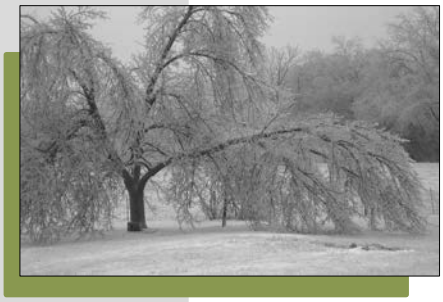
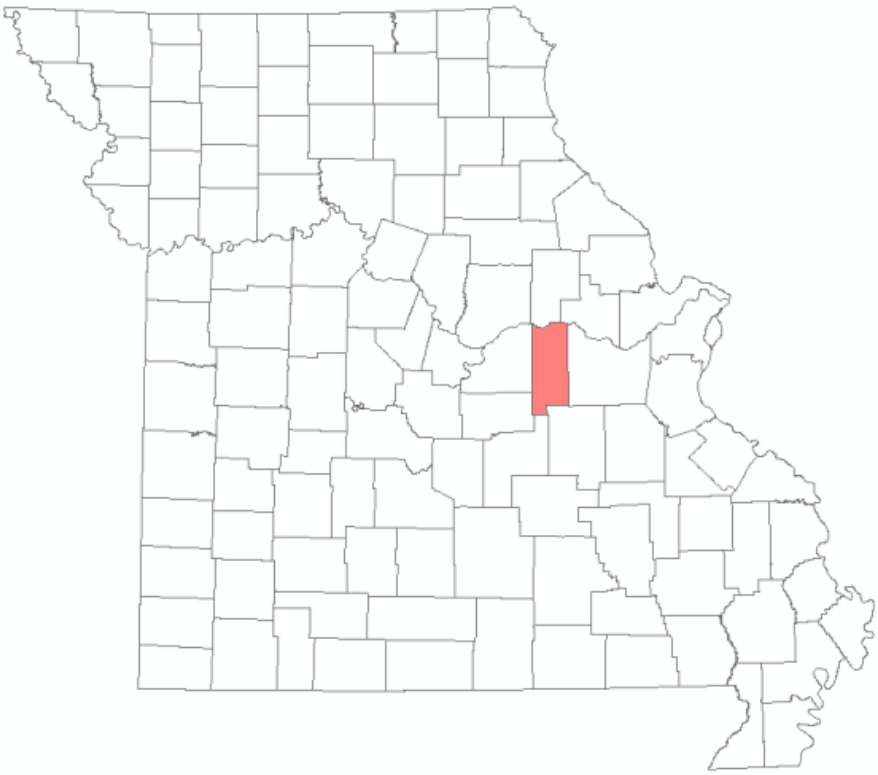


Gasconade County Multi-Jurisdiction Natural Hazard Mitigation Plan



Meramec Regional Planning Commission • November 2016

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Phone: (573) 265-2993

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CONTRIBUTORS

Gasconade County Hazard Mitigation Planning Committee

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

Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Organization
Larry Miskel	Presiding Commissioner	County	Gasconade County
Jerry Lairmore	Associate Commissioner	County	Gasconade County
James Holland	Associate Commissioner	County	Gasconade County
Lesa Lietzow	County Clerk	County	Gasconade County
Randy Esphorst	Sherriff	Sherriff's Dept.	Gasconade County
Kris Bayless	EMD	Emergency Management	Gasconade County
Gasconade Co. Road Dept.	-	Road Dept.	Gasconade County
Fay Owsley	Public Administrator	County	Gasconade County
Ronald Shafferkoetter	Mayor	City Admin.	Bland
Rachel Anderson	City Clerk	City Amin.	Bland
Tom Dodson	City Marshall	Law Enforcement	Bland
Rodney Turner	Street and Water Super.	City	Bland
Fire Chief	Fire Chief	Fire Dept.	Bland
Chief of Police	Chief of Police	Police Dept.	Gasconade
Kelly Head	Mayor	City Admin.	Gasconade
Morris Pearle	City Clerk	City Admin.	Gasconade
Public Works	-	Public Works	Gasconade
Tom Shabel	Mayor	City Admin.	Hermann
Patricia Heaney	City Clerk	City Admin.	Hermann
Mark Wallace	City Administrator	City Admin.	Hermann
Marlon Walker	Police Chief	Police Dept.	Hermann
Fire Chief	Fire Chief	City	Hermann
Wayne Bruckerhoff	-	Public Works	Hermann
Sam Birk	Mayor	City Admin.	Morrison
Beth Nolte	City Clerk	City Admin.	Morrison
Clifford Rost	Fire Chief	Fire Dept.	Morrison
Delmar Mitchen	-	City and Water	Morrison
John Kamler	Mayor	City Admin.	Owensville
Bobbi Limberg	City Clerk	City Admin.	Owensville
Nathan Schauf	City Administrator	City Admin.	Owensville
Robert Rickerd	Marshall	Police Dept.	Owensville
Curtis Aytes	Fire Chief	Fire Dept.	Owensville
Dan Dyer	EMD	Emergency Management	Owensville

Name	Title	Department	Jurisdiction/Agency/Organization
Jeff Kuhne	-	Public Works	Owensville
Shannon Grus	Mayor	City Admin.	Rosebud
Ann Parker	City Clerk	City Admin.	Rosebud
Matt Lindemeyer	Police Chief	Police Dept.	Rosebud
Dennis Eilers	Street, Water, Sewer Commissioner	Public Works	Rosebud
Dr. Tracey Hankins	Superintendent	School District	Gasconade Co. R-I
Dr. Chuck Garner	Superintendent	School District	Gasconade Co. R-II
Dr. Patrick Call	Superintendent	School District	Bland Middle School/Maries Co. R-II

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

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

Stakeholder Representatives

Name	Title	Agency/Organization
Administrator		Gasconade Co. Health Dept.
Administrator		Victorian Place of Hermann
Administrator		Hermann Senior Housing
Administrator		Frene Valley Health Center
Administrator		Gasconade Terrace Assisted
-		Three Rivers Electric Co-Op
-		Crawford Electric Co-Op Inc
Administrator		American Red Cross
-		USDA, Natural Resources Conservation Office
-		Enbridge Energy
-		Capital Region Medical Clinic
-		Medical Clinic of Owensville
Administrator		Hermann Area District Hospital
Preston Kramer		MoDOT
Sherry Smith		Gasconade Co. Div. of Aging
-		Missouri Department of Conservation
-		Missouri State Highway Patrol Troop F
-		Fidelity Communications
-		Ameren UE
-		Intercounty Electric Co-Op
-		USACE
Tom Waters	Chairman	MLDDA

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EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Gasconade County and participating cities and school districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses to the county and its communities and schools resulting from hazard events. The plan is an update of a plan that was approved on March 6, 2012. The original plan was approved in June 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:

- Gasconade County
- City of Bland
- City of Gasconade
- City of Hermann
- City of Morrison
- City of Owensville
- City of Rosebud
- Gasconade Co. R-I School District
- Gasconade Co. R-II School District
- Maries Co. R-II School District

Gasconade County and the jurisdictions listed above developed a multi-jurisdictional Hazard Mitigation Plan that was originally approved by FEMA in June 2004 with an update approved by FEMA on March 6, 2012. This current planning effort serves as an update (hereafter referred to as the 2017 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 Gasconade County and participating jurisdictions. The MPC updated the risk assessment that identified and profiled hazards that pose a risk to Gasconade 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.

- Gasconade County
- City of Bland
- City of Gasconade
- City of Hermann
- City of Morrison
- City of Owensville
- City of Rosebud
- Gasconade Co. R-I School District
- Gasconade Co. R-II School District
- Maries Co. R-II School District

Model Resolution

Resolution # _____

Adopting the Gasconade 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 "Gasconade 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 Gasconade 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 "Gasconade County Multi-Jurisdictional Local Hazard Mitigation Plan" as an official plan.

.

Date: _____

Certifying Official: _____

1 Introduction and Planning Process

1.1 Purpose

Gasconade County and eight other jurisdictions prepared this local hazard mitigation plan to guide hazard mitigation planning for the purpose of better protecting the people and property of the county from the effects of natural hazard events. Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set and appropriate strategies to lessen impacts are determined, prioritized and implemented.

The mission of the Gasconade 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 Gasconade 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 Gasconade County that do not adopt the 2017 plan will not be eligible for funding through these grant programs.

1.2 Background and Scope

The 2017 Gasconade Hazard Mitigation Plan is an update of the original plan developed and approved in June 2004. The first update of the 2004 plan was approved by FEMA on March 6, 2012. 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 2012 and 2017 plan, including the following:

- Gasconade County
- City of Bland
- City of Gasconade
- City of Hermann
- City of Morrison
- City of Owensville
- City of Rosebud
- Gasconade Co. R-I School District
- Gasconade Co. R-II School District
- Maries Co. R-II School District

The information and guidance in this plan document will be used to help guide and coordinate mitigation activities and decisions for local jurisdictions and organizations. Proactive mitigation planning will help reduce the cost of disaster response and recover to local communities and residents by protecting critical infrastructure, reducing liability exposure and minimizing overall community impacts and disruptions. Gasconade 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 Gasconade 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 Gasconade County and the jurisdictions within to handle disasters and will document valuable local knowledge on the most efficient and effective ways to reduce loss.

Table 1.1 Summary of 2017 Revisions to Plan

Chapter	Summary of Revisions
Chapter 1 Introduction and Planning Process	Updated with 2016 information and reformatted to follow the 9-27-16 model outline. Provided information on how the planning process followed the *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).* Added information on RiskMAP
Chapter 2 Planning Area Profile and Capabilities	Updated with 2016 data and reformatted to follow the 9-27-16 model outline.
Chapter 3 Risk Assessment	Updated with 2016 data and reformatted to follow the 9-27-16 model outline.
Chapter 4 Mitigation Strategy	Updated with 2016 data and reformatted to follow the 9-27-16 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 2016 data and reformatted to follow the 9-27-16 model outline.
Appendices	Updated with 2016 data and reformatted to follow the 9-27-16 model outline.

*2016 data encompasses the most recent available data.

1.4 Planning Process

44 CFR Requirement 201.6(c)(1): [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process and how the public was involved.

The Gasconade County Hazard Mitigation Planning Committee first organized in 2004 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 June 2004. An update was completed and approved in March 2012.

MRPC's role in developing and updating the Gasconade 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 Gasconade 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 Gasconade County Multi-Hazard Mitigation Plan was developed as the result of a collaborative effort among Gasconade County, the cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud, Gasconade R-I School District, Gasconade R-II School District, Maries Co. R-II School District, public agencies, non-profit organizations, the private sector as well as regional, state and federal agencies. MRPC contacted and asked for volunteers to serve on the planning committee from the county and local city governments, school districts, the county health department, local businesses 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 Gasconade County. Staff worked with the Gasconade 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 2017 planning process began with a meeting held in conjunction with the Gasconade County Commission meeting on March 24, 2016. 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 May 5, 2016. 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 24th. 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 March.

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.

Gasconade 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 Gasconade County Mitigation Planning Committee

Name	Title	Department	Jurisdiction/Agency/ Organization	Direct Participation	Indirect Participation
Mark Wallace	City Admin.	City Admin.	Hermann	X	
James Holland	Associate Commissioner	County	Gasconade Co.	X	
Jerry Larimore	Associate Commissioner	County	Gasconade Co.	X	
Kris Bayless	EMD	Emergency Management	Gasconade Co.	X	
Larry Miskel	Presiding Commissioner	County	Gasconade Co.	X	
Dr. Tracey Hankins	Superintendent	School District	Gasconade Co. R-I	X	
Chuck Garner	Superintendent	School District	Gasconade Co. R-II	X	
Dr. Patrick Call	Superintendent	School District	Maries Co. R-II	X	
Nathan Schauf	City Administrator	City Admin.	Owensville	X	
Rachel Anderson	City Clerk	City Admin.	Bland	X	
Kelly Head	Mayor	City Admin.	Gasconade		X
Dennis Eilers	Street, Water, Sewer Commissioner	Public Works	Rosebud	X	
Ann Parker	City Court Clerk	City Admin.	Rosebud	X	
Sam Birk	Mayor	City Admin.	Morrison		X
Greg Lara	-	Health Dept.	Gasconade Co. Health Dept.	X	
Jennifer Miinch	-	Health Dept.	Gasconade Co. Health Dept.	X	
Katie Meyer	-	Health Dept.	Gasconade Co. Health Dept.	X	
Morgan Patterson	Trooper	Law Enforcement	Missouri State Highway Patrol	X	
Coby Holzschuh	Trooper	Law Enforcement	Missouri State Highway Patrol	X	
Marlon Walker	Police Chief	Police Dept.	Hermann Police Dept.	X	
Donielle Farrar	-	-	American Red Cross	X	
Dan McKinney	Administrator	Admin.	Hermann Area District Hospital	X	
Gary Stafford	-	-	Hermann Area District Hospital	X	
Chuck Howard	Chief Deputy	Sheriff's Dept.	Gasconade Co. Sheriff's Dept.	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.

Gasconade 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:

- Gasconade County
- City of Bland
- City of Gasconade
- City of Hermann
- City of Morrison
- City of Owensville
- City of Rosebud
- Gasconade Co. R-I School District
- Gasconade Co. R-II School District
- Maries Co. R-II School District
- Ameren UE
- American Red Cross
- Capital Region Medical Clinic
- Crawford Electric Co-Op Inc
- Enbridge Energy
- Fidelity Communications
- Gasconade Co. Health Dept.
- Gasconade Co. Div. of Aging
- Hermann Area District Hospital
- Hermann Senior Housing
- Intercounty Electric Co-Op
- Medical Clinic of Owensville
- Missouri Dept. of Conservation
- MoDOT
- Missouri State Highway Patrol
- MLDDA
- Three Rivers Electric Co-Op
- USACE
- USDA, Natural Resources
- Victorian Place of Hermann

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

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

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

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

Table 1.3 Jurisdictional Participation in the Planning Process

Jurisdiction	Meeting #1	Meeting #2	Interviews	Data Collection Survey/Call	Update/Develop/ Prioritize Mitigation Actions	Review/ Comment on Plan
Gasconade Co.	x	x	x	x	x	
Bland				x	x	
City of Gasconade				x	x	
Hermann	x			x	x	
Morrison				x	x	
Owensville	x			x	x	
Rosebud				x	x	
Gasconade Co. R-I				x	x	
Gasconade Co. R-II	x			x	x	
Maries Co. R-II				x	x	

1.6 The Planning Steps

Gasconade 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 Gasconade County Plan Update Process

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

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

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

The planning team was selected by contacting the leadership of each jurisdiction, explaining the process, and asking them to send appropriate representation to the planning meetings. In addition they were asked to provide input on who they wanted to include on the planning

committee. Stakeholders such as electric cooperatives and sewer districts were also contacted and invited. In addition, it was suggested that representatives of some of the local critical facilities be included on the planning committee, such as medical clinics and nursing homes. All meetings were also publicized to allow additional interested parties to attend and participate. Gasconade County offered to host the meetings in conjunction with the regular commission meetings and two meeting dates were selected – March 24, 2016 and May 5, 2016.

At the first meeting on March 24, 2016, MRPC staff made introductions and provided an overview of hazard mitigation planning and the Gasconade 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 24, 2016, staff met with Gasconade 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 plan. The MPC reviewed and prioritized all of the action items at their May 5, 2016 meeting.

At the second meeting on May 5, 2016, the group reviewed the complete list of action items developed at both the March 24, 2016 meeting. MRPC provided an explanation of the prioritization process using both STAPLEE and cost benefit scoring. The MCP then provided input on prioritizing all of the action items. Staff took those recommendations and developed a matrix of the action items with the STAPLEE and cost benefit scores. This matrix was mailed out to all of the individuals and organizations on the mailing list for the MPC with a request for feedback. All suggestions for changes were incorporated into the plan. The group also reviewed the list of critical facilities in the plan and provided feedback on any changes or additions to that list. It was decided at this meeting that staff would mail out data collection surveys to each of the jurisdictions and begin working on the plan. Plan chapters would be shared with the MPC via mail, email and website. If necessary the group would meet again but no date was set.

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 & Gasconade 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 24, 2016
Planning Meeting #2	Review of action items & prioritization process; discussion and identification of critical facilities	May 5, 2016
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 24, 2016

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 Gasconade 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) where a copy of the draft plan could be viewed or downloaded. The document was made available on the website on November 23, 2016. Hard copies of the final draft were placed at the Gasconade County Courthouse and city hall buildings for Bland, Gasconade, Hermann, Morrison, Owensville, and Rosebud. A hard copy of the draft could be obtained directly from MRPC by request. Members of the local media, both radio, newspaper and on-line were invited to attend planning meetings. Information was shared by these media outlets with the public on the planning process and where to find draft copies of the plan. Copies of public notices and press release are included in **Appendix A: Planning Process**.

No comments were received from the public.

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

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

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

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

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

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

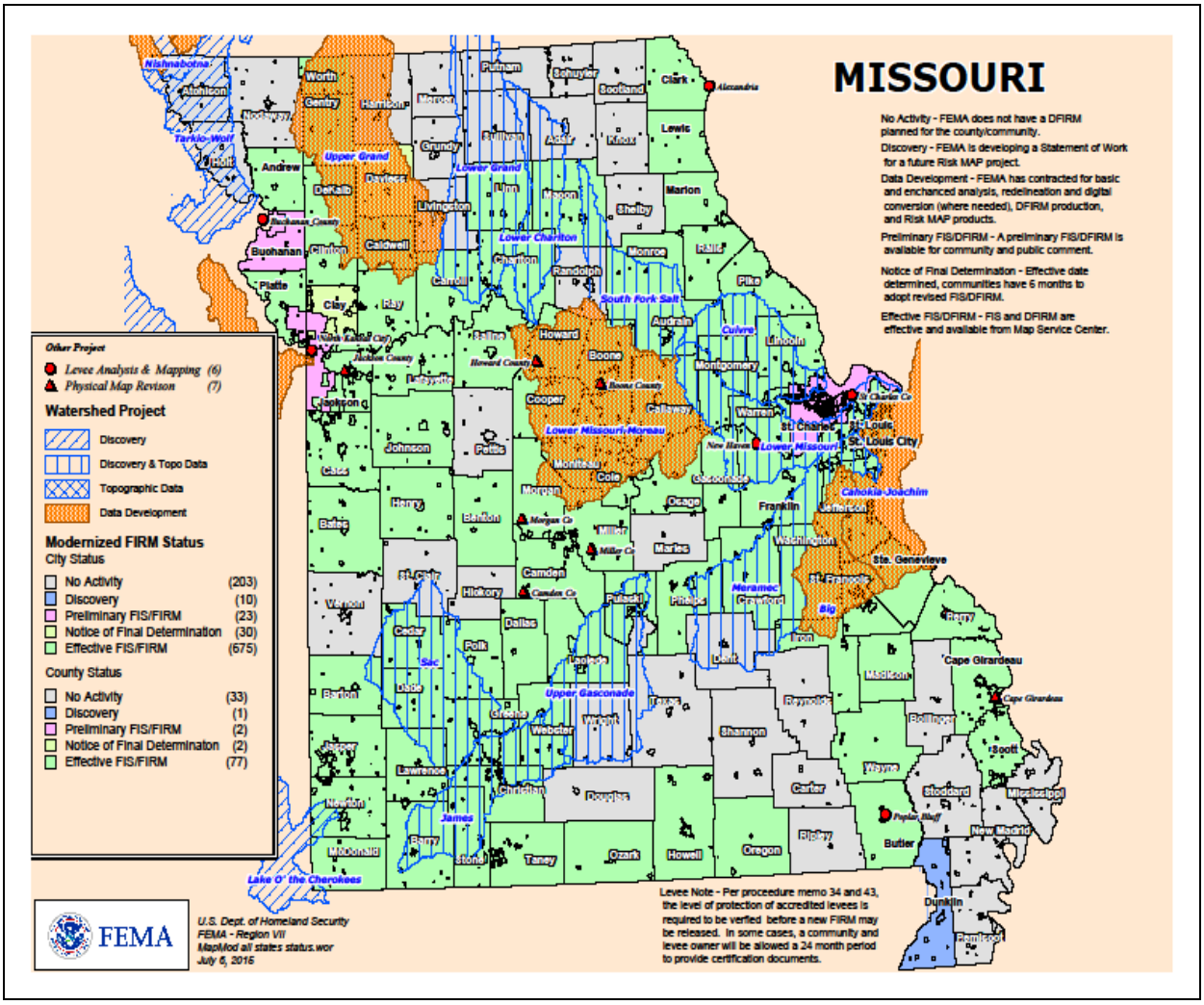
The survey provided to every jurisdiction asked how mitigation actions were being incorporated into other planning documents. The county road and bridge department did a good job of incorporating mitigation projects into their regular maintenance program. Those projects have been incorporated into the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

Coordination with FEMA Risk MAP Project

Gasconade 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. Gasconade County is a rural area with the largest community's population at approximately 2,658. 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 Gasconade County at the first planning meeting on March 24, 2016 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 2017 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 24, 2016. 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 Gasconade 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 24, 2016 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 Gasconade 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 May 5, 2016 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.

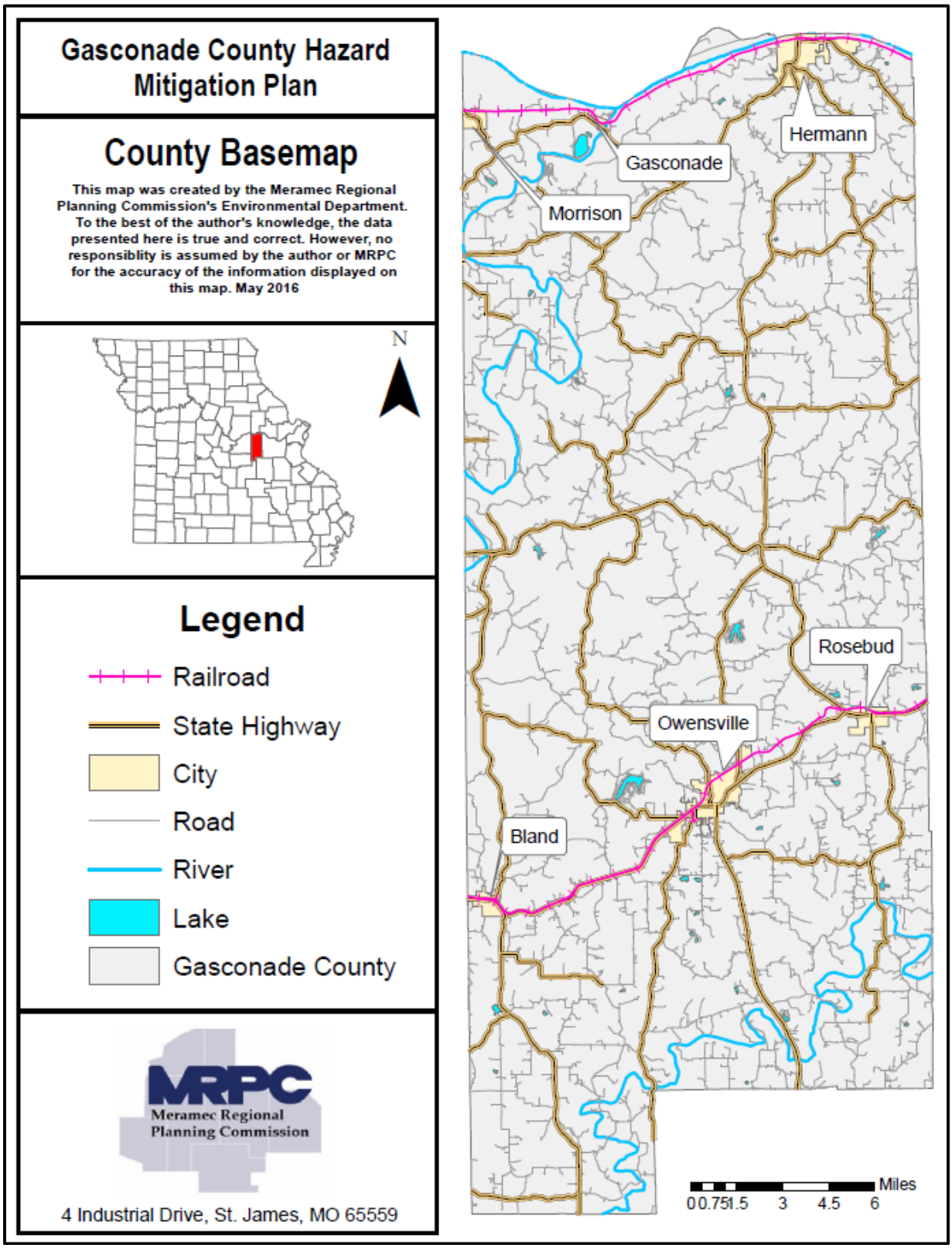
Step 10: Implement, Evaluate, and Revise the Plan (Handbook Tasks 7 & 9)

At both planning meetings (March 24, 2016 and May 5, 2016) 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 Gasconade County's strategy for implementation, evaluation and revising the plan.

2 PLANNING AREA PROFILE AND CAPABILITIES

2.1 Gasconade County Planning Area Profile

Figure 2.1. Map of Gasconade County



Gasconade County has a population of approximately 15,014 according to the most recent census data[1]. **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 Gasconade 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

	Total Population		Change Over Period	
Demographic Region	**2000**	**2014**	**Change**	**Percent**
Gasconade County	15,374	15,014	-360	-2.34
Missouri	5,607,285	6,063,589	456,304	8.14
United States	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

	Median Household Income (USD)		Change Over Period	
Demographic Region	**1999**	**2014**	**Change**	**Percent**
United States	$41,994	$53,046	$11,052	26.31
Missouri	$37,934	$47,380	$9,446	24.9
Gasconade County	$35,047	$42,574	$7,527	21.47

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

	Median House Value (USD)		Change Over Period	
Demographic Region	**2000**	**2014**	**Change**	**Percent**
United States	$119,600	$194,300	$74,700	62.49
Missouri	$89,900	$147,400	$57,500	63.96
Gasconade County	$70,500	$116,300	$45,800	64.96

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

2.1.2 Geography, Geology and Topography

Gasconade County has a total land area of 524 square miles. The bulk land cover in the county is woodlands; however there are areas of the county that are utilized for row crop production, particularly in the river valleys. The area has karst terrain, which is characterized by springs, caves, losing streams, and sinkholes. Additionally the county is comprised of 6.6 square miles of total water area. Incorporated jurisdictions within the county include Bland, Gasconade, Hermann, Morrison, Owensville, and Rosebud.

[1] U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

Gasconade County is located in south central Missouri, approximately 50 miles east of the state capital of Jefferson City, approximately 130 miles northeast of Springfield, Mo. and approximately 70 miles west of St. Louis, Mo. The county is bordered on the north by Montgomery and Warren Counties. On the east side the county is bordered by Osage and Maries Counties. To the south the county is bordered by Phelps and Pulaski Crawford. Franklin County shares a border with Gasconade to the west.

The topography in Gasconade County can be divided into two areas: the area to the south within the Bourbeuse Watershed; and the area to the north, which drains into the Gasconade and Missouri rivers. In the Bourbeuse Watershed, the topography is fairly gentle with rolling hills. North of Highway 28 the topography becomes rough with steep sided valleys and narrow ridges. The maximum relief in the county is approximately 500 feet, with the highest area being at the north edge of the Bourbeuse River Valley, and the lowest at the Missouri River.

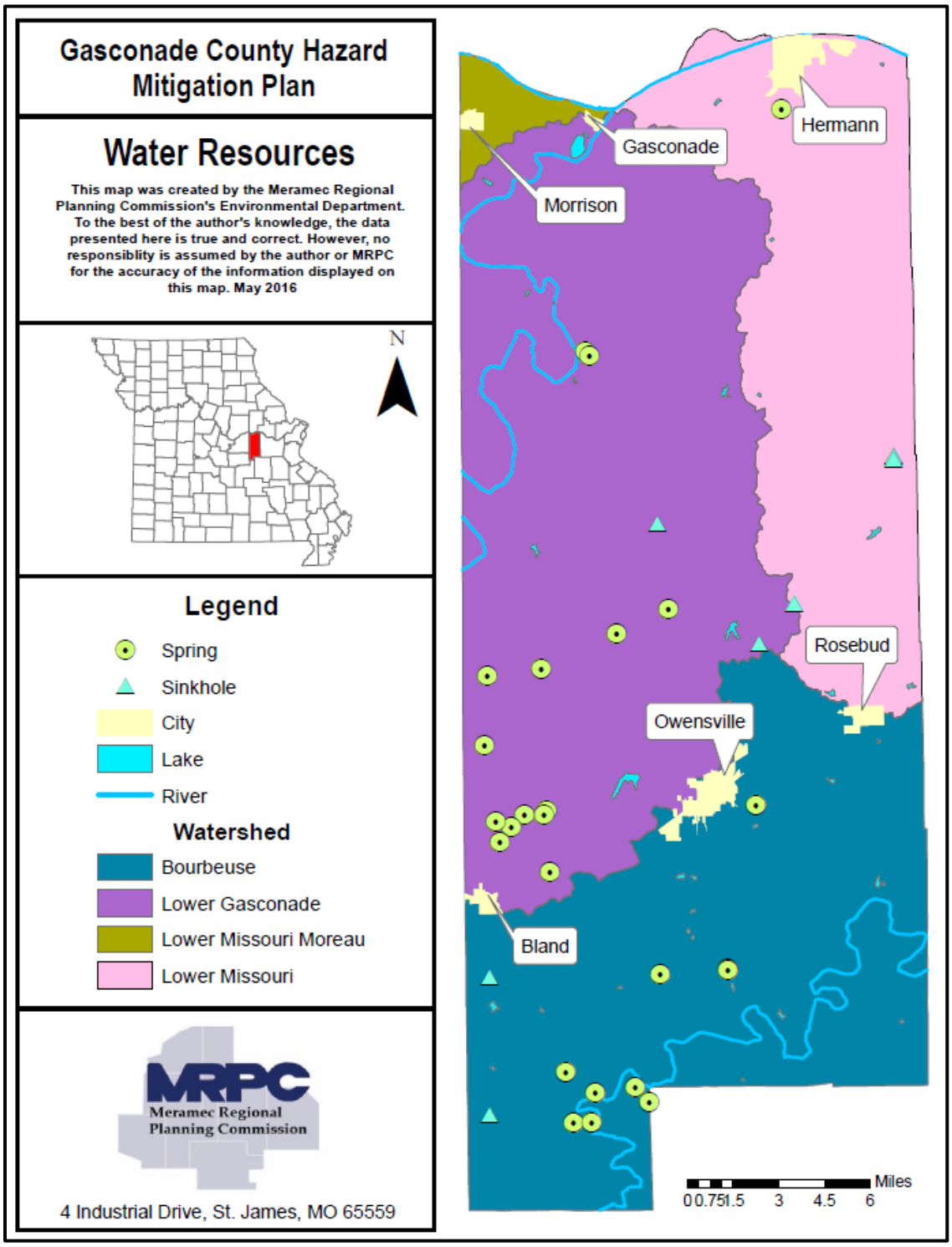
A drainage basin is the total area drained by a river and all of its tributaries. A watershed is the area drained by a single stream. During the last 100 years, stream channels in the Ozarks have become wider and shallower and deep-water fish habitat has been lost. Historical data indicate that channel 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.

Gasconade County is located in three river basins: Gasconade, Bourbeuse, and Missouri. 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 gradient 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.

As a whole, the Gasconade River watershed is rural with low population. 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.

Figure 2.2. Gasconade County Watershed/Water Resources



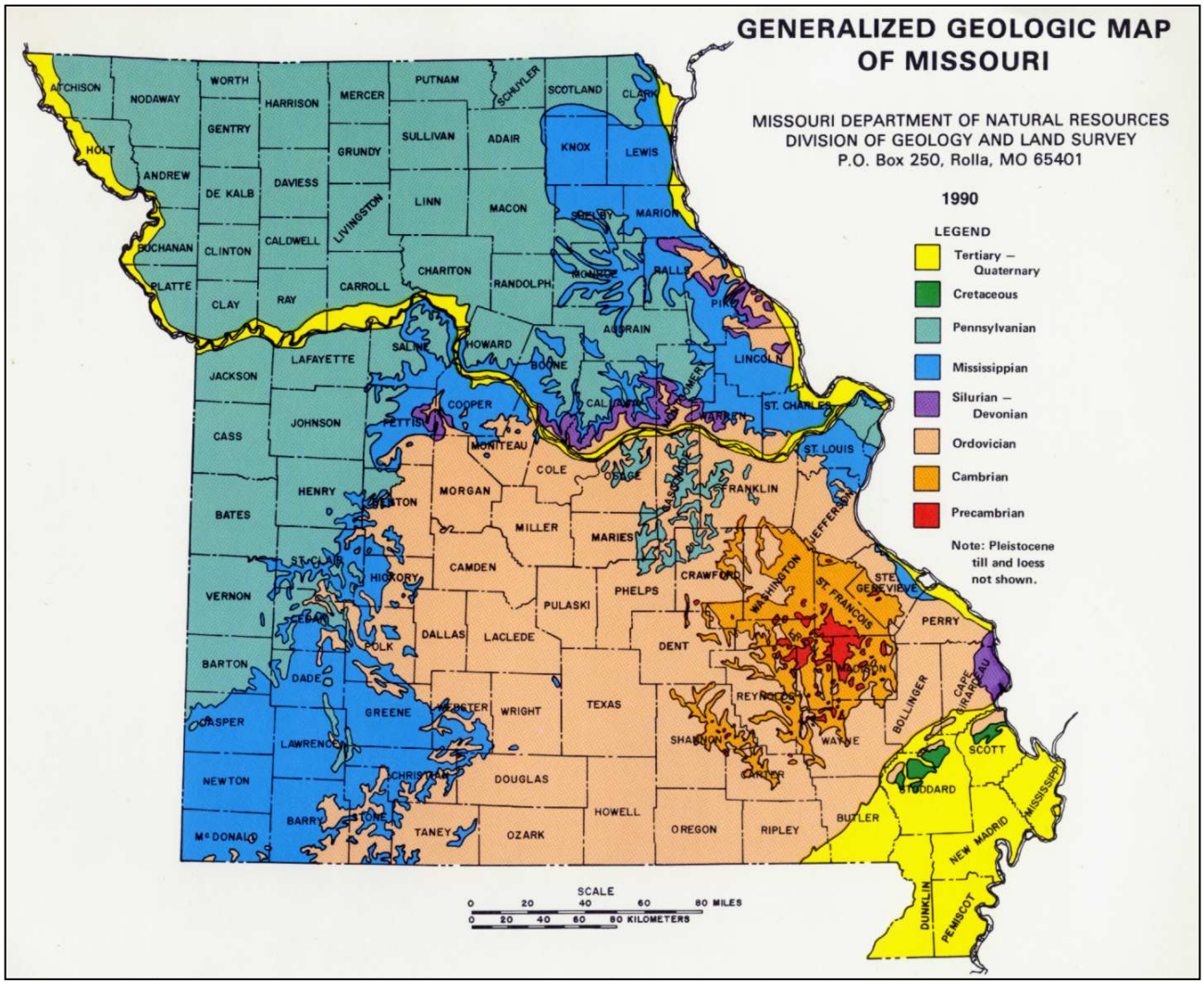
The Gasconade River watershed annual precipitation ranges from 40.35 to 42.67 inches with an annual mean of 41.66 inches. This precipitation and the local geology provides good base flow conditions and lower variability in stream flow throughout major portions of the watershed. Average runoff had greater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

The Gasconade River watershed's designated stream uses, assigned by the Missouri Department of Natural Resources (MDNR) are warm water aquatic life protection and fishing, and livestock and wildlife watering. Threats to beneficial uses in the Gasconade River watershed are point and non-point sources of pollutants. The number of point pollution sources and flow from point pollution sources is low. In fact, improvements have been made to point source discharges through monitoring by the MDNR and sewage treatment upgrades. Also, the Gasconade River has recovered well from the December 1988 oil spill that released hundreds of thousands of gallons of crude oil into the main stem Gasconade River from a broken pipeline near Vienna. On the contrary, non-point source pollution remains a difficult challenge. Numerous MDNR Soil and Water Program Special Area Land Treatment projects in the Upper Gasconade River Hydrologic Unit (HU), and portions of the Upper Osage Fork HU are addressing nutrient problems that have cattle manure as their sources. Sand and gravel mining in sensitive areas can and has effected fisheries, especially sensitive cool- and cold-water fisheries. Runoff from farms, mining operations, construction sites, forest operations, residential septic's, and impervious surface in urbanized areas create a complex resource management challenge.

The Upper Gasconade River watershed was poorly forested along major segments of its tributaries and main stem compared to the Lower Gasconade River watershed. Thirty-eight percent of the major stream segments within the Upper Gasconade River watershed and 46% of the major segments of the Lower Gasconade River watershed had forested corridors. Results of the corridor quality ratio used to assess stream segments indicated that the Lower Gasconade River watershed had more stream segments rated as good (81%) than the Upper Gasconade River watershed (64%). Based on the land use/ land cover Geographic Information Systems (GIS) analysis, priority management should be given to those hydrologic units that were rated relatively low on the objective rating scale. The Lower Gasconade River HU was rated as poor due to the lack of forested stream corridor. In addition, the Lower Roubidoux Creek HU, should be given priority management attention because of its sensitive springs, growing human population, and urbanization.

The county is located in the Ozark Plateau – the largest outcrop area of Ordovician-age rocks in the United States. This rock is 505 to 441 million years old and made up primarily of carbonates and thin shales with three distinctive sandstone layers: the Gunter at the base of the column, the red and white Roubidoux which is often used as a building stone and the St. Peter glass sand. This stone is the result of a time period when Missouri was covered by a shallow sea and the stone frequently produces aquatic fossils from that time period. Portions of this formation contain rock that dissolves and fractures over time from rainwater, thus resulting in the karst features found throughout the Ozarks.

Figure 2.3. Generalized Geologic Map of Missouri



Gasconade County has several soil types. The northern part of the county is located in the Missouri Alluvium soils, which are in the broad, nearly level to gently sloping bottom land area of the Missouri River. These soils formed in deep silty loamy and clayey alluvium. The Missouri Alluvium includes the Haynie-Blake-Booker soil association.

The Central Mississippi Valley Wooded Slopes soils are located on thick loess covered hills with rolling narrow ridgetops and steep valley sideslopes. These soils developed in deep loess deposits on ridgetops and valley slopes near the Missouri River along the northern part of Gasconade County. Soils formed in loess and cherty limestone and dolomite are on ridges at a greater distance from the Missouri River. Deep silty, loamy and clayey soils are on the benches and floodplains of small streams. The Central Mississippi Valley Wooded Slopes soils include the Menfro-Winfield soil association.

The Ozark Border soils are located in an area of dissected plateau characterized by narrow ridgetops and narrow valleys. A thin mantle of loess caps the ridgetops. The steep sideslopes contain deep cherty, clayey, reddish-colored soils developed over dolomite or limestone. Sandy, loamy and gravelly alluvial soils are in the bottom lands. These soils are found throughout most

of Gasconade County.

The Ozark Border soils include the Union-Goss-Gasconade Peridge and Hobson-Clarksville-Gasconade soil associations. Ozark Soils are found in the central part of Gasconade County. These soils are located in 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 can be found on the ridges. Soils formed in loamy, sandy and cherty alluvium are in narrow bottom-land areas.

2.1.3 Climate

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

Because of its inland location, Missouri and Gasconade County are subject to frequent changes in temperature. The average annual temperature is 53°F. The average annual high temperature is 65.2°F With the average annual low at 40.8°F. The average high and low in January is 40°F and 18°F, respectively. In July the average high and low are 87°F and 64°F, respectively. A high temperature of 114 degrees has been observed in Hermann.

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 Gasconade County between 2000 and 2014 by jurisdiction. The unincorporated area of Gasconade County was determined by subtracting the populations of the incorporated areas from the overall county population.

Table 2.4. Gasconade County Population 2000-2014 by Jurisdiction

Jurisdiction	2000 Population	2014 Population	2000-2014 # Change	2000-2014 % Change
Unincorporated Gasconade County	8,849	8,683	-166	-1.8
Bland	565	557	-8	-1.4
Gasconade	267	245	-22	-8.2
Hermann	2,674	2,400	-274	-10.2
Morrison	123	93	-30	-24.3
Owensville	2,500	2,658	158	.72
Rosebud	364	378	14	3.8

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 Gasconade County, Missouri, and the U.S. In 2010 there were an estimated 6,333 households within the county[2].

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
Gasconade County	5.2	20.9
Missouri	6.3	14.6
United States	6.4	13.7

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
Gasconade County	2.31
Missouri	2.57
United States	2.70

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 Gasconade County along with its national percentile.

[2] U.S. Census Bureau, 2009-2013 5-Year American Community Survey

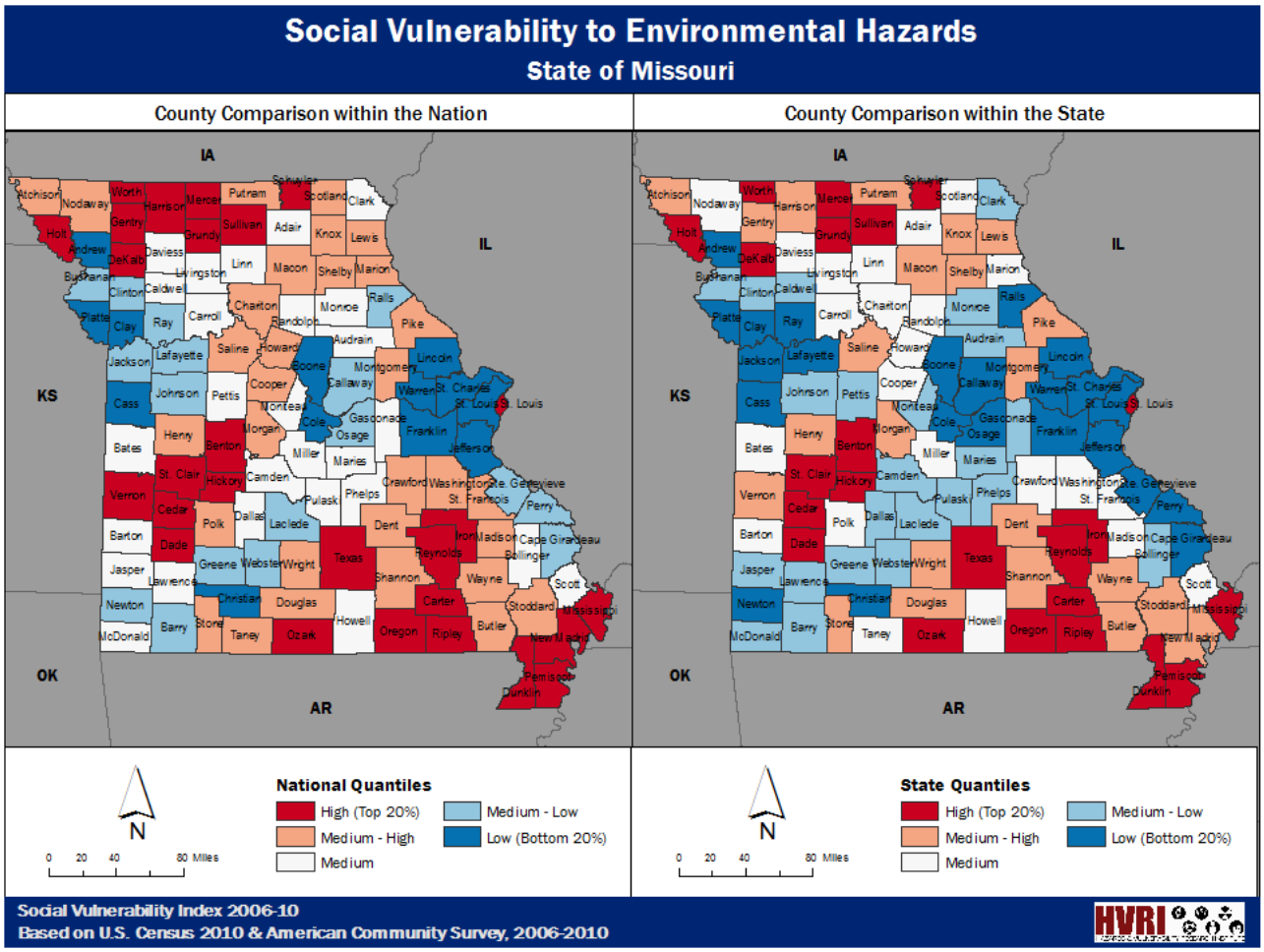
Table 2.7. Social Vulnerability Index (SoVI ®)

State	County	SoVI Score (06 - 10)	National Percentile (06 - 10)
Missouri	Gasconade County	-0.110691	49.66%

Source: 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[3]. **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.

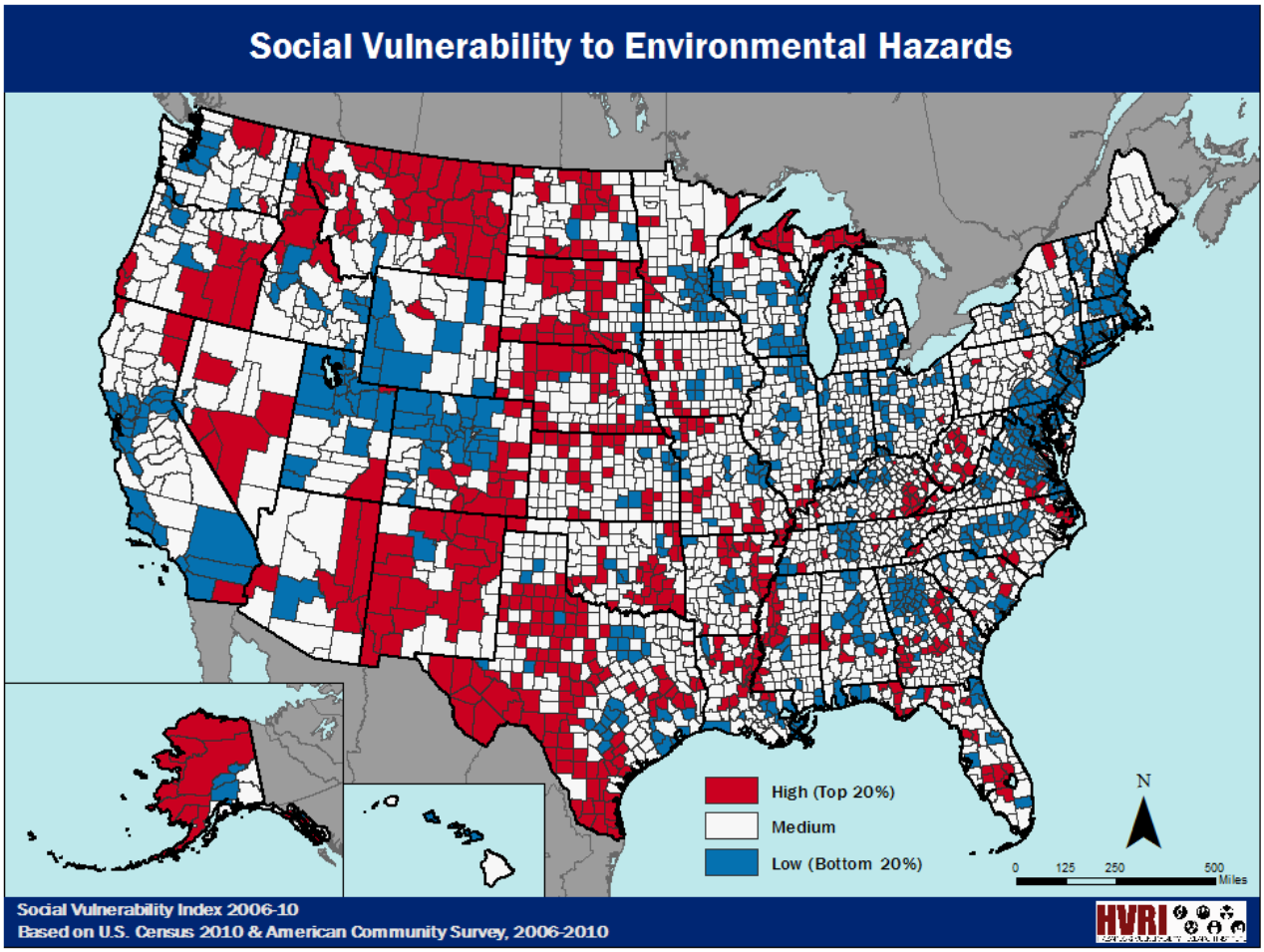
Figure 2.4. 2006 – 2010 Missouri Social Vulnerability to Environmental Hazards (SoVI ®)



Source: http://webra.cas.sc.edu/hvri/products/sovi2010_maps.aspx

[3] http://webra.cas.sc.edu/hvri/products/sovifaq.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 Gasconade County.

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

Jurisdiction	% in Labor Force	% of Population Unemployed	% of Families Below the Poverty Level	High School Diploma ONLY, ages 25+	Bachelor's degree or higher, ages 25+	% of population (language spoken at home other than English
Gasconade County	58.3	10.6	11.4	42.1	15.6	1.7
Bland	53.1	30.7	22.8	45.1	10.7	1.8
Gasconade	37.6	12.5	14.5	56.3	6.8	2.1
Hermann	51.8	7.7	7.9	41.4	18.5	0.8
Morrison	68.2	19.0	4.5	58.8	12.5	1.1
Owensville	58.2	9.5	22.1	40.9	12.5	0.9
Rosebud	50.8	9.6	5.7	38.1	15.6	2.7

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

2.1.5 History

Organized in November 1820, Gasconade County was named for the Gasconade River. Gasconade City was elected as the first seat of the justice for the county. Gasconade City remained the county seat until 1825 when, because of a flood, it was deemed advisable to move the seat to Bartonville. Bartonville was located on the Gasconade River in what is now Osage County and remained the county seat until it, too, was flooded. The county seat was then moved a second time to Mount Sterling, located in a place known as Shockley's Bluff or Starky's Bluff. The county seat remained at Mount Sterling until 1842 when an election was held to determine if the seat should be moved to Hermann. Hermann had promised to render substantial financial assistance to the county if the county seat would be located there. As a result of the election held on March 14, 1842, the county seat moved to Hermann. The town paid for the courthouse, which was built in the center of a block on East Front Street. This site, high on a bluff above the Missouri River, is one of few courthouse sites that takes advantage of a natural vista. The square, two-story, brick building with hip roof cost about $3,000. The County Court used this courthouse until 1896 when they ordered it razed.

The present courthouse, a gift to the county from Charles D. Eitzen, was built in 1896-98. Architects were J. B. Legg, St. Louis, and A. W. Elsner, Jefferson City, who originally presented plans calling for a 143-by-88-foot building. The two-story courthouse had a finished basement and a dome that rose 120 feet. Originally, the building was to be constructed of light-gray or medium-buff brick with matching terra cotta trim. The main roof was to be dark Pennsylvania slate, the dome roofs of tin, painted a copper color. The rotunda and corridors were to be tiled in Italian marble and mosaic. In February 1897 the court called for bids. Thirty contractors responded, but all bids for the Legg-Elsner design were too high. The architects then modified the plans, eliminating some of the more costly specifications. Red brick with white stone trim was substituted for the gray or buff brick. Again the court called for bids; H. J. Wallau received the building contract for $41,500 and completed his work in 1898. On the first floor, offices open off a long east-west hall; the 41-by-44-foot Circuit Court room is located on the west end of the second story. The dedication of the building took place May 25, 1898. Fire damaged the building on February 3, 1905, but the building was repaired and continues to be used today.

The community of Gasconade grew up around a horse driven grist mill located near the mouth of the Gasconade River. The mill was established in 1811. The community of Gasconade was the first county seat and narrowly missed being selected as the capital city of Missouri in 1821. The Corps of Engineers has a boatyard in the community.

The history of the settlement of the City of Hermann is of particular interest. The selection of the location for the town site was originally made under the auspices of the Deutsche Ansiedlung Geschellschaft (German Settlement Society) of Philadelphia. In March 1837, the society sent a representative through Indiana, Michigan, Illinois, Wisconsin and Missouri to look for a suitable place for a proposed German settlement. By Oct. 5, 1837, the president of the society announced to the membership that a large piece of land had been purchased in Missouri. At the same meeting during which the announcement was made, the society resolved that the name of the new town would be Hermann. Mr. Bayer, who had investigated the town site, was made general agent of the society and agreed to accept the 80 acres of land in the new settlement and a salary of $600 per year. Every member of the society arriving in the new town was to have the privilege of choosing one lot for himself.

The first storekeeper in Hermann was H.W.D. Wiedersprecher. The railroad was built through the town in 1854, and from that time until the Civil War, the town prospered.

Also located in Gasconade County were the cities of Bland and Owensville. Located in the southwest portion of the county, Bland was named after Congressman Richard P. Bland. A trading post was founded near a spring where William Haynes was the first settler in the Bland area in the 1850's. The community of Bland experienced the negative effects of the Civil War when in 1864, General Price's army robbed the stores, requisitioned livestock and destroyed what could not be carried away. In 1900, the railroad was being built through the region and the first station in Bland was a boxcar. In 1902 a station was built in the community, as well as the Bland Commercial Bank. In 1904, the Bland Courier's first newspaper edition was published and was printed twice weekly with 500 subscribers.

Owensville was laid out in 1886 by the Owensville Improvement Company, consisting of Robert Robyn, Dr. G. Ettmueller, Michael Jordan, Dr. M.W. Hoge and George H. Buschmann. The first three were citizens of Hermann, while the other two founders were from the vicinity of Owensville. The company bought 280 acres of land and platted the town. According to legend, the town was named as a result of a game of horseshoes between storeowner Francis Owen and blacksmith Edward Luster, with the understanding that the settlement would be named after the winner. Although Luster won the game, legend has that he decided to name the settlement after Owen because Owensville sounded better than Lusterville.

The City of Morrison is named after Alfred William Morrison, a plantation owner and former state treasurer. The city was first organized in 1899. The City of Rosebud was established when the Rock Island Railroad built a depot in the area and named it after the wild rosebushes in bloom at the time. The city was formally organized in 1911. In 1915 John Watkins opened a clay mine southeast of Rosebud and built a miniature railroad consisting of a locomotive and five cars that each held two tons of clay to haul the clay to the Rock Island Railroad station in Rosebud. He named his locomotive Molly Watkins and the little train served the mine for several years.

2.1.6 Occupations

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

Table 2.9. Occupation Statistics, Gasconade 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
Gasconade County	1,690	1,111	1,386	848	1,505
Bland	48	47	45	3	31
Gasconade	10	7	18	9	26
Hermann	219	147	267	72	236
Morrison	10	16	6	8	7
Owensville	259	232	244	89	240
Rosebud	23	34	18	17	50

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 2007 Census of Agriculture, the number of farms in the county was 867 encompassing 212,641 total acres. In addition, the average farm was 245 acres. According to the 2012 Census of Agriculture, Gasconade County had fallen to 859 farms encompassing 208,922 acres, with an average farm size of 243 acres. 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, 53,480 acres of cropland were harvested, with forage (hay, haylage, grass silage, and greenchop) being the top crop in the county. Moreover, 30,257 cattle and calves were raised. The average agricultural products sold per farm were $30,208. Lastly, the total number of hired workers in the county was 347 individuals comprising 5.3% of the total workforce[4].

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

2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area

FEMA's Hazard Mitigation Assistance (HMA) grant program provides funding for mitigation activities which have the potential to reduce disaster losses and protect life and property from future disaster damages[5]. 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	Declaration	Project Total ($)
200.1 Acquisition of Private Real Property - Riverine	Hermann	07/09/1993	556,074
200.1 Acquisition of Private Real Property - Riverine	City of Gasconade	06/02/1995	Not Approved/Denied
Total			$556,074

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.

[4] 2012 Census of Agriculture, Missouri Farm Commodity Sales, USDA, National Agriculture Statistics Service
[5] https://www.fema.gov/media-library/assets/documents/103279

2.2.1 Unincorporated Gasconade County

Overview

The jurisdiction of Gasconade County includes all unincorporated areas within the county boundaries. Gasconade County is governed by a three-member County Commission. The Commission is composed of a presiding commissioner, representing all of the county's population who is elected for a four-year term. Two associate commissioners representing roughly half the county's population each, are elected for four-year terms. The commission meets on Thursday of each week. Other elected county officials include the county clerk, assessor, circuit clerk and recorder, collector, treasurer, prosecuting attorney, sheriff, county surveyor, public administrator and coroner.

Technical and Fiscal Resources

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. Gasconade County has staff resources in floodplain management, emergency management, and GIS. The county has a 9-1-1 central dispatch center. Additionally, there are no county sirens. A mass notification system is also utilized (Everbridge).

Fiscal tools or resources that the county 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

Gasconade County participates in the National Flood Insurance Program. The County Emergency Management Director serves as the Floodplain Manager. Construction occurring in the floodplain in unincorporated areas of the county is required to obtain a permit from the county. The county has a Local Emergency Operations plan (LEOP), Hazard Mitigation Plan, Regional Transportation Plan (MRPC), and a Regional Comprehensive Economic Development Strategy (MRPC).

Other Mitigation Activities

The Office of Emergency Management, local fire departments, Sheriff's Department and the Gasconade 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, storm preparedness, heat wave preparedness and DARE (Drug Abuse Resistance Education).

Table 2.11. Demographic and Structure Risk Parameters For Unincorporated Gasconade 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 Gasconade County	2,857	0	15.3	780.7	3,137.9	1,588	677.6

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

Table 2.12. Unincorporated Gasconade County Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	N/A
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	2012
County Mitigation Plan	2012
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes – CEDS – Regional
Transportation Plan	Yes – 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
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant - Nondelegated	Yes

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

Capabilities	Status Including Date of Document or Policy
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2016

2.2.2 City of Bland

Overview

Bland is located in the south eastern portion of Gasconade County. The community was established in the 1850's and named in 1877. State highway 28 intersects the City of Bland. According to the 2014 U.S. Census, the community has a population of 557. Bland is incorporated as a fourth class city (1902) with a four member board of aldermen and a mayor. The city employs a city clerk, city attorney, city marshal, and city collector.

Technical and Fiscal Resources

Ambulance service is provided by the Ozark Central Ambulance District located in Belle. There is also a Volunteer Fire Department within the community. The community has enhanced 9-1-1 through the Gasconade County 9-1-1 system. The city has one warning siren which is controlled by the fire department.

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

Existing Plans and Policies

Bland currently participates in the National Flood Insurance Program, joined in August 1984. The city has a Capital Improvement Plan, City Emergency Operations Plan, Hazard Mitigation Plan, Regional Transportation Plan (MRPC), Regional Comprehensive Economic Development Strategy (MRPC), and Flood Mitigation Assistance Plan.

Table 2.13. Demographic and Structure Risk Parameters For Bland

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
Bland	195	0	29.4	12.8	90.7	62.0	17.0

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

Table 2.14. City of Bland Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	2018
City Emergency Operations Plan	Yes
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	N/A
Local Mitigation Plan	2012
County Mitigation Plan	2012
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes – CEDS – Regional
Transportation Plan	Yes – Regional
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	Yes
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Version: International Property Maintenance Code
Floodplain Ordinance	6/10/2008
Subdivision Ordinance	No
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant – Non-delegated	Yes

Capabilities	Status Including Date of Document or Policy
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	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Haz Mit
Hazard Analysis/Risk Assessment (County)	N/A
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
Staff/Department	
Building Code Official	N/A
Building Inspector	Yes - MRPC
Mapping Specialist (GIS)	No
Engineer	Yes
Development Planner	No
Public Works Official	Yes
Emergency Management Director	No
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	N/A
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Phelps Co. PHA
Planning Consultant	No
Regional Planning Agencies	MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.	No

Capabilities	Status Including Date of Document or Policy
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	N/A

Source: Data Collection Questionnaire, 2016

2.2.3 City of Gasconade

Overview

Gasconade is located in the north central portion of Gasconade County at the mouth of the Gasconade River. The community was established in 1811. Gasconade was incorporated as a fourth class city in 1926. Gasconade was the first county seat of Gasconade County and missed being the capital of Missouri by two votes in 1821. State highway 100 intersects the City of Gasconade. According to the 2014 U.S. Census, the community has a population of 245. Gasconade has a four member board of aldermen and a mayor. The city employs a city collector and treasurer.

Technical and Fiscal Resources

Law enforcement in the community is provided by the Gasconade County Sheriff's Department. The community is served by the Morrison Volunteer Fire Department and has a fire sub-station inside the city limits. The Hermann Area Ambulance District provides emergency medical services. The community has enhanced 9-1-1 through the Gasconade County 9-1-1 system.

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

Gasconade participates in the National Flood Insurance Program (NFIP). The city joined the NFIP in December 1984.

