening. By Monday morning May 13th, a large area of two inches fell north of Interstate 44, with the heaviest bands of three to six inches from Joplin northeast to Greenfield, Bolivar and Urbana. Another area of excessive rain fell over eastern Texas, northern Shannon, and southern Dent counties where locally three to six inches fell.
8. **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.
9. **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.
10. **07/12/2003:** Emergency management officials observed a foot of water crossing several low water bridges near the city of Rolla making them impassable.

11. **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.
12. **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.
13. **05/29/2006:** Excessive rainfall caused flash flooding within the city of Rolla. Several roads became impassable to motorists.
14. **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.
15. **05/10/2007:** Heavy thunderstorms caused flooding over Highway 63 near its intersection with Highway H.
16. **09/07/2007:** A creek in St. James flooded out of its banks. Multiple low water crossings across Phelps County also experienced flash flooding.
17. **01/07/2008:** Excessive rainfall caused numerous low water crossings to experience flash flooding west of Rolla.
18. **02/05/2008:** Numerous roads became impassable from flash flooding on the eastern edge of Rolla.
19. **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.
20. **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.
21. **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.
22. **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.
23. **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.
  24. **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.
  25. **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.
  26. **12/27/2008:** Urban flooding in Rolla led to water running in a few homes.
  27. **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.
  28. **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.
  29. **10/30/2009:** Homes were evacuated along Beaver Creek due to flooding.
  30. **03/25/2010:** Low water crossings were flooded.
  31. **05/12/2010:** The low water crossing on County Road 5220, south of Rolla, was flooded to an unknown depth and impassable.
  32. **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 4:45 am.
    - a. Water, a foot and a half deep, was flowing over road to the campground in Maramec Spring State Park.
  33. **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.
  34. **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.
  35. **05/01/2011:** Emergency manager reported several low water crossings flooded in Phelps County.

36. **03/15/2012:** Highway C was closed due to flooding.
- Water flooded out homes causing evacuations to be conducted. Highway D was closed due to flooding.
37. **04/10/2013:** Water was over the roadway along Highway E, at Wild Cat Creek.
38. **08/07/2013:** High water was over the roadway at State Highway T.
- 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.
  - 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.
  - County Road 3000 at the Little Dry Fork had approximately two to three feet of rushing water over the bridge and was impassable.
  - Highway P west of the Highway T intersection had high water and was impassable.
  - A bridge was washed out by the First Baptist Church.
  - 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.
  - 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.
  - Meramec Spring Park was flooded including the campgrounds which had been evacuated prior to flash flooding.
39. **04/03/2014:** Several roads were reported closed around the county due to flooding.
40. **07/02/2015:** Route J was closed one mile north of Route M at the Big Piney River.

**Table 3.52. NCDC Phelps County Riverine Flood Events Summary, 1995 to 2015**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
1998	1	0	0	\$36,000	\$3,000
2002	6	0	0	\$110,000	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

Source: NCDC, data accessed [01/05/2016]

**Narratives on flood events:**

- 07/26/1998:** A series of thunderstorm complexes over central and south central Missouri produced widespread flooding. Cooperative weather stations reported over 8 inches of rain at Versailles (Morgan County), Rolla (Phelps County, and Salem (Dent County). Flooding caused widespread damage to roads and low water crossings and bridges. The Missouri Governor declared a state of emergency for several counties in central Missouri including Benton, Dent, Maries, Miller, Morgan, Phelps, and Shannon. In Miller County, flooding caused

widespread damage to roads and low water bridges. Significant damage occurred to corn (50% damaged), soybean (50% damaged), hay (35% damaged) crops. Cattle (300 head) and poultry (3000 turkeys or chickens) were lost. Extensive damage to farm property and equipment was also reported. In Morgan County, widespread flooding significantly damaged roads and bridges. One state bridge on Hwy TT (Gravois Mills Bridge) was destroyed. Several cars were washed off of roads. No injuries or deaths were reported. Homes and campgrounds near Versailles and Gravois Mills required evacuations. Some homes and businesses received flooding of lower floors or basements. Damage to crops included soybeans (20% loss), corn (20 to 30% loss), and hay. Some livestock was lost. There was also extensive damage to farmland and equipment. The Lamine River Conservation Area suffered some flood damage. In Phelps County, flooding damaged some roads and low water bridges. Some damage to the hay crop was reported. Flooding of basements and lower floors of some homes was reported in Rolla. The Meramec Spring Fish Hatchery suffered damage from flooding. In Maries County, three bridges were destroyed including a local landmark "swinging rope" bridge near Vienna which was built in 1930. In Shannon County, flooding caused widespread damage to roads and low water bridges. Flooding also washed away a large number of hay bales.

2. **01/31/2002:** A prolonged moderate rainfall event occurred over the Ozarks from the early morning to the evening hours of January 31, 2002. One day earlier, heavy rainfall provided nearly one inch of rain over the flooded areas, which made for already wet soil conditions prior to this event. A shallow arctic front, which provided the focus for a large scale overrunning precipitation event, was nearly stationary along the Arkansas border during the day. The rainfall begun early Thursday morning with an almost continuous influx of steady rainfall from 9 am January 31, to approximately 6 pm that evening. Rainfall rates were generally low and ranged from one half, to three quarters of an inch per hour in the heaviest downpours. However, a general one to two tenths per hour was more consistent with the overall rainfall pattern, with isolated convective activity during the afternoon hours. 24 hour rainfall totals, including Doppler radar estimates in the flooded areas, ranged from one inch, to nearly three inches in Phelps, Pulaski, Texas, Howell and Shannon Counties. Numerous low water crossings, streams and county roads were flooded throughout the event. Several of the county roads were closed and did not reopen until Friday morning, February 1, 2002. The hardest hit areas were in Pulaski and Shannon Counties where Cave, Spring, and Creek roadways along the Big Piney River, and Highway H between Highway 16 and 106, were closed for nearly 24 hours.
3. **02/01/2002:** This is the continuation of the flood event of January 31, 2002. Although the rainfall had ended, runoff continued which caused several roads, low water crossings, and small streams to remain flooded through the morning. Runoff from the small streams caused the Big Piney River to rise above flood stage early Friday morning. Also, the Gasconade River, North Fork, Jacks Fork, and Eleven Point Rivers of central and south central Missouri rose significantly during this event.
4. **04/19/2002:** A prolonged flooding event developed over portions of the Lake of the Ozarks region from late April 19th through early morning of April 21st. The initial flash flooding eased during the early morning of April 20th as the complex of thunderstorms moved east of the area. However, runoff continued which allowed small streams, creeks and even the larger Gasconade River in Maries County to flood during the first part of the weekend. Additional thunderstorms develop during the afternoon and evening of April 20th, which produced an additional one to three inches of rain over the already saturated soils over the area. This produced another flash flooding episode where creeks and small streams rose rapidly in a short period of time. This prolonged flooding event eased during the early morning of April

21st. However, numerous county roads and low water crossings remain closed or impassable for nearly 36 hours.

5. **05/08/2002:** The flash flooding event on the 7th and early 8th, became a major flooding event across all of southern and central Missouri through the early afternoon of May 9th. In addition to the numerous road closures, bridges blocked by debris, evacuations of towns, campgrounds, parks, and moderate river flooding, many communities had their worst flooding in more than 10 years. The American Red Cross set up shelters in Branson and Cassville due to evacuations. Flooded roadways forced several school districts across southwest Missouri to close for a few days. Several areas of west central Missouri also had crop damage. In addition to all of the flash flooding reports, river flooding became significant as all of the southern Missouri rivers rose above flood stage by the middle of May. Some of the rivers crested at levels equivalent to the 1993 flood event.
6. **05/12/2002:** This is the continuation of the flooding that occurred over portions of southern Missouri on May 12th and 13th. Although numerous low water crossings, bridges, and area rivers flooded for the second time in less than a week, this area was more concentrated over portions of southwest Missouri and portions of extreme south central Missouri. One of the more significant factors this time with the flooding is that the area lakes rose to critical levels, especially Bull Shoals and Table Rock Lake, where the water rose to a few feet below the flood pool. This flooding event prolonged the closure of numerous roads and low water bridges over central and southern Missouri. The additional heavy rain also worsened already existing river flooding over the region. Polk County received over eight inches of rainfall during a 12 hour period which caused most of the southern part of the county to have significant road erosion. Parts of Dent County also reported significant basement flooding and road erosion.
7. **05/17/2002:** This is the continuation of the flooding from May 16th and 17th. Runoff was excessive over south central Missouri and portions of southwest Missouri where local rivers and smaller tributaries continued to rise. The runoff slowly subsided during the early morning hours of May 18th. During the first three weeks of May, many areas of the Ozarks and southeast Kansas received between seven and twelve inches of rainfall. Not only did this cause major flooding of roadways, rivers and creeks, this contributed to lake levels rising to near record heights. Bull Shoals Lake rose so high that it caused Highway K to flood for several weeks. It forced seven families that live along Highway K to travel to and from their homes via canoes or rafts. A city park was closed for several weeks on Lake Taneycomo and caused their local fair to be cancelled. The significant and widespread flooding that occurred over the region caused the President to declare the following counties in southern Missouri disaster areas; Camden, Cedar, Christian, Dent, Greene, Hickory, Jasper, Laclede, McDonald, Newton, Polk, Stone, Texas, Vernon, Wright, Barry, Barton, Dade, Dallas, Webster, Taney, Douglas, Howell, Oregon, Lawrence and Shannon counties.
8. **01/05/2005:** Several periods of heavy rain in conjunction with little vegetation over the winter months set the stage for widespread flooding across much of extreme southeast Kansas and southern and central Missouri. In Phelps County, numerous roads and low lying areas were inundated and impassable by motorists countywide.
9. **03/19/2008:** Excessive rainfall developed over southern Missouri during the evening of 17 March. A line of training convection assumed a position roughly along a line from Anderson to Ozark to Licking. This convection expanded with time, eventually covering nearly all of extreme southeast Kansas and the Missouri Ozarks. Moderate to heavy rain continued into the overnight period and did not stop until the morning of 19 March. This flooding is a continuation of the flash flooding. Widespread flooding continued for several days after the

rain ended.

10. **09/03/2008:** Five to six inches of rain fell over Phelps County. Numerous low water crossings flooded throughout the county.
11. **10/29/2009:** Route C near Route T was closed due to flooding.
12. **04/02/2010:** The low water crossings on County Roads 3220 and 3040 were reported to have 8 to 12 inches of water running across them.
13. **04/03/2010:** A low water crossing on County Road 8280 was reported impassable due to high water.
14. **05/14/2010:** Excessive rainfall caused flash flooding over a section of Highway Y approximately three miles northwest of Rolla. This section of the highway has been closed off to motorists.
15. **05/20/2010:** Excessive rainfall caused sections of Highway Y to flood and be closed to motorists.
16. **03/17/2013:** Route AA in west central Phelps County was closed in the vicinity of Mill Creek due to flooding.
  - a. Approximately one foot of flowing water was over County Road 3000 in the vicinity of Little Dry Fork.

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

From the data obtained from the NCDC<sup>37</sup>, there were 17 riverine flooding events (**Table 3.52**) over a period of 20 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 85% (17 events/20 years x 100 = 85%). Furthermore, data was obtained for flash flooding within the County. Phelps County endured 56 flash flooding events (**Table 3.51**) over a 20 year period. Since multiple occurrences are anticipated per year (56 events/20 years) the probability of flash flooding is 100%, with an average of 2.8 events annually (**Table 3.54**).

---

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

<b>Location</b>	<b>Annual Avg. % P</b>
<b>Phelps County</b>	85%

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

---

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

---

**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.

## **Vulnerability**

### ***Vulnerability Overview***

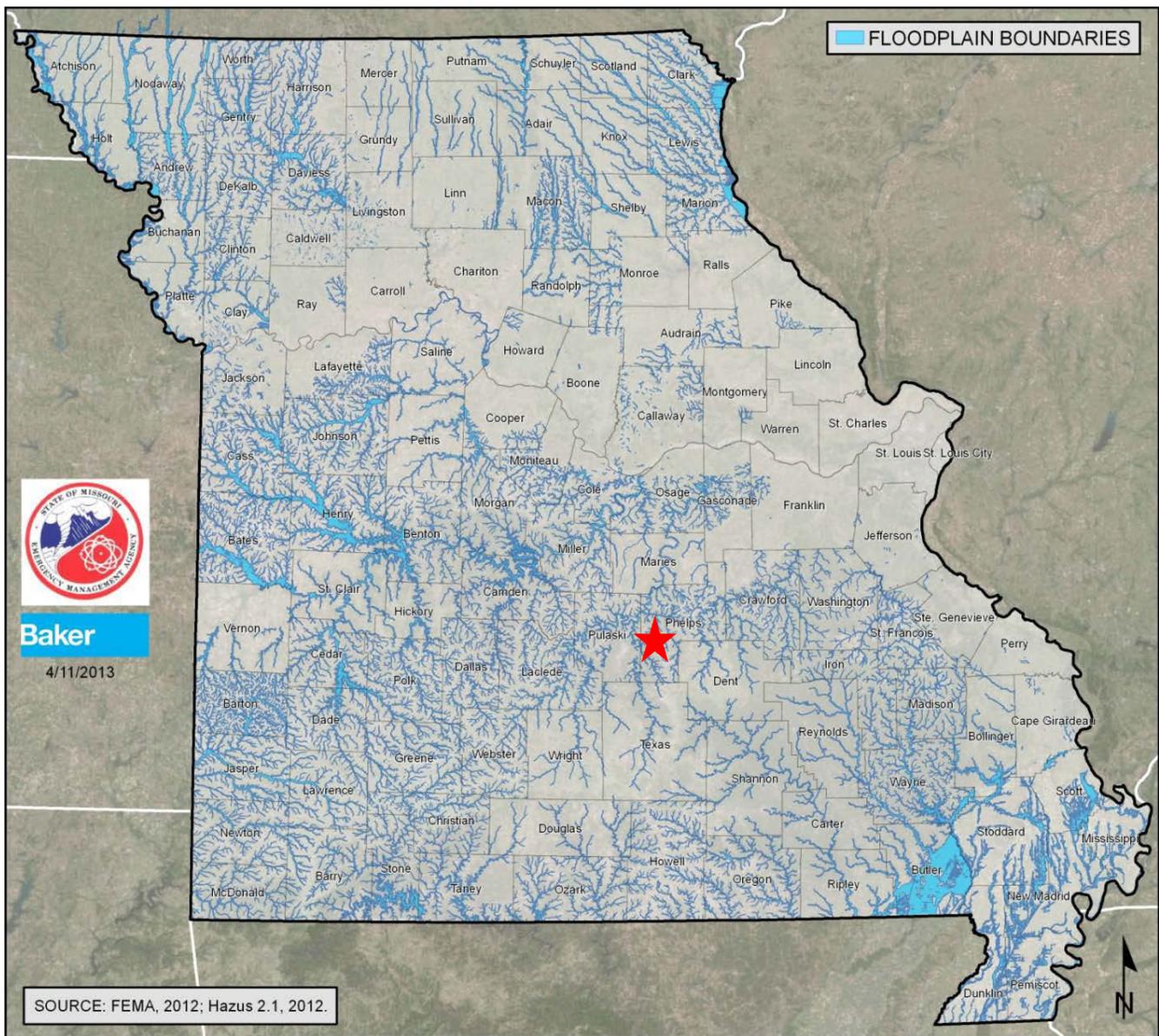
For the vulnerability analysis of riverine and flash flooding for Phelps County, data was obtained from the 2013 Missouri State Hazard Mitigation Plan. The 2013 Plan was updated by enhancing the flood vulnerability assessment and loss estimation capabilities of Hazus by leveraging a number of improved local data inputs. This was achieved by integrating DFIRM depth grids for 51 additional counties. Furthermore, the State re-analyzed the previous 29 depth grids used in 2010, to utilize the latest enhancements available in Hazus 2.1; bringing the total number of regions analyzed using DFIRM depth grids to 80 jurisdictions. The subsequent set of improved data inputs included an enhanced building inventory database, which is an improvement over the standard Hazus 2.1 stock data. That data, coupled with the DFIRM depth grids, enabled Level 2 Hazus flood analysis for all 114 counties<sup>38</sup>.

**Figure 3.47** depicts the 100-year floodplain boundaries for all counties within Missouri. These DFIRM floodplains are comprised of streams based on a <1 sq. mile drainage area.

---

<sup>38</sup> 2013 Missouri State Hazard Mitigation Plan

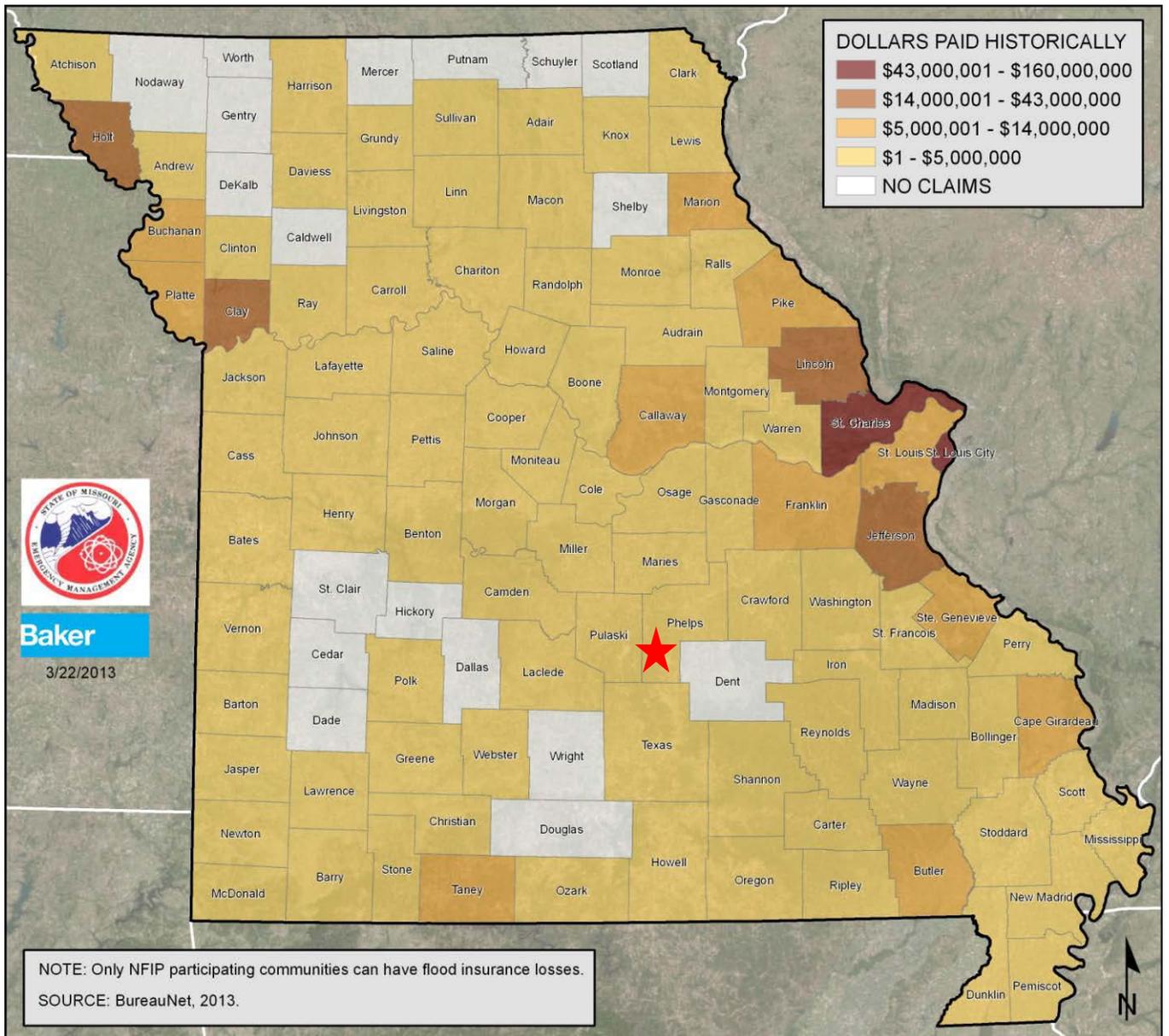
**Figure 3.47. DFIRM and Hazus Countywide Base-Flood Scenarios: Modeled Floodplain Boundaries**



Source: 2013 Missouri State Hazard Mitigation Plan

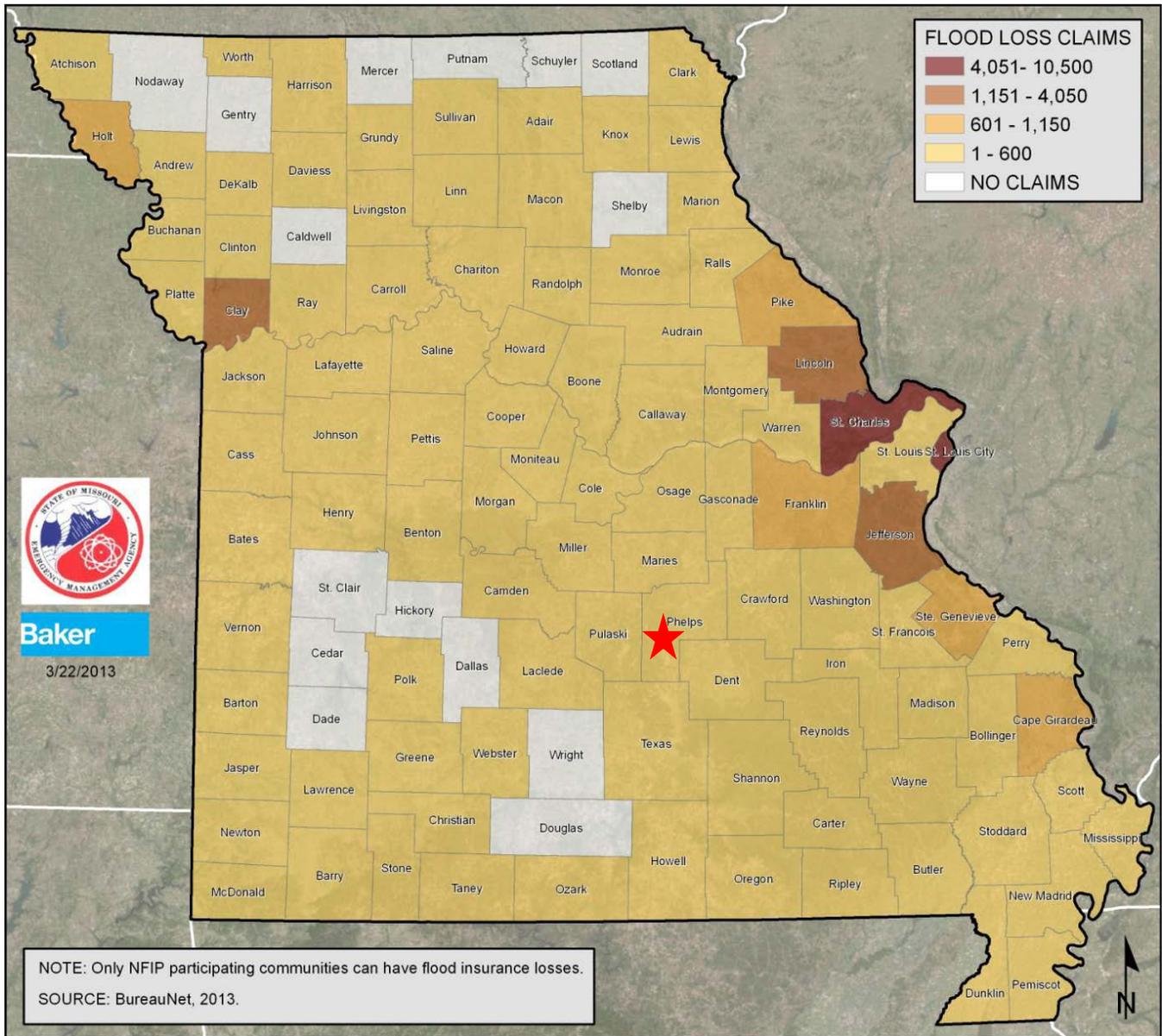
In addition, the state analyzed NFIP flood-loss data to establish areas in Missouri that are most at risk to flooding. **Figure 3.48** illustrates the dollars paid historically for flood insurance losses in Missouri by county from 1978 to 2013. Moreover, **Figure 3.49** depicts flood loss claims in Missouri during the same timeline.

**Figure 3.48. Dollars Paid Historically for Flood Insurance Losses in Missouri by County, 1978 – Jan 2013**



Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.49. Flood Loss Claims in Missouri by County, 1978 – Jan 2013**



Source: 2013 Missouri State Hazard Mitigation Plan

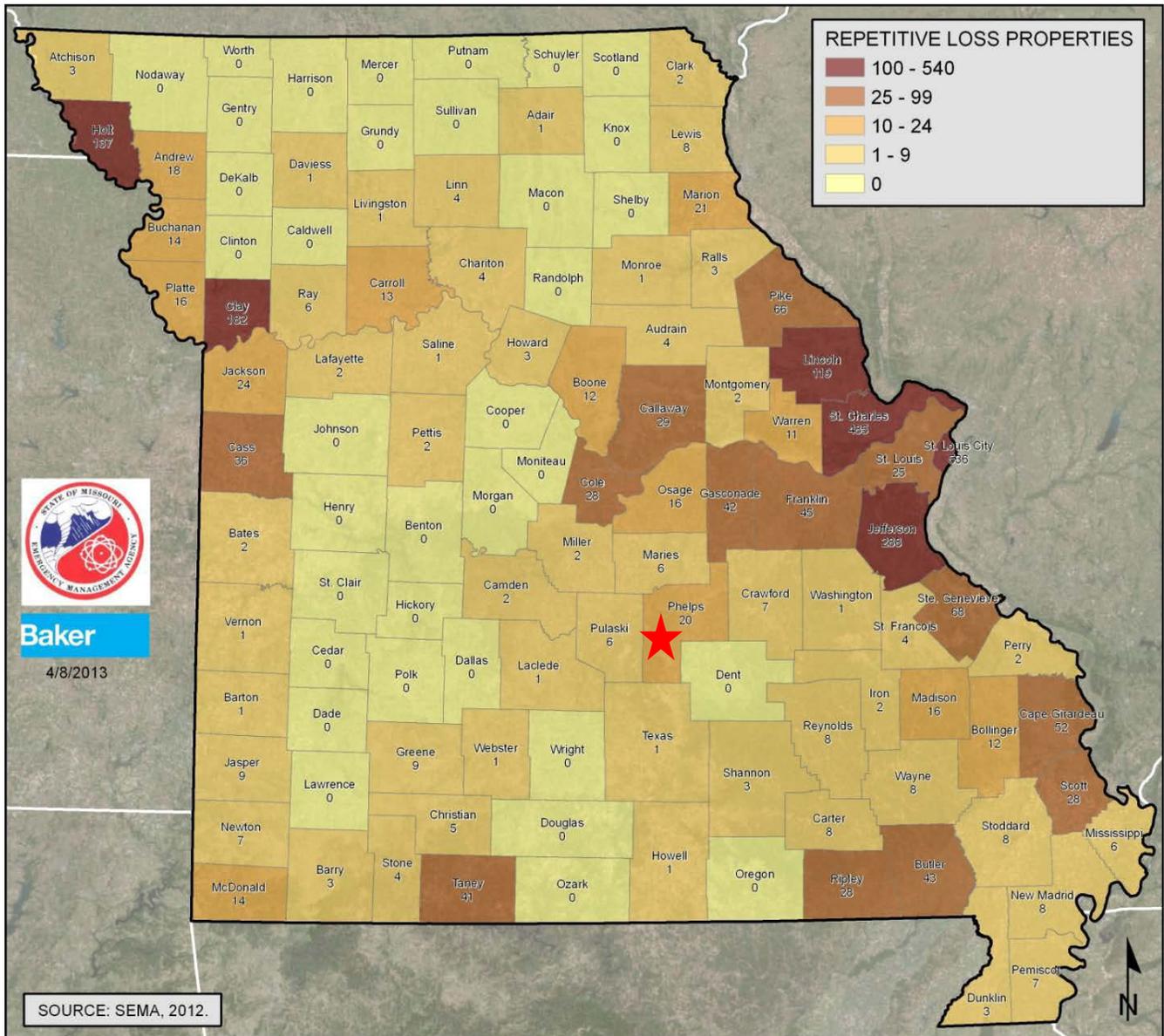
Table 3.55 and Figure 3.50 illustrate the number of repetitive loss properties in Phelps County.

**Table 3.55. Phelps County’s Repetitive Loss Property Summary**

County	Number of Repetitive Loss Properties	Number of Losses	Total Paid (\$)	Loss Ratio	Average Payment
Phelps	20	46	\$1,601,604	2.3	\$34,817

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.50. Repetitive Flood Loss Properties by County, 1978 - 2009**



Source: 2013 Missouri State Hazard Mitigation Plan

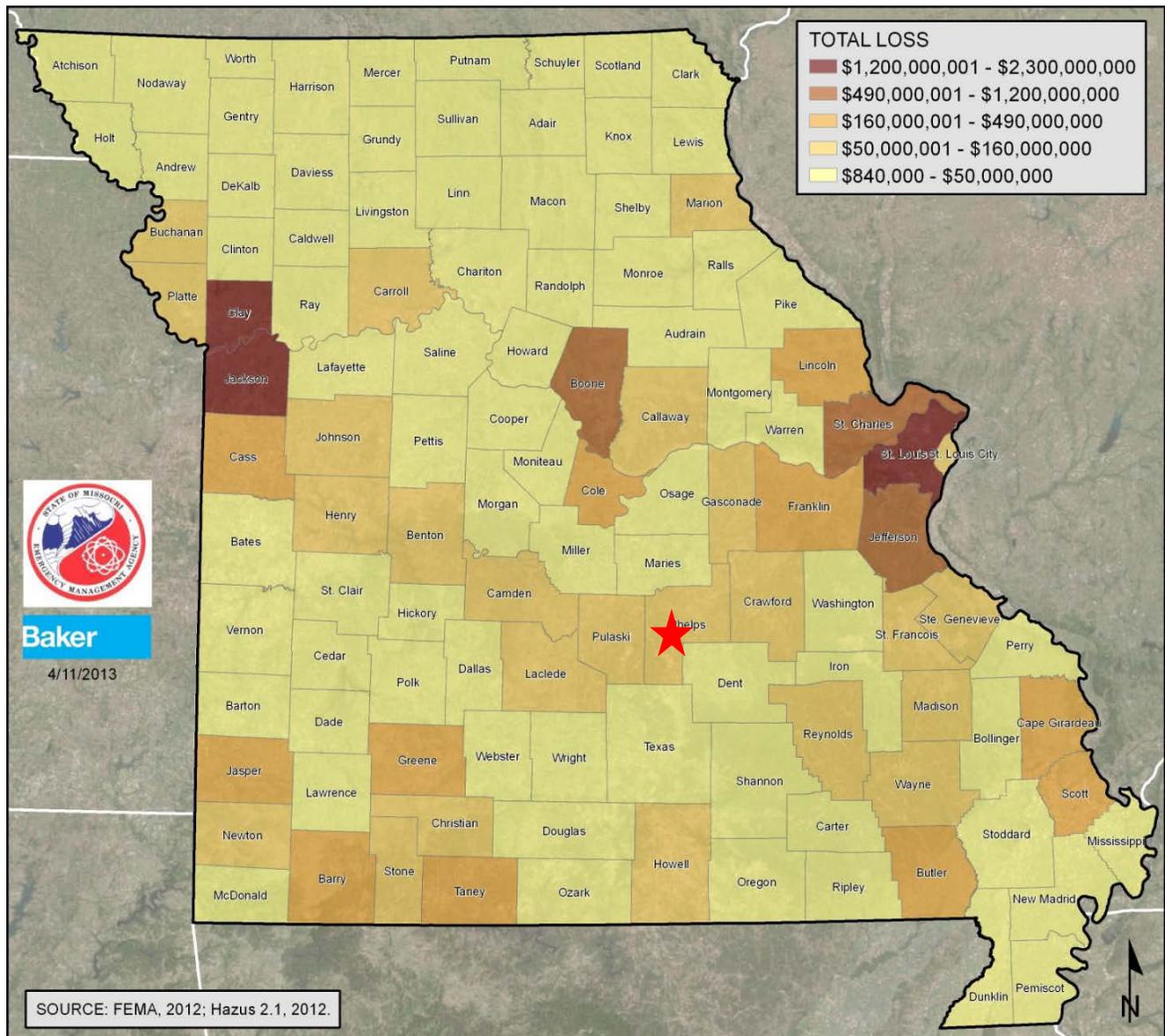
Furthermore, the state analyzed potential loss estimates to flooding. The purpose of the analysis is to determine where flood losses can occur and the degree of severity. These results were generated from DFIRM data and Hazus floodplain data. **Table 3.56** provides information regarding total direct building loss and income loss to Phelps County. In addition, **Figure 3.51** and **Figure 3.52** depict Hazus countywide base-flood (100 year) scenarios including building and income loss for total loss and loss ratio respectively.