Table 2.15. Demographic and Structure Risk Parameters For Gasconade

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
Gasconade	62.0	0	19.6	3.9	62.9	63.0	39.0

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

Table 2.16. City of Gasconade Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	N/A
Local Mitigation Plan	2012
County Mitigation Plan	2012
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes – CEDS – Regional
Transportation Plan	Yes – 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
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant - Nondelegated	Yes

Capabilities	Status Including Date of Document or Policy
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
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Haz Mit
Hazard Analysis/Risk Assessment (County)	N/A
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
Staff/Department	
Building Code Official	-
Building Inspector	-
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Director	No
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – Regional - MREPC
County Emergency Management Commission	N/A
Sanitation Department	-
Transportation Department	-
Economic Development Department	-
Housing Department	Phelps Co. PHA
Planning Consultant	No
Regional Planning Agencies	MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.	No

Capabilities	Status Including Date of Document or Policy
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	No
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	-

Source: Data Collection Questionnaire, 2016

2.2.4 City of Hermann

Overview

Hermann is located in the north northwest portion of Gasconade County on the bank of the Missouri River at the mouth of Frene Creek. The city was created on December 6, 1937 by a German Settlement Society from Philadelphia. State highways 100 and 19 intersect in Hermann. A bridge crosses the Missouri River on Highway 19. According to the 2014 U.S. Census, the community has a population of 2,400. Hermann is incorporated as a fourth class city and has a four member board of aldermen and a mayor. The city employs a full-time city administrator, clerk, chief of police, street/parks superintendent, collector, treasurer, economic director, fire chief, city attorney, court clerk, emergency management director, municipal judge, and utilities superintendent..

Technical and Fiscal Resources

The City of Hermann is served by a Police Department, Hermann Area Ambulance District, and Volunteer Fire Department. The city is served by Gasconade County's Enhanced 9-1-1 system. Hermann has four warning sirens which are controlled by the city Police Department and Gasconade County 9-1-1 dispatch.

Additional warning is provided through the local radio station KWWR, KWRE, KSLQ, KLPW and KMCR Radio and the local Channel 13 cable television station.

The city EOC is located at the Police Department with the Hermann Area Ambulance Base serving as a backup location. The community and city government has high speed broadband internet capabilities at all critical 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, debt through general obligation bonds, debt through special tax bonds, and withhold spending in hazard prone areas.

Existing Plans and Policies

The City of Hermann participates in the National Flood Insurance Program. Building codes and floodplain ordinances are enforced by the building inspector and the flood plain manager. Hermann has a City Emergency Operations Plan, Hazard Mitigation Plan, Regional Transportation Plan (MRPC), and a Regional Comprehensive Economic Development Strategy (MRPC).

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 Hermann

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
Hermann	291.0	0	12.3	165.6	592.8	360.0	16.0

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

Table 2.18. City of Hermann Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	N/A
Local Mitigation Plan	2012
County Mitigation Plan	2012
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes – CEDS – Regional
Transportation Plan	Yes – 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
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	IBC
Floodplain Ordinance	2009
Subdivision Ordinance	Yes
Tree Trimming Ordinance	Yes

Capabilities	Status Including Date of Document or Policy
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	Yes
Landscape Ordinance	No
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
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)	No
ISO Fire Rating	
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	Yes
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Haz Mit
Hazard Analysis/Risk Assessment (County)	N/A
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
Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	N/A
Sanitation Department	No
Transportation Department	No

Capabilities	Status Including Date of Document or Policy
Economic Development Department	Yes
Housing Department	Phelps Co. PHA
Planning Consultant	No
Regional Planning Agencies	MRPC
Historic Preservation	Yes
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	Yes
Environmental Organization	Yes
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.	Yes
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
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	Yes

Source: Data Collection Questionnaire, 2016

2.2.5 City of Morrison

Overview

Morrison is located in the northeast corner of Gasconade County on Highway 100. The city was first organized in 1899. Morrison is incorporated as a fourth class city. According to the 2014 US Census, the city has a population of 93. There is a four member board of aldermen and a mayor. The city employs a part-time city clerk, a part-time street maintenance worker, a part-time water meter reader and a part-time city municipal worker. The city provides municipal services for water only.

Technical and Fiscal Resources

Morrison has one warning siren that is activated by Ameren UE. The city is located within ten miles of the nuclear power plant in Callaway County. The city is served by Gasconade County 9-1-1 and has a volunteer fire department. Ambulance service is provided through Hermann Area Ambulance District and the Osage Ambulance District in neighboring Osage County. Law enforcement is provided by the Gasconade County Sheriff's Office.

Existing Plans and Policies

Morrison participates in the National Flood Insurance Program. The president of the board of

alderman serves as the city floodplain manager. The community does not have building codes. The city is also part of the county LEOP.

Table 2.19. Demographic and Structure Risk Parameters For Morrison

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
Morrison	13.0	0	11.8	2.0	14.9	34.0	3.0

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

Table 2.20. City of Morrison Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	N/A
Local Mitigation Plan	2012
County Mitigation Plan	2012
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes – CEDS – Regional
Transportation Plan	Yes – 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
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	

Capabilities	Status Including Date of Document or Policy
Zoning/Land Use Restrictions	Yes
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	-
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Haz Mit
Hazard Analysis/Risk Assessment (County)	N/A
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
Staff/Department	
Building Code Official	-
Building Inspector	-
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Director	No
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – Regional - MREPC
County Emergency Management Commission	N/A
Sanitation Department	-
Transportation Department	-
Economic Development Department	-
Housing Department	Phelps Co. PHA
Planning Consultant	No
Regional Planning Agencies	MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No

Capabilities	Status Including Date of Document or Policy
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.	No
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	No
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	-

Source: Data Collection Questionnaire, 2016

2.2.6 City of Owensville

Overview

By 1840, the territory now known as Gasconade County had been settled, and a small community was taking shape at the crossroads of trail connecting St. Louis to Springfield. The community was located near an ox cart path used to transport iron ore from Maramec Iron Works near St. James to riverboat docks at Hermann.

By the turn of the century the community grew into a small thriving business center. Agriculture products and clay were among the first commodities produced to provide considerable business for the railroad that snaked its way through the area.

Agriculture, mining, and shoemaking were the economic mainstays of the community until World War II. The industrial community began to diversify when plastic fabrication and commercial printing firms settled in Owensville in the late 1960's.

Owensville sits at the crossroads of Highways 19 and 28 in the south central part of the county. Owensville is a 4th class city with a four member board of aldermen and a mayor. The city also employs a city administrator, city clerk, deputy city clerk, attorney, collector, marshal, fire chief, public works director, building commissioner and municipal judge.

Technical and Fiscal Resources

The city is served by Gasconade County's enhanced 9-1-1 system as well as having its own dispatch system. The city has three severe weather sirens that are activated the emergency management director and the Gasconade County 9-1-1. The city is served by the Owensville Volunteer Fire Department and the Owensville Area Ambulance District. The community and city government have high speed broadband internet capabilities at all critical 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, impact fees for new development, debt through general obligation bonds, debt through special tax bonds, and debt through private activities.

Existing Plans and Policies

Owensville has building codes and a floodplain ordinance that are enforced by the city building inspector and administrator. All residential and non-residential construction, both new and renovations require a building permit and inspections by the city. The city has a comprehensive plan, city emergency operations plan, hazard mitigation plan, regional transportation plan (MRPC), and regional comprehensive economic development strategy plan (MRPC).

Table 2.21. Demographic and Structure Risk Parameters For Owensville

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
Owensville	546.0	0	24.0	204.6	528.9	213.0	85.5

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

Table 2.22. City of Owensville Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	2/25/13
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	N/A
Local Mitigation Plan	2012
County Mitigation Plan	2012
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes – CEDS – Regional
Transportation Plan	Yes – Regional
Land-use Plan	Yes
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
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	IBC 2003
Floodplain Ordinance	7/5/2011 – City Code Ch. 415

Capabilities	Status Including Date of Document or Policy
Subdivision Ordinance	Yes – Ch. 405
Tree Trimming Ordinance	Yes – Ch. 520
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
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	5
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Haz Mit
Hazard Analysis/Risk Assessment (County)	N/A
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	Yes
Staff/Department	
Building Code Official	Yes – Part time
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	Yes- Contract
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	MREPC
County Emergency Management Commission	N/A

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

Source: Data Collection Questionnaire, 2016

2.2.7 City of Rosebud

Overview

Rosebud is located on the eastern edge of Gasconade County on Highway 50. The community was established as a train stop along the Rock Island Railroad in 1911. Rosebud is a fourth class city. According to the 2014 U.S. Census, the community has a population of 378. Rosebud has a four member board of aldermen and a mayor. The city also employs a city clerk, attorney, city court judge, city court clerk, collector, chief of police and street, water and sewer commissioner.

Technical and Fiscal Resources

The City of Rosebud has a Police Department. Ambulance service is provided by the Gerald Area Ambulance District in neighboring Franklin County. The community is served by the volunteer Gerald-Rosebud Fire Protection District which is located in Gerald. The community has enhanced 9-1-1 through the Gasconade County 9-1-1 system. The city has one warning sirens which is controlled by the Gasconade County 9-1-1 center.

Fiscal tools or resources that the city could potentially use to help fund mitigation activities include Community Development Block Grants, levy taxes for specific purposes, fees for water, sewer, gas,

or electric services, impact fees for new development, debt through general obligation bonds, and debt though special tax bonds.

Existing Plans and Policies

Rosebud does not currently participate in the National Flood Insurance Program. Rosebud has building codes which are enforced by the street commissioner or chief of police depending on who the board of alderman appoints. The city is included in the county LEOP. Rosebud has a city emergency operations plan, hazard mitigation plan, regional transportation plan (MRPC), regional comprehensive economic development strategy plan (MRPC), and land-use plan.

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 2.23. Demographic and Structure Risk Parameters For Rosebud

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
Rosebud	93.0	0	10.5	13.9	102.8	34.0	36.0

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

Table 2.24. City of Rosebud Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes – 6/15
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	N/A
Local Mitigation Plan	2012
County Mitigation Plan	2012
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes – CEDS – Regional
Transportation Plan	Yes – Regional
Land-use Plan	Yes
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
Policies/Ordinance	
Zoning Ordinance	Yes

Capabilities	Status Including Date of Document or Policy
Building Code	Some – per ordinance
Floodplain Ordinance	No
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant - Nondelegated	No
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	No
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No – unless school
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Haz Mit
Hazard Analysis/Risk Assessment (County)	N/A
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	Yes
Staff/Department	
Building Code Official	Yes – PT
Building Inspector	Yes – PT
Mapping Specialist (GIS)	No
Engineer	Yes
Development Planner	No
Public Works Official	Yes – FT
Emergency Management Director	No
NFIP Floodplain Administrator	No
Bomb and/or Arson Squad	No
Emergency Response Team	Yes – County
Hazardous Materials Expert	Yes – OFP

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

Source: Data Collection Questionnaire, 2016

Table 2.25 summarizes the mitigation capabilities of Gasconade County and its jurisdictions.

Table 2.25. Mitigation Capabilities Summary Table

CAPABILITIES	Unincorporated Gasconade County	Bland	Gasconade	Hermann	Morrison	Owensville	Rosebud
Planning Capabilities							
Comprehensive Plan	No	No	No	No	No	2/25/13	No
Builder's Plan	No	No	No	No	No	No	No
Capital Improvement Plan	No	2018	No	No	No	No	No
City Emergency Operations Plan	N/A	Yes	Yes	Yes	Yes	Yes	Yes 6/15
County Emergency Operations Plan	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local Recovery Plan	No	No	No	No	No	No	No
County Recovery Plan	No	N/A	N/A	N/A	N/A	N/A	N/A
Local Mitigation Plan	2012	2012	2012	2012	2012	2012	2012
County Mitigation Plan	2012	2012	2012	2012	2012	2012	2012
Local Mitigation Plan (PDM)	No	No	No	No	No	No	No
County Mitigation Plan (PDM)	No	No	No	No	No	No	No
Economic Development Plan	Yes – CEDS – Regional	Yes – CEDS – Regional	Yes – CEDS – Regional	Yes – CEDS – Regional	Yes – CEDS – Regional	Yes – CEDS – Regional	Yes – CEDS – Regional
Regional Transportation Plan	Yes – Regional	Yes – Regional	Yes-Regional	Yes – Regional	Yes – Regional	Yes – Regional	Yes – Regional
Land-use Plan	No	No	No	No	No	Yes	Yes
Flood Mitigation Assistance (FMA) Plan	No	Yes	No	No	No	No	No
Watershed Plan	No	No	No	No	No	No	No
Firewise or other fire mitigation plan	No	No	No	No	No	No	No
School Mitigation Plan	No	No	No	No	No	No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No	No	No	No	No	No	No

CAPABILITIES	Unincorporated Gasconade County	Bland	Gasconade	Hermann	Morrison	Owensville	Rosebud
Policies/Ordinance							
Zoning Ordinance	No	Yes	Yes	Yes	Yes	Yes	Yes
Building Code	No	Version: International Property Maintenance Code	Yes	IBC	Yes	IBC 2003	Some – per ordinance
Floodplain Ordinance	Yes	6/10/2008	Yes	2009	Yes	7/5/2011 – City Code Ch. 415	No
Subdivision Ordinance	No	No	No	Yes	No	Yes – Ch. 405	Yes
Tree Trimming Ordinance	No	Yes	No	Yes	No	Yes – Ch. 520	No
Nuisance Ordinance	No	Yes	Yes	Yes	Yes	Yes	Yes
Storm Water Ordinance	No	Yes	No	No	No	No	Yes
Drainage Ordinance	No	Yes	No	No	No	No	Yes
Site Plan Review Requirements	No	Yes	Yes	Yes	Yes	Yes	Yes
Historic Preservation Ordinance	No	No	No	Yes	No	No	No
Landscape Ordinance	No	No	No	No	No	No	No
Wetlands and Riparian Areas Conservation Plan	No	No	No	No	No	No	No
Debris Management Plan	No	No	No	No	No	No	No
Program							
Zoning/Land Use Restrictions	No	Yes	Yes	Yes	Yes	Yes	Yes
Codes Building Site/Design	No	No	No	Yes	No	Yes	No
National Flood Insurance Program (NFIP) Participant – Non-delegated	Yes	Yes	Yes	Yes	Yes	Yes	No
NFIP Community Rating System (CRS) Participating Community	No	No	No	No	No	No	No
Hazard Awareness Program	No	No	No	No	No	No	No

CAPABILITIES	Unincorporated Gasconade County	Bland	Gasconade	Hermann	Morrison	Owensville	Rosebud
National Weather Service (NWS) Storm Ready	No	No	No	No	No	No	No
Building Code Effectiveness Grading (BCEGs)	No	No	No	No	No	No	No
ISO Fire Rating	9		-		-	5	No
Economic Development Program	No	No	No	No	No	No	No
Land Use Program	No	No	No	No	No	No	No
Public Education/Awareness	Yes	No	No	No	No	No	No – unless school
Property Acquisition	No	No	No	No	No	No	No
Planning/Zoning Boards	No	Yes	No	Yes	No	Yes	Yes
Stream Maintenance Program	No	No	No	Yes	No	No	No
Tree Trimming Program	No	No	No	Yes	No	No	No
Engineering Studies for Streams (Local/County/Regional)	No	No	No	No	No	No	No
Mutual Aid Agreements	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Studies/Reports/Maps							
Hazard Analysis/Risk Assessment (Local)	Haz Mit	Haz Mit	Haz Mit	Haz Mit	Haz Mit	Haz Mit	Haz Mit
Hazard Analysis/Risk Assessment (County)	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Flood Insurance Maps	Yes	No	No	No	No	No	No
FEMA Flood Insurance Study (Detailed)	Yes	No	No	No	No	No	No
Evacuation Route Map	Yes	No	No	No	No	No	No
Critical Facilities Inventory	Yes	No	No	No	No	No	No
Vulnerable Population Inventory	Yes	No	No	No	No	No	No
Land Use Map	No	No	No	No	No	Yes	Yes
Staff/Department							
Building Code Official	No	N/A	-	Yes	-	Yes – Part time	Yes – PT

CAPABILITIES	Unincorporated Gasconade County	Bland	Gasconade	Hermann	Morrison	Owensville	Rosebud
Building Inspector	No	Yes - MRPC	-	Yes	-	Yes	Yes – PT
Mapping Specialist (GIS)	Yes	No	No	No	No	No	No
Engineer	Contract	Yes	No	No	No	Yes- Contract	Yes
Development Planner	No	No	No	No	No	No	No
Public Works Official	Yes	Yes	Yes	Yes	Yes	Yes	Yes – FT
Emergency Management Director	Yes	No	No	Yes	No	Yes	No
NFIP Floodplain Administrator	Yes	Yes	Yes	Yes	Yes	Yes	No
Bomb and/or Arson Squad	Yes	No	No	No	No	No	No
Emergency Response Team	Yes	No	No	No	No	No	Yes – County
Hazardous Materials Expert	Yes	No	No	No	No	No	Yes – OFP
Local Emergency Planning Committee	MREPC	MREPC	MREPC	MREPC	MREPC	MREPC	MREPC
County Emergency Management Commission	No	N/A	N/A	N/A	N/A	N/A	N/A
Sanitation Department	No	No	-	No	-	No	No
Transportation Department	Yes	No	-	No	-	No	No
Economic Development Department	MRPC	No	-	Yes	-	No	No
Housing Department	Phelps Co. PHA	Phelps Co. PHA	Phelps Co. PHA	Phelps Co. PHA	Phelps Co. PHA	Phelps Co. PHA	Phelps Co. PHA
Planning Consultant	Yes	No	No	No	No	No	No
Regional Planning Agencies	MRPC	MRPC	MRPC	MRPC	MRPC	MRPC	MRPC
Historic Preservation	Historic Society	No	No	Yes	No	No	No
Non-Governmental Organizations (NGOs)							
American Red Cross	Yes	No	No	No	No	No	Yes
Salvation Army	No	No	No	No	No	No	Yes
Veterans Groups	Yes	No	No	Yes	No	Yes	Yes
Environmental Organization	No	No	No	Yes	No	No	Yes
Homeowner Associations	Yes	No	No	No	No	No	No

CAPABILITIES	Unincorporated Gasconade County	Bland	Gasconade	Hermann	Morrison	Owensville	Rosebud
Neighborhood Associations	Maybe	No	No	No	No	No	Yes
Chamber of Commerce	No	No	No	Yes	No	Yes	Yes
Community Organizations (Lions, Kiwanis, etc.	No	No	No	Yes	No	Yes	Yes
Financial Resources							
Apply for Community Development Block Grants	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund projects through Capital Improvements funding	Yes	Yes	No	Yes	No	Yes	No
Authority to levy taxes for specific purposes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fees for water, sewer, gas, or electric services	No	Yes	Yes	Yes	Yes	Yes	Yes
Impact fees for new development	No	No	Yes	No	Yes	Yes	Yes
Incur dept through general obligation bonds	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incur debt through special tax bonds	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incur debt through private activities	No	No	No	No	No	Yes	No
Withhold spending in hazard prone areas	No	N/A	-	Yes	-	No	N/A

Source: Data Collection Questionnaires, 2015

2.2.8 Public School District Profiles and Mitigation Capabilities

The following school districts are participating jurisdictions in this plan: Gasconade Co. R-I School District, Gasconade Co. R-II School District, and Maries Co. R-II School District. As public institutions responsible for the care and education of the county's children, these school districts share an interest with Gasconade 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

Gasconade County R-I and Maries County R-II have NOAA all hazard radios on site to provide early warning of hazard events. In addition, each school district has fire alarms and intercom systems capable of providing specific instructions in the event of an emergency. None of the districts reported a public address alert system.

None of the school districts have dedicated grant writers on staff. Existing staff work on grants when necessary.

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 on a quarterly basis or semi-annual basis. All districts practice lock-down security training at least once a year. None of the schools have a designated safe area for tornados in accordance with FEMA standards.

Table 2.26. School District Buildings and Enrollment Data, 2016

District Name	Building Name	Enrolment
Gasconade Co. R-I School District		
	Hermann High	328
	Hermann Middle	363
	Hermann Elem.	328
Gasconade Co. R-II School District		
	Owensville High	591
	Owensville Middle	284
	Owensville Elem.	577
	Gerald Elem.	309
Maries Co. R-II School District		
	Bland Middle	262

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

Figure 2.6. Gasconade County School Districts

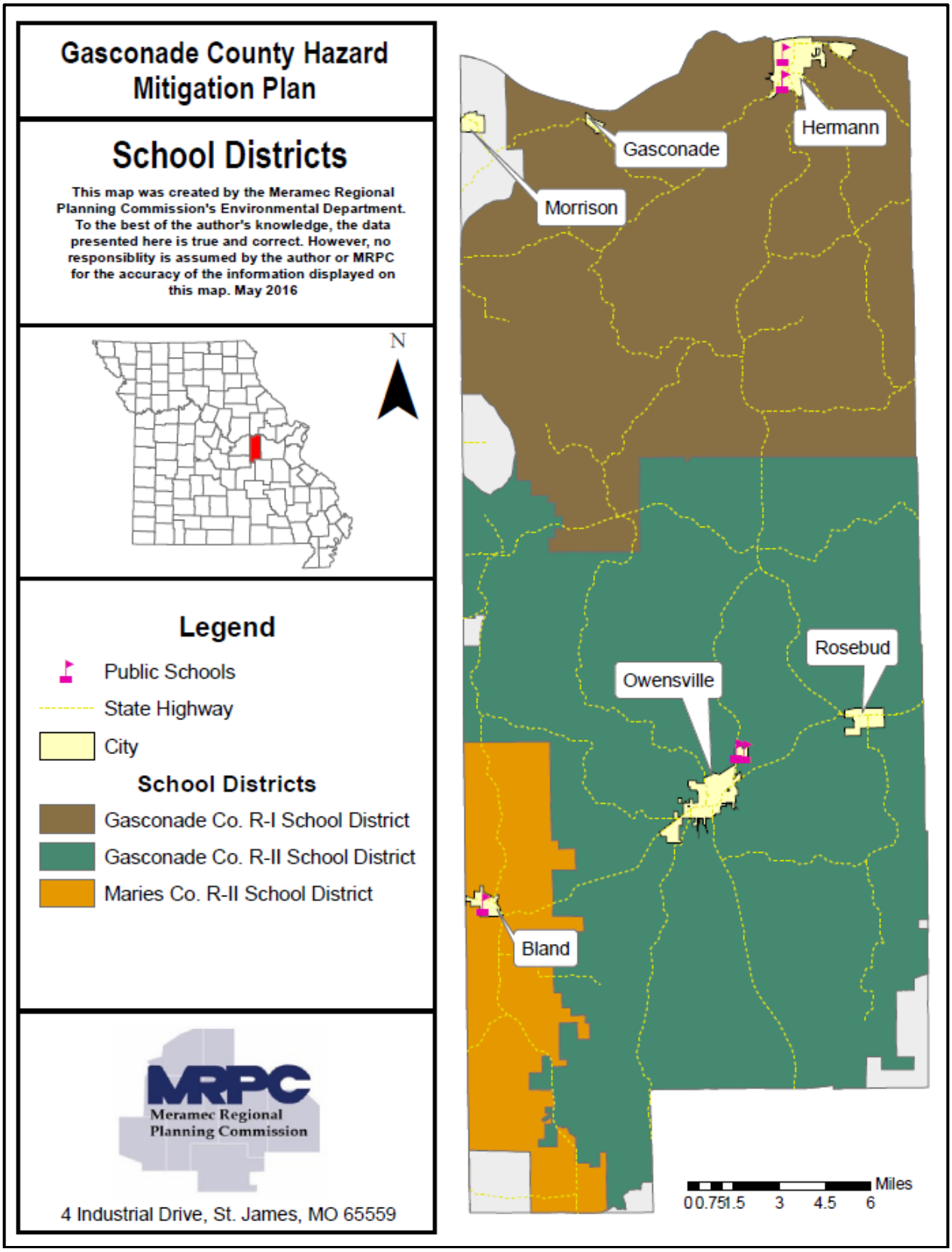


Table 2.27. Summary of Mitigation Capabilities- Gasconade Co. R-I, Gasconade Co. R-II, Maries Co. R-II

Capability	Gasconade Co. R-I	Gasconade Co. R-II	Maries Co. R-II
Planning Elements			
Master Plan/Date	2015	N/A	No
Capital Improvement	August 2016	April 2015	No
School Emergency Plan/Date	August 2016	August 2015	2016
Weapons Policy/Date	2/8/2001	May 2014	1/22/2004
Personnel Resources			
Full-Time Building Official (Principle)	Yes	Yes	Yes
Emergency Manager	Yes	Yes	Yes
Grant Writer	No	No	No
Public Information Officer	Yes	Yes	Yes
Financial Resources			
Capital Improvements Project Funding	No	No	No
Local Funds	No	No	Yes
General Obligation	No	Yes	No
Special Tax Bonds	No	No	No
Private Activities/Donations	No	Yes	No
State and Federal Funds/Grants	Yes	No	No
Other			
Public Education Programs	With Fire Dept.	With Fire Dept.	No
Privately or Self-Insured?	-	-	-
Fire Evacuation Training	Monthly	Yearly	Monthly
Tornado Sheltering Exercises	Spring, 201	Yearly	2-3x per year
Public Address/Emergency Alert System	Intercom	All Call Capabilities	Phone Intercom/ fire alert system
NOAA Weather Radios	Yes	-	Yes
Lock-Down Security Training	Sept. 2016	Yearly	Yearly
Mitigation Programs	No	Yes	Yes
Tornado Shelter/Safe-room	No	No	No
Campus Police	No	Yes	No

Source: Data Collection Questionnaires, 2015

2.2.9 Critical Facilities

The table below (**Table 2.28**) provides information for critical facilities in the planning area. Specific information includes a Hazus ID if applicable, jurisdiction, building name/owner, and address. Facilities addressed include emergency, fire department, law enforcement, medical, and schools. Furthermore, **(Table 2.29)** provides information in regards to colleges/universities located in the planning area.

Table 2.28. Gasconade County Critical Facilities by Type and Jurisdiction

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Emergency Facilities						
	Gasconade Co.	Gasconade Co. E-911	405A E. Lincoln Ave.	Owensville	MO	65066
	Gasconade Co.	Emergency Management Director	Courthouse, PO Box 295	Hermann	MO	65041
Fire Department Facilities						
MO000260	Morrison	Morrison Volunteer Fire Dept. #1	524 Hwy 100	Morrison	MO	65061
MO000261	Owensville	Owensville Fire Dept. #1	819 Franklin Ave.	Owensville	MO	65066
MO000754	Bland	Bland Fire Protection Dist. #1	206 Kansas City	Bland	MO	65014
	Hermann	Hermann Volunteer FD #1	214 E. 2nd St.	Hermann	MO	65041
	Hermann	Hermann Volunteer FD #2	103 Hwy. 100	Hermann	MO	65041
	Hermann	Hermann Volunteer FD #3	2063 Hwy 19	Hermann	MO	65041
	Gasconade	Morrison Volunteer Fire Dept. #2	480 Oak St.	Gasconade	MO	65063
	Bland	Bland Fire Protection Dist. #2	4604 Gorrell Rd	Bland	MO	65014
	Mt. Sterling	Owensville Fire Dept. #2	2710 Hwy. A	Mt. Sterling	MO	65062
	Owensville	Owensville Fire Dept. #3	600 Springfield Rd.	Owensville	MO	65066
Law Enforcement Facilities						
MO000095	Owensville	Owensville City Police Dept.	109 N 2nd St.	Owensville	MO	65066
MO000150	Gasconade Co.	Gasconade Co. Sheriff	119 E 1st St. #22	Hermann	MO	65041
MO000189	Hermann	Hermann Police Dept.	129 E 4th St.	Hermann	MO	65041
MO000453	Gasconade	Gasconade City Police Dept.	480 Oak St.	Morrison	MO	65061
	Rosebud	Rosebud Police Dept.	307 N. Cedar	Rosebud	MO	63091
Medical Facilities						
MO000001	Hermann	Hermann Area Dist. Hospital	509 West 18th St.	Hermann	MO	65041
	Gasconade	Gasconade Co. Health Dept.	300 Schiller St.	Hermann	MO	65041

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
School Facilities						
MO000491	Hermann	Hermann Elem.	328 W Seventh St.	Hermann	MO	65041
MO000492	Hermann	Hermann High	176 Bearcat Crossing	Hermann	MO	65041
MO001007	Owensville	Owensville K-2 CTR.	2000 Dutchmen Dr.	Owensville	MO	65066
MO001009	Owensville	Owensville High	3336 Highway 19	Owensville	MO	65066
MO001010	Owensville	Owensville Middle	3340 Highway 19	Owensville	MO	65066
MO001676	Hermann	St. George School	133 W 4th St.	Hermann	MO	65041
MO001677	Rosebud	Immanuel Lutheran School	300 1st St. N	Rosebud	MO	63091
MO002562	Hermann	Hermann Middle	164 Blue Pride Dr.	Hermann	MO	65041
MO002776	Bland	Maries Co. R2 Middle School	300 S Main	Bland	MO	65014

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

Although there are no post-secondary schools in Gasconade County, there are two colleges located within 35 miles from the center of the county. These campuses and their locations are shown in **Table 2.29**.

Table 2.29. Gasconade County Colleges/Universities

College/University	Location	Description
State Technical College of Missouri	One Technology Drive, Linn, MO 65051	Associates Degree and Certificates
East Central College	1964 Prairie Dell Road, Union, MO 63084	Associate Degree

3 RISK ASSESSMENT

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

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

This chapter is divided into four main parts:

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

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

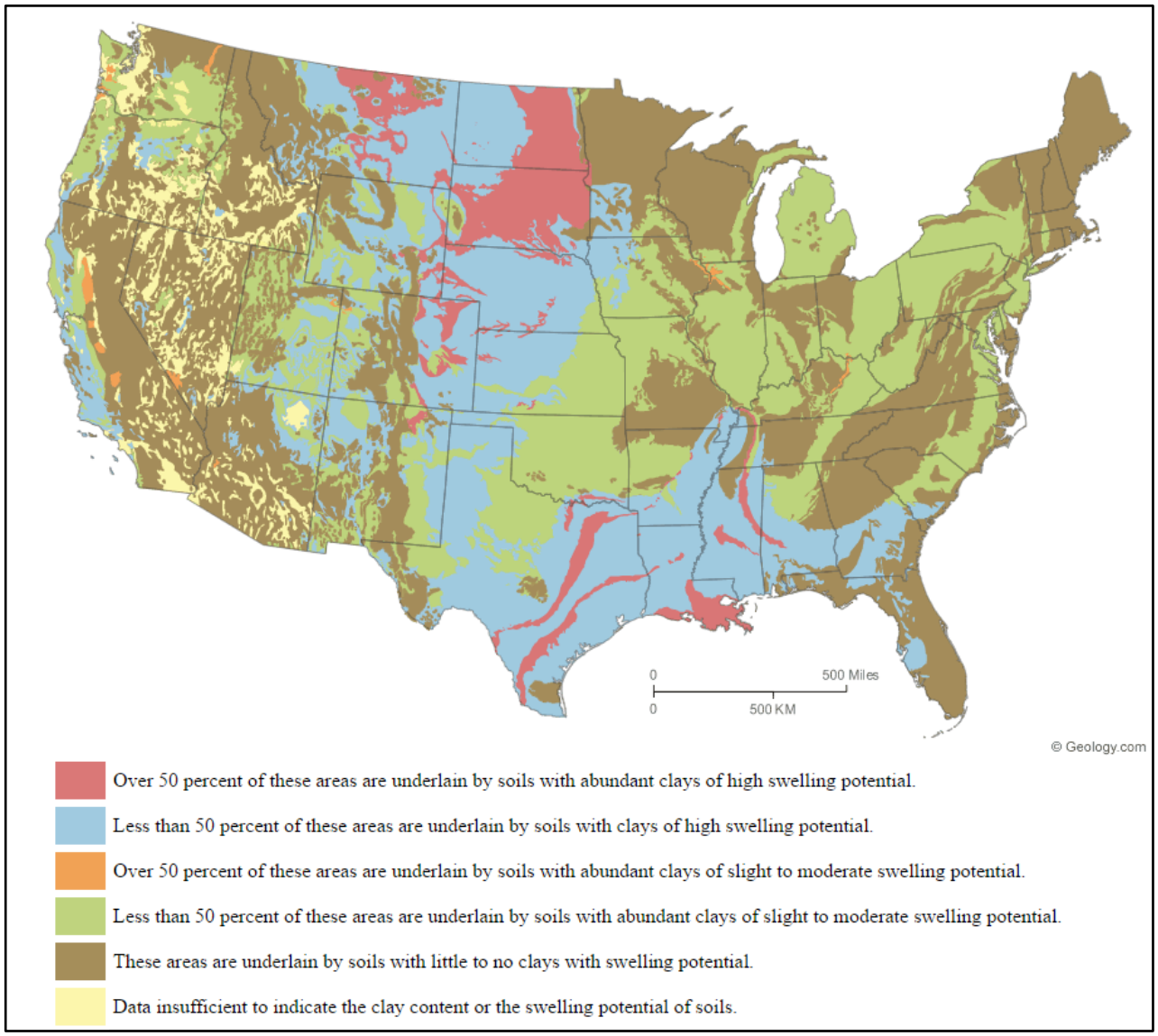
Hazards not occurring in the planning area, or considered insignificant were eliminated from this plan. **Table 3.1** outlines the hazards eliminated from the plan and the reasons for doing so. Additionally, some hazards were combined in the Gasconade County Plan to match the hazards listed in the Missouri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

Table 3.1. Table 3.1 Hazards Not Profiled in the Plan

Hazard	Reason for Omission
Avalanche	No mountains in the planning area.
Coastal Erosion	Planning area is located in the Midwest, not on any coast.
Coastal Storm	Planning area is located in the Midwest, not on any coast.
Debris Flow	There are no mountainous areas in the planning area where this type of event occurs.
Expansive Soils	No expansive soils exist within the planning area. According to the USGS National Geologic Map Database[1], the planning area is underlain by soils with little to no clays with swelling potential (**Figure 3.1**).
Hurricane	Planning area is located in the Midwest, not on any coast.
Volcano	There are no volcanic areas in the county.

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

Figure 3.1. Swelling clays map of the conterminous United States



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

3.1.2 Review Disaster Declaration History

In order to assess risk, it was logical to review the disaster declaration history for the State of Missouri and specifically for Gasconade 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 57 federally declared disasters since 1957. Of those, 29 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 Gasconade County from 1990 through 2016.

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

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-1463	Missouri Flooding, Severe Storm	Declaration Date: May 06, 2003 Incident Period: May 04, 2003 to May 30, 2003	IA, PA
DR-1676	Missouri Severe Winter Storms and Flooding	Declaration Date: January 15, 2007 Incident Period: January 12, 2007 to January 22, 2007	PA
DR-1749	Missouri Severe Storms and Flooding	Declaration Date: March 19, 2008 Incident Period: March 17, 2008 to May 09, 2008	IA, PA
DR-4250	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Declaration Date: January 21, 2016 Incident Period: December 23, 2015 to January 09, 2016	IA, PA

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

3.1.3 Research Additional Sources

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

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

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

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

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

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

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

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

3.1.4 Hazards Identified

Table 3.3 lists the hazards that significantly impact each jurisdiction within the planning area and were chosen for further analysis in alphabetical order. However, not all hazards impact every jurisdiction such as dam failure. “X” indicates the jurisdiction is impacted by the hazard, and a "-" indicates the hazard is not applicable to that jurisdiction. As Gasconade 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	Levee Failure	Thunderstorms/High Winds/ Lightning/Hail	Tornado	Severe Winter Weather
Gasconade Co.	x	x	x	x	x	x	x	x	x	x	x
Bland	x	x	x	x	x	x	x	-	x	x	x
Gasconade	x	x	x	x	x	x	x	x	x	x	x
Hermann	x	x	x	x	x	x	x	x	x	x	x
Morrison	x	x	x	x	x	x	x	x	x	x	x
Owensville	x	x	x	x	x	x	x	-	x	x	x
Rosebud	x	x	x	x	x	x	x	-	x	x	x
School Districts											
Gasconade Co. R-I	x	x	x	x	x	x	x	-	x	x	x
Gasconade Co. R-II	x	x	x	x	x	x	x	-	x	x	x
Maries Co. R-II	x	x	x	x	x	x	x	-	x	x	x

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

		Gasconade County	Bland	Gasconade	Hermann	Morrison	Owensville	Rosebud	Gasconade Co. R-I	Gasconade Co. R-II	Maries Co. R-II
Dam Failure	P	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Drought	P	15.41%	15.41%	15.41%	15.41%	15.41%	15.41%	15.41%	15.41%	15.41%	15.41%
	V	L	L	L	L	L	L	L	L	L	L
Earthquake	P	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	V	L	L	L	L	L	L	L	L	L	L
Extreme Heat	P	69.23%	69.23%	69.23%	69.23%	69.23%	69.23%	69.23%	69.23%	69.23%	69.23%
	V	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Fires (Urban/Structural and Wild)	P	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	V	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M
Flooding	P	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%
	V	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Land Subsidence/Sinkholes	P	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Levee Failure	P	5%	0%	5%	5%	5%	0%	0%	0%	0%	0%
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Thunderstorm: *Heavy Rain/High Winds/Lightning/Hail	P	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	V	M	M	M	M	M	M	M	M	M	M

		Gasconade County	Bland	Gasconade	Hermann	Morrison	Owensville	Rosebud	Gasconade Co. R-I	Gasconade Co. R-II	Maries Co. R-II
Tornado	P	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	V	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Severe Winter Weather/Snow/Ice/Severe Cold	P	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	V	L	L	L	L	L	L	L	L	L	L
Vulnerability Rating Key: L = Low, L-M = Low-Medium, M = Medium, M-H = Medium-High, H = High, NDA = No Data Avail.											
*indicates hazard utilized for probability.											

3.1.5 Multi-Jurisdictional Risk Assessment

For this multi-jurisdictional hazard mitigation plan, each hazard is profiled in which the risks are assessed on a planning area wide basis. Some hazards, such as dam failure, vary in risk across the county. If variations exist within the planning area, discussion is included in each profile. Gasconade 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 Bland, Gasconade, Hermann, Morrison, Owensville, and Rosebud. 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. 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 Error! Reference source not found.**.** 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.

Error! Reference source not found. 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 ($)
Bland	557	558	-	-	-
Gasconade	245	287	-	-	-
Hermann	2,400	1,946	-	-	-
Morrison	93	173	-	-	-
Owensville	2,658	2,450	-	-	-
Rosebud	378	432	-	-	-
Unincorporated Gasconade County	8,683	19,978	-	-	-
Total	15,014	25,824	-	-	-

Sources: U.S. Census Bureau, 2010-2014 5-Year American Community Survey, MO_2014_Missouri_Structures_Project_gdb – Amec Foster Wheeler

Table 3.6. Building Values/Exposure by Usage Type

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Total
Bland	-	-	-	-	
Gasconade	-	-	-	-	-
Hermann	-	-	-	-	-
Morrison	-	-	-	-	-
Owensville	-	-	-	-	-
Rosebud	-	-	-	-	-
Incorporated Gasconade County	$751,940,000	$151,161,000	$67,060,000	$12,698,000	$982,859,000
Total	$751,940,000	$151,161,000	$67,060,000	$12,698,000	$982,859,000

Source: 2012 Gasconade County Hazard Mitigation Plan

Table 3.7. Building Counts by Usage Type

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Other	Total
Bland	413	7	3	0	2	425
Gasconade	140	3	0	1	0	144
Hermann	1,379	113	32	7	20	1,551
Morrison	65	2	0	0	0	67
Owensville	1,432	110	28	8	28	1,606
Rosebud	178	11	2	0	4	195
Unincorporated Gasconade County	9,007	388	127	81	73	9,676
Total	12,614	634	192	97	127	**13,664**

Source: 2012 Gasconade County Hazard Mitigation Plan (HAZUS-MH)

There is a discrepancy between building counts in **Table 3.5** and **Table 3.7**. Building count data in **Table 3.5** was developed by University of Missouri students utilizing ArcGIS in 2014; dataset provided by Amec Foster Wheeler. The dataset utilized in **Table 3.7** was taken from the 2012

Gasconade County Hazard Mitigation Plan. During that time, HAZUS-MH and ArcGIS was utilized to equate the county's building count. Within a two year period, it is highly improbable that the building count nearly doubled between 2012 and 2014. Human and program error is most likely the reason for the discrepancy. However, the 2014 dataset is most likely accurate as it is utilized for DFIRM and Risk Map training across Missouri. Unfortunately, building counts by usage type was not provided in the 2014 dataset.

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 ($)
Gasconade Co. R-I	1,019	-	-	-	-
Gasconade Co. R-II	1,761	6	57,021,470	5,662,139	62,683,609
Maries Co. R-II	262	1	6,000,000	2,000,000	8,000,000

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:

- 2012 Gasconade County Hazard Mitigation Plan

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

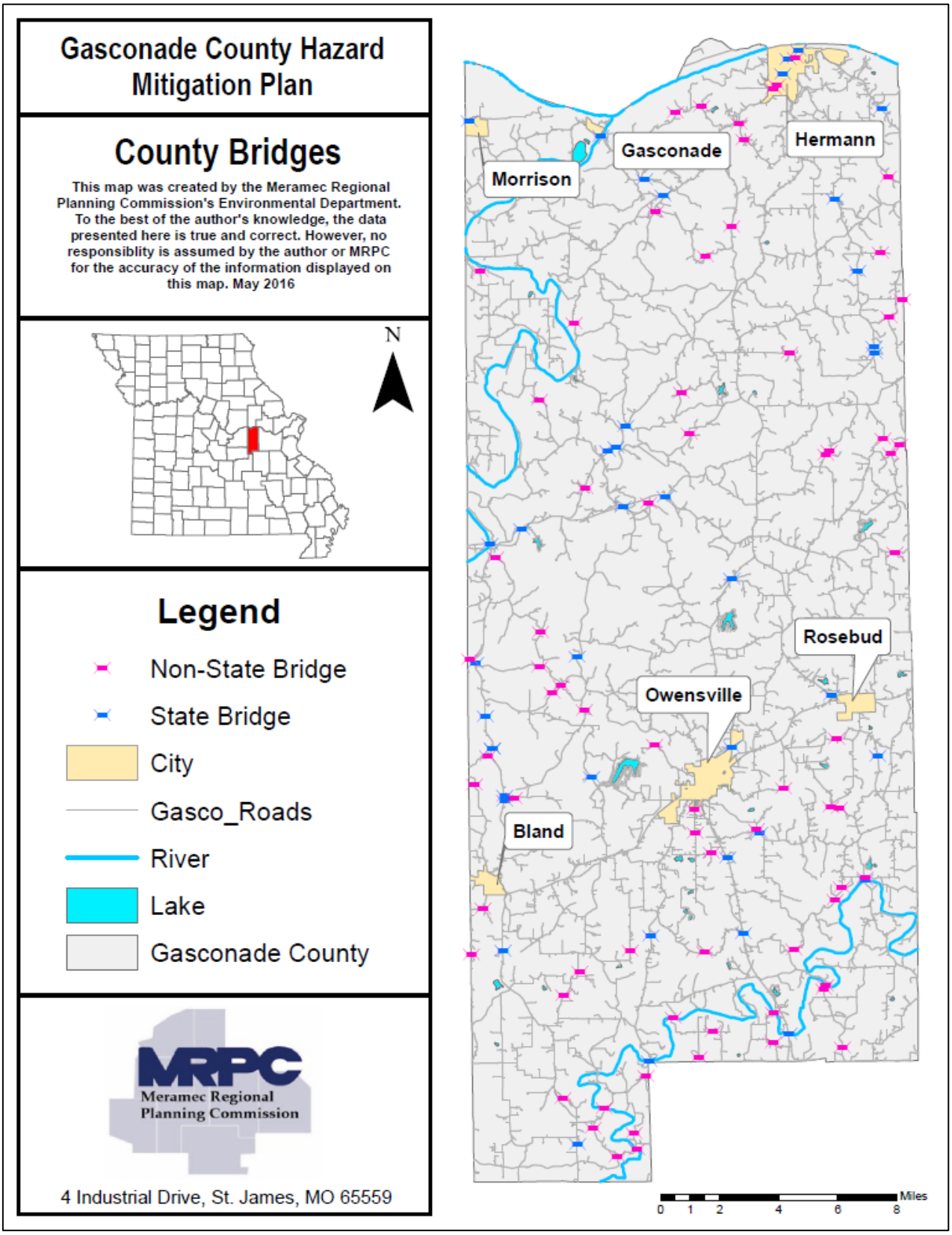
	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Highway Bridge	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	Total
Unincorporated Gasconade County	0	0	0	8	0	1	0	1	0	0	127	0	0	0	0	1	0	1	0	0	0	6	0	145
Bland	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	2	1	0	0	1	12
Gasconade	0	0	0	0	-	0	0	1	0	0	1	0	0	-	0	1	-	1	-	0	-	0	-	4
Hermann	1	0	12	1	3	0	1	1	0	0	3	2	0	2	2	1	0	1	5	3	0	12	1	51
Morrison	0	0	0	0	-	0	1	1	0	0	1	0	0	-	0	0	-	1	-	0	-	1	-	5
Owensville	0	0	4	1	-	0	1	1	0	0	1	1	0	-	4	1	-	1	-	3	-	19	-	37
Rosebud	0	0	0	0	-	0	1	1	0	0	1	0	0	-	0	1	-	1	-	1	-	1	-	7
Totals	1	0	17	11	4	1	5	7	0	0	134	3	0	2	6	6	1	7	7	8	0	39	2	261

Source: Data Collection Questionnaires; HAZUS, etc.

According to the National Bridge Inventory there are a total of 134 bridges in Gasconade County[2]. **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 2 scour critical bridges within the county.

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

Figure 3.2. Gasconade County Bridges



Source: MSDIS, MoDOT, MRPC

3.2.3 Other Assets

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

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

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

Table 3.10. Threatened and Endangered Species in Gasconade County

Common Name	Scientific Name	Status
Bird		
Ruga Red Knot	*Calidris canutus rufa*	Threatened (F)
Piping Plover	*Charadrius melodus*	Threatened (F)
Least tern	*Sterna antillarum*	Endangered (F)
Fish		
Crystal Darter	*Crystallaria asprella*	Endangered (S)
Lake Sturgeon	*Acipenser fulvescens*	Endangered (S)
Pallid Sturgeon	*Scaphirhynchus albus*	Endangered (F) (S)
Mammal		
Gray bat	*Myotis grisescens*	Endangered (F) (S)
Indiana bat	*Myotis sodalis*	Endangered (F) (S)
Northern long-eared bat	*Myotis septentrionalis*	Threatened (F)
Mollusk		
Ebonyshell	*Fusconaia ebena*	Endangered (S)
Elephant Ear	*Elliptio crassidens*	Endangered (S)
Pink mucket	*Lampsilis abrupta*	Endangered (F) (S)
Scaleshell	*Leptoea leptodon*	Endangered (F) (S)
Snuffbox	*Epioblasma triquetra*	Endangered (F) (S)
Spectaclecase	*Cumberlandia monodonta*	Endangered (F)
Salamander		
Eastern Hellbender	*Cryptobranchus alleganiensis allenganiensis*	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 Gasconade County.

Table 3.11. Parks in Gasconade County

Area Name	Address	City
Canaan CA	From Bland, take Route A north about 1.20 miles, then east on the area's southernmost access road (the road north of Rehmert Road). North access is on Highway A north an additional 1.70 miles, then east on Boettcher Road 1.50 miles.	Bland
Fredericksburg Ferry Access	From Linn, take Highway 50 east 3 miles, then Highway 89 north 3.50 miles, then Route J east 6 miles, then on Routes J and N north 4 miles, then Route J east 2 miles, and Old Ferry Road 1 mile to the Gasconade River.	Linn
Gasconade Park Access	In Gasconade, take Main Street north, then Oak Street east (right) to the end of the street.	Gasconade
Helds Island Access	From Mt. Sterling, take Highway 50 east, then Route K north 4 miles until it turns into a gravel road, continue 2 miles to the Access entrance, which is marked by a cantilever sign.	Mt. Sterling
Hermann Riverfront Park	Hermann Riverfront Park is in downtown Hermann along the Missouri River.	Hermann
Mint Spring Access	From Owensville, take Route EE south 9.50.	Owensville
Ming Spring CA	From Owensville, take Route EE south 9.50 miles.	Owensville
Tea Access	From Owensville take Highway 19 south 2 miles, then Route V east 5 miles, and Route T south 4 miles to Tea Road.	Owensville

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 Gasconade County.

Table 3.12. Community Owned Parks in Gasconade County

Park Name	Address	City
Memorial Park	712 Park Dr.	Owensville
Buschmann Park	402 S 4th St	Ownesville
Winter Park	409 Roadoak Road	Owensville
Luster Park	111 S 2nd St	Owensville
Hermann City Park	118 West 13th St	Hermann
River Park	-	Gasconade

Source: Google Search,

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

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

Property	Address	City	Date Listed
Hermann Historic District	-	Hermann	10/30/09
Hermann Historic District	214 and 304 Franklin, 301-501 Gellert, 2202 MO 100	Hermann	11/29/06
Hermann Historic District	Wharf, First, Mozart, 5th, Schiller, 4th, Gutenberg, and Reserve Sts.	Hermann	10/30/09
Kotthoff-Weeks Farm Complex	-	Hermann	3/28/83
Old Stone Hill Historic District	West 12th, Goethe, Jefferson Sts. And Iron Rd.	Hermann	5/21/69
Poeschel, William, House	W 10th St.	Hermann	6/21/90
Rotunda, The	Washington St.	Hermann	11/2/95
Ruskaup House	Hwy. 50	Drake	3/29/83
Shobe-Morrison House	W of Morrison off MO 100	Morrison	2/10/83
Vallet-Danuser House	E of Hermann on Hwy. 100	Hermann	9/23/82

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

Economic Resources: **Table 3.14** provides major non-government employers in the planning area. There are approximately 414 employer establishments within the county, employing on average 11 individuals each[3].

Table 3.14. Major Non-Government Employers in Gasconade County

Employer Name	Product or Service	Employees
Gasconade Co. Schools	Education	275
Frene Valley Health Care	Nursing Facility	120
Hermann Area Hospital	Hospital	160
Frene Valley Health Care South	Nursing Facility	110
Lost Valley Lake Resort/Mid-America Resorts	RV and Campground	150
Pioneer Industries, LLC	Lumber yard	140
RR Donnelley	Printing	201
Wal-Mart	Retail	103

Source: 2013 Community Economic Development Strategy

Agriculture plays an important role in Gasconade County in terms of employment. The Agribusiness Employment Location Quotient for the County is greater than 1.5; meaning that there is a high share of agribusiness employment to its share of total national employment[4]. In addition, there were 347 hired farm laborers[5], comprising 5.3%[6] of the total workforce in 2012. In addition, the market value of products sold in 2012 was $25,948,000; 64% from livestock sales, and 36% from crop sales.

[3] Cbb.census.gov
[4] http://www.missourieconomy.org/pdfs/missouri_farms_and_agribusiness.pdf;
[5] http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Missouri/
[6] U.S. Census Bureau, 2008-2012 American Community Survey

3.3 Future Land Use and Development

Table 3.15 provides population growth statistics for Gasconade County.

Table 3.15. Gasconade County Population Growth, 2000-2014

Jurisdiction	Total Population 2000	Total population 2014	2000-2014 # Change	2000-2014 % Change
Unincorporated Gasconade County	8,849	8,683	-166	-1.8
Bland	565	557	-8	-1.4
Gasconade	267	245	-22	-8.2
Hermann	2,674	2,400	-274	-10.2
Morrison	123	93	-30	-24.3
Owensville	2,500	2,658	158	.72
Rosebud	364	378	14	3.8

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 2000	Housing Units 2014	2000-2014 # Change	2000-2014 % change
Unincorporated Gasconade County	4,658	4,966	308	6.6
Bland	299	280	-19	-6.3
Gasconade	141	173	32	22.7
Hermann	1,285	1,290	5	.39
Morrison	63	74	11	17.5
Owensville	1,202	1,195	-7	-.58
Rosebud	165	187	22	13.3

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 Gasconade County Hazard Mitigation Plan (2012), only one jurisdiction reported commercial and industrial developments. Hermann reported expansions for Moore Gear and the Hermann Area Hospital.

Jurisdictions also reported anticipated future developments within the next 5 years (2016-2021). Bland anticipates city wide water infrastructure development and Owensville reported a possibility of a new government center or police station. Gasconade Co, Gasconade, Hermann, Morrison, and Rosebud do not anticipate future developments within the next 5 years.

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

School District's Development

Gasconade County R-II was the only district to report development since the last Hazard Mitigation Plan update. Additions were made at Owensville Elementary and Gerald Elementary (to be completed fall 2016).

Gasconade County R-II anticipates minor renovations to numerous buildings. In addition, Maries Co. R-II anticipates a new elementary school building. Gasconade County R-I does not anticipate development between 2016 and 2021.

For student enrollment Gasconade Co. R-I anticipates a 2% decrease, Gasconade Co. R-II anticipates a 1-2% increase, and Maries Co. R-II anticipates constant or slightly increased enrollment.

Socioeconomic Profile

The University of Missouri Extension developed a Social and Economic Profile for Gasconade County. Population trend data suggests that Gasconade County will increase by 907 individuals within the next 4 to 14 years[7]. Furthermore, business incentives are available in the County including MissouriWorks, a program for qualified job creators which enables the retention of withholding tax or tax credits that can be transferrable, refundable and/or saleable. 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[8]. **Figure 3.3** displays socioeconomic data for Gasconade County compared to the State of Missouri.

[7] UM Extension Social and Economic Profile http://mcdc2.missouri.edu/cgi-bin/broker?_PROGRAM=websas.cntypage.sas&_SERVICE=appdev&_debug=0&county=29073
[8] https://www.ded.mo.gov/Programs.aspx

Figure 3.3. Gasconade County Socioeconomic Profile

Sales Tax

	Rate
Hermann	2.00%
Gasconade County	1.38%
Missouri	4.23%
Total	7.61%

Property Tax

	Rate
Gasconade County	0.85%

Median Household Income

Gasconade County	$42,574
Missouri	$47,764

Median Housing Value

Gasconade County	$116,300
Missouri	$136,700

Cost of Living

Community	Cost of living index	Year
Gasconade County	87.4	2016
Missouri	89.9	2016

Total Retail Sales

Year	Gasconade
2012	$171,382,000

Per Capita Income

Gasconade County	$22,067
Missouri	$26,006

Transportation

Airport	-
Highways	US 50
State Highways	19, 28, 100
Transportation Services	Greyhound, Amtrak
Railroad	Union Pacific, Central Midland
Parcel Service	UPS, Fed Ex, DHL, USPS

Sources:

1. U.S. Census Bureau, 2010-2014 5-Year American Community Survey
2. https://www.salestaxhandbook.com/missouri/rates/hermann
3. http://www.city-data.com
4. http://smartasset.com
5. Missouri Economic Research and Information Center, https://www.missourieconomy.org/indicators/cost_of_living/
6. https://www.census.gov/quickfacts/table/PST045215/29073/embed/accessible
7. http://mcdc2.missouri.edu/cgi-bin/broker?_PROGRAM=websas.cntypage.sas&_SERVICE=appdev&_debug=0&county=29073

3.4 Hazard Profiles, Vulnerability, and Problem Statements

Each hazard that has been determined to be a potential risk to Gasconade County is profiled individually in this section of the plan document. The profile will consist of a general hazard description, location, severity/magnitude/extent, previous events, future probability, a discussion of risk variations between jurisdictions, and how anticipated development could impact risk. At the end of each hazard profile will be a vulnerability assessment, followed by a summary problem statement.

Hazard Profiles

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

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

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

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

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

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

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

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

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

Vulnerability Assessments

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Problem Statements

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

3.4.1 Dam Failure

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

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

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

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

Table 3.17. MDNR Dam Hazard Classification Definitions

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

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

Table 3.18. NID Dam Hazard Classification Definitions

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

Source: National Inventory of Dams

Geographic Location

Dams in Planning Area

According to the Department of Natural Resources there are 83 dams within Gasconade County; including Class 1 (7), Class 2 (15), Class 3 (60), and unknown (1) dams (**Table 3.19**). In addition, the state regulates 14 of the 83 dams. The NID recognizes 81 dams in the planning area; including high (20), significant (4), and low (57) NID hazard class dams. None of the dams are owned or operated by the United States Army Corps of Engineers (USACE). County dams are privately or commercially owned. **Table 3.20** provides the names, locations, and other pertinent information for all NID High Hazard Dams in the planning area.

Table 3.19. Gasconade County Dams Hazard Risk

Name of Dam	DNR Hazard Class	NID Hazard Class
A C Schneider Lake (Too Small)	3	**-**
Ahmad Lake Dam	3	Low
Bains Lake Dam	3	Low
Bay Lake Dam	3	Low
Becker Lake Dam	3	Low
Benson Lake Dam	**1**	**High**
Boston Lake Dam	3	Low
Brandt Lake Dam	3	Low
Brown Shanty Lake Dam	**1**	**High**
Busch Lake Dam	3	Low
Dougherty Dam	-	Low

Name of Dam	DNR Hazard Class	NID Hazard Class
Dr Henson Lake Dam	**1**	**High**
Epple Lake Dam	3	Low
Frericks Sect-34 Lake Dam	3	Low
Fricke Lake Dam	3	Low
Dade.lee Dam	3	Low
Garofalo Lake Dam	3	Low
Gehrke Lake Dam	2	**High**
Godefroid Lake Dam	3	Low
Gouldner Lake Dam	2	**High**
Grebe Lake Dam	3	Low
Harring Lake Dam	3	Low
Helmut Weber Dam	3	Significant
Hensley Lake Dam	3	Low
Hickory Lake Dam	3	Low
Hoffmann Lake Dam	3	Low
J.C.'s Lunker Lagoon	2	Low
Jackson Lake Dam	3	Low
Jasper Lake Dam	3	Low
Jasper Lake Dam	3	Low
Jasper Lake Dam	2	**High**
John C. Hill Lake Dam	2	**High**
Kehr Lake Dam	2	**High**
Keiser Lake Dam	3	Low
Kohrman Lake Dam	3	Low
Laboube Lake Dam	3	Low
Lake Carawood Dam	2	**High**
Lake Northwoods Dam	2	**High**
Lake Northwoods Dam West	3	Low
Lake Timber Ridge Dam	**1**	**High**
Landwehr lake Dam	2	**High**
Langenberg Lake Dam	2	**High**
Laury Lake Dam	3	Low
Laylow Dam	2	Low
Lerwick Lake Dam	3	Low
Limberg Lake Dam	3	Low
Lost Valley Lake Dam	2	**High**
Lost Valley Lake Dam #2	**1**	**High**
McGowen Lake Dam	3	Low
Memory Lake Dam	3	Low

Name of Dam	DNR Hazard Class	NID Hazard Class
Mistler Lake Dam	3	Low
Mononame 538 (Clay Pit)	3	-
Mueller Lake Dam	3	Low
Mueller Lake Dam	3	Low
Novak Lake Dam	3	Low
Peaceful Valley Lake Dam	**1**	**High**
Pershing Farms Dam	3	Low
Ponticello Lake Dam	3	Low
Pueschel Lake Dam	3	Low
Raack Lake Dam	3	Low
Raeker Lake Dam	3	Low
Sammons Lake Dam	3	Low
Schneider Lake Dam Lower	2	**High**
Schneider Lake Dam Upper	2	**High**
Seetal Lake Dam	**1**	**High**
Shockley Lake Dam	3	Low
South Sediment Pond Dam	3	Significant
Sunswept Lake Dam	3	Low
Swiss Lake Estates Dam	2	**High**
Tayloe Lake Dam East	3	Low
Tayloe Lake Dam West	3	Low
Tea Lake Dam Number 2	3	Low
Tea Lakes Dam #1	3	Low
Terry Jordan Lake Dam	3	Significant
Trampe Lake Dam	3	Low
W Grimm	3	Low
W J Slais Dam	3	Low
Wagner Lake Dam	3	Low
Walkenbach Lake Dam-North	3	Low
Walkenbach Lake Dam-South	3	Low
Weiss Lake Dam	3	Low
Windy Hill Lake Dam	3	Significant
Worthington Lake Dam	3	Low

Source: Missouri Department of Natural Resources, Water Resources Program

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

Dam Name	NIDID	Hazard Potential *	NID Height (Ft.)	NID Storage	River	Nearest City *	Distance To City (Mi.) *
BENSON LAKE DAM	MO30667	High	25	54	FRENE CREEK	HERMANN	5
BROWN SHANTY LAKE DAM	MO30197	High	34	164	TR-GASCONADE RIVER	GASCONADE	1
DR HENSON LAKE DAM	MO31570	High	29	47	FRENE CREEK	HERMANN	-
GEHRKE LAKE DAM	MO31354	High	30	64	TR-HORSTMAN CREEK	NEW HAVEN	16
GOULDNER LAKE DAM	MO30672	High	34	109	TR-LITTLE BERGER CREEK	NEW HAVEN	15
JASPER LAKE DAM	MO31565	High	30	64	TR-LITTLE BERGER CREEK	NEW HAVEN	18
JOHN C. HILL LAKE DAM	MO40128	High	52	523	LITTLE BERGER CREEK	HERMANN	4.5
KEHR LAKE DAM	MO31341	High	30	353	TR-RED OAK CREEK	ROSEBUD	-
LAKE CARAWOOD DAM	MO30107	High	36	167	TR-BIG BERGER CREEK	NEW HAVEN	18
LAKE NORTHWOODS DAM	MO30110	High	50	2097	TR.TO SECOND CR.	BAY	8
LAKE TIMBER RIDGE DAM	MO30762	High	43	810	TR.TO PINOAK CR.	GASCONADE	23
LANDWEHR LAKE DAM	MO30665	High	30	96	TR-DRY FK-BOURBEUSE RIVER	NOSER MILL	14
LANGENBERG LAKE DAM	MO31351	High	34	473	TR-BOEUF CREEK	BEEMONT	5
LOST VALLEY LAKE DAM	MO30757	High	30	626	TR-BIG BRCH-BOEUF CREEK	WASHINGTON	30
LOST VALLEY LAKE DAM #2	MO40144	High	42	913	BIG BRANCH	-	-
PEACEFUL VALLEY LAKE DAM	MO30196	High	64	4784	TR-CEDAR BRANCH CREEK	COOPER HILL	-
SCHNEIDER LAKE DAM LOWER	MO31586	High	25	27	TR-LITTLE BERGER CREEK	NEW HAVEN	20
SCHNEIDER LAKE DAM UPPER	MO31585	High	25	27	TR-LITTLE BERGER CREEK	NEW HAVEN	20

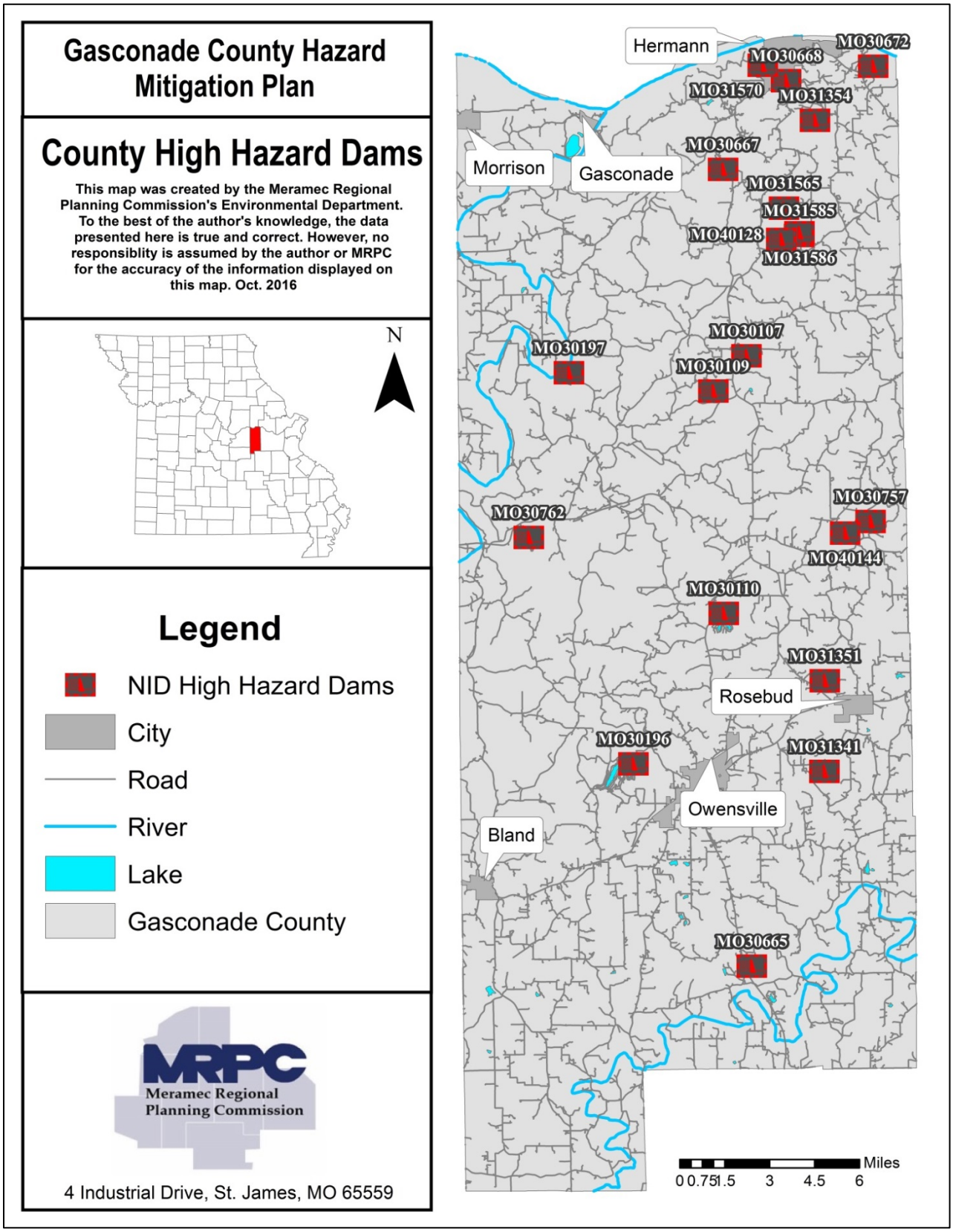
Dam Name	NIDID	Hazard Potential *	NID Height (Ft.)	NID Storage	River	Nearest City *	Distance To City (Mi.) *
SEETAL LAKE DAM	MO30668	High	51	232	TR-FRENE CREEK	HERMANN	1
SWISS LAKE ESTATES DAM	MO30109	High	42	667	TR-PUNCHEON CREEK	FREDRICKSBURG	25

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

Figure 3.3 depicts locations of NID high hazard dams located in the planning area. If a dam failure were to occur in Gasconade County, depending upon dam and location, the severity would range between negligible to life threatening. Road infrastructure, residential structures, commercial buildings, and public buildings are all vulnerable to losses. There are areas of assembly in dam inundation zones, specifically retail stores in Hermann, MO.

Seven dam inundation maps were available from the Missouri Department of Natural Resources. These Regulated Dams include John C. Hill Lake Dam, Lake Northwoods Dam, Lake Timber Ridge Dam, Lost Valley Lake Dam #2, Peaceful Valley Lake Dam, Seetal Lake Dam, and Swiss Lake Estates Dam (**Figure 3.4** to **Figure 3.10**). No other dam inundation maps were available for the remaining NID High Hazard Dams in the county.

Figure 3.3. NID High Hazard Dam Locations in Gasconade County



Source: MSDIS, MRPC
* Dams MO31586 and MO31585 overlap

Figure 3.4. John C. Hill Lake Dam Inundation Zone

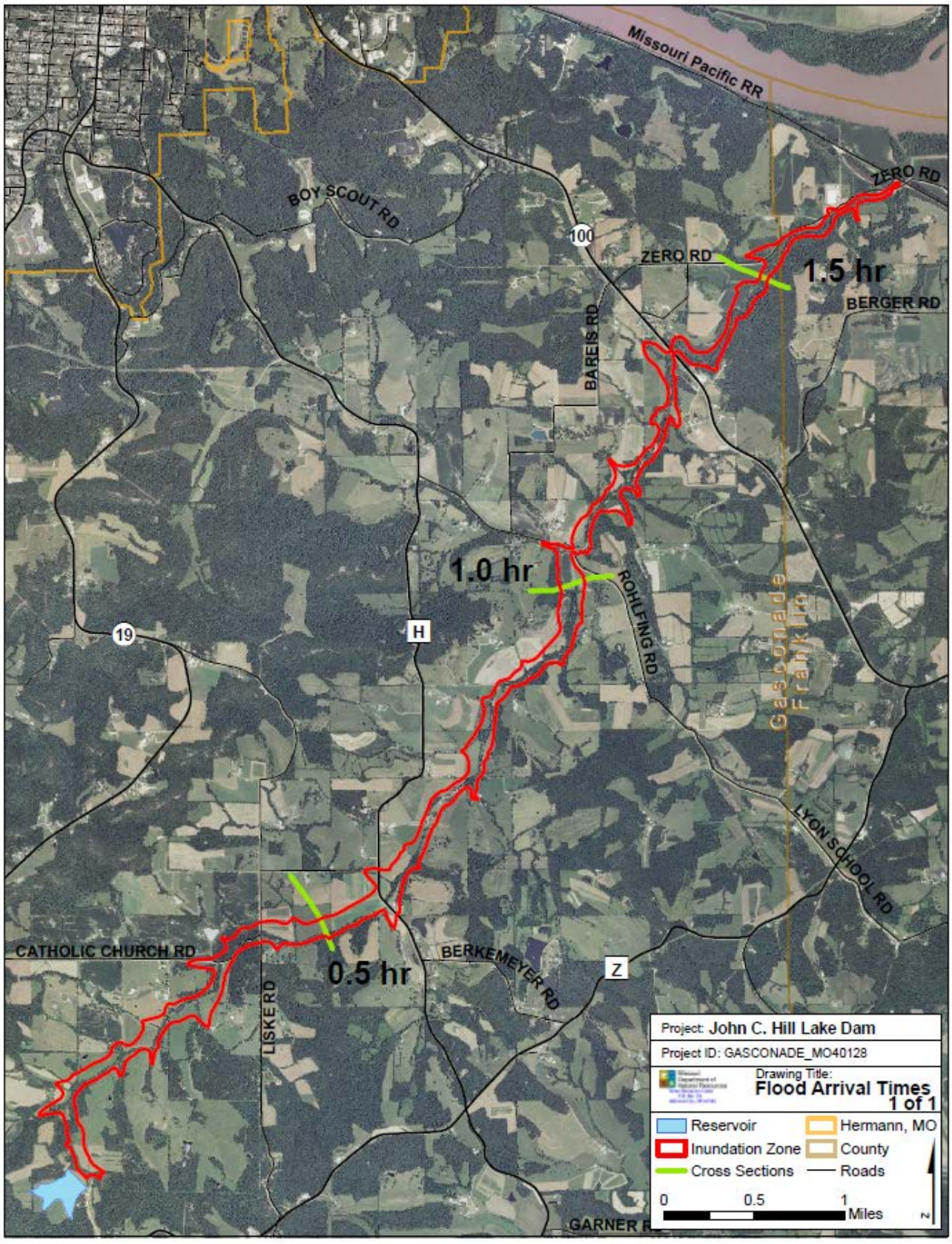


Figure 3.5. Lake Northwoods Dam Inundation Zone

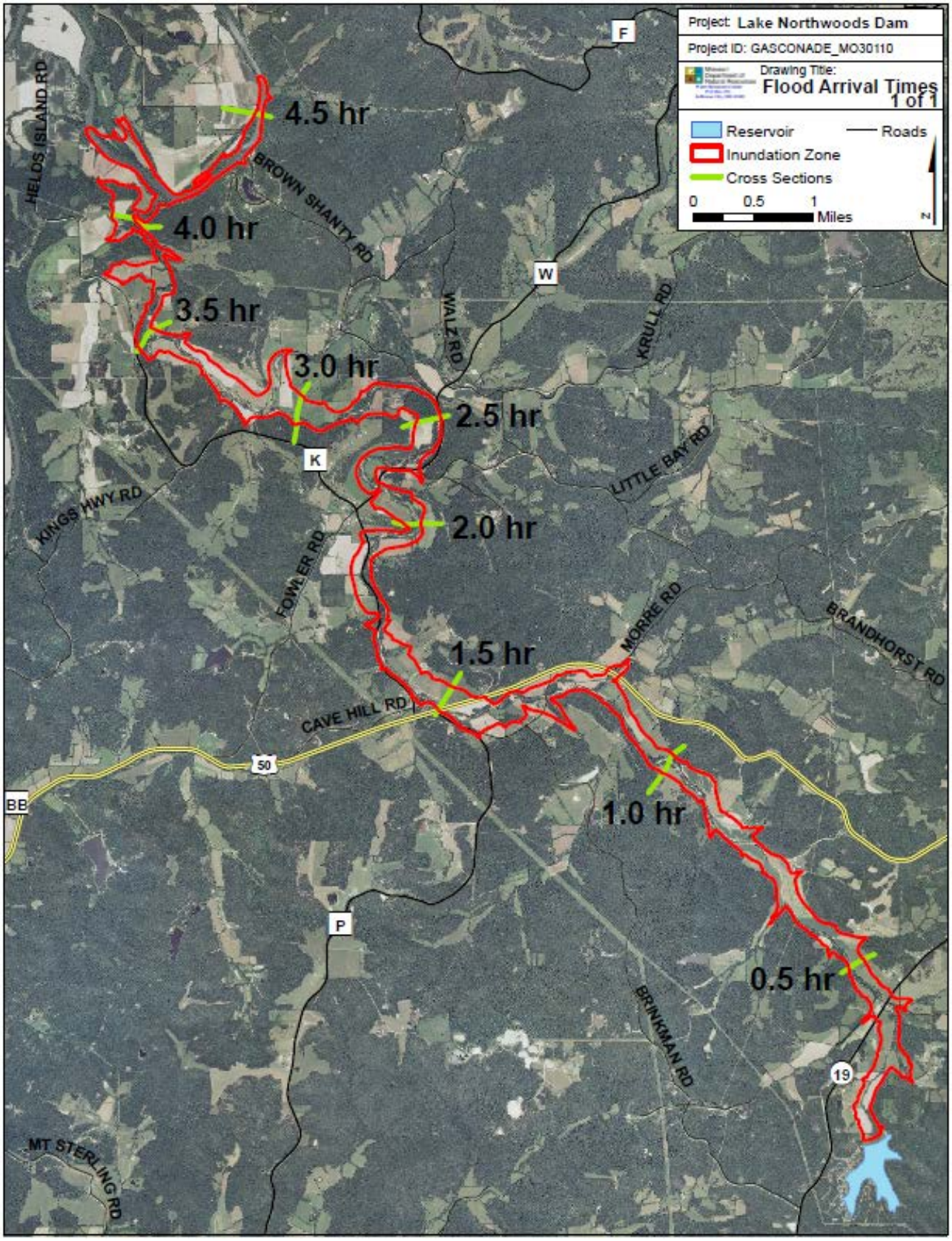


Figure 3.6. Lake Timber Ridge Dam Inundation Zone

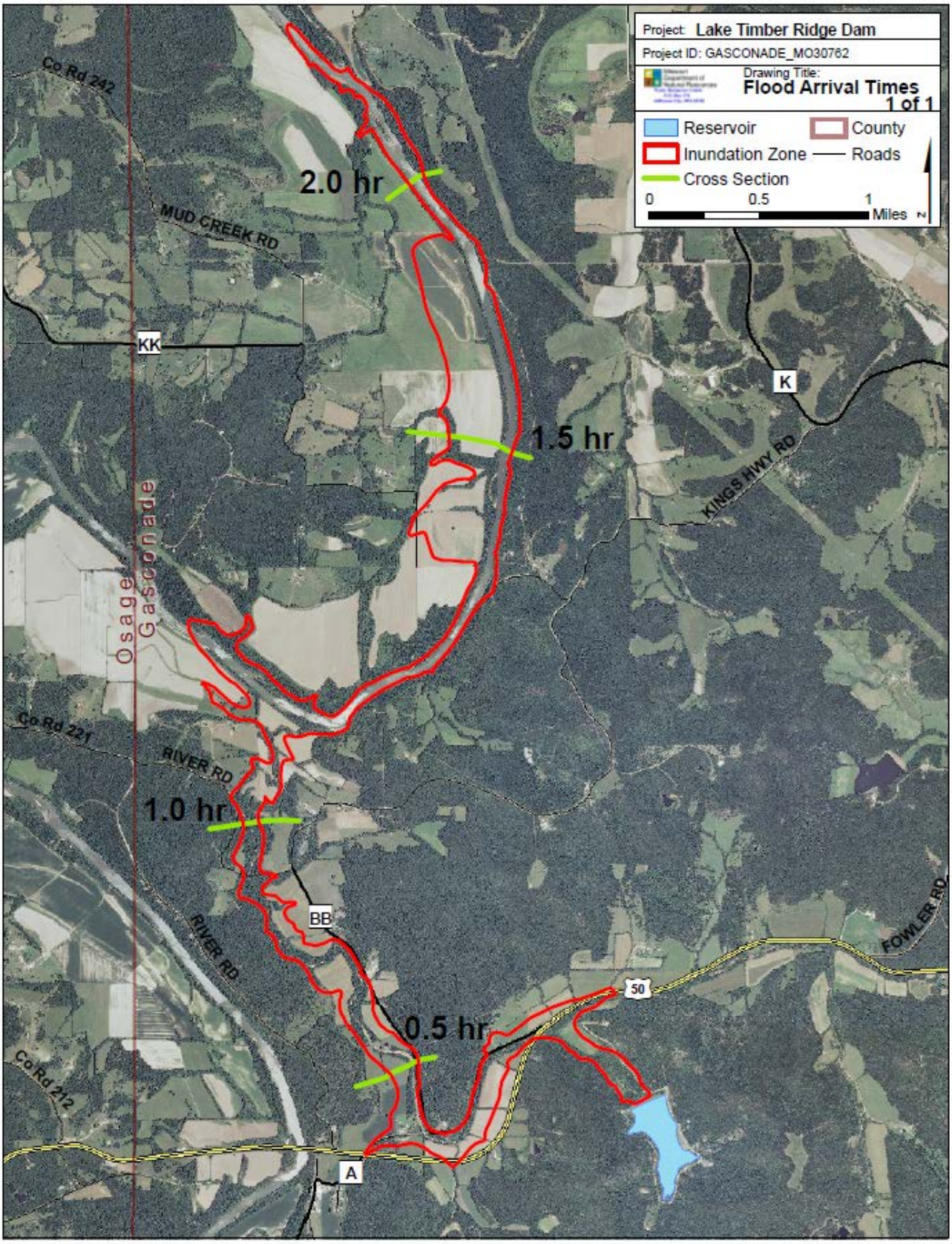


Figure 3.7. Lost Valley Lake Dam #2 Inundation Zone

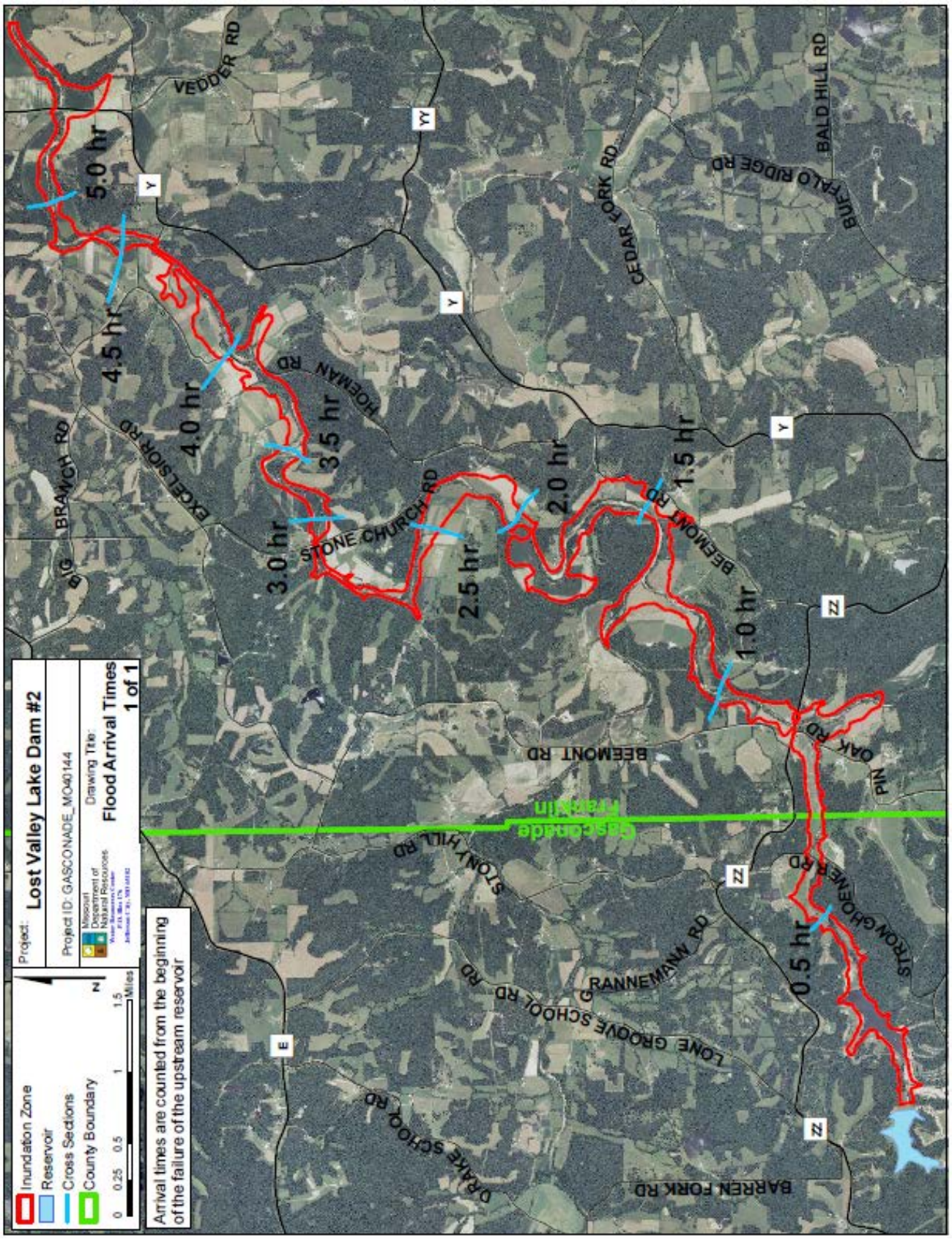


Figure 3.8. Peaceful Valley Lake Dam Inundation Zone

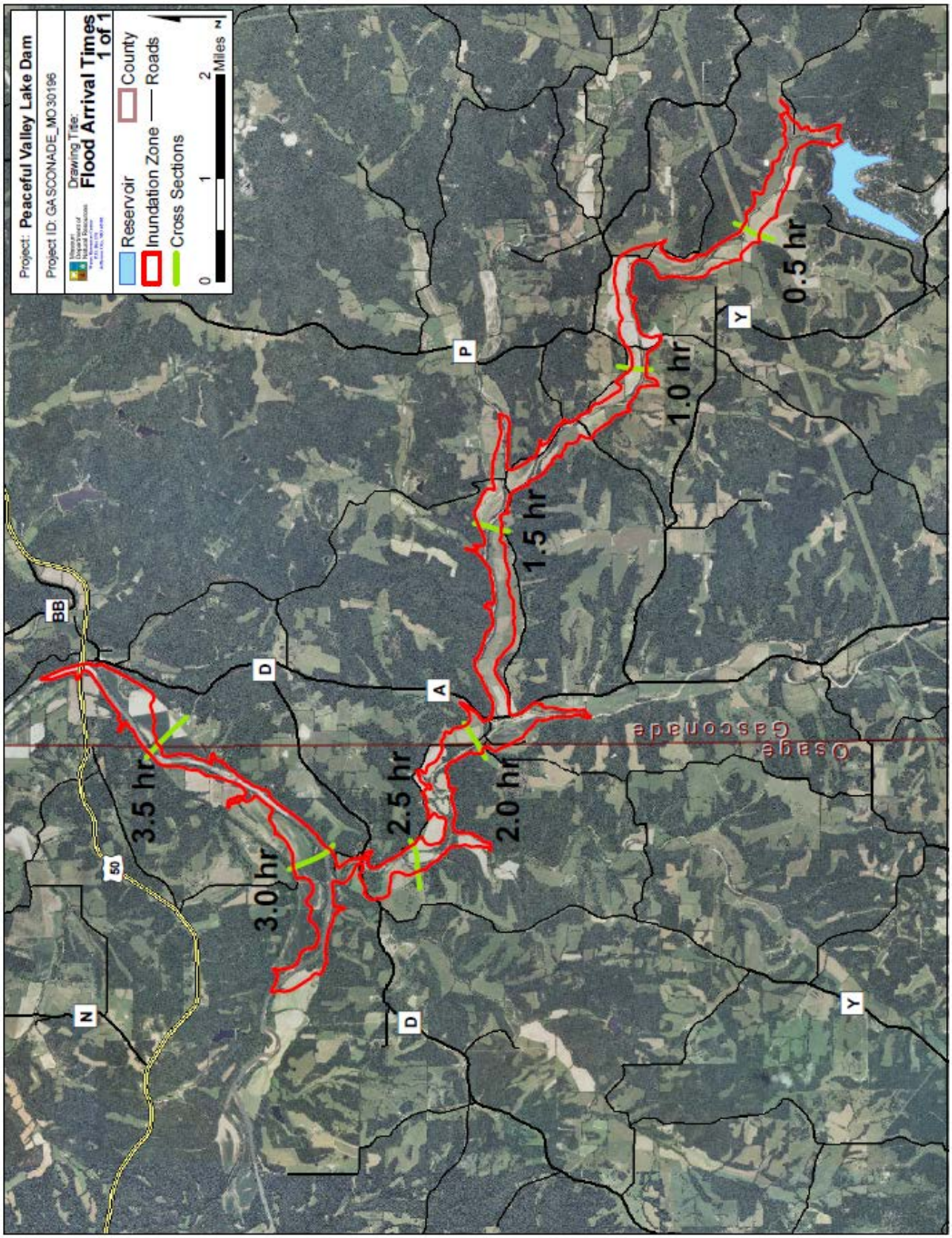


Figure 3.9. Seetal Lake Dam Inundation Zone

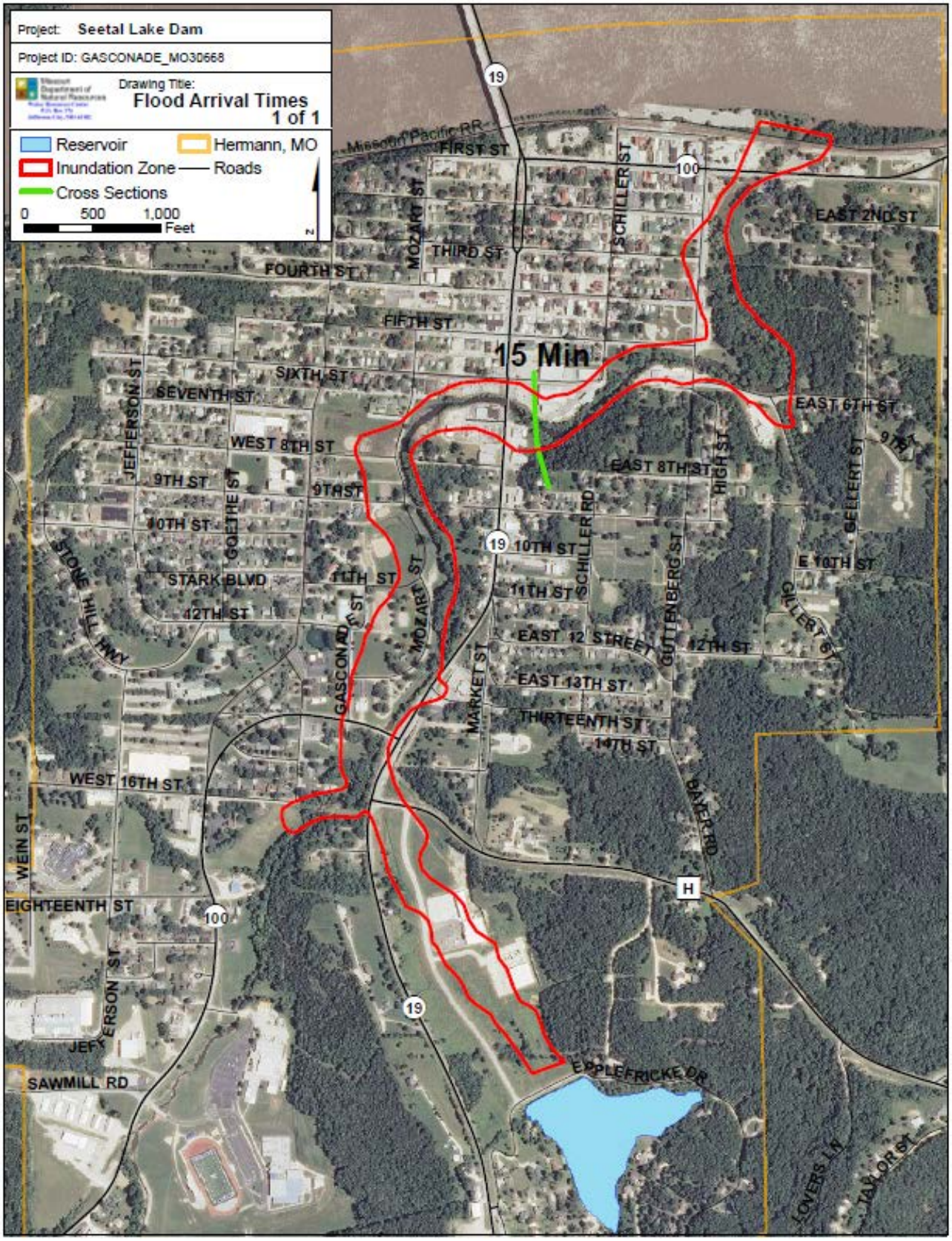
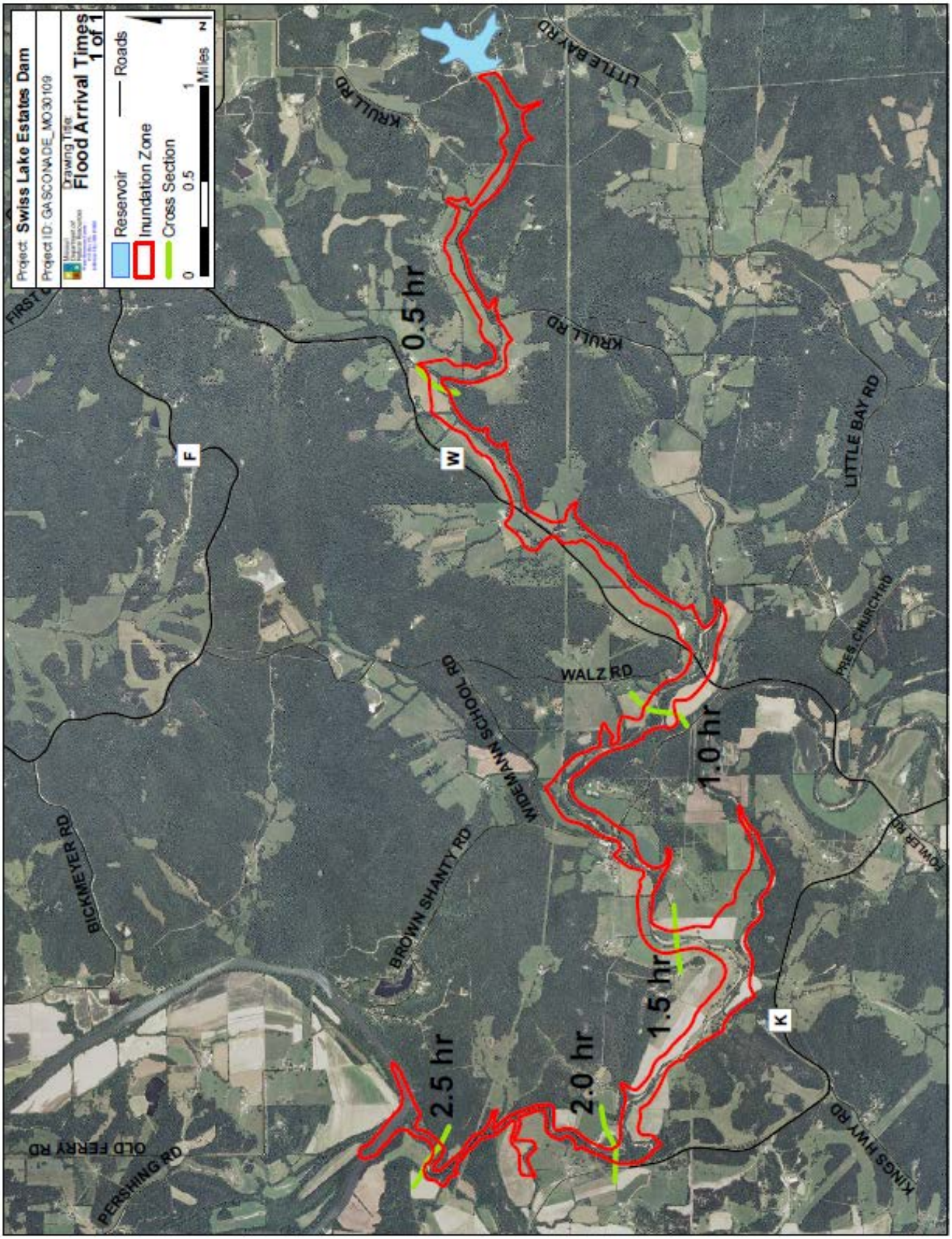


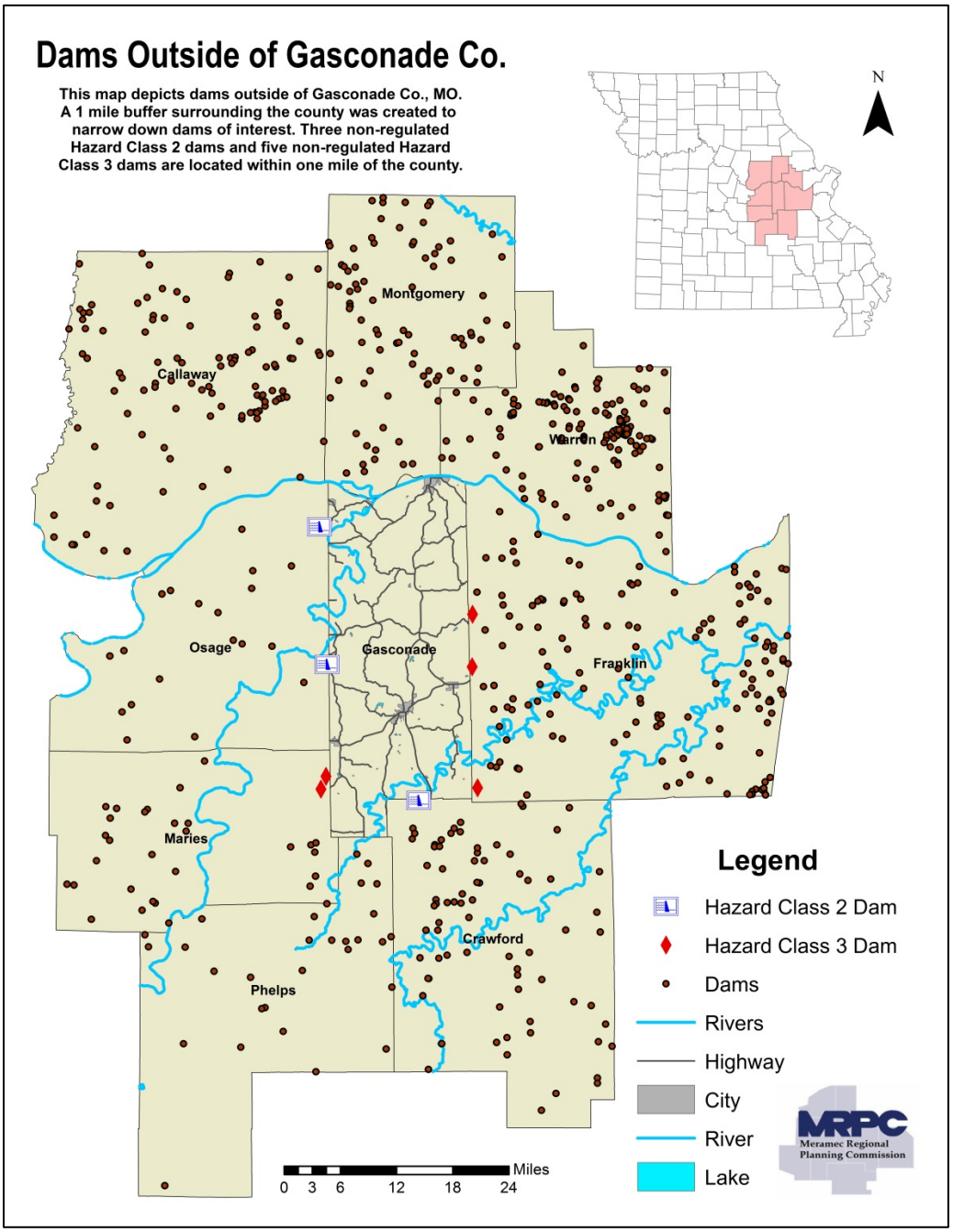
Figure 3.10. Swiss Lake Estates Dam Inundation Zone



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 Gasconade County from surrounding counties during a failure event. However, it was noted that Indian Hills Lake Dam in Crawford County (Regulated, Class 3) would have to travel approximately 15 miles of streambed before it would reach Gasconade County. **Figure 3.11** depicts dams outside of Gasconade County. Three Hazard Class 2 dams (non-regulated) are located within a 1 mile buffer. Five other dams located within the 1 mile buffer are Hazard Class 3 (non-regulated).

Figure 3.11. Upstream Dams Outside Gasconade 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 Seetal Lake Dam in Hermann. With retail stores located approximately 260 yards downstream, residents would have a miniscule amount of time to evacuate; loss of life would be likely.

Previous Occurrences

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

In the early morning hours of December 14, 2005, a combination of human and mechanical error in the pump station resulted in the reservoir being overfilled. The manmade dam around the reservoir failed and dumped over a billion gallons of water down the side of Profitt Mountain, into and through Johnson's Shut-Ins State Park and into the East Fork of the Black River. The massive wall of water scoured a channel down the side of the mountain that was over 6000 feet wide and 7,000 feet long that carried a mix of trees, rebar, concrete, boulders and sand downhill and into the park[11]. 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[12]. 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[13].

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

[10] 2013 Missouri State Hazard Mitigation Plan

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

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

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

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[14].

Event Description

According to Stanford University's National Performance of Dams Program, no dam incidents have been recorded for Gasconade County[15].

Probability of Future Occurrence

Since it is unknown which dams, if any might fail at any given time, determining the probability of future occurrence is not possible[16]. In addition, dam failure within the county has not occurred according to available data. **Table 3.4** depicts dam failure probability as no data available (NDA).

Vulnerability

Vulnerability Overview

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

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

County	Class 1	Class 2	Class 3	Total	Estimated # of Buildings Vulnerable	Average Exposure Value per Structure ($)	Estimated Total Potential Building Exposure ($)	Estimated Total Population Exposure	Estimated Building Losses ($)
Gasconade	4	3	7	14	55	82,323	9,091,906	127	4,545,953

Source: 2013 Missouri State Hazard Mitigation Plan

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

- Class 1 dams, the number of structures in the inundation area was estimated to be 10

[14] United States Geological Survey Fact Sheet 131-02. October 2002
[15] http://www.npdp.standord.edu/dam_incidents
[16] 2013 Missouri State Hazard Mitigation Plan

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.

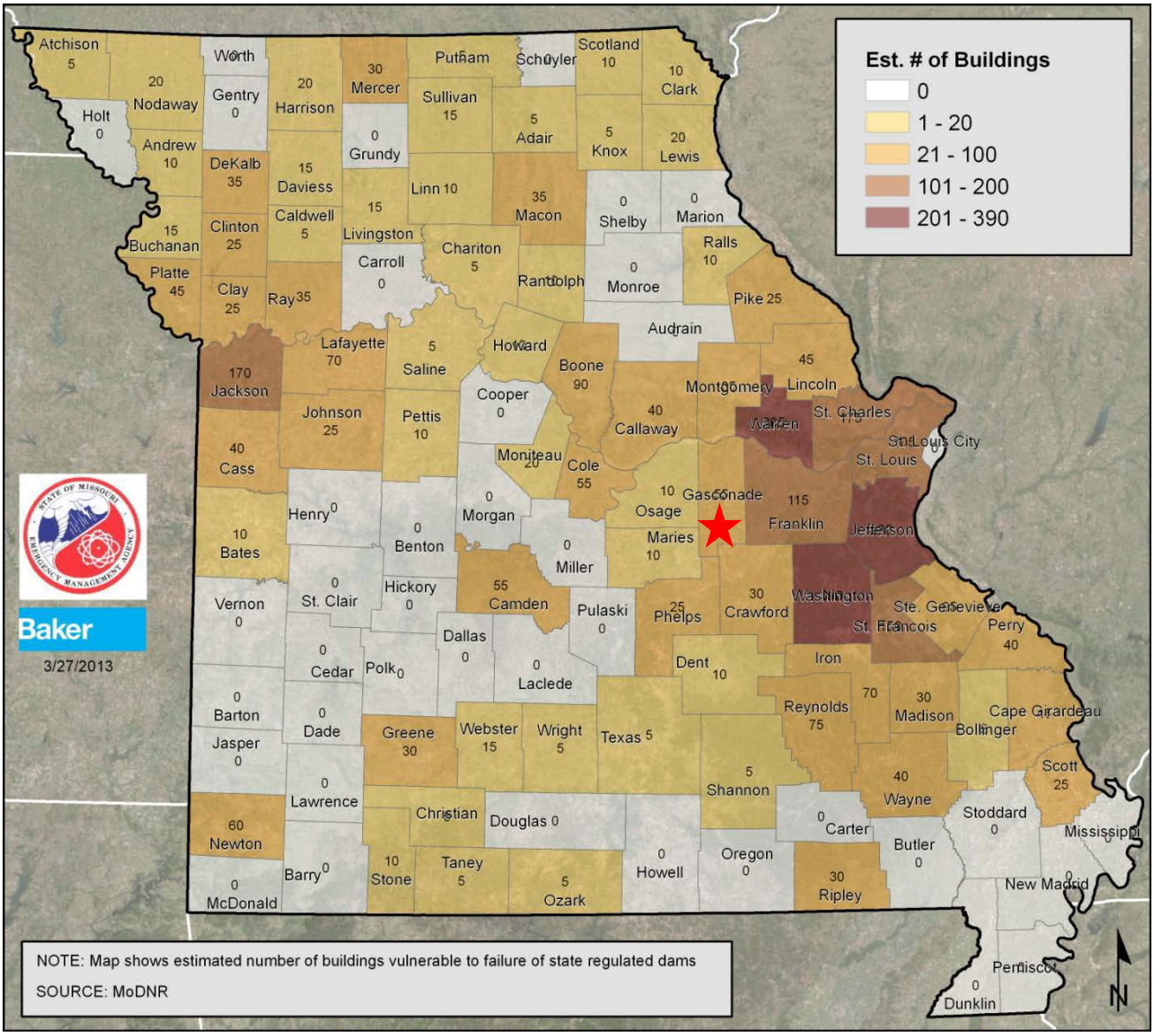
According to the 2013 Missouri State Hazard Mitigation Plan, there is an estimated 21-100 buildings vulnerable to failure of State-regulated dams (**Figure 3.12**). Furthermore, the state quantified potential loss estimates in terms of property damages. To execute the analysis, the following assumptions 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 blockers were intersected with available State regulated dam inundation areas to identify the vulnerable population for each county[17].

Figure 3.13 and **Figure 3.14** 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.

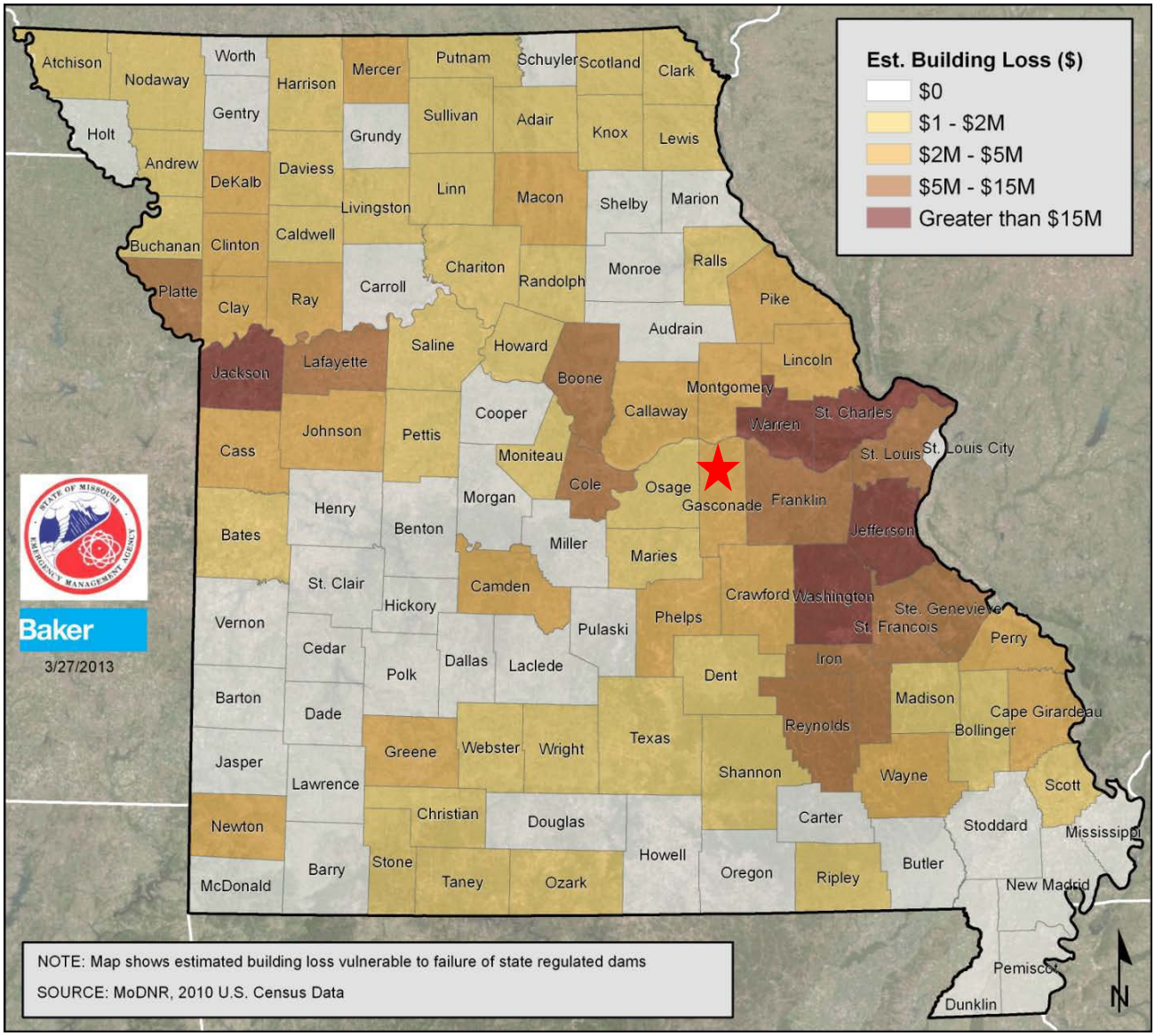
[17] 2013 Missouri State Hazard Mitigation Plan

Figure 3.12. Estimated Number of Buildings Vulnerable to Failure of State-regulated Dams



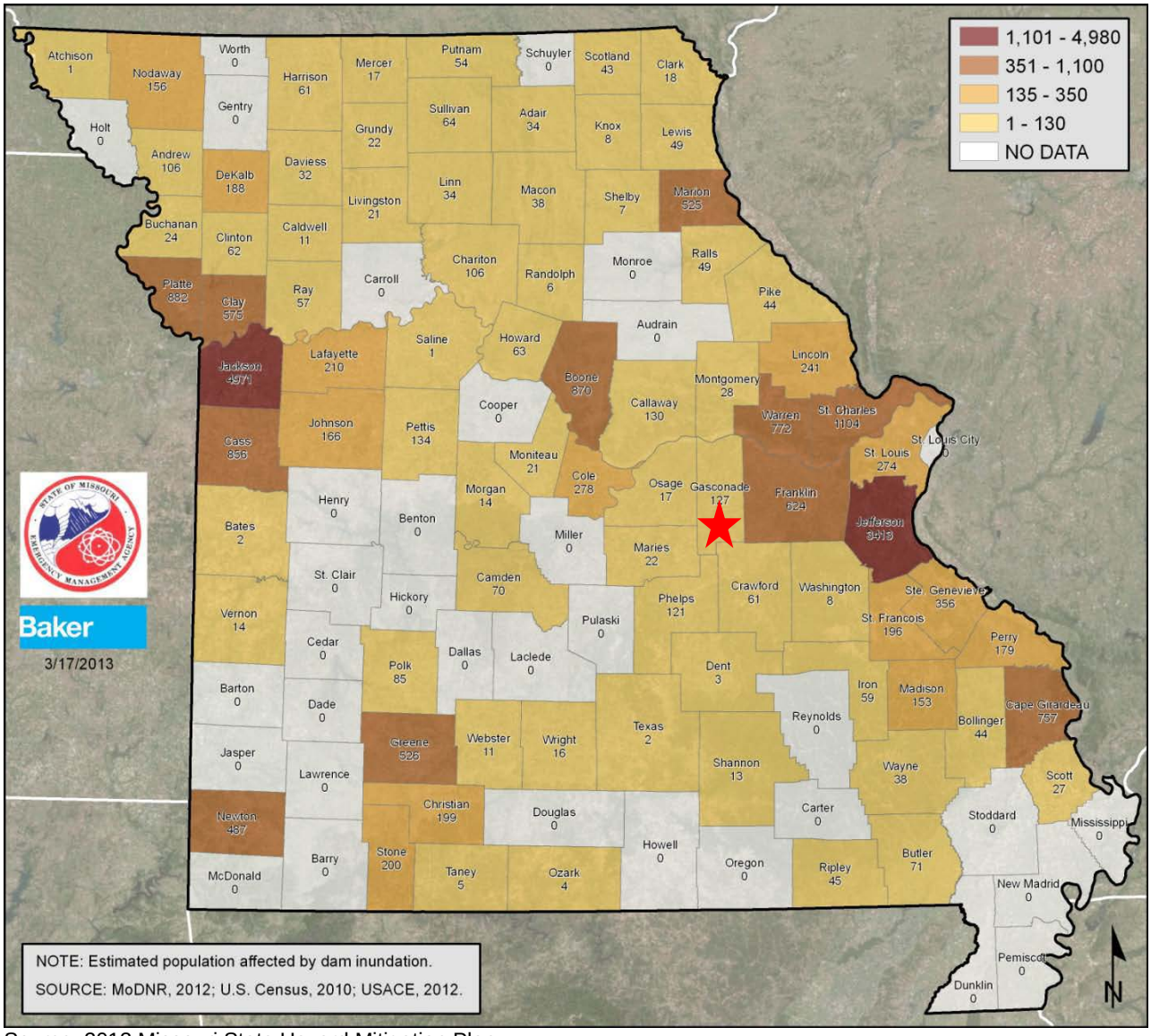
Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Gasconade County

Figure 3.13. Estimated Building Losses from Failure of State-regulated Dams



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

Figure 3.14. Estimated Population Exposure to Failure of State-regulated Dams



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

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

The most obvious worst case dam failure scenario would occur at Seetal Lake Dam (**Figure 3.9**) in Hermann. During a failure event, serious loss to road infrastructure, commercial and residential structures, and human life is likely. Other high hazard dams within the county would most likely experience loss to road infrastructure and residential structures. However, the majority of dams in Gasconade County are rural in nature.

Impact of Future Development

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

Hazard Summary by Jurisdiction

Variations in vulnerability across the planning area depend upon multiple variables. Nonetheless, Gasconade County school districts and special districts do not have assets located in dam breach inundation areas. Seetal Lake Dam in Hermann seems to be most vulnerable to losses during the event of failure due to the number of assets within the inundation zone.

Problem Statement

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

3.4.2 Drought

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

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

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

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

- Agricultural drought focus is on soil moisture deficiencies, differences between actual and potential evaporation, reduced ground water or reservoir levels, etc. Plant demand for water depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil.

- Socioeconomic drought refers to when physical water shortage begins to affect people[18].

Geographic Location

All areas and jurisdictions in Gasconade County are susceptible to drought, but particularly cities where thousands of residents are served by the same source of water. These cities use deep hard rock wells that are 1,100 to 1,800 feet deep and can experience drought when recharge of these wells is low. The number of individuals within the county served by groundwater is 8,243[19]. However, rural residences with individual wells will likely be affected as well. Approximately 63% of the land in the county is utilized for agricultural purposes. Furthermore, livestock sales comprise 64% of the market of agricultural products sold in Gasconade County. A drought would directly impact livestock production and the agriculture economy in Gasconade County[20].

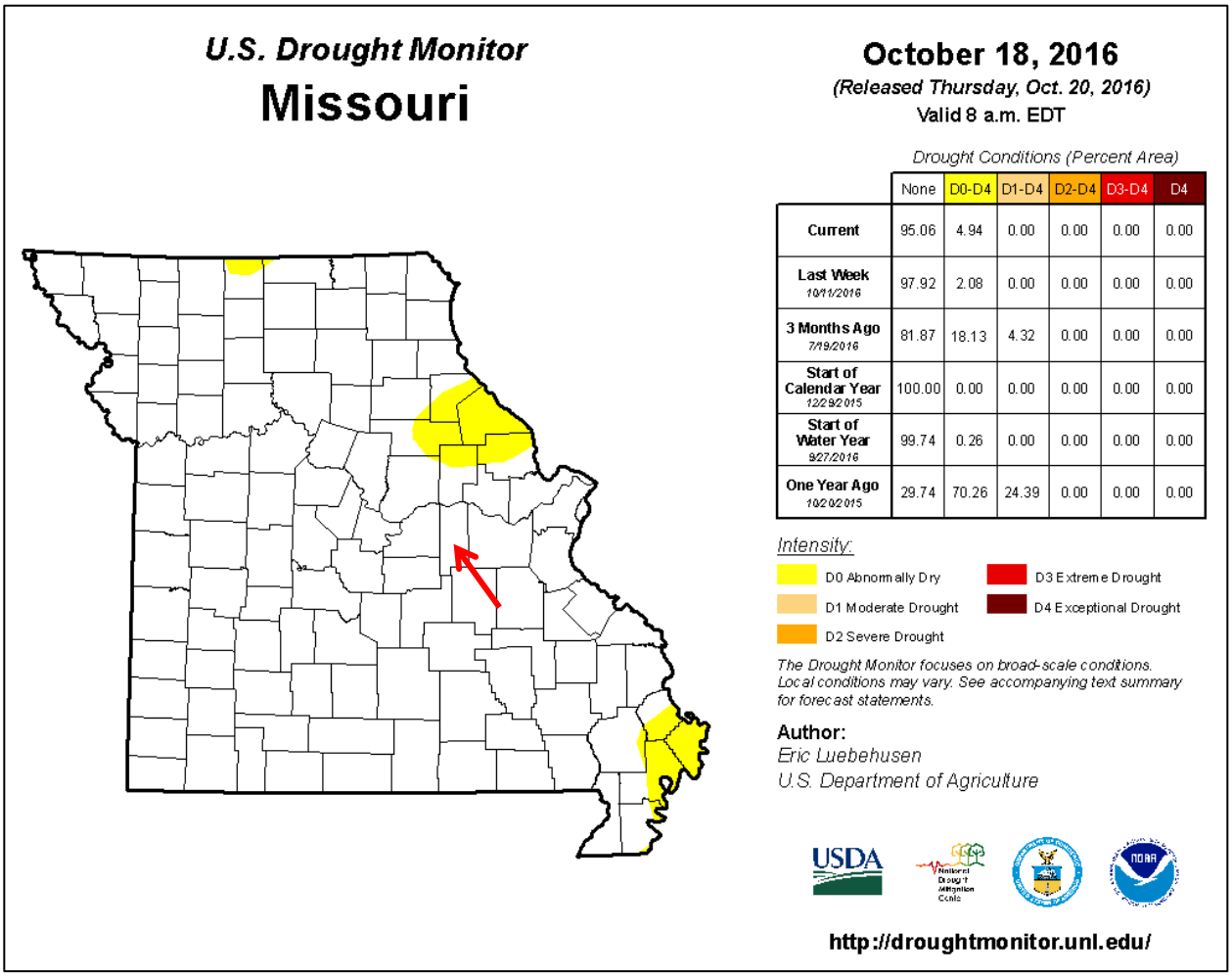
Severity/Magnitude/Extent

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[21].

Figure 3.15 depicts a U.S. Drought Monitor map of Missouri on October 18, 2016. 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 (Gasconade County).

[18] http://www.drought.unl.edu/ http://droughtreporter.unl.edu/
[19] 2013 Missouri State Hazard Mitigation Plan
[20] http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/cp29161.pdf
[21] Ibid

Figure 3.15. U.S. Drought Monitor Map of Missouri on October 18, 2016



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

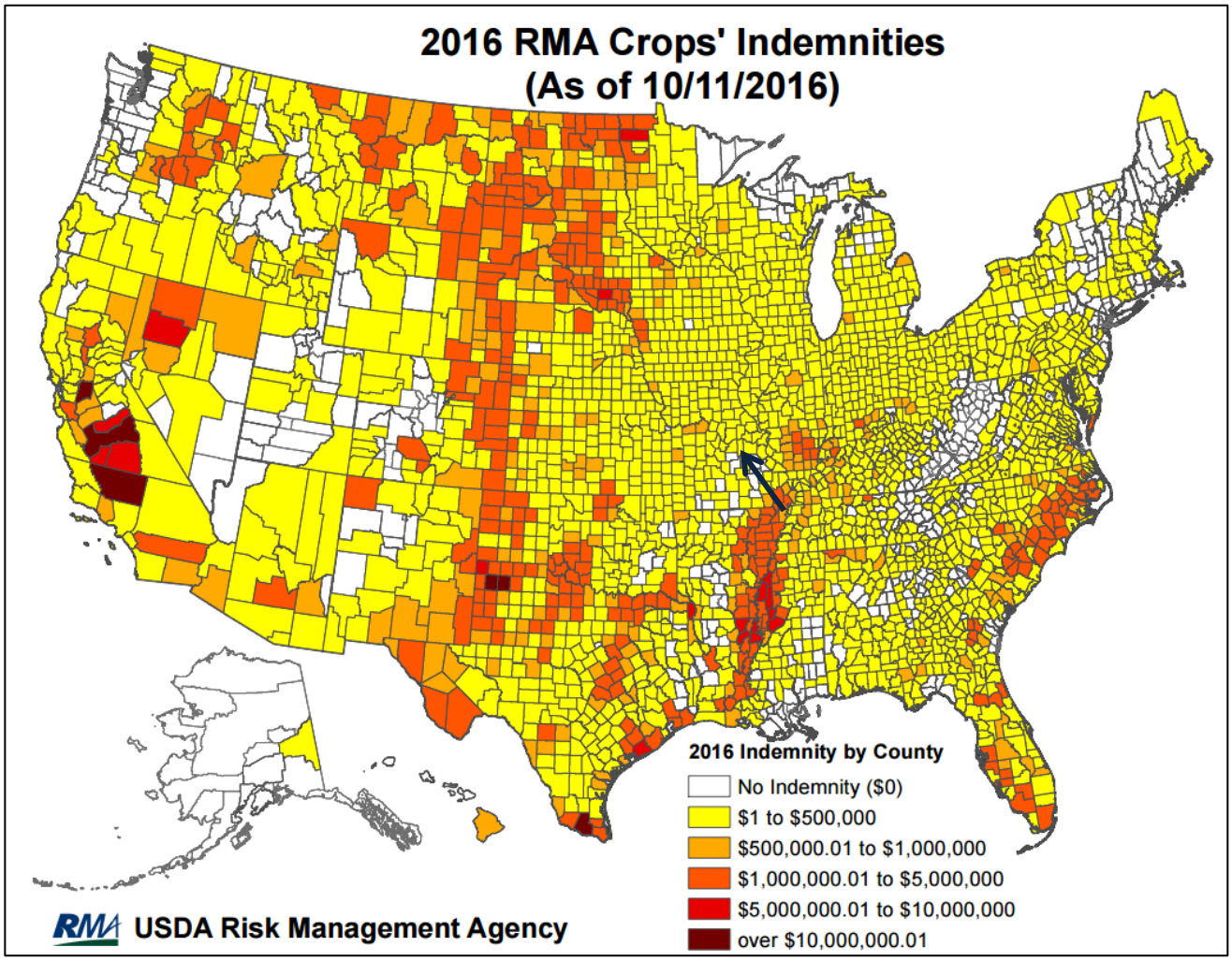
Table 3.22 details crop losses between 1998 and 2012 for Gasconade County. Additionally, **Figure 3.16** illustrates RMA crop indemnities for 2016 across the United States. Gasconade County fell in the range of $1 to $500,000 in crop indemnities.