**Table 3.56. Total Direct Building Loss and Income Loss to Phelps County**

County	Structural Damage	Contents Damage	Inventory Loss	Total Direct Loss	Total Income Loss	Total Direct and Income Loss	Calc. Loss Ratio
Phelps	\$30,148,220.56	\$43,059,491.68	\$462,615.14	\$73,670,327.38	\$687,119.55	\$74,357,446.93	2.20

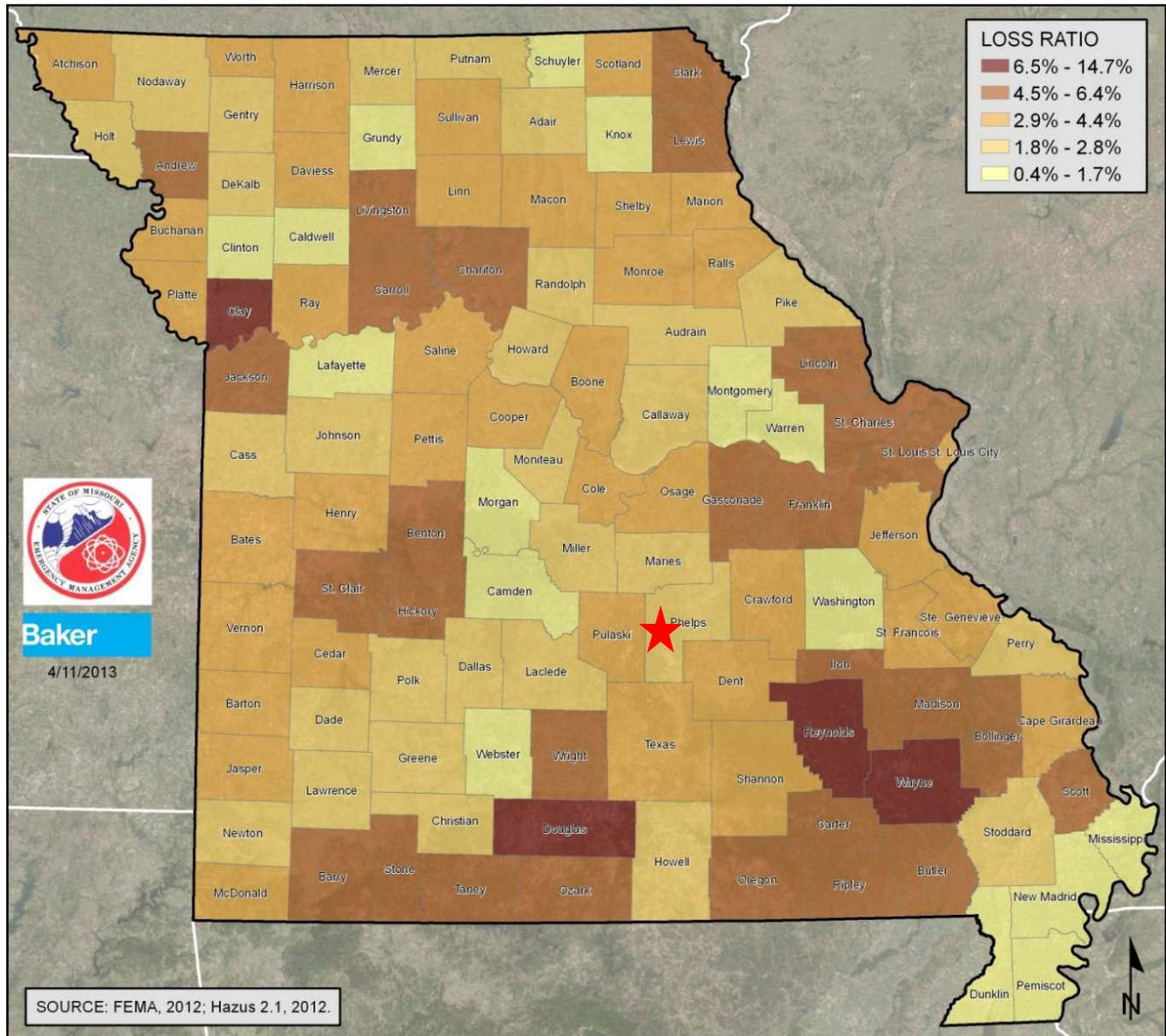
Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.51. Hazus Countywide Base-Flood Scenarios: Building and Income Loss**



Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.52. Hazus Countywide Base-Flood Scenarios: Building Loss Ratio**



Source: 2013 Missouri State Hazard Mitigation Plan

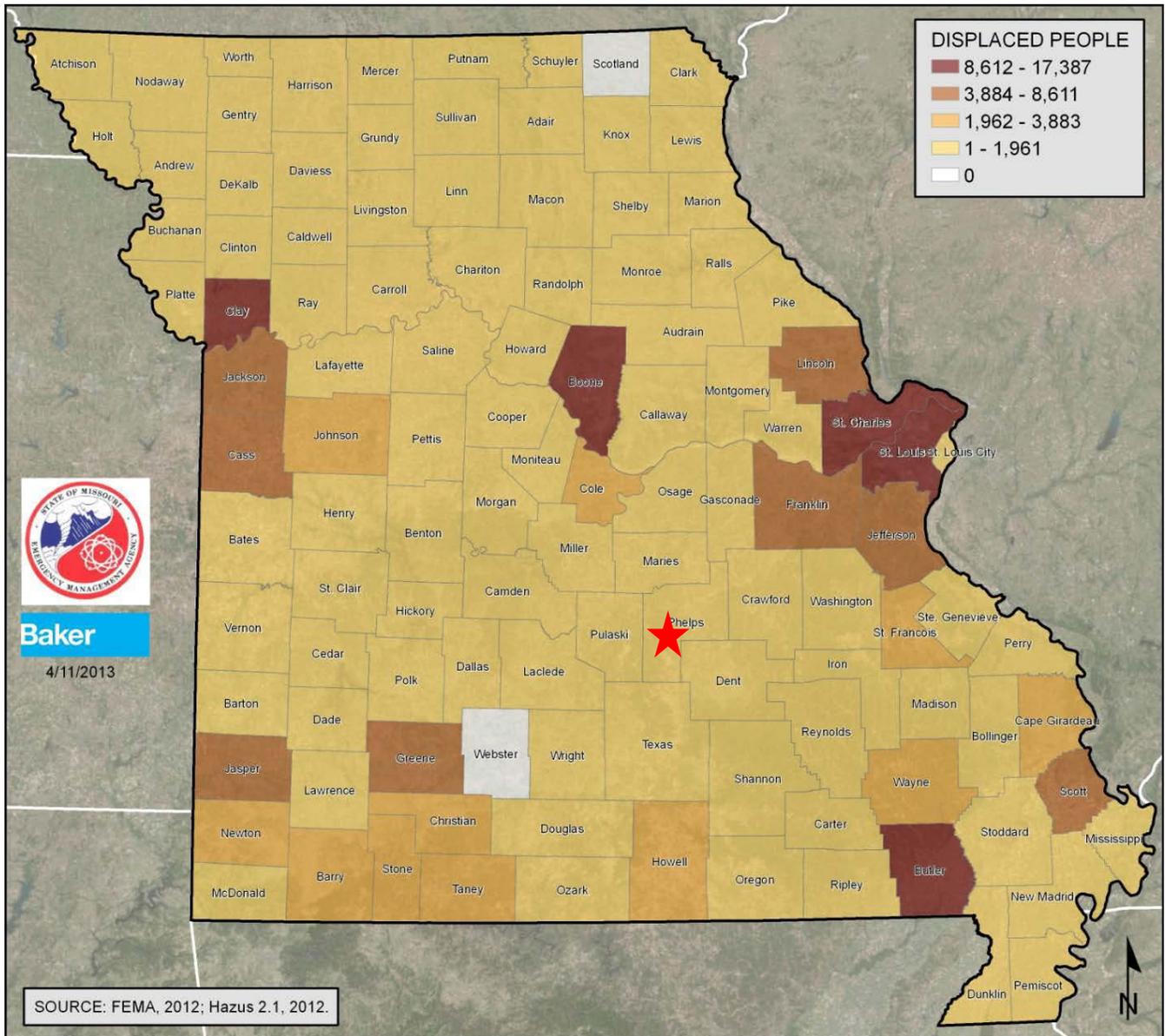
Lastly, the State determined the estimated number of displaced households and need for shelters within Phelps County in the event of a 100 year flood. **Table 3.57** and **Figure 3.53** illustrate this information.

**Table 3.57. Estimated Displaced households and Shelter Needs for Phelps County**

County	Displaced Households	Displaced Population Requiring Shelter
Phelps	619	375

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.53. Hazus Countywide Base-Flood Scenarios: Displaced People**



Source: 2013 Missouri State Hazard Mitigation Plan

**Potential Losses to Existing Development**

Every jurisdiction in Phelps County contains a portion of the 100 Year Floodplain. Although the Hazus model indicates that the next flash flood in Phelps County will likely have minimal impact on the day-to-day activities of the County overall, 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 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, 3330, 3520, 5180, 5520, 7530, 8070, 8280, and 8410 and will be threatened.

A tributary to the Little Piney Creek runs through Newburg, which increases the vulnerability to flooding. In addition, according to the Data Questionnaire, the Newburg R-II School District has district facilities within the floodplain, but was not specified. Several areas damaged during the August 2013 flooding have been mitigated, leaving fewer areas of potential destruction.

### ***Impact of Future Development***

Impact of future development is correlated to floodplain management and regulations set forth by the county and jurisdictions<sup>39</sup>. Future development within low-lying areas near rivers and streams, or where interior drainage systems are not adequate to provide drainage during heavy rainfall events should be avoided. Additionally, future development would also increase impervious surface causing additional water run-off and drainage problems during heavy rainfall events.

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

Vulnerability to flooding slightly varies across the planning area. The jurisdictions most vulnerable to flooding include Doolittle, Newburg, Rolla, and Unincorporated Phelps County. Other jurisdictions within the planning area are not as vulnerable; however some do have few properties within the floodplain.

### **Problem Statement**

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

---

<sup>39</sup> 2015 Boone County Hazard Mitigation Plan

### 3.4.7 Land Subsidence/Sinkholes

---

Some specific sources for this hazard are:

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

#### **Hazard Profile**

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

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

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

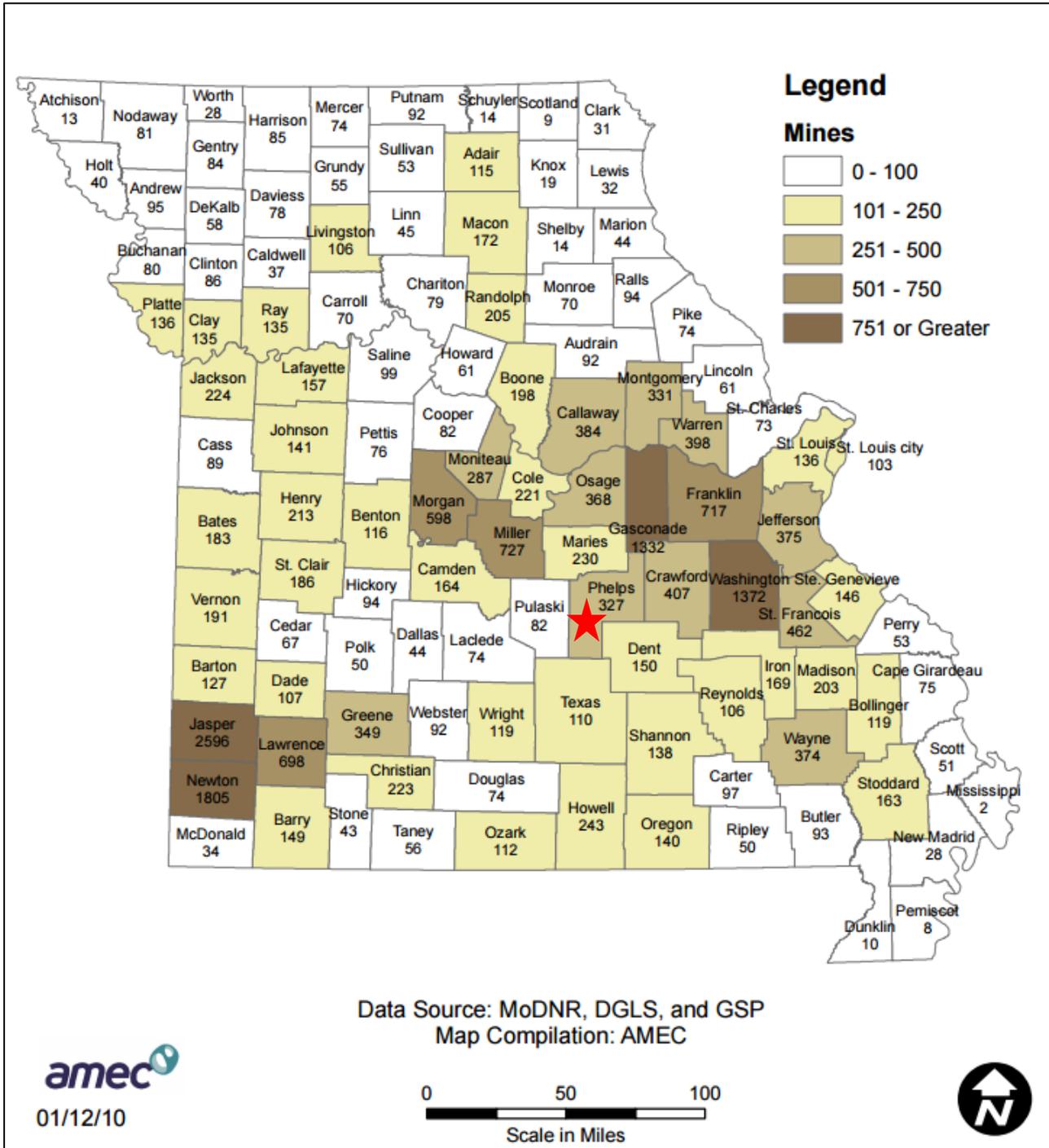
In the case of sinkholes, the rock below the surface is rock that has been dissolving by circulating groundwater. As the rock dissolves, spaces and caverns form, and ultimately the land above the spaces collapse. In Missouri, sinkhole problems are usually a result of surface materials above openings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

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

According to SEMA, there were approximately 327 mining activities in Phelps County. The only

detailed information available in regards to current mining in Phelps County emanates from the Missouri Department of Natural Resources. There is only one mine on recorded for Phelps County; which produces pyrite. **Figure 3.54** depicts mines in Missouri by County.

**Figure 3.54. Mines in Missouri by County**

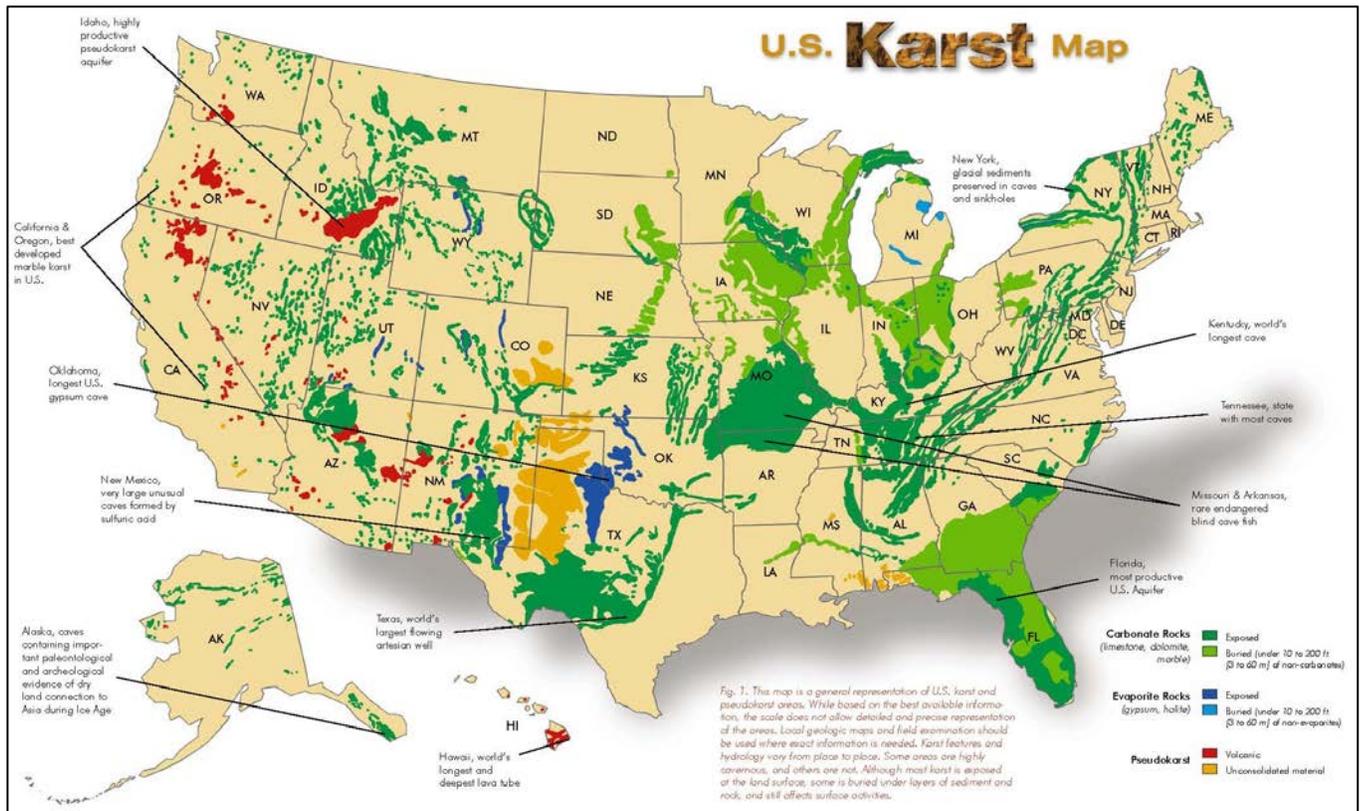


Source: [http://sema.dps.mo.gov/programs/mitigation\\_management.php](http://sema.dps.mo.gov/programs/mitigation_management.php)

**Geographic Location**

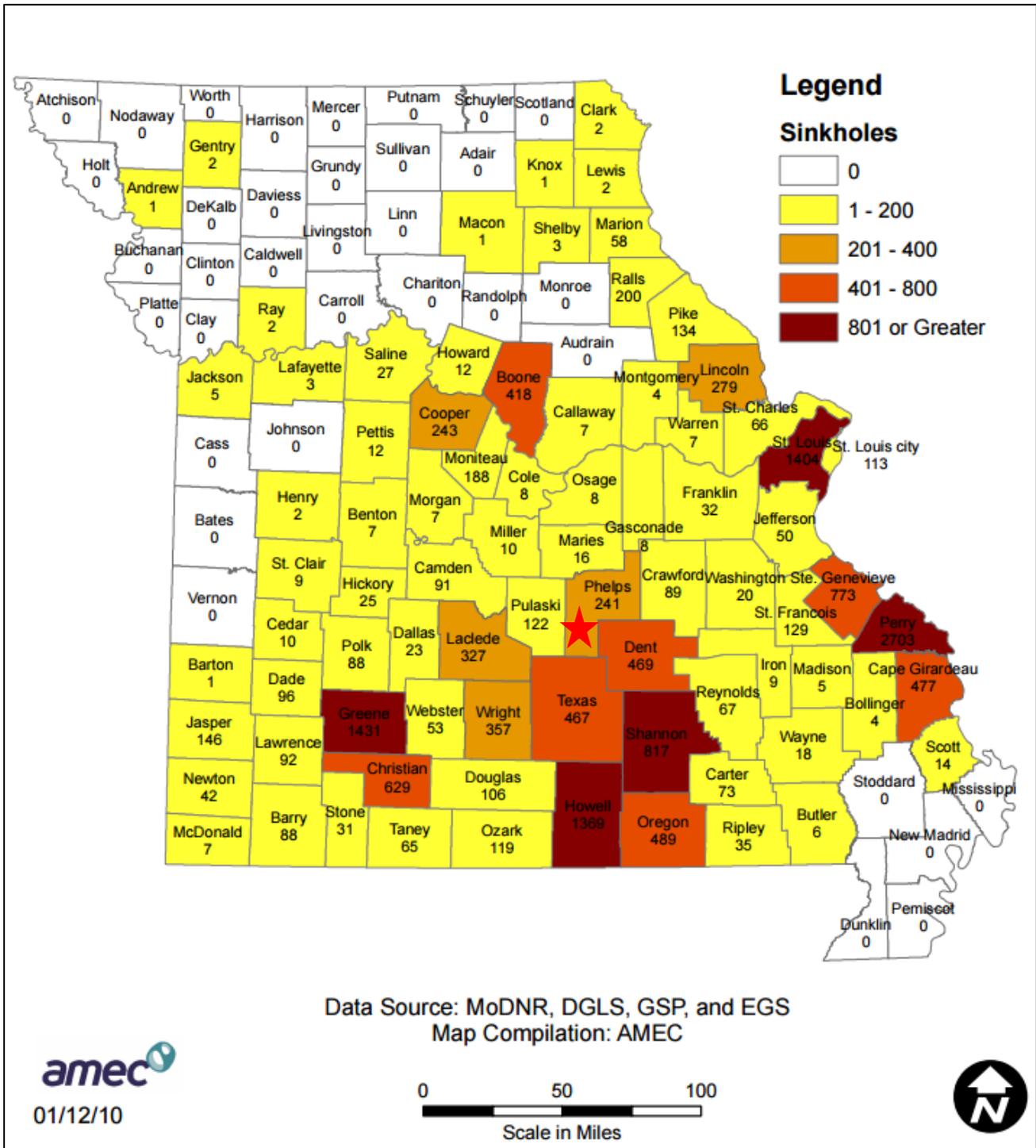
**Figure 3.55** depicts karst topography across the United States. Missouri's karst topography is comprised of carbonate rocks such as limestone, dolomite, and marble. Variability in areas prone to sinkholes does not differ greatly across the County. There are approximately 241 sinkholes that have been recorded within Phelps County (**Figure 3.56**).

**Figure 3.55. U.S. Karst Map**



Source: [http://www.northeastern.edu/protect/wp-content/uploads/US\\_KarstMap.jpg](http://www.northeastern.edu/protect/wp-content/uploads/US_KarstMap.jpg)

Figure 3.56. Sinkholes in Missouri



Source: [http://sema.dps.mo.gov/programs/mitigation\\_management.php](http://sema.dps.mo.gov/programs/mitigation_management.php)

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

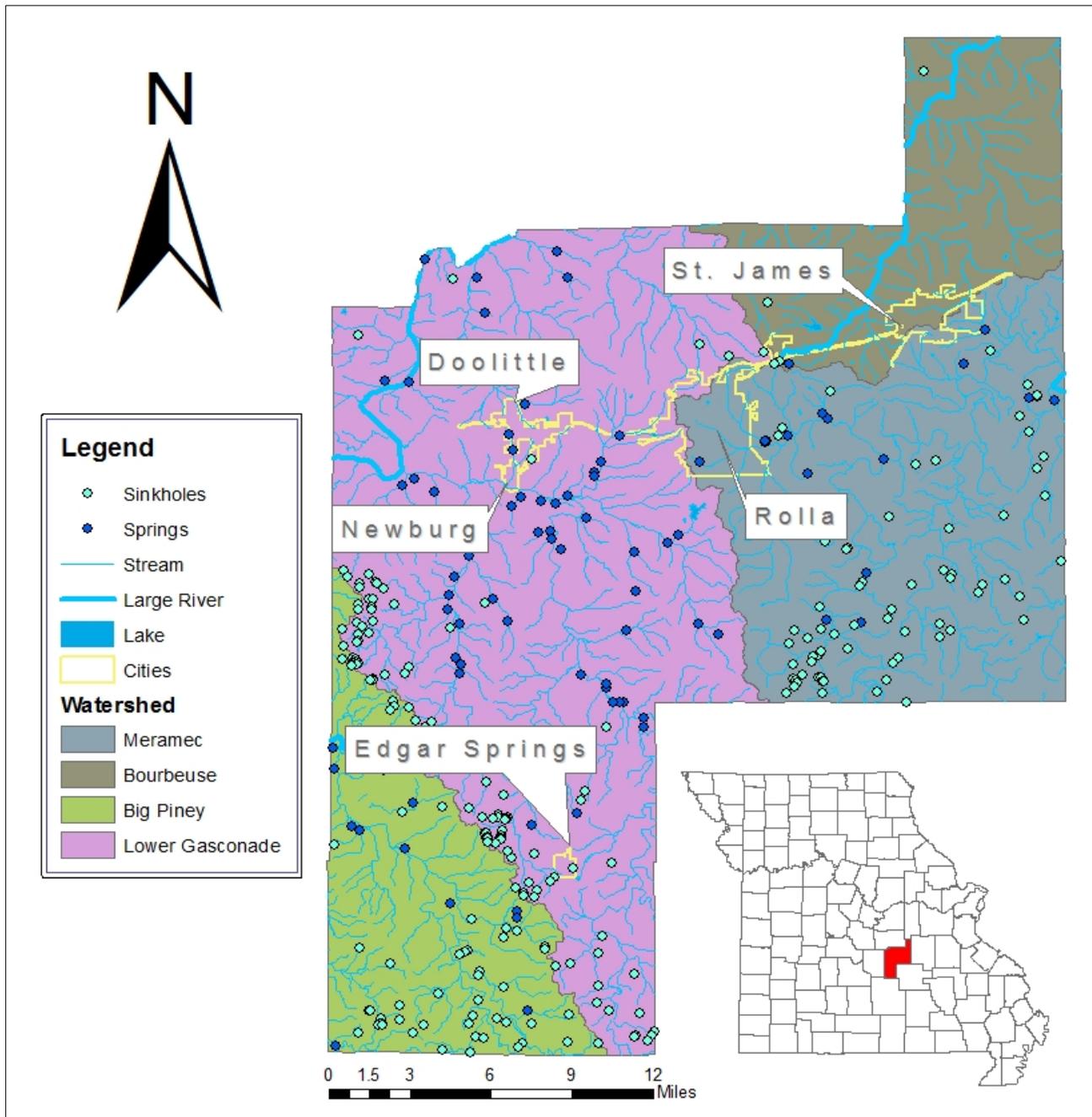
Sinkholes vary in size and location, and these variances will determine the impact of the hazard. A sinkhole could result in the loss of a personal vehicle, a building collapse, or damage to infrastructure such as roads, water, or sewer lines. Groundwater contamination is also possible from a sinkhole.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

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

### ***Previous Occurrences***

Although there are 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 (**Figure 3.57**), 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.

Figure 3.57. Phelps County Watershed/Water Resources



**Phelps County Hazard Mitigation Plan**

MRPC  
4 Industrial Drive  
St. James, MO  
65559

**Water Resources**

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 responsibility is assumed by the author or MRPC for the accuracy of the information displayed on this map. October 2015



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

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

## **Vulnerability**

### ***Vulnerability Overview***

Unfortunately, no statistics are available for the number of subsurface locations that may potentially collapse in the future, forming a sinkhole. However, areas have been identified that have the greatest vulnerability for future sinkholes including Cape Girardeau, Dent, Greene, Howell, Laclede, Oregon, Perry, Shannon, St. Louis, and Texas Counties<sup>40</sup>.

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

The most likely type of damage to occur in conjunction with a sinkhole collapse is property damage related to foundation disturbance. Signs include cracks in interior and exterior walls; doors and windows that no longer sit square or open and close properly; depressions forming in the yard; cracks in the street, sidewalk, foundation or driveway; and turbidity in local well water. All of these can be early indicators that a sinkhole is forming in the vicinity<sup>41</sup>. In the event of a sudden collapse, an open sinkhole can form in a matter of minutes and swallow lawn, automobiles and homes. This has occurred in some parts of Missouri, particularly in the southwest part of the state, but there have been no dramatic incidents like this in Phelps County

### ***Impact of Future Development***

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

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

**Figure 3.57** illustrates a significant number of sinkholes in Phelps County. The jurisdictions most likely to be impacted by sinkholes are Edgar Springs, Newburg, and Rolla. As evidenced by the map of sinkholes in Phelps County, there is at least one known sinkhole in the city limits of Edgar Springs and Newburg. The other jurisdictions, both cities and school districts, are located in areas of the county where the concentration of sinkholes is much lower.

---

<sup>40</sup> 2013 Missouri State Hazard Mitigation Plan

<sup>41</sup> <http://sinkhole.org/commonsigns.php>

## **Problem Statement**

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

## 3.4.8 Thunderstorm/High Winds/Lightning/Hail

---

Some Specific Sources for this hazard are:

- FEMA 320, Taking Shelter from the Storm, 3rd edition, [http://www.weather.gov/media/bis/FEMA\\_SafeRoom.pdf](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](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](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](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](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>;
- NCDC data;
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- National Severe Storms Laboratory – hail map, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bighail.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif)

### **Hazard Profile**

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

##### ***Thunderstorms***

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

##### ***High Winds***

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

## ***Lightning***

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

## ***Hail***

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

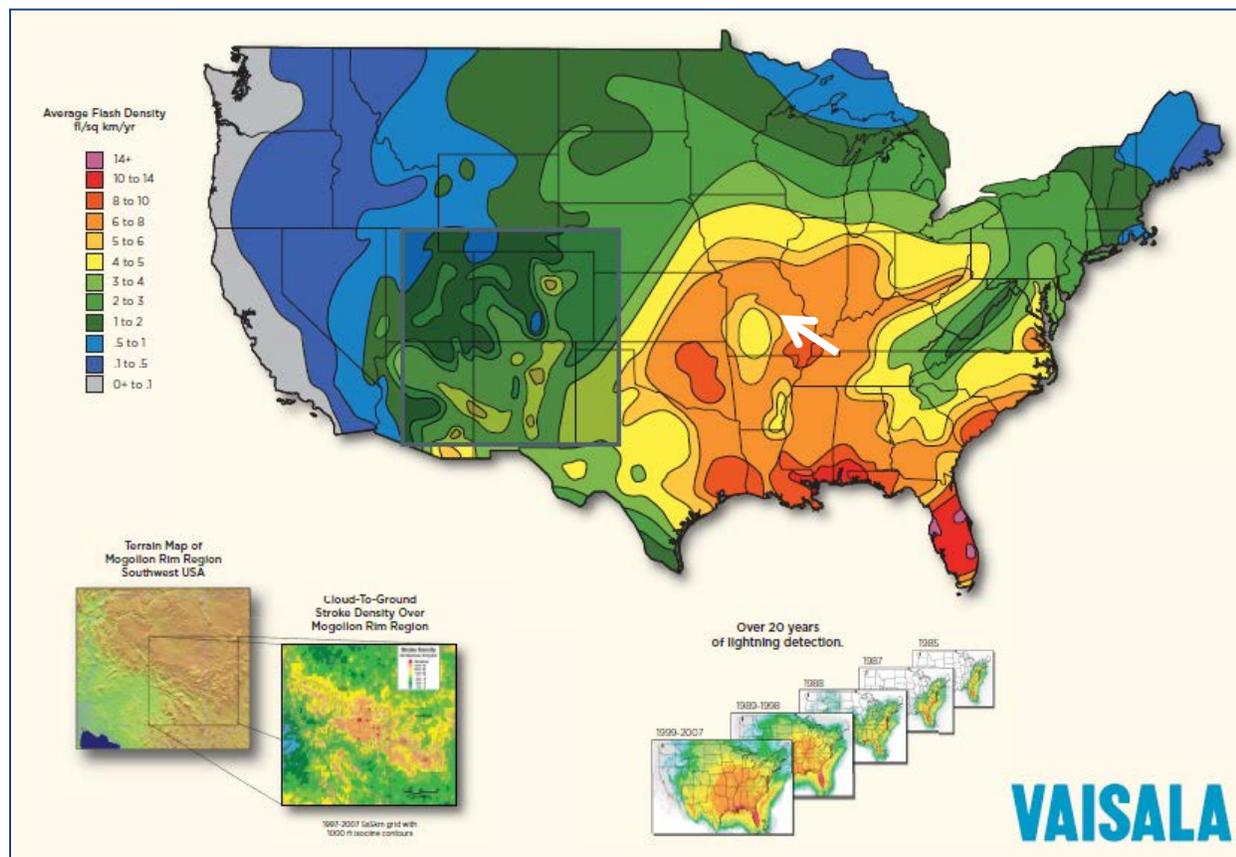
At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼” diameter or pea sized hail requires updrafts of 24 miles per hour, while a 2 ¾” diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest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

## ***Geographic Location***

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

**Figure 3.58** depicts the location and frequency of lightning in Missouri. Additionally, the map indicates that the flash density of Phelps County ranges between 6 and 8 flashes per square kilometer per year.