Table 3.22. Gasconade 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
$2,096,490	1	$139,766	$8,075,000	1.73 %	1

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

Figure 3.16. 2016 RMA Crop Indemnities for the United States



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

According to the USDA's Risk Management Agency, there have been 25 crop insurance payments due to drought between since 1995. **Table 3.23** illustrates the year, number of payments, and total amount of crop insurance payments.

Table 3.23. Gasconade County Crop Indemnity Payments (1995-2016)

Year	Number of Payments	Total
2011	6	$177,165.50
2012	12	$1,387,293.05
2013	4	$45,019
2015	1	$11,747.20
2016	2	$1,432.50

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

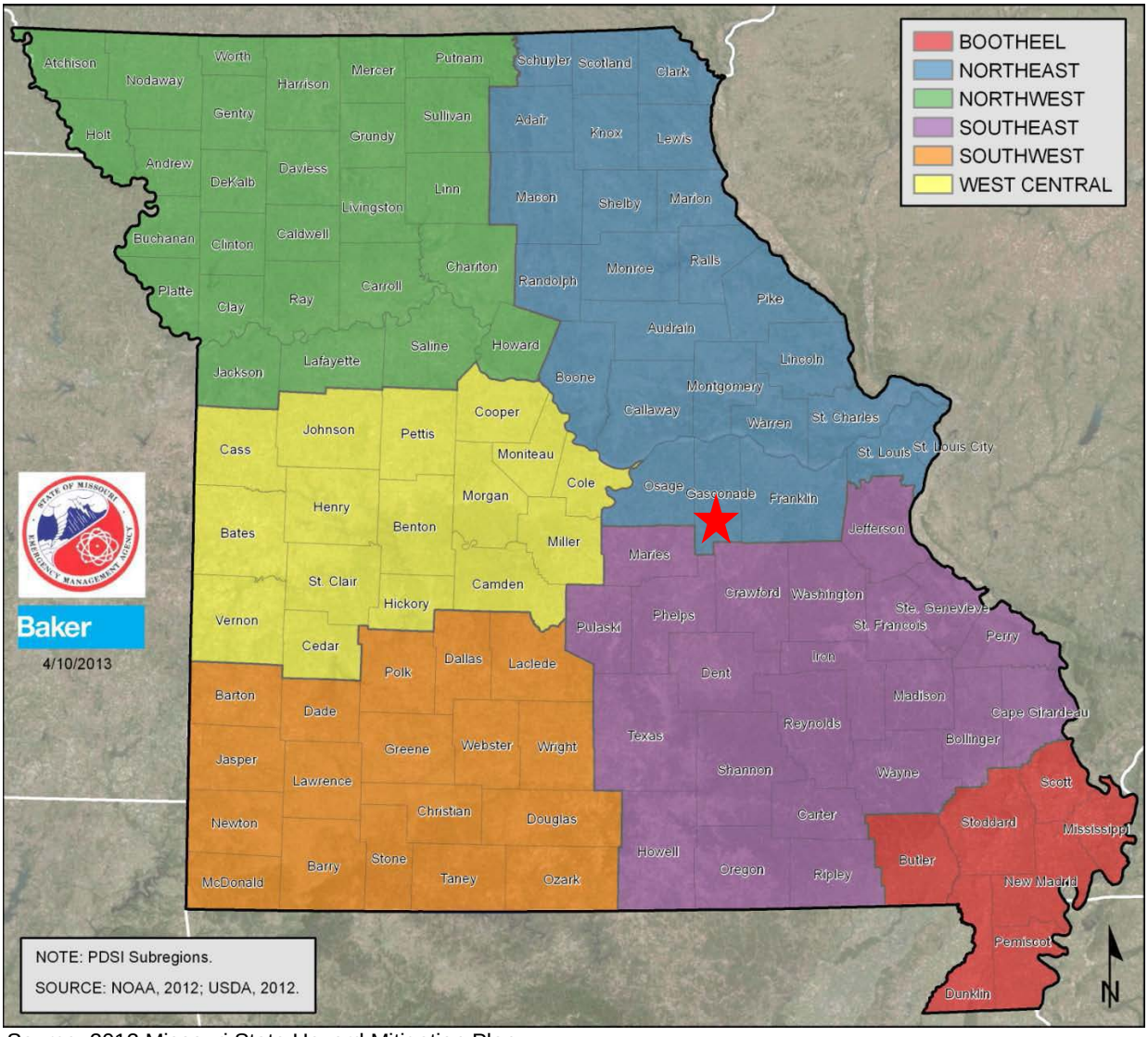
The Palmer Drought Indices measure dryness based on recent precipitation and temperature. The indices are based on a "supply-and-demand model" of soil moisture. Calculation of supply is relatively straightforward, using temperature and the amount of moisture in the soil. However demand is more complicated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

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

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

Figure 3.17 illustrates the Palmer Drought Severity Index sub-regions of Missouri. Gasconade County is categorized under the Northeast sub-region.

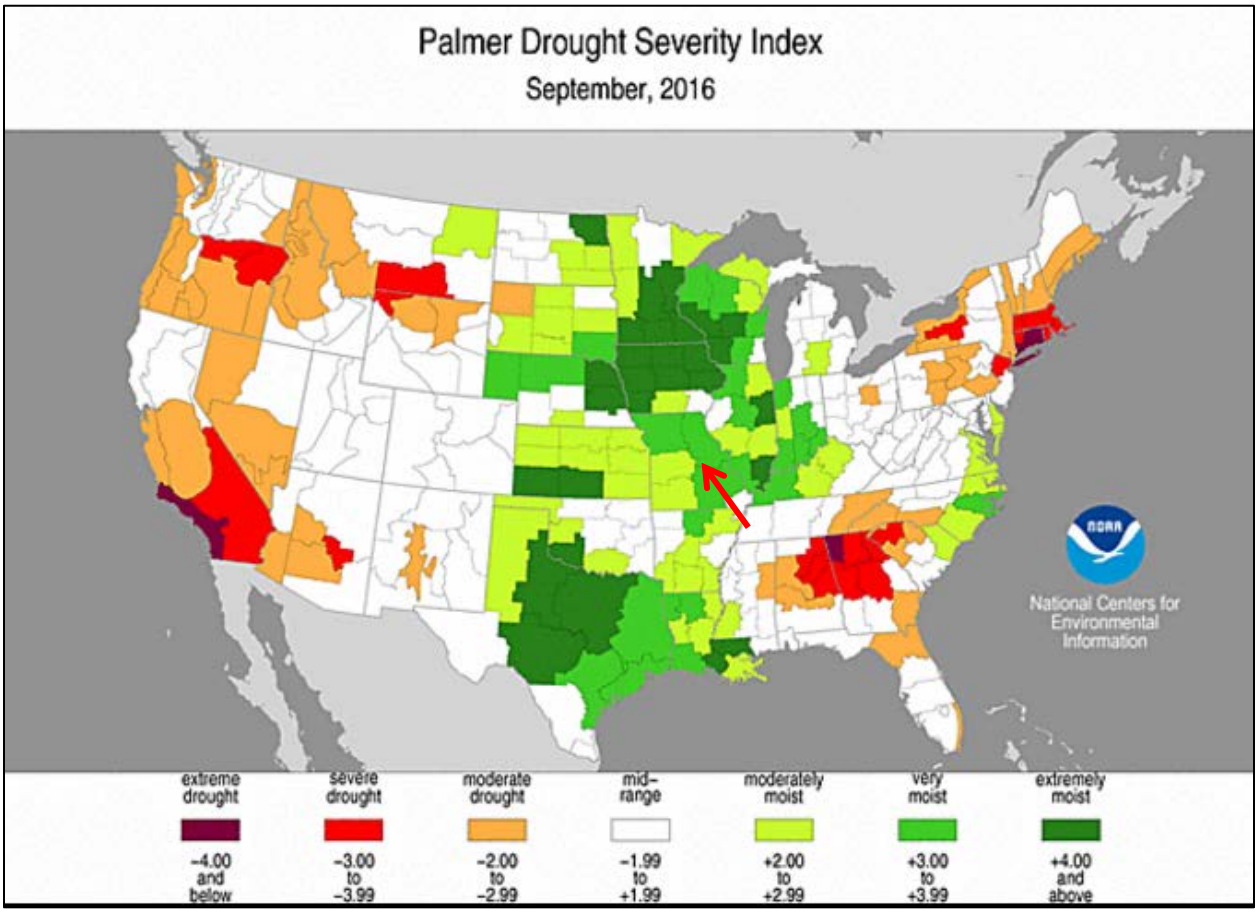
Figure 3.17. Palmer Drought Severity Index: Missouri Sub-regions



Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.18 is an example of the Palmer Modified Drought Index for the United States on September, 2016.

Figure 3.18. Palmer Modified Drought Index National Map September, 2016



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

Data was collected from the Missouri Department of Natural Resources (2016 Census of Missouri Public Water Systems) to determine water source by jurisdiction. All Gasconade County jurisdictions utilize well water as their sole source of water (**Table 3.24**). Communities that exclusively depend upon ground water could experience hardship in the event of a long term drought.

Table 3.24. 2016 Water Source by Jurisdiction

Jurisdiction	% of source that is groundwater
Bland	100
Gasconade	100
Hermann	100
Morrison	100
Owensville	100
Rosebud	100

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

Previous Occurrences

Table 3.25 offers Palmer Drought Severity Index data for Gasconade County between 2010 and 2015. This information exemplifies drought conditions on a monthly basis for Missouri's Northeast sub-region within the United States.

Table 3.25. Palmer Drought Severity Index for Gasconade County, MO (2010 – 2015)

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

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 Gasconade County, historical climate data was analyzed. There were 37 months of recorded drought (**Table 3.26**) over a 20 year span (January, 1996 to December, 2015). The number of months in drought (37) was divided by the total number of months (240) and multiplied by 100 for the annual average percentage probability of drought (**Table 3.27**). Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increase change of drought.

Table 3.26. Palmer Drought Severity Index for Gasconade County, MO (1996 – 2015)

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

Source: http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/zin/199409-201511
*x indicates drought

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

Location	Annual Avg. % P of Drought
Gasconade County	15.41%

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

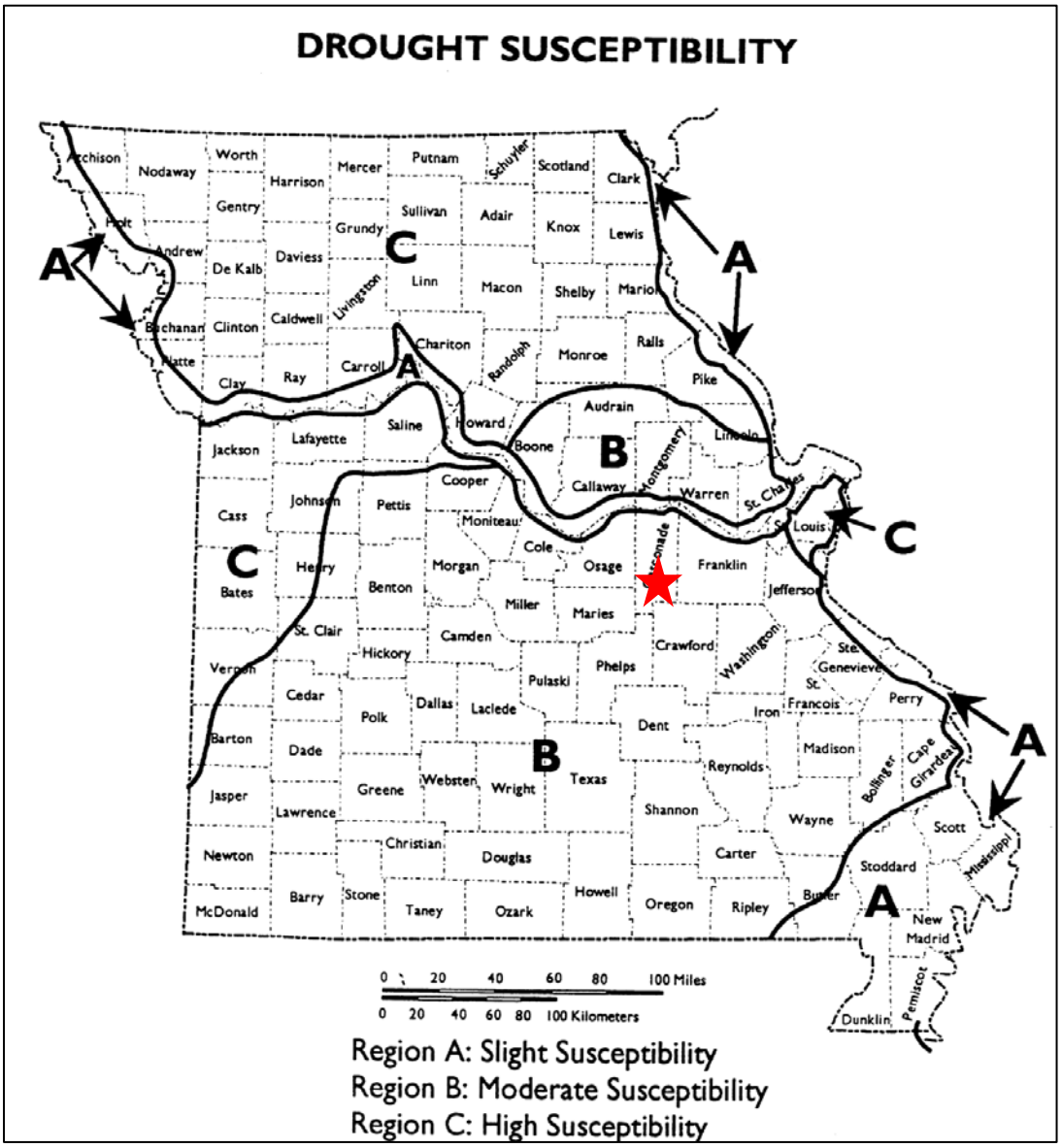
Vulnerability

Vulnerability Overview

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for the drought vulnerability analysis. **Table 3.28** depicts the ranges for drought vulnerability factor ratings created by SEMA. The array ranges between 1 (low) and 5 (high). The factors considered include crop loss ratio rating and annualized crop claims paid. These two factors were utilized as agricultural losses data is readily available; thus making them the best factors to determine drought vulnerability throughout the State. Gasconade County is determined as having a low vulnerability to crop loss (**Table 3.22**) as a result of a drought. Additionally, SEMA has divided the State into 3 regions in regards to drought susceptibility (**Figure 3.19**). Gasconade 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[22].

[22] 2013 Missouri State Hazard Mitigation Plan

Figure 3.19. Drought Susceptibility in Missouri



Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.28. Ranges for Drought Vulnerability Factor Ratings

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

Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.29. Vulnerability of Gasconade 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
Gasconade	$2,096,490	1	$139,766	$8,075,000	1.73%	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[23].

Impact of Future Development

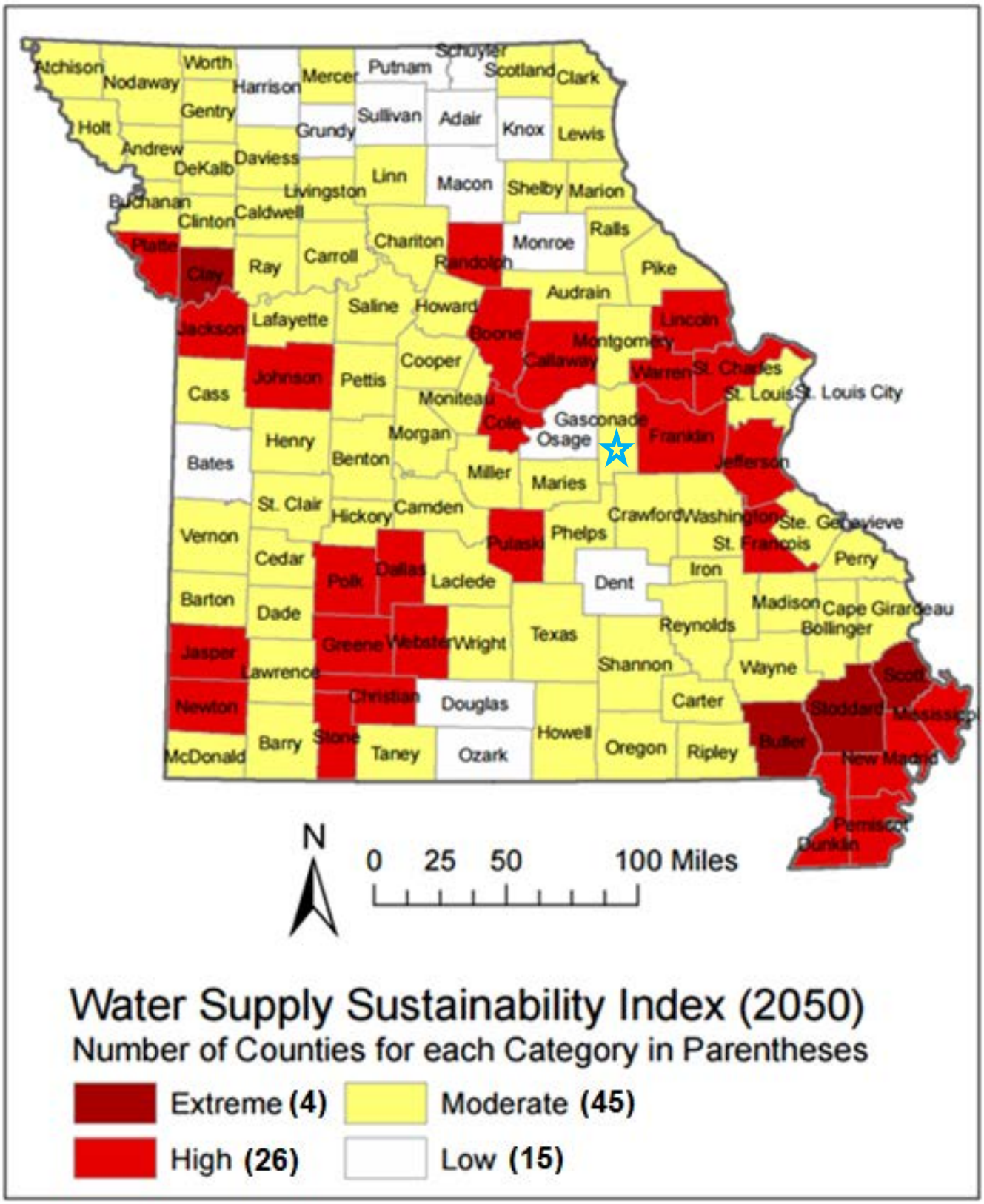
Impacts of drought on future development within Gasconade County would be negligible. Population trend analysis from the University of Missouri Extension suggests that Gasconade County will increase by approximately 907 individuals within the next 4 to 14 years[24]. Moreover, with an increasing population, water use and demand would be expected to increase as well; potentially straining the water supply systems. Bland anticipates new water infrastructure within the next 5 years. However, long term drought could expose vulnerabilities during construction/upgrades of water distribution and sewer infrastructures. Furthermore, any agriculture related development in terms of crop or livestock production would also be at risk.

Impact of Climate Change

A new analysis, performed for the Natural Resources Defense Council, examined the effects of climate change on water supply and demand in the contiguous United States. The study found that more than 1,100 counties will face higher risks of water shortages by mid-century as a result of climate change. Two of the principal reasons for the projected water constraints are shifts in precipitation and potential evapotranspiration (PET). Climate models project decreases in precipitation in many regions of the U.S., including areas that may currently be described as experiencing water shortages of some degree. Gasconade County is predicted to experience moderate water shortages as a result of global warming (**Figure 3.20**) by the year 2050.

[23] 2015 Boone County Hazard Mitigation Plan
[24] UM Extension Social and Economic Profile http://mcdc2.missouri.edu/cgi-bin/broker?_PROGRAM=websas.cntypage.sas&_SERVICE=appdev&_debug=0&county=29161

Figure 3.20. Water Supply Sustainability Index (2050) with Climate Change Impacts



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

Hazard Summary by Jurisdiction

The variations between jurisdictions are non-existent to minimal. All jurisdictions within Gasconade 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 Gasconade County is considered low risk, as of now. However, climate change predictions suggest increased risks by the year 2050. Gasconade County has a relatively strong agricultural economy. Drought would impact commodities, specifically livestock and crops. Potential impacts to local economies and infrastructures are foreseeable in the event of a long term drought.

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

3.4.3 Earthquakes

Some specific sources for this hazard are:

- U.S. Seismic Hazard Map, United States Geological Survey, http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lg.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 Gasconade 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[25].

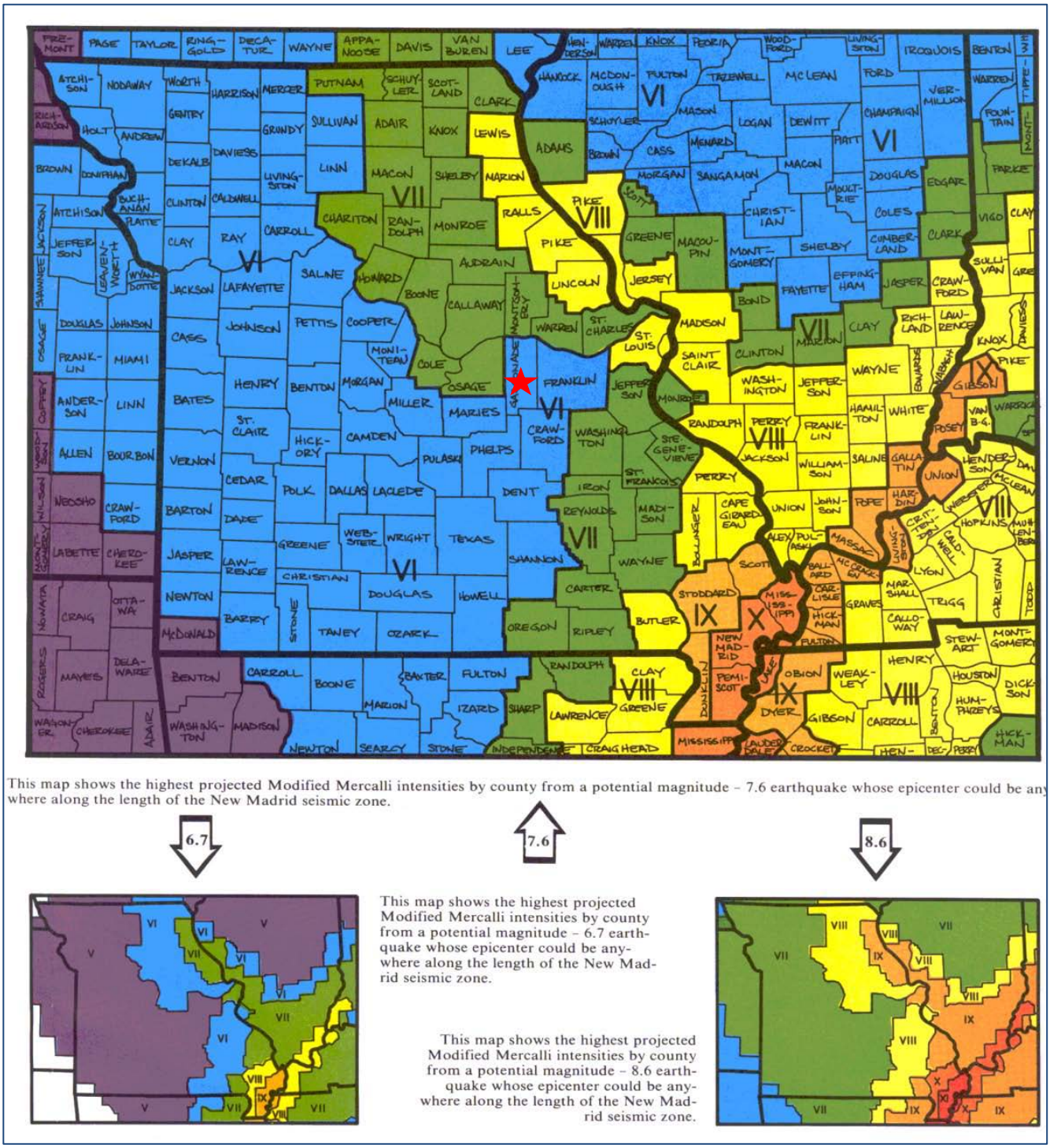
Geographic Location

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 3.21 depicts impact zones for a magnitude 7.6 earthquake along the New Madrid Fault along with associated Modified Mercalli Intensities. Gasconade 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, Gasconade County would experience a Modified Mercalli Intensity of V (**Figure 3.22**). 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 3.22** and **Table 3.30** further define Richter Scale intensities.

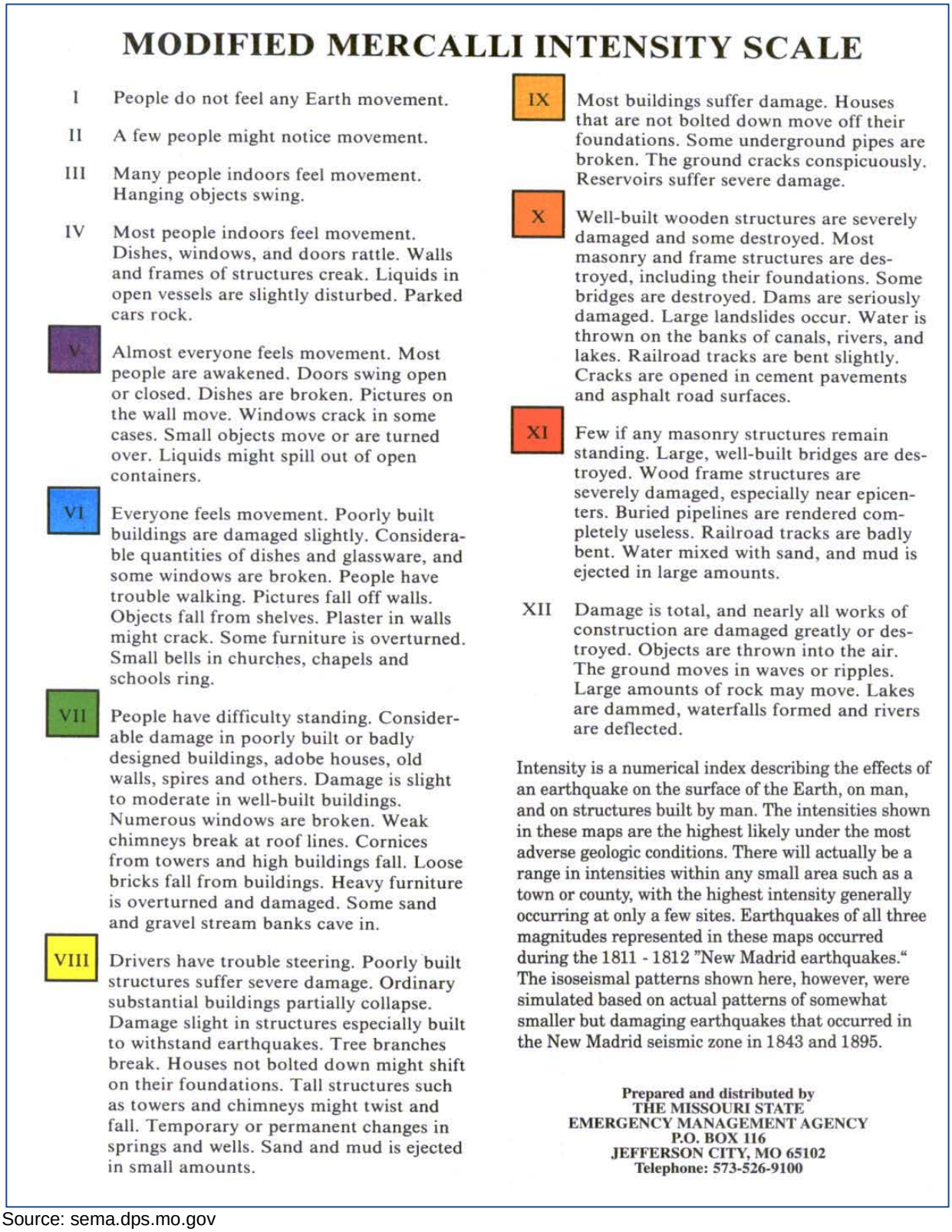
[25] Missouri Department of Natural Resources, Facts about the New Madrid Seismic Zone

Figure 3.21. Impact Zones for Earthquake Along the New Madrid Fault



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

Figure 3.22. Projected Earthquake Intensities



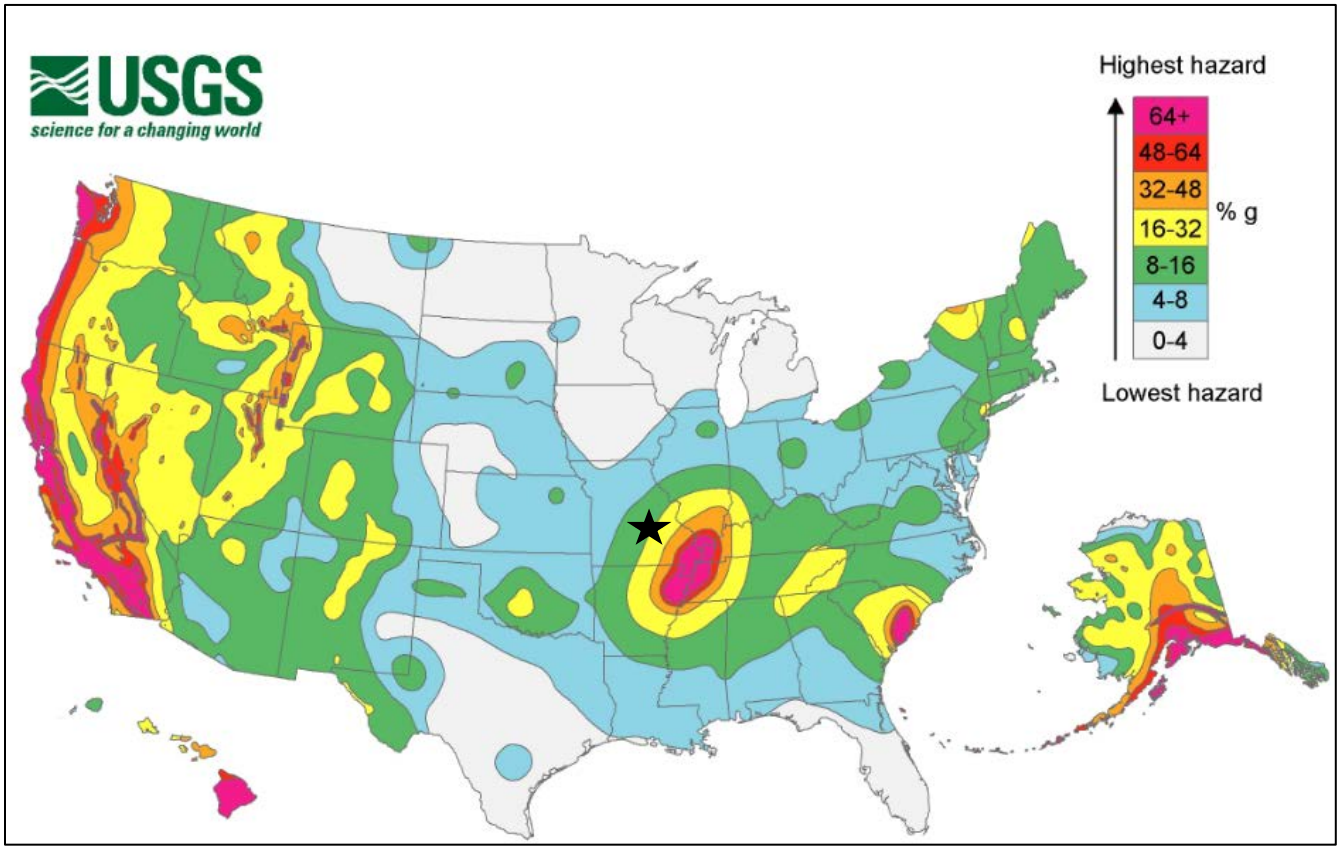
Source: sema.dps.mo.gov

Table 3.30. Richter Scale of Earthquake Magnitude

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

Figure 3.23 illustrates the seismicity in the United States. A black star indicates the location of Gasconade 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 3.23. United States Seismic Hazard Map



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

Severity/Magnitude/Extent

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

Richter Magnitude Scale

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Several area residents observed a small seismic occurrence during the early morning hours of July 8, 2003 in Crawford County. According to information from the USGS, a micro-earthquake happened about 20 miles northeast of Rolla and measured 2.9 on the Richter scale. The earthquake originated at a depth of about 3.1 miles beneath the earth's surface. In southern parts of Missouri, earthquakes of this magnitude happen frequently, but are an unusual event in Gasconade 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[27].

Probability of Future Occurrence

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

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

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

Vulnerability

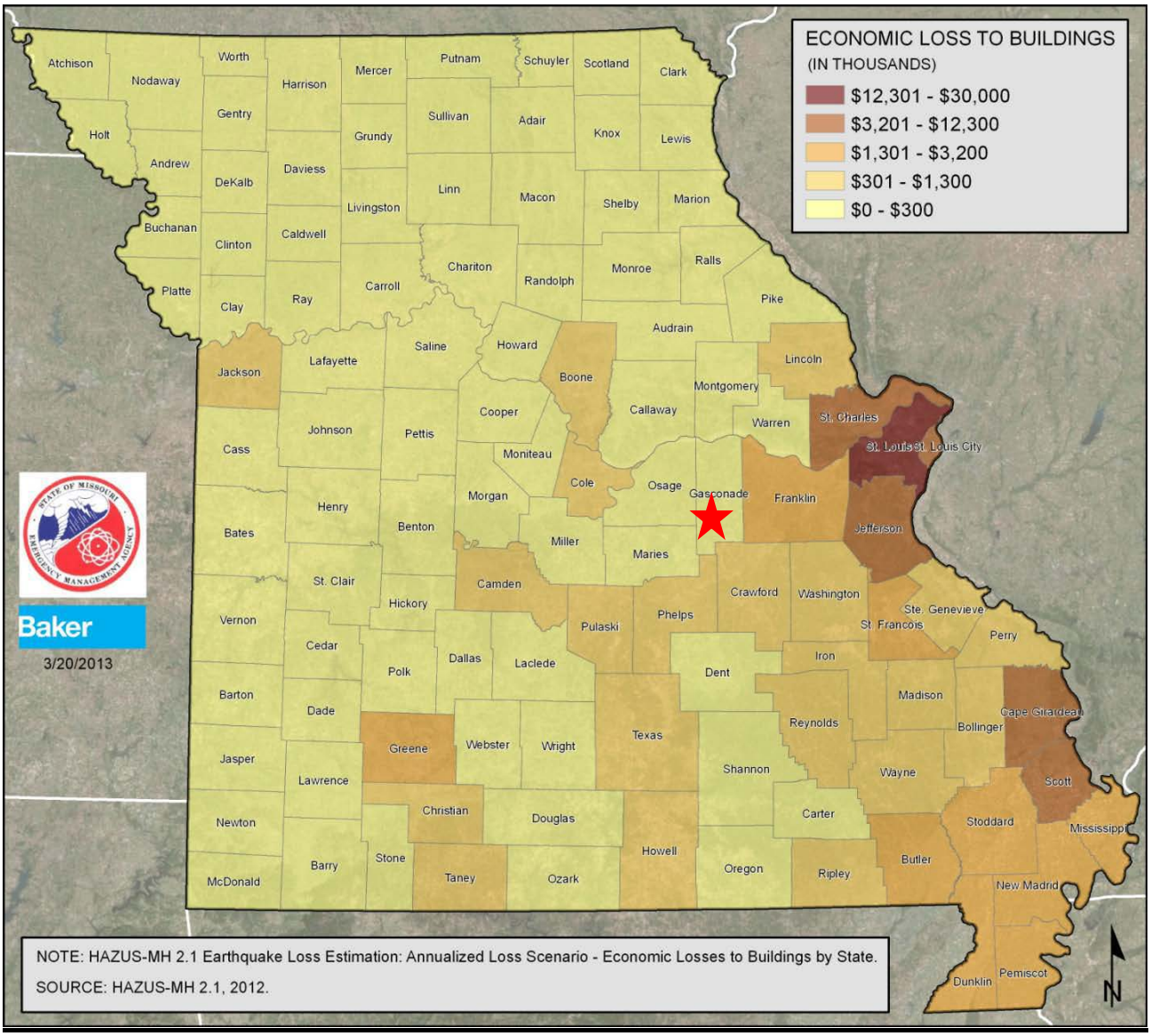
Vulnerability Overview

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[29]. 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.

[27] Missouri State Hazard Mitigation Plan May 2007
[28] SEMA
[29] 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[30]. The Hazus earthquake loss estimation is depicted in **Figure 3.24** and **Table 3.31**. Gasconade County's buildings are suggested to lose between $0 and $300,000 in any one year; thus ranking the county as having the 38st highest expected loss in the state, or low vulnerability. This loss ratio indicates impacts on local economies in the event of an earthquake, and the difficulty for jurisdictions to recover from said event.

Figure 3.24. Hazus Earthquake Loss Estimation: Annualized Loss Scenario –Total Economic Losses to Buildings.



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

[30] 2013 Missouri State Hazard Mitigation Plan

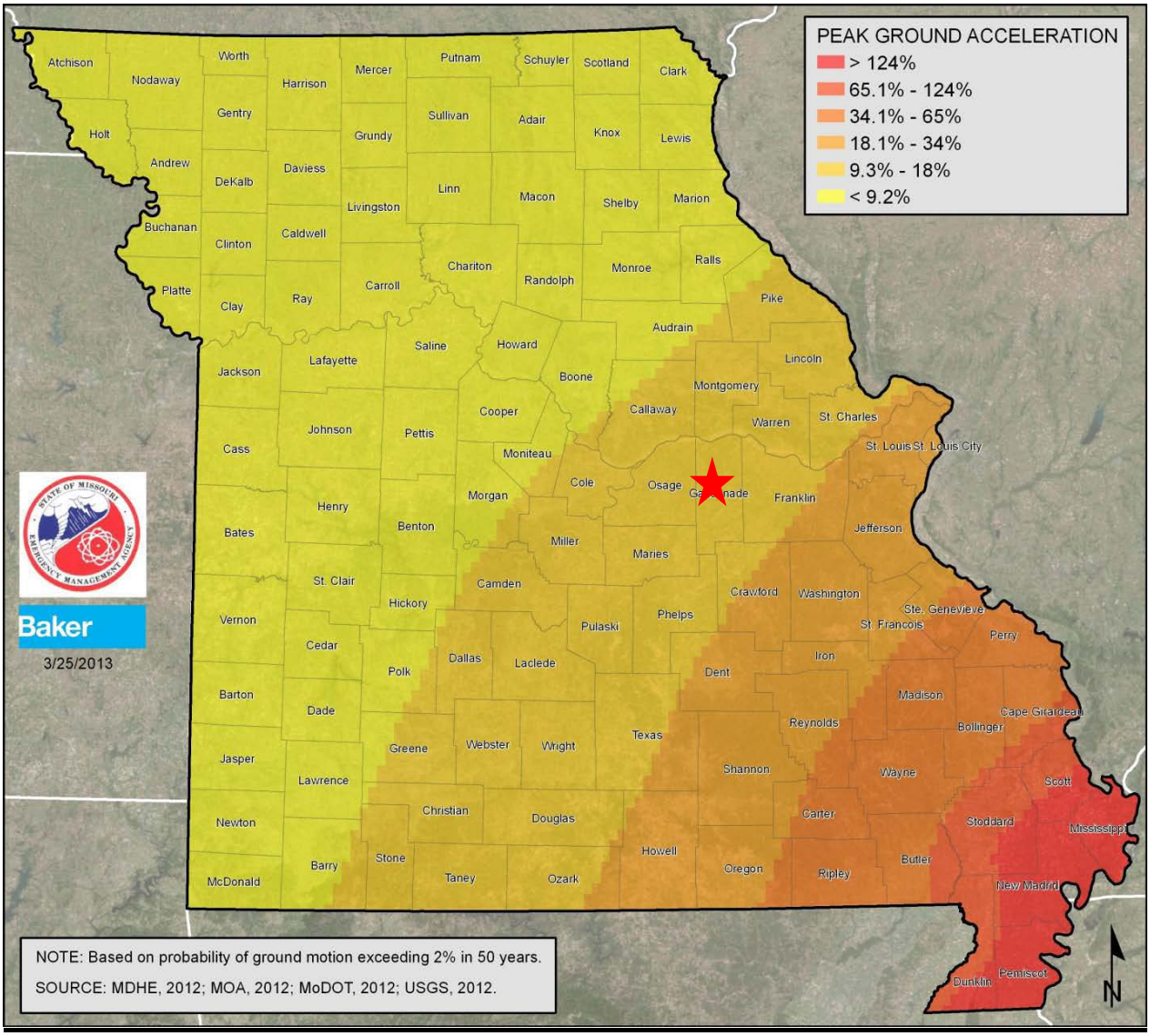
Table 3.31. Hazus Earthquake Loss Estimation: Annualized Loss Scenario

Location	Building Loss Total ($)*	Loss Ratio %**	Income Loss Total ($)*	Total Economic Loss to Buildings ($)*	Loss Ratio Rank
Gasconade	152	0.01	42	194	38

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

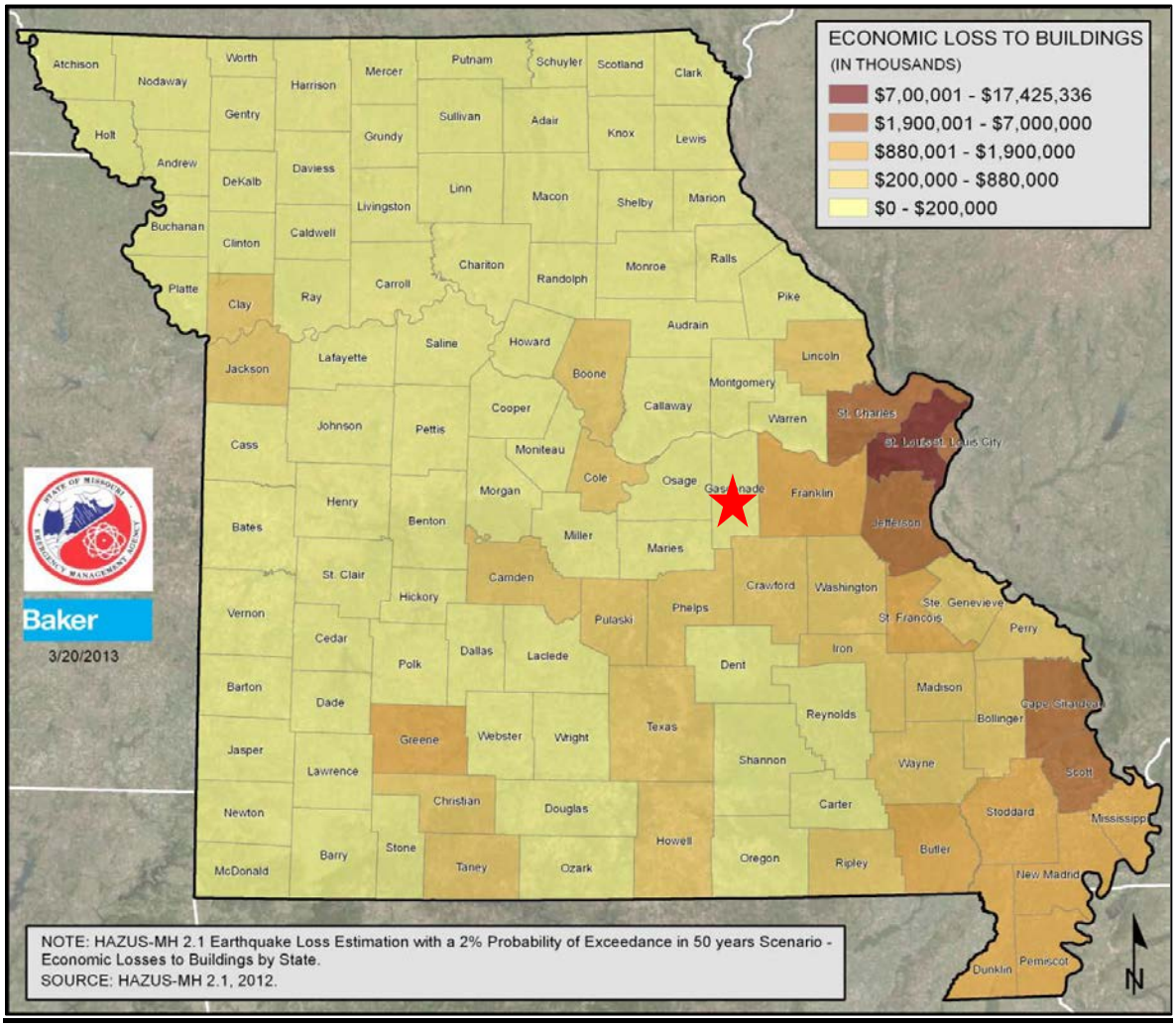
Likewise, SEMA developed a second scenario which incorporated a 2% probability of exceedance in 50 years. This model was to demonstrate a worst case scenario. **Figure 3.25** provides estimates of peak ground acceleration and spectral acceleration (ground shaking potential) at intervals of 0.3 and 1.0 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. Gasconade County is estimated to have peak ground acceleration between 9.3 and 18%. Furthermore, **Figure 3.26** illustrates total economic loss to buildings including content and inventory loss, and wage/income loss in the event of the modeled earthquake. Gasconade County is anticipated to lose between $0 and $200,000 in a 50 year scenario. Moreover, in the same event the county is estimated to experience between 3.1% and 7% loss (damage) of the total building inventory (**Figure 3.27). Table 3.32** further exemplifies the County's loss ratio.

Figure 3.25. Hazus Earthquake 2% Probability of Exceedance in 50 Years – Ground Shaking Potential



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

Figure 3.26. Hazus Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Total Economic Loss to Buildings



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

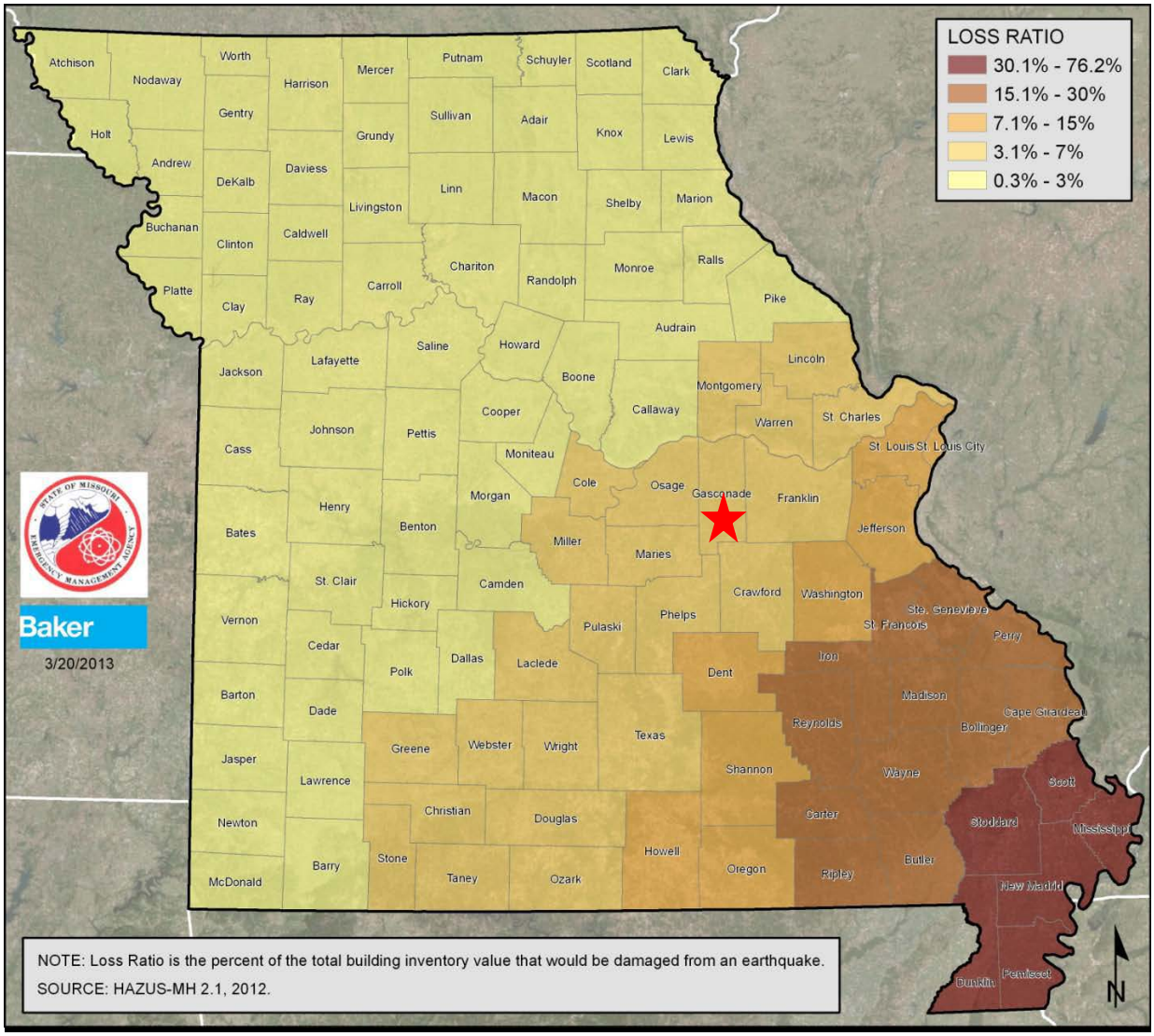
Table 3.32. Hazus-MH Earthquake Loss Estimation: 2% Probability of Exceedance in 50 Years Scenario Results Building Impacts by County, Ranked by Highest Building Losses

County	Structural Damage ($)*	Non-Structural Damage ($)*	Contents Damage and Inventory Loss ($) *	Loss Ratio (%) **	Income Loss ($)*	Total Economic Loss to Buildings ($)*,***	Loss Ratio Rank
Gasconade	20,332	59,605	21,311	4.70	26,912	128,160	36

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



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

In terms of social impacts for the same earthquake event, **Table 3.33** defines casualty severity, displaced households, and short-term shelter needs that are utilized in **Table 3.34.** During this scenario, Gasconade County is estimated to have 29 injuries requiring medical attention without hospitalization, 5 injuries requiring hospitalization, 1 life threatening injuries, and 1 death. Moreover, 47 individuals are expected to become displaced from their homes, along with 28 individuals requiring short-term shelter needs.

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

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

Source: Hazus 2.1

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

County	MMI Zone	Level 1	Level 2	Level 3	Level 4	Total	Displaced Households	Short-Term Shelter Needs
Gasconade	VII	29	5	1	1	36	47	28

Source: 2013 Missouri State Hazard Mitigation Plan

Potential Losses to Existing Development

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

Impact of Future Development

Future development at risk includes new water infrastructure development in Bland and a new government center or police station in Owensville. 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[31].

[31] 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. Gasconade County is not near the New Madrid Shock Zone, but it will most likely endure mild secondary effects from the earthquake, such as fire, structure damage, utility disruption, environmental impacts, and economic disruptions/losses. However, damages could differ if there are structural variations in the planning area's built environment. For example, if one community has a higher percentage of residences built prior to 1939 than the other participants, that community is likely to experience higher damages. **Table 3.35** depicts the percent of residences built prior to 1939 in Gasconade County. Morrison (45.9%), Gasconade (36.4%), and Hermann (27.9%) have the most residences susceptible to damage in the event of an earthquake. If a major earthquake should occur, Gasconade County would likely be deeply impacted by the number of refugees traveling through the area seeking safety and assistance.

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

Jurisdiction	% of Residences built prior to 1939
Unincorporated Gasconade County	16.6
Bland	22.1
Gasconade	36.4
Hermann	27.9
Morrison	45.9
Owensville	17.8
Rosebud	18.2

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), Gasconade County is estimated to have 29 injuries requiring medical attention without hospitalization, 5 injuries requiring hospitalization, 1 life threatening injuries, and 1 death. Moreover, 47 individuals are expected to become displaced from their homes, along with 28 individuals requiring short-term shelter needs. Additionally, the county is expected to encounter $0 to $200,000 in total economic losses to buildings. Moreover, Morrison, Gasconade, and Hermann are particularly at risk due to the percent of residences built prior to 1939.

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

3.4.4 Extreme Heat

Hazard Profile

Some specific sources for this hazard are:

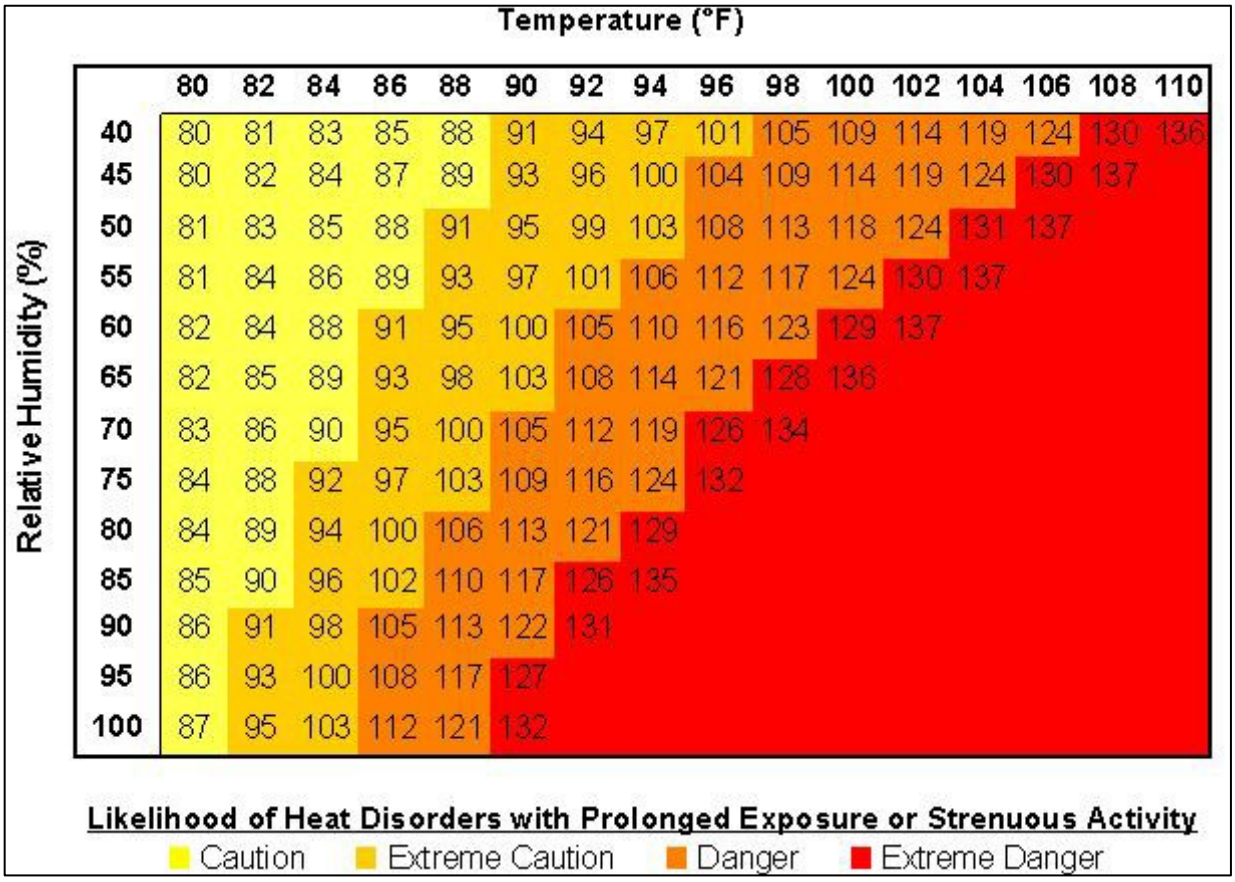
- National Climatic Data Center, Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
- Heat Index Chart & typical health impacts from heat, National Weather Service; National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml ;
- Daily temperatures averages and extremes,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

Hazard Description

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. The remainder of this section profiles extreme heat. Extreme cold events are profiled in combination with Winter Storm in **Section 3.4.11.** According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. These high temperatures generally occur from June through September, but are most prevalent in the months of July and August. Regional reports indicate all of Missouri is subject to heat wave during the summer months. Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index chart shown in **Figure 3.28** 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 3.28. 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 Gasconade 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 a 10-year time period from 2006 to 2015 were $40,874.45. Extreme heat can also strain electricity delivery infrastructure overloaded during peak use of air conditioning during extreme heat events. Another type of infrastructure damage from extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

From 1979 to 2013, there were approximately 9,000 fatalities in the U.S. attributed to heat. This translates to an annual national average of 264 deaths[32]. Fortunately, there were no recorded heat related deaths in the planning area, according to the Bureau of Environmental Epidemiology[33]. The

[32] https://www3.epa.gov/climatechange/pdfs/print_heat-deaths-2015.pdf
[33] http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2b.pdf

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

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

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

Table 3.36. Typical Health Impacts of Extreme Heat

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

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

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

Previous Occurrences

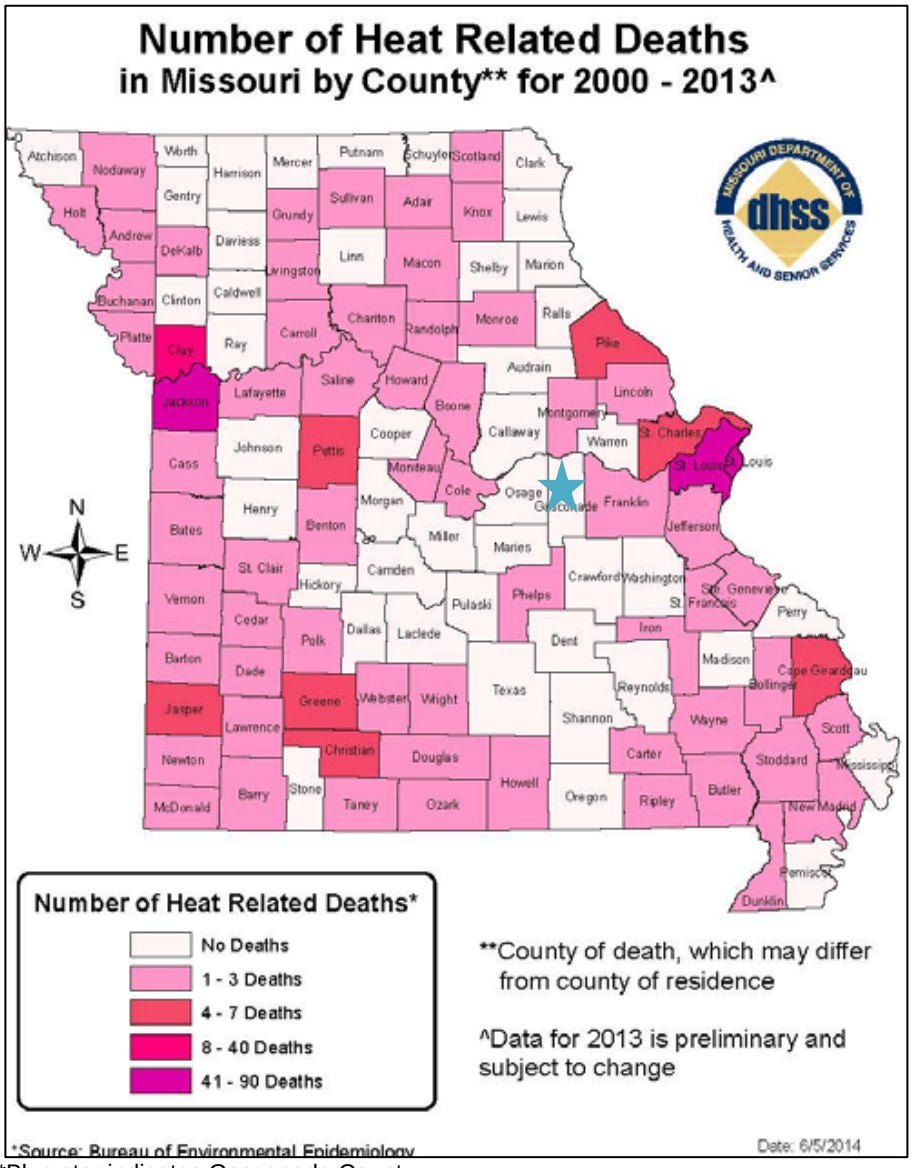
Table 3.37 provides data in relation to record heat events between 1996 and 2015 in Gasconade County. Maximum heat index values and temperatures are shown for each extreme temperature event. Fortunately, there were zero recorded injuries and fatalities during this time. In addition, **Figure 3.29** illustrates heat related deaths by county in Missouri between 2000 and 2013.

Table 3.37. Gasconade County Recorded Heat Events 1996 – 2015

Month, Year	# of Event Days	Fatalities	Injuries	Temperature (F°)	Heat Index Values (F°)
8/23/1998	2	0	0	90s	105
7/18/1999	14	0	0	90-100	105-115
7/7/2001	3	0	0	90+	105-110
7/17/2001	1	0	0	90+	110-115
7/21/2001	4	0	0	90+	105-115
7/29/2001	3	0	0	90+	105-110
8/1/2001	1	0	0	90+	105
8/7/2001	3	0	0	90+	102-110
8/21/2001	2	0	0	90-100	105-110
7/8/2002	2	0	0	90+	105-110
7/20/2002	3	0	0	90+	105-115
7/26/2002	6	0	0	90+	105-115
8/1/2002	7	1	0	101	-
8/15/2003	7	0	0	90-100	-
8/24/2003	5	0	0	90-100	105-110
7/20/2004	3	0	0	90+	105-110
7/20/2005	1	0	0	100+	105-120
7/17/2006	4	0	0	90-100	105-110
7/29/2006	3	0	0	100	105-110
8/1/2006	2	0	0	100	-
7/1/2011	3	0	0	90+	105
7/10/2011	3	0	0	90-100	-
8/6/2011	2	0	0	90+	105-110
8/31/2011	1	0	0	100+	105-110
9/1/2011	3	0	0	104	105
8/31/2013	1	0	0	100	105-110
9/1/2013	1	0	0	100	105-110
Total	**90**	**1**	**0**	**-**	**-**

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

Figure 3.29. Heat Related Deaths in Missouri 2000 - 2013



*Blue star indicates Gasconade County

Probability of Future Occurrence

Table 3.38 illustrates the annual average percent probability of extreme heat in Gasconade County. The County's likelihood of enduring an extreme heat event per year is 100% (27 events/20 years x 100 = 1.35). The average number of events per year is 1.35. Extreme heat events can be found in **Table 3.37.**

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

Location	Annual Avg. % P	Avg. Number of Events
Gasconade County	100%	1.35

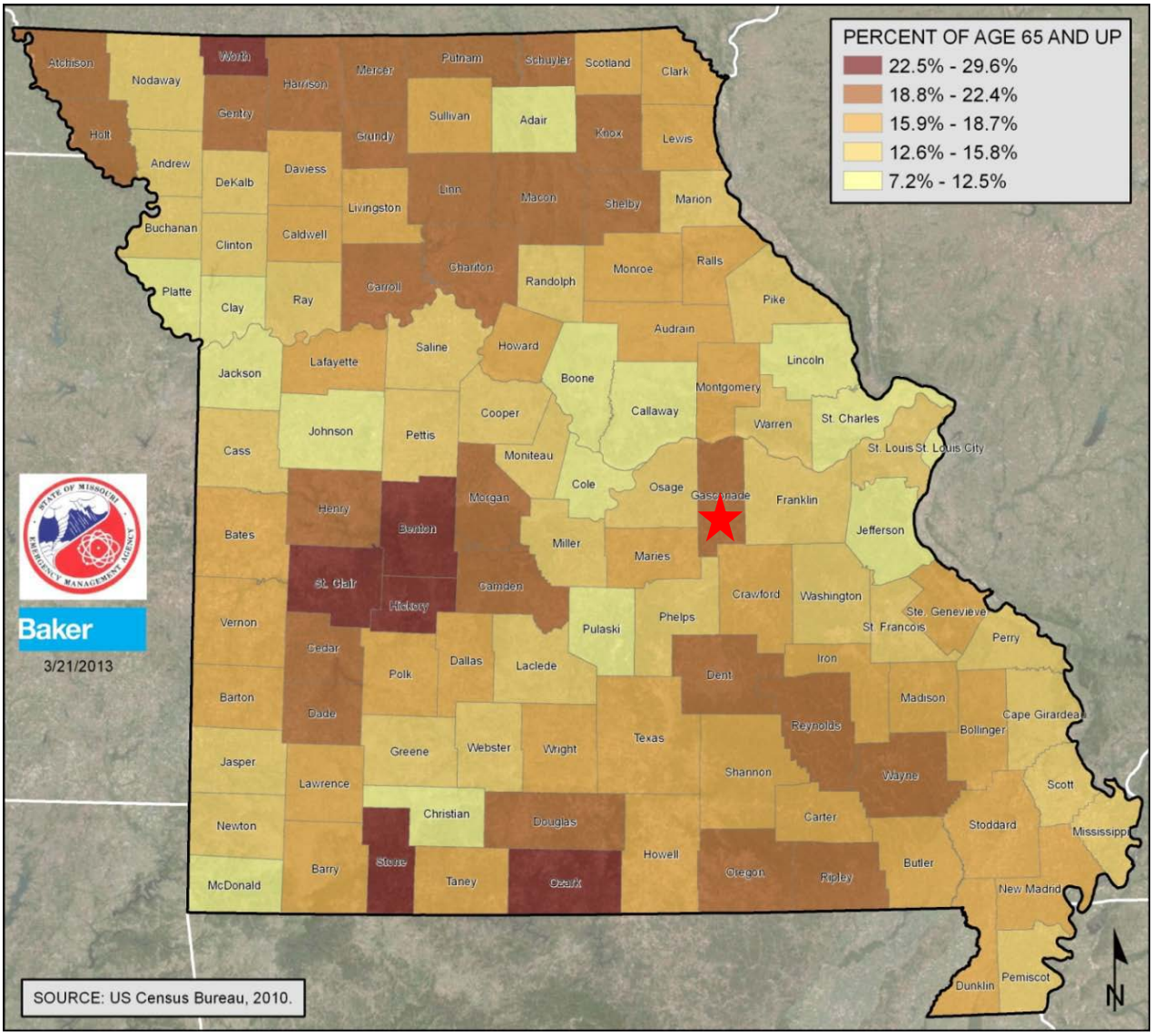
*P = probability; see page 3.24 for definition.

Vulnerability

Vulnerability Overview

Gasconade County, along with the rest of the state of Missouri is vulnerable to extreme heat. However, those jurisdictions with higher percentages of individuals below the age of 5, and above the age of 65 tend to be more at risk (**Table 3.39**). **Figure 3.30** depicts the distribution of the elderly population across Missouri. In 2010, 18.8 to 22.4% of the county was comprised of individuals ages 65 and up.

Figure 3.30. Distribution of Elderly Population



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

Potential Losses to Existing Development

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

Impact of Future Development

Population trends from 2000 to 2014 for Gasconade County and various jurisdictions indicate that 2 out of 7 jurisdictions were growing. These jurisdictions include Owensville and Rosebud. 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 3.39** below summarizes vulnerable populations in the participating jurisdictions. Note that school and special districts are not included in the table because students and those working for the special districts are not customarily in these age groups.

Table 3.39. County Population Under Age 5 and Over Age 65 (2010-2014)

Jurisdiction	Population Under 5 Years	Population 65 Years and over
Incorporated Gasconade County	5.2	20.9
Bland	2.3	16.3
Gasconade	1.6	25.7
Hermann	6.9	24.7
Morrison	2.2	16.1
Owensville	7.7	19.9
Rosebud	3.7	27.2

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

Hazard Profile

Hazard Description

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

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

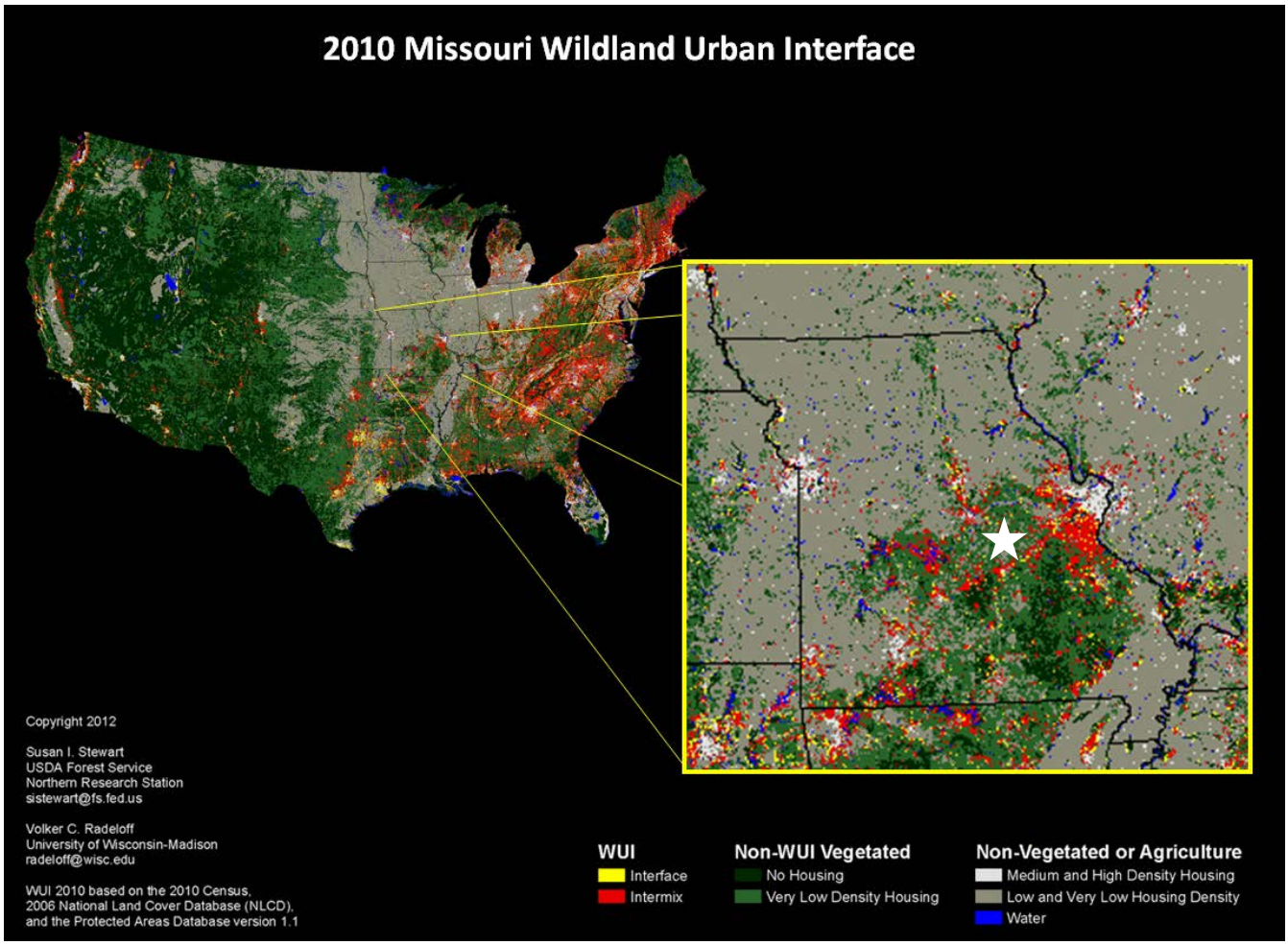
The Forestry Division of the Missouri Department of Conservation (MDC) is responsible for protecting privately owned and state-owned forests and grasslands from wildfires. To accomplish this task, eight forestry regions have been established in Missouri for fire suppression. The Forestry Division works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

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

Geographic Location

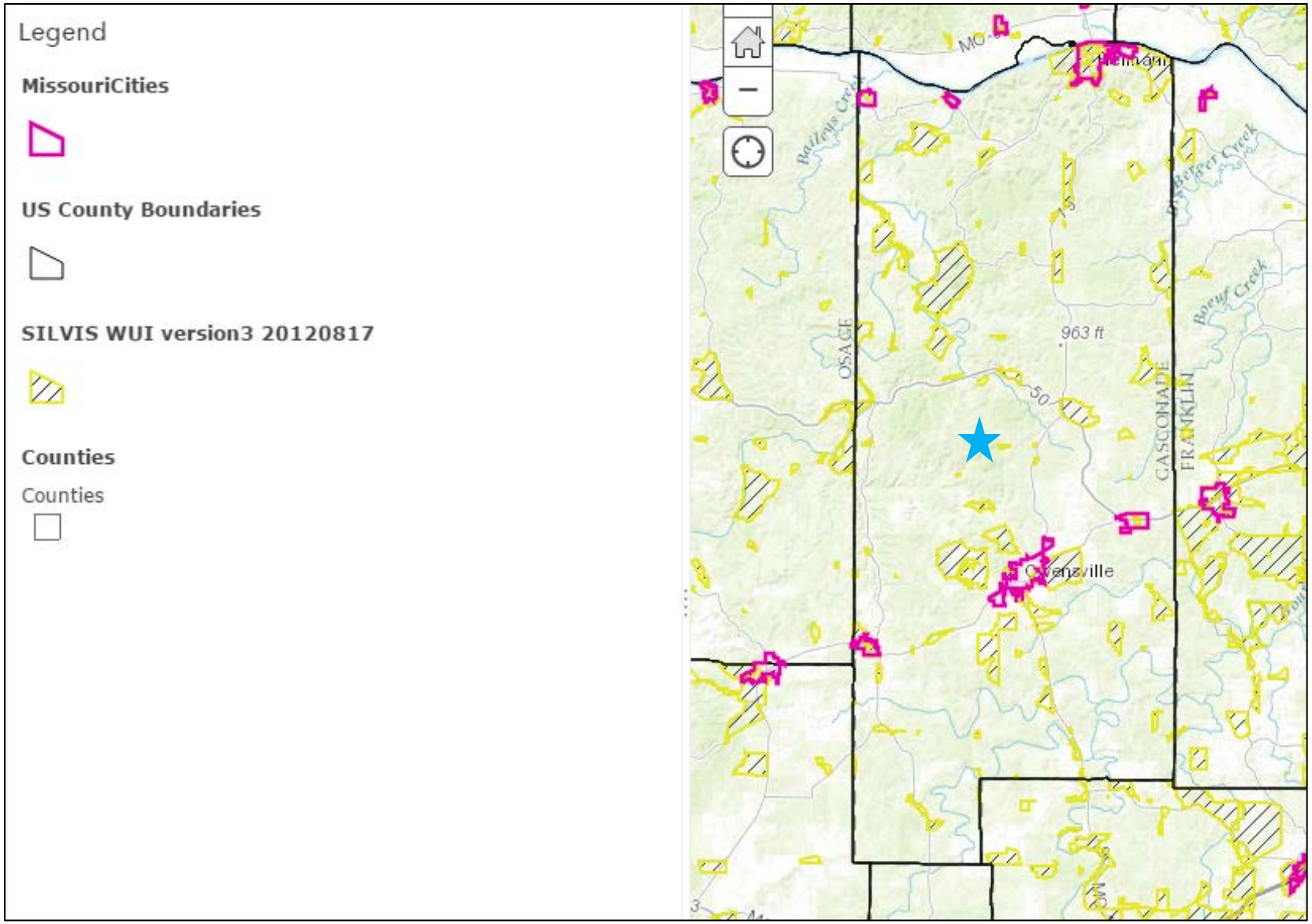
The risk of structural fire does not vary widely across the planning area. However, damages due to wildfires are expected to be higher in communities with more wildland–urban interface (WUI) areas. WUI refers to the zone of transition between unoccupied land and human development and needs to be defined in the plan. Within the WUI, there are two specific areas identified: 1) Interface and 2) Intermix. The interface areas are those areas that abut wildland vegetation and the Intermix areas are those areas that intermingle with wildland areas (**Figure 3.31**). To determine specific WUI areas and variations, data was obtain from ArcGIS, Streets and SILVIS (**Figure 3.32**). According to the WUI area map of Gasconade County, each jurisdiction resides in a WUI area.

Figure 3.31. 2010 Missouri Wildland Urban Interface (WUI)



Source: http://silvis.forest.wisc.edu/maps/wui
Note: White star roughly estimates Gasconade County's location

Figure 3.32. Gasconade County Wildlife Urban Interface



Source: ArcGIS, Streets
*Blue star indicates Gasconade County

Severity/Magnitude/Extent

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

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

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

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

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

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

Previous Occurrences

Between 2004 and 2008 there was an estimated 65 annual average of urban/structural fires in Gasconade County. Additionally, the average annual property loss was $530,075. Total deaths and injuries reported totaled 1 and 3, respectively[34].

Between 1996 and 2015, wildfires consumed 1,244.27 acres in Gasconade County[35]. **Table 3.40** provides data in regards to general damage reports for wildfires in Gasconade County during the same timeline.

[34] 2013 Missouri State Hazard Mitigation Plan
[35] http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx

Table 3.40. 1996 – 2015 Wildfire General Damage Report

Building Type	Damaged	Threatened	Destroyed
Residential	0	14	0
Out Buildings	3	34	1
Commercial	0	0	0

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[36] (**Appendix: F**), 127 wildfire events occurred in Gasconade County between 1996 and 2015. This information was utilized to determine the annual average percent probabilities of wildfires. Since multiple occurrences are anticipated per year (127 events/20 years), the probability of wildfires per year is 100% with an average of 6.35 events per year (**Table 3.41**). In addition, 4 outbuildings were considered damaged (3) and destroyed (1) due to wildfires between 1996 and 2015. The average percent probability of structural damage due to wildfires is 20% (4 events/20 years *100) (**Table 3.42**).

According to the 2013 Missouri State Hazard Mitigation Plan, the probability of structural/urban fires in Gasconade County per year is 100% with an average of 65 structural fires annually[37] (**Table 3.43**).

Table 3.41. Annual Average Percentage Probability of Wildfires in Gasconade County

Location	Annual Avg. % P	Avg. Number of Events
Gasconade County	100%	6.35

*P = probability; see page 3.24 for definition.

Table 3.42. Annual Average Percentage Probability of Structural Damage due to Wildfires in Gasconade County

Location	Annual Avg. % P
Gasconade County	20%

*P = probability; see page 3.24 for definition.

[36] http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx
[37] 2013 Missouri State Hazard Mitigation Plan

Table 3.43. Annual Average Percentage Probability of Structural/Urban Fires in Gasconade County

Location	Annual Avg. % P	Avg. Number of Events
Gasconade County	100%	65

*P = probability; see page 3.24 for definition.

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 Gasconade County. Unfortunately, only 61 percent of fire departments in the State of Missouri reported occurrences to NFIRS. **Table 3.44** depicts the ranges for urban/structure fire vulnerability ratings. Furthermore, **Table 3.45** illustrates vulnerability analysis utilizing statistical data for urban/structural fires for Gasconade County between 2004 and 2008[38].

Table 3.44. Ranges for Urban/Structure Fire Vulnerability Factor Ratings

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

Source: 2013 Missouri State Hazard Mitigation Plan

[38] 2013 Missouri State Hazard Mitigation Plan

Table 3.45. 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
Gasconade	15.9	1	65	2	1,699,937,000	3	530,075	0.000312	3	1	3	5	2	0.08	1	2	2

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

For wildfires, data was obtained from the Missouri Department of Conservation (MDC). **Table 3.46** depicts the ranges for wildfire vulnerability factor ratings, including the two factors considered; likelihood and annualized acres burned. **Table 3.47** 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 Gasconade County is low (1).

Table 3.46. 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 3.47. 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
Gasconade	77	8.6	1	846	94	1	3	1

Source: 2013 Missouri State Hazard Mitigation Plan

Potential Losses to Existing Development

According to the 2013 Missouri State Hazard Mitigation Plan, the average annual property loss due to urban/structure fires was $530,075 (2004 to 2008). Unfortunately, due to lack of data, a monetary value could not be associated with wildfire loss. However the annual average percent probability for structural loss due to wildfires is 20%.

Impact of Future Development

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

Hazard Summary by Jurisdiction

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

Problem Statement

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

3.4.6 Flooding (Flash and River)

Some specific sources for this hazard are:

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

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 3.33 depicts Gasconade 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 Gasconade County (**Figure 3.33** to **Figure 3.38**). Included in the maps are public schools within each jurisdiction. **Table 3.48** shows Gasconade County NCDC flood events by location between 1996 and 2015.

Figure 3.33. Gasconade County 100-Year Flood Model

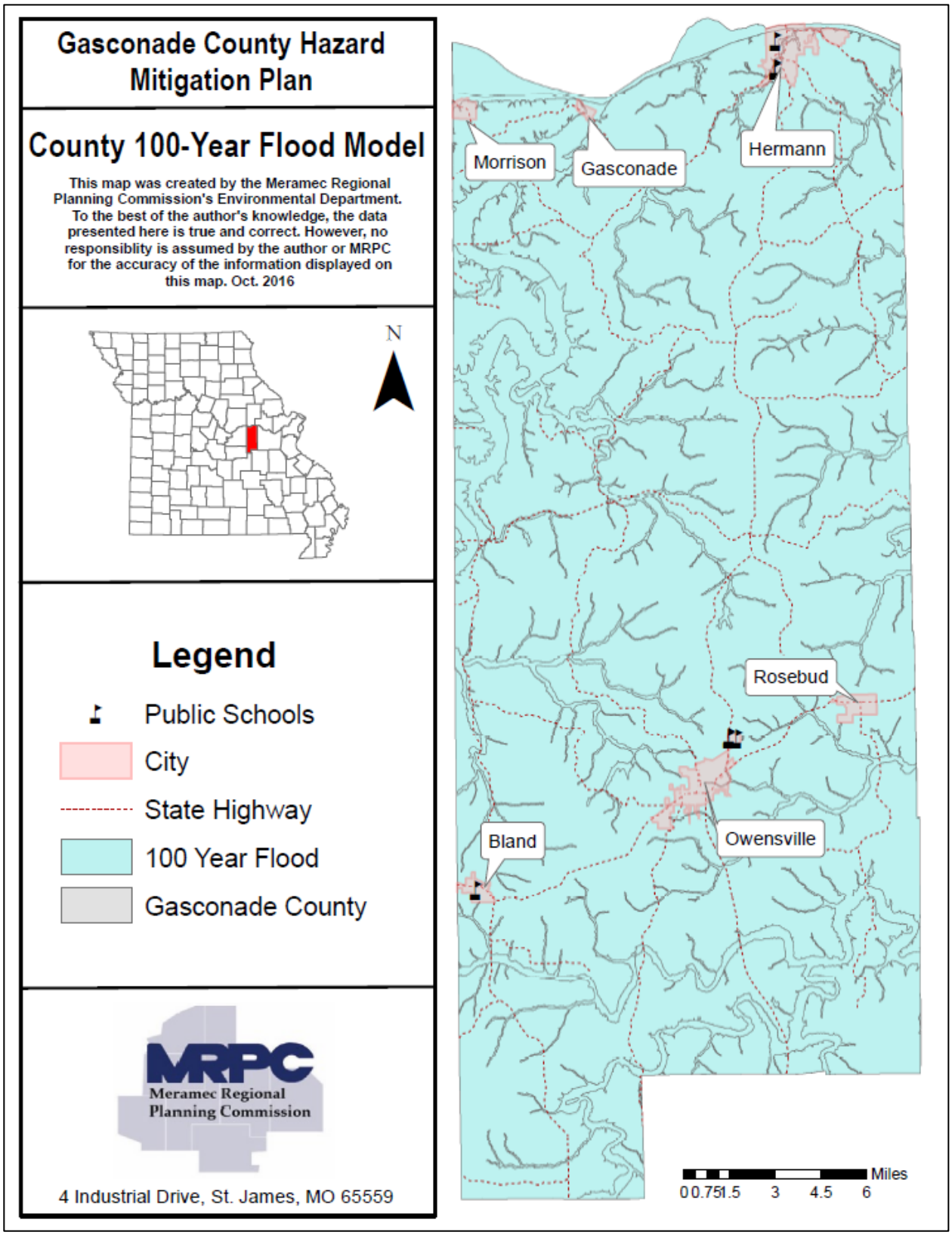
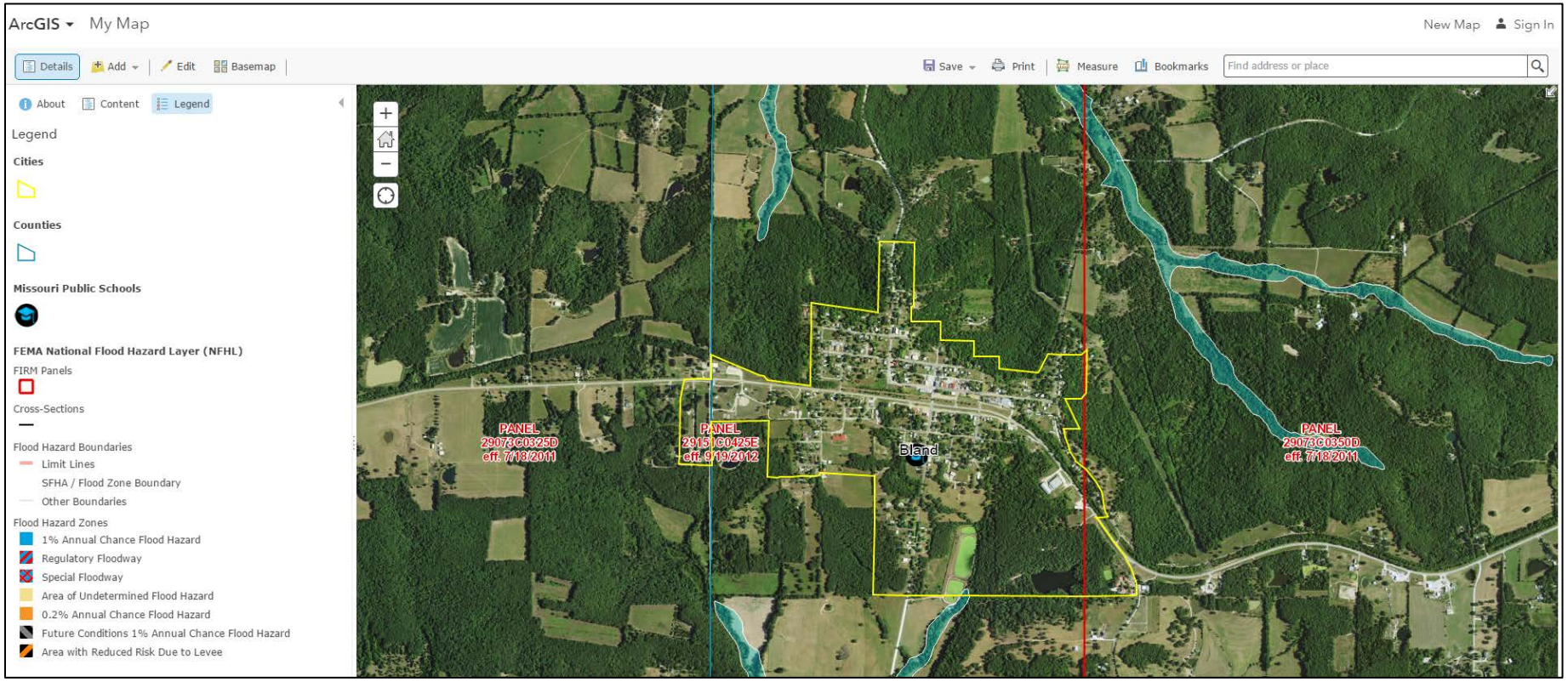
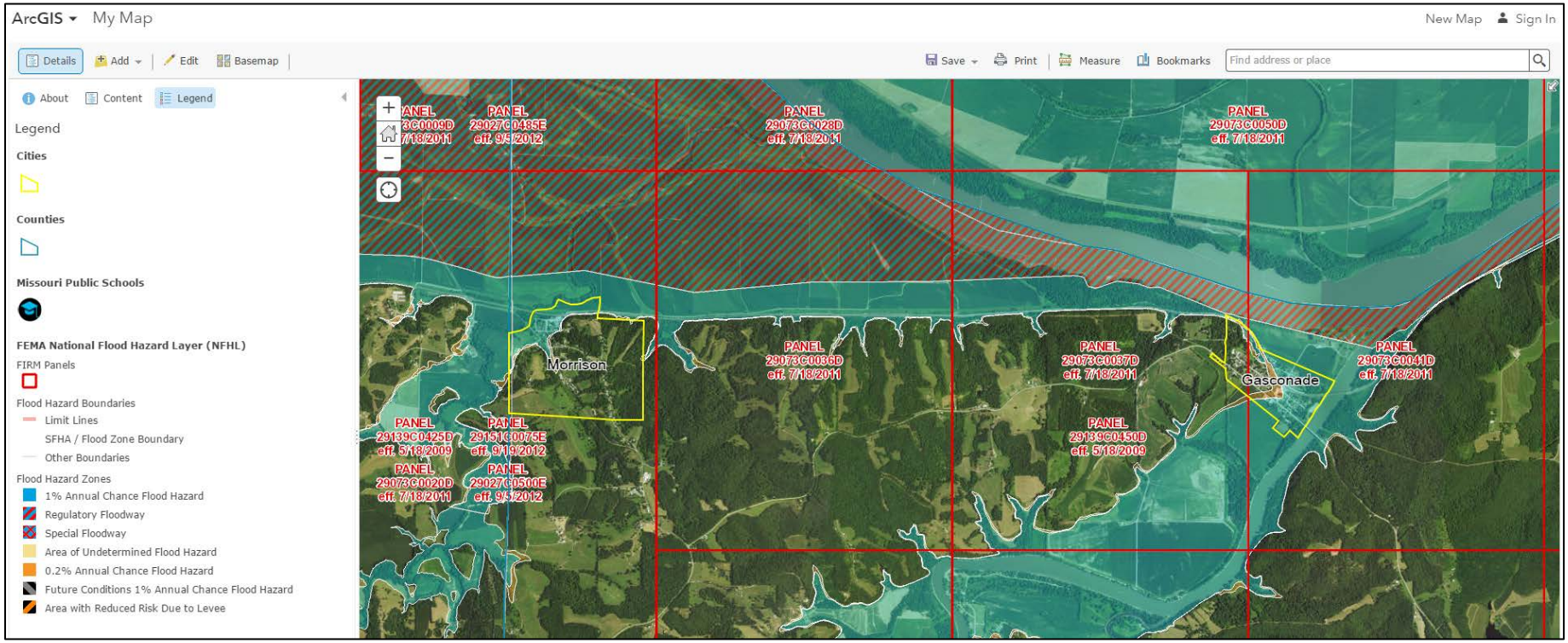


Figure 3.34. Bland, Missouri Special Flood Hazard Areas (SFHAs)



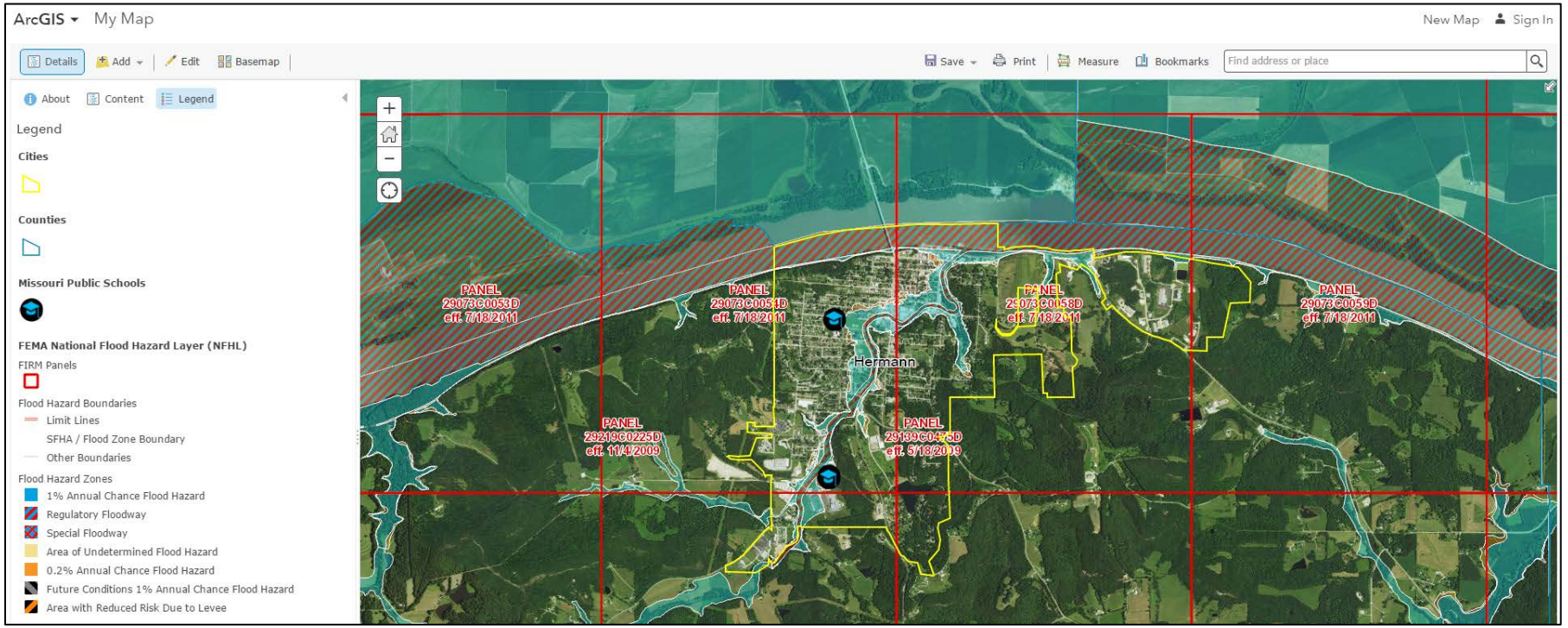
Source: ESRI's ArcGIS, Streets

Figure 3.35. Gasconade and Morrison, Missouri Special Flood Hazard Areas (SFHAs)



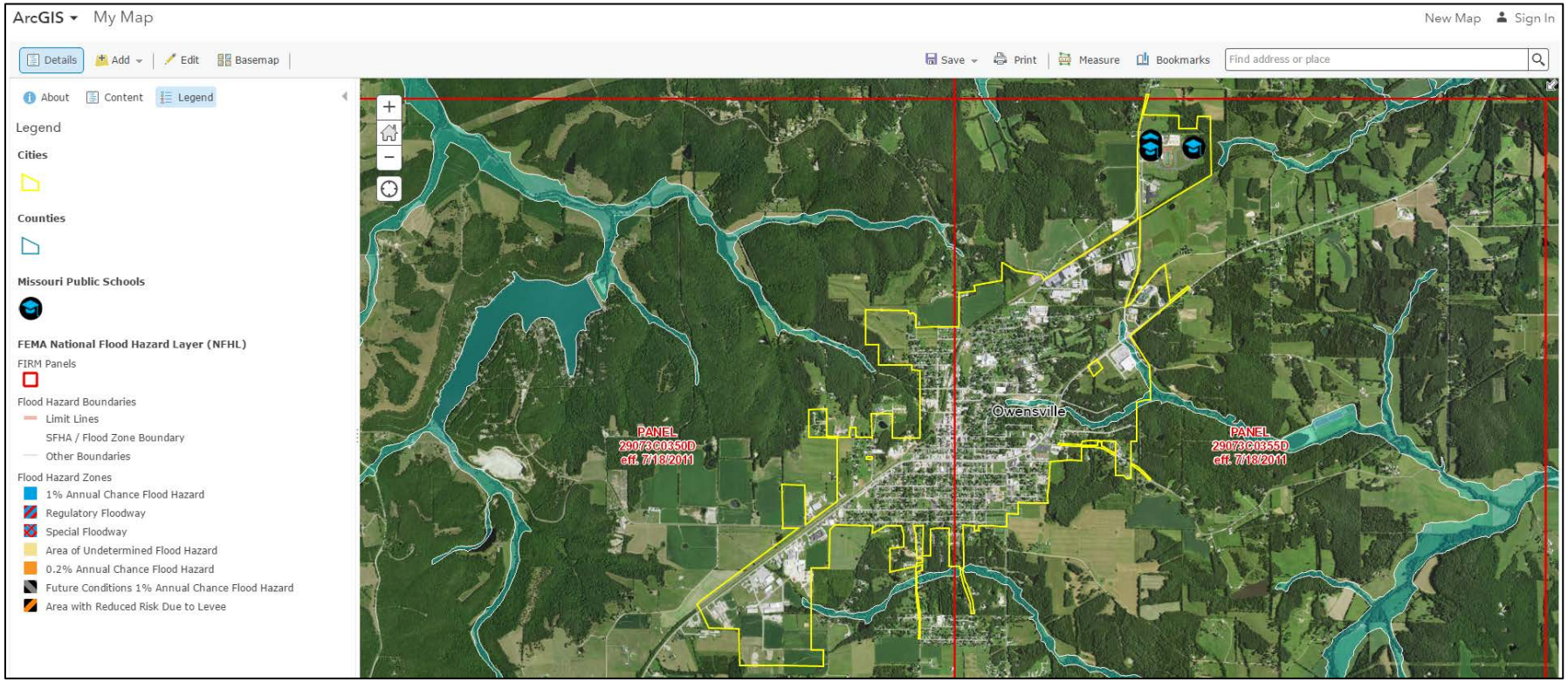
Source: ESRI's ArcGIS, Streets

Figure 3.36. Hermann, Missouri Special Flood Hazard Areas (SFHAs)



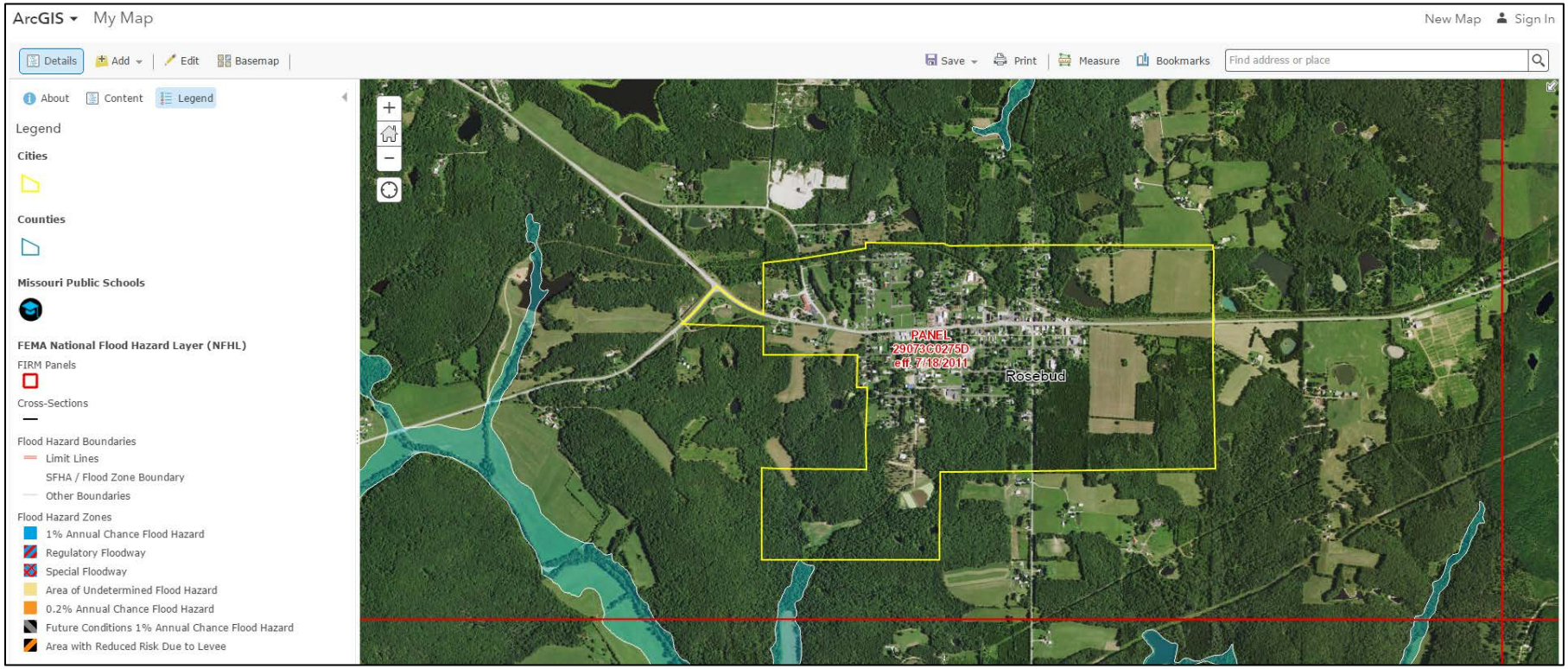
Source: ESRI's ArcGIS, Streets

Figure 3.37. Owensville, Missouri Special Flood Hazard Areas (SFHAs)



Source: ESRI's ArcGIS, Streets

Figure 3.38. Rosebud, Missouri Special Flood Hazard Areas (SFHAs)



Source: ESRI's ArcGIS, Streets

Table 3.48. Gasconade County NCDC Flood Events by Location, 1996-2015

Location	# of Events
Gasconade (Zone)	4
Gasconade County	1
Gasconade	1
Hermann	1
Morrison	2
Mt. Sterling	1

Source: National Climatic Data Center

Flash flooding occurs in SFHAs and locations in the planning area that are low-lying. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. After review of NCDC data, Unincorporated Gasconade County is the most prone jurisdiction to flash flooding events. **Table 3.49** provides information in regards to flash flood events between 1996 and 2015.

Table 3.49. Gasconade County NCDC Flash Flood Events by Location, 1996-2015

Location	# of Events
Gasconade County	6
South Portion of County	1
Eland	3
Hermann Municipal Airport	1
Woollam	1
Morrison	3
Hermann	1
Redbird	1

Source: National Climatic Data Center

Severity/Magnitude/Extent

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

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

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

When roads and bridges are inundated by water, damage can occur as the water scours materials around bridge abutments and gravel roads. Floodwaters can also cause erosion undermining road beds. In some instances, steep slopes that are saturated with water may cause mud or rock slides

onto roadways. These damages can cause costly repairs for state, county, and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard. Further information regarding scour critical bridges can be found in **Section 3.2.2**.

Between 1996 and 2015, there were 36 recorded crop insurance claims totaling $1,517,534.79 in loss due to flooding within Gasconade County[39].

National Flood Insurance Program (NFIP) Participation

Table 3.50 lists jurisdictions within the planning area that participate in NFIP. In addition, **Table 3.51** provides the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction.

Table 3.50. NFIP Participation in Gasconade County

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	E Prc Date
290801	Gasconade County	Y	07/18/11	09/04/87
290139	Bland	Y	0718/11(M)	08/24/84
290140	Gasconade	Y	07/18/11	12/18/84
290141	Hermann	Y	07/18/11	03/05/76
290142	Morrison	Y	07/18/11	09/18/86
290143	Owensville	Y	07/18/11(M)	06/03/78
-	Rosebud	N	-	-

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 3.51. NFIP Policy and Claim Statistics as of [08/31/2016]

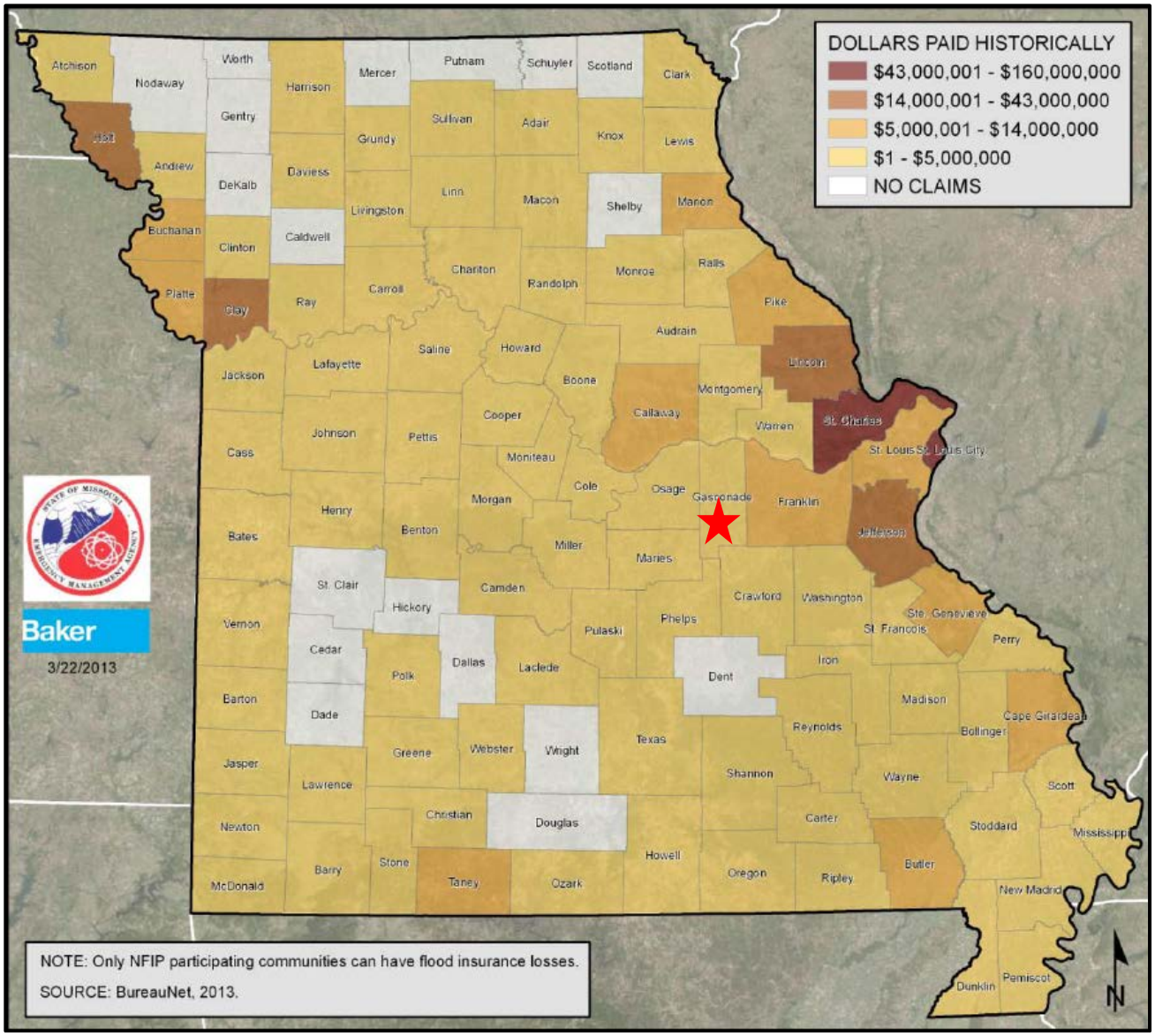
Community Name	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Gasconade County	199	181	1	17	2,816,801.97
Gasconade	70	65	0	5	515,280.32
Hermann	180	135	2	43	3,217,623.69
Morrison	6	5	0	1	82,794.61
Owensville	2	1	0	1	1,144.69

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

The following figures depict the dollars paid historically for flood insurance losses in Missouri by county from 1978 to Jan. 2013 (**Figure 3.39**)**,** and historical flood loss claims in Missouri by county, 1979 to Jan. 2013 (**Figure 3.40**).

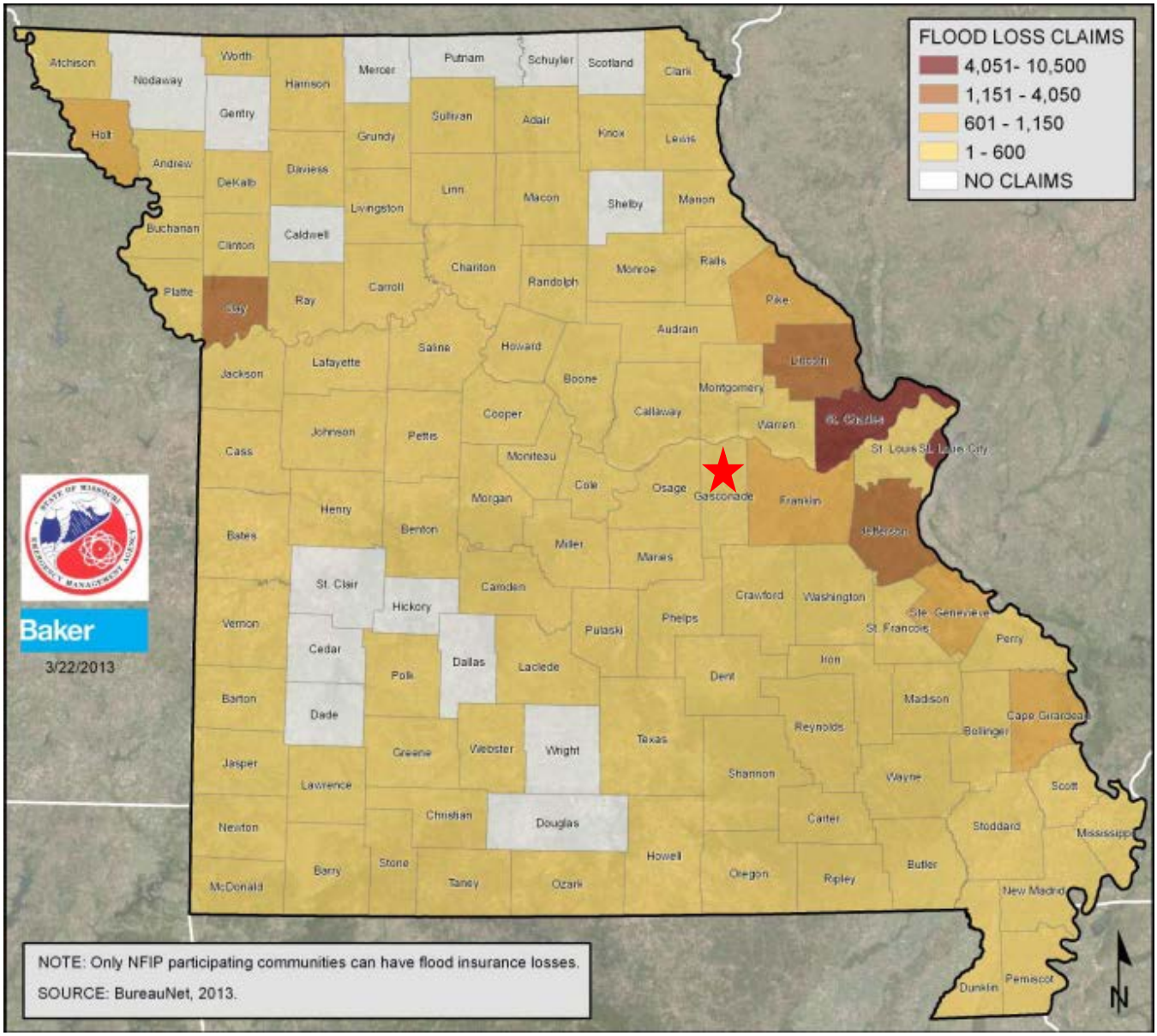
[39] http://www.rma.usda.gov/data/cause.html

Figure 3.39. Dollars Paid Historically for Flood Insurance Losses in Missouri by County, 1978 to Jan. 2013



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

Figure 3.40. Historical Flood Loss Claims in Missouri by County, 1978 to Jan. 2013

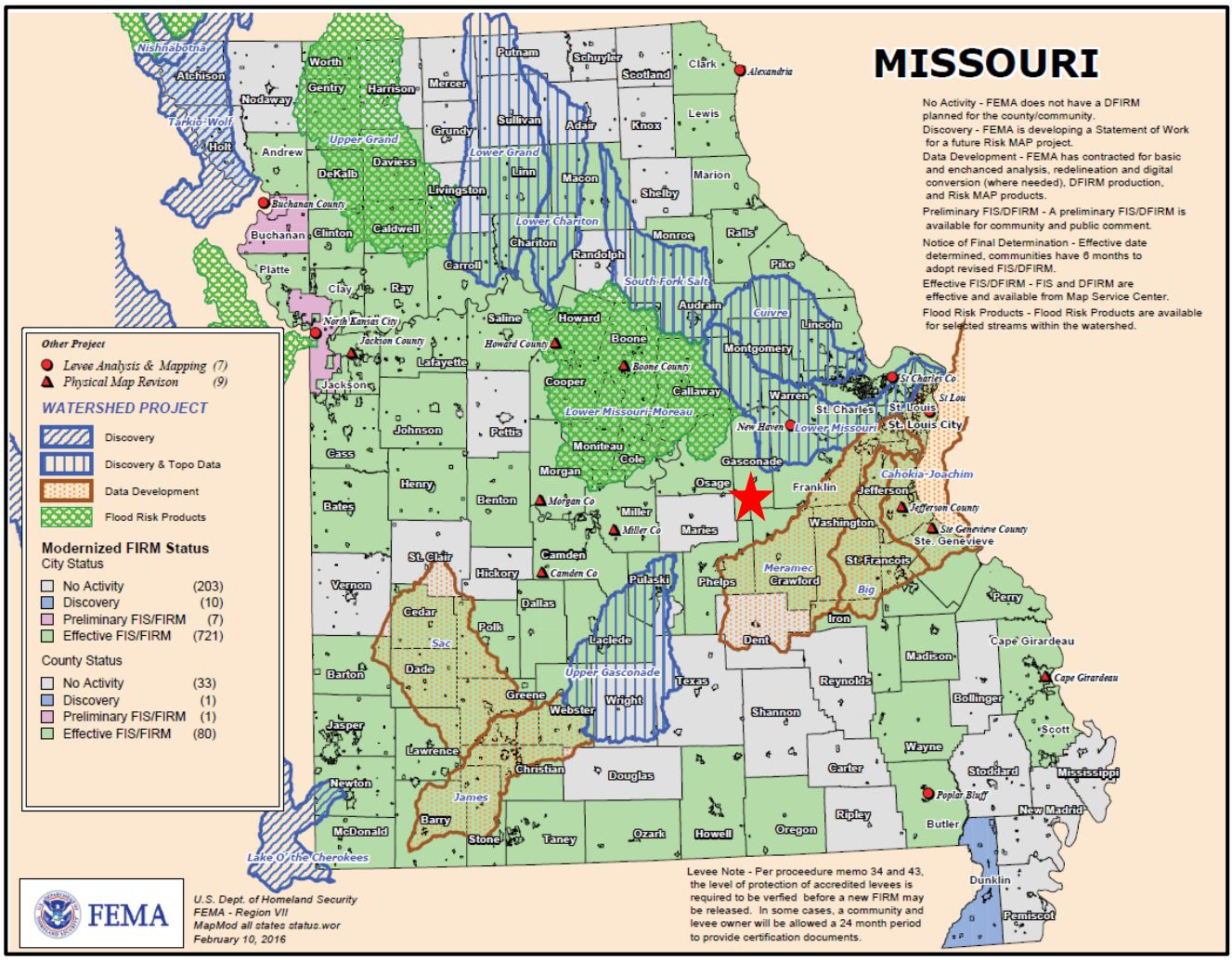


Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Gasconade County

RiskMAP

Risk mapping, assessment, and planning is a FEMA program which provides communities with flood information and tools to enhance their mitigation plan and take action to better protect their citizens. The northeastern half of Gasconade County is in the discovery and topo data stage. **Figure 3.41** below depicts various watershed projects and FIRM statuses for Missouri.

Figure 3.41. RiskMAP 2015



Source: SEMA, 2016
*Red star indicates Gasconade County

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

Repetitive Loss Properties are those properties with at least two flood insurance payments of $5,000 or more in a 10-year period. According to the Flood Insurance Administration, jurisdictions included in the planning area have a combined total of 62 repetitive loss properties (30 in Gasconade Co., 1 in Gasconade, 27 in Hermann, and 4 in Morrison) with 240 losses as of 2/29/2016. Of those properties, there are 52 residential and 10 commercial properties (mitigated and non-mitigated).

Total payments (building and contents) were $4,812,540.08. The average payment was $20,815.73.

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 are 26 SRL properties in Gasconade County.

Previous Occurrences

Table 3.52 provides information regarding Presidential Flooding Disaster Declarations between 1996 and 2015 for Gasconade County.

Table 3.52. Gasconade County Presidential Flooding Disaster Declarations 1996 to 2015

Declaration No.	Date	State	Incident Description
DR-1463	05/04/2003	Missouri	Missouri Severe Storms, Tornadoes, and Flooding
DR-1676	1/12/2007	Missouri	Missouri Severe Winter Storms and Flooding
DR-1749	3/17/2008	Missouri	Missouri Severe Storms and Flooding
DR-4250	12/23/2015	Missouri	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding

FEMA, Disaster Declarations for Missouri, Flooding

Data was obtained from the NCDC regarding flash and river flooding over the last 20 years. **Table 3.53** and **Table 3.54** provide this information. Additionally, narratives available for each event are included.

Table 3.53. NCDC Gasconade County Riverine Flood Events Summary, 1996 to 2015

Year	# of Events	# of Deaths	# of Injuries	Property Damages ($)	Crop Damages ($)
1996	1	0	0	0	0
1998	2	0	0	0	0
2001	1	0	0	0	0
2002	1	0	0	0	0
2007	1	0	0	5,000	10,000
2008	1	0	0	0	0
2010	1	0	0	0	0
2013	1	0	0	1,000	2,000
2015	1	0	0	160,000	0

Source: NCDC, data accessed [10/25/2016]

Narratives on flood events:

1. **05/01/1996:** The Mississippi and Missouri Rivers, and several smaller rivers in the area, flooded during much of May due to heavy spring rains. The heavy rain primarily fell from late April through early May. Rainfall for the month average from 1 to 7 inches above normal with measurable rain falling in the hydrologic service area 16 days during the month. Following are some of the crests reached along the major rivers during month. Most crests ranged from 3 to 7 feet over flood stage. Many of the rises in late April and early May were very rapid, considering the size of the rivers. On the Missouri River at Hermann, the river at one point

rose 10 feet in about 24 hours.

2. **03/20/1998:** Overnight rain of 2 to 3 inches produced minor flooding. Low-water crossings became impassable and some small streams rose out of their banks. County roads AK and MM in Franklin County were closed for a while as were a few county roads in Gasconade County. In Jefferson County the Big River rose out of its banks at Byrnesville.

3. **10/06/1998:** Heavy rain over west Missouri and further upstream caused flooding on the Missouri River in central and eastern Missouri. On average, river stages rose to 5 to 7 feet over flood stage. The stages quickly fell and were back below flood levels after 5 to 6 days. Damage was minimal, primarily because wetlands and low-land agricultural areas were the only locations flooded. Many of the wetlands had been established as a result of the Great Flood of 1998.

4. **06/04/2001:** The Mississippi River flooded in May, and in June the Missouri River took over. Heavy rain across the Missouri River Basin sent the river over its banks to heights in some places not seen since the flooding in 1995. Despite the high river levels, damages were minimal compared to what they could have been. This is because many homes and businesses were relocated out of the flood plain after the devastating flooding of the early and mid-90s. The bulk of the flooding this time occurred in newly established wetlands or in farmhands on the river side of levees. Some towns however were affected.

5. **05/08/2002:** Several heavy rain events caused the Missouri River to flood from Central Missouri east to its confluence with the Mississippi River. Most of the flooding started around the 8th and ended by the 20th. The exception being at Gasconade, MO where the river remained in flood until May 28. The river peaked from about 6 to 11 feet over flood stage. Several roads along the river were closed at various times and many acres of farm land went under water. The Katy Trail Sate Park, a bike and hiking trail that runs along the river from Central Missouri to St. Charles, was damaged at several locations along the river. Damage to homes and businesses was virtually nonexistent due to relocations and buy outs after the Great Flood of 1993.

6. **05/08/2007:** The Missouri River flooded parts of the northern border of Gasconade County from Gasconade to Hermann. Two city parks in Hermann were flooded, otherwise flooding was limited to farmland along the river and to some roads near the river in the Hermann area.

7. **09/14/2008:** Up to 5 inches of rain fell in a short amount of time as the remnants of Hurricane Ike moved through the region causing flooding. Numerous roads were flooded countywide and numerous creeks were well out of their banks due to the heavy rain.

8. **06/05/2010:** The Missouri River went into flood early in the month and stay that way into July. Moderate flooding occurred which only affected some roadways and farmland along the river.

9. **06/01/2013:** The Missouri River started June in flood and hit major flood levels very early in the month cresting on the 1st. The river fell below flood stage on the 7th. Damage was limited to some closed roads and flooded farmland.

10. **12/27/2015:** Between 6 and 9 inches of rain fell across Gasconade County during a 2 day period. All of this rain caused the creeks and rivers to rise. The Gasconade River and Missouri River went into flood with several points cresting at major levels. Almost 20 structures were either damaged or destroyed from the river flooding. Damage estimates so far were around $160 Thousand.

Table 3.54. NCDC Gasconade County Flash Flood Events Summary, 1996 to 2015

Year	# of Events	# of Deaths	# of Injuries	Property Damages ($)	Crop Damages ($)
1996	2	0	0	0	0
1997	1	0	0	0	0
2000	1	0	0	0	0
2002	3	0	0	0	0
2008	1	0	0	0	0
2009	2	0	0	0	0
2010	3	0	0	30,000	0
2012	1	0	0	0	0
2013	1	0	0	0	0
2015	2	0	0	0	0

Source: NCDC, data accessed [10/25/2016]

Narratives on flood events:

1. **04/21/1996:** Heavy rain caused flooding of county roads, mainly in low-lying areas.