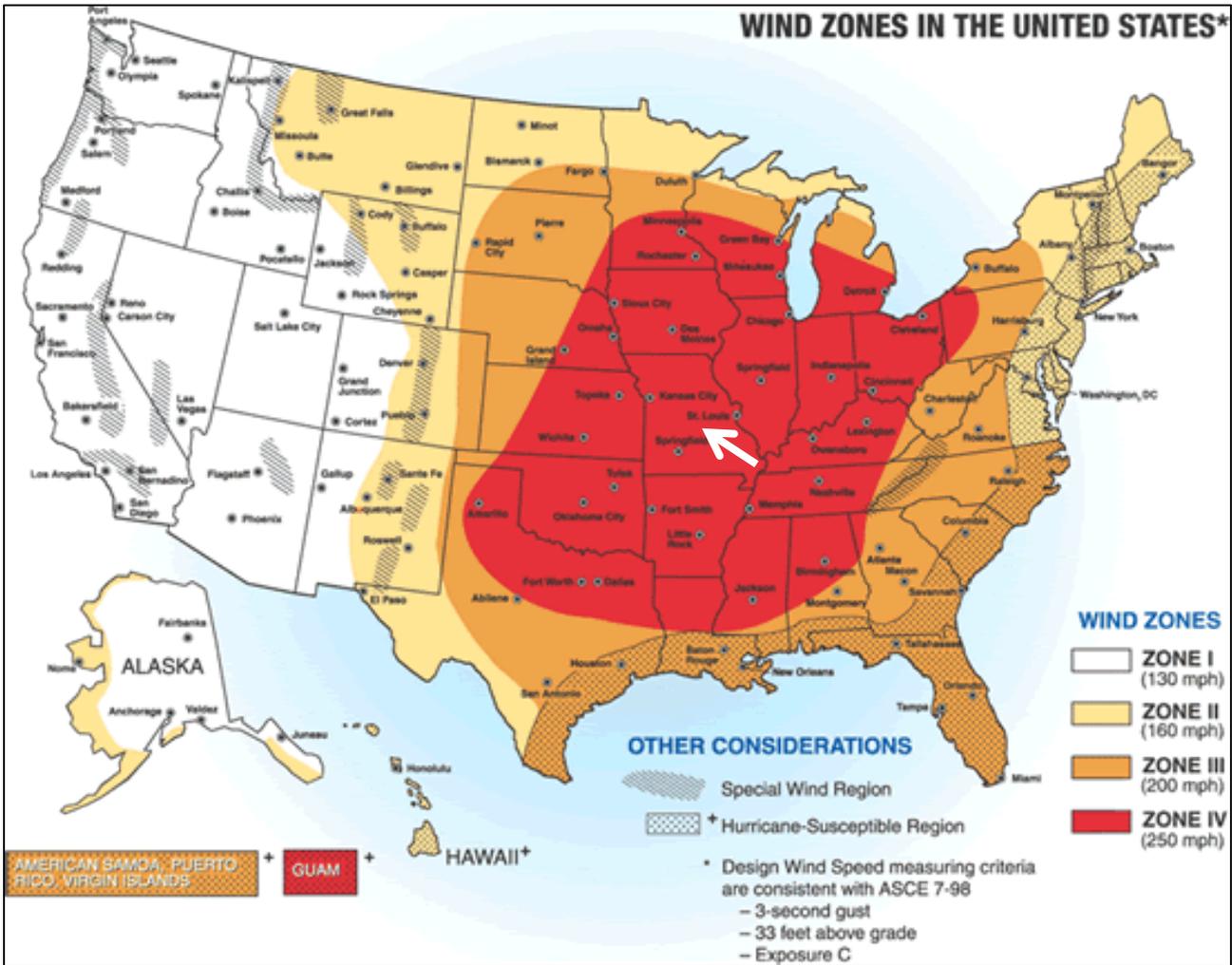
**Figure 3.58. Location and Frequency of Lightning in Missouri**



Source: National Weather Service, [http://www.lightningsafety.noaa.gov/stats/08\\_Vaisala\\_NLDN\\_Poster.pdf](http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf).  
Note: 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 3.59**).

**Figure 3.59. Wind Zones in the United States**



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

**Severity/Magnitude/Extent**

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

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

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

Based on information provided by the Tornado and Storm Research Organization (TORRO), **Table 3.58** below describes typical damage impacts of the various sizes of hail.

**Table 3.58. Tornado and Storm Research Organization Hailstorm Intensity Scale**

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

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

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

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

Between 1995 and 2014, there were 0 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.

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 3.59**. Moreover, thunderstorm wind was included with high winds. NCDC data was obtained for lightning, and hail events between 1995 and 2015 as well (**Table 3.60**, **Table 3.61**, and **Table 3.62**). However, limitations to the use of NCDC reported lightning events include the fact that only lightning events that result in fatality, injury and/or property and crop damage are in the NCDC.

**Table 3.59. NCDC Phelps County Heavy Rain Events Summary, 1995 to 2015**

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

Source: NCDC, data accessed [01/05/2016]

**Table 3.60. NCDC Phelps County High Wind Events Summary, 1995 to 2015**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
1995	5	0	0	\$1,100	52
1996	2	0	0	\$10,000	-
1998	2	0	0	\$23,000	-
1999	2	0	0	\$10,000	-
2000	3	0	0	\$11,000	-
2001	3	0	0	\$120,000	-
2002	3	0	0	\$25,000	52
2003	2	0	0	-	65
2004	3	0	0	-	60
2005	5	0	0	\$10,000	55
2006	4	0	0	-	60
2007	3	0	0	\$10,000	60
2008	7	0	0	\$90,000	65
2009	4	0	0	\$116,000	70
2010	2	0	0	-	52
2011	6	0	0	\$90,000	61
2012	4	0	0	-	52
2013	1	0	0	-	52
2014	2	0	0	\$11,000	55

Source: NCDC, data accessed [01/05/2016]

**Table 3.61. NCDC Phelps County Lightning Events Summary, 1995 to 2015**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damage
2001	1	0	0	\$150,000	0
2002	1	0	0	\$50,000	0
2010	1	0	0	\$5,000	0
2013	1	0	0	\$2,000	0

Source: NCDC, data accessed [01/05/2016]

**Table 3.62. NCDC Phelps County Hail Events Summary, 1995 to 2015**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
1995	2	0	0	\$7,400	1.75
1996	5	0	0	0	1.75
1997	1	0	0	0	1.75

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
1998	4	0	0	0	0.88
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
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

Source: NCDC, data accessed [01/05/2016]

### **Probability of Future Occurrence**

From the data obtained from the NCDC<sup>42</sup>, annual average percent probabilities were calculated for heavy rainfall, high winds, lightning, and hail. Heavy rainfall has a 35 percent annual average percent probability of occurrence (7 events/20 years x 100) (**Table 3.63**). Heavy rainfall events can be found in **Table 3.59**.

Since multiple high wind occurrences are anticipated each year (63 events/20 years), the probability of high winds is 100% with an average of 3.15 events per year (**Table 3.64**). High wind events can be found in **Table 3.60**.

In Phelps County, 4 lightning events (**Table 3.61**) in 20 years were recorded. The annual average percent probability is 20% (4 event/20 years x 100) (**Table 3.65**).

Lastly, the annual average percent probability of hail occurrence is 100% (71 events/20 years) with an average of 3.55 events per year (**Table 3.66**). Hail events can be found in **Table 3.62**.

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

Location	Annual Avg. % P
Phelps County	35%

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

<sup>42</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

---

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

Location	Annual Avg. % P	Avg. # of Events
Phelps County	100%	3.15

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

---

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

Location	Annual Avg. % P
Phelps County	20%

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

---

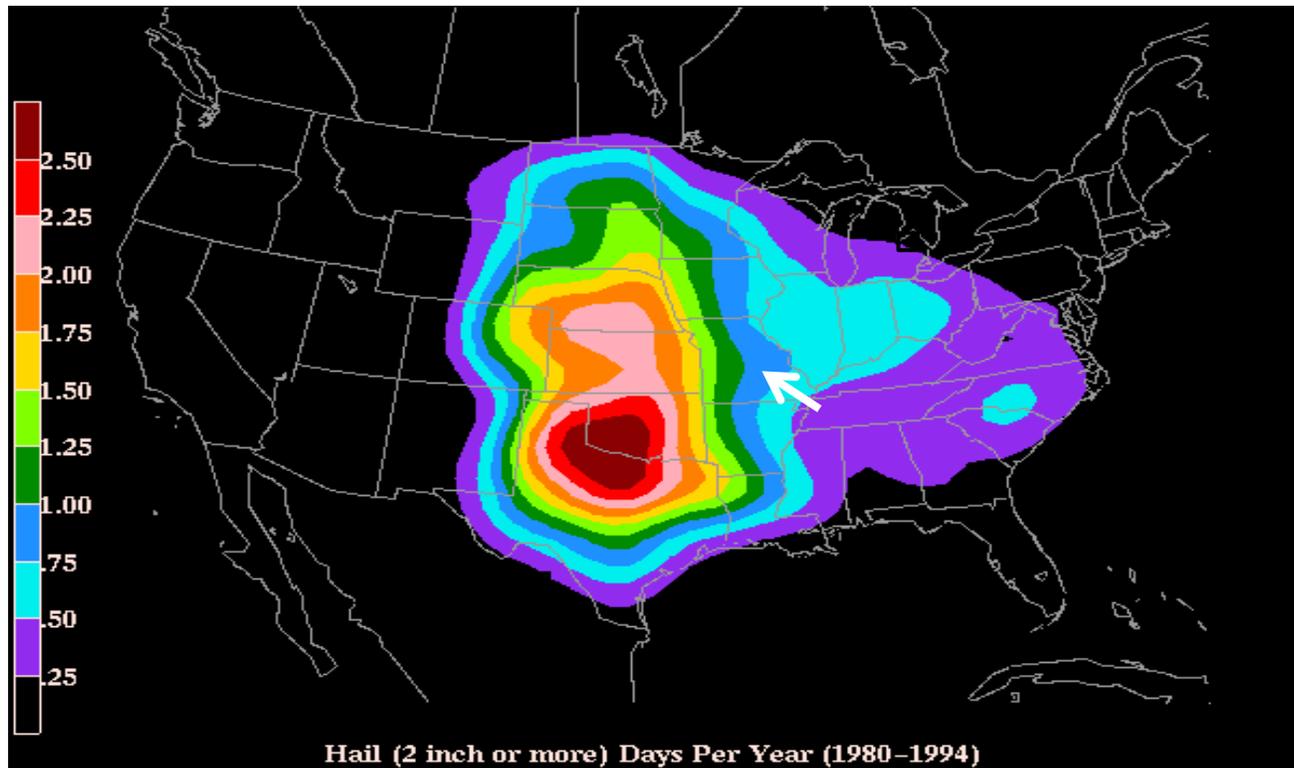
**Table 3.66. Annual Average % Probability of Hail in Phelps County**

Location	Annual Avg. % P	Avg. # of Events
Phelps County	100%	3.55

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

**Figure 3.60** 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 3.60. Annual Hailstorm Probability (2" diameter or larger), U 1980- 1994**



Source: NSSL, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bighail.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif)

Note: White arrow points to Phelps County

## **Vulnerability**

### ***Vulnerability Overview***

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for vulnerability overview and analysis. Since severe thunderstorms occur frequently throughout Missouri, specific parameters were analyzed for each hazard. These parameters include damaging winds in excess of 67 mph (58 kts.), hail in excess of 0.75 inches, and damaging lightning strikes. **Table 3.67** illustrates housing density, building exposure, and crop exposure for Phelps County. Moreover, **Table 3.68** provides additional statistical data for the vulnerability analysis.

**Table 3.67. Phelps County Housing Density, Building Exposure and Crop Exposure**

<b>County</b>	<b>Housing Units/sq. mi.</b>	<b>Total Building Exposure (\$)</b>	<b>Crop Exposure (2007 Census of Ag.)</b>	<b>Social Vulnerability Index</b>
Phelps	26.7	\$4,283,040,000	\$1,510,000	1

Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.68. Additional Statistical Data Compiled for Vulnerability Analysis**

County	Total Hail Incidences	Total hail Property Loss (\$)	Total Crop Insurance Paid for Hail Damage (\$)	Total Wind Incidence (\$)	Total Wind Property Loss (\$)	Total Crop Insurance Paid for wind Damage (\$)	Total Lightning Incidences	Total Lightning Property Loss (\$)
Phelps	133	\$12,400	\$0	77	\$1,116,100	\$0	3	\$205,000

Source: 2013 Missouri State Hazard Mitigation Plan

Five factors were utilized in the overall vulnerability analysis of lightning. These factors include housing density, likelihood of occurrence, building exposure, average annual property loss ratio, and social vulnerability. For hail and wind, crop exposure and average annual crop insurance claims were also utilized. To better analyze the vulnerability analysis of severe thunderstorms, rating values were established; low, medium-low, medium, medium-high, and high (**Table 3.69**).

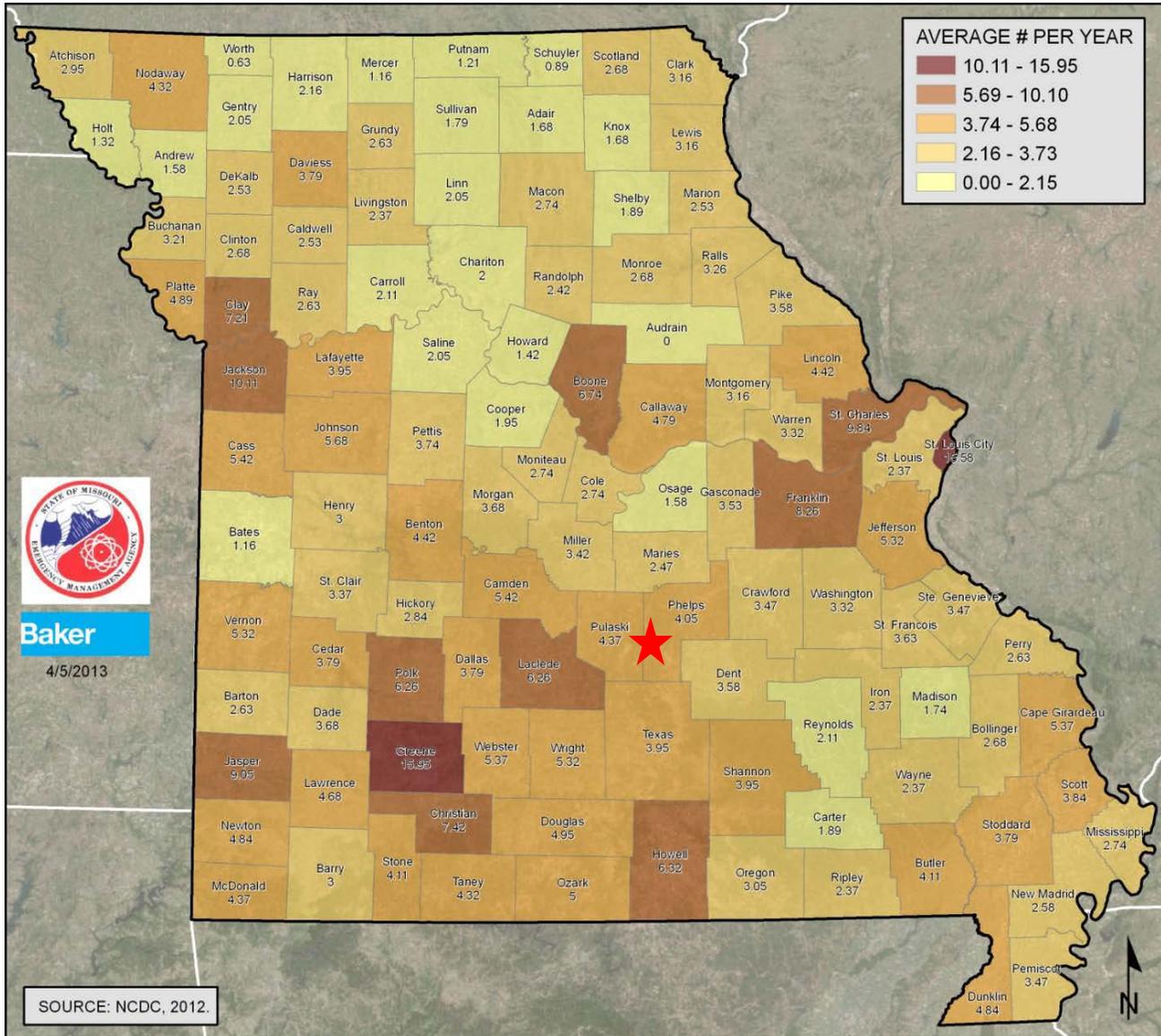
**Table 3.69. Ranges for Severe Thunderstorm Vulnerability Factor Ratings**

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

Source: 2013 Missouri State Hazard Mitigation Plan

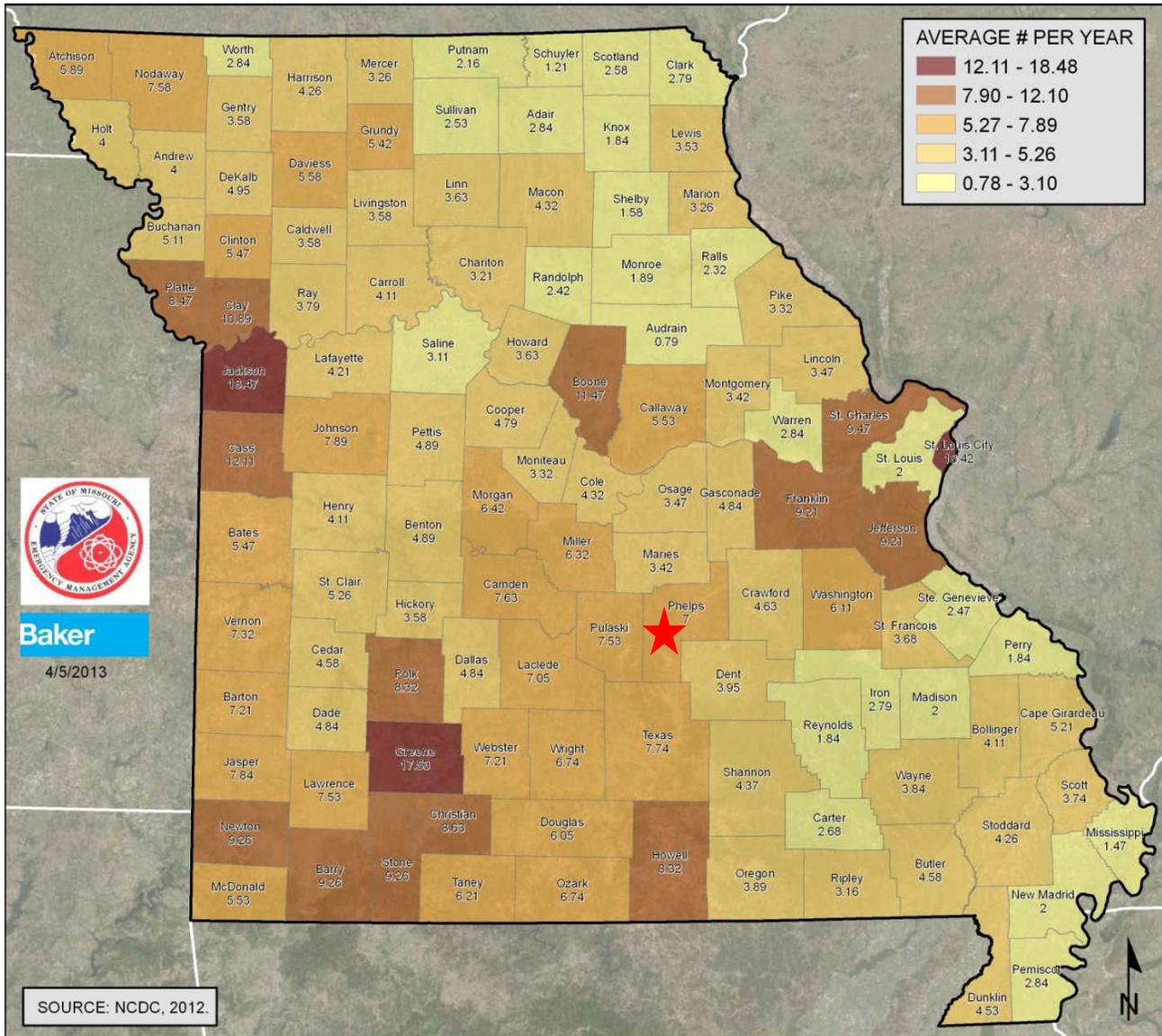
Figure 3.61 through Figure 3.63 depicts the likelihood of occurrence of high winds, hail, and lightning events in Missouri.

**Figure 3.61. Likelihood of Occurrence of High Wind Events (67 MPH and higher)**



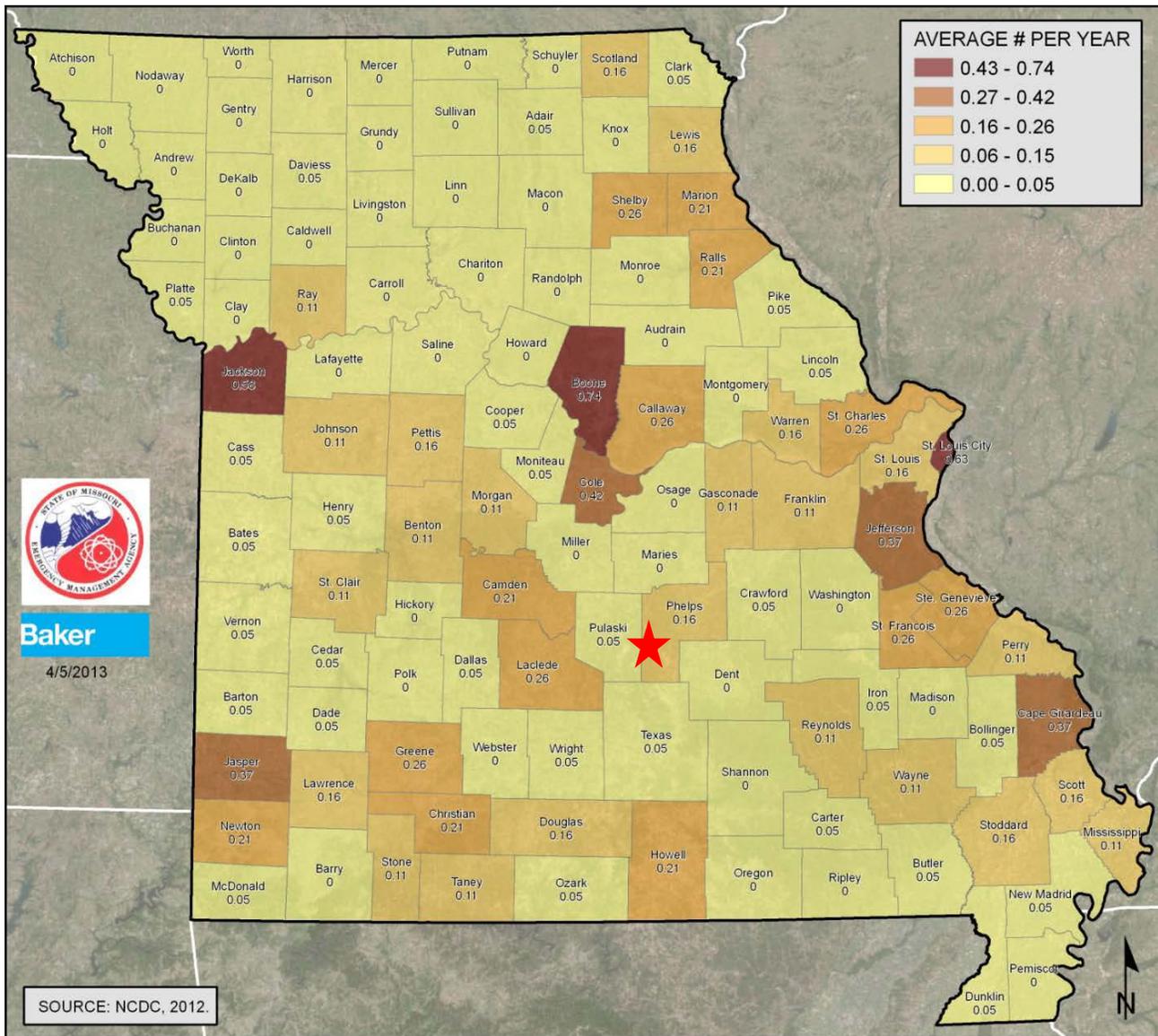
Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.62. Likelihood of Occurrence of Damaging Hail Events (.75 inches and larger)**



Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.63. Likelihood of Occurrence of Damaging Lightning Events**



Source: 2013 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 following data provides the calculated ranges applied to determine overall vulnerability of Missouri counties to severe thunderstorms (Table 3.70). Table 3.71 provides the calculated vulnerability rating for the severe thunderstorm hazard. Figure 3.64 that follows provides the mapped results of this analysis by county<sup>43</sup>.

<sup>43</sup> 2013 Missouri State Hazard Mitigation Plan

**Table 3.70. Ranges for Severe Thunderstorm Combined Vulnerability Rating**

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

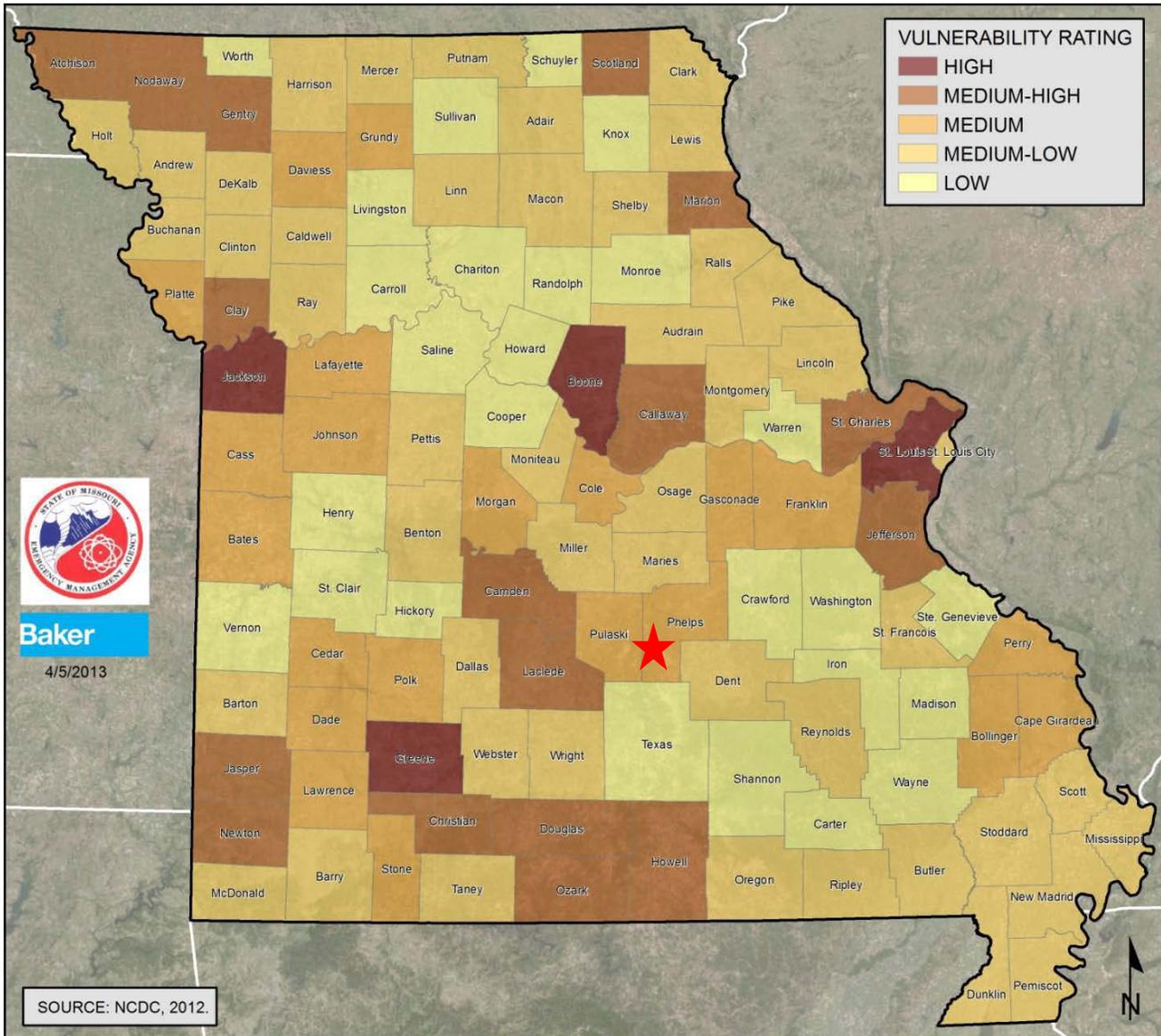
Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.71. Severe Thunderstorm Combined Vulnerability Rating**

County	Housing Density Rating	Wind Likelihood Rating	Annualized Wind Property Loss	Annualized Wind Crop Loss	Hail Likelihood Rating	Annualized Hail Property Loss	Annualized Hail Crop Loss	Lightning Likelihood Rating	Annualized Lightning Property Loss	Total Thunderstorm Vulnerability	Combined Vulnerability
Phelps	1	3	1	1	3	1	1	2	2	15	Medium

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.64. Vulnerability Summary for Severe Thunderstorms**



Source: 2013 Missouri State Hazard Mitigation Plan

**Potential Losses to Existing Development**

According to the NCDC Phelps County experienced approximately \$741,500 in property damages from severe thunderstorms between 1995 and 2015. 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<sup>44</sup>.

<sup>44</sup> 2015 Boone County Hazard Mitigation Plan

### ***Future Development***

As previously mentioned, the population within Phelps County is expected to increase by approximately 2,544 within the next 5 to 15 years. However, it is difficult to determine future impacts. However, anticipated development in each jurisdiction will result in increased exposure (**Page 23**). Likewise, increased development of residential structures will increase jurisdiction's vulnerability to damages from severe thunderstorms/ high winds/lightning/hail.

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

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

### **Problem Statement**

Early warnings are possibly the best hope for residents when severe weather strikes. Cities that do not already possess warning systems should plan to purchase a system. Additional public awareness also includes coverage by local media sources. Storm shelters are another important means of mitigating the effects of severe thunderstorms. A community-wide shelter program should be adopted for residents who may not have adequate shelter in their homes. Residents should also be encouraged to build their own storm shelters to prepare for emergencies. Local governments should encourage residents to purchase weather radios to ensure that everyone has sufficient access to information in times of severe weather.

## 3.4.9 Tornado

---

Some specific sources for this hazard are:

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

### **HazardProfile**

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

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

High winds not associated with tornadoes are profiled separately in this document in **Section 3.4.8, Thunderstorm/High Wind/Hail/Lightning.**

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

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

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

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

**Geographic Location**

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

**Severity/Magnitude/Extent**

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

Tornado magnitude is classified according to the EF- Scale (or the Enhanced Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (**Table 3.72**) 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 3.72. 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](http://www.spc.noaa.gov/faq/tornado/ef-scale.html)

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.73**. 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 3.73. Enhanced Fujita Scale with Potential Damage**

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

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

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

### ***Previous Occurrences***

**Table 3.74** illustrates NCDC data reported for tornado events and damages since 1993 in the planning area. Prior to that date, only highly destructive tornadoes were recorded.