2. **04/28/1996:** Heavy rain of 4 to 6 inches caused widespread flash flooding across the county. Several county roads were washed out.

3. **06/22/1997:** Rainfall of 2 to 4 inches caused flash flooding across the area. Frene Creek in Herman rose over its banks flooding a city park. Street flooding was reported in Owensville.

4. **05/06/2000:** Rainfall up to 6 inches fell on Gasconade County causing most small streams and creeks to quickly overflow their banks. No major damage was noted, but several roads were closed for several hours due to floodwater.

5. **05/09/2002:** Another round of 2-4 inches of rain on already saturated ground led to more flash flooding across the area. Numerous roads across the area became impassable due to high water. Many of the small creeks and streams, already high because of previous rain, quickly flooded again.

6. **05/12/2002:** The third heavy rain event of the month brought 3-6 inches of rain over Mother's Day weekend resulting in widespread flash flooding across much of Central and Eastern Missouri. Some weather watchers reported nearly a food of rain in a 15 day period. Countless creeks and small streams flooded leaving roads underwater. In rural areas, many roads and bridges were severely damaged by floodwater. Urban areas were also overrun by water as storm water drainage systems were quickly overwhelmed. Many people in cities suffered flooded basements. In Centralia, in Boone County, street flooding left people stranded. In Montgomery County, Routes Y, K, J, CC, E and others were flooded and closed. In Franklin County, several roads were closed in Pacific, Robertsville, Catawissa and others. In Gasconade County, Routes N and D were flooded and closed. In Lincoln County, several roads were closed in Troy, Winfield and across the south portion of the county. In St. Louis County, roads were flooded, especially in southern and western areas.

7. **08/18/2002:** Rainfall of 3 to 4 inches flooded several roads across southern Gasconade County. Street flooding was also reported in several areas of Owensville.

8. **03/31/2008:** Three to four inches of rain fell over Gasconade county over a short period of

time on already saturated soils. Numerous roads were closed due to flooding including the intersection of Highways B and C south of Bland, Piezuck Road and Highway 19 on the north side of Owensville, Kings Highway in Mount Sterling, as well as Moore Road and Highway 19 in Bay. Water was flowing over U.S. Highway 50 east of Mount Sterling, but it was not closed.

9. **05/08/2009:** Up to 4 inches of rain fell in a short amount of time causing flash flooding. Numerous roads were flooded for a time including Wildcat Road, Van Horn Road and Glaser Hollow Road.

10. **07/04/2009:** Between 5 and 6 inches of rain fell in a short amount of time causing flash flooding in portions of Hermann. Frene Creek rose quickly and caused extensive damage to the driveway that leads into the Hermann Middle School parking lot. Thirty to thirty-five feet of the roadway and bridge were destroyed by the rushing waters.

11. **06/08/2010**: Up to 5 inches of rain fell in a short amount of time on already saturated soils causing flash flooding. Numerous roads were flooded and a couple of roads and culverts were washed out. Route Y west of Owensville was flooded for a time. Also, the road leading to the the bridge on the south entrance to Peaceful Valley Lake subdivision was washed out due to the heavy rains and had to be repaired.

12. **07/09/2010:** Up to five inches of rain fell in a short amount of time on already saturated soils causing flash flooding. Several roads were flooded including Stollmeyer Road.

13. **09/18/2010**: Between 3 and 5 inches of rain fell onto already saturated soils causing flash flooding. Frene Creek in Hermann rose quickly and came out of its banks next to the city park where dozens of people were camping for the third annual Hermann Cyclocross race. The police and fire department were able to get everyone out of the campground, though two vehicles were flooded as well as numerous tents, bikes and one popup camper that could not be moved quickly enough. No injuries were reported.

14. **03/15/2012:** Up to two inches of rain fell in a short amount of time causing flash flooding. Several roads were flooded including Highway A just north of Bland.

15. **05/31/2013:** Up to four inches of rain fell in a short amount of time causing flash flooding. Several roads throughout the county were flooded, including several near Stone Hill Winery in Hermann.

16. **06/19/2015**: Up to 3 inches of rain fell onto already saturated soils causing flash flooding. Numerous roads were flooded throughout the county.

17. **12/26/2015:** Between 5 and 6 inches of rain fell causing flash flooding. Numerous roads were flooded including U.S. Highway 50 near Mt. Sterling and Route A in multiple areas between Routes Y and D. Also, Routes W and K were closed due to flash flooding from Second Creek.

Probability of Future Occurrence

From the data obtained from the NCDC[40], there were 10 riverine flood events (**Table 3.54)** over a period of 20 years. This information was utilized to determine the annual average percent probability of riverine flooding (**Table 3.55**). The probability of riverine flooding in Gasconade County per year is 50% (10 events/20 years x 100 = 50%). Furthermore, data was obtained for flash flooding within the county. Gasconade County endured 17 flash flooding events (**Table 3.53**) over a 20 year period. The probability of

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

flash flooding in Gasconade County per year is 85% (17 events/20 years x 100 = 85%) (**Table 3.56**).

Table 3.55. Annual Average % Probability of Riverine Flooding in Gasconade County

Location	Annual Avg. % P
Gasconade County	50%

*P = probability; see page 3.24 for definition.

Table 3.56. Annual Average % Probability of Flash Flooding in Gasconade County

Location	Annual Avg. % P
Gasconade County	85%

*P = probability; see page 3.24 for definition.

Vulnerability

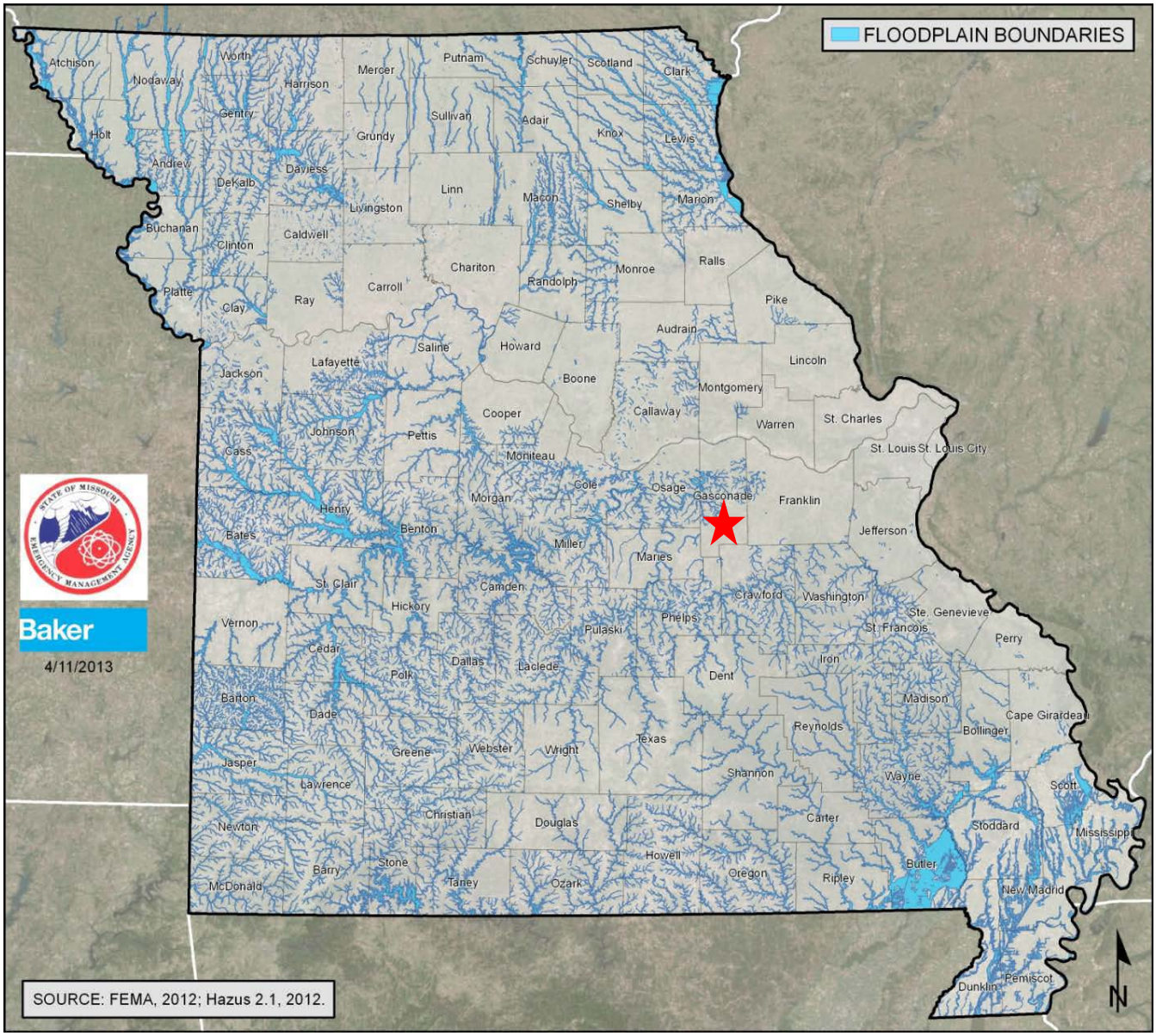
Vulnerability Overview

For the vulnerability analysis of riverine and flash flooding for Gasconade 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[41].

Figure 3.42 depicts the 100-year floodplain boundaries for all counties within Missouri. These DFIRM floodplains are comprised of streams based on a <1 sq. mile drainage area.

[41] 2013 Missouri State Hazard Mitigation Plan

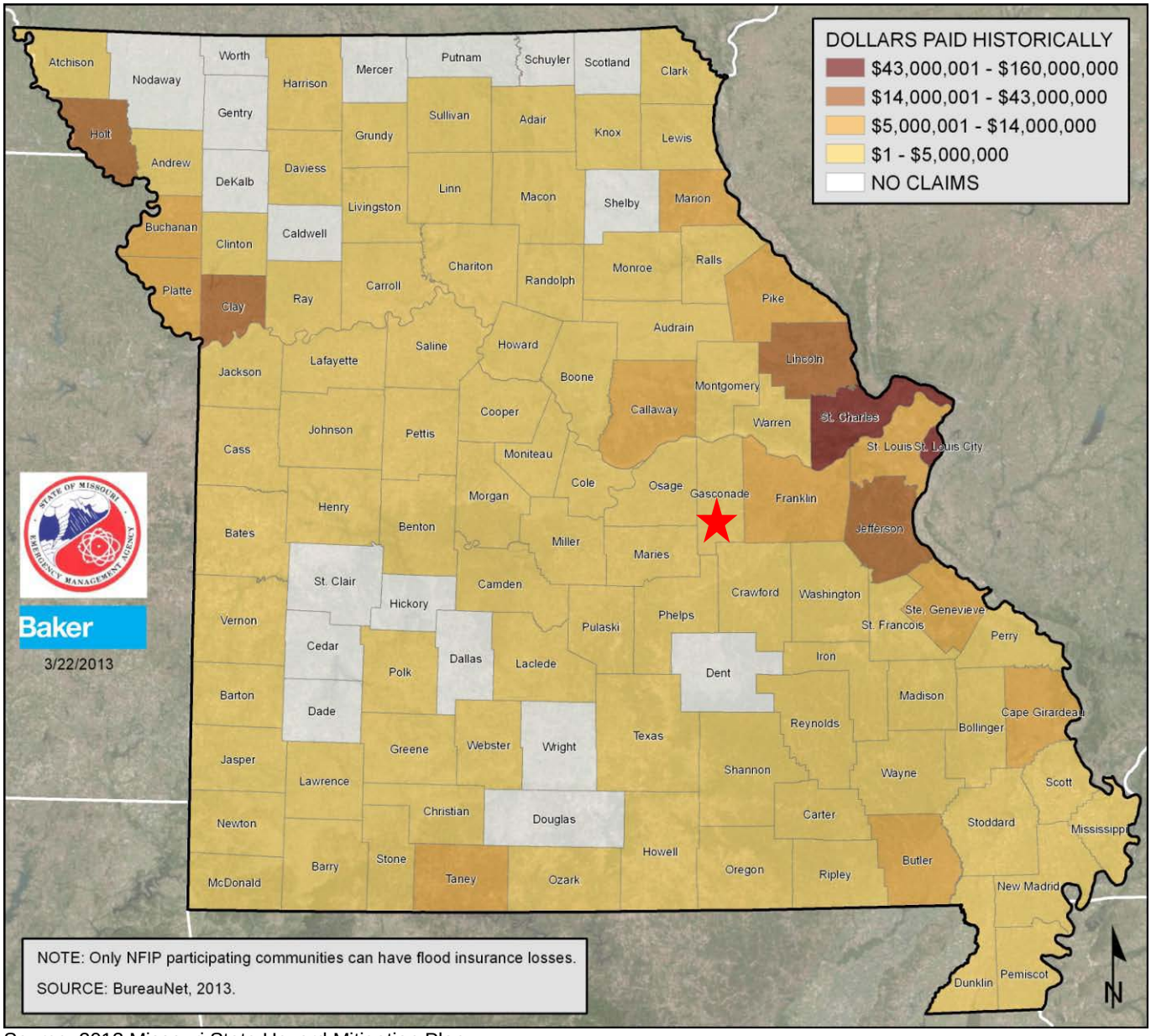
Figure 3.42. DFIRM and Hazus Countywide Base-Flood Scenarios: Modeled Floodplain Boundaries



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

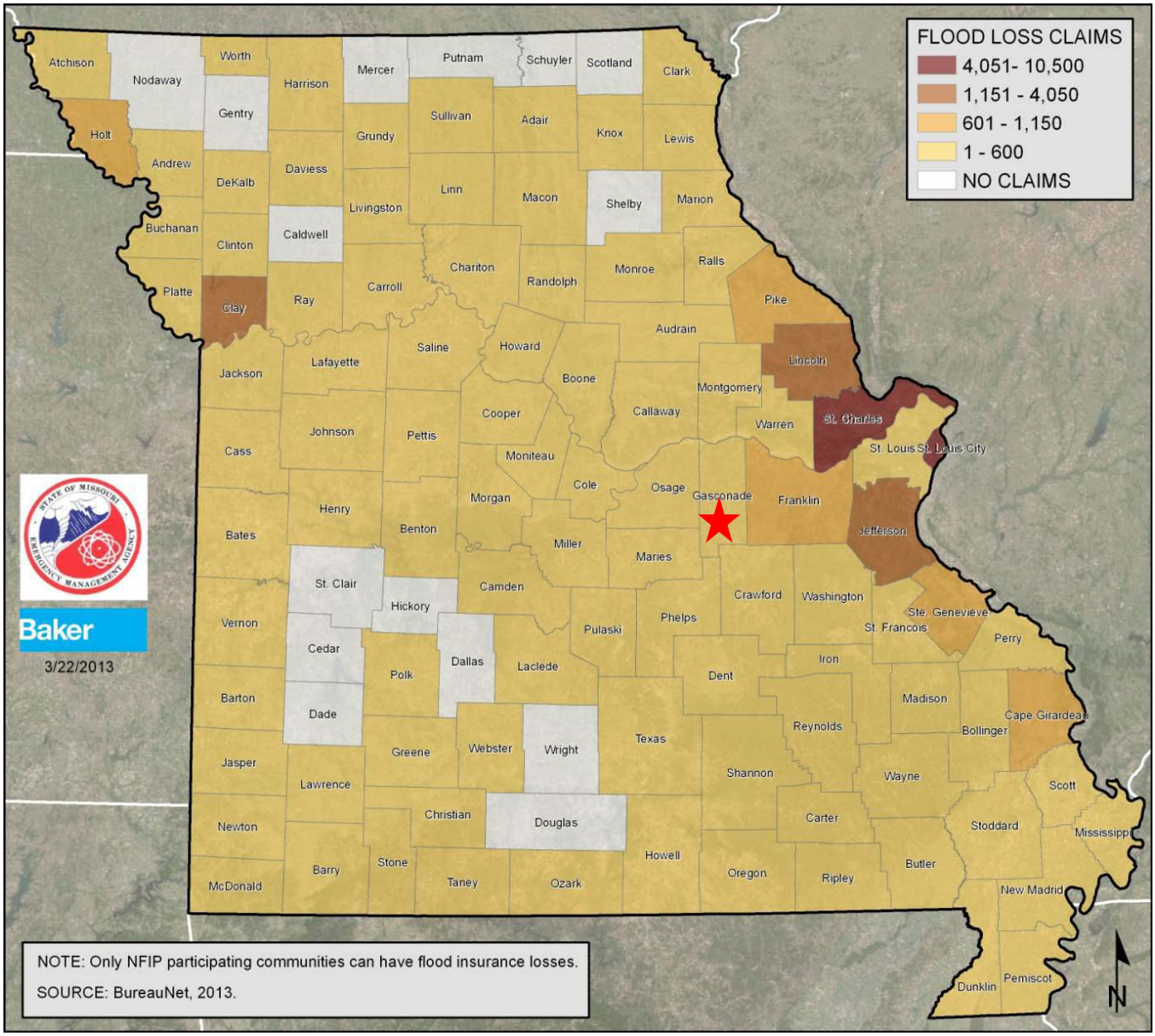
In addition, the state analyzed NFIP flood-loss data to establish areas in Missouri that are most at risk to flooding. **Figure 3.43** illustrates the dollars paid historically for flood insurance losses in Missouri by county from 1978 to 2013. Moreover, **Figure 3.44** depicts flood loss claims in Missouri during the same timeline.

Figure 3.43. Dollars Paid Historically for Flood Insurance Losses in Missouri by County, 1978 –Jan 2013



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

Figure 3.44. Flood Loss Claims in Missouri by County, 1978 – Jan 2013



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

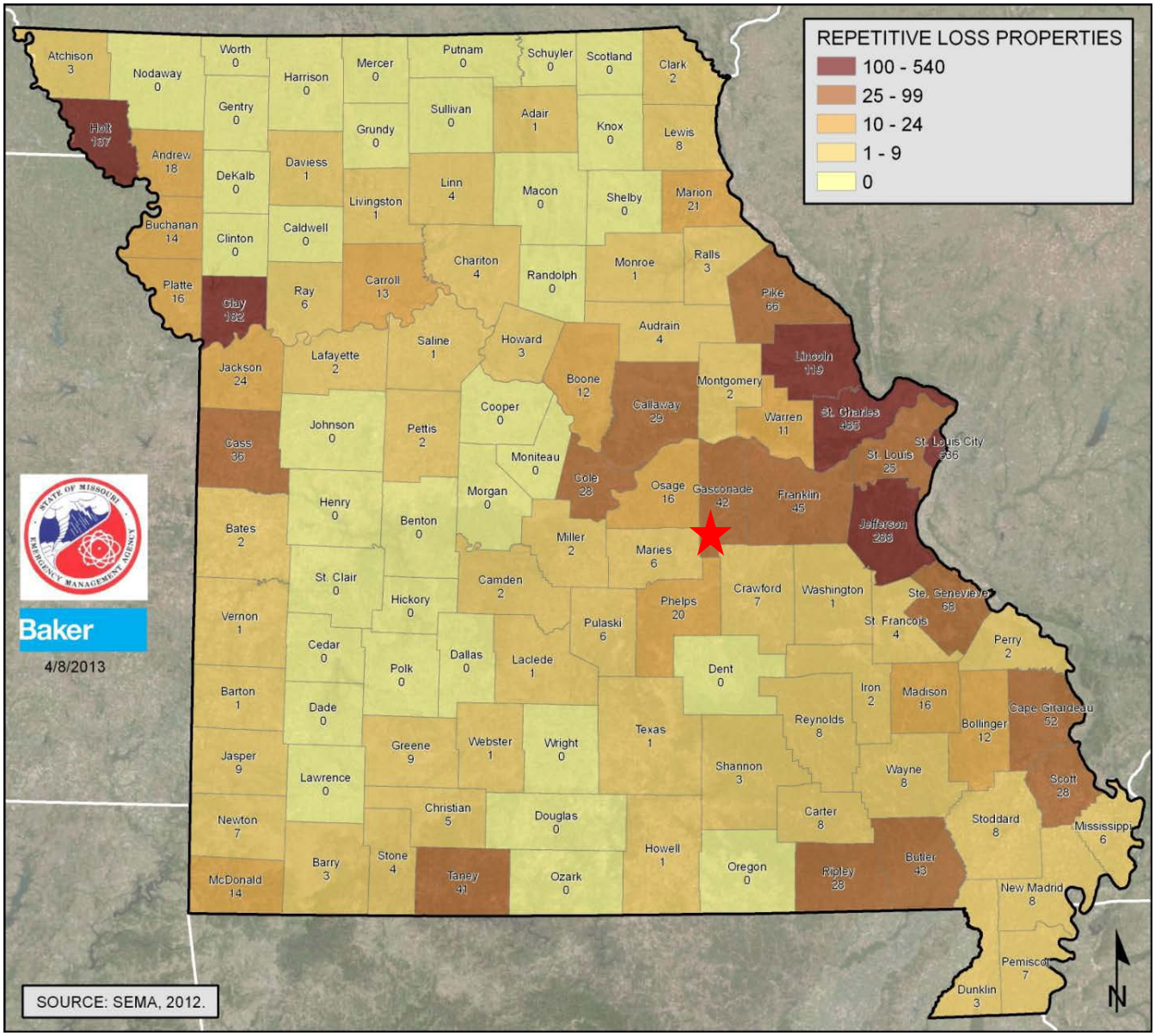
Table 3.57 and **Figure 3.45** illustrate the number of repetitive loss properties in Gasconade County.

Table 3.57. Gasconade County's Repetitive Loss Property Summary

County	Number of Repetitive Loss Properties	Number of Losses	Total Paid ($)	Loss Ratio	Average Payment
Gasconade	42	185	$3,773,168	4.4	$20,395

Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.45. Repetitive Flood Loss Properties by County, 1978 - 2009



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

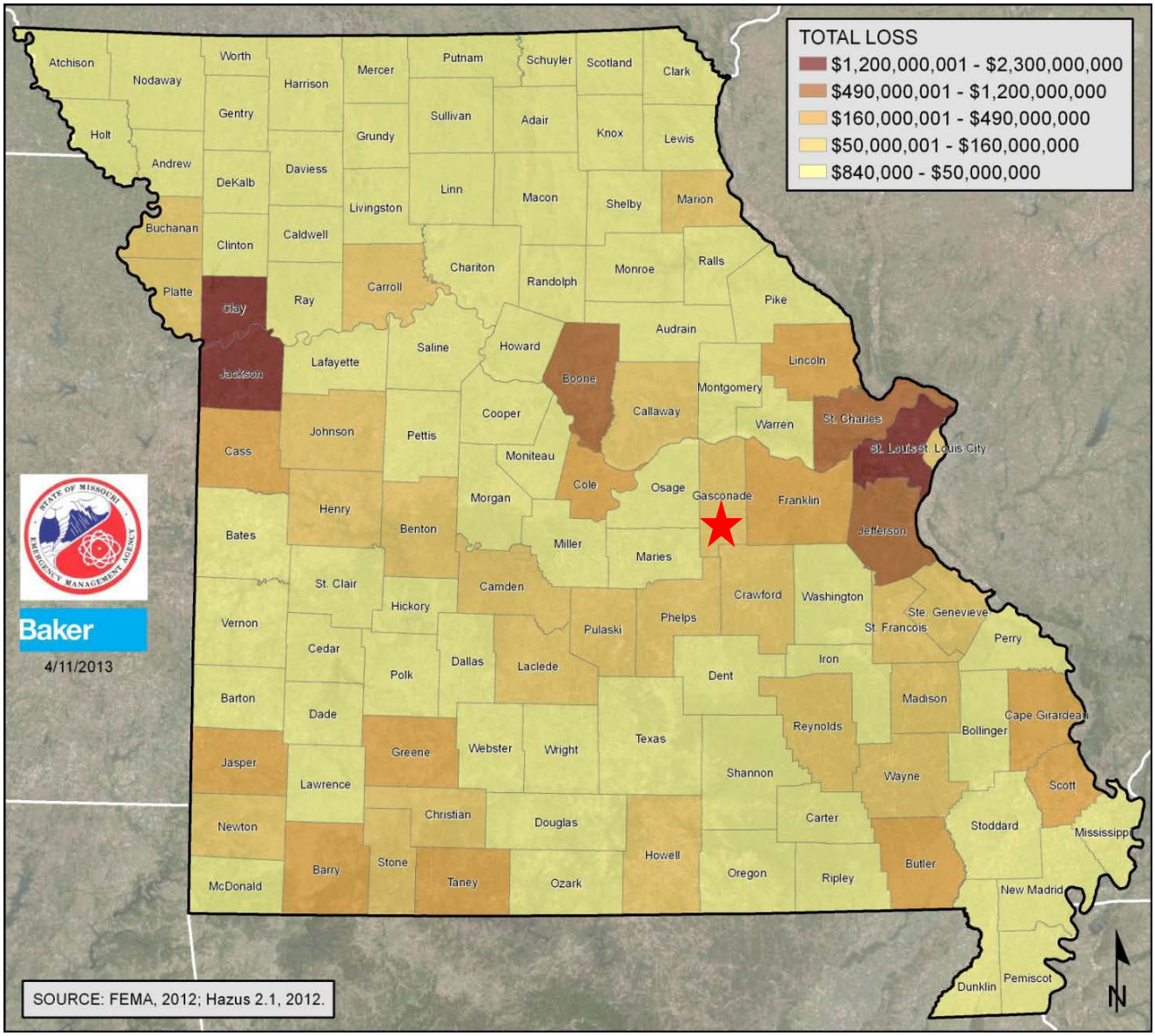
Furthermore, the state analyzed potential loss estimates to flooding. The purpose of the analysis is to determine where flood losses can occur and the degree of severity. These results were generated from DFIRM data and Hazus floodplain data. **Table 3.58** provides information regarding total direct building loss and income loss to Gasconade County. In addition, **Figure 3.46** and **Figure 3.47** depict Hazus countywide base-flood (100 year) scenarios including building and income loss for total loss and loss ratio respectively.

Table 3.58. Total Direct Building Loss and Income Loss to Gasconade County

County	Structural Damage	Contents Damage	Inventory Loss	Total Direct Loss	Total Income Loss	Total Direct and Income Loss	Calc. Loss Ratio
Gasconade	$30,927,050.71	$27,889,182.24	$706,319.32	$59,522,552.27	$565,254.14	$60,087,806.41	5.00

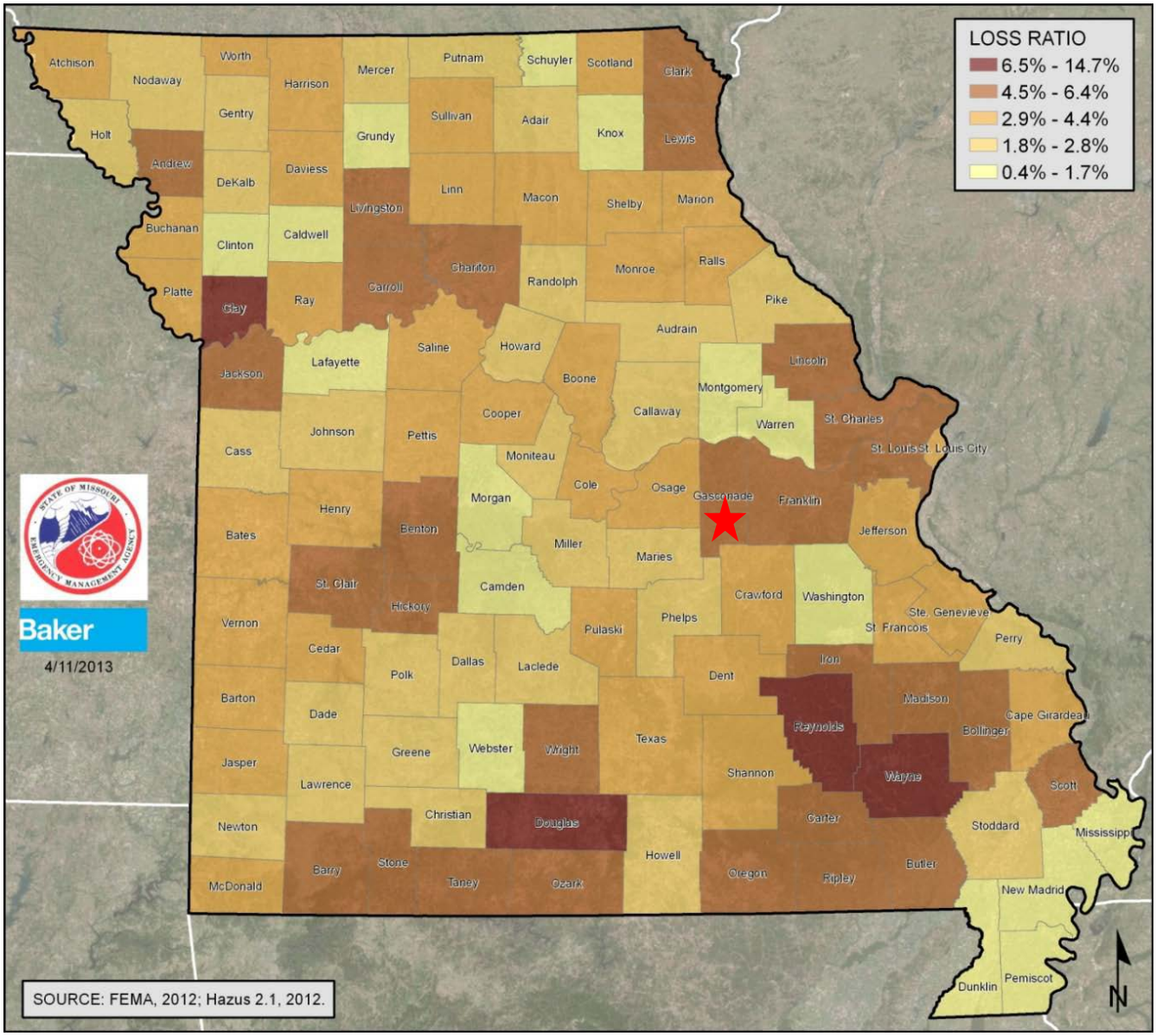
Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.46. Hazus Countywide Base-Flood Scenarios: Building and Income Loss



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

Figure 3.47. Hazus Countywide Base-Flood Scenarios: Building Loss Ratio



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

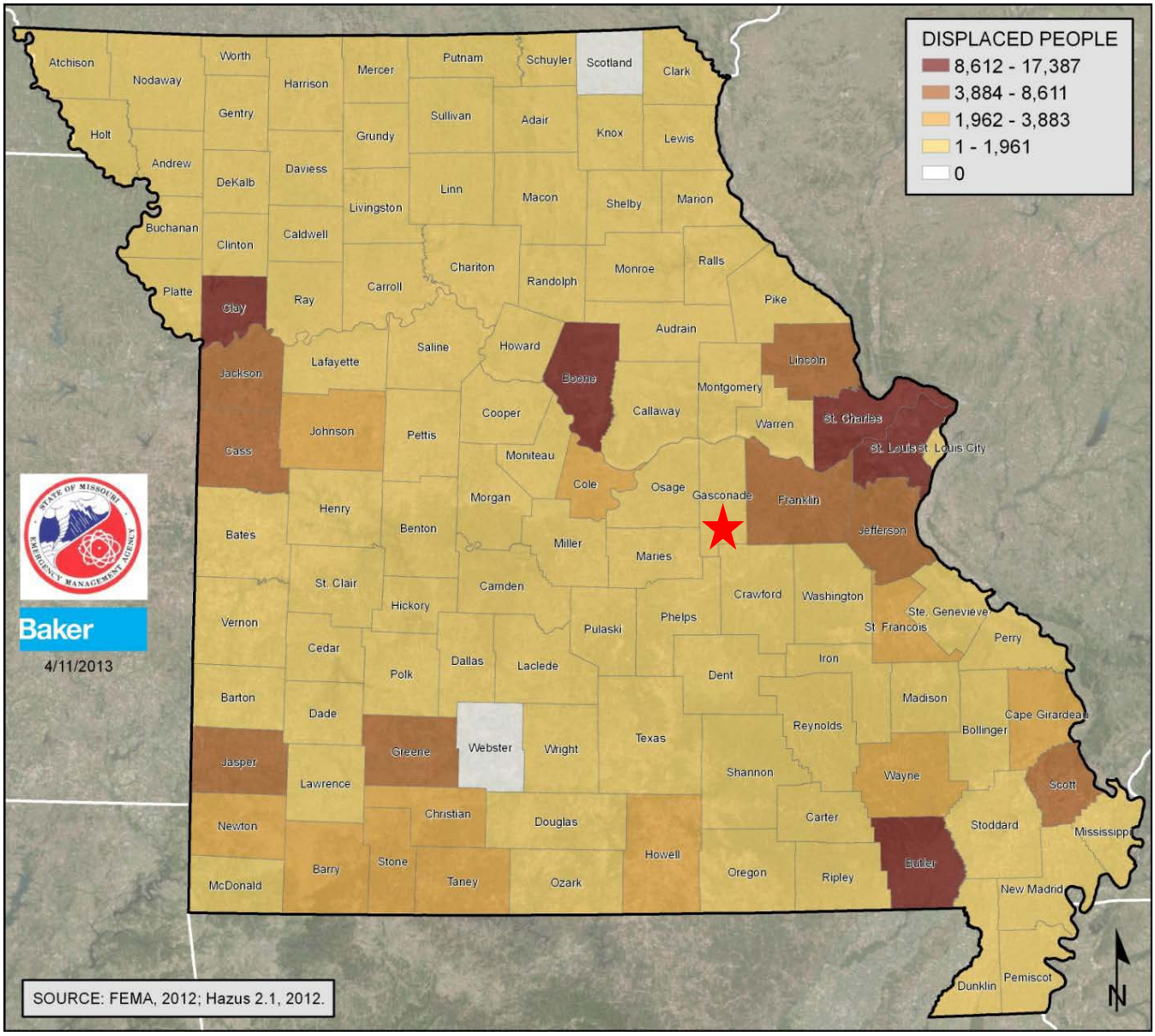
Lastly, the State determined the estimated number of displaced households and need for shelters within Gasconade County in the event of a 100 year flood. **Table 3.59** and **Figure 3.48** illustrate this information.

Table 3.59. Estimated Displaced households and Shelter Needs for Gasconade County

County	Displaced Households	Displaced Population Requiring Shelter
Gasconade	1,125	197

Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.48. Hazus Countywide Base-Flood Scenarios: Displaced People



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

Potential Losses to Existing Development

Every jurisdiction in Gasconade County contains a portion of the 100 Year Floodplain except for Rosebud. According to the HAZUS model, Gasconade County has a building loss ratio of 4.5% to 6.4% for countywide base-flood scenarios, which is relatively high in relation with other counties in the state. Additionally, the county has a high number of repetitive loss properties. With the annual average probability for flooding at 50% and 85% for flash floods, Gasconade County's existing development is vulnerable. Especially development located in low-lying areas, near rivers or streams, or where drainage systems are not adequate are all prone to flooding.

According to the 2016 Questionnaire, no school districts within the county have buildings located

within the floodplain. Lastly, several buildings damaged historically to flooding have been mitigated, leaving fewer areas of potential destruction.

Impact of Future Development

Impact of future development is correlated to floodplain management and regulations set forth by the county and jurisdictions[42]. Future development within low-lying areas near rivers and streams, or where interior drainage systems are not adequate to provide drainage during heavy rainfall events should be avoided. Additionally, future development would also increase impervious surface causing additional water run-off and drainage problems during heavy rainfall events.

Hazard Summary by Jurisdiction

Vulnerability to flooding slightly varies across the planning area. The jurisdictions most vulnerable to flooding include Unincorporated Gasconade County, Hermann, and Gasconade. 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.

[42] 2015 Boone County Hazard Mitigation Plan

3.4.7 Land Subsidence/Sinkholes

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

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

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

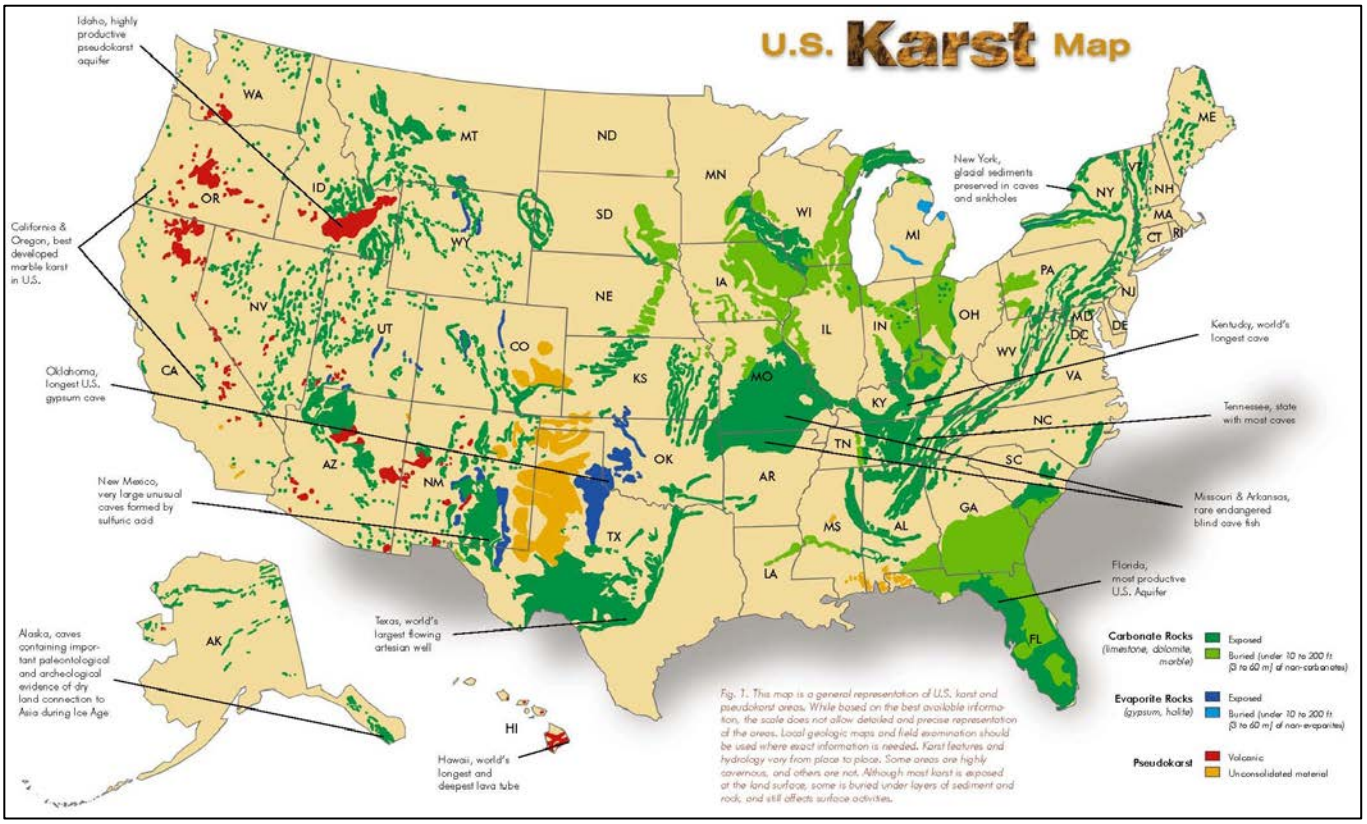
In the case of sinkholes, the rock below the surface is rock that has been dissolving by circulating groundwater. As the rock dissolves, spaces and caverns form, and ultimately the land above the spaces collapse. In Missouri, sinkhole problems are usually a result of surface materials above openings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

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

Geographic Location

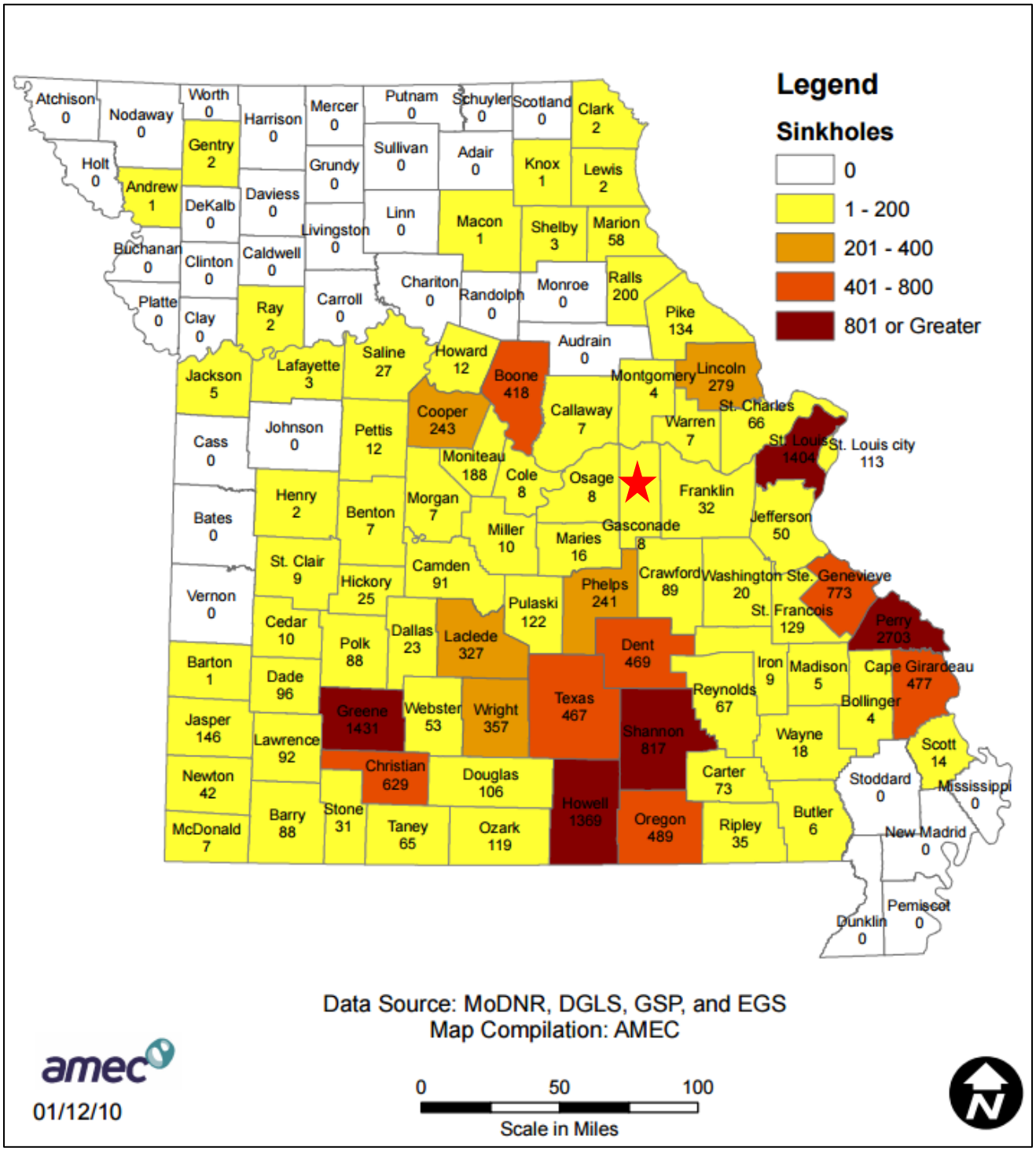
Figure 3.49 depicts karst topography across the United States. Missouri's kart topography is comprised of carbonate rocks such as limestone, dolomite, and marble. Variability in areas prone to sinkholes does not differ greatly across the county. There are approximately 8 sinkholes that have been recorded within Gasconade County (**Figure 3.50**). According to **Figure 3.51** there are approximately 1332 mines in Gasconade County. According to the Missouri Department of Natural Resources, Gasconade County primarily produces crushed stone such as limestone, dolomite, granite, and felsite. Activities such as mining or drilling are known to be responsible for the formation of sinkholes.

Figure 3.49. U.S. Karst Map



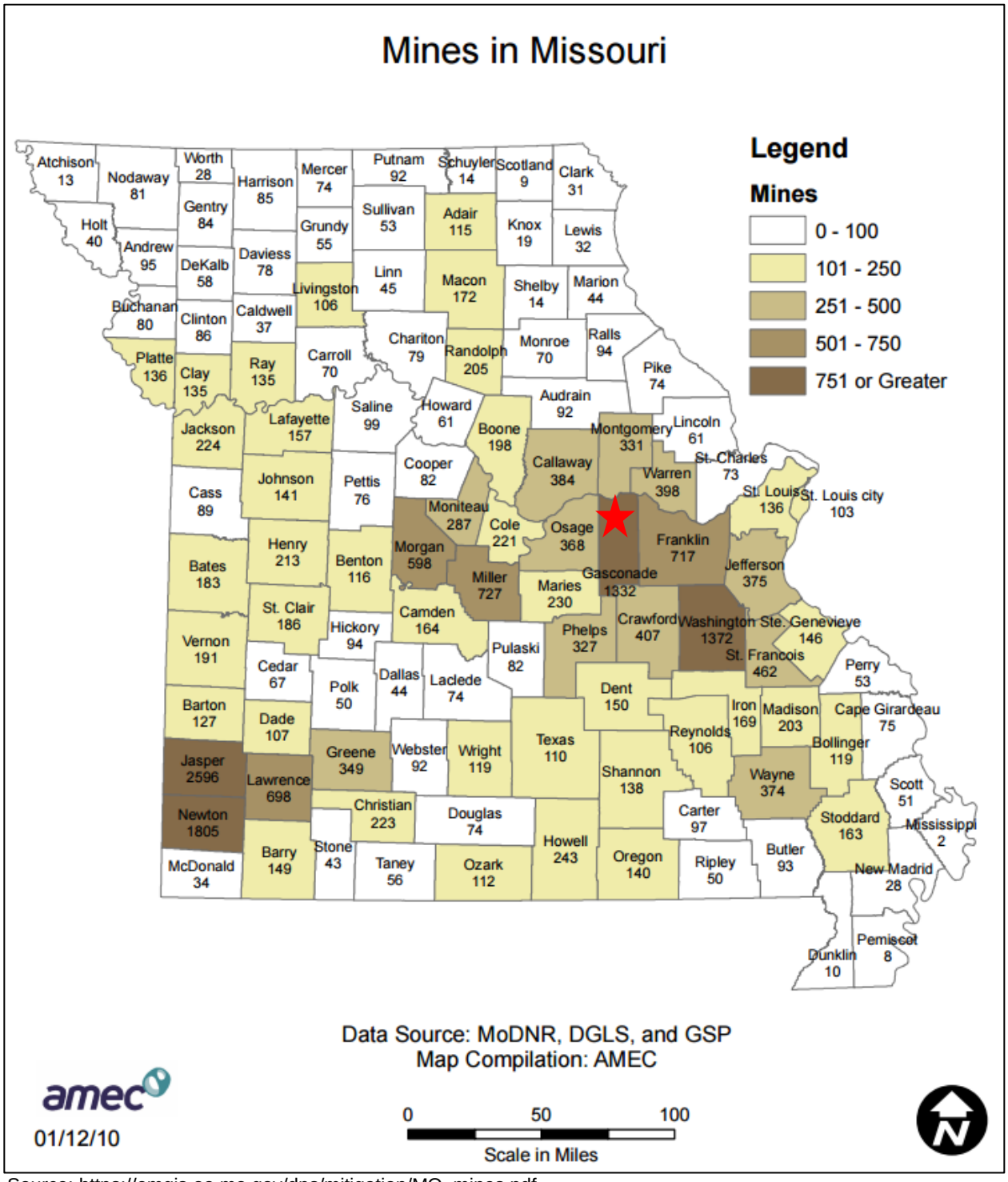
Source: http://www.northeastern.edu/protect/wp-content/uploads/US_KarstMap.jpg

Figure 3.50. Sinkholes in Missouri



Source: http://sema.dps.mo.gov/programs/mitigation_management.php

Figure 3.51. Mines in Missouri



Source: https://emgis.oa.mo.gov/dps/mitigation/MO_mines.pdf

Severity/Magnitude/Extent

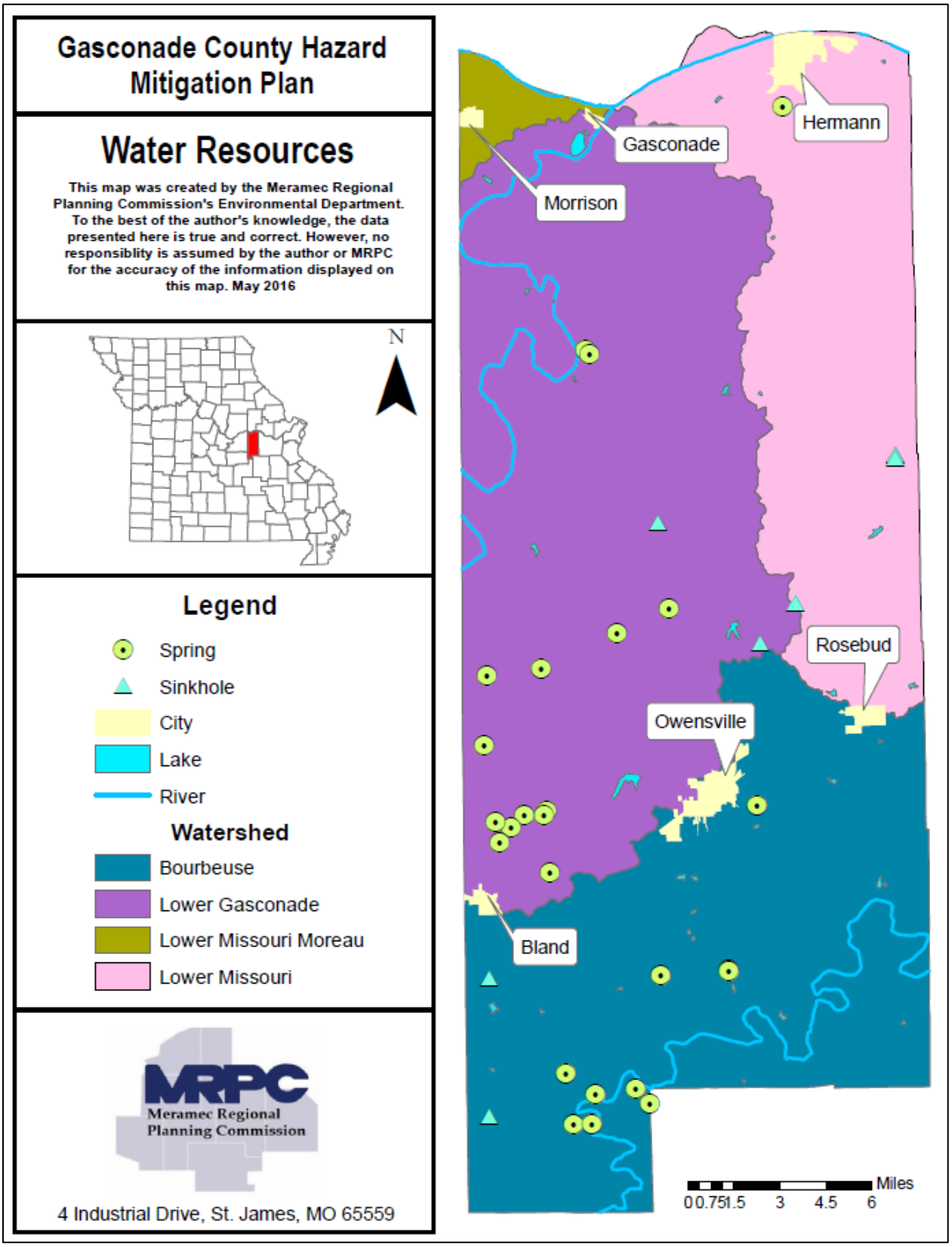
Sinkholes vary in size and location, and these variances will determine the impact of the hazard. A sinkhole could result in the loss of a personal vehicle, a building collapse, or damage to infrastructure such as roads, water, or sewer lines. Groundwater contamination is also possible from a sinkhole.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

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

Previous Occurrences

Although there are few sinkholes and sinkhole areas in Gasconade County, incidents have occurred in other parts of southern Missouri. Fortunately, there are no recorded incidents of death due to sinkholes in the county. Based on **Figure 3.52**, recorded sinkholes are rural in nature and reside within unincorporated parts of the county.

Figure 3.52. Gasconade County Watershed/Water Resources



Probability of Future Occurrence

Due to the lack of data for previous sinkhole events in Gasconade 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[43].

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[44]. 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 Gasconade County

Impact of Future Development

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

Hazard Summary by Jurisdiction

Figure 3.52 illustrates 8 sinkholes in Gasconade County. The jurisdiction most likely to be impacted by sinkholes is unincorporated Gasconade County.

Problem Statement

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

[43] 2013 Missouri State Hazard Mitigation Plan
[44] http://sinkhole.org/commonsigns.php

3.4.8 Levee Failure

Some sources of data for this hazard include:

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

Hazard Profile

Hazard Description

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

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

> **Overtopping: When a Flood Is Too Big**
> Overtopping occurs when floodwaters exceed the height of a levee and flow over its crown. As the water passes over the top, it may erode the levee, worsening the flooding and potentially causing an opening, or breach, in the levee.
>
> **Breaching: When a Levee Gives Way**
> A levee breach occurs when part of a levee gives way, creating an opening through which floodwaters may pass. A breach may occur gradually or suddenly. The most dangerous breaches happen quickly during periods of high water. The resulting torrent can quickly swamp a large area behind the failed levee with little or no warning.

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

Geographic Location

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

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

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

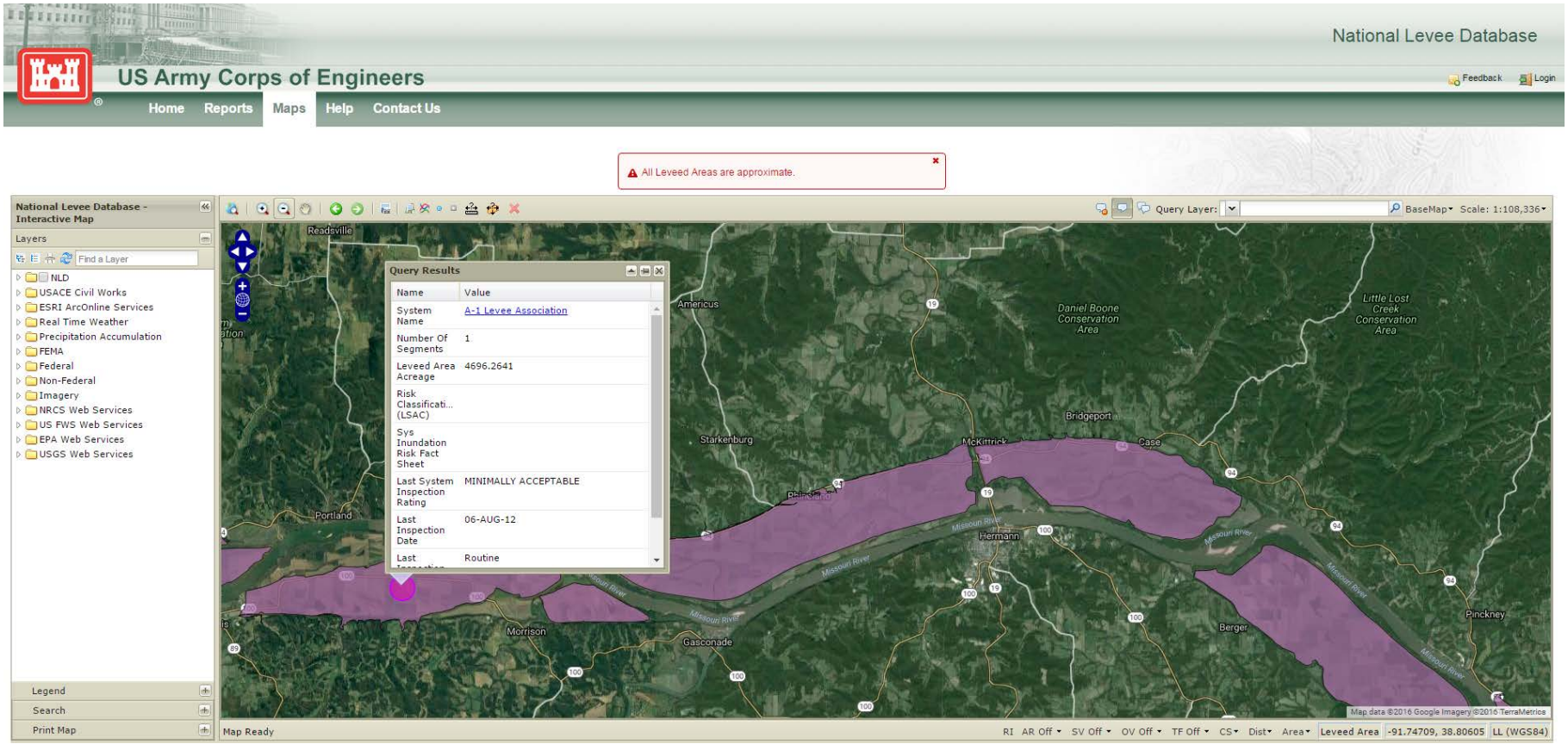
According to the USACE, there are four USACE maintained levees within Gasconade County. Detailed levee data can be found in **Table 3.59**. Leveed areas can be seen in **Figure 3.53** to **Figure 3.56.** According to the maps, there are no schools or special district assets located in said protected areas.

Table 3.60. Gasconade County Levees

County	System Name/Sponsor	Length (miles)	Inspection Date	Inspection Rating	Leveed Area Type	Leveed Area Acreage
Gasconade	Diermann Levee District	2.75	27-Feb-14	Minimally Acceptable	Agricultural	173.73
Gasconade	A-1 Levee Association	11.83	6-Aug-12	Minimally Acceptable	Agricultural	4,969.26
Gasconade	Tri-County Levee District, Sec 1	12.13	6-Aug-14	Acceptable	Agricultural	7,690.05
Gasconade	Morrison Lower Bottom Levee District	3.67	9-Aug-12	Minimally Acceptable	Agricultural	950.63

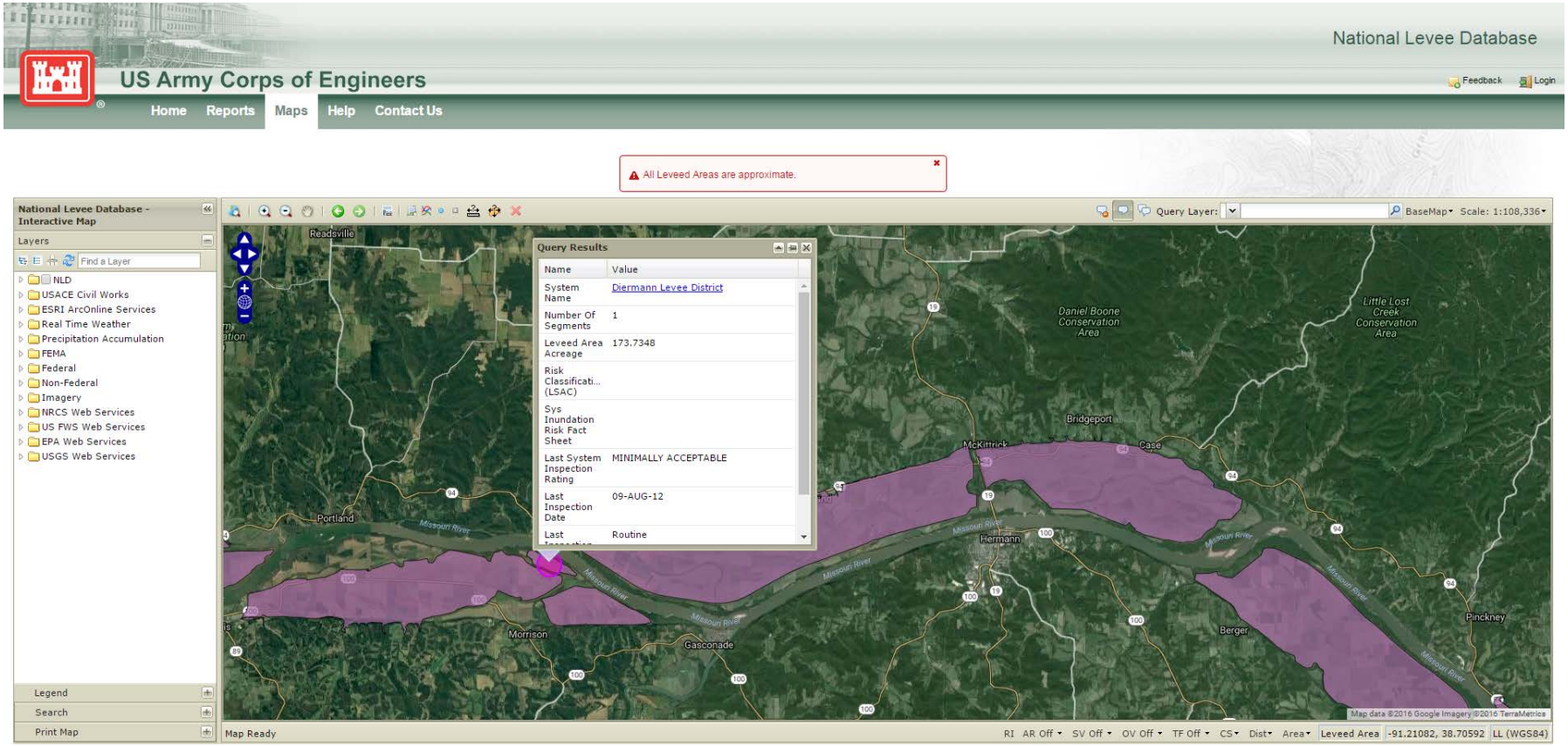
Source: http://nld.usace.army.mil/egis/f?p=471:1:

Figure 3.53. A-1 Levee Association



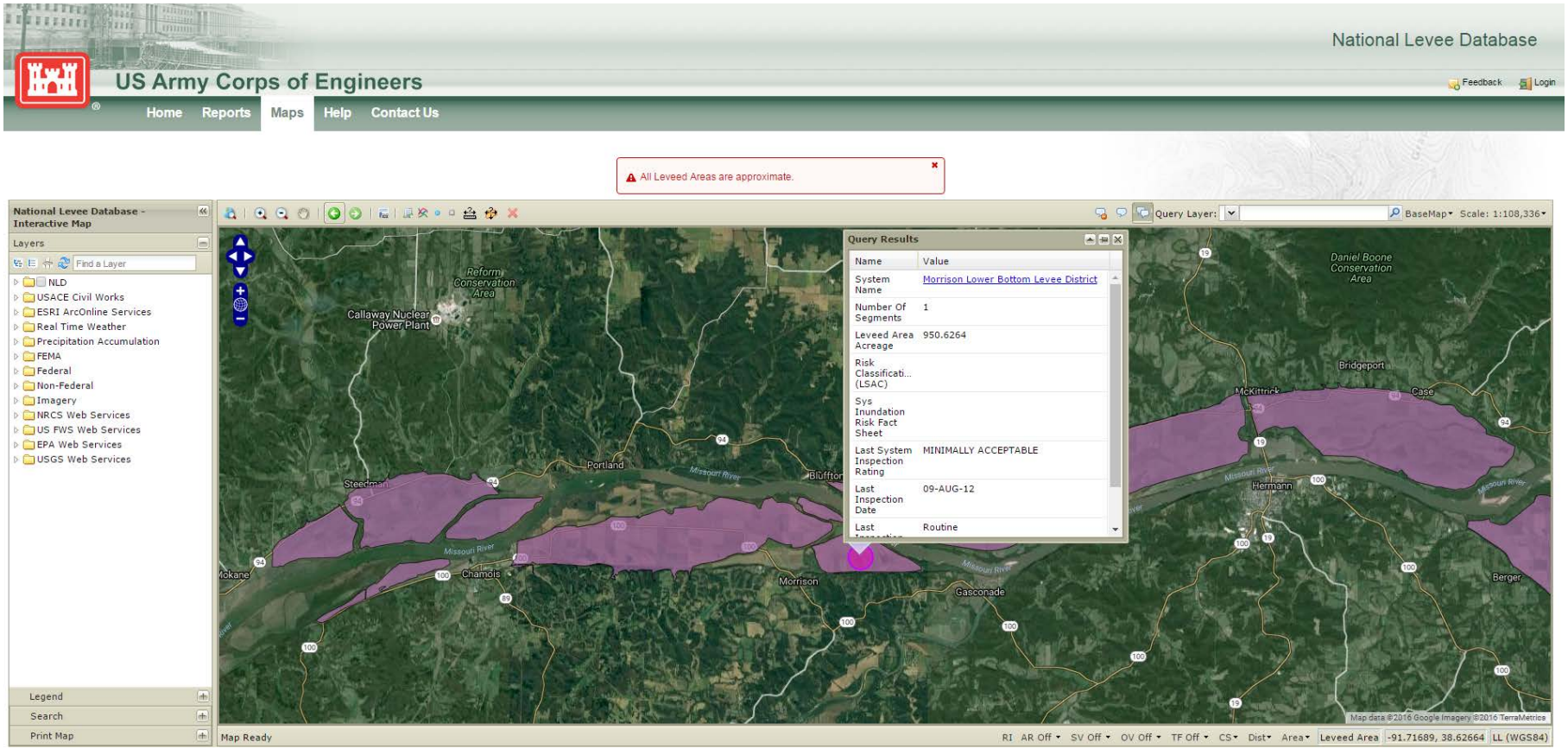
Source: http://nld.usace.army.mil/egis/f?p=471:69:0::NO::P69_SUBMITTED:1

Figure 3.54. Diermann Levee District



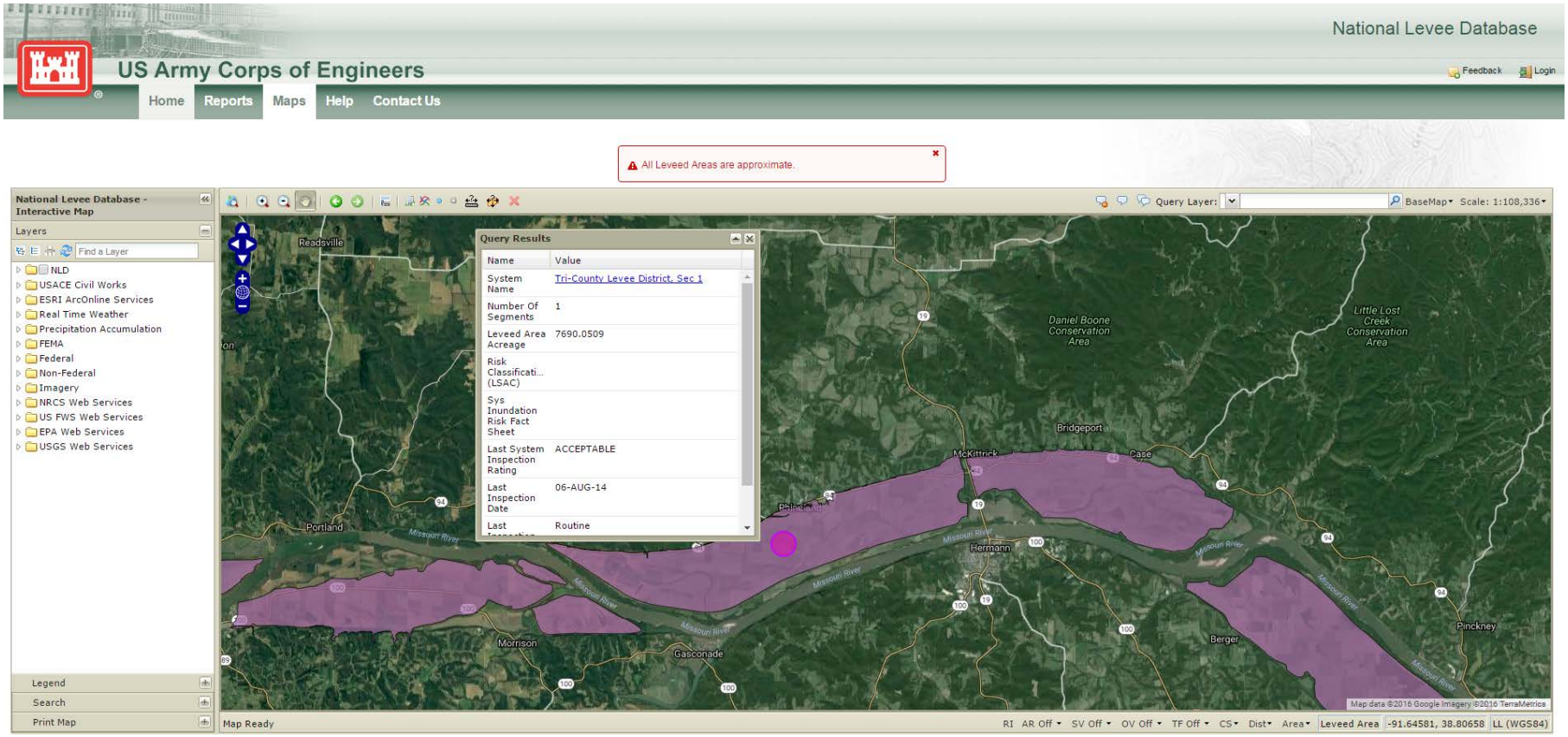
Source: http://nld.usace.army.mil/egis/f?p=471:69:0::NO::P69_SUBMITTED:1

Figure 3.55. Morrison Lower Bottom Levee District



Source: http://nld.usace.army.mil/egis/f?p=471:69:0::NO::P69_SUBMITTED:1

Figure 3.56. Tri-County Levee District, Sec 1



Source: http://nld.usace.army.mil/egis/f?p=471:69:0::NO::P69_SUBMITTED:1

Severity/Magnitude/Extent

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

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

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

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

Both Routine and Periodic Inspections result in a rating for operation and maintenance. Each levee segment receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or Unacceptable. **Figure 3.57** below defines the three ratings.

Figure 3.57. Definitions of the Three Levee System Ratings

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

According to the USACE, one levee received an inspection rating of acceptable (Tri-County Levee District), and the other three levees received an inspection rating of minimally acceptable.

Previous Occurrences

According to local officials, a 250 foot breech occurred in a privately owned levee near the City of Gasconade; 18 homes and the city park were damaged due to the flood water. Unfortunately, due to data limitations, additional information was not available for the planning area.

Probability of Future Occurrence

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

Table 3.61. Annual Average % Probability of Levee Failure in Gasconade County

Location	Annual Avg. % P
Gasconade County	5%

*P = probability; see page 3.24 for definition.

Vulnerability

Vulnerability Overview

Areas most vulnerable to levee failure are identified in **Figures 3.53** to **3.56.** These areas are in close proximity to the cities of Morrison, Gasconade, and Hermann. However, the protected leveed areas are classified as “agricultural” land. Therefore special districts and assets should not be present. Nonetheless, multiple privately owned levees exist within the county. Unfortunately these levees tend to be neglected until a failure occurs.

Potential Losses to Existing Development

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

Impact of Previous and Future Development

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

Hazard Summary by Jurisdiction

Communities in close proximately to USACE leveed areas include Morrison, Gasconade, and Hermann. However, the leveed areas are considered agricultural. Privately owned levees are present; however a maintained inventory does not exist.

Problem Statement

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

3.4.9 Thunderstorm/High Winds/Lightning/Hail

Some Specific Sources for this hazard are:

- FEMA 320, Taking Shelter from the Storm, 3rd edition, http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf Lightning Map, National Weather Service, http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf National Weather Service, http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf
- Death and injury statistics from lightning strikes, National Weather Service.
- Wind Zones in the U.S. map, FEMA, http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm;
- Annual Windstorm Probability (65+knots) map U.S. 1980-1994, NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif
- Hailstorm intensity scale, The Tornado and Storm Research Organization (TORRO), http://www.torro.org.uk/site/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

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.

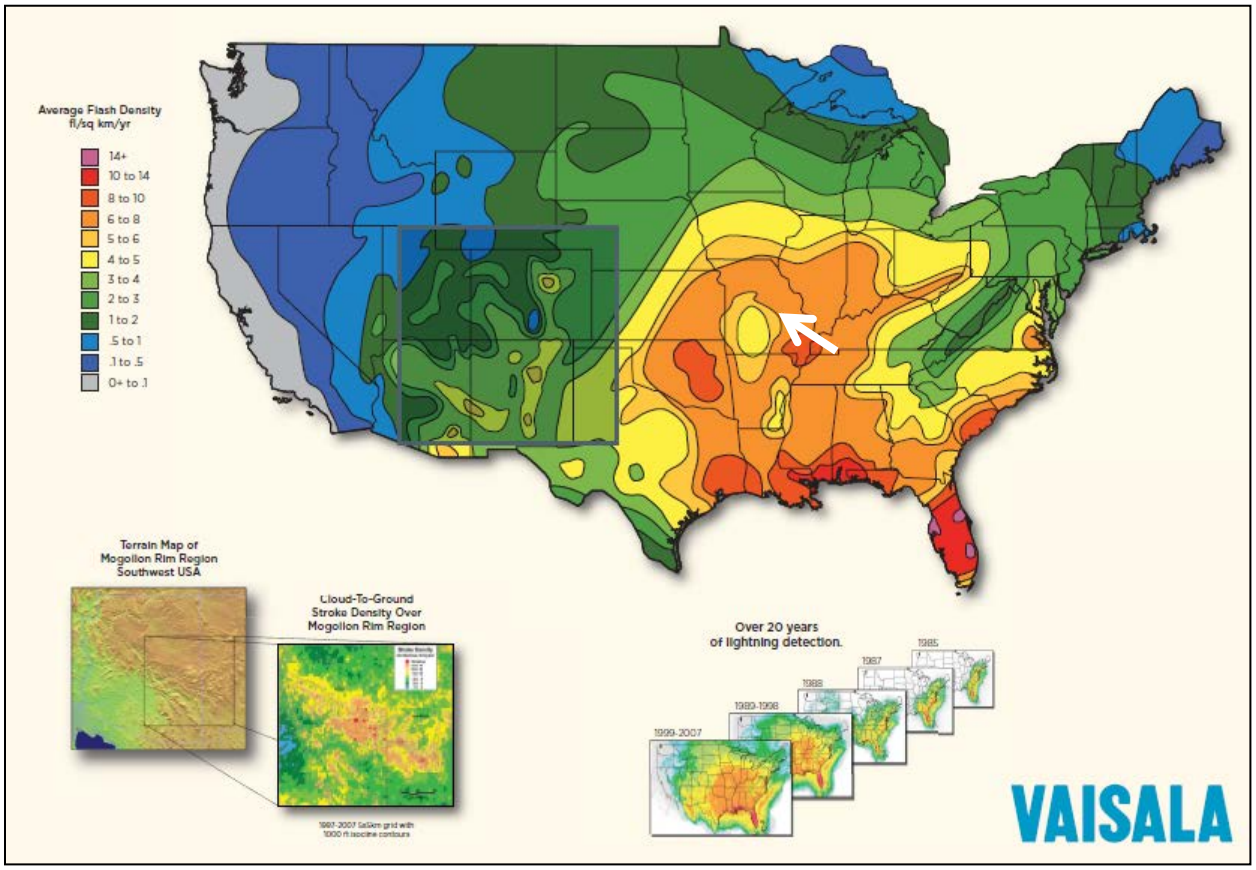
At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 miles per hour, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest 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 Gasconade County ranges between 6 and 8 flashes per square kilometer per year.

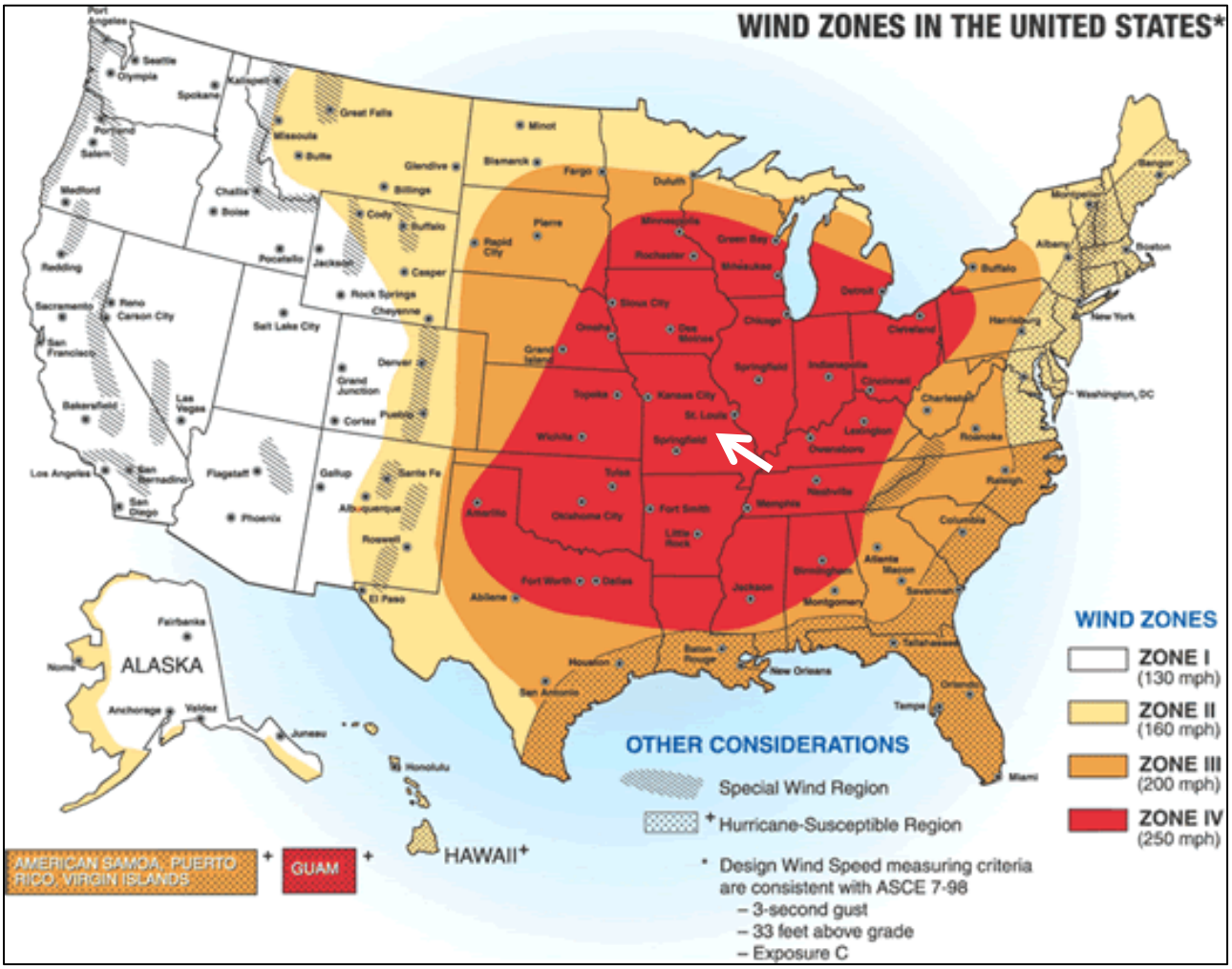
Figure 3.58. Location and Frequency of Lightning in Missouri



Source: National Weather Service, http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf.
* Gasconade 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
* Gasconade County is indicated by a white arrow.

Severity/Magnitude/Extent

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

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

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

Based on information provided by the Tornado and Storm Research Organization (TORRO), **Table 3.62** below describes typical damage impacts of the various sizes of hail.

Table 3.62. Tornado and Storm Research Organization Hailstorm Intensity Scale

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

Source: Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University
Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity. http://www.torro.org.uk/site/hscale.php

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

Between 1996 and 2015, there were 0 recorded crop insurance claims for Thunderstorms, lightning, high wind, and hail in Gasconade 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 3.63**. Moreover, thunderstorm wind was included with high winds. NCDC data was obtained for lightning, and hail events between 1996 and 2015 as well (**Table 3.64**, **Table 3.65**, and **Table 3.66).** 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 3.63. NCDC Gasconade County Heavy Rain Events Summary, 1996 to 2015

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Rainfall (Inch)
2003	1	0	0	0	2-5
2005	1	0	0	0	3-6
2008	1	0	0	0	2-4
Total	**3**	**0**	**0**	**0**	**-**

Source: NCDC, data accessed [11/14/2016]

Table 3.64. NCDC Gasconade County High Wind Events Summary, 1996 to 2015

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
1998	7	0	0	0	61
1999	3	0	0	0	60
2000	5	0	0	0	62
2001	4	0	0	0	55
2002	4	0	0	10.00K	55
2003	2	0	0	20.00K	61
2004	3	0	0	0	55
2005	3	0	0	0	61
2006	2	0	0	0	60
2007	3	0	0	0	52
2008	3	0	0	0	56
2009	1	0	0	0	52
2010	7	0	0	5.00K	52
2011	4	0	0	0	70
2012	3	0	2	0	78
2013	1	0	0	0	56
2014	3	0	0	0	56
2015	2	0	0	0	56
Total	**60**	**0**	**2**	**35.00K**	**-**

Source: NCDC, data accessed [11/14/2016]

Table 3.65. NCDC Gasconade County Lightning Events Summary, 1996 to 2015

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damage
2008	1	0	0	$125.00K	0
Total	**1**	**0**	**0**	**$125.00K**	**0**

Source: NCDC, data accessed [11/14/2016]

Table 3.66. NCDC Gasconade County Hail Events Summary, 1996 to 2015

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
1996	1	0	0	0	.75
1997	1	0	0	1.000M	2.00
1998	2	0	0	0	1.75
2000	2	0	0	0	1.00
2001	3	0	0	0	1.25

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
2002	2	0	0	0	1.75
2003	4	0	0	0	1.75
2004	4	0	0	0	2.75
2005	3	0	0	0	1.00
2006	6	0	0	0	1.00
2007	2	0	0	0	.88
2008	2	0	0	0	.75
2009	2	0	0	0	1.75
2010	1	0	0	0	1.00
2011	11	0	0	0	2.75
2012	9	0	0	0	2.00
2013	2	0	0	0	1.75
2014	1	0	0	0	.75
2015	1	0	0	0	2.75
Total	**59**	**0**	**0**	**1.000M**	**-**

Source: NCDC, data accessed [11/14/2016]

Probability of Future Occurrence

From the data obtained from the NCDC[45], annual average percent probabilities were calculated for heavy rainfall, high winds, lightning, and hail. Heavy rainfall has a 15 percent annual average percent probability of occurrence (3 events/20 years x 100) (**Table 3.67**). Heavy rainfall events can be found in **Table 3.63**.

Since multiple high wind occurrences are anticipated each year (60 events/20 years), the probability of high winds is 100% with an average of 3 events per year (**Table 3.68).** High wind events can be found in **Table 3.64.**

In Gasconade County, 1 lightning event (**Table 3.65**) in 20 years was recorded. The annual average percent probability is 5% (1 event/20 years x 100) (**Table 3.69**).

Lastly, the annual average percent probability of hail occurrence is 100% (59 events/20 years) with an average of 2.95 events per year (**Table 3.70**). Hail events can be found in **Table 3.66**.

Table 3.67. Annual Average % Probability of Heavy Rain in Gasconade County

Location	Annual Avg. % P
Gasconade County	15%

*P = probability; see page 3.24 for definition.

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

Table 3.68. Annual Average % Probability of High Winds in Gasconade County

Location	Annual Avg. % P	Avg. # of Events
Gasconade County	100%	3

*P = probability; see page 3.24 for definition.

Table 3.69. Annual Average % Probability of Lightning in Gasconade County

Location	Annual Avg. % P
Gasconade County	5%

*P = probability; see page 3.24 for definition.

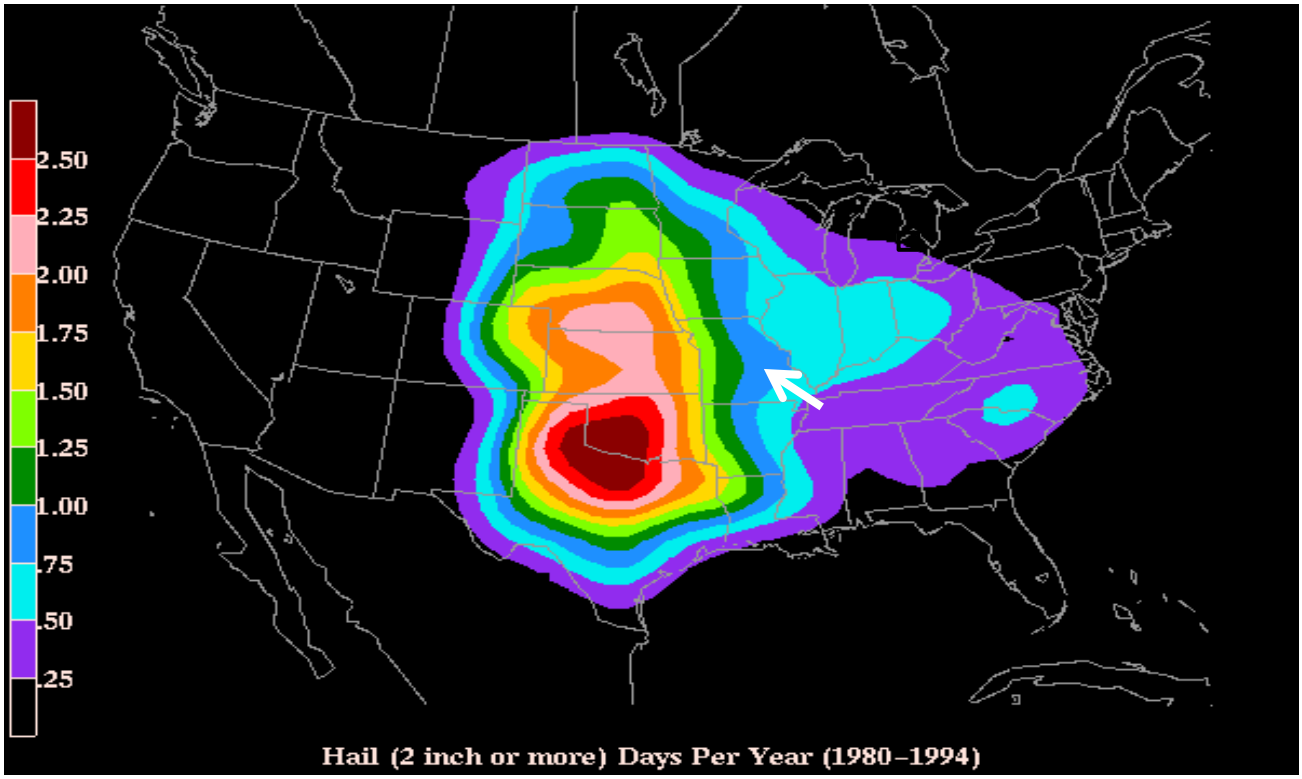
Table 3.70. Annual Average % Probability of Hail in Gasconade County

Location	Annual Avg. % P	Avg. # of Events
Gasconade County	100%	2.95

*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 Gasconade County is identified with a white arrow.

Figure 3.60. Annual Hailstorm Probability (2'' diameter or larger), 1980- 1994



Source: NSSL,http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif
* White arrow indicates Gasconade 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 3.71** illustrates housing density, building exposure, and crop exposure for Gasconade County. Moreover, **Table 3.72** provides additional statistical data for the vulnerability analysis.

Table 3.71. Gasconade County Housing Density, Building Exposure and Crop Exposure

County	Housing Units/sq. mi.	Total Building Exposure ($)	Crop Exposure (2007 Census of Ag.)	Social Vulnerability Index
Gasconade	15.8	$1,699,937,000	$8,075,000	3

Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.72. 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 ($)	Total Lightning Incidences	Total Lightning Property Loss ($)
Gasconade	92	$1,000,000	$0	67	$1,191,600	$0	2	$125,800

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 3.73**).

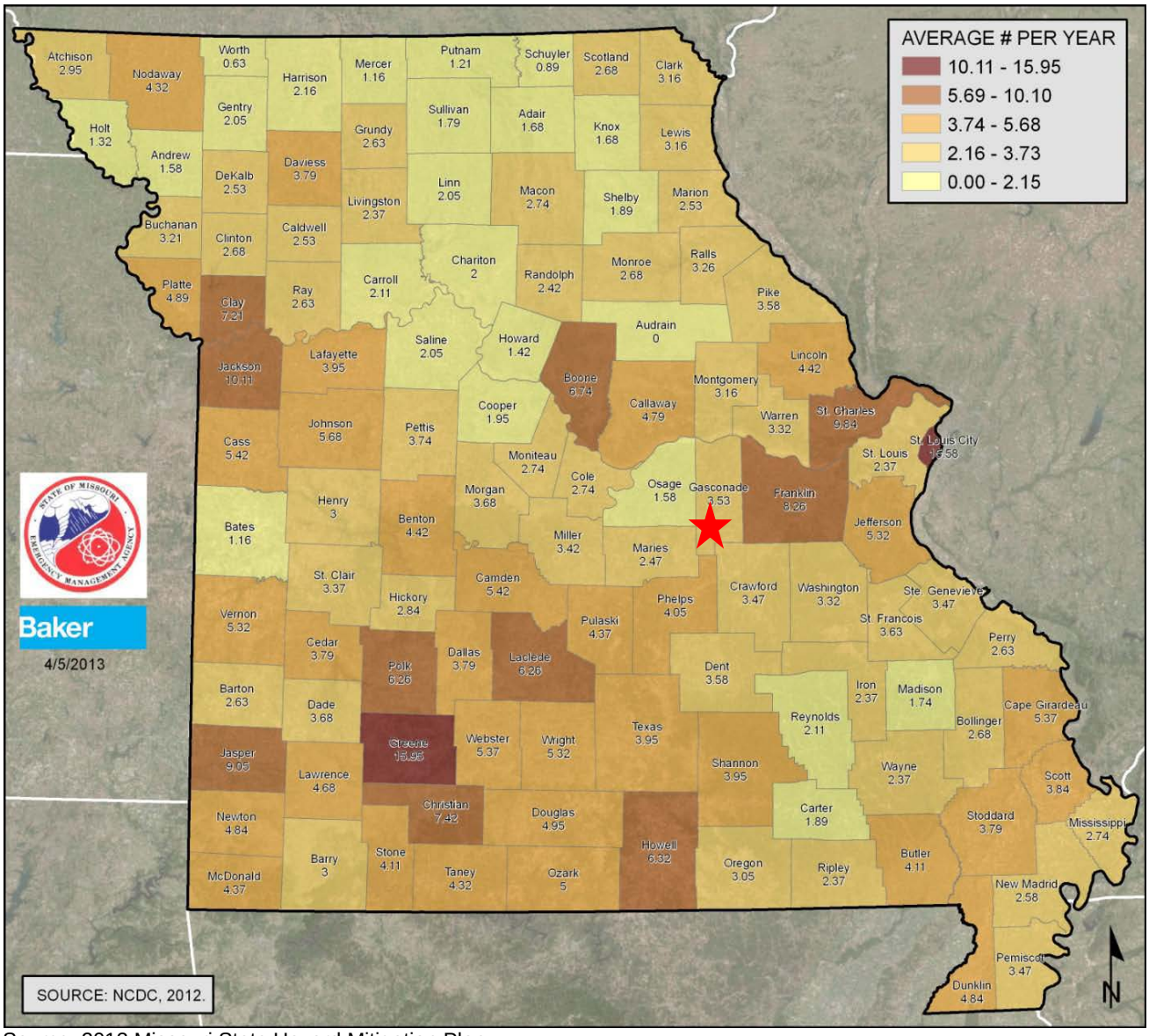
Table 3.73. Ranges for Severe Thunderstorm Vulnerability Factor Ratings

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

Source: 2013 Missouri State Hazard Mitigation Plan

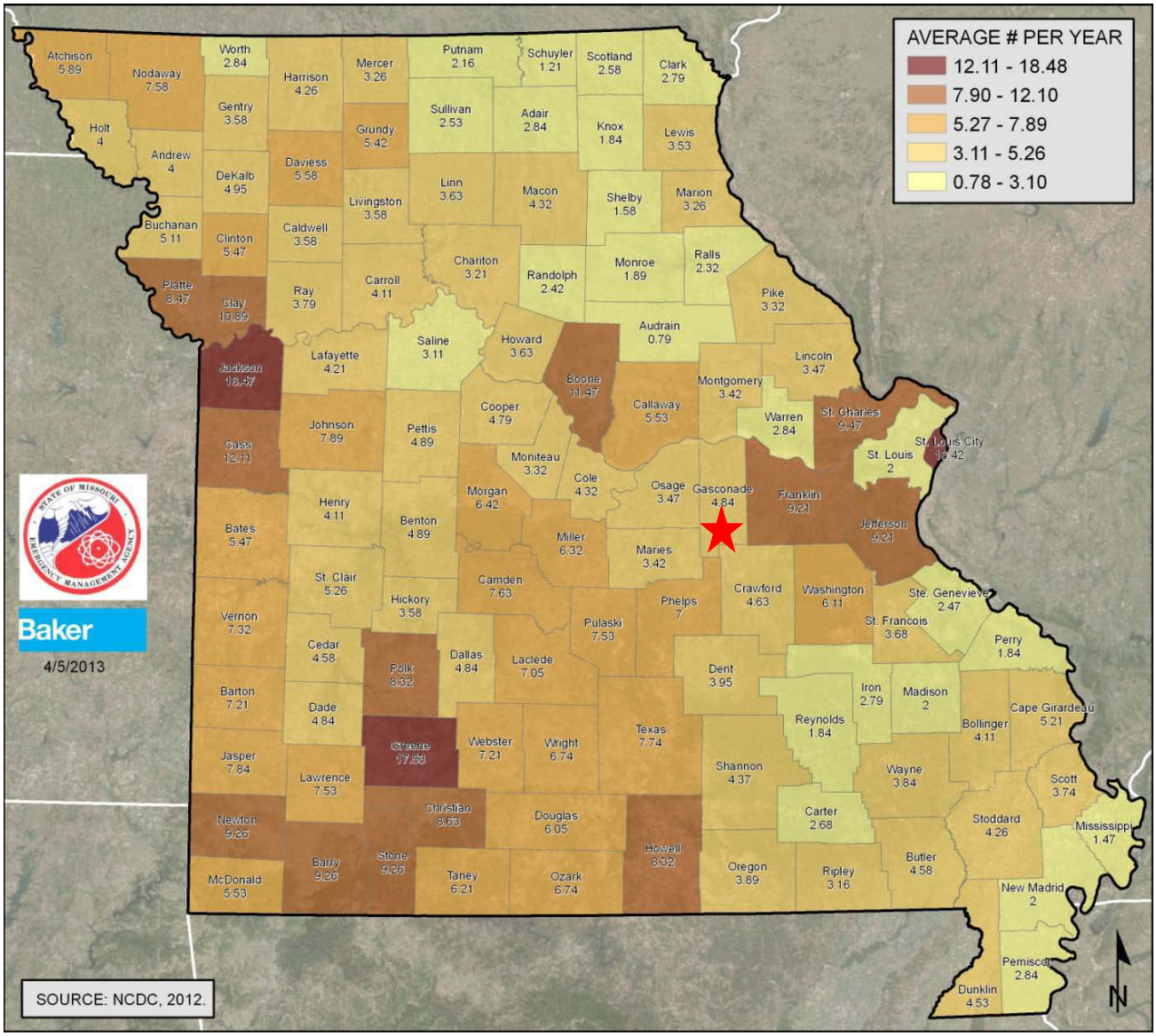
Figure 3.61 through **Figure 3.63** depicts the likelihood of occurrence of high winds, hail, and lightning events in Missouri.

Figure 3.61. Likelihood of Occurrence of High Wind Events (67 MPH and higher)



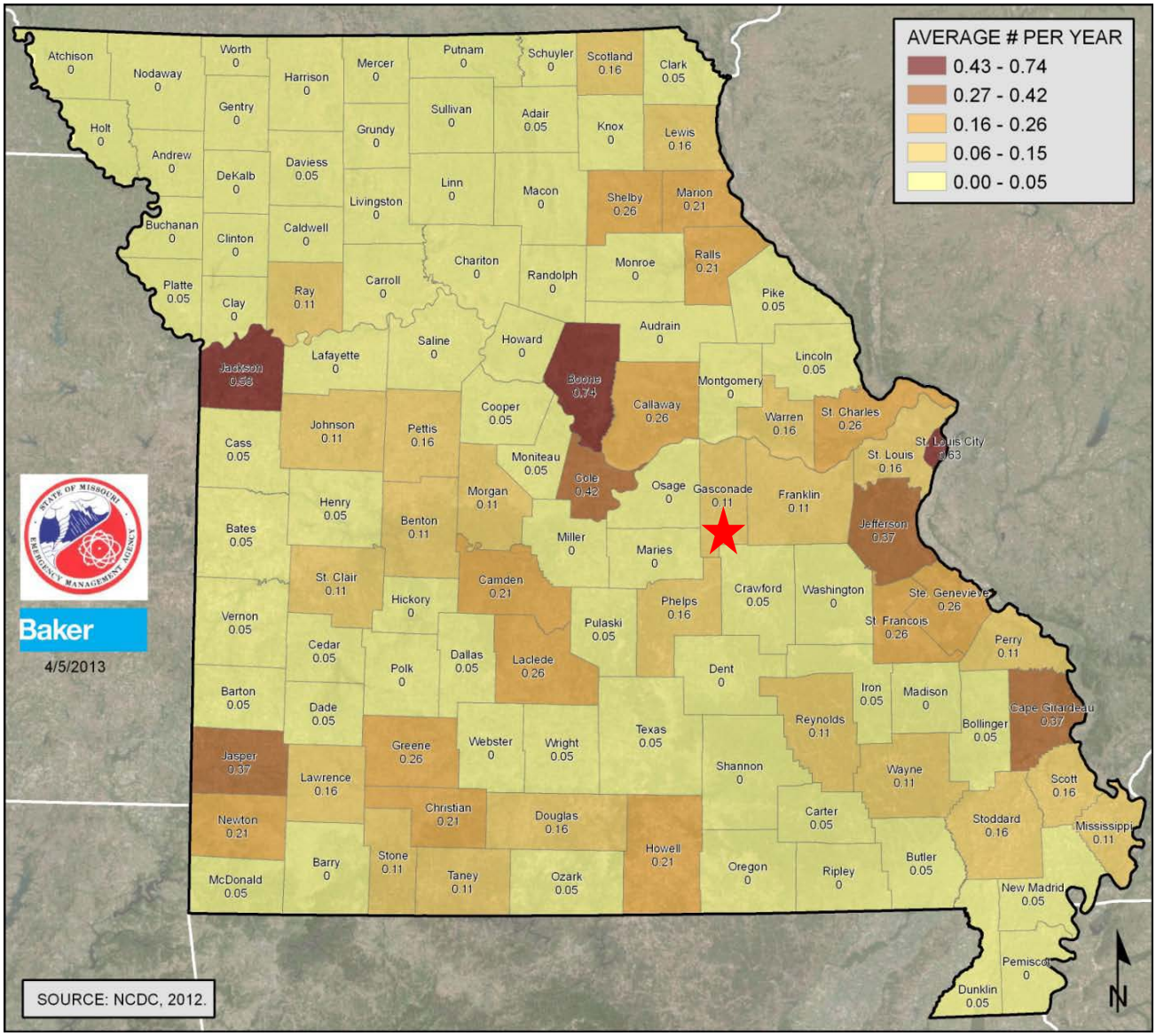
Source: 2013 Missouri State Hazard Mitigation Plan
*Red star indicates Gasconade County

Figure 3.62. Likelihood of Occurrence of Damaging Hail Events (.75 inches and larger)



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

Figure 3.63. Likelihood of Occurrence of Damaging Lightning Events



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

After ranges were applied to all factors in the analysis for wind, hail, and lightning, they were weighted equally and factored together to determine an overall vulnerability rating. Following, a combined vulnerability rating was calculated. The following data provides the calculated rages applied to determine overall vulnerability of Missouri counties to severe thunderstorms (**Table 3.74**). **Table 3.75** provides the calculated vulnerability rating for the severe thunderstorm hazard. **Figure 3.64** that follows provides the mapped results of this analysis by county[46].

[46] 2013 Missouri State Hazard Mitigation Plan

Table 3.74. 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

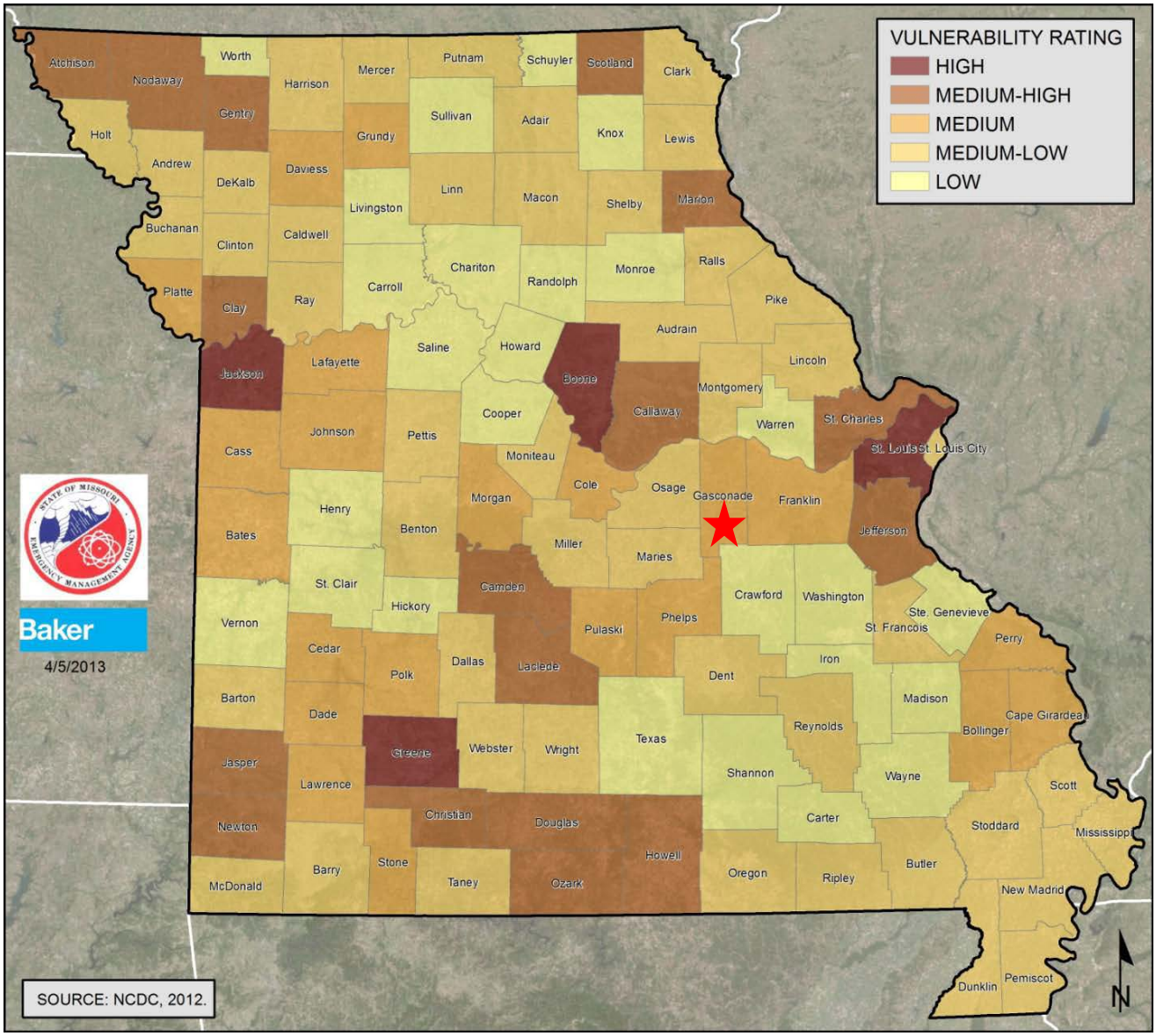
Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.75. 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
Gasconade	1	2	2	1	2	1	1	2	3	15	Medium

Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.64. Vulnerability Summary for Severe Thunderstorms



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

Potential Losses to Existing Development

According to the NCDC Gasconade County experienced approximately $1,160,000 in property damages from severe thunderstorms between 1996 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[47].

[47] 2015 Boone County Hazard Mitigation Plan

Future Development

As previously mentioned, the population within Gasconade County is expected to increase by approximately 907 within the next 4 to 14 years. However, it is difficult to determine future impacts. However, anticipated development in each jurisdiction will result in increased exposure (**Page 3.23**). Likewise, increased development of residential structures will increase jurisdiction's vulnerability to damages from severe thunderstorms/ high winds/lightning/hail.

Hazard Summary by Jurisdiction

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

Problem Statement

Early warnings are possibly the best hope for residents when severe weather strikes. Cities that do not already possess warning systems should plan to purchase a system. Additional public awareness also includes coverage by local media sources. Storm shelters are another important means of mitigating the effects of severe thunderstorms. A community-wide shelter program should be adopted for residents who may not have adequate shelter in their homes. Residents should also be encouraged to build their own storm shelters to prepare for emergencies. Local governments should encourage residents to purchase weather radios to ensure that everyone has sufficient access to information in times of severe weather.

3.4.10 Tornado

Some specific sources for this hazard are:

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

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 3.4.9,** Thunderstorm/High Wind/Hail/Lightning.

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

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

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

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

Geographic Location

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

Severity/Magnitude/Extent

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

Tornado magnitude is classified according to the EF- Scale (or the Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (**Table 3.76**) attempts to rank tornadoes according to wind speed based on the damage caused. This update to the original F Scale was implemented in the U.S. on February 1, 2007.

Table 3.76. Enhanced F Scale for Tornado Damage

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

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

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.77**. The damage descriptions are summaries. For the actual EF scale it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator.

Table 3.77. Enhanced Fujita Scale with Potential Damage

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

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

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

Previous Occurrences

Table 3.78 illustrates NCDC data reported for tornado events and damages from 1996 to 2015 in the planning area. Prior to that 1993, only highly destructive tornadoes were recorded.

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

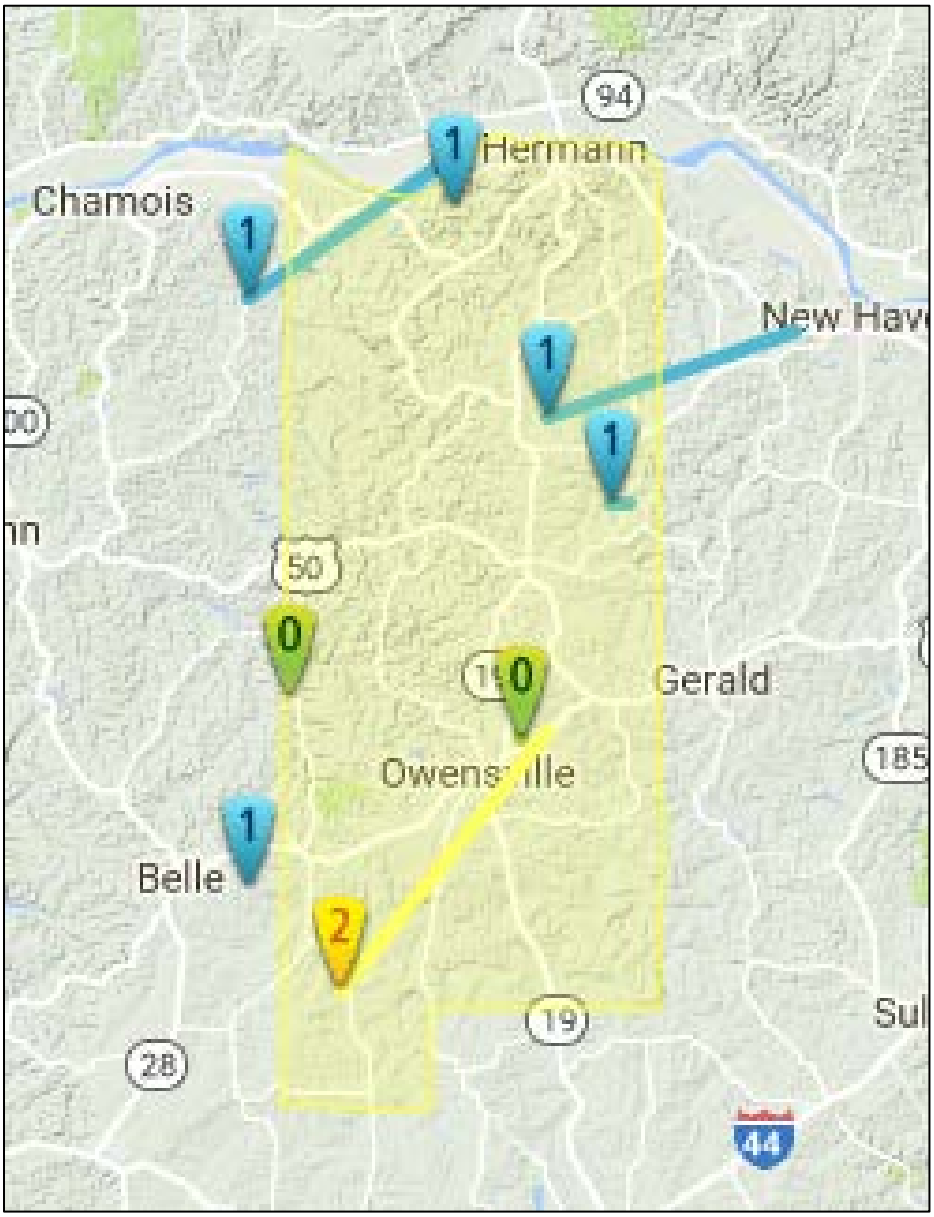
Table 3.78. Recorded Tornadoes in Gasconade County, 1996 – 2015

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
1/07/2008	3W Woollam	3WNW Woollam	.28	50	EF0	0	0	0	0
2/27/2011	3SW Stony Hill	2SSW Stony Hill	.74	175	EF1	0	0	0	0
6/07/2014	2NE Owensville	2NE Owensville	.05	20	EF0	0	0	0	0
-	-	Total	1.07	245	-	0	0	0	0

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

Figure 3.65 depicts historic tornado paths across Gasconade County.

Figure 3.65. Gasconade County Map of Historic Tornado Paths



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

According to the USDA Risk Management Agency's record, there were no insurance payments in Gasconade County for crop damages as a result of tornadoes between 1996 and 2015.

Probability of Future Occurrence

From the data obtained from the NCDC[48], an annual average percent probability was calculated for tornadoes within Gasconade County (**Table 3.79).** There is a 15 percent annual average probability of a tornado occurrence (3 events/20 years x 100). Tornado events can be found in **Table 3.78**. In addition, **Figure 3.66,** obtained from the 2013 Missouri State Hazard Mitigation Plan, also illustrates tornado probabilities across the State.

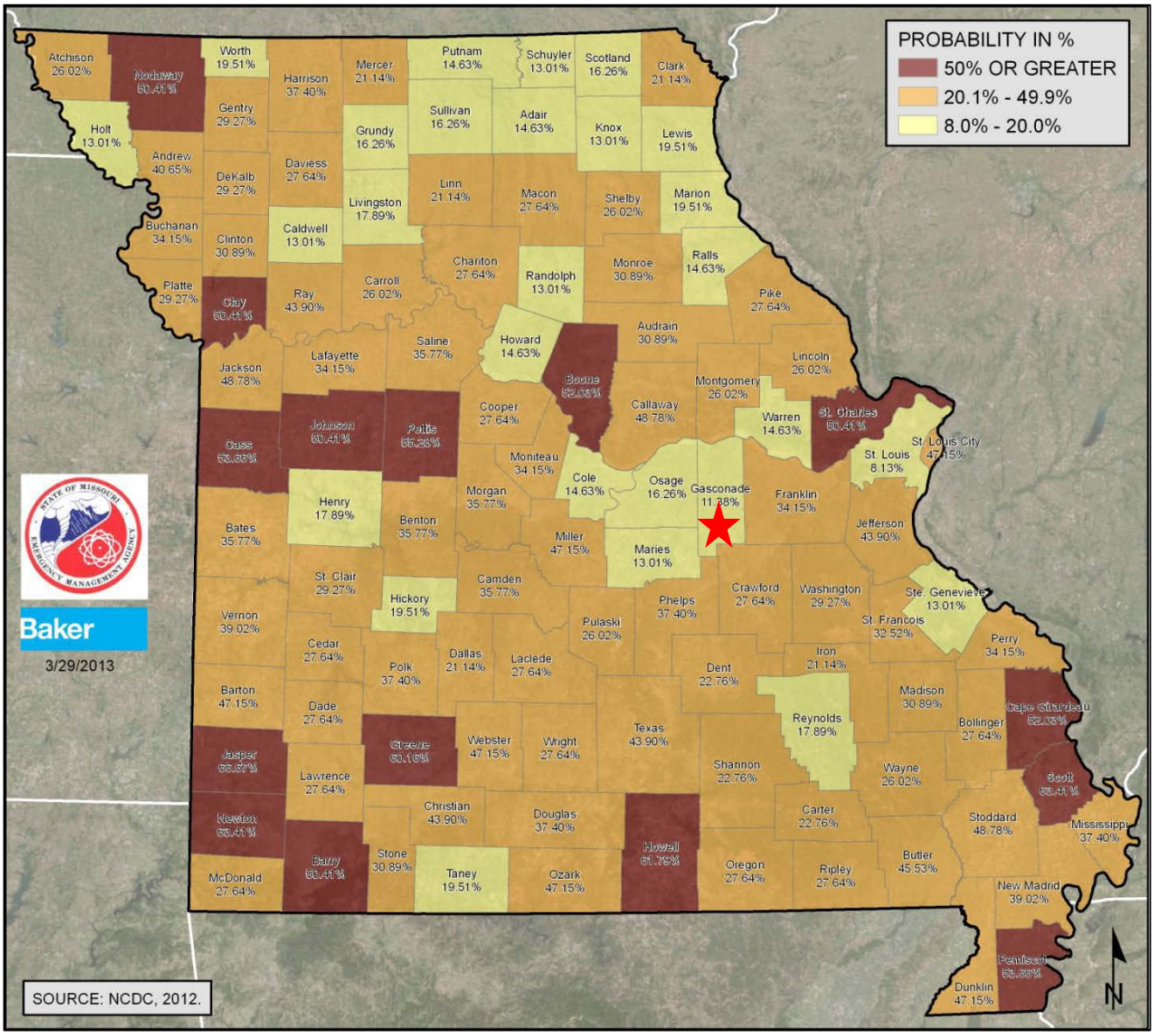
[48] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI

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

Location	Annual Avg. % P
Gasconade County	15%

*P = probability; see page 3.24 for definition.

Figure 3.66. Missouri Tornado Probability



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

Vulnerability

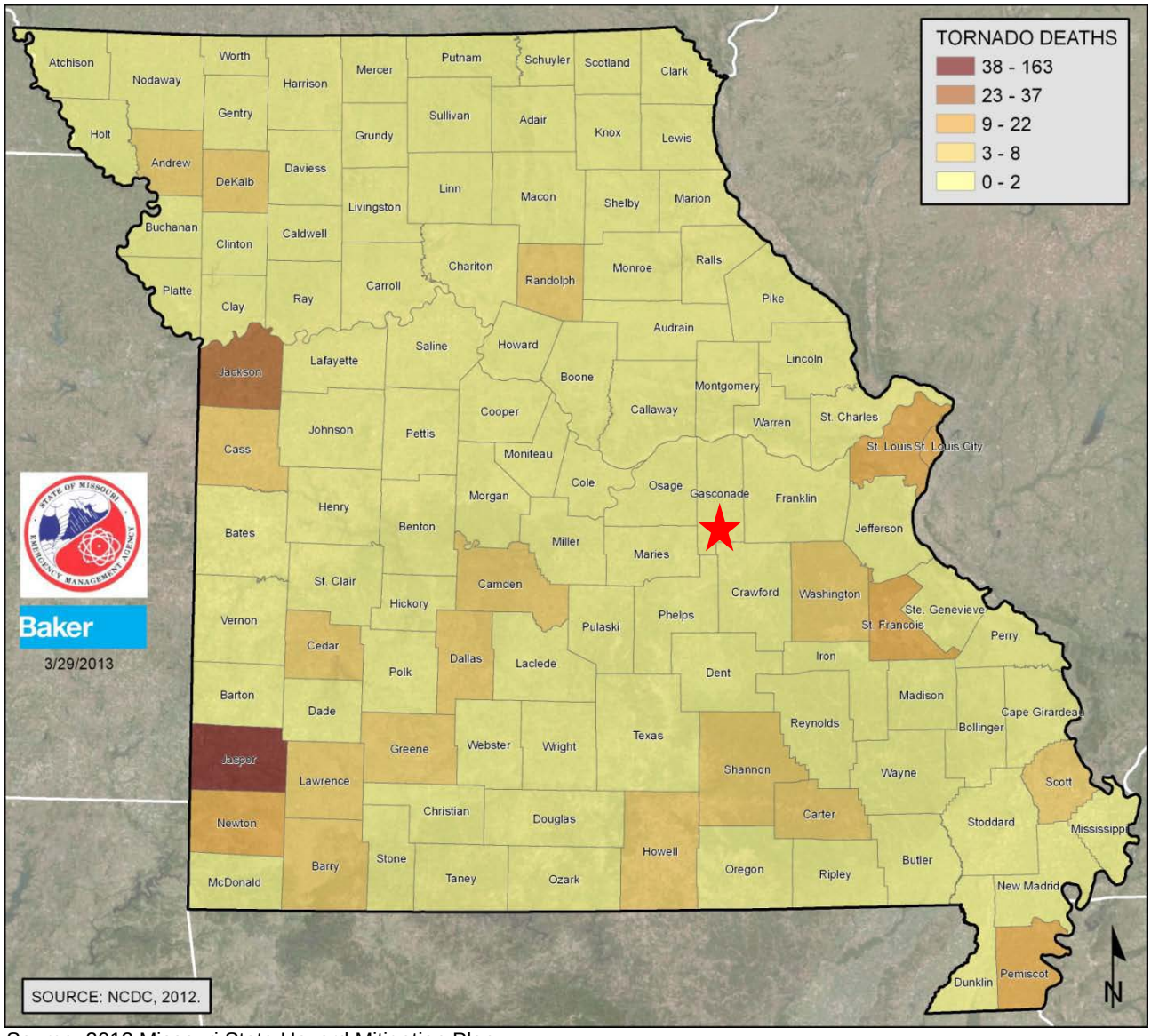
Vulnerability Overview

Gasconade 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
*Red star indicates Gasconade County

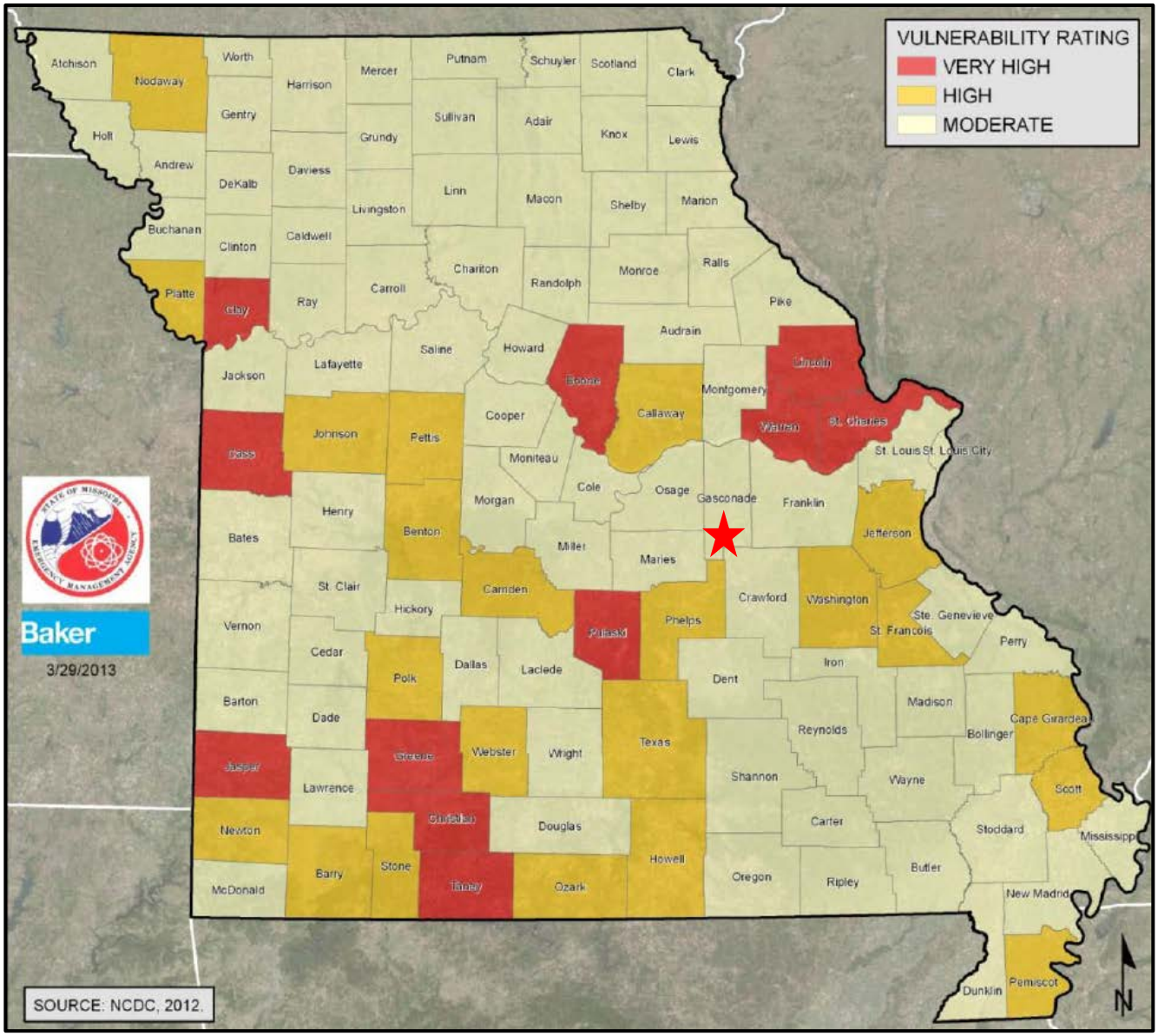
Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for tornado vulnerability. The analysis depicts the likelihood of future tornado impacts, average annual property loss ratio, population change, and house change. Factors were ranked from 1 to 3; moderate, high, and very high, respectively. The factor scores are totaled to estimate Gasconade County's vulnerability to tornadoes (**Table 3.80**). 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 3.80. 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
*Red star indicates Gasconade County

Table 3.81 provides information in regards to tornado probability, potential loss, and risk summary for Gasconade County. This table was calculated to determine 10 counties with the largest annualized historic tornado losses between 1950 and July 31, 2012 (**Table 3.82** and **Figure 3.70**).