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

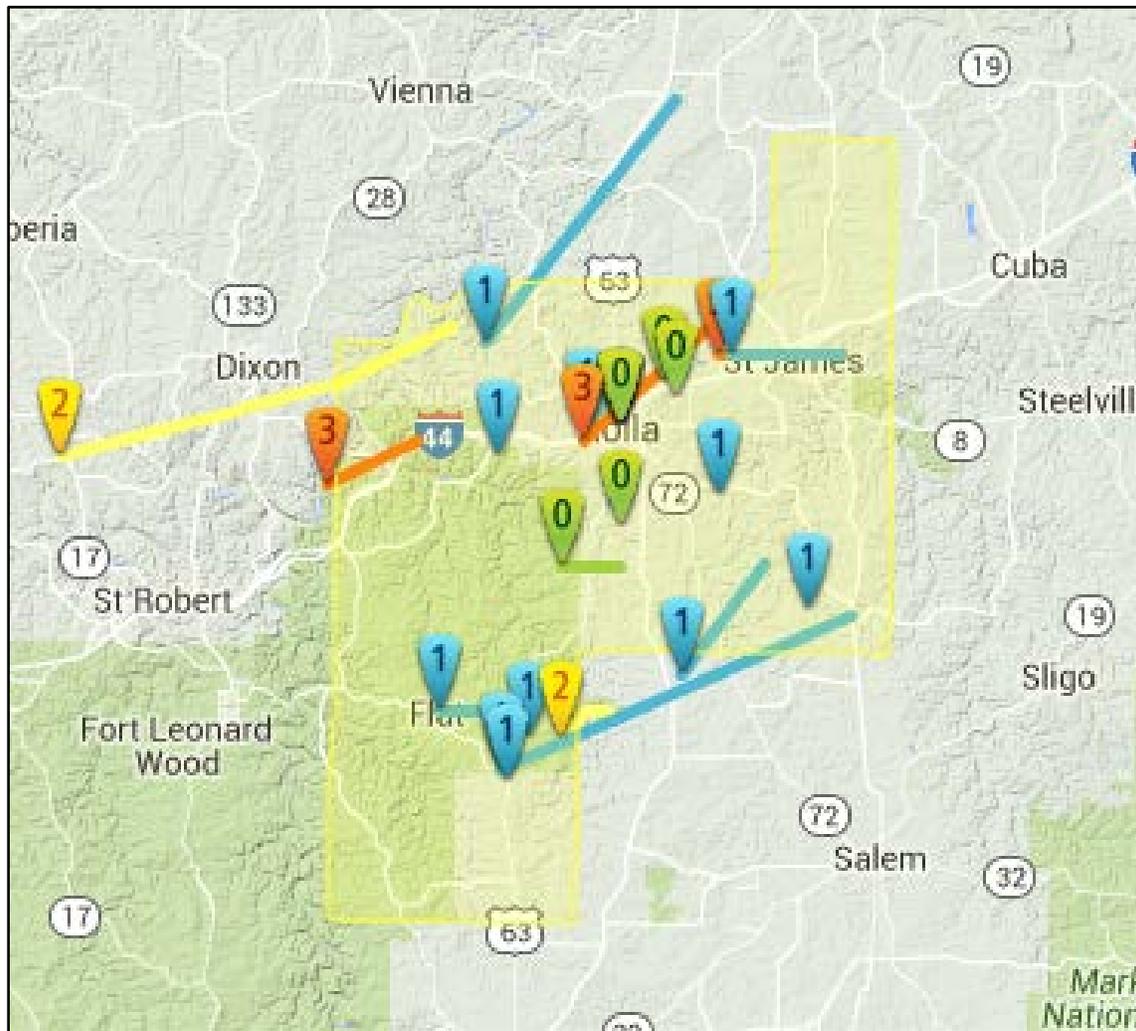
**Table 3.74. Recorded Tornadoes in Phelps County, 1993 – Present**

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	\$3,500,000	-
06/01/1999	37.75/91.85	5E Flat	5	400	F1	0	0	\$100,000	-
06/01/1999	4NE Edgar SPGS	5NE Edgar SPGS	1	250	F2	0	0	\$175,000	-
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	\$1,500,000	-
08/24/2007	OSE Dillion	0SE Dillion	1	75	EF0	0	0	\$10,000	0
01/07/2008	2NNW Powellville	2N Bundy Jct	4.67	400	EF3	0	0	\$110,000	0
01/07/2008	4N Doolittle	7SW Rolla Vichy ARPT	3.77	100	EF1	0	0	\$5,000	0
12/31/2010	2ENE Rolla Downtown ARPT	3WNW Flag SPGS	11	500	EF3	2	0	\$1,000,000	0
12/31/2010	5W Seaton	2WSW Austria	5.55	440	EF1	0	0	\$50,000	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
-	Total	-	59.39	3,040	-	2	2	\$6,450,000	0

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

**Figure 3.65** depicts historic tornado paths across Phelps County.

**Figure 3.65. Phelps County Map of Historic Tornado Paths**



Source: Missouri Tornado History Project, <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 1995 and 2015.

***Probability of Future Occurrence***

From the data obtained from the NCDC<sup>45</sup>, an annual average percent probability was calculated for tornadoes within Phelps County (**Table 3.75**). There is a 40.90 percent annual average probability of a tornado occurrence (9 events/22 years x 100). Tornado events can be found in **Table 3.74**. In addition, **Figure 3.66**, obtained from the 2013 Missouri State Hazard Mitigation Plan, also illustrates tornado probabilities across the State.

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



## Vulnerability

### *Vulnerability Overview*

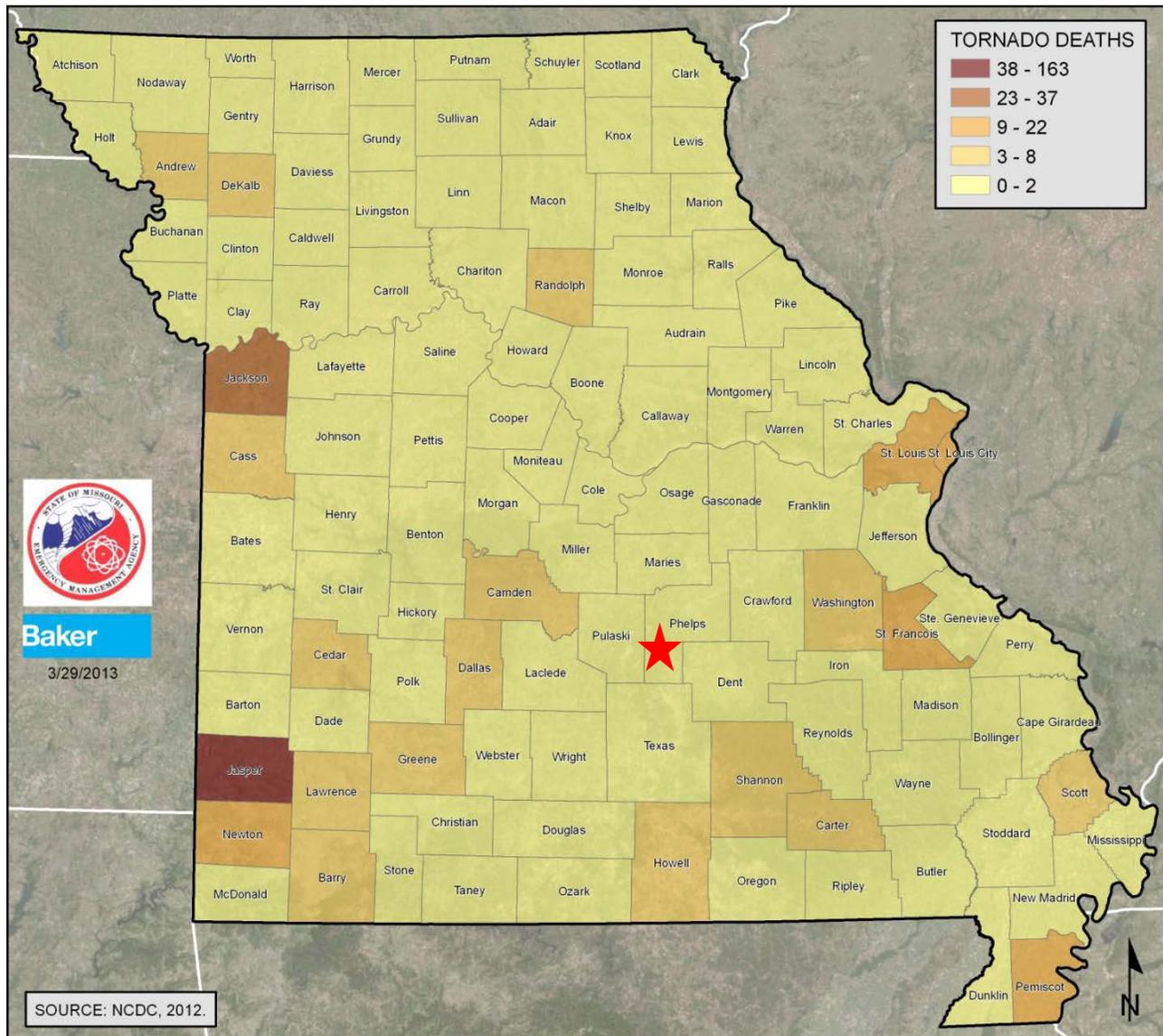
Phelps County resides in a region of the United States that has a high frequency of dangerous and destructive tornadoes. This region seen in **Figure 3.67** is referred to as “Tornado Alley”. Furthermore, **Figure 3.68** illustrates areas where perilous tornadoes historically have occurred in Missouri.

Figure 3.67. Tornado Alley in the U.S.



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

**Figure 3.68. Missouri Tornado Deaths by county, 1950 – March 17, 2012**



Source: 2013 Missouri State Hazard Mitigation Plan

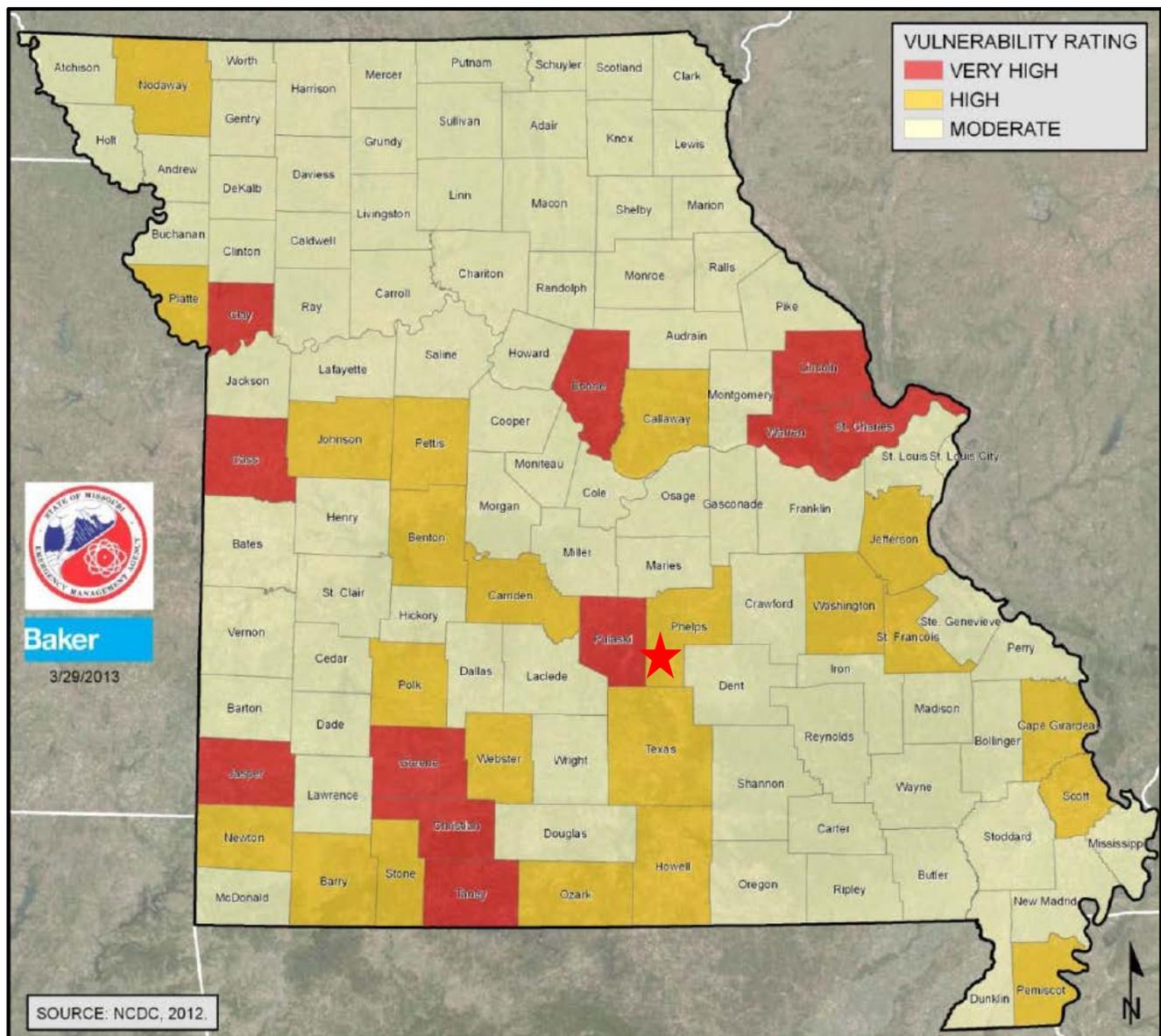
Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for tornado vulnerability. The analysis depicts the likelihood of future tornado impacts, average annual property loss ratio, population change, and house change. Factors were ranked from 1 to 3; moderate, high, and very high, respectively. The factor scores are totaled to estimate Phelps County's vulnerability to tornadoes (**Table 3.76**). Since tornadoes are probable to occur across the state, the lowest risk factor is still considered moderate. **Figure 3.69** depicts the vulnerability summary for tornadoes across Missouri by County.

**Table 3.76. Factors and Ranges Considered in Tornado Vulnerability Analysis**

Factors Considered	Moderate (1)	High (2)	Very High (3)
Likelihood of Occurrence (# of events/ yrs. Of data)	6 - 24	25 - 49	50 - 68
Loss Ratio %	0 - .113	0.114 - .226	0.227 - 0.340
Population % Change	Below 6	7 - 22	23 - 39
Housing % Change	Below 12	13 - 25	26 - 39
Overall Vulnerability Rating	4 and 5 Rating	6 and 7 Rating	3 and 9 Rating

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.69. Vulnerability Summary for Tornadoes**



Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.77** provides information in regards to tornado probability, potential loss, and risk summary for Phelps County. This table was calculated to determine 10 counties with the largest annualized historic tornado losses between 1950 and July 31, 2012 (**Table 3.78** and **Figure 3.70**). Phelps County is one of the top counties with annualized historic losses; however, is not one of the top 13 counties with the greatest likelihood of being impacted by a tornado<sup>46</sup>.

**Table 3.77. Tornado Probability, Potential Loss, and Risk Summary**

County	# of Tornadoes	Likelihood of Occurrence	Probability Rating	Total Exposure (\$)	Annualized Historic Loss	Loss Ratio	Loss Ratio Rating	Population Growth % Change	Pop. Change Rating	House % Change	Housing Ratio Rating	Total Vulnerability
Phelps	16	26.02%	2	\$3,755,326,000	\$1,876,552	0.05%	1	27.00%	3	19.14%	2	High

Source: 2013 Missouri State Hazard Mitigation Plan

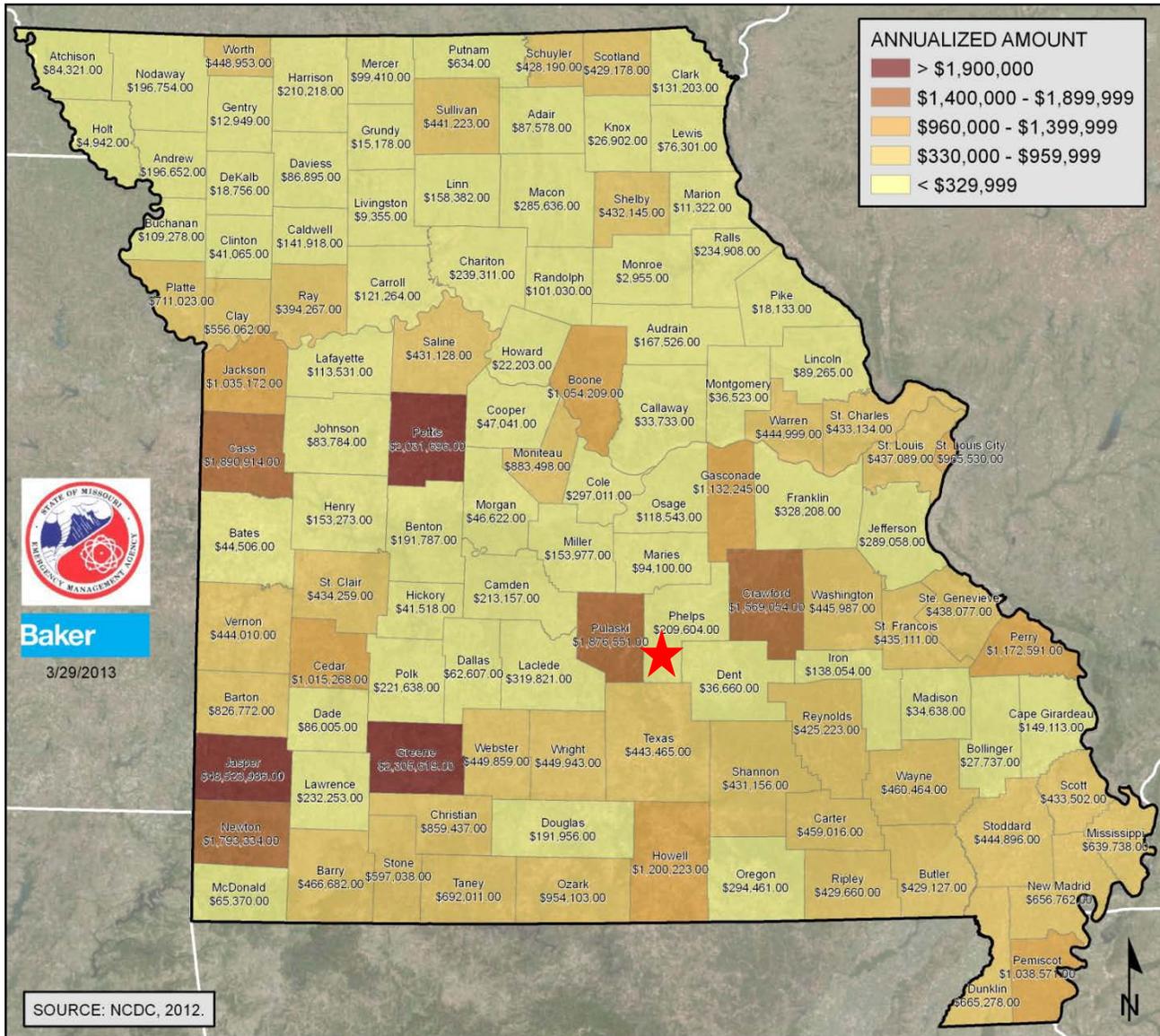
**Table 3.78. Top 10 Counties Ranked by Annualized Historic Tornado Loss 1950 – July 2012**

County	Annualized Historic Loss 1950 - July 31, 2012
Jasper	\$48,523,987
Greene	\$2,305,620
Pettis	\$2,031,696
Cass	\$1,890,914
Phelps	\$1,876,552
Newton	\$1,793,334
Crawford	\$1,569,054
Perry	\$1,172,592
Howell	\$1,200,223
Gasconade	\$1,132,245

Source: 2013 Missouri State Hazard Mitigation Plan

<sup>46</sup> 2013 Missouri State Hazard Mitigation Plan

**Figure 3.70. Annualized Tornado Damages**



Source: 2013 Missouri State Hazard Mitigation Plan

**Potential Losses to Existing Development**

The average annual loss for Phelps County due to tornadoes is \$155,133.33 (previous 60 years<sup>47</sup>). With this information we can estimate that each year there will be approximately \$155,133.33 in loss to existing development. Additionally, the largest recorded tornado in the planning area has been an EF-3. Utilizing this information we can infer that there is potential for another tornado of equivalence.

**Future Development**

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

<sup>47</sup> 2013 Missouri State Hazard Mitigation Plan

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 3.34** for jurisdictions most vulnerable to damage due to the age of the structure. Furthermore, data was obtained from the U.S. Census Bureau for the number of mobile homes in Phelps County. From the information provided in **Table 3.79**, Doolittle and Edgar Springs are most vulnerable to losses due to the number of mobile homes residing within the jurisdiction.

**Table 3.1. Percentage of Mobile Homes in Phelps County, 2014**

Jurisdiction	Number of Mobile Homes	Percentage of Mobile Homes*
Unincorporated Phelps County	1,778	9.0%
Doolittle	46	18.4%
Edgar Springs	19	18.6%
Newburg	43	12.0%
Rolla	283	3.4%
St. James	51	3.1%
Incorporated Phelps County	2,220	11.3%

Source: U.S. Census Bureau, 2010-2014 5-Year American Community Survey

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

\*\*Total housing units for all jurisdictions = 19,662

**Problem Statement**

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

### 3.4.10 Winter Weather/Snow/Ice/Severe Cold

---

Some specific sources for this hazard are:

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

#### **Hazard Profile**

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

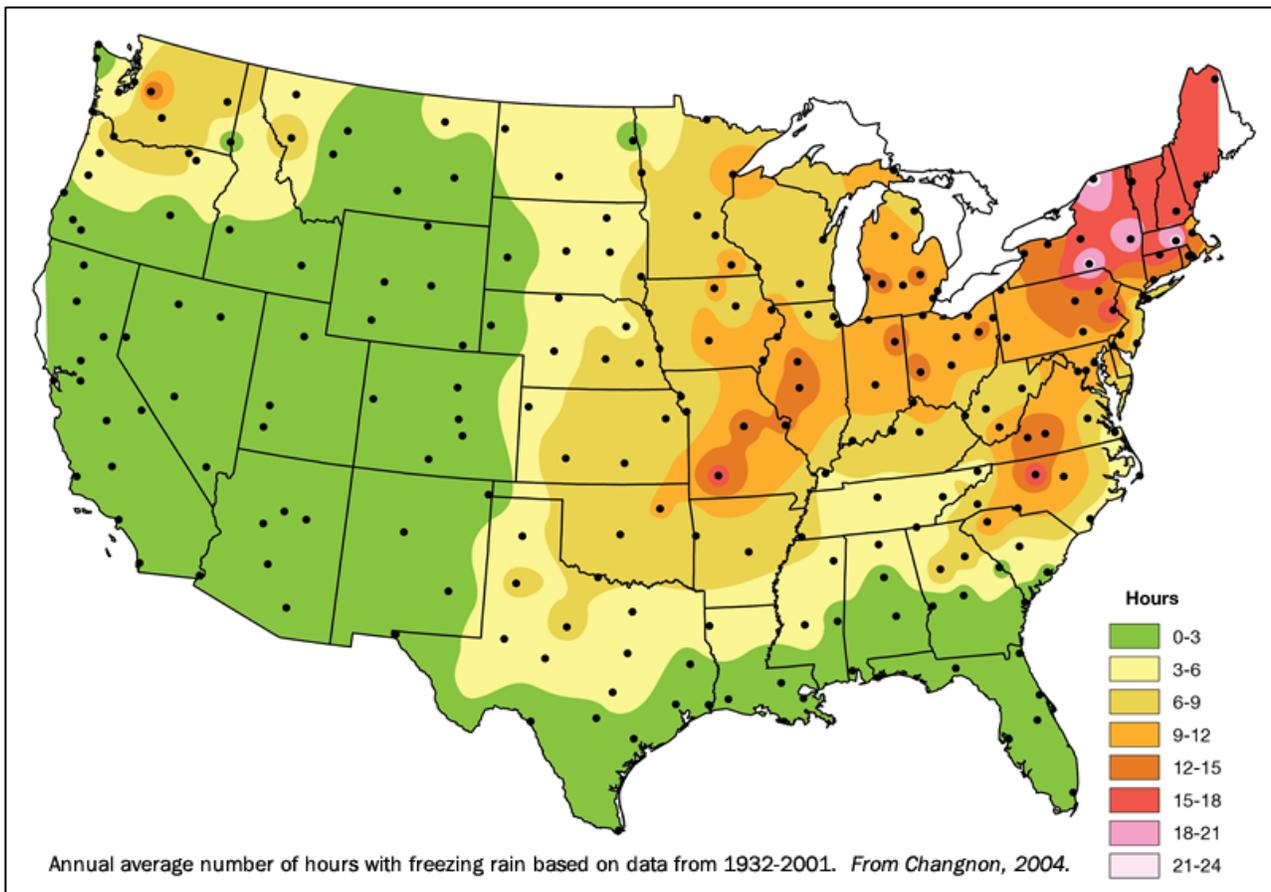
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows.

- **Blizzard**—Winds of 35 miles per hour or more with snow and blowing snow reducing visibility to less than ¼ mile for at least three hours.
- **Blowing Snow**—Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls**—Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- **Snow Showers**—Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- **Freezing Rain**—Measurable rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces, such as trees, cars, and roads, forming a coating or glaze of ice. Most freezing-rain events are short lived and occur near sunrise between the months of December and March.
- **Sleet**—Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects.

##### ***Geographic Location***

Severe winter weather typically strikes Missouri more than once every year. 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 3.71** illustrates statewide average number of hours per year with freezing rain. Phelps County receives approximately 9 to 12 hours.

**Figure 3.71. NWS Statewide Average Number of Hours per Year with Freezing Rain**



Source: Chagnon, 2004, [http://mrcc.isws.illinois.edu/living\\_wx/icestorms/](http://mrcc.isws.illinois.edu/living_wx/icestorms/)

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

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

Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower a building's heating system and cause water and sewer pipes to freeze and rupture. Extreme cold also increases the likelihood for ice jams on flat rivers or streams. When combined with high winds from winter storms, extreme cold becomes extreme wind chill, which is hazardous to health and safety.

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

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

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

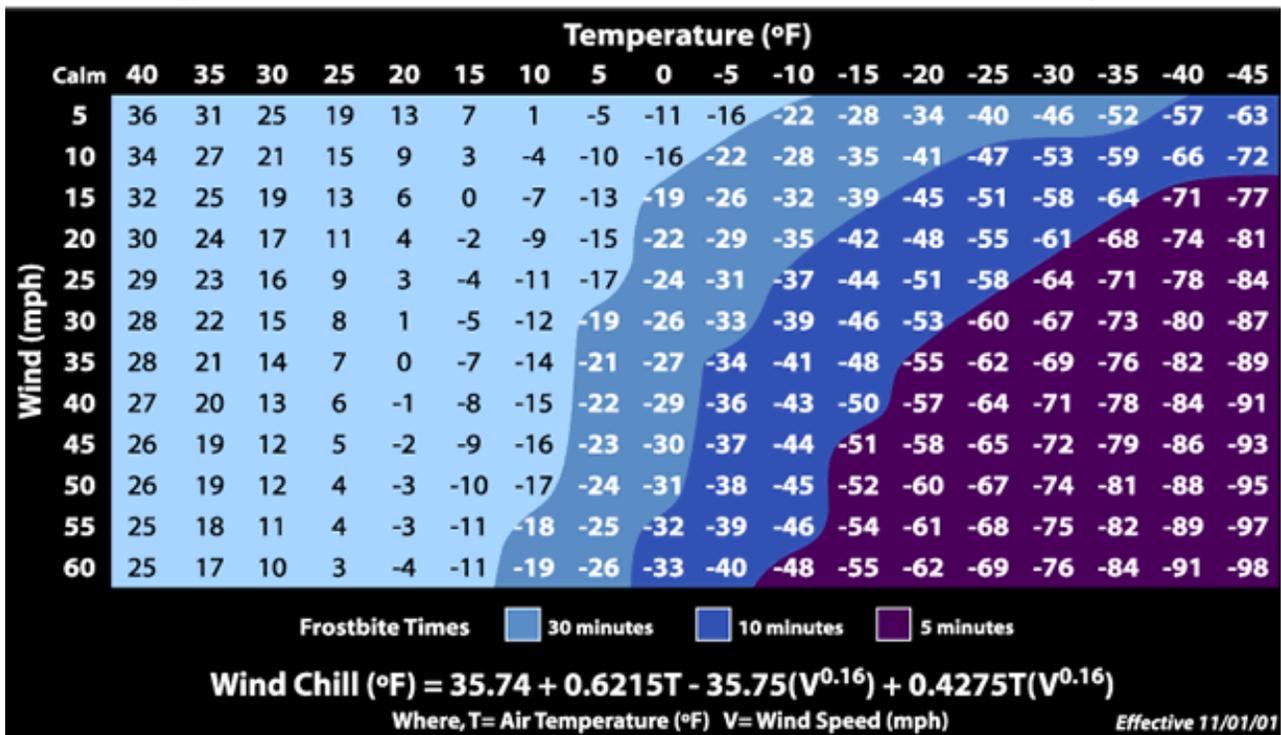
Overhead power lines and infrastructure are also vulnerable to damages from winter storms. In particular, ice accumulation during winter storms can damage power lines and equipment. Damages also occur to lines and equipment from falling trees and tree limbs weighted down by ice. Potential losses could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

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

Wind can greatly amplify the impact of cold ambient air temperatures. Provided by the National Weather Service, **Figure 3.72** below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Winter storms, cold, frost, and freeze all can influence or negatively impact crop production. However, data obtained from the USDA's Risk Management Agency for insured crop losses indicates that there were no claims paid in Phelps County between 1995 and 2014 for severe winter weather.

Figure 3.72. Wind Chill Chart



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

**Previous Occurrences**

Data was obtained from the NCDC for winter weather reported events and damages since 2004 (Table 3.80). 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 3.80. NCDC County A Winter Weather Events Summary, 2004 - Present

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Ice Storm	01/25/2004	0	0	0
Winter Storm	02/05/2004	0	0	0
Winter Storm	11/30/2006	0	300,000	0
Ice Storm	01/12/2007	0	5,000	0
Winter Storm	01/20/2007	0	0	0
Ice Storm	12/10/2007	0	10,000	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

Source: NCDC, data accessed [insert date]

## Narratives:

1. **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.
2. **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 advected 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.
3. **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.
4. **01/12/2007:** Significant tree and power line damage occurred from ice accumulations of one and a half inches.
5. **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.
6. **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.
7. **02/11/2008:** Sleet accumulations of one to two inches with minor accumulations of freezing rain were observed.
8. **02/21/2008:** Sleet accumulations of one half to one and a half inches were observed.

9. **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.
10. **02/28/2009:** Heavy snow with accumulations of four to seven inches.
11. **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.
12. **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.
13. **01/05/2014:** Heavy snow with accumulations of 8 to 12 inches.
14. **03/02/2014:** Sleet accumulations around 1/2 inch with snow accumulations of 1 to 3 inches.
15. **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.
16. **02/28/2015:** Winter storm brought significant snowfall with total snow accumulations of 4 to 6 inches.

**Probability of Future Occurrence**

From the data obtained from the NCDC<sup>48</sup>, annual average percent probabilities were calculated for winter weather within Phelps County (**Table 3.81**). There were 16 recorded events (**Table 3.80**) over an 11 year period. There is 100 percent annual average probability of winter weather occurrence (16 events/11 years x 100), with an average of 1.45 events per year.

**Table 3.81. Annual Average % Probability of Winter Weather in Phelps County**

Location	Annual Avg. % P	Avg. # of Events
<b>Phelps County</b>	100%	1.45

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

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

## Vulnerability

### *Vulnerability Overview*

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for vulnerability information regarding Phelps County. Various data sources were utilized for statistical analysis including the following:

- National Climatic Data Center (NCDC)
- FEMA's Public Assistance Funds
- Crop Insurance Claims data from the USDA's Risk Management Agency
- HAZUS-MR4
- U.S. Census Data
- USDA's Census of Agriculture

The following Table (**Table 3.82**) includes data elements for severe winter weather.

**Table 3.82. Phelps County Housing Density, Building Exposure, Crop Exposure, Social Vulnerability Index, Total incidents, Total Property Loss, and Total Crop Insurance Paid Data**

County	Housing Units/sq. mi.	Total Building Exposure (\$)	Crop Exposure (2007) (\$)**	Total Incidences	Total \$ Property Los (\$)	Total Crop Insurance Paid (\$)
Phelps	26.7	\$4,283,040,000	\$1,510,000	25	\$8,050,793	\$23,993

Seven factors were utilized to determine overall severe winter storm vulnerability. These factors include housing density, likelihood of occurrence, building exposure, crop exposure, average annual property loss ratio, average annual crop insurance claims and social vulnerability. Furthermore, 5 rating values were developed for each factor. **Table 3.83** illustrates vulnerability analysis rating factors.

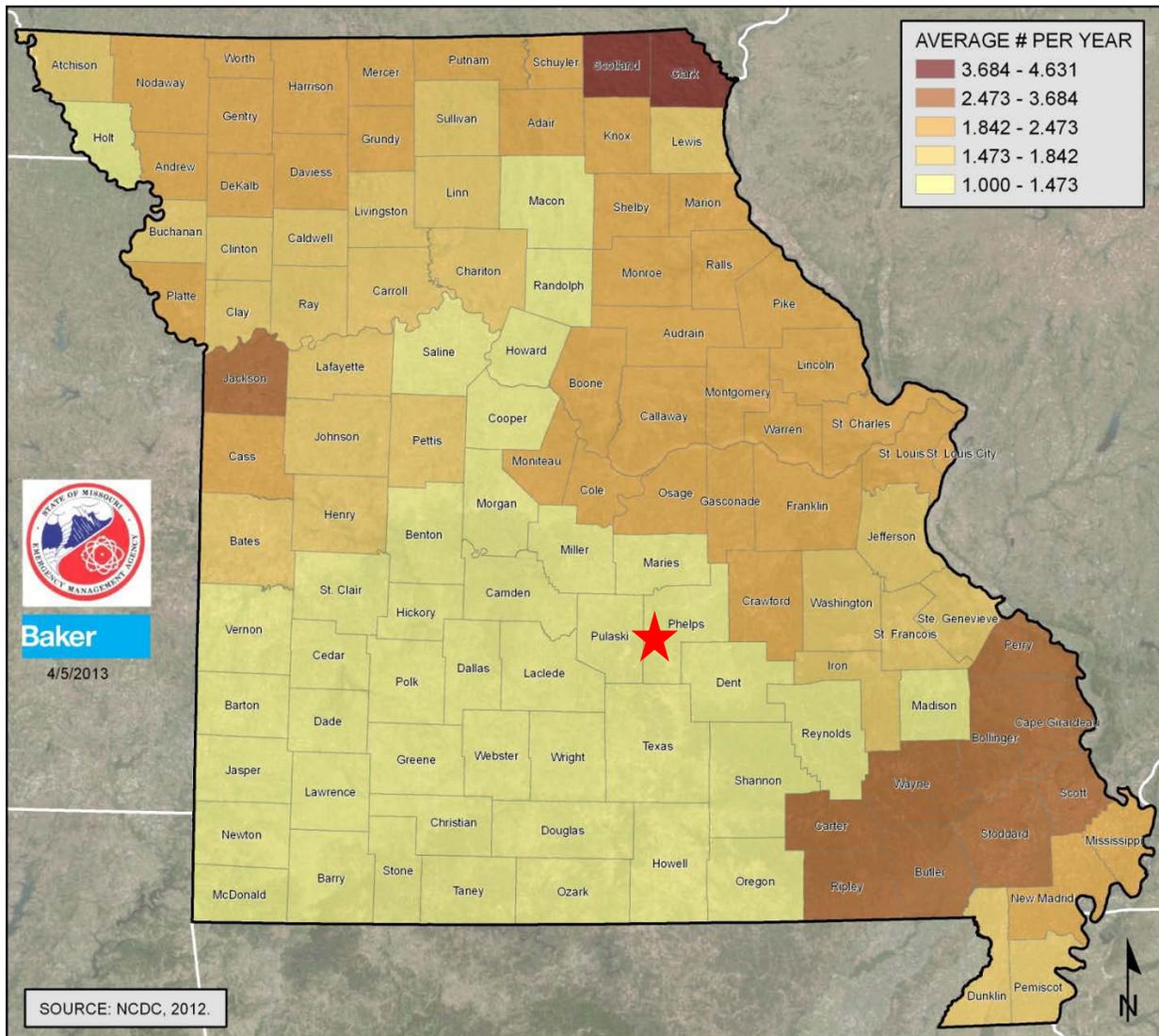
**Table 3.83. Vulnerability Analysis Rating Factors**

Factors considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Housing Density (# per sq. mile)	<50	50 - 99	100 - 299	300 - 499	>500
Crop Exposure (4)	<\$10M	\$10M to \$24M	\$25M to \$49M	\$50M to \$99M	>\$100M
Social Vulnerability	1	2	3	4	5
Likelihood of Occurrence (# of events/ yrs. Of data)	1.000 - 1.473	1.473 - 1.842	1.842 - 2.473	2.473 - 3.684	3.684 - 4.631
Annualized Property Loss Ratio (annual property loss/exposure)	0.0 - 0.000110	0.000111 - 0.000274	0.000275 - 0.000636	0.000637 - 0.001397	0.001398 - 0.003270

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.73** illustrates the likelihood of occurrence of severe winter weather across Missouri. Phelps County was estimated to have an average of 1.000 to 1.473 severe winter weather events per year.

**Figure 3.73. Likelihood of Occurrence of Severe Winter Weather**



Source: 2013 Missouri State Hazard Mitigation Plan

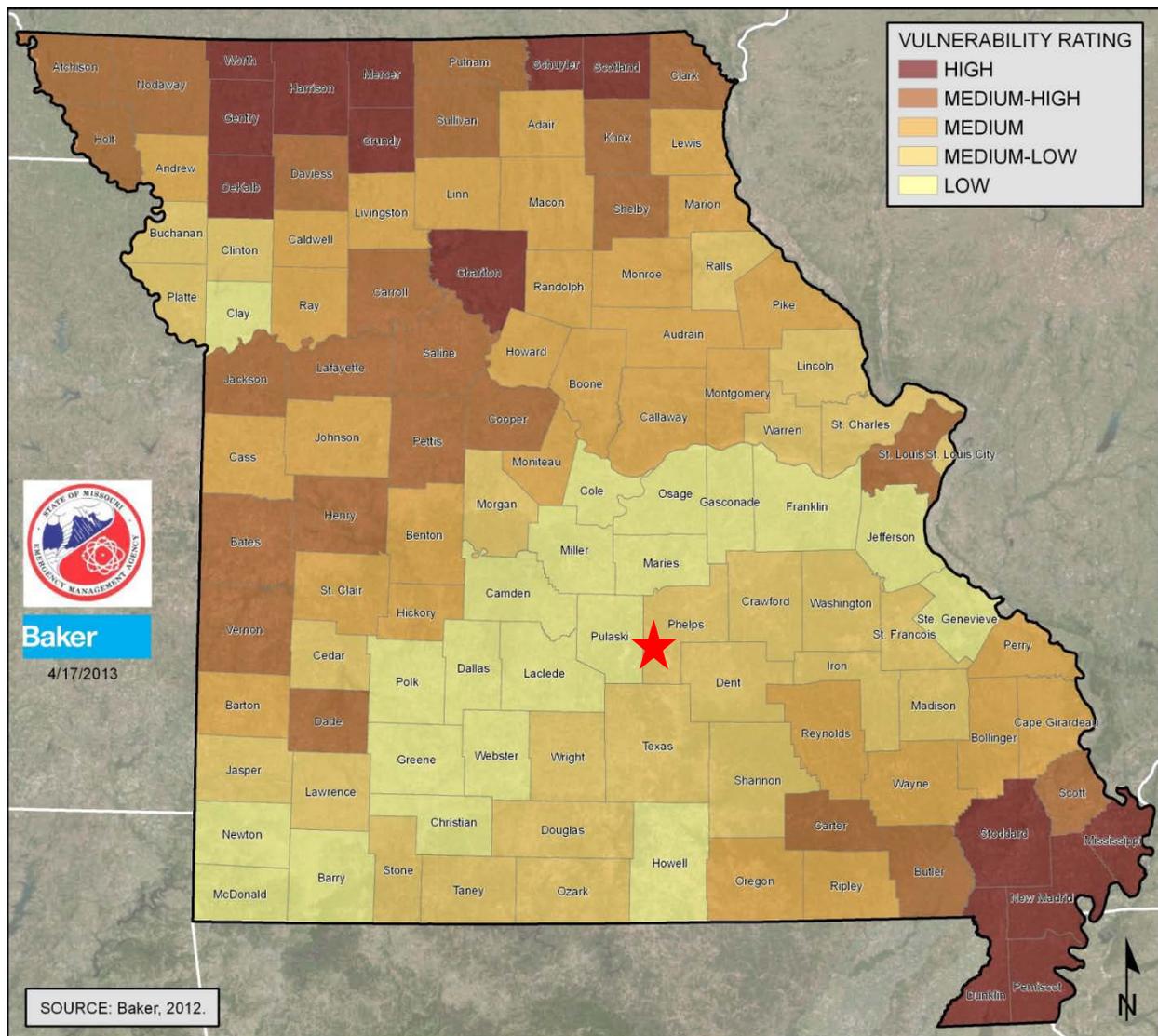
**Table 3.84** depicts the calculated vulnerability rating for each factor considered in the vulnerability analysis for severe winter weather hazards. The overall vulnerability rating for severe winter weather in Phelps County is Low. Moreover, **Figure 3.74** illustrates vulnerability ratings for each county within Missouri.

**Table 3.84. Phelps County Vulnerability Analysis for Severe Winter Weather**

County	Housing Density Rating	Likelihood Rating	Property Loss Rating	Crop Exposure Rating	Crop Loss Ratio Rating	Social Vulnerability Index	Total Score and Vulnerability	Vulnerability Rating
Phelps	1	1	1	1	4	3	11	Medium-Low

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.74. Vulnerability Summary for Severe Winter Storm**



Source: 2013 Missouri State Hazard Mitigation Plan



### ***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 is anticipated to increase, which would increase the number of individuals at risk during a winter weather event.

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

Variations in impacts are not anticipated for severe winter weather across the planning area. Yet, areas with high number of mobile homes tend to experience increased damages. Unincorporated Phelps County and Rolla have the highest abundance of mobile homes, making the area more prone to increase exposure to damage.

### **Problem Statement**

In summary, Phelps County is expected to experience at least one severe winter weather event annually; however the County has a Medium-Low vulnerability rating. Since the County does not have a strong agricultural economy, crop losses are not anticipated in the future. Jurisdictions should enhance their weather monitoring to be better prepared for severe weather hazards. If the jurisdictions monitor winter weather, they can dispatch road crews to prepare for the hazard. County and city crews can also trim trees along power lines to minimize the potential for outages due to snow and ice. Citizens should also be educated about the benefits of being proactive to alleviate property damage as well.

---

## 4 MITIGATION STRATEGY

---

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

**44 CFR Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.**

This section presents the mitigation strategy updated by the Mitigation Planning Committee (MPC) based on the updated risk assessment. The mitigation strategy was developed through a collaborative group process. The process included review of general goal statements to guide the jurisdictions in lessening disaster impacts as well as specific mitigation actions to directly reduce vulnerability to hazards and losses. The following definitions are taken from FEMA's *Local Hazard Mitigation Review Guide (October 1, 2012)*.

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

### 4.1 Goals

---

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

This planning effort is an update to Phelps County’s existing hazard mitigation plan originally approved by FEMA in November 2004 and updated and approved by FEMA on December 1, 2011. Therefore, the goals from the updated 2011 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 2013 State Hazard Mitigation Plan goals were reviewed. As the existing goals were broad, still applicable, and supported the 2013 State Hazard Mitigation Plan goals, the MPC saw no reason to make any changes. The 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 has been one death due to natural hazard events. (A thirteen year old boy is assumed to have drowned near St. James in July 2015.) 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, proposed mitigation actions discussed at the first meeting, mitigation projects provided by the Phelps County Road and Bridge Department as well as stakeholders such as the public water supply districts. 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 zero completed actions, two deleted actions, and fifty six continuing actions.

**Table 4.1** provides a summary of the action statuses for each jurisdiction. See **Appendix C: Completed/Deleted Mitigation Actions** for a summary of the completed and deleted actions from the previous plan.

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

Completed Actions	Completion Details (date, amount, funding source)
Deleted Actions	Reason for Deletion
5.1.3	Low Priority: Jurisdictions have addressed the issue or is not feasible.
5.2.1	Low Priority: Jurisdictions have addressed the issue or is not feasible.

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

### 4.3 Implementation of Mitigation Actions

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

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

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

Definitely yes = 3 points

Maybe yes = 2 points  
Probably no = 1  
Definitely no = 0

The following questions were asked for each proposed action.

S: Is the action socially acceptable?  
T: Is the action technically feasible and potentially successful?  
A: Does the jurisdiction have the administrative capability to successfully implement this action?  
P: Is the action politically acceptable?  
L: Does the jurisdiction have the legal authority to implement the action?  
E: Is the action economically beneficial?  
E: Will the project have an environmental impact that is either beneficial or neutral? (score “3” if positive and “2” if neutral)

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

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

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

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

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

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

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

In addition, the group considered the cost of mitigation versus the long-term savings in relation to potential lives saved and property damage avoided.

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

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

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

- A hypothetical action with “All definitely YES” on STAPLEE and High Benefit/Little Cost:  
Total Score = 28

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

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

The results of the STAPLEE process and Benefit/Cost analysis were then mailed out to all MPC members for feedback and consensus.

The final scores are listed below in the analysis of each action. Correspondence regarding the STAPLEE process is included in Appendix C: A spreadsheet with the action items and final scores is illustrated in Figure 4.1.

### Jurisdictional Floodplain Management Programs

Every jurisdiction in Phelps County, except Edgar Springs, regulates development in the floodplain by reviewing permit applications for all development including new and existing structures. Elevation certificates are required for all new construction, and existing structures with 50% or more damage following a flood are required to elevate. Floodplain maps are available in hard copy at each jurisdiction’s courthouse or municipal building. Furthermore floodplain maps can be found online through FEMA’s website <https://msc.fema.gov/portal>. Lastly, none of the jurisdictions currently participate in active monitoring activities within the floodplain.

**Table 4.1. Jurisdictional Floodplain Ordinance Adoption Date**

Community Name	Ordinance Adoption Date
Phelps County	1/22/2008
Doolittle	1/8/2008
Edgar Springs	No Special Flood Hazard Area*
Newburg	4/3/1987
Rolla	4/1/2002
St. James	3/14/2016

Source: Data Collection Questionnaires

\* Listed as participating in the NFIP per FEMA’s Community Status Book Report<sup>1</sup>; NSFHA (SEMA)

<sup>1</sup> [www.fema.gov/cis/mo.html](http://www.fema.gov/cis/mo.html)

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES		1 = Prob NO											
		2 = Maybe YES		0 = Def NO											
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
1.1.1	Implement an education program on personal emergency preparedness that teaches residents how to prepare emergency survival kits with water, blankets, flashlights, etc. and how to shut off their home utilities during emergencies.	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
1.1.3	Provide information to citizens on individual mitigation activities such as building personal shelters and assuring that propane tanks are appropriately tied down.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
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.	3	3	3	3	3	2	3	20	IC, LF, EMCC	6	-1	5	25	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.	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.	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	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.1.8	Develop and disseminate material on FEMA approved tornado safe rooms, available funding, and the importance of designated storm shelters.	3	3	3	3	3	1	3	19	IC, EMCC	4	-5	-1	18	M
1.2.1	Continue to promote use of weather radios by local residents and schools to insure advanced warning about threatening weather.	3	3	3	3	3	3	3	21	IC, EMCC	4	-1	3	24	H
1.2.2	Continue to partner with local radio stations to ensure that appropriate warning of impending disasters is provided to all residents and disseminate press releases and brochures regarding the importance of weather radios.	3	3	3	3	3	3	3	21	IC, EMCC	4	-1	3	24	H
1.2.3	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.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.3.1	Provide information on tree trimming and dead tree removal programs to utility companies and local government.	3	3	3	3	3	2	2	19	IC, PD, LF, EMCC	8	-3	5	24	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
1.3.2	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	Increase availability (if necessary construction) of 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
2.1.1	Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.	3	2	2	3	3	1	3	17	IC, PD, LF, EMCC	8	-5	3	20	H
2.1.2	Continue to encourage businesses and public entities to develop and implement emergency plans.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-3	5	26	H
2.1.3	Encourage the installation of backup generators for critical infrastructure such as water 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 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 including elevations and buyouts.	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.	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.	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 2 = Maybe YES							1 = Prob NO 0 = Def NO						
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
2.3.3	Monitor developments in data availability concerning the impact of 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.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
3.1.1	Distribute SEMA brochures on natural disasters, preparedness and NFIP at public facilities and events.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
3.1.2	Distribute regular press releases from county and city EMD offices concerning hazards, where they strike, frequency, preparedness and how to mitigate.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
3.1.3	Encourage and promote weather spotter classes throughout the county.	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
3.2.1	Provide opportunities through existing meetings (Co. communications, HSOC, MRPC) for EMDs, city/county officials & SEMA to meet and 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
3.3.2	Distribute press releases by cities/county regarding adopted mitigation measures to keep public abreast of changes and/or new regulations.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
3.4.1	Encourage county health department and local Red Cross Chapter to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
3.4.2	Publicize county or citywide drills.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
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

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES 1 = Prob NO 0 = Def NO													
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Loss Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
4.1.1	Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
4.1.2	Continue to encourage joint training (and drills) between agencies, public and private entities (including schools/businesses).	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
4.1.3	Pool different agency resources to achieve widespread mitigation planning results.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
4.1.4	Maintain updated mutual aid agreements between emergency response agencies inside and outside the region.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
4.2.1	Re-evaluate the hazard mitigation plan, merge with other community planning and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H
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
5.1.2	Encourage communities to budget for enhanced warning systems by providing information on enhanced warning systems.	3	2	2	3	3	2	3	18	IC, LF EMCC	6	-3	3	21	H
5.1.3	Encourage all communities to develop stormwater management plans in all new development – both residential and commercial properties.	2	2	1	1	3	1	3	13	PD	2	-5	-3	10	L
5.2.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.	1	2	2	1	2	1	3	12	PD, EMCC	4	-5	-1	11	L
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.	2	2	2	1	2	1	3	13	PD, EMCC	4	-1	3	16	M
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 through public/private partnerships and by encouraging the incorporation of safe rooms into new construction and renovations.	3	3	3	3	3	1	2	18	IC, PD, EMCC	6	-5	1	19	M
6.1.1	Work with SEMA Region I coordinator to learn about new mitigation funding opportunities.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES		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
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 develop and 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
6.2.2	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.	3	3	2	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H

**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:** Implement an education program on personal emergency preparedness that teaches residents how to prepare emergency survival kits with water, blankets, flashlights, etc. and how to shut off their home utilities during emergencies.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Residents are not always prepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities. This action item will improve the preparedness of individual households.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1.1
<b>Name of Action or Project:</b>	Personal Preparedness Education/Awareness Program
<b>Action or Project Description:</b>	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
<b>Estimated Cost:</b>	\$500 -\$3,500 estimated cost
<b>Benefits:</b>	In respect to avoided losses, this action will reduce the costs associated with providing shelter and assistance to residents affected by disasters. If residents are able to manage on their own for two to three days, this allows additional time for response and recovery activities to be established and power to be restored and allows emergency responders to focus on critical issues such as search and rescue, fire suppression, etc.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County and city EMDs
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	N/A
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Activity has occurred in this area as most emergency response agencies, health departments and EMDs promote individual preparedness and provide <i>Ready in 3</i> brochures. SEMA distributes press releases periodically on personal preparedness. Rolla Municipal Utilities posts information on their website, FaceBook page. A more focused and coordinated effort would help to achieve comprehensive coverage for all the jurisdictions.

**Action 1.1.2:** Promote development of emergency plans by businesses and public entities.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Absence of emergency plans by businesses and public entities.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1.2
<b>Name of Action or Project:</b>	Promoting the development of emergency plans by businesses and public entities.
<b>Action or Project Description:</b>	Promote development of emergency plans by businesses and public entities.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMDs
<b>Action/Project Priority:</b>	27 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Continuing not started
<b>Report of Progress</b>	During the last update of the CEDS, a chapter on economic recovery and resiliency was added which is a tool for local leaders to reduce vulnerability to natural hazards and expedite recovery public and private infrastructure. Implementation progress has been restricted due to lack of funding to develop a program to encourage and assist businesses and public entities in developing emergency plans. EMDs are encouraged to share resources available through SEMA and FEMA on emergency planning for businesses and public entities. Walmart Distribution Center #6069, one of the larger employers in the area, has an emergency plan on file with St. James emergency responders.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of public knowledge on individual mitigation activities.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1.3
<b>Name of Action or Project:</b>	Individual mitigation activities education/awareness program.
<b>Action or Project Description:</b>	Provide information to citizens on individual mitigation activities such as building personal shelters and assuring that propane tanks are appropriately tied down.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$2,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMDs, floodplain managers
<b>Action/Project Priority:</b>	26 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Planning and zoning ordinances, building codes and development plans could be revised to include requirements for some mitigation actions in new development. For example – requiring storm water control measures, fire suppression or fuel tank tie downs in all new construction.
<b>Progress Report</b>	
<b>Action Status</b>	New – in progress
<b>Report of Progress</b>	Local county and city floodplain ordinances provide guidance on building requirements in floodplain areas and are overseen by local floodplain coordinators. Phelps County has a subdivision development ordinance with requirements for road construction if a developer wants to county to take over maintenance of subdivision roads. The county is considering adding a stormwater management plan requirement to that ordinance. Additional efforts could be made by local EMDs to make people aware of actions they can take to make themselves and their property less vulnerable to disasters, such as building tornado shelters; securing fuel tanks; or sharing information on the Fire Wise Program to make homes less vulnerable to wild fires.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Residents are not always aware of the precautions that should be taken during threats of natural disasters such as heat waves and severe weather. Providing reminders through press releases and public announcements helps raise awareness and encourages residents to take the necessary precautions to stay safe.
<b>Hazard(s) Addressed:</b>	Severe heat and severe weather (lightening, wind, ice, cold)
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1.4
<b>Name of Action or Project:</b>	Personal Precautions Awareness Program for Severe Heat and Severe Weather
<b>Action or Project Description:</b>	Provide education/awareness of personal safety precautions to follow during heat waves and severe weather through press releases during seasons when these hazards are of concern.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$2,000
<b>Benefits:</b>	This project will reduce the number of injuries and deaths attributed to heat related and severe weather such as lightening or severe cold weather.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County and city EMDs; county health department
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	County and city LEOPs
<b>Progress Report</b>	
<b>Action Status</b>	New in Progress
<b>Report of Progress</b>	Activity has occurred in this area as most health departments and EMDs promote individual preparedness and provide Ready in 3 brochures. SEMA distributes press releases periodically on personal preparedness. Press releases and public service announcements are distributed during heat waves and severe weather. Weather spotter classes are offered periodically. A more focused and coordinated effort would help to achieve comprehensive coverage for all the jurisdictions.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge of school staff in regards to natural hazards and emergency plans.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1.5
<b>Name of Action or Project:</b>	Natural hazards and safety education program for school staff
<b>Action or Project Description:</b>	Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$2,500 – \$3,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	School superintendents for all school districts
<b>Action/Project Priority:</b>	28 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	General training/revenue funds of school districts
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Action should be included in the school crisis plan as well as the regular staff training program.
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	New action item added in 2016 update.

**Action 1.1.6:** Schools need to continue to conduct emergency preparedness exercises on a regular basis.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	St. James R-I, Newburg R-II, Phelps County R-III, Rolla 31
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	School districts must continuously exercise, train, and practice for emergencies in order to insure that all staff are trained and students are prepared for incidents that may occur in order to reduce the potential for injuries or deaths.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1.6
<b>Name of Action or Project:</b>	School exercise/emergency training program
<b>Action or Project Description:</b>	Regularly conduct emergency preparedness exercises.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,000 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	School Superintendents
<b>Action/Project Priority:</b>	27 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	School general revenue. Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	School crisis plans should include references to exercises and exercise schedules.
<b>Progress Report</b>	
<b>Action Status</b>	New - Ongoing
<b>Report of Progress</b>	All schools conduct regular drills for tornados and fire and coordinate those efforts with local emergency response agencies.

**Action 1.1.7:** Regularly review and update school emergency plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	St. James R-I, Newburg R-II, Phelps County R-III, Rolla 31
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with insufficient emergency school emergency plans
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1.7
<b>Name of Action or Project:</b>	Regular review and update of school emergency plans.
<b>Action or Project Description:</b>	Regularly review and update school emergency plans.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$2,500 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	School Superintendents
<b>Action/Project Priority:</b>	28 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Ongoing review and updating of emergency plans should be part of the existing plan document.
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	St. James R-I is currently reviewing and doing a major rewrite of the school emergency plan.

**Action 1.1.8:** Develop and disseminate material on FEMA approved tornado safe rooms, available funding, and the importance of designated storm shelters.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	St. James R-I, Newburg R-II, Phelps County R-III, Rolla 31, Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla, St James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with insufficient storm shelters and tornado safe rooms in schools that do not have them.
<b>Hazard(s) Addressed:</b>	Tornado, Severe Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1.8
<b>Name of Action or Project:</b>	Expansion of storm shelter availability and construction of certified tornado safe rooms.
<b>Action or Project Description:</b>	Develop and disseminate material on FEMA approved tornado safe rooms, available funding, and the importance of designated storm shelters.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$2,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMDs for storm shelters School Superintendents for school certified tornado safe rooms
<b>Action/Project Priority:</b>	18 - M
<b>Timeline for Completion:</b>	5 years to increase the number of storm shelters in the county. 10 years to construct certified tornado safe rooms in each school district.
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs for county and cities. School capital improvement plans and emergency plans.
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Phelps County R-III school district has a FEMA certified tornado shelter. The St. James Industrial Park has a designated storm shelter located in the Tacony Manufacturing building that serves the entire industrial park. Lack of financial resources for construction continues to be the main obstacle, however, school districts are interested in building safe rooms if funding can be secured.

**Action 1.2.1:** Continue to promote use of weather radios by local residents and schools to insure advanced warning about threatening weather.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Rolla 31, Phelps County R-III
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of communication/advanced warnings for threatening weather.
<b>Hazard(s) Addressed:</b>	Severe Weather, Flash Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2.1
<b>Name of Action or Project:</b>	Weather radio promotion
<b>Action or Project Description:</b>	Continue to promote use of weather radios by local residents and schools to insure advanced warning about threatening weather.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$2,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD
<b>Action/Project Priority:</b>	24 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	N/A
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Some promotion of the use of weather radios by residents has been carried out over the past five years, but not in a sustained, organized fashion. All school districts have weather radios. Missouri Highway Patrol Troop I has a system for notifying canoe outfitters of severe weather. Nursing homes generally have weather radios. St. James posts information through its FaceBook page. This program would benefit from an annual press release targeting those residents who are not part of the enhanced warning system and encouraging them to purchase weather radios.

**Action 1.2.2:** Continue to partner with local radio stations to ensure that appropriate warning of impending disasters is provided to all residents and disseminate press releases and brochures regarding the importance of weather radios.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of communication/advanced warnings of impending disasters for residents
<b>Hazard(s) Addressed:</b>	Tornado, Severe Weather, Flash Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2.2
<b>Name of Action or Project:</b>	Emergency coordination with local radio stations
<b>Action or Project Description:</b>	Continue to partner with local radio stations to ensure that appropriate warning of impending disasters is provided to all residents and disseminate press releases and brochures regarding the importance of weather radios.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$500 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs
<b>Action/Project Priority:</b>	24 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	EMDs and elected officials indicate that they have excellent working relationships with local radio stations and media outlets including internet based media. However, these are relationships that must be continued and maintained on an on-going basis. So this action item is classified as "continuing."

**Action 1.2.3:** Monitor developments in data availability concerning the impact of disasters such as dam failure, tornados, sinkholes, land subsidence and wildfire upon Pulaski County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III, Rolla 31
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of data concerning the impact of natural disasters upon the County
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2.3
<b>Name of Action or Project:</b>	Reducing Vulnerability of People
<b>Action or Project Description:</b>	Monitor developments in data availability concerning the impact of disasters such as dam failure, tornadoes, sinkholes, land subsidence, and wildfire upon Pulaski County and all jurisdictions through local, state, and federal agencies for use in hazard mitigation planning.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County and city EMDs, Phelps County Commission, city councils of Doolittle, Edgar Springs, Newburg, Rolla, St. James and school boards of all school districts.
<b>Action/Project Priority:</b>	28 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinances
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 1.3.1:** Provide information on tree trimming and dead tree removal programs to utility companies and local government.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated power outages from trees interfering with power lines and/or blocking roads.
<b>Hazard(s) Addressed:</b>	Severe Wind Storm, Severe Winter Storm, Tornado
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3.1
<b>Name of Action or Project:</b>	Tree trimming and dead tree removal
<b>Action or Project Description:</b>	Continue to encourage tree trimming and dead tree removal programs by utility companies and local government.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$3,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Phelps County Road & Bridge Department, Public Works/Utility Departments for cities, Local electric cooperatives serving Phelps County
<b>Action/Project Priority:</b>	24 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Phelps County, Rolla and St. James all indicated that they have aggressive tree trimming programs. Rolla Municipal Utilities also has an education program with property owners on tree trimming. The electric cooperatives that serve Phelps County - Intercounty Electric, Gascoage Electric and Crawford Electric - do tree trimming for their transmission lines. All jurisdictions indicated that they have increased their efforts on tree trimming and dead tree removal over the past five years.

**Action 1.3.2:** Continue to examine road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, Rolla, Newburg, St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with flooding and inadequate road/bridge structures and impacts on residents and their property.
<b>Hazard(s) Addressed:</b>	Flood, Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3.2
<b>Name of Action or Project:</b>	Reducing Vulnerability of People
<b>Action or Project Description:</b>	Continue to examine road and bridge upgrades to improve drainage and reduce flooding and the risk to residents and property.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$12,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Phelps County Road and Bridge Department, Rolla Public Works Director, Newburg Water/Sewer Superintendent, St. James Street Supervisor,
<b>Action/Project Priority:</b>	25 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Phelps County has road building specifications for subdivision builders to follow if they want the county to take over the subdivision roads.
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Phelps County has completed the following projects to reduce impacts from flooding: Clean out ditches on 59 county roads; add crossover culverts to 33 roads; install upsized culverts on 41 roads; installed shot rock in areas around bridges and culverts that erode; repaired two low water slabs; and hammered rock out of ditches on 9 roads to improve water flow. Upgrades have been done on bridges on County Roads 3610 and 8100 including a bridge replacement. A low water crossing was replaced on CR 5420. A gravel low water crossing on CR 8130 was replaced with a bridge. County purchased a hammer and excavator to expand ditches to improve water flow and keep water off roads. 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with nonexistent/inadequate shelters for residents during disasters
<b>Hazard(s) Addressed:</b>	Severe Weather, Severe Winter Storm, Tornado, Extreme Heat
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3.3
<b>Name of Action or Project:</b>	Establishing shelters
<b>Action or Project Description:</b>	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.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$3,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Phelps County Commission, city councils of all cities, EMDs, County Health Dept., Red Cross, County and City EMDs
<b>Action/Project Priority:</b>	26 - H
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP
<b>Progress Report</b>	
<b>Action Status</b>	New in Progress
<b>Report of Progress</b>	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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3.4
<b>Name of Action or Project:</b>	Alternative shelters for facilities that house disabled and elderly populations
<b>Action or Project Description:</b>	Continue to work to increase communications between facilities that house vulnerable populations and with local EMDs and agencies responsible for sheltering.
<b>Applicable Goal Statement:</b>	Reduce risks for facilities that house vulnerable populations through better planning, communications, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$3,500 (each)
<b>Benefits:</b>	
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County and city EMDs, Phelps County Health Department
<b>Action/Project Priority:</b>	21 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with nonexistent/unavailable storm shelters for individual families and large groups
<b>Hazard(s) Addressed:</b>	Severe Weather, Tornado
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3.5
<b>Name of Action or Project:</b>	Increase the availability of storm shelters.
<b>Action or Project Description:</b>	Increase availability (if necessary construction) of storm shelters for individual families and large groups, including near large employment centers and schools.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$15,000 - \$5 Million
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Phelps County Commission, EMDs, city councils of cities, school boards
<b>Action/Project Priority:</b>	18 - M
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	A FEMA certified tornado shelter has been constructed at the Phelps County R-III schools. Tacony Manufacturing in St. James has a 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 2.1.1:** Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities to critical facilities during the occurrence of an earthquake or tornado.
<b>Hazard(s) Addressed:</b>	Tornado, Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1.1
<b>Name of Action or Project:</b>	Critical facilities self-inspection
<b>Action or Project Description:</b>	Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$2,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission, Mayors of each city, school superintendents for each school district,
<b>Action/Project Priority:</b>	20 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Rolla Municipal Utilities did a facility upgrade to make the “nerve center” more tornado and earthquake resistant. The largest barrier to this action is the lack of expertise at the local level to carry out the inspections, as well as lack of funding to hire experts.

**Action 2.1.2:** Continue to encourage businesses and public entities to develop and implement emergency plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities of natural hazard damages to businesses and public resources.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1.2
<b>Name of Action or Project:</b>	Property & Infrastructure Protection
<b>Action or Project Description:</b>	Continue to encourage businesses and public entities to develop and implement emergency plans.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$5,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMDs, city councils
<b>Action/Project Priority:</b>	26 - H
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, Meramec Regional CEDS
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – Revised to include Public Entities
<b>Report of Progress</b>	The listed jurisdictions have not had the resources available to complete emergency plans for their individual jurisdiction. In some cases they fall under the county plan. Walmart Distribution Center #6069 has an emergency response plan on file with local emergency response agencies.

**Action 2.1.3:** Encourage the installation of backup generators for critical infrastructure such as water systems and emergency services.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with power outages for critical infrastructure/facilities
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1.3
<b>Name of Action or Project:</b>	Encourage backup generators for critical infrastructure.
<b>Action or Project Description:</b>	Encourage the installation of backup generators for critical infrastructure such as water systems and emergency services
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$25,000 - \$80,000 per generator unit
<b>Benefits:</b>	Losses avoided by implementing this action include loss-of-function/displacement impacts and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMDs, Local Government
<b>Action/Project Priority:</b>	21 - H
<b>Timeline for Completion:</b>	10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Capital improvement plans, LEOPs, comprehensive plans
<b>Progress Report</b>	
<b>Action Status</b>	New - in Progress
<b>Report of Progress</b>	The city of Doolittle has three portable generators – one with the city and two with the fire department. The Doolittle Fire Department also has one fixed generator at the fire station. Edgar Springs has one fixed generator at the sewer plant. Newburg has one portable generator. The city of Rolla has numerous portable generators for backing up critical facilities throughout the city. RMU has 17 portable generators and seven fixed generators at critical facilities. St. James has six portable generators. Phelps County has three fixed generators (one at the county jail, one at the health department and one in the computer room of the courthouse. The Phelps County Sheriff’s office has one portable generator

**Action 2.2.1:** Educate residents, realtors, and contractors about the dangers of floodplain development and the benefits of the NFIP.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities of properties in the floodplain during a flood event.
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2.1
<b>Name of Action or Project:</b>	Floodplain education/awareness
<b>Action or Project Description:</b>	Educate residents, realtors and contractors about the dangers of floodplain development and the benefits of the NFIP
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$5,000 - \$6,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Floodplain Managers, Phelps County Commission, Mayors of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Action/Project Priority:</b>	25 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain management ordinances, LEOP, economic development plan, capital improvement plans, comprehensive plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress – added “realtors and contractors”
<b>Report of Progress</b>	Information, brochures, etc. on floodplain development and the NFIP is available through floodplain managers for the county and participating cities. Phelps County has floodplain information available on-line. The program could benefit from direct mailings to realtors, contractors and residents with property located in the floodplain. This is a program that requires on-going activity as people move in and out of the county/cities.

**Action 2.2.2:** Encourage development of storm water management plans/ordinances in those jurisdictions that do not currently have them and in all new development including unincorporated areas.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Edgar Springs and Newburg
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with flood events in areas that do not possess adequate storm water management plans
<b>Hazard(s) Addressed:</b>	Flood, Severe Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2.2
<b>Name of Action or Project:</b>	Encourage development of storm water management plans/ordinances
<b>Action or Project Description:</b>	Encourage development of storm water management plans in those jurisdictions that do not currently have them and in all new developments, and encourage the county to review and strengthen any subdivision ordinances to incorporate mitigation measures such as storm water management.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$5,000 - \$25,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Phelps County Commission, city councils of Edgar Springs and Newburg, City Engineers, Public Works Directors
<b>Action/Project Priority:</b>	23 - H
<b>Timeline for Completion:</b>	10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Capital Improvement plans, builders plans, comprehensive plans, transportation plans, land-use plans, flood mitigation assistance plans
<b>Progress Report</b>	
<b>Action Status</b>	New in Progress
<b>Report of Progress</b>	The cities of Doolittle, Rolla and St. James have stormwater ordinances. Phelps County is considering adding a requirement for a stormwater management plan in the county subdivision ordinance.

**Action 2.2.3:** Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with flooding and unregulated floodplain development.
<b>Hazard(s) Addressed:</b>	Flood, Severe Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2.3
<b>Name of Action or Project:</b>	Floodplain management compliance enforcement.
<b>Action or Project Description:</b>	Continue to enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$4,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Floodplain managers, Phelps County Commission, city councils of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Action/Project Priority:</b>	23 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain ordinances, builder's plans, comprehensive plans, capital improvement plans,
<b>Progress Report</b>	
<b>Action Status</b>	New in Progress
<b>Report of Progress</b>	All jurisdictions that are members of NFIP are working to insure compliance with their respective floodplain ordinances. This is an on-going endeavor and could benefit from additional inspections of floodplain areas and additional education/awareness activities for builders and residents.

**Action 2.2.4:** Continue to look at ways to reduce vulnerabilities in the Beaver Creek area including elevations and buyouts.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Vulnerabilities in the Beaver Creek area
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2.4
<b>Name of Action or Project:</b>	Floodplain management compliance enforcement.
<b>Action or Project Description:</b>	Continue to look at ways to reduce vulnerabilities in the Beaver Creek area including elevations and buyouts.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$4,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Floodplain coordinator, Phelps County Commission
<b>Action/Project Priority:</b>	16 - M
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	New in Progress
<b>Report of Progress</b>	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.

**Action 2.3.1:** Encourage minimum standards for building codes in all cities.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cities of Doolittle and Edgar Springs
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities to property and communities in the event of a natural disaster due to substandard construction.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3.1
<b>Name of Action or Project:</b>	Property & Infrastructure Protection
<b>Action or Project Description:</b>	Encourage the adoption of minimum standard building codes by all communities that do not currently have them.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$3,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Doolittle and Edgar Springs city councils
<b>Action/Project Priority:</b>	26 - H
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	
<b>Progress Report</b>	
<b>Action Status</b>	Continuing Not Started
<b>Report of Progress</b>	There has been no progress in this area due to the communities not having the resources to enforce building codes.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with unsecured hazardous materials, tanks, and mobile homes during flood, severe weather, or tornado events.
<b>Hazard(s) Addressed:</b>	Flood, Severe Weather, Tornado
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3.2
<b>Name of Action or Project:</b>	Encourage the development of regulations or ordinances for securing materials tanks and mobile homes to reduce hazards during storms and flooding.
<b>Action or Project Description:</b>	Encourage local governments to develop and implement regulations and/or ordinances for securing hazardous materials, tanks, and mobile homes to reduce hazards during storms, flooding, and high winds.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$3,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Phelps County Commission, city councils of all cities
<b>Action/Project Priority:</b>	22 - H
<b>Timeline for Completion:</b>	10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, and services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	City and county ordinances, builders plans, comprehensive plans, LEOP, building codes, floodplain ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing Not Started
<b>Report of Progress</b>	Local governments indicated they do not have the expertise or resources to complete this action item at this time.

**Action 2.3.3:** Monitor developments in data availability concerning the impact of 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with absence of data concerning natural disasters.
<b>Hazard(s) Addressed:</b>	Dam failure, tornadoes, sinkholes, land subsidence, and wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3.3
<b>Name of Action or Project:</b>	Monitor developments in data availability for the purpose of improving hazard mitigation planning.
<b>Action or Project Description:</b>	Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence, and wildfire upon Pulaski County and all jurisdictions through local, state, and federal agencies for use in hazard mitigation planning.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,000 – \$7,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMDs
<b>Action/Project Priority:</b>	28 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, and services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**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 3.1.1:** Distribute SEMA brochures on natural disasters, preparedness and NFIP at public facilities and events.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the public's lack of knowledge in regards to natural disasters, preparedness, and NFIP.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1.1
<b>Name of Action or Project:</b>	Outreach & Education on natural disasters, preparedness and NFIP
<b>Action or Project Description:</b>	Distribute SEMA brochures on natural disasters, preparedness and NFIP at public facilities and events.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$500 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, School Safety officers
<b>Action/Project Priority:</b>	27 - H
<b>Timeline for Completion:</b>	Ongoing
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Outreach and education activities are an on-going activity. Local emergency response agencies frequently distribute materials at local events. The county health department maintains brochures and information at the courthouse.

**Action 3.1.2:** Distribute regular press releases from county and city EMD offices concerning hazards, where they strike, frequency, preparedness and how to mitigate.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge concerning hazards, where they occur, frequency, preparedness, and how to mitigate.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1.2
<b>Name of Action or Project:</b>	Press releases on hazards, preparedness and how to mitigate
<b>Action or Project Description:</b>	Distribute regular press releases from county and city EMD offices concerning hazards, where they strike, frequency, preparedness, and how to mitigate.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$500 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Phelps County Health department
<b>Action/Project Priority:</b>	27 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	This is an on-going activity. Press releases on hazards, preparedness and/or mitigation are issued on a regular basis by SEMA, the county health department, EMDs and city government.

**Action 3.1.3:** Encourage and promote weather spotter classes throughout the County.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of trained weather spotters
<b>Hazard(s) Addressed:</b>	Tornado, Severe Storm
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1.3
<b>Name of Action or Project:</b>	Press releases on hazards, preparedness and how to mitigate
<b>Action or Project Description:</b>	Encourage and promote weather spotter classes throughout the County.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$500 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Phelps County Health Department, School Safety Officers
<b>Action/Project Priority:</b>	28 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, Hazard Mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	New in Progress
<b>Report of Progress</b>	Weather spotter classes have been held in the area periodically. This program would benefit from a more focused, coordinated effort to organize and promote classes.

**Action 3.1.4:** Educate staff and parents on school safety protocols.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge by staff and parents on school safety protocols.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1.4
<b>Name of Action or Project:</b>	Educate staff and parents on school safety protocols.
<b>Action or Project Description:</b>	Actively engage staff and parents in relations to school safety protocols during natural hazard events.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$500 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Superintendents and school safety officers for St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31
<b>Action/Project Priority:</b>	26 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, school emergency plans
<b>Progress Report</b>	
<b>Action Status</b>	New in Progress
<b>Report of Progress</b>	School districts do some education with staff and parents on school emergency procedures. However, this effort would benefit from a more focused effort to bring all parents, faculty and staff up to speed on emergency plans and procedures.

**Action 3.2.1:** Provide opportunities through existing meetings (Co. communications, HSOC, MRPC) for EMDs, city/county officials, and SEMA to meet and familiarize officials with mitigation planning, implementation, and budgeting for mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of knowledge/information of officials in regards to mitigation planning, implementation, and budgeting for mitigation projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.2.1
<b>Name of Action or Project:</b>	Mitigation awareness/education meetings with local officials and SEMA
<b>Action or Project Description:</b>	Provide opportunities through existing meetings (Co. communications, HSOC, MRPC) for EMDs, city/county officials, and SEMA to meet and familiarize officials with mitigation planning, implementation, and budgeting for mitigation projects.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$1,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Local Elected Officials
<b>Action/Project Priority:</b>	26 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	N/A
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - Ongoing
<b>Report of Progress</b>	The Region I SEMA area coordinator holds quarterly meetings in the region and discussions include a variety of topics, including mitigation. MRPC has provided information and presentations on mitigation at regular board meetings that included representatives from 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.3.1
<b>Name of Action or Project:</b>	Review hazard mitigation plan, merge with other community planning and coordinate and integrate activities with emergency plans and procedures.
<b>Action or Project Description:</b>	Re-evaluate the hazard mitigation plan, merge with other community planning and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operation plans and procedures.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$3,500 – \$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Local Planners, City Administrators, MPC
<b>Action/Project Priority:</b>	21 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, hazard mitigation plan, school crisis management plans, comprehensive plans, builder's plans, capital improvement plan, economic development plan, transportation plan, land-use plan, floodplain ordinances, stormwater ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	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 local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

**Action 3.3.2:** Distribute press releases by cities/county regarding adopted mitigation measures to keep public abreast of changes and/or new regulations.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Community lack of knowledge regarding adopted mitigation measures
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.3.2
<b>Name of Action or Project:</b>	Outreach & education on completed mitigation measures
<b>Action or Project Description:</b>	Distribute press releases by all jurisdictions regarding adopted mitigation measures to keep public abreast of changes and/or new regulations.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$700 – \$1,700
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Local Governments, school superintendents
<b>Action/Project Priority:</b>	26 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Jurisdictions share information on implemented mitigation measures with local media to make residents aware. Examples of projects shared include the certified tornado safe room at Phelps County R-III schools and numerous road and bridge improvements made in the county.

**Action 3.4.1:** Encourage county health department and local Red Cross Chapter to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Public lack of knowledge of proper measures to take during times of threatening conditions.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4.1
<b>Name of Action or Project:</b>	Public awareness campaign for the public to understand threats and protective measures to take to protect themselves.
<b>Action or Project Description:</b>	Encourage county health department and local Red Cross Chapter to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$2,000 – \$4,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Local Governments, county health department director, Local Red Cross Chapter leadership
<b>Action/Project Priority:</b>	26 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The county health department and local Red Cross Chapter currently work to increase awareness of the proper measures to take during times of threatening conditions such as heat waves. This is an on-going activity.

**Action 3.4.2:** Publicize county or citywide drills.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack of knowledge in regards to the proper measures to take during hazard events.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4.2
<b>Name of Action or Project:</b>	Publicizing drills.
<b>Action or Project Description:</b>	Publicize county or citywide drills to make the general public aware of training/exercises being conducted locally and raise awareness of emergency preparedness and what measures should be taken.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$500 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs
<b>Action/Project Priority:</b>	28 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	This is an on-going activity. Local governments make the public aware of drills/trainings/exercises through press releases to the media and follow up articles on drills. SEMA also publicizes drills that are being done on a regional or statewide level.

**Action 3.4.3:** Encourage the development of a county-wide CERT and/or COAD/VOAD program and educate the public on how they can benefit from these types of programs.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of information on and need for CERT and/or COAD/VOAD programs to help communities prepare for and plan for disasters
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4.3
<b>Name of Action or Project:</b>	Promote the development of CERT, COAD, VOAD
<b>Action or Project Description:</b>	Encourage the development of a county-wide CERT and/or COAD/VOAD program and educate the public on how they can benefit from these types of programs.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$1,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs
<b>Action/Project Priority:</b>	28 - H
<b>Timeline for Completion:</b>	5 years to form CERT/VOAD/COAD, awareness – on-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	CERT trainings were most recently held in Phelps County in 2014.

**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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy/communication among organizations/agencies for mitigation related planning.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.1.1
<b>Name of Action or Project:</b>	Encourage joint meetings of different organizations/agencies and continued communication on mitigation
<b>Action or Project Description:</b>	Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
<b>Estimated Cost:</b>	\$500 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs
<b>Action/Project Priority:</b>	28 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan, LEOPs
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	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 4.1.2:** Continue to encourage joint training (and drills) between agencies, public and private entities (including schools/businesses).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy/communication/coordination among agencies, public, and private entities on disaster training and emergency drills/exercises.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.1.2
<b>Name of Action or Project:</b>	Encourage joint training/drills/exercises among all jurisdictions and local businesses.
<b>Action or Project Description:</b>	Continue to encourage joint training (and drills) between agencies, public and private entities (including schools/businesses).
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
<b>Estimated Cost:</b>	\$1,000 - \$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Emergency Response Agencies, School Superintendents
<b>Action/Project Priority:</b>	25 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, School crisis plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Jurisdictions, EMDs and emergency response agencies within Phelps County cooperate on training and drills on a regular basis. Fire and police departments regularly train with local school districts. The Region I SEMA area coordinator works with local entities throughout the six-county area to do at least one exercise each year that is either regional or state-wide. The Meramec Regional Emergency Planning Committee (MREPC) coordinates tabletop and full-scale exercises from time to time throughout the region. The most recent tabletop (2015) was held in St. James and involved multiple emergency response agencies and the St. James R-I school district.

**Action 4.1.3:** Pool different agency resources to achieve widespread mitigation planning results.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources among agencies which hinder mitigation results.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.1.3
<b>Name of Action or Project:</b>	Pooling resources for mitigation activities
<b>Action or Project Description:</b>	Pool different agency resources to achieve widespread mitigation planning results.
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
<b>Estimated Cost:</b>	\$1,000 - \$4,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Phelps County Commission, city councils of Doolittle, Edgar Springs, Newburg, Rolla and St. James, School boards of St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31
<b>Action/Project Priority:</b>	24 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, LEOPs, Capital Improvement plans, Comprehensive plans, Strategic plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	All jurisdictions reported that they are interested in finding ways to pool resources to accomplish mitigation projects. There has been interest in thinking outside the box on funding upgrades to low water crossing projects and tapping into different funding sources (Missouri Department of Conservation funds to protect endangered species and open streams to allow free movement of fish.)

**Action 4.1.4:** Maintain updated mutual aid agreements between emergency response agencies inside and outside the region.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of communication/coordination among emergency response agencies and securing mutual aid agreements.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.1.4
<b>Name of Action or Project:</b>	Maintenance and improvement of mutual aid agreements.
<b>Action or Project Description:</b>	Maintain updated mutual aid agreements between emergency response agencies inside and outside the region.
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
<b>Estimated Cost:</b>	\$750 - \$1,750
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Fire chiefs, ambulance district directors, police chiefs, sheriff
<b>Action/Project Priority:</b>	27 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, mutual aid agreements
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	In the past few years, SEMA has made fire mutual aid agreements a priority and assigned a mutual aid coordinator for the region. The fire mutual aid coordinator for Region I is located at Rolla Fire & Rescue. Fire mutual aid agreements are in place. All jurisdictions indicated that all mutual aid agreements between various emergency response agencies are in good shape at the current time. This is, however, an on-going activity and mutual aid agreements will require periodic review to insure that the documents continue to meet the needs of the agencies involved.

**Action 4.2.1:** Re-evaluate the hazard mitigation plan, merge with other community planning and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy with the hazard mitigation plan, community plans, hazard mitigation activities, and emergency operation plan/procedures.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.2.2
<b>Name of Action or Project:</b>	Review hazard mitigation plan, merge with other community planning and coordinate and integrate activities with emergency plans and procedures.
<b>Action or Project Description:</b>	Re-evaluate the hazard mitigation plan, merge with other community planning and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operation plans and procedures.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$3,500 – \$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Local Planners, City Administrators, MPC
<b>Action/Project Priority:</b>	21 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, hazard mitigation plan, school crisis management plans, comprehensive plans, builder's plans, capital improvement plan, economic development plan, transportation plan, land-use plan, floodplain ordinances, storm water ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	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 local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

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

**Action 5.1.1:** Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of incorporating hazard mitigation in the long term planning and development of activities by each jurisdiction.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.1.1
<b>Name of Action or Project:</b>	Incorporating hazard mitigation into all long-range planning and development activities.
<b>Action or Project Description:</b>	Incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$2,500 - \$25,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Local Planners, City Administrators, MPC
<b>Action/Project Priority:</b>	29 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, hazard mitigation plan, school crisis management plans, comprehensive plans, builder's plans, capital improvement plan, economic development plan, transportation plan, land-use plan, floodplain ordinances, storm water ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	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 local officials become familiar with mitigation and understand how it fits within other planning activities, this action

	item will continue to expand.
--	-------------------------------

**Action 5.1.2:** Encourage communities to budget for enhanced warning systems by providing information on enhanced warning systems.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities due to inadequate warning systems.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.1.2
<b>Name of Action or Project:</b>	Encourage budgeting for enhanced warning systems
<b>Action or Project Description:</b>	Encourage communities to budget for enhanced warning systems.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$3,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMD, Phelps County Commission, city councils of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Action/Project Priority:</b>	21 - H
<b>Timeline for Completion:</b>	10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, capital improvement plans, hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Phelps County has adopted the Everbridge Mass Notification system county-wide which automatically delivers voice calls, text messages and emails to subscribed users within the direct path of any storms as soon as an alert is issued by the National Weather Service and is used to make other warning notifications.

**Action 5.1.3:** Encourage all communities to develop storm water management plans in all new development – both residential and commercial properties.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with non-existent storm water management plans
<b>Hazard(s) Addressed:</b>	Flood, Severe Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.1.3
<b>Name of Action or Project:</b>	Encourage all communities to develop storm water management plans.
<b>Action or Project Description:</b>	Encourage all communities/jurisdictions to develop storm water management plans.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$800 - \$1,800
<b>Benefits:</b>	Losses avoided by implementing this action include property damages.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Local Planners, Local Governments
<b>Action/Project Priority:</b>	10 - L
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	N/A
<b>Progress Report</b>	
<b>Action Status</b>	<b>Deleted.</b> Three of five communities have storm water ordinances in place. Edgar Springs and Newburg do not currently have the resources to institute or enforce storm water ordinances or plans and this action received a “Low” priority rating.
<b>Report of Progress</b>	Doolittle, Rolla and St. James have storm water ordinances in place. Phelps County is considering adding a stormwater plan requirement to the county subdivision ordinance.

**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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with floodplain properties
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.2.1
<b>Name of Action or Project:</b>	Government purchase of properties in the floodplain
<b>Action or Project Description:</b>	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$3,500 - \$500,000
<b>Benefits:</b>	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Local Government, County & City EMDs, Floodplain Managers
<b>Action/Project Priority:</b>	11 - L
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain ordinances
<b>Progress Report</b>	
<b>Action Status</b>	<b>Deleted.</b> This action received a “Low” priority rating and was removed from the list of actions. Floodplain buyouts were done in the Jerome area by Phelps County many years ago but have not been pursued since then.
<b>Report of Progress</b>	N/A

**Action 5.2.2:** Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with repetitive loss properties.
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.2.2
<b>Name of Action or Project:</b>	Zoning repetitive loss properties as open space.
<b>Action or Project Description:</b>	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$1,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Government, Local Planners, City EMDs, Floodplain Managers
<b>Action/Project Priority:</b>	16 - M
<b>Timeline for Completion:</b>	5 to 10 years
<b>Potential Fund Sources:</b>	Local general revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain ordinances, Hazard Mitigation plan, comprehensive plans, strategic plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing Not Started
<b>Report of Progress</b>	As this action was prioritized as medium, no action has been taken thus far.

**Action 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 through public/private partnerships and by encouraging the incorporation of safe rooms into new construction or renovations.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack storm shelters/tornado safe rooms near schools and large employment centers.
<b>Hazard(s) Addressed:</b>	Severe Weather, Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.2.3
<b>Name of Action or Project:</b>	Encourage the construction of storm shelters and tornado safe rooms
<b>Action or Project Description:</b>	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 through public/private partnerships and by encouraging the incorporation of safe rooms into new construction or renovations.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$5,000 - \$5 Million
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Phelps County Commission, city councils of Doolittle, Edgar Springs, Newburg, Rolla and St. James, school boards of St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Action/Project Priority:</b>	19 - M
<b>Timeline for Completion:</b>	10 to 20 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, Hazard Mitigation plan, capital improvement plans, building plans, comprehensive plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	A FEMA certified tornado safe room has been constructed at Phelps County R-III. Lack of financial resources for construction continues to be the main obstacle, however, other school districts and communities are interested in building safe rooms if funding can be secured.

**Goal 6:** Secure resources for investment in hazard mitigation.

**Action 6.1.1:** Work with SEMA Region I coordinator to learn about new mitigation funding opportunities.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for natural hazard mitigation projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.1.1
<b>Name of Action or Project:</b>	Working with SEMA to learn about mitigation funding opportunities.
<b>Action or Project Description:</b>	Work with SEMA Region 1 coordinator to learn about new mitigation funding opportunities.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$1,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, City EMDs, Local Governments
<b>Action/Project Priority:</b>	28 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	General revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Region I SEMA coordinator is available and meets regularly with local government and emergency response agencies on a variety of topics, including mitigation. SEMA also regularly notifies local governments and school districts about funding opportunities.

**Action 6.1.2:** Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Roads/bridges in need of upgrades
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.1.2
<b>Name of Action or Project:</b>	Structuring grant proposals to meet mitigation needs.
<b>Action or Project Description:</b>	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$3,500 - \$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City/County Engineers, Phelps County Commission, city councils of Doolittle, Edgar Springs, Newburg, Rolla and St. James, Local Grant Writers
<b>Action/Project Priority:</b>	24 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, strategic plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Phelps County's policy is to try to incorporate upgrades in all road and bridge projects. Cities also strive to make mitigation improvements on all road and bridge projects. 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.1.3
<b>Name of Action or Project:</b>	Coordination with state/local/federal agencies to integrate mitigation into economic and community development projects
<b>Action or Project Description:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Phelps County Commission, Mayors of Doolittle, Edgar Springs, Newburg, Rolla and St. James, Local Planners, local economic developers, Community Development organizations, County and city EMDs
<b>Action/Project Priority:</b>	23 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James, St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects among local jurisdictions
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.1.4
<b>Name of Action or Project:</b>	Budgeting for mitigation projects
<b>Action or Project Description:</b>	Encourage local jurisdictions to budget for mitigation projects
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$500 - \$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County & City EMDs, Phelps County Commission, city councils of Doolittle, Edgar Springs, Newburg, Rolla and St. James, school boards of St. James R-I, Newburg R-II, Phelps County R-III and Rolla 31 school districts
<b>Action/Project Priority:</b>	23 - H
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvements plans, comprehensive plans, CEDS, strategic plans, LEOPs
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of cost-share programs with private property owners for hazard mitigations projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.2.1
<b>Name of Action or Project:</b>	Encourage local mitigation cost-share programs
<b>Action or Project Description:</b>	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.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$5,000 - \$500,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Phelps County Commission, city councils of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Action/Project Priority:</b>	14 - M
<b>Timeline for Completion:</b>	5 -10 years to implement and then on-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvement plans, comprehensive plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Some of the communities will work with developers to cost-share projects that deal with storm water run-off. In some situations a community or the county will install a culvert if the individual pays for the culvert to insure that installation is done correctly and the culvert is sized appropriately. This is a program that could benefit from more organized guidelines and focused efforts if additional funding could be secured.

**Action 6.2.2:** Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of public knowledge of the importance/benefit of hazard mitigation projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.2.2
<b>Name of Action or Project:</b>	Public awareness program on benefits of public and private hazard mitigation projects.
<b>Action or Project Description:</b>	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$750 - \$1,750
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County and City EMDS, Phelps County commission, mayors of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Action/Project Priority:</b>	26 - H
<b>Timeline for Completion:</b>	5 years to implement and then on-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, comprehensive plans, capital improvements plans, strategic plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	There has been some progress on this activity. Press releases on the hazard mitigation plan raise awareness. Press releases and activities following the 2013 flood raised awareness of mitigation and activities that local governments as well as private citizens can do to reduce their vulnerabilities to disasters. This activity would benefit from the development and distribution or posting of brochures on hazard mitigation.

**Action 6.3.1:** Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.3.1
<b>Name of Action or Project:</b>	Prioritizing mitigation projects
<b>Action or Project Description:</b>	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$1,500 - \$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County and City EMDs, Local Governments, Local Planners, City/County Engineers, MPC
<b>Action/Project Priority:</b>	25 - H
<b>Timeline for Completion:</b>	On-going – should be periodically reviewed and updated
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

# 5 PLAN MAINTENANCE PROCESS

---

<b>5 PLAN MAINTENANCE PROCESS .....</b>	<b>5.1</b>
<i>5.1 Monitoring, Evaluating, and Updating the Plan.....</i>	<i>5.1</i>
5.1.1 Responsibility for Plan Maintenance .....	5.1
5.1.2 Plan Maintenance Schedule .....	5.2
5.1.3 Plan Maintenance Process.....	5.2
5.2 Incorporation into Existing Planning Mechanisms .....	5.3
5.3 Continued Public Involvement .....	5.6

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

## 5.1 Monitoring, Evaluating, and Updating the Plan

---

**44 CFR Requirement 201.6(c)(4): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.**

### 5.1.1 Responsibility for Plan Maintenance

Periodic revisions and updates of the Plan are required by Missouri SEMA to ensure that the goals and objectives for 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 1.1** below lists the planning mechanisms by jurisdiction into which the Hazard Mitigation Plan will be integrated.

**Table 1.1. Planning Mechanisms Identified for Integration of Hazard Mitigation Plan**

Jurisdiction	Planning Mechanisms
Unincorporated Phelps County	Local Emergency Operations Plan (LEOP) County Mitigation Plan Economic Development Plan Transportation Plan Floodplain Ordinance
Doolittle	County Emergency Operations Plan County Mitigation Plan Transportation Plan Nuisance Ordinance Storm Water Ordinance
Edgar Springs	Builder’s Plan City Emergency Operations Plan County Emergency Operations Plan County Mitigation Plan Transportation Plan Nuisance Ordinance Drainage Ordinance
Newburg	County Emergency Operations Plan Local Mitigation Plan County Mitigation Plan Transportation Plan Building Code Nuisance Ordinance Drainage Ordinance
Rolla	Comprehensive Plan Capital Improvement Plan City Emergency Operations Plan County LEOP Local Mitigation Plan County Mitigation Plan Economic Development Plan

Jurisdiction	Planning Mechanisms
	Transportation Plan Land-Use Plan Flood Mitigation Assistance (FMA) Plan Watershed Plan Zoning Ordinance Building Code Floodplain Ordinance Subdivision Ordinance Nuisance Ordinance Storm Water Ordinance Drainage Ordinance Site Plan Review Requirements Historic Preservation Ordinance Landscape Ordinance
St. James	Comprehensive Plan Capital Improvement Plan County LEOP County Mitigation Plan Transportation Plan Building Code Subdivision Ordinance Tree Trimming Ordinance Nuisance Ordinance Nuisance Ordinance Storm Water Ordinance Drainage Ordinance Site Plan Review Requirements Historic Preservation Ordinance Landscape Ordinance
Phelps Co. R-III	School Emergency Plan Weapons Policy
Newburg R-II	School Emergency Plan Weapons Policy
St. James R-I	Master Plan Capital Improvement School Emergency Plan Weapons Policy
Rolla 31	Master Plan Capital Improvement School Emergency Plan Weapons Policy

Source: Jurisdiction surveys 2015

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.....	6.2
B: Planning Process .....	6.6
C: Completed/Deleted Mitigation Actions.....	6.35
D: Adoption Resolutions .....	6.40
E: Critical/Essential Facilities .....	6.50
F: MDC Wildfire Data Search.....	6.54

## A: References

---

1. American FactFinder, U.S. Dept. of Commerce, United States Census Bureau
2. Missouri Department of Natural Resources, Dam and Reservoir Safety, <http://dnr.mo.gov/env/wrc/dam-safety/statemap.htm>
3. Stanford University's National Performance of Dams Program, <http://npdp.stanford.edu/index.html>
4. National Inventory of Dams, <http://geo.usace.army.mil/>
5. MO DNR Dam & Reservoir Safety Program
6. National Resources Conservation Service, <http://www.nrcs.usda.gov>
7. DamSafetyAction.org, <http://www.damsafetyaction.org/MO/>
8. Maps of effects of drought, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln, <http://www.drought.unl.edu/>
9. Historical drought impacts, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln, <http://droughtreporter.unl.edu/>
10. Recorded low precipitation, NOAA Regional Climate Center, <http://www.hprcc.unl.edu>
11. Water shortages, Missouri's Drought Response Plan, Missouri Department of Natural Resources, <http://dnr.mo.gov/pubs/WR69.pdf>
12. Populations served by groundwater by county, USGS-NWIS, <http://maps.waterdata.usgs.gov/mapper/index.html>
13. Census of Agriculture, [http://www.agcensus.usda.gov/Publications/2012/Full\\_Report/Volume\\_1\\_Chapter\\_2\\_County\\_Level/Missouri/](http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1_Chapter_2_County_Level/Missouri/) & [http://www.agcensus.usda.gov/Publications/2012/Online\\_Resources/County\\_Profiles/Missouri/](http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/)
14. USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
15. Natural Resources Defense Council, <http://www.nrdc.org/globalWarming/watersustainability/>
16. U.S. Seismic Hazard Map, United States Geological Survey, [http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014\\_lg.jpg](http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lg.jpg)

17. 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone map, <http://www.igsb.uiowa.edu/Browse/quakes/quakes.htm>
18. Probability of magnitude 5.0 or greater within 100 Years, United States Geological Survey, <https://geohazards.usgs.gov/eqprob/2009/index.php>
19. National Climatic Data Center, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>
20. Heat Index Chart & typical health impacts from heat, National Weather Service; National Weather Service Heat Index Program, [www.weather.gov/os/heat/index.shtml](http://www.weather.gov/os/heat/index.shtml)
21. 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://www.hprcc.unl.edu/data/historical/index.php?state=ia&action=select_state&submit=Select+State)
22. Hyperthermia mortality, Missouri; Missouri Department of Health and Senior Service, <http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper1.pdf>
23. Hyperthermia mortality by Geographic area, Missouri Department of Health and Senior Services, <http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2.pdf>
24. Missouri Department of Conservation Wildfire Data Search, <http://mdc4.mdc.mo.gov/applications/FireReporting/Report.aspx>
25. Statistics, Missouri Division of Fire Safety
26. National Statistics, US Fire Administration
27. Fire/Rescue Mutual Aid Regions in Missouri
28. Forestry Division of the Missouri Department of Conservation
29. National Fire Incident Reporting System (NFIRS), <http://www.dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.asp>
30. Firewise Missouri, <http://www.firewisemissouri.org/wildfire-in-missouri.html>
31. University of Wisconsin Silvis Lab, [http://silvis.forest.wisc.edu/maps/wui\\_main](http://silvis.forest.wisc.edu/maps/wui_main)
32. Watershed map, Environmental Protection Agency, [http://cfpub.epa.gov/surf/county.cfm?fips\\_code=19169](http://cfpub.epa.gov/surf/county.cfm?fips_code=19169)
33. FEMA Map Service Center, Digital Flood Insurance Rate Maps (DFIRM) for all jurisdictions, if available, <http://msc.fema.gov/portal>
34. NFIP Community Status Book, <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book>

35. NFIP claims status, BureauNet, <http://bsa.nfipstat.fema.gov/reports/reports.html>
36. Flood Insurance Administration—Repetitive Loss List
37. National Climatic Data Center, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>
38. USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
39. Missouri Department of Natural Resources, <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>
40. <http://www.businessinsider.com/where-youll-be-swallowed-by-a-sinkhole-2013-3>
41. <http://water.usgs.gov/edu/sinkholes.html>
42. <http://pubs.usgs.gov/fs/2007/3060/>
43. FEMA 320, Taking Shelter from the Storm, 3rd edition, [http://www.weather.gov/media/bis/FEMA\\_SafeRoom.pdf](http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf)
44. Lightning Map, National Weather Service, [http://www.lightningsafety.noaa.gov/stats/08\\_Vaisala\\_NLDN\\_Poster.pdf](http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf)
45. Death and injury statistics from lightning strikes, National Weather Service.
46. Wind Zones in the U.S. map, FEMA, [http://www.fema.gov/plan/prevent/saferoom/tsfs02\\_wind\\_zones.shtm](http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm)
47. Annual Windstorm Probability (65+knots) map U.S. 1980-1994, NSSL, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bigwind.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif)
48. Hailstorm intensity scale, The Tornado and Storm Research Organization (TORRO), <http://www.torro.org.uk/site/hscale.php>
49. NCDC data
50. USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
51. National Severe Storms Laboratory – hail map, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bighail.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif)
52. Enhanced F Scale for Tornado Damage, NWS, [www.spc.noaa.gov/faq/tornado/ef-scale.html](http://www.spc.noaa.gov/faq/tornado/ef-scale.html)
53. Enhanced Fujita Scale's damage indicators and degrees of damage table, NOAA Storm Prediction Center, [www.spc.noaa.gov/efscale/ef-scale.html](http://www.spc.noaa.gov/efscale/ef-scale.html)

54. Tornado Activity in the U.S. map (1950-2006), FEMA 320, Taking Shelter from the Storm, 3rd edition;
55. Tornado Alley in the U.S. map, <http://www.tornadochaser.net/tornalley.html>
56. Enhanced Fujita Scale, [www.spc.noaa.gov/efscale/ef-scale.html](http://www.spc.noaa.gov/efscale/ef-scale.html)
57. National Climatic Data Center, <http://www.ncdc.noaa.gov/stormevents/>
58. Tornado History Project, map of tornado events, <http://www.tornadohistoryproject.com/tornado/Missouri>
59. Wind chill chart, National Weather Service, <http://www.nws.noaa.gov/om/winter/windchill.shtml>
60. 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>
61. USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
62. National Climatic Data Center, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>

## B: Planning Process

---

### HMPC Mailing list

Randy Verkamp  
Presiding Commissioner  
200 N. Main Street  
Rolla, MO 65401

Rick Lisenbe  
Sheriff  
200 N. Main Street  
Rolla, MO 65401

John Butz  
City Administrator  
P.O. Box 979  
Rolla, MO 65401

Robert Williams  
FireChief  
P.O. Box 979  
Rolla, MO 65401

Scott Caron  
Parks & Recreation Director  
P.O. Box 979  
Rolla, MO 65401

Paul Smith  
Doolittle Mayor  
380 Eisenhower  
Doolittle, MO 65401

David Simpson  
Water/Sewer Superintendent  
P.O. Drawer K  
Newburg, MO 65550

Chrissy Crider  
Newburg EMD  
P.O. Drawer K  
Newburg, MO 65550

Phil Scuggs  
Edgar Springs Mayor  
P.O. Box 13  
Edgar Springs, MO 65462

James Poucher  
Newburg Mayor  
P.O. Drawer K  
Newburg, MO 65550

Gary Hicks  
Associate Commissioner  
200 N. Main Street  
Rolla, MO 65401

Sandy North  
Phelps County EMD  
200 N. Main Street  
Rolla, MO 65401

John Petersen  
Community Development Director  
P.O. Box 979  
Rolla, MO 65401

Steve Hargis  
Public Works Director  
P.O. Box 979  
Rolla, MO 65401

Brady Wilson  
Director of Environ. Serv.  
P.O. Box 979  
Rolla, MO 65401

William S. Jones  
Police Chief  
380 Eisenhower  
Doolittle, MO 65401

Electric Superintendent  
P.O. Drawer K  
Newburg, MO 65550

Dennis Wilson  
St. James Mayor  
100 S. Jefferson  
St. James, MO 65559

Kody Lucas  
Chief of Police  
P.O. Box 13  
Edgar Springs, MO 65462

Kris Finch  
Police Chief  
P.O. Drawer K  
Newburg, MO 65550

Larry Stratman  
Associate Commissioner  
200 N. Main Street  
Rolla, MO 65401

Louis J. Magdits, IV  
Rolla Mayor  
P.O. Box 979  
Rolla, MO 65401

Rick Williams  
Chief of Police  
P.O. Box 979  
Rolla, MO 65401

Rodney Bourne  
Rolla Municipal Utilities GM  
P.O. Box 979  
Rolla, MO 65401

Rick Williams  
Rolla EMD  
P.O. Box 979  
Rolla, MO 65401

Travis Gray  
Superintendent  
380 Eisenhower  
Doolittle, MO 65401

Danny Hamilton  
Street Superintendent  
P.O. Drawer K  
Newburg, MO 65550

Ron Jones  
Police Chief  
100 S. Jefferson  
St. James, MO 65559

Everett Perkins  
Superintendent Water  
P.O. Box 13  
Edgar Springs, MO 65462

Jeff Davis  
Fire Chief  
100 S. Jefferson  
St. James, MO 65559

Bruce Parton  
Fire Chief/EMD  
100 S. Jefferson  
St. James, MO 65559

John Edgar  
Street Supervisor  
100 S. Jefferson  
St. James, MO 65559

John Westerman  
Newburg R-11  
P.O. Box C  
Newburg, MO 65550

Gary Fulks  
Sho-Me Power Cooperative  
P.O. Box D  
Marshfield, MO 65706

Fidelity Communications  
64 North Clark St.  
Sullivan, MO 63080

Gregory Stratman  
Webster University/Rolla Metro.  
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

Dave N. Wakeman  
AMEREN UE  
P.O. Box 1558  
Jefferson City, MO 65102

Chris Mueller  
Centurytel  
P.O. Box 158  
St. James, MO 65559

Mike Licklider  
Utilities Superintendent  
100 S. Jefferson  
St. James, MO 65559

Clay Coffman  
Parks & Recreation Director  
100 S. Jefferson  
St. James, MO 65559

Sherry Heavin  
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

Marylarussi  
Drury University  
1034 S. Bishop Ave  
Rolla, MO 65401

Kimberly Bonine  
Columbia College  
500 Blue's Lake Parkway  
Rolla, MO 65401

Cedar Knoll Home  
13635 State Rt. V  
St. James, MO 65559

Tom Werdenhouse  
Three Rivers Electric Cooperative  
P.O. Box 918  
Linn, MO 65051

Dave Griffith  
American Red  
431 E. McCarty  
Jefferson City, MO 65101

Administrator  
St. Johns Clinic  
1605 Martin Springs Drive  
Rolla, Mo 65401

Joy Tucker  
St. James R-1  
122 East Scioto Street  
St. James, MO 65559

Dr. Aaron Zalis  
Rolla 31  
500A Forum Drive  
Rolla, MO 65401

Todd Preston  
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

Heritage Park Skilled Care  
1200 McDutchen Rd  
Rolla, MO 65401

Lea's Haven  
803 E. 12th Street  
Rolla, MO 65401

Parkside Assisted Living  
1700 E. 10th Street Rolla,  
MO 65401

Presbyterian Manor  
1200 Homelife Plaza  
Rolla, MO 65401

Rolla Manor Care  
1800 White Columns Dr.  
Rolla, MO 65401

Rosewood Residential Care  
10880 Hanley Dr.  
Rolla, MO 65401

St. James Nursing Center  
P.O. Box 69  
St. James, MO 65559

Administrator  
Boys & Girls Town of Missouri  
P.O. Box 189  
St. James, MO 65559

Missouri State Highway Patrol  
P.O. Box 128  
Rolla, MO 65401

Jeff Faulkner  
BNSF Railway  
508 E. Main St  
Cuba, MO 65453

All Star Gas  
12055 County Rd. 3110  
Rolla, MO 65401

Carol Daniels  
City Clerk  
P.O. Box 979  
Rolla, MO 65402

Leo Pelek  
Ferrellgas  
602 E. 18th Street  
Rolla, MO 65401

Linda Hanrahan  
St. James Ambulance  
P.O. Box 296  
St. James, MO 65559

Forest Supervisors Office  
Mark Twain National Forest  
401 Fairgrounds Rd.  
Rolla, MO 65401

Missouri Department of Conservation  
12655 State Rt. Y  
Rolla, MO 65401

Preston Kramer  
MoDOT  
17855 Hwy B  
St. James, MO 65559

Poe's Gas  
P.O. Box 28  
Rolla, MO 65401

Dr. Brad Frazier  
Walmart Distribution Center  
1100 Matlock Dr.  
St. James, MO 65559

David Wallen  
Missouri Pipeline & Missouri Gas  
110 Algana Court  
St. Peters, MO 63376

Commanding Officer  
MONG Amory  
201 Fairgrounds Rd  
Rolla, MO 65401

Della Bishop  
City Clerk  
380 Eisenhower  
Doolittle, MO 65401

Paula James  
City Administrator  
P.O. Box 13  
Edgar Springs

Pamela Grow  
Phelps County Clerk  
200 N. Main Street  
Rolla, MO 65401

Sarah Wheeler  
City Clerk  
100 S. Jefferson  
St. James, MO 65559

Phillis Harris  
City Clerk  
P.O. Drawer K  
Newburg, MO 65550

Philip Iman  
American Red  
431 E. McCarty  
Jefferson City, MO 65101

Gary Koegeboehn  
NUSTAR Pipeline  
7340 W. 21<sup>st</sup> N, Ste. 200  
Wichita, KS 67205

For immediate release  
March 4, 2015

For more information, contact  
Tammy Snodgrass at (573) 265-2993

### **Public meeting scheduled for Phelps County Hazard Mitigation Plan update**

ST JAMES-City and County officials, school leaders, emergency management agencies and interested residents are invited to attend a public meeting March 10 to discuss updates to the Phelps County Hazard Mitigation Plan.

The meeting will be held at the Phelps County Courthouse at 10 a.m.

The county must have an approved hazard mitigation plan in order for Phelps County schools, cities, agencies and others to access state hazard mitigation grant funds. The plan includes an assessment of natural hazards, showcases past accomplishments and sets goals and action items to reduce the impact of natural hazards in the future.

Meramec Regional Planning Commission (MRPC) is updating the plan in partnership with the Phelps County Commission. Questions may be directed to MRPC Assistant Director Tammy Snodgrass at [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org) or 573-265-2993.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. A professional staff of 20, directed by the MRPC board, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at [www.meramecregion.org](http://www.meramecregion.org) or on Facebook at [www.facebook.com/meramecregion](http://www.facebook.com/meramecregion).

## MEMORANDUM

TO: Phelps County Hazard Mitigation Planning Committee

FROM: Tammy Snodgrass, MRPC Environmental Programs Manager/Assistant Director

DATE: February 20, 2015

SUBJECT: Hazard mitigation planning meeting March 10, 2015

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 an approved, updated hazard mitigation plan to SEMA and FEMA by the end of this year in order to continue to be eligible for some hazard mitigation grants, so it is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

**A meeting of the Phelps County hazard mitigation planning committee is scheduled for Tuesday, March 10 at 10:00 a.m. in the multi-purpose room of the Phelps County Courthouse in Rolla.**

The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. This can include activities such as improvements to roads and bridges that were prone to flooding, new programs that have reduced risk to residents and/or businesses and new tornado shelters that have been constructed in the past five years

As the county, each city and school district will be asked to formally approve and adopt the 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 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, or via e-mail: [tsnodgrass@merameregion.org](mailto:tsnodgrass@merameregion.org). I look forward to seeing you at the meeting.

TS

**Advisory Committee Meeting  
Phelps County Hazard Mitigation Plan Update**

**AGENDA**

**10:00 a.m. ~ March 10, 2015**

**Phelps County Courthouse Multi-purpose Room**

- I. Welcome and Introductions – Tammy Snodgrass**
  
- II. Overview of Hazard Mitigation Planning and Phelps County Hazard Mitigation Plan**  
*Staff will provide an overview of the planning process and a brief review of the existing hazard mitigation plan*
  
- III. Discussion of Goals and Objectives and Progress Made in Five Years**  
*Staff will lead the review of existing goals and a group discussion on what progress has been made in addressing hazard mitigation over the past five years.*
  
- IV. Discussion of Possible Changes to Goals and Action Items for Next Five Years**  
*After reviewing the plan document and looking at what has been accomplished, the group will be asked to discuss if needs have changed and what, if any changes need to be made to goals and action items for the revised plan.*
  
- V. Setting of Date and Time for Next Meeting**
  
- VI. Adjourn**

## NOTICE OF PUBLIC MEETING

Date and time of posting: **March 3, 2:00 p.m.**

Notice is hereby given that the **Phelps County Hazard Mitigation Planning Committee** will meet at 10:00 a.m. on **Thursday, March 10, 2015** at the Phelps County Courthouse located in Rolla, Mo.

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Overview of Hazard Mitigation Planning and Pulaski County Hazard Mitigation Plan
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Discussion of Possible Changes to Goals and Action Items for Next Five Years
- Setting of Date and Time for Next Meeting
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Tammy 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.

Sign In Sheet

Phelps County Hazard Mitigation Plan Review Meeting  
 March 10, 2015 ~ 10:00 a.m.

Name	Representing	Email Address	Phone #	Address
BRUCE FISKE	MSMP	BRUCE.FISKE@MSMP.DPS.MD.GOV	573-368-2345	TROUP I
Randy Vertan	Phelps County	randy.vertan@phelpscounty.mo.gov	573-763-0010	

Name	Representing	Email Address	Phone #	Address
STEVEN CHILDEN	MSPA-I	Steven.Children@mshp. ApS, mo. gov	(573) 868-2345	P.O. Box 128 Rolla, mo 65402
Ree Jones	St. James PD	r.jones@sjpd.co	573-263-5172	260 W. Bankers St. James, MO
Tom Parker	Rolla Municipal Utilities	+parker@rollamunicipal utilities.org	573-364-1572	
Vicki Cason	Rolla Municipal Utilities	vcason@rollamunicipal utilities.org	573-364-1572	P.O. Box 767 Rolla, MO 65402
Amy Herrman	Rolla Public Schools 31	aherrman@rdla.k12.mo.us	573-458-0139	900 Bulldog Run Rolla, MO 65401
Robert Gilbert	Rolla Mayor	Robert.Gilbert@776	202-9867	1800 White Clouds Dr.

## Tammy Snodgrass

---

**From:** Tammy Snodgrass  
**Sent:** Monday, April 27, 2015 9:46 AM  
**To:** Randy Verkamp; gary.hicks@phelpscounty.org; larry.stratman@phelpscounty.org; Pam.grow@phelpscounty.org; James Poucher (newburg.mayor@gmail.com); admin@rollacity.org; John Butz; Jeff Davis; bruce.fiske@mshp.dps.mo.gov; steven.childers@mshp.dps.mo.gov; r.jones@sjpd.co; tparker@rollamunicipalutilities.org; vcason@rollamunicipalutilities.org; aherrman@rolla.k12.mo.us; jwesterman@newburg.k12.mo.us; sguffey@newburg.k12.mo.us; rmudd@newburg.k12.mo.us; sheavin@pcr3.k12.mo.us; azalis@rolla.k12.mo.us; jtucker@stjsschools.org; Kim Shockley; kmccarthy@stjsschools.org; paularayejames@yahoo.com; paulsmith@embarqmail.com  
**Cc:** Lyle Thomas  
**Subject:** Phelps County Hazard Mitigation planning meeting Tuesday, April 28  
**Importance:** High

### Phelps County Jurisdictions and Hazard Mitigation Planning Committee Members:

Just a reminder – the Phelps County Hazard Mitigation planning committee will be meeting tomorrow – Tuesday, April 28<sup>th</sup> at 10:00 a.m. at the Phelps County Courthouse in the first floor meeting room. We will be reviewing the prioritization process and prioritized action items as well as discussing critical infrastructure in the county. We do not expect to hold another planning meeting until the draft plan is ready for review.

It is very important that we have good representation from each of the jurisdictions in the county – including county and city government and school districts. FEMA and SEMA require that all jurisdictions participate in the planning process.

Thank you for your involvement, and if you have any questions, please do not hesitate to contact me.

*Tamara F. Snodgrass*

Environmental Programs Manager/Assistant Director  
Meramec Regional Planning Commission  
4 Industrial Drive  
St. James, MO 65559  
(573) 265-2993  
FAX (573) 265-3550  
[tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org)

Please consider the environment before printing this email.

*MRPC Mission:*

*The mission of MRPC is to enhance the quality of life for residents of the Meramec Region.*

**Advisory Committee Meeting**  
**Phelps County Hazard Mitigation Plan Update**  
**AGENDA**  
**10:00 a.m. ~April 28, 2015**  
**Phelps County Courthouse ~ 1<sup>st</sup> Floor Meeting Room**

**I. Welcome and Introductions – Tammy Snodgrass**

**II. Review of Action Items and Prioritization**

*The committee will be asked to review and prioritize identified action items and determine if any should be removed or added. Prioritization will include STAPLEE and discussion of cost benefit.*

**III. Discussion of and Identification of Critical Facilities**

*Staff will provide a list of critical facilities and ask the committee to review for accuracy and provide input on additions and/or deletions. Staff will also ask the group to assist in providing information on the value of critical infrastructure.*

**IV. Discussion of Planning Process**

*Staff will provide a brief explanation of how the planning process will move forward, including the survey that will be distributed to jurisdictions.*

**V. Adjourn**

## NOTICE OF PUBLIC MEETING

Date and time of posting: April 27, 2015, 10:00 a.m.

Notice is hereby given that the **Pulaski County Hazard Mitigation Stakeholders** will conduct a public meeting at 10:00 a.m. on Tuesday, April 28, 2015 at the Phelps County Court House.

### **Phelps County Hazard Mitigation Plan Update Stakeholders,**

Our first meeting to gather action items for the County Hazard Mitigation Plan update was conducted on March 10. Our next meeting is scheduled for 10:00 a.m. on Tuesday, April 28, 2015 in the 1<sup>st</sup> Floor County Court House meeting room. We will be seeking additional input and prioritize action items. We urge those who represent the county government, municipalities, public works, emergency services, medical and residential care facilities, schools and all other organizations who are faced with the possibility of natural and manmade disasters to actively participate in this second meeting.

Please contact Tammy Snodgrass via email at [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org) or (573)265-2993 if you need further information or have any questions regarding this planning process.

Representatives of the news media may obtain copies of this notice by contacting:

**Lyle Thomas**  
**4 Industrial Drive**  
**St. James, MO 65559**  
**573-265-2993**

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

**Phelps County Hazard Mitigation Plan Review Meeting  
April 28, 2015 ~ 10:00 a.m.**

Name	Representing	Email Address	Phone #	Address
Vicki Cason	Rmu	vcason@rollamunicipalutilities.org	573-364-1572	102 W. 9th P.O. Box 767 Rolla, MO
Rob Stark	MSHP	Robert.Stark@mshpdc.maryland.gov	573-368-2345	Nagami Rd. West P.O. Box 128 Rolla, MO 65462
Jeff Breen	Rolla city fire & rescue	JBreen@rollacity.org	573-364-3989	1490 E 16th Rolla MO 65401

## MEMORANDUM

TO: Phelps County Hazard Mitigation Planning Committee

FROM: Tammy Snodgrass, Assistant Director/Environmental Programs Manager

DATE: May 19, 2015

SUBJECT: Review of Prioritization of Phelps County Hazard Mitigation Action Items

Enclosed please find a copy of the prioritization of hazard mitigation action items that was developed by the Phelps County Hazard Mitigation Planning Committee (HMPC). This list was presented to the HMPC at their April 28<sup>th</sup> meeting. We are sharing the prioritized list to insure that all planning partners have an opportunity to review and provide input.

The attachment includes not only the action items, but a description of the methods used to prioritize the list. The State and Federal Emergency Management agencies (SEMA and FEMA) require that action items be prioritized by using both the STAPLEE method and Cost Benefit Analysis (CBA). The enclosed document includes the scoring criteria. The action items are listed in a table that includes the STAPLEE score, CBA score, numeric score and priority.

What we need planning partners to do is to look at the last two columns of the table. These show the final score and whether the action item is considered a High, Medium or Low priority. We would like you to provide feedback on whether or not you agree with how the action items were prioritized.

It is important that the plan meet the needs of the jurisdictions included in the plan. If you disagree with how one or more items scored, please contact myself or Lyle Thomas and share your thoughts. We can be reached via email at [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org) or [lthomas@meramecregion.org](mailto:lthomas@meramecregion.org) or by phone at (573) 265-2993.

Also enclosed is an in-kind match form. Any time you spend travelling to and from and attending meetings; reviewing materials; or collection information for the hazard mitigation plan update can be used to match the grant funding this planning effort. If we do not document enough in-kind match, the jurisdictions will have to provide additional cash match. Please complete the in-kind form and return it to us at your earliest convenience. Any information disclosed on the form will remain confidential.

Thank you for your time and participation and please let us know if you have any questions.

TS  
Enclosures

## MEMORANDUM

TO: Phelps County Hazard Mitigation Plan Jurisdictions

FROM: Tammy Snodgrass, Assistant Director/Environmental Programs Manager, MRPC

DATE: July 27, 2015

SUBJECT: Survey to update the Phelps County Hazard Mitigation Plan

Enclosed please find a survey and in-kind match form. We are currently updating the Phelps County Natural Hazards Mitigation Plan. The county, including cities and school districts, must maintain an up-to-date plan in order to be eligible for some hazard mitigation grants. These grants can be used to build certified tornado safe rooms as well as upgrade low water crossings or roadways to make them less vulnerable to flooding. The purpose of this plan is to help jurisdictions take steps before a disaster occurs to make their schools and communities less vulnerable to natural hazards such as tornadoes, flooding and winter storms.

Jurisdictions involved in the plan and planning process include Phelps County, the cities located within the county and the school districts. Each jurisdiction will be asked to review and adopt the plan once it is completed. Each jurisdiction is also required to participate in the planning process. Completing and returning this survey is one way that your jurisdiction can meet this requirement.

Also enclosed is an in-kind match form. The project is funded through a grant which requires in-kind match. Any time you spend reviewing the plan, gathering and submitting information or participating in planning meetings can be considered in-kind match. Please complete the form with the survey.

Please return the survey and in-kind match form no later than August 21, 2015. The documents can be faxed to (573) 265-3550; emailed to [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org) or mailed to 4 Industrial Drive, St. James, Mo. 65559.

If you have any questions or concerns, please do not hesitate to contact me at (573) 265-2993 or via email at [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org). Your assistance is greatly appreciated.

TS

Enclosures

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

<b>Figure 4.4 Prioritization of Mitigation Actions</b>		3 = Def YES		1 = Prob NO		2 = Maybe YES		0 = Def NO							
<b>Action No.</b>	<b>Mitigation Actions</b>	<b>S</b>	<b>T</b>	<b>A</b>	<b>P</b>	<b>L</b>	<b>E</b>	<b>E</b>	<b>STAPLEE Total</b>	<b>Losses Avoided (2 pts. Each)</b>	<b>Benefit</b>	<b>Cost</b>	<b>B/C Total</b>	<b>Total</b>	<b>Priority</b>
1.1.1	Implement an education program on personal emergency preparedness that teaches residents how to prepare emergency survival kits with water, blankets, flashlights, etc. and how to shut off their home utilities during emergencies.	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
1.1.3	Provide information to citizens on individual mitigation activities such as building personal shelters and assuring that propane tanks are appropriately tied down.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
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.	3	3	3	3	3	2	3	20	IC, LF, EMCC	6	-1	5	25	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.	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.	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	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.1.8	Develop and disseminate material on FEMA approved tornado safe rooms, available funding, and the importance of designated storm shelters.	3	3	3	3	3	1	3	19	IC, EMCC	4	-5	-1	18	M
1.2.1	Continue to promote use of weather radios by local residents and schools to insure advanced warning about threatening weather.	3	3	3	3	3	3	3	21	IC, EMCC	4	-1	3	24	H
1.2.2	Continue to partner with local radio stations to ensure that appropriate warning of impending disasters is provided to all residents and disseminate press releases and brochures regarding the importance of weather radios.	3	3	3	3	3	3	3	21	IC, EMCC	4	-1	3	24	H
1.2.3	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.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.3.1	Provide information on tree trimming and dead tree removal programs to utility companies and local government.	3	3	3	3	3	2	2	19	IC, PD, LF, EMCC	8	-3	5	24	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
1.3.2	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	Increase availability (if necessary construction) of 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
2.1.1	Continue to encourage a self-inspection program at critical facilities to assure that building infrastructure is earthquake and tornado resistant.	3	2	2	3	3	1	3	17	IC, PD, LF, EMCC	8	-5	3	20	H
2.1.2	Continue to encourage businesses and public entities to develop and implement emergency plans.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-3	5	26	H
2.1.3	Encourage the installation of backup generators for critical infrastructure such as water 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 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 including elevations and buyouts.	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.	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.	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													
		S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
2.3.3	Monitor developments in data availability concerning the impact of 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.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
3.1.1	Distribute SEMA brochures on natural disasters, preparedness and NFIP at public facilities and events.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
3.1.2	Distribute regular press releases from county and city EMD offices concerning hazards, where they strike, frequency, preparedness and how to mitigate.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
3.1.3	Encourage and promote weather spotter classes throughout the county.	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
3.2.1	Provide opportunities through existing meetings (Co. communications, HSOC, MRPC) for EMDs, city/county officials & SEMA to meet and 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
3.3.2	Distribute press releases by cities/county regarding adopted mitigation measures to keep public abreast of changes and/or new regulations.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
3.4.1	Encourage county health department and local Red Cross Chapter to use publicity campaigns that make residents aware of proper measures to take during times of threatening conditions (e.g. drought, heat wave)	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
3.4.2	Publicize county or citywide drills.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
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

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES		1 = Prob NO		2 = Maybe YES		0 = Def NO							
		S	T	A	P	L	E	E	STAPLEE Total	Loss Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
Action No.	Mitigation Actions														
4.1.1	Continue to encourage joint meetings of different organizations/agencies for mitigation related planning.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
4.1.2	Continue to encourage joint training (and drills) between agencies, public and private entities (including schools/businesses).	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
4.1.3	Pool different agency resources to achieve widespread mitigation planning results.	3	2	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
4.1.4	Maintain updated mutual aid agreements between emergency response agencies inside and outside the region.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
4.2.1	Re-evaluate the hazard mitigation plan, merge with other community planning and coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	3	2	2	2	3	1	3	16	IC, PD, LF, EMCC	8	-3	5	21	H
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
5.1.2	Encourage communities to budget for enhanced warning systems by providing information on enhanced warning systems.	3	2	2	3	3	2	3	18	IC, LF, EMCC	6	-3	3	21	H
5.1.3	Encourage all communities to develop stormwater management plans in all new development – both residential and commercial properties.	2	2	1	1	3	1	3	13	PD	2	-5	-3	10	L
5.2.1	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.	1	2	2	1	2	1	3	12	PD, EMCC	4	-5	-1	11	L
5.2.2	Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.	2	2	2	1	2	1	3	13	PD, EMCC	4	-1	3	16	M
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 through public/private partnerships and by encouraging the incorporation of safe rooms into new construction and renovations.	3	3	3	3	3	1	2	18	IC, PD, EMCC	6	-5	1	19	M
6.1.1	Work with SEMA Region I coordinator to learn about new mitigation funding opportunities.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H

<b>Figure 4.4 Prioritization of Mitigation Actions</b>		3 = Def YES		1 = Prob NO		2 = Maybe YES		0 = Def NO							
<b>Action No.</b>	<b>Mitigation Actions</b>	<b>S</b>	<b>T</b>	<b>A</b>	<b>P</b>	<b>L</b>	<b>E</b>	<b>E</b>	<b>STAPLEE Total</b>	<b>Loss Avoided (2 pts. Each)</b>	<b>Benefit</b>	<b>Cost</b>	<b>B/C Total</b>	<b>Total</b>	<b>Priority</b>
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 develop and 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
6.2.2	Implement public awareness program about the benefits of hazard mitigation projects, both public and private through press releases and brochures.	3	3	2	3	3	2	3	19	IC, PD, LF, EMCC	8	-1	7	26	H
6.3.1	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.	3	3	2	2	3	2	3	18	IC, PD, LF, EMCC	8	-1	7	25	H

## HAZARD MITIGATION JURISDICTION SURVEY

\_\_\_\_\_ **Jurisdiction**

\_\_\_\_\_ **Name of Person Completing Survey**

Please answer the following questions and submit the information to MRPC no later than August 7, 2015. We need this information to complete the review and update of the Pulaski County Hazard Mitigation plan. If you have questions or need assistance, please contact Tammy Snodgrass at (573) 265-2993 or via email at [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org). Also enclosed is an in-kind match form. The county must provide in-kind match for this project. Please track the time you spend on this survey, complete the in-kind match form and return it with your survey. Thank you for your assistance.

### List of Buildings and wells with insurance replacement values (listed on property insurance documents):

---

---

---

---

---

---

---

### Questions:

1. Participate in National Flood Insurance Program (NFIP)?  Yes  No
    - a. What year did your community join? \_\_\_\_\_
    - b. Floodplain management ordinance?  Yes  No
    - c. Floodplain manager: \_\_\_\_\_
    - d. Flood Insurance Study?  Yes  No
    - e. Do you maintain Elevation Certificates?  Yes  No
  
  2. Police Department?  Yes  No Located: \_\_\_\_\_
    - a. Number of officers: \_\_\_\_\_
    - b. DARE Officer?  Yes  No
  
    - c. Central Communications Center?  Yes  No  
Located: \_\_\_\_\_
    - d. Backup location?  
\_\_\_\_\_
    - e. 9-1-1 capabilities?  
\_\_\_\_\_
- If no central communications – what does the jurisdiction use for emergency communications? \_\_\_\_\_
-

3. Warning sirens or system(s) in place? Please describe type(s) of systems, numbers of sirens, etc.:

---

---

---

---

a. Who has authority to activate warning systems? \_\_\_\_\_

4. Ambulance service provided by: \_\_\_\_\_

5. Fire Department: City/Rural Volunteer/Fire Protection District ISO Rating: \_\_\_\_/\_\_\_\_

a. Does fire department provide any education/awareness programs? \_\_\_\_ Yes \_\_\_\_ No  
If yes, what kinds of programs?

\_\_\_\_\_

b. Any other programs/training?  
\_\_\_\_\_

6. Building Codes? \_\_\_\_ Yes \_\_\_\_ No What year established? \_\_\_\_\_

a. Who enforces/administers?  
\_\_\_\_\_

b. Any certified inspectors on staff? \_\_\_\_ Yes \_\_\_\_ No How many?  
\_\_\_\_\_

c. Other Codes?  
\_\_\_\_\_

d. Building permits/inspections required? \_\_\_\_ Yes \_\_\_\_ No New and Renovations?  
\_\_\_\_ Yes \_\_\_\_ No

e. Site plan review requirements? \_\_\_\_ Yes \_\_\_\_ No

7. Planning and Zoning Ordinance(s)? \_\_\_\_ Yes \_\_\_\_ No Year established: \_\_\_\_\_

8. Stormwater Management Ordinance(s)? \_\_\_\_ Yes \_\_\_\_ No Year established: \_\_\_\_\_

9. What plans does the jurisdiction have in place?

Economic Development Plan? \_\_\_\_

Emergency Operations Plan? \_\_\_\_

Comprehensive Plan? \_\_\_\_

Infrastructure Plan? \_\_\_\_

Capital Improvements Plan? \_\_\_\_

Others: \_\_\_\_\_

10. Does the jurisdiction have any other plans, ordinances or programs not listed above that are related to emergency management, floodplain or hazard mitigation? Please describe:

---

---

---

---

---

---

---

---

---

**Thank you for completing this survey. Part of the requirement for being a participating jurisdiction on the hazard mitigation plan is to actively participate in the planning process. Providing data and information fulfills the participation requirements.**

**An in-kind match form is also enclosed. Please track any time spent gathering data and completing this survey. Complete the in-kind match form and submit it with the survey to:**

**By mail: Tammy Snodgrass  
MRPC  
4 Industrial Drive  
St. James, Mo. 65559  
By FAX: (573) 265-3550  
By email: [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org)**

**HAZARD MITIGATION JURISDICTION SURVEY**

\_\_\_\_\_ County

\_\_\_\_\_ School District

Please answer the following questions and submit the information to MRPC no later than \_\_\_\_\_. We need this information to complete the review and update of the \_\_\_\_\_ County Hazard Mitigation plan. If you have questions or need assistance, please contact Tammy Snodgrass at (573) 265-2993 or via email at [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org). Also enclosed is an in-kind match form. The county must provide in-kind match for this project. Please track the time you spend on this survey, complete the in-kind match form and return it with your survey. Thank you for your assistance.

**List of Buildings with insurance replacement values (listed on property insurance documents):**

---

---

---

---

---

---

**Questions:**

1. Are any district facilities located in the floodplain? \_\_\_ Yes \_\_\_ No
  - a. Does the school carry flood insurance? \_\_\_ Yes \_\_\_ No
2. Does the school have a DARE officer or similar joint program with the local Police Department? \_\_\_ Yes \_\_\_ No Please describe:

---

3. What warning system(s) are in place? Sirens \_\_\_ Fire Alarms \_\_\_ Automated Phone Messages \_\_\_ Automated Text Messages \_\_\_ Public Address System \_\_\_ Please describe type(s) of system(s):

---

---

---

---

- a. Who has authority to activate warning systems?

---

4. What type of exercises/drills are done to prepare staff and students for emergencies? Please list and indicate frequency of drills:

---

---

---

---

---

---

5. What Fire Department serves the school district?

a. Does the Fire Department provide any education/awareness programs at the school?

Yes  No If "yes", please describe:

---

---

---

---

6. Does the district have a designated crisis planning committee responsible for reviewing and updating the emergency/crisis plan and/or coordinating drills/exercises?  Yes  No Please describe:

---

---

---

7. Does the school have a designated grant writer?  Yes  No If so, who?

---

8. Does the district have a crisis management plan in place?  Yes  No

9. Does the district participate in any state emergency planning programs such as ERIP or similar provided through the State Emergency Management Agency or Office of Homeland Security?

Yes  No If so, please list: \_\_\_\_\_

10. Does the district have *certified* tornado safe rooms?  Yes  No If yes, please list location(s):

---

---

---

---

a. Does the district have sufficient certified tornado safe room capacity for all students and staff?  Yes  No

11. Any other programs/training relative to emergency response provided at or through the school district?

---

---

---

---

---

12. Does the district have any other plans, policies or programs related to emergency/crisis management and/or hazard mitigation not listed above? Please describe:

---

---

---

---

---

---

---

**Thank you for completing this survey. Part of the requirement for being a participating jurisdiction on the hazard mitigation plan is to actively participate in the planning process. Providing data and information fulfills the participation requirements.**

**An in-kind match form is also enclosed. Please track any time spent gathering and/or reviewing data and completing this survey. Complete the in-kind match form and submit it with the survey to:**

**By mail: Tammy Snodgrass  
MRPC  
4 Industrial Drive  
St. James, Mo. 65559  
By FAX: (573) 265-3550  
By email: [tsnodgrass@meramecregion.org](mailto:tsnodgrass@meramecregion.org)**

## MEMORANDUM

TO: Phelps County Hazard Mitigation Plan Jurisdictions

FROM: Ryan Dunwoody, Environmental Programs Specialist, MRPC

DATE: January 04, 2015

SUBJECT: Questionnaire to update the Phelps County Hazard Mitigation Plan

Attached please find a questionnaire and in-kind match form. We are currently updating the Phelps County Natural Hazards Mitigation Plan. The county, including cities and school districts, must maintain an up-to-date plan in order to be eligible for some hazard mitigation grants. These grants can be used to build certified tornado safe rooms as well as upgrade low water crossings or roadways to make them less vulnerable to flooding. The purpose of this plan is to help jurisdictions take steps before a disaster occurs to make their schools and communities less vulnerable to natural hazards such as tornadoes, flooding and winter storms.

It is very important that you complete the attached questionnaire and return it to my office ASAP. We are operating on a schedule and have to submit the plan to SEMA and FEMA for review. We cannot complete the first draft without this information.

Jurisdictions involved in the plan and planning process include Phelps County, the cities located within the county and the school districts. Each jurisdiction will be asked to review and adopt the plan once it is completed. Each jurisdiction is also required to participate in the planning process. Completing and returning this questionnaire is one way that your jurisdiction can meet this requirement.

Also enclosed is an in-kind match form. The project is funded through a grant which requires in-kind match. Any time you spend reviewing the plan, gathering and submitting information or participating in planning meetings can be considered in-kind match. Please complete the form with the questionnaire.

The documents can be faxed to (573) 265-3550; emailed to [rdunwoody@meramecregion.org](mailto:rdunwoody@meramecregion.org) or mailed to 4 Industrial Drive, St. James, Mo. 65559.

If you have any questions or concerns, please do not hesitate to contact me at (573) 265-2993 or via email at [rdunwoody@meramecregion.org](mailto:rdunwoody@meramecregion.org). Your assistance is greatly appreciated.

Ryan Dunwoody

Enclosures

## C: Completed/Deleted Mitigation Actions

Please note: Although none of the action items have been “completed”, many of these activities are on-going and great strides have been made to make mitigation improvements in all of the jurisdictions.

### Action Status Summary

Jurisdiction	Completed Actions	Deleted Actions	Continuing Actions
Phelps County		5.1.3, 5.2.1	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.8, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.5, 2.1.1, 2.1.3, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.3.2, 2.3.3, 3.1.1, 3.1.2, 3.1.3, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.4.1, 3.4.2, 3.4.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.2.2, 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.2.1, 5.2.2, 5.2.3, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.2.1, 6.2.2, 6.3.1,
Doolittle		5.1.3, 5.2.1	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.8, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.3.1, 1.3.3, 1.3.4, 1.3.5, 2.1.1, 2.1.2, 2.1.3, 2.2.1, 2.2.3, 2.3.1, 2.3.2, 2.3.3, 3.1.1, 3.1.2, 3.1.3, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.4.2, 3.4.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.2.2, 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.2.1, 5.2.2, 5.2.3, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.2.1, 6.2.2, 6.3.1,
Edgar Springs		5.1.3, 5.2.1	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.8, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.3.1, 1.3.3, 1.3.4, 1.3.5, 2.1.1, 2.1.2, 2.1.3, 2.2.1, 2.2.2, 2.2.3, 2.3.1, 2.3.2, 2.3.3, 3.1.1, 3.1.2, 3.1.3, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.4.2, 3.4.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.2.2, 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.2.1, 5.2.2, 5.2.3, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.2.1, 6.2.2, 6.3.1,
Newburg		5.1.3, 5.2.1	1.1.1, 1.1.2, 1.1.3, 1.1.4,

Jurisdiction	Completed Actions	Deleted Actions	Continuing Actions
			1.1.8, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.5, 2.1.1, 2.1.2, 2.1.3, 2.2.1, 2.2.2, 2.2.3, 2.3.2, 2.3.3, 3.1.1, 3.1.2, 3.1.3, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.4.2, 3.4.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.2.2, 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.2.1, 5.2.2, 5.2.3, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.2.1, 6.2.2, 6.3.1,
Rolla		5.1.3, 5.2.1	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.8, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.3.1, 1.3.3, 1.3.4, 1.3.5, 2.1.1, 2.1.2, 2.1.3, 2.2.1, 2.2.3, 2.3.2, 2.3.3, 3.1.1, 3.1.2, 3.1.3, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.4.2, 3.4.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.2.2, 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.2.1, 5.2.2, 5.2.3, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.2.1, 6.2.2, 6.3.1,
St. James		5.1.3, 5.2.1	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.8, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.5, 2.1.1, 2.1.2, 2.1.3, 2.2.1, 2.2.3, 2.3.2, 2.3.3, 3.1.1, 3.1.2, 3.1.3, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.4.2, 3.4.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.2.2, 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.2.1, 5.2.2, 5.2.3, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.2.1, 6.2.2, 6.3.1,
St. James R-I			1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.2.2, 1.2.4, 1.3.5, 2.1.1, 2.3.3, 3.3.1, 3.1.3, 3.1.4, 3.3.1, 3.3.2, 4.1.1, 4.1.2, 4.1.3, 4.2.2, 5.1.1, 6.1.1, 6.1.4,
Newburg R-II			1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.2.2, 1.2.4, 1.3.5, 2.1.1, 2.3.3, 3.3.1, 3.1.3, 3.1.4, 3.3.1, 3.3.2, 4.1.1, 4.1.2,

Jurisdiction	Completed Actions	Deleted Actions	Continuing Actions
			4.1.3, 4.2.2, 5.1.1, 6.1.1, 6.1.4,
Phelps County R-III			1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.2.2, 1.2.4, 1.3.5, 2.1.1, 2.3.3, 3.3.1, 3.1.3, 3.1.4, 3.3.1, 3.3.2, 4.1.1, 4.1.2, 4.1.3, 4.2.2, 5.1.1, 6.1.1, 6.1.4,
Rolla 31			1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.2.2, 1.2.4, 1.3.5, 2.1.1, 2.3.3, 3.3.1, 3.1.3, 3.1.4, 3.3.1, 3.3.2, 4.1.1, 4.1.2, 4.1.3, 4.2.2, 5.1.1, 6.1.1, 6.1.4,

**Action 5.1.3:** Encourage all communities to develop storm water management plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with non-existent storm water management plans
<b>Hazard(s) Addressed:</b>	Flood, Severe Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.1.3
<b>Name of Action or Project:</b>	Encourage all communities to develop storm water management plans.
<b>Action or Project Description:</b>	Encourage all communities/jurisdictions to develop storm water management plans.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$800 - \$1,800
<b>Benefits:</b>	Losses avoided by implementing this action include property damages.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Local Planners, Local Governments
<b>Action/Project Priority:</b>	10 - L
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	N/A
<b>Progress Report</b>	
<b>Action Status</b>	<b>Deleted.</b> Three of five communities have storm water ordinances in place. Edgar Springs and Newburg do not currently have the resources to institute or enforce storm water ordinances or plans and this action received a “Low” priority rating.
<b>Report of Progress</b>	Doolittle, Rolla and St. James have storm water ordinances in place. Phelps County is considering adding a stormwater plan requirement to the county subdivision ordinance.

**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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Phelps County, cities of Doolittle, Edgar Springs, Newburg, Rolla and St. James
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with floodplain properties
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.2.1
<b>Name of Action or Project:</b>	Government purchase of properties in the floodplain
<b>Action or Project Description:</b>	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.
<b>Applicable Goal Statement:</b>	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.
<b>Estimated Cost:</b>	\$3,500 - \$500,000
<b>Benefits:</b>	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Local Government, County & City EMDs, Floodplain Managers
<b>Action/Project Priority:</b>	11 - L
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain ordinances
<b>Progress Report</b>	
<b>Action Status</b>	<b>Deleted.</b> This action received a “Low” priority rating and was removed from the list of actions. Floodplain buyouts were done in the Jerome area by Phelps County many years ago but have not been pursued since then.
<b>Report of Progress</b>	N/A

## D: Adoption Resolutions

---

Adoption resolutions have been mailed out to the jurisdictions and will be included in the final draft submitted to FEMA.

RESOLUTION NO. 2016-001

**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

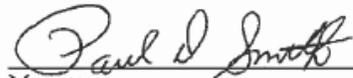
WHEREAS, the Missouri State Emergency Management Agency and Federal Emergency Management Agency officials have reviewed the Phelps County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

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 Board of Aldermen 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.

  
\_\_\_\_\_  
Mayor

5-9-16  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Witness

May 9, 2016  
\_\_\_\_\_  
Date

RESOLUTION NO. 216

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

**WHEREAS**, the City of Edgar Springs 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 Edgar Springs 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 Edgar Springs 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 Edgar Springs 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 Edgar Springs Board of Aldermen 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.

*Kevin Tolson*  
Mayor

5-31-16  
Date

*Francis B. Jackson*  
Witness

5-31-16  
Date

RESOLUTION NO. 275

**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 Board of Aldermen 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.

  
\_\_\_\_\_  
Mayor

4-21-16  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Witness

4-21-16  
\_\_\_\_\_  
Date

RESOLUTION NO. 2016-5-3(2)

**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 fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

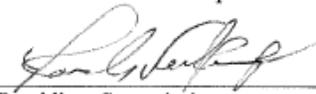
**WHEREAS**, the Missouri State Emergency Management Agency and Federal Emergency Management Agency officials have reviewed the Phelps County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

**WHEREAS**, the 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;

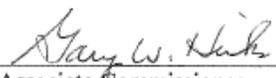
**NOW, THEREFORE BE IT RESOLVED**, that the Phelps County Commission adopts the Phelps County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

  
\_\_\_\_\_  
Presiding Commissioner

5-3-16  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Associate Commissioner

5-3-16  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Associate Commissioner

5-3-16  
\_\_\_\_\_  
Date

RESOLUTION NO. 1858

**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 BY THE CITY COUNCIL OF THE CITY OF ROLLA, MISSOURI, AS FOLLOWS:**

**Section 1:** That the City Council of the City of Rolla, Missouri, 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.

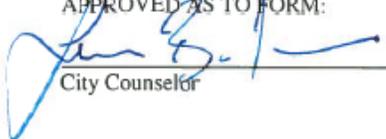
PASSED BY THE CITY COUNCIL OF THE CITY OF ROLLA, MISSOURI AND APPROVED BY THE MAYOR THIS 18<sup>TH</sup> DAY OF APRIL 2016.

ATTEST:

  
\_\_\_\_\_  
City Clerk

APPROVED:   
\_\_\_\_\_  
Mayor

APPROVED AS TO FORM:

  
\_\_\_\_\_  
City Counselor

1858

RESOLUTION NO. 16-247

**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 Board of Aldermen 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.

*Bill White*  
Mayor

3-16-16  
Date

*Dorab Wheeler*  
Witness

3-16-16  
Date

RECEIVED

RESOLUTION NO. 2016-01

MAR 23 2016

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

Meramec RPC  
St. James, MO

WHEREAS, the 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, the Newburg R-II School District fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

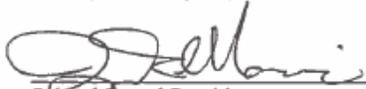
WHEREAS, the Missouri State Emergency Management Agency and Federal Emergency Management Agency officials have reviewed the Phelps County Multi-Jurisdictional Natural Hazards Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

WHEREAS, the 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 the 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 the Newburg R-II School Board of Education 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.

  
\_\_\_\_\_  
School Board President

3/17/16  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Witness

3/17/16  
\_\_\_\_\_  
Date

RESOLUTION NO. 2016-01

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

**WHEREAS**, the 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**, the 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**, the 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 the 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 the Phelps County R-III School Board of Education 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.

Misty House  
School Board President

5-12-16  
Date

Caroline Bradford  
Witness

5-12-16  
Date

RESOLUTION NO. 2016-01

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

**WHEREAS**, the 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**, the 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**, the 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

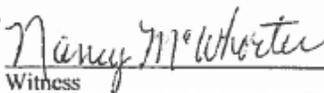
**WHEREAS**, adoption by the governing body of the Rolla 31 School District demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

**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 the Rolla 31 School Board of Education 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.

  
\_\_\_\_\_  
School Board President

5/12/16  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Witness

5/12/16  
\_\_\_\_\_  
Date

RESOLUTION NO. 2016-01

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

**WHEREAS**, the 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**, the 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**, the 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

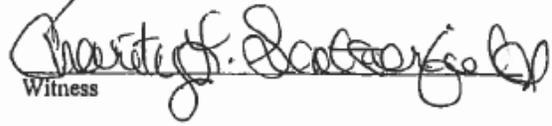
**WHEREAS**, adoption by the governing body of the St. James R-I School District demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

**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 the St. James R-I School Board of Education 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.

  
\_\_\_\_\_  
School Board President

3-17-16  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Witness

3-17-16  
\_\_\_\_\_  
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
<b>Emergency Facilities</b>						
	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.	203 N. Louise	St. James	MO	65559
<b>Fire Department Facilities</b>						
	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
	Newburg	Newburg Volunteer FD	260 Water St.	Newburg	MO	65550
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
<b>Law Enforcement Facilities</b>						
	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

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>Law Enforcement Facilities</b>						
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
	Rolla	University Police, MO S&T	1870 Miner Cir.	Rolla	MO	65401
MO000245	St. James	St. James City Police	200 N. Bourbeuse St.	St. James	MO	65559
<b>Medical Facilities</b>						
	Phelps County	Phelps Cnty. Reg. Medical Center	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	416 S. Bishop Ave.	Rolla	MO	65401
	Rolla	Pcrmc Medical Group, Inc.	1050 W. Tenth St.	Rolla	MO	65401
	Rolla	St. John's Hospital - Lebanon, Outpatient Surgery Center	1605 Martin Springs Dr.	Rolla	MO	65401
	Rolla	St. John's Clinic - Rolla Family Medicine	1605 Martin Springs Dr., Ste. 230	Rolla	MO	65401
	Rolla	St. John's Clinic - Rolla Pediatrics	1605 Martin Springs Dr., Ste. 250	Rolla	MO	65401
	St. James	Forest City Family Practice	1000 N. Jefferson	St. James	MO	65559
	St. James	St. John's Clinic	107 W Eldon St.	St. James	MO	65559
<b>School Facilities</b>						
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.	104 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
MO001525	Rolla	Rolla Lutheran School	807 W. 11th St.	Rolla	MO	65401
MO001628	Rolla	St. Patrick Elem. School	19 St. Patrick Ln.	Rolla	MO	65401

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>School Facilities</b>						
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
MO001627	St. James	Boys Town of Missouri, Inc.	13160 CR. 3610	St. James	MO	65559
MO002151	St. James	St. James High	101 E. Scioto	St. James	MO	65559
<b>Childcare Facilities</b>						
	Rolla	Mickelson, Kristina Lynn	11075 Woodale Dr.	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	Creative Kids Learning Center	1412 Heller St.	Rolla	MO	65401
	Rolla	Campbell, Peggy Joe	1608 Spencer St.	Rolla	MO	65401
	Rolla	Presbyterian Preschool	919 E. Tenth St.	Rolla	MO	65401
	Rolla	First Baptist Church Child Care Center	801 N. Cedar St.	Rolla	MO	65401
	Rolla	Rosey Cozey Cottage Daycare, LLC	601 E 5th 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	Deb's Babies & Tots	204 N. Cedar St.	Rolla	MO	65401
	Rolla	Ahearn, Katie	806 Cambridge Dr.	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	Hope Preschool and Child Care Center	102 N Rucker	Rolla	MO	65401
	Rolla	First United Methodist Church Preschool	804 Main St.	Rolla	MO	65401

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>Childcare Facilities</b>						
	Rolla	Tender Hearts Preschool Academy, LLC	11697 CR. 8030	Rolla	MO	65401
	St. James	Creative Play Learning Center on Morgan's Mountain	19410 CR. 3620	St. James	MO	65559
	St. James	Mel Carnahan Family Learning Cntr. Of Phelps County	220 E. Scioto St.	St. James	MO	65559
	St. James	The Kiddie Korral	116 N. Seymour St.	St. James	MO	65559
	St. James	Wools, Mary Beth	319 N. Seymour St.	St. James	MO	65559
	St. James	Perona, Loretta Sue	323 Winter Dr.	St. James	MO	65559
	St. James	Ms. Deannas Preschool All Day Program	200 W. Hardy St.	St. James	MO	65559
	St. James	St. John Lutheran Early Childhood Cntr.	229 W. James Blvd.	St. James	MO	65559
	St. James	St. James Head Start Center	1518 Lola Ln.	St. James	MO	65559
<b>Nursing Homes</b>						
	Rolla	Choices For People Adult Day Care	1815 Forum 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	Heritage Park Skilled Care	1200 McCutchen Dr.	Rolla	MO	65401
	Rolla	Meramec Sunrise Assisted Living Facility	803 E. 12th St.	Rolla	MO	65401
	Rolla	Rolla Manor Care Center	1800 White Columns Dr.	Rolla	MO	65401
	St. James	Golden 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



3/12/2005 15:59	Phelps	Rolla	Ozark	Miscellaneous	3	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
3/12/2005 17:14	Phelps	Rolla	Ozark	Miscellaneous	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
3/13/2005 11:26	Phelps	Rolla	Ozark	Debris	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
3/14/2005 15:51	Phelps	Rolla	Ozark	Unknown	2	0	1	0	0	1	0	0	0	wagon	Primary Re ROLLA RFPA INC
3/17/2005 10:29	Phelps	St. James	Ozark	Debris	0.25	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/17/2005 10:58	Phelps	St. James	Ozark	Debris	2	0	0	0	0	3	0	0	0	wagon	Primary Re ST JAMES RFD
3/17/2005 23:00	Phelps	Seaton	Ozark	Miscellaneous	23	0	0	0	0	0	0	0	0	wagon	Mutual Aid ROLLA FORESTRY
3/18/2005 10:28	Phelps	Cook Station	Ozark	Debris	35	0	0	0	1	1	0	0	0	wagon	Mutual Aid ST JAMES RFD
3/20/2005 13:20	Phelps	St. James	Ozark	Debris	0.5	0	0	0	0	1	0	0	0	wagon	Primary Re ST JAMES RFD
3/29/2005 9:21	Phelps	Rolla	Ozark	Debris	10	0	0	0	1	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
3/29/2005 11:00	Phelps	428 Pike Rd.	Ozark	Debris	60	0	0	0	0	0	0	0	0	carrol	Primary Re MIDDLETOWN CFA
3/29/2005 11:10	Phelps	St. James	Ozark	Debris	8	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/29/2005 11:12	Phelps	Rolla	Ozark	Unknown	30	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
3/29/2005 11:13	Phelps	Rolla	Ozark	Arson	50	0	0	0	0	0	0	0	0	halb	Mutual Aid ROLLA FORESTRY
3/29/2005 11:52	Phelps	St. James	Ozark	Debris	8	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/29/2005 13:05	Phelps	Rolla	Ozark	Debris	3	0	0	0	1	0	0	0	0	wagon	Primary Re ROLLA FORESTRY
3/30/2005 10:24	Phelps	Edgar Springs	Ozark	Debris	450	0	0	0	30	20	0	2	4	halb	Mutual Aid ROLLA FORESTRY
3/30/2005 13:19	Phelps	Rolla	Ozark	Unknown	500	0	0	0	2	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
3/30/2005 14:53	Phelps	St. James	Ozark	Unknown	0.5	0	0	0	0	0	0	0	0	wagon	Mutual Aid ST JAMES RFD
3/31/2005 14:45	Phelps	Rolla	Ozark	Debris	99	0	0	0	0	0	0	0	0	halb	Primary Re ROLLA FORESTRY
3/31/2005 15:33	Phelps	St. James	Ozark	Unknown	0.25	0	0	0	0	1	0	0	0	wagon	Primary Re ST JAMES RFD
4/3/2005 11:50	Phelps	Dixon	Ozark	Debris	2	0	0	0	0	0	0	0	0	wagon	Primary Re DIXON RFD
4/3/2005 14:22	Phelps	Rolla	Ozark	Miscellaneous	8	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
4/3/2005 19:30	Phelps	Hwy K	Ozark	Arson	4	0	0	0	0	0	0	0	0	carrol	Primary Re MIDDLETOWN CFA
4/18/2005 15:54	Phelps	Rolla	Ozark	Unknown	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
11/12/2005 5:19	Phelps	Rolla	Ozark	Miscellaneous	10	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
11/12/2005 5:30	Phelps	ROLLA	Ozark	Arson	23	0	0	0	0	0	0	0	0	halb	Mutual Aid ROLLA FORESTRY
11/12/2005 14:20	Phelps	ROLLA	Ozark	Arson	6	0	0	0	1	0	0	0	0	halb	Mutual Aid ROLLA FORESTRY
11/19/2005 15:58	Phelps	Rolla	Ozark	Debris	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
11/23/2005 16:00	Phelps	Rolla	Ozark	Miscellaneous	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
1/15/2006 11:23	Phelps	St. James	Ozark	Miscellaneous	0.1	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
1/15/2006 14:36	Phelps	St. James	Ozark	Debris	1	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
1/18/2006 16:51	Phelps	Rolla	Ozark	Miscellaneous	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
1/19/2006 15:38	Phelps	St. James	Ozark	Not Report	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
1/25/2006 18:43	Phelps	Rolla	Ozark	Unknown	2	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
1/25/2006 18:43	Phelps	Rolla	Ozark	Unknown	2	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
1/26/2006 15:27	Phelps	Newburg	Ozark	Debris	10	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
1/27/2006 16:06	Phelps	St. James	Ozark	Debris	1.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
2/14/2006 0:00	Phelps	Rolla	Ozark	Debris	1	0	0	0	0	0	0	0	1	wagon	Primary Re ROLLA RFPA INC
2/14/2006 12:34	Phelps	Rolla	Ozark	Debris	2	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
2/14/2006 12:53	Phelps	St. James	Ozark	Debris	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
2/19/2006 22:56	Phelps	Rolla	Ozark	Unknown	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
2/23/2006 12:58	Phelps	Rosati	Ozark	Debris	2	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
2/23/2006 13:04	Phelps	Rolla	Ozark	Miscellaneous	0.25	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
2/23/2006 13:06	Phelps	Rolla	Ozark	Equipment	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
2/24/2006 19:40	Phelps	St. James	Ozark	Debris	1	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
2/27/2006 10:32	Phelps	St. James	Ozark	Unknown	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/7/2006 18:31	Phelps	Rolla	Ozark	Unknown	2	0	0	0	0	0	1	0	0	Guest	Primary Re ROLLA RFPA INC
3/14/2006 15:19	Phelps	St. James	Ozark	Debris	0.25	0	0	0	0	0	1	0	0	wagon	Primary Re ST JAMES RFD
3/16/2006 9:37	Phelps	Rolla	Ozark	Debris	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
3/19/2006 18:37	Phelps	Rolla	Ozark	Unknown	0.1	0	0	0	0	0	0	0	0	Guest	Primary Re ROLLA RFPA INC
3/23/2006 11:53	Phelps	Rolla	Ozark	Debris	1	0	0	0	0	0	0	0	0	Guest	Primary Re ROLLA RFPA INC
3/26/2006 9:49	Phelps	Royal	Ozark	Debris	3	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/26/2006 12:28	Phelps	Rolla	Ozark	Debris	1	0	0	0	0	0	0	0	0	Guest	Primary Re ROLLA RFPA INC
3/26/2006 20:44	Phelps	Rolla	Ozark	Miscellaneous	0.75	0	0	0	0	0	0	0	0	Guest	Primary Re ROLLA RFPA INC
3/30/2006 11:35	Phelps	St. James	Ozark	Debris	1	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/31/2006 13:38	Phelps	Royal	Ozark	Debris	3	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
4/1/2006 14:00	Phelps	Rolla	Ozark	Miscellaneous	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
4/4/2006 16:46	Phelps	Cold Springs west	Ozark	Unknown	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
4/13/2006 12:50	Phelps	Rolla	Ozark	Miscellaneous	0.2	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
6/2/2006 13:40	Phelps	Rolla	Ozark	Debris	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
7/2/2006 15:12	Phelps	Rolla	Ozark	Unknown	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
7/2/2006 15:32	Phelps	Rolla	Ozark	Unknown	1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
7/9/2006 10:58	Phelps	Rolla	Ozark	Unknown	0.1	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
7/29/2006 14:10	Phelps	St. James	Ozark	Unknown	0.05	0	0	0	1	0	0	0	0	wagon	Mutual Aid VICHY VFPA
8/5/2006 18:20	Phelps	Rolla	Ozark	Debris	0.05	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
8/8/2006 16:30	Phelps	Rolla	Ozark	Lightning	89	0	0	0	0	0	0	0	0	JonesT	Mutual Aid ROLLA FORESTRY
8/8/2006 16:30	Phelps	Doolittle	Ozark	Unknown	200	0	0	0	0	0	0	0	0	wagon	Mutual Aid VICHY VFPA
11/21/2006 11:19	Phelps	Rolla	Ozark	Miscellaneous	0.25	0	0	0	0	0	0	0	0	wagon	Primary Re ROLLA RFPA INC
1/26/2007 13:01	Phelps	St. James	Ozark	Unknown	4	0	0	0	0	1	0	0	0	wagon	Primary Re ST JAMES RFD
2/10/2007 13:39	Phelps	St. James	Ozark	Unknown	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
2/23/2007 15:40	Phelps	Rolla	Ozark	Debris	50	0	0	0	5	2	0	0	0	halb	Mutual Aid ROLLA FORESTRY
2/23/2007 19:02	Phelps	St. James	Ozark	Unknown	2	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/4/2007 21:19	Phelps	St. James	Ozark	Unknown	0.25	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/5/2007 14:55	Phelps	Rolla	Ozark	Not Report	25	0	0	0	2	1	0	0	0	halb	Mutual Aid ROLLA FORESTRY
3/6/2007 14:50	Phelps	Rosati	Ozark	Debris	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/10/2007 13:49	Phelps	St. James	Ozark	Debris	1.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/10/2007 14:50	Phelps	St. James	Ozark	Debris	2	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/11/2007 3:26	Phelps	St. James	Ozark	Camptire	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
3/21/2007 17:11	Phelps	St. James	Ozark	Debris	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
4/9/2007 18:19	Phelps	St. James	Ozark	Debris	0.25	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
4/19/2007 16:20	Phelps	St. James	Ozark	Debris	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
4/20/2007 12:48	Phelps	St. James	Ozark	Debris	0.25	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
4/22/2007 13:05	Phelps	St. James	Ozark	Debris	0.5	0	0	0	0	0	0	0	0	wagon	Primary Re ST JAMES RFD
8/15/2007 17:00	Phelps	Rolla	Ozark	Debris	20	0	0	0	0	0	0	0	0	gallid	Mutual Aid ROLLA FORESTRY
1/3/2008 17:07	Phelps	Rolla	Ozark	Miscellaneous	0.5	0	0	0	1	0	0	0	0	rolrfrd	Primary Re ROLLA RFPA INC
1/4/2008 1:11	Phelps	Rolla	Ozark	Unknown	0.5	0	0	0	0	0	0	0	0	rolrfrd	Primary Re ROLLA RFPA INC
1/7/2008 12:03	Phelps	Rolla	Ozark	Miscellaneous	0.5	0	0	0	2	1	0	0	0	rolrfrd	Primary Re ROLLA RFPA INC
1/20/2008 15:30	Phelps	ROLLA	Ozark	Camptire	25	0	0	0	0	0	0	0	0	rolrfrd	Primary Re ROLLA RFPA INC
3/2/2008 14:15	Phelps	Edgar Springs	Ozark	Miscellaneous	120	0	0	0	0	0	0	0	0	JonesT	Mutual Aid ROLLA FORESTRY
3/2/2008 14:20	Phelps	Rolla	Ozark	Debris	22	0	0	0	1	2	0	0	0	gallid	Mutual Aid ROLLA FORESTRY
3/2/2008 14:30	Phelps	Rolla	Ozark	Unknown	700	0	0	0	0	0	0	0	0	steelfd	Mutual Aid STEELVILLE FPD
3/2/2008 14:30	Phelps	ROLLA	Ozark	Not Report	320	0	0	0	0	0	0	0	0	cutbfd	Mutual Aid CUBA CFO
3/12/2008 15:00	Phelps	Rolla	Ozark	Unknown	100	0	0	0	0	0	0	0	0	steelfd	Mutual Aid STEELVILLE FPD
3/13/2008 12:57	Phelps	Rolla	Ozark	Debris	2	0	0	0	0	0	0	0	0	gallid	Primary Re ROLLA FORESTRY
3/25/2008 17:30	Phelps	Edgar Springs	Ozark	Arson	110	0	0	0	2	0	0	0	0	halb	Mutual Aid ROLLA FORESTRY
1/2/2009 20:20	Phelps	Rolla	Ozark	Miscellaneous	1	0	0	0	0	0	0	0	0	rolrfrd	Primary Re ROLLA RFPA INC
1/9/2009															