Table 3.81. 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
Gasconade	7	11.38 %	1	$1,699,937,000	$1,132,245	0.067 %	1	-0.8 %	1	1.28 %	1	Moderate

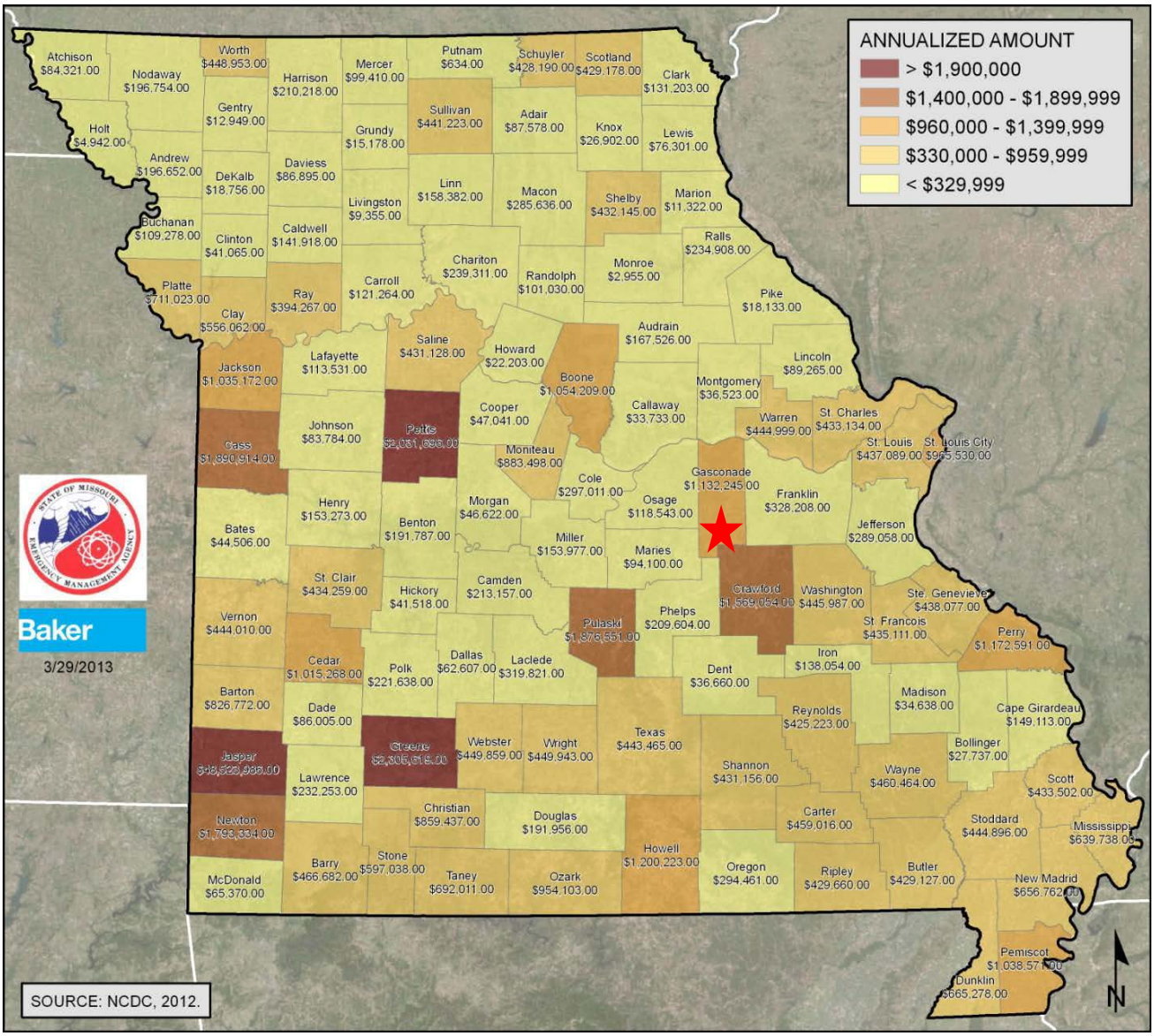
Source: 2013 Missouri State Hazard Mitigation Plan

Table 3.82. 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

Figure 3.70. Annualized Tornado Damages



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

Potential Losses to Existing Development

The annualized damage for Gasconade County due to tornadoes is $1,132,245 (previous 60 years[49]). With this information we can estimate that each year there will be approximately $18,870.75 in loss to existing development. Additionally, the largest recorded tornado in the planning area has been an EF-2. Utilizing this information we can infer that there is potential for another tornado of equivalence.

Future Development

[49] 2013 Missouri State Hazard Mitigation Plan

As populations and development increases across the county, the vulnerability will increase as well. In order to protect jurisdictions from increased tornado vulnerabilities future analysis, training, and implementation should be considered at the planning, engineering, and architectural design stages.

Hazard Summary by Jurisdiction

As previously stated, a tornado event could occur anywhere in the planning area. However, some jurisdictions would suffer heavier damages because of the age of housing or high concentration of mobile homes. See **Table 3.35** for jurisdictions most vulnerable to damage due to the age of the structure. Furthermore, data was obtained from the U.S. Census Bureau for the number of mobile homes in Gasconade County. From the information provided in **Table 3.83,** Rosebud, Unincorporated Gasconade County, and Gasconade are most vulnerable to losses due to the number of mobile homes residing within the jurisdiction.

Table 3.83. Percentage of Mobile Homes in Gasconade County, 2014

Jurisdiction	Number of Mobile Homes	Percentage of Mobile Homes*
Unincorporated Gasconade County	965	11.8%
Bland	29	10.4%
Gasconade	19	11.0%
Hermann	40	3.1%
Morrison	3	4.1%
Owensville	85	7.1%
Rosebud	40	21.4%
Incorporated Gasconade County	1,181	14.5%

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 = 8,165

Problem Statement

Early warnings are possibly the best hope for residents when severe weather strikes. While more than two hours warning is not possible for tornados, citizens must immediately be aware when a city will be facing a severe weather incident. Jurisdictions that do not already possess warning systems should plan to purchase a system. Storm shelters are another important means of mitigating the effects of tornados. Additional public awareness also includes coverage by local media sources. A community-wide shelter program should be adopted for residents who may not have adequate shelter in their homes. Residents should also be encouraged to build their own storm shelters to prepare for emergencies. Local governments should encourage residents to purchase weather radios to ensure that everyone has sufficient access to information in times of severe weather.

3.4.11 Winter Weather/Snow/Ice/Severe Cold

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

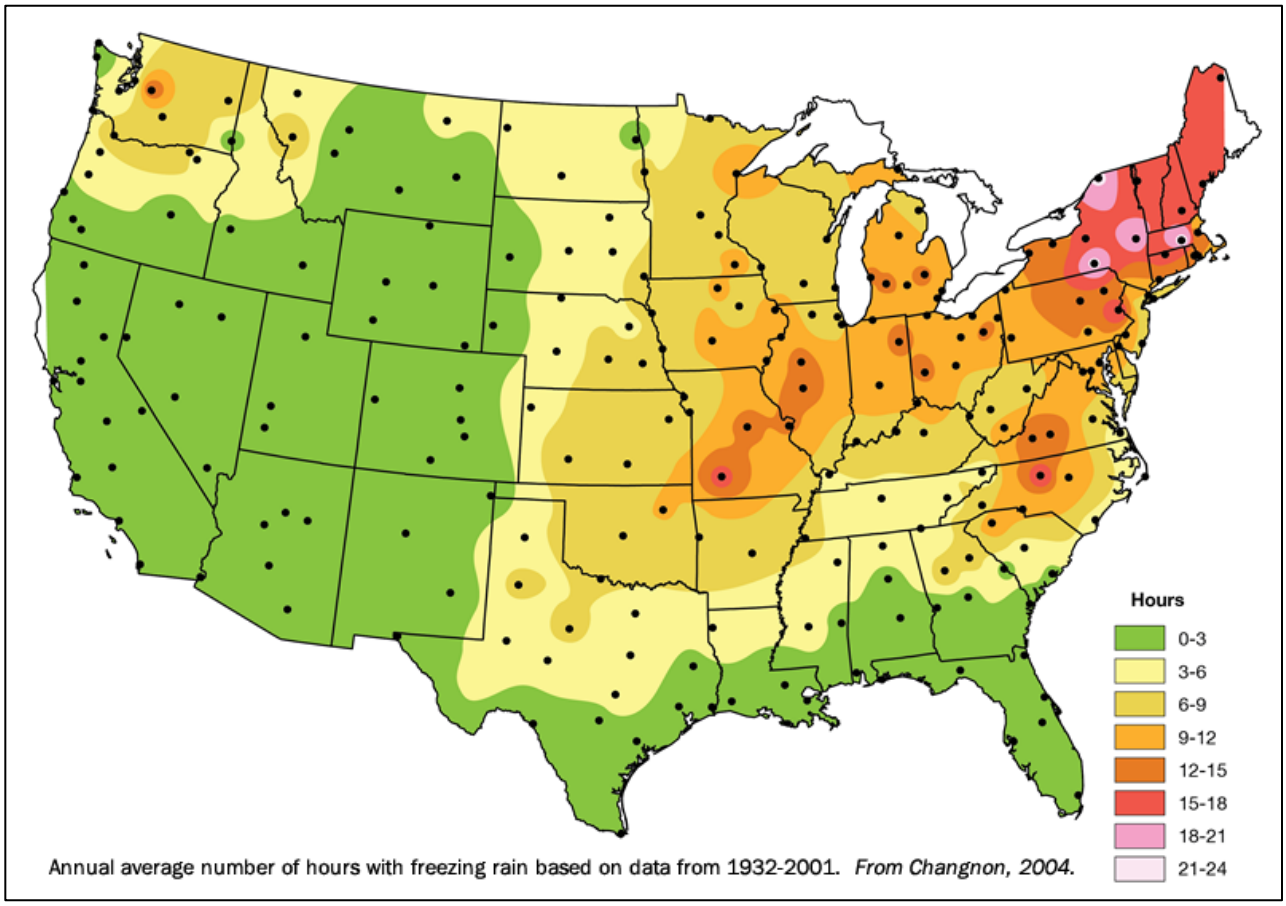
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows.

- **Blizzard**—Winds of 35 miles per hour or more with snow and blowing snow reducing visibility to less than ¼ mile for at least three hours.
- **Blowing Snow**—Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls**—Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- **Snow Showers**—Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- **Freezing Rain**—Measurable rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces, such as trees, cars, and roads, forming a coating or glaze of ice. Most freezing-rain events are short lived and occur near sunrise between the months of December and March.
- **Sleet**—Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects.

Geographic Location

Severe winter weather typically strikes Missouri more than once every year. Gasconade 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. Gasconade 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. Gasconade County receives approximately 9 to 12 hours.

Figure 3.71. NWS Statewide Average Number of Hours per Year with Freezing Rain



Source: Changon, 2004, http://mrcc.isws.illinois.edu/living_wx/icestorms/

Severity/Magnitude/Extent

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

Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower a building's heating system and cause water and sewer pipes to freeze and rupture. Extreme cold also increases the likelihood for ice jams on flat rivers or streams. When combined with high winds from winter storms, extreme cold becomes extreme wind chill, which is hazardous to health and safety.

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

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

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

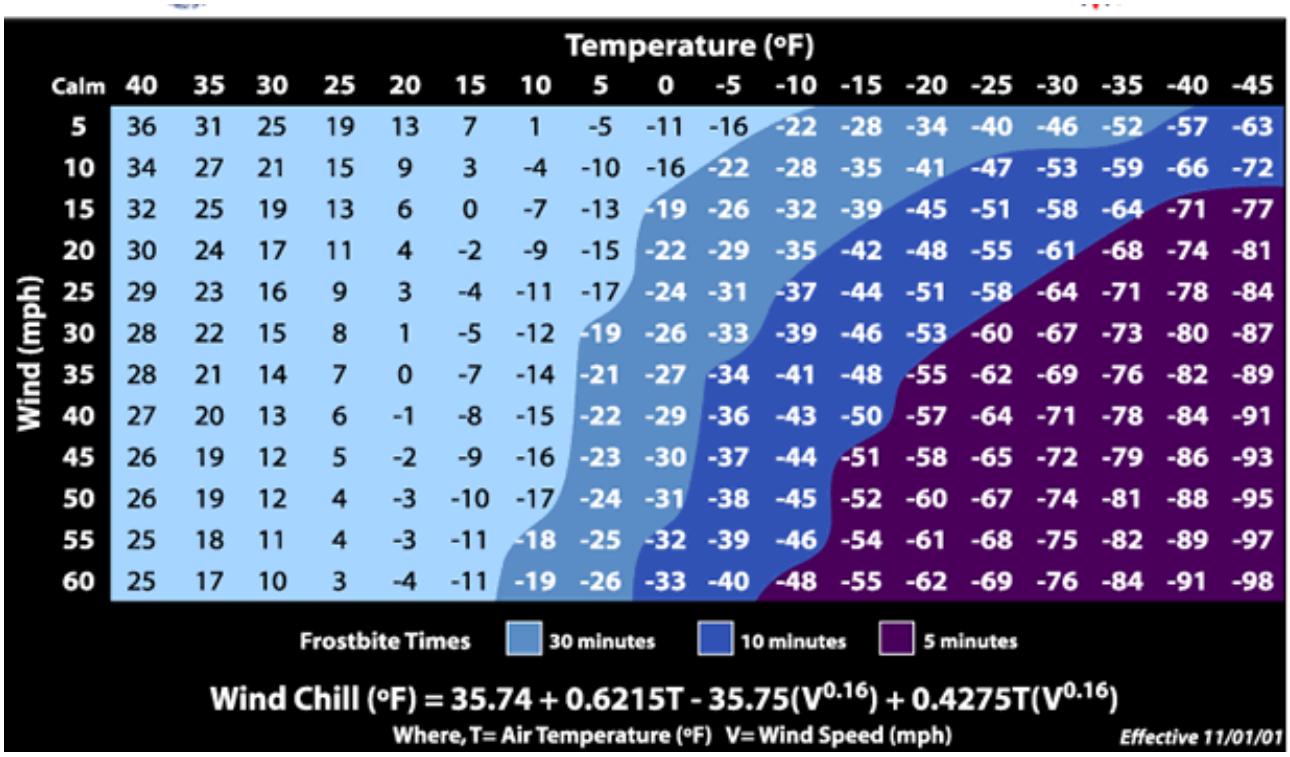
Overhead power lines and infrastructure are also vulnerable to damages from winter storms. In particular, ice accumulation during winter storms can damage power lines and equipment. Damages also occur to lines and equipment from falling trees and tree limbs weighted down by ice. Potential losses could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

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

Wind can greatly amplify the impact of cold ambient air temperatures. Provided by the National Weather Service, **Figure 3.72** 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 Gasconade County between 1996 and 2015 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 between 1996 and 2015 **(Table 3.84**). 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 3.84. NCDC County A Winter Weather Events Summary, 1996 - 2015

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Winter Storm	1/2/1996	0	0	0
Ice Storm	11/25/1996	0	0	0
Winter Storm	1/8/1997	0	0	0
Winter Storm	1/15/1997	0	0	0
Winter Storm	1/27/1997	0	0	0
Winter Storm	4/10/1997	0	0	0
Winter Storm	12/8/1997	0	0	0
Winter Storm	1/12/1998	0	0	0
Winter Storm	3/8/1998	0	0	0
Winter Storm	12/21/1998	0	0	0
Winter Storm	1/1/1999	0	0	0
Winter Storm	1/27/2000	0	0	0
Winter Storm	3/11/2000	0	0	0
Heavy Snow	12/13/2000	0	0	0
Extreme Cold/Wind	12/16/2000	0	0	0
Winter Storm	2/25/2002	0	0	0

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Winter Storm	3/2/2002	0	0	0
Winter Storm	3/25/2002	0	0	0
Winter Storm	12/4/2002	0	0	0
Winter Storm	12/24/2002	0	0	0
Winter Storm	1/1/2003	0	0	0
Winter Storm	2/23/2003	0	0	0
Winter Storm	12/13/2003	0	0	0
Winter Storm	1/25/2004	0	0	0
Winter Storm	11/24/2004	0	0	0
Winter Storm	12/8/2005	0	0	0
Winter Storm	11/30/2006	0	0	0
Winter Storm	12/1/2006	0	0	0
Ice Storm	1/12/2007	0	137,000	0
Ice Storm	12/8/2007	0	0	0
Winter Weather	2/11/2008	0	0	0
Sleet	2/21/2008	0	0	0
Winter Weather	2/23/2008	0	0	0
Cold/Wind Chill	1/1/2010	0	0	0
Winter Weather	1/6/2010	0	0	0
Heavy Snow	1/19/2011	0	0	0
Winter Storm	1/31/2011	0	0	0
Winter Storm	2/1/2011	0	0	0
Blizzard	2/1/2011	0	0	0
Winter Storm	2/21/2013	0	0	0
Heavy Snow	3/24/2013	0	0	0
Winter Storm	1/5/2014	0	0	0
Winter Storm	1/5/2014	0	0	0
Cold/Wind Chill	1/6/2014	0	0	0
Winter Storm	3/1/2014	0	0	0

Source: NCDC, data accessed [11/15/2016]

Notable Winter Narratives:

1. **1/12/2007:** An arctic boundary settled south of the area on the 12th and 13th of January bringing subfreezing temperatures to the northwestern half of the county warning area. Three rounds of precipitation occurred during this period, with the first being the most destructive of all. Significant tree and limb damage was reported as a result of this storm, together with widespread power outages. More than 100,000 homes and businesses lost power during this storm. About 1.5 inches of sleet fell and a 1/2 inch of ice accumulation hit parts of Central and Northeast Missouri. From 1/4 to 1/2 inch of ice accumulated from freezing rain across Eastern Missouri and parts of Southwest Illinois. Flooding of low lying areas and low water crossings occurred across the eastern Ozarks late Friday night and Saturday morning.

Probability of Future Occurrence

From the data obtained from the NCDC[50], annual average percent probabilities were calculated for winter weather within Gasconade County (**Table 3.85)**. There were 45 recorded events (**Table 3.84**) over a 20 year period. There is 100 percent annual average probability of winter weather occurrence (45 events/20 years x 100)**,** with an average of 2.25 events per year.

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

Table 3.85. Annual Average % Probability of Winter Weather in Gasconade County

Location	Annual Avg. % P	Avg. # of Events
Gasconade County	100%	2.25

*P = probability; see page 3.24 for definition.

Vulnerability

Vulnerability Overview

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for vulnerability information regarding Gasconade 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 3.86**) includes data elements for severe winter weather.

Table 3.86. Gasconade 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 ($)	Total Crop Insurance Paid ($)
Gasconade	15.8	$1,699,937,000	$8,075,000	43	$3,354,358	$8,583

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 3.87** illustrates vulnerability analysis rating factors.

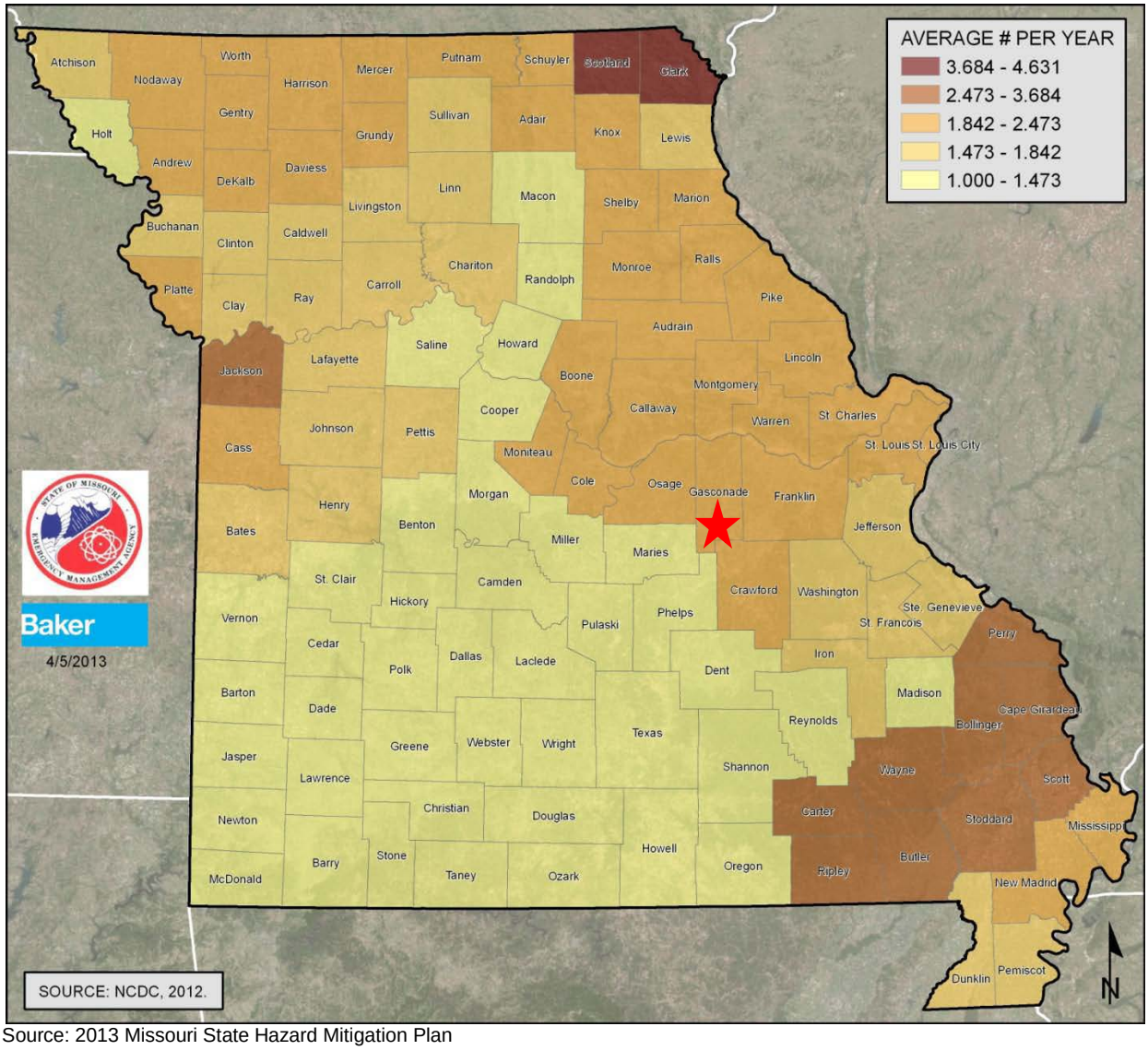
Table 3.87. Vulnerability Analysis Rating Factors

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. Gasconade County was estimated to have an average of 1.842 to 2.473 severe winter weather events per year.

Figure 3.73. Likelihood of Occurrence of Severe Winter Weather



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

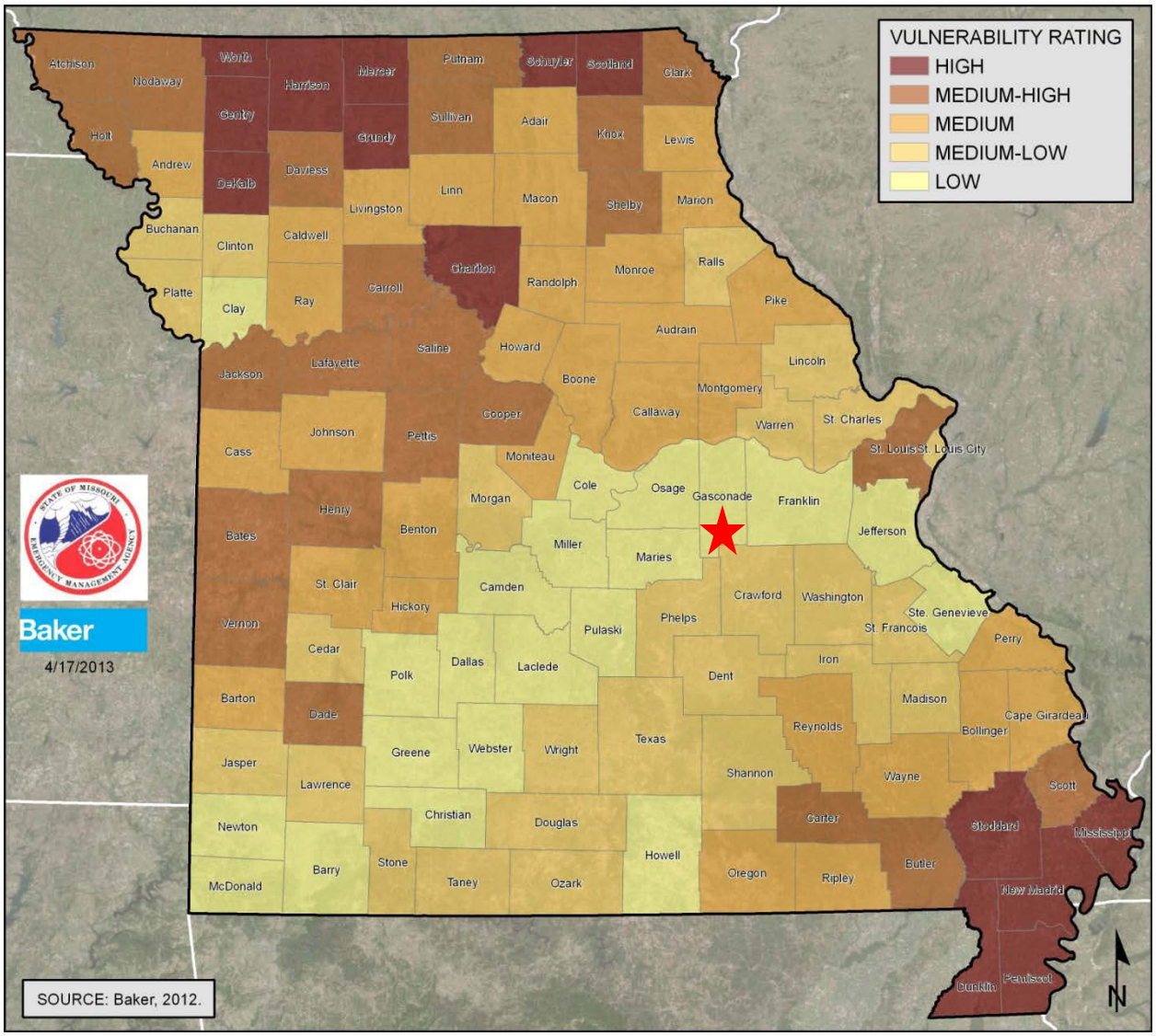
Table 3.88 depicts the calculated vulnerability rating for each factor considered in the vulnerability analysis for severe winter weather hazards. The overall vulnerability rating for severe winter weather in Gasconade County is Low. Moreover, **Figure 3.74** illustrates vulnerability ratings for each county within Missouri.

Table 3.88. Gasconade 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
Gasconade	1	3	1	1	1	3	10	Low

Source: 2013 Missouri State Hazard Mitigation Plan

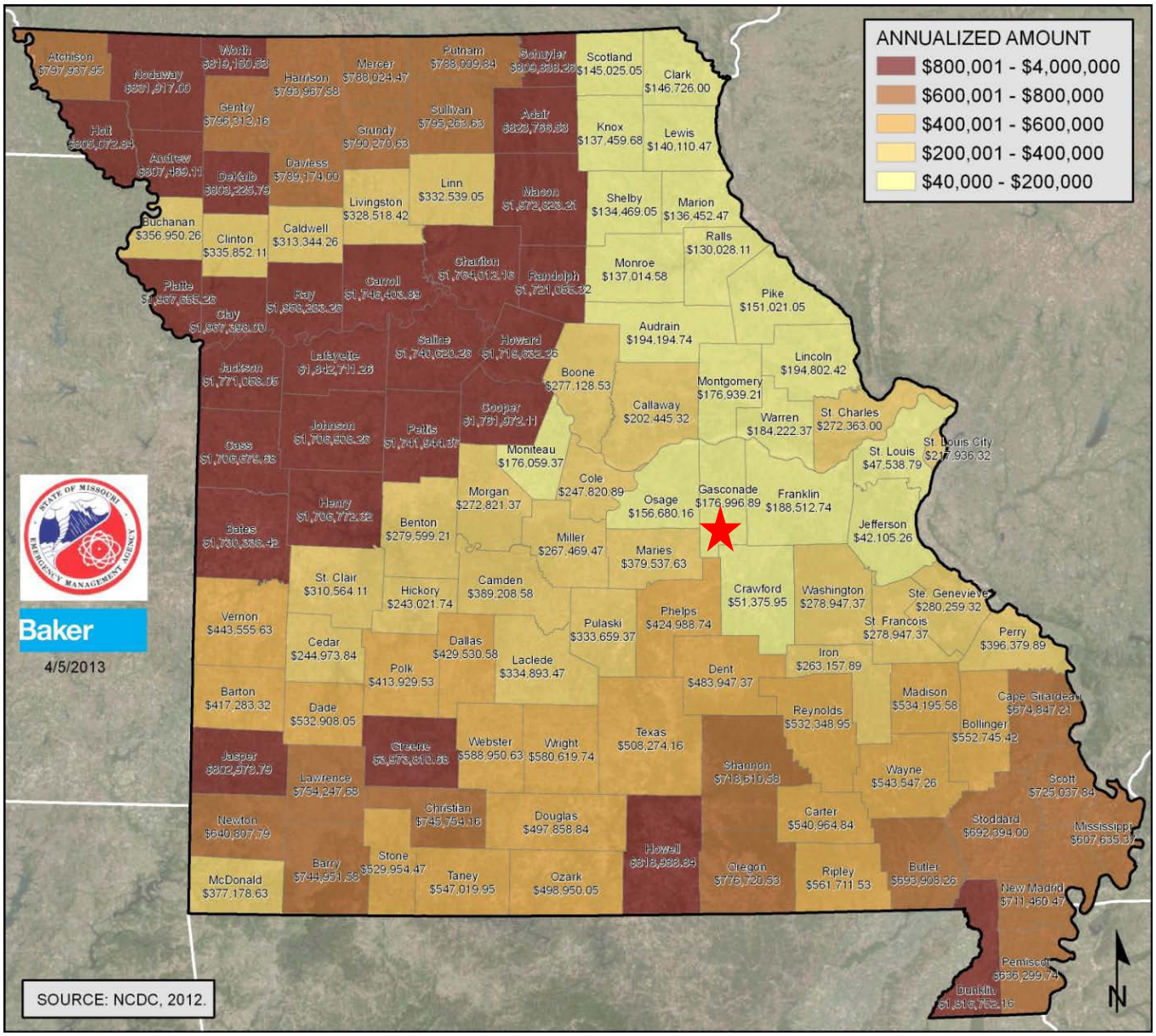
Figure 3.74. Vulnerability Summary for Severe Winter Storm



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

Annualized severe winter weather damages were obtained from the 2013 Missouri State Hazard Mitigation Plan. Gasconade County is estimated as having $40,000 to $200,000 in damages per year due to severe winter weather (**Figure 3.75**).

Figure 3.75. Annualized Severe Winter Weather Damages



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

Potential Losses to Existing Development

The next severe winter storm will most likely close schools and businesses for multiple days, and make roadways hazardous for travel. Heavy ice accumulation may damage electrical infrastructures, causing prolonged power outages for large portions of the region. In addition, freezing temperatures make water lines vulnerable to freeze/thaw. Fallen tree limbs also pose a threat to various structures/infrastructures across the county.

Future Development

Data for future development for the planning area is sparse. However, winter weather will affect the county as a whole. Any future development is at risk to damages and increased exposure. 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. Rosebud, Unincorporated Gasconade County, and Gasconade have the highest abundance of mobile homes, making the area more prone to increase exposure to damage.

Problem Statement

In summary, Gasconade County is expected to experience at least one to two severe winter weather events annually; however the county has a low vulnerability rating. Jurisdictions should enhance their weather monitoring to be better prepared for severe weather hazards. If jurisdictions monitor winter weather, they can dispatch road crews to prepare for the hazard. County and city crews can also trim trees along power lines to minimize the potential for outages due to snow and ice. Citizens should also be educated about the benefits of being proactive to alleviate property damage as well preparing for power outages.

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 Gasconade County's existing hazard mitigation plan originally approved by FEMA in June 2004 and updated and approved by FEMA on March 6, 2012. Therefore, the goals from the updated 2012 Gasconade 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 Gasconade County goals are as follows:

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

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

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

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

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

Goal 6: Secure resources for investment in hazard mitigation.

4.2 Identification and Analysis of Mitigation Actions

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

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

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

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

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

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

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

Based on the status updates, there were zero completed actions, 20 deleted actions, and 33 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)
1.1.4: Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather	The county carried out a distribution of over 800 Alert FM weather radios through a grant in 2013.
1.1.6: Partner with local radio stations to insure that appropriate warning of impending disasters is provided to all residents in the countywide listening area.	The county EMD has partnered with local radio stations to assure that appropriate warning of impending disasters is provided in the countywide listening area.
1.1.8: Continue tree trimming and dead tree removal programs.	The planning group stated that all applicable jurisdictions have aggressive tree trimming programs in place.
1.2.1: Purchase generators in smaller communities for backup power to critical facilities and add more generators in larger communities.	Generators have been purchased directly or with the assistance of Homeland Security funds for the Gasconade County Health Department (1), City of Hermann (2), all nursing homes in the county (6), 911 Center (1), Sheriff's Department (1), Gasconade County (1), and Hermann Area Hospital (1).
2.1.3: Upgrade and maintain levee in Morrison.	This levee is now in good condition. The levee was reinforced in December 2012.
3.1.1: Distribute SEMA brochures at public facilities & events.	The county EMD distributes Ready-in-3 brochures at the local Walmart store and at local events such as fairs and festivals.
3.1.2: Distribute regular press releases on hazards, vulnerable areas, frequency and preparedness.	The county EMD posts information on the county emergency management FaceBook page, as does the county health department on their FaceBook page. SEMA press releases are distributed to local media. Information on how to obtain a weather radio is made available at local retailers and the county fair.
3.1.3: Establish an outreach directory of elderly and special needs residents who may need assistance during disasters.	County 911 maintains a list of vulnerable and special needs residents who may need help during heat waves, evacuations or other disasters. Has been in place since 2014.
3.1.4: Encourage local residents to purchase weather radios thru press releases & brochures.	The county has a program in place to raise awareness about the benefits of owning/utilizing weather radios. The county and all cities also have the Everbridge phone alert system in place – phone, email, text, pager alerts. All landlines are automatically enrolled in the alert system and residents are made aware of the need to enroll if they wish to receive alerts on their cellphones.

Completed Actions	Completion Details (date, amount, funding source)
3.1.5: Ask SEMA mitigation specialists to present info to EMDs, city councils, county commission, and local planning organizations on mitigation planning and implementation and budgeting for mitigation projects.	SEMA area coordinator regularly holds meetings in Gasconade County and provides information on a variety of emergency management topics, including mitigation. Presentations on hazard mitigation have been provided by SEMA mitigation officer through local RPC.
3.1.7: Distribute press releases by cities/county regarding adopted mitigation measures to keep public aware of changes and/or new regulations.	The County EMD distributes press releases on activities as well as posting information on the emergency management FaceBook page.
3.1.8: Encourage county health department and local American Red Cross Chapter to use publicity campaigns to make residents aware of proper measures to take during times of threatening conditions.	County Health Department and/or Emergency Management Director provide booths with information at local events and distribute Ready-in-3 materials. Also provide information on Ready-in-3 and impending hazards (heat waves, ice storms, etc.) through both FaceBook pages.
3.1.9: Publicize county-wide or city-wide drills.	All drills are publicized through the EMD's FaceBook page and through local media outlets.
4.1.1: Encourage joint meetings of organizations/agencies for mitigation planning.	A number of joint meetings occur involving Gasconade County: Region F HSOC – quarterly; Region F SEMA area coordinator meetings- quarterly; nuclear power plant multi-county planning meetings and drills.
4.1.2: Establish joint training/drills between agencies, public and private entities (including schools/businesses).	Gasconade County is part of the Ameren nuclear plant planning area so they are involved in multiple drills each year related to the nuclear plant that involve multiple agencies, counties and organizations – public and private. In addition, the schools carry out emergency drills that include local emergency responders.
4.1.3: Pool different agency resources to achieve widespread mitigation results.	Gasconade County is involved in several initiatives that pool agency resources including the nuclear power plant related planning activities of multiple counties; participating in Web EOC with SEMA; Region F homeland security oversight committee.
4.1.4: Establish partnerships to coordinate more shelters with kitchen facilities, generators, beds, first aid supplies, etc.	The county cooperates with Red Cross to do trainings, establish shelters. The health department has a staffer who can provide training on how to dispense medicines and vaccines. The county has a shelter trailer with cots and blankets. Conducted reception and care drills with Ameren. Also removed as this is more of a response action item rather than hazard mitigation.
4.1.5: Encourage meetings between EMD, City/county officials and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects.	Hazard mitigation has been a topic of discussion at SEMA area coordinator meetings as well as presentations at Meramec Regional Planning Commission.
5.1.1: Encourage communities to budget for enhanced warning systems.	The Everbridge alert system is available county-wide and provides alerts via email, pager, text and phone call.
5.1.8: Encourage the designation of public buildings as safe shelters and develop accessibility plans for the public during times of need.	Gasconade County has designated several public buildings as safe shelters including the Owensville Fire House and several of the school districts' buildings.
Deleted Actions	**Reason for Deletion**
1.1.7: Work with cable companies to get warning on local access channels.	The planning group felt that this was out-of-date – that there are better methods of providing warning.

Completed Actions	Completion Details (date, amount, funding source)
2.1.6: Educate the public on self-inspection of homes and businesses.	The planning group ranked this as a low priority and did not want to pursue it further.

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 Gasconade County, except Rosebud, 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
Gasconade County	No Floodplain Ordinance*
Bland	6/10/2008*
Gasconade	12/18/1984*
Hermann	2009*
Morrison	9/18/1986*
Owensville	7/05/2011*
Rosebud	Not participating in the NFIP

Source: Data Collection Questionnaires

* Listed as participating in the NFIP per FEMA's Community Status Book Report[1]; NSFHA (SEMA)

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

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES			1 = Prob NO 0 = Def NO									
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
1.1.1	Implement an education program on personal emergency preparedness that teaches residents how to prepare emergency survival kits with water, blankets, flashlights, etc. and how to shut off their home utilities during emergencies. Ready-in-3 brochures/videos and information will be made readily available to the public through the health department and local government offices.	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 by providing information on business continuity and emergency planning through local chambers of commerce and emergency management offices.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.1.3	Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.	3	2	2	3	3	2	2	17	IC, PD, LF, EMCC	8	-3	5	22	H
1.1.4	Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence, and wildfire upon Gasconade County and all jurisdictions through local, state, and federal agencies	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-2	6	24	H
1.1.5	Examine potential road and bridge upgrades that would improve drainage, reduce flooding and the risk to residents and property.	3	3	3	3	3	3	2	20	IC, PD, LF, EMCC	8	-3	5	25	H
1.1.6	Educate school staff on natural hazards and make sure all staff are familiar with school emergency plans including evacuation and safety procedures.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.1.7	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	Regularly review school facilities and re-evaluate designated safe areas to insure that these areas are the safest locations to shelter students and staff.	3	2	2	3	3	3	3	19	IC, LF, EMCC	6	-1	5	24	H
1.2.1	Disseminate information on the importance of and funding sources for constructing storm shelters, especially tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.	3	3	2	3	3	2	3	19	IC, EMCC	4	-2	2	21	H
2.1.1	Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.	3	2	2	3	3	3	2	18	IC, PD, LF, EMCC	8	-2	6	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
2.1.2	Promote development of emergency plans by businesses and public entities by providing information on business continuity and emergency planning through local chambers of commerce and emergency management offices.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
2.1.3	Find resources to maintain and upgrade levee in Gasconade.	3	2	2	3	3	3	1	17	IC, PD, LF, EMCC	8	-3	5	22	H
2.1.4	Educate residents, realtors and contractors about the dangers of floodplain development and the benefits of the National Flood Insurance Program.	3	2	2	2	3	3	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
2.1.5	Provide information on the benefits of establishing minimum building codes to those jurisdiction that currently lack minimum building code requirements.	2	2	2	1	3	3	3	16	IC, PD, LF, EMCC	8	-2	6	22	H
2.1.6	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.	2	2	2	2	3	3	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
2.1.7	Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Gasconade County and all jurisdictions through local, state, and federal agencies.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-2	6	24	H
3.1.1	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.	3	2	2	3	3	3	3	19	IC, PD, LF, EMCC	8	-2	6	25	H
3.1.2	Distribute SEMA brochures on natural disasters and NFIP at public facilities and events.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
3.1.3	Educate parents on school safety protocols.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
4.1.1	Encourage elected officials to disseminate information about hazard mitigation projects to the public.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
5.1.1	Provide information to all communities on the benefits and costs of developing storm water management plans.	3	2	2	2	3	3	3	18	IC, PD, LF, EMCC	8	-2	6	24	H
5.1.2	Coordinate and integrate hazard mitigation activities where appropriate with emergency operations plans and procedures.	3	2	2	3	3	3	3	19	IC, PD, LF, EMCC	8	-2	6	25	H
5.1.3	Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.	2	3	2	2	3	3	3	18	PD, EMCC	4	-2	2	20	H

Figure 4.4 Prioritization of Hazard Mitigation Actions		3 = Def YES 1 = Prob NO 2 = Maybe YES 0 = Def NO.													
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
5.1.4	Encourage local government to purchase properties in the flood plain as funds become available and convert that land into public space/recreation area.	2	2	2	2	3	3	3	17	IC, PD, LF, EMCC	8	-3	5	22	H
5.1.5	Provide information to communities on the benefits of zoning repetitive loss properties in the floodplain as open space.	1	2	2	2	3	3	3	16	IC, PD, LF, EMCC	8	-1	7	23	H
5.1.6	Disseminate information on the importance of and funding sources for constructing storm shelters, especially tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.	3	3	2	3	3	2	3	19	IC, EMCC	4	-2	4	21	H
6.1.1	Work with SEMA Region I coordinator and State Hazard Mitigation Officer to learn about new mitigation funding opportunities	3	3	3	3	3	3	3	21	IC, LF, EMCC	8	-1	7	28	H
6.1.2	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	3	2	2	2	3	3	3	18	IC, LF, EMCC	8	-2	6	24	H
6.1.3	Work with state/local/federal agencies to include mitigation in all economic & community development projects.	3	2	2	2	3	3	3	18	IC, LF, EMCC	8	-2	6	24	H
6.1.4	Provide information to local governments on the benefits of budgeting for and implementing hazard mitigation projects.	3	2	2	3	3	3	3	19	IC, LF, EMCC	8	-1	7	26	H
6.1.5	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole	3	2	2	3	3	3	3	19	IC, LF, EMCC	8	-1	7	26	H
6.1.6	Implement public awareness program on the benefits of hazard mitigation projects, both public and private.	3	2	2	3	3	3	3	19	IC, LF, EMCC	8	-1	7	28	H
6.1.7	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.	3	2	2	3	3	3	3	19	IC, LF, EMCC	8	-1	7	28	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. Ready-in-3 brochures/videos and information will be made readily available to the public through the health department and local government offices.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud.
Risk / Vulnerability	
Problem being Mitigated:	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.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	Personal Preparedness Education/Awareness Program
Action or Project Description:	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 at special events and through the county health department and local government offices.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
Estimated Cost:	$500 -$3,500 estimated cost
Benefits:	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.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs and county health department.
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going, full implementation should be completed by 2020.
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods or services
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continuing and updated - in progress
Report of Progress	Activity has occurred in this area as most emergency response agencies, health departments and EMDs promote individual preparedness and provide *Ready in 3* brochures. SEMA distributes press releases periodically on personal preparedness. The county health department and county EMD post information on their websites, and FaceBook pages. 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 by providing information on business continuity and emergency planning through local chamber of commerce and emergency management offices.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud.
Risk / Vulnerability	
Problem being Mitigated:	Absence of emergency plans by businesses and public entities.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.1.2
Name of Action or Project:	Promoting the development of emergency plans by businesses and public entities.
Action or Project Description:	Promote development of emergency plans by businesses and public entities.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$4,500 - $5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMDs
Action/Project Priority:	27 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
Progress Report	
Action Status	Continuing and updated - not started
Report of Progress	During the last update of the CEDS, a chapter on economic recovery and resiliency was added which is a tool for local leaders to reduce vulnerability to natural hazards and expedite recovery public and private infrastructure. Implementation progress has been restricted due to lack of funding to develop a program to encourage and assist businesses and public entities in developing emergency plans. EMDs are encouraged to share resources available through SEMA and FEMA on emergency planning for businesses and public entities and through chambers of commerce.

Action 1.1.3: Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems and increase use by individuals of existing warning systems.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud.
Risk / Vulnerability	
Problem being Mitigated:	Need to improve warning and communications systems throughout the county.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.1.3
Name of Action or Project:	Finding funding to improve warning and communications systems county-wide and increase use of existing warning systems.
Action or Project Description:	Provide information to local governments and citizens on the existing warning systems in place in Gasconade County and encourage better utilization of those systems (Everbridge). In addition, actively search for funding to improve both warning systems and communications throughout the county.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 - $5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMDs
Action/Project Priority:	22 - H
Timeline for Completion:	On-going - with goal of 2020 for having 80 percent or more of the population signed up for Everbridge.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Continuing and updated – in progress
Report of Progress	The county has the Everbridge system available throughout the county and to all cities within the county. People with landline phones are automatically signed up for the program, however, people with only cellphones must enroll. A push needs to be made to make people aware of the warning system and encourage them to enroll. In addition, the county and cities need to continue to work to improve communications systems within the county to improve county-wide as well as state-wide communications during disasters and joint response efforts.

Action 1.1.4: Monitor developments in data availability concerning the impact of levee failure, dam failulre, tornados, sinkholes, land subsidence and wildfire upon Gasconade County and all jurisdictions through local, state and federal agencies.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud, Gasconade County R-I , R-II and Maries R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Lack of data concerning the impact of natural disasters upon the County and its jurisdictions
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.4
Name of Action or Project:	Monitor developments in data availability for the purpose of improving hazard mitigation planning.
Action or Project Description:	Monitor developments in data availability concerning the impact of disasters such as dam failure, tornadoes, sinkholes, land subsidence, and wildfire upon Gasconade County and all jurisdictions through local, state, and federal agencies for use in hazard mitigation planning.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, Gasconade County Commission, city councils/boards of, Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud, Gasconade County R-I and R-II School Districts
Action/Project Priority:	24 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOPs, floodplain ordinances
Progress Report	
Action Status	In progress and on-going
Report of Progress	Some work has been done on this action item. The Missouri Department of Natural Resources has been working on a levee study that includes Gasconade County. When that data is made available, it will be incorporated into future revisions of the planning document.

Action 1.1.5: Examine potential road and bridge upgrades that would improve drainage, reduce flooding and the risk to residents and property.

Action Worksheet	
Name of Jurisdiction:	Gasconade County Commission, city councils/boards of Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud.
Risk / Vulnerability	
Problem being Mitigated:	Gasconade County and many of its jurisdictions have issues with low water crossings, stormwater run-off, undersized culverts, etc.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.1.5
Name of Action or Project:	Mitigation road and bridge improvements.
Action or Project Description:	Review all road and bridge improvements with consideration given to mitigating flooding. Mitigation actions could include sizing up culverts when replacing them; upgrading from low water crossings to a bridge; raising roadbeds that frequently flood; etc.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$4,500 – 10,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Road and bridge departments for the county as well as for each city jurisdiction and in some cases public works departments.
Action/Project Priority:	25 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, road and bridge funds, MoDOT allocations, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, comprehensive plans, capital improvement plans, road and bridge plans
Progress Report	
Action Status	Existing – in progress
Report of Progress	The county routinely works toward upgrading county roads and bridges when replacements are made. Culverts are routinely sized up to improve drainage. As funding allows, low water crossings are replaced with bridges. Local communities do the same, but all efforts are dependent upon available funding.

Action 1.1.6: Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.

Action Worksheet	
Name of Jurisdiction:	Gasconade County R-I, R-II and Maries R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge of school staff in regards to natural hazards and emergency plans.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.1.6
Name of Action or Project:	Natural hazards and safety education program for school staff
Action or Project Description:	Educate school staff on natural hazards and make sure all staff are familiar with school emergency plan including evacuation and safety procedures.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$2,500 – $3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School superintendents for both school districts
Action/Project Priority:	28 - H
Timeline for Completion:	Both districts should implement an on-going education program by 2018.
Potential Fund Sources:	General training/revenue funds of school districts
Local Planning Mechanisms to be Used in Implementation, if any:	Action should be included in the school crisis plan as well as the regular staff training program.
Progress Report	
Action Status	New
Report of Progress	New action item added in 2016 update.

Action 1.1.7: Regularly review and update school emergency plans.

Action Worksheet	
Name of Jurisdiction:	Gasconade County R-I, R-II and Maries County R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	School districts should review and update their emergency plans on an annual basis and following any major events.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	1.1.7
Name of Action or Project:	School emergency plan annual review and update.
Action or Project Description:	Review and update the school emergency plan on at least an annual basis and following any major events.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$1,000 - $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School Superintendents and principals
Action/Project Priority:	28 - H
Timeline for Completion:	Both school districts should incorporate annual emergency plan reviews into their normal operations by 2018.
Potential Fund Sources:	School general revenue. Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	School crisis plans, LEOPs
Progress Report	
Action Status	New – added in 2016 update
Report of Progress	

Action 1.1.8: Regularly review school facilities and re-evaluate designated safe areas to insure that these areas are the safest locations to shelter students and staff.

Action Worksheet	
Name of Jurisdiction:	Gasconade R-I, R-II and Maries County R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with school facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students and staff in the event of high winds/tornados.
Hazard(s) Addressed:	Tornado, Severe Weather
Action or Project	
Action/Project Number:	1.1.8
Name of Action or Project:	Review and evaluation of designated school safe rooms.
Action or Project Description:	School district personnel, with help if necessary, should review and re-evaluate those areas of school facilities that have been designated as safe rooms during tornado warnings. These areas should be re-evaluated periodically to determine if they are still the safest locations for students and staff to shelter during a tornado or high wind event.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$1,500 - $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMDs, school superintendents
Action/Project Priority:	24 - H
Timeline for Completion:	A re-evaluation should be completed no later than 2019.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOPs, school emergency plan
Progress Report	
Action Status	New – added to 2016 update.
Report of Progress	

Action 1.2.1: Disseminate information on the importance of and funding sources for constructing storm shelters, especially tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud, Gasconade County R-I and R-II, Maries County R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with insufficient storm shelters and tornado safe rooms in schools and heavily populated areas that do not have them.
Hazard(s) Addressed:	Tornado, Severe Weather
Action or Project	
Action/Project Number:	1.2.1
Name of Action or Project:	Raising awareness of the need for expansion of storm shelter availability and construction of certified tornado safe rooms.
Action or Project Description:	Develop and disseminate material on FEMA approved tornado safe rooms, available funding, and the importance of designated storm shelters.
Applicable Goal Statement:	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
Estimated Cost:	$1,500 – $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualtiesand emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMDs for storm shelters School Superintendents for school certified tornado safe rooms
Action/Project Priority:	21 - H
Timeline for Completion:	5 years to increase the number of storm shelters in the county. 10 years to construct certified tornado safe rooms in each school district.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOPs for county and cities; school capital improvement plans and emergency plans; hazard mitigation plan
Progress Report	
Action Status	Revised in 2016 update
Report of Progress	Little progress here. The costs of construction are a major obstacle.

Action 2.1.1: Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud, Gasconade County R-I, R-II and Maries County R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with critical facilities that may or may not be resistant to earthquakes and/or tornados and severe weather.
Hazard(s) Addressed:	Earthquake, Tornado, Severe Weather
Action or Project	
Action/Project Number:	2.1.1
Name of Action or Project:	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
Action or Project Description:	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornados or severe weather.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$1,500 - $10,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs
Action/Project Priority:	24 - H
Timeline for Completion:	Information should be provided to critical facilities by 2019.
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOPs
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

Action 2.1.2: Promote development of emergency plans by businesses and public entities by providing information on business continuity and emergency planning through local chambers of commerce and emergency management offices.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities to local businesses and public entities that do not have continuity and/or emergency plans in place.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Provide information on continuity/emergency planning to local businesses and public entities that do not currently have plans in place.
Action or Project Description:	EMDs should provide information on business continuity and emergency planning and its importance through local chambers of commerce and through direct contact with local businesses and public entities that may not have these types of plans in place. Emphasis should be placed on economic impacts to individual entities and the community as a whole.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$500 - $1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, City EMDs
Action/Project Priority:	27 - H
Timeline for Completion:	Initial contacts and information delivered by 2019.
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOPs, hazard mitigation plan, Community Economic Development Strategy
Progress Report	
Action Status	Revised and continuing - in progress
Report of Progress	Continuity planning has been added to the regional Community Economic Development Strategy (CEDS). Business continuity planning workshops have been provided in the region.

Action 2.1.3: Find resources to maintain and upgrade the levee in Gasconade.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, city of Gasconade
Risk / Vulnerability	
Problem being Mitigated:	The levee protecting portions of the community of Gasconade suffered damage during December 2015 flooding and the local community does not have the resources to make the necessary repairs.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.1.3
Name of Action or Project:	Improving and maintaining the levee in Gasconade.
Action or Project Description:	Actively seek funding and/or assistance in making the necessary repairs and future maintenance of the levee.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$50,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, Gasconade board of aldermen
Action/Project Priority:	22 - H
Timeline for Completion:	2018
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOPs, floodplain ordinances
Progress Report	
Action Status	New
Report of Progress	

Action 2.1.4: Educate residents, realtors and contractors about the dangers of floodplain development and the benefits of the National Flood Insurance Program.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison and Owensville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with flooding and floodplain development
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.1.4
Name of Action or Project:	Education for residents, realtors and contractors on the dangers of and requirements associated with floodplain development.
Action or Project Description:	Provide information by distributing floodplain brochures and press releases on the dangers of floodplain development and the requirements as outlined in the county and individual city floodplain ordinances.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$3,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, local designated floodplain managers
Action/Project Priority:	25 - H
Timeline for Completion:	On-going – brochures should be developed and distributed by 2019. Press releases distributed annually to local media.
Potential Fund Sources:	Local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinances
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Some floodplain management education is occurring in Gasconade County, but this action item would benefit from a focused, coordinated effort to increase awareness and educate not just residents but also realtors and contractors.

Action 2.1.5: Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, city of Rosebud.
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities to property and communities in the event of a natural disaster due to substandard construction.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.5
Name of Action or Project:	Information/awareness program for the benefits of minimum building codes.
Action or Project Description:	Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$3,000-$10,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, Local Government
Action/Project Priority:	22 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Jurisdictional Builders Plan
Progress Report	
Action Status	Revised - Continuing Not Started
Report of Progress	There has been no progress in this area. The action item has been revised to provide more focus on providing information to Gasconade County and the city of Rosebud. Gasconade County currently has no building codes in place. Rosebud's codes could be expanded and improved. Providing information on the benefits of strong building codes may provide the impetus to adopt building codes or improve current codes.

Action 2.1.6: Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, and Owensville.
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with unsecured hazardous materials, tanks, and mobile homes during flood, severe weather, or tornado events.
Hazard(s) Addressed:	Flooding, Tornado, Severe Storms
Action or Project	
Action/Project Number:	2.1.6
Name of Action or Project:	Review and develop or strengthen regulations or ordinances for securing materials tanks and mobile homes to reduce hazards during storms and flooding.
Action or Project Description:	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$1,000-$3,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, City EMD, Local Government, local floodplain managers
Action/Project Priority:	24 - H
Timeline for Completion:	Reviews of floodplain ordinances should be completed by 2019.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	City and county ordinances, builders plans, comprehensive plans, LEOP, building codes, floodplain ordinances
Progress Report	
Action Status	Revised - Not Started
Report of Progress	This action item has been revised to focus efforts on reviewing floodplain ordinances in order to look for ways to strengthen those ordinances to improve mitigation activities if those ordinances do not currently include requirements for securing tanks and mobile homes.

Action 2.1.7: Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence, and wildfire upon Gasconade County and all jurisdictions through local, state, and federal agencies.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud, Gasconade Co. R-I, Gasconade Co. R-II, Maries Co. R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with absence of data concerning natural disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	2.1.7
Name of Action or Project:	Monitor developments in data availability for the purpose of improving hazard mitigation planning.
Action or Project Description:	Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence, and wildfire upon Gasconade County and all jurisdictions through local, state, and federal agencies.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$5,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, Gasconade County Commission, city councils/boards of Bland, Gasconade, Hermann, Morrison, Owensville and Rosebud, Gasconade County R-I and R-II school districts and Maries County R-II School District
Action/Project Priority:	24 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOPs, floodplain ordinances
Progress Report	
Action Status	In-progress and on-going
Report of Progress	Some work has been done on this action item. The Missouri Department of Natural Resources has been working on a levee study that includes Gasconade County. When that data is made available, it will be incorporated into future revisions of the planning document.

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: Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud, Gasconade Co. R-I, Gasconade Co. R-II, Maries Co. R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.1.1
Name of Action or Project:	Review hazard mitigation plan, merge with other community planning and coordinate and integrate activities with emergency plans and procedures.
Action or Project Description:	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
Applicable Goal Statement:	Promote education, outreach, research, and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.
Estimated Cost:	$3,500 - $4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, City EMDs, Local Planners, City Administrators, MPC
Action/Project Priority:	25 - H
Timeline for Completion:	On-going – should be reviewed after any major disasters and on an annual basis to determine if action items are being addressed on schedule. Hazard mitigation actions should be incorporated into applicable plans/ordinances as those documents are reviewed and updated.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	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 plans/ordinances
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the 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 3.1.2: Distribute SEMA brochures on natural disasters and NFIP at public facilities and events.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud, Gasconade Co. R-I, Gasconade Co. R-II, Maries Co. R-II
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the public's lack of knowledge in regards to natural disasters, preparedness, and NFIP.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.1.2
Name of Action or Project:	Outreach & Education on natural disasters, preparedness and NFIP
Action or Project Description:	Distribute SEMA brochures on natural disasters and NFIP at public facilities and events.
Applicable Goal Statement:	Promote education, outreach, research, and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.
Estimated Cost:	$500-$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, City EMDs, School Safety Officers
Action/Project Priority:	28 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, hazard mitigation plan, floodplain ordinances
Progress Report	
Action Status	Continuing in Progress
Report of Progress	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. The county and jurisdiction would benefit from a more focused approach to distributing information on NFIP and floodplain development requirements.

Action 3.1.3: Educate parents on school safety protocols.

Action Worksheet	
Name of Jurisdiction:	Gasconade Co. R-I, Gasconade Co. R-II, Maries Co. R-II
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge on school safety protocols.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.1.3
Name of Action or Project:	Educate parents on school safety protocols.
Action or Project Description:	Actively provide information to and engage with parents on school safety protocols during natural hazard events in order to reduce and/or avoid confusion during and after an event.
Applicable Goal Statement:	Promote education, outreach, research, and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.
Estimated Cost:	$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	School district superintendents and principals
Action/Project Priority:	28 - H
Timeline for Completion:	Information and engagement should be incorporated into back-to-school activities no later than 2019-20 school year.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOPs, school emergency plans
Progress Report	
Action Status	New
Report of Progress	

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

Action 4.1.1: Encourage elected officials to disseminate information about hazard mitigation projects to the public.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud, Gasconade Co. R-I, Gasconade Co. R-II, Maries Co. R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Lack of knowledge concerning local hazard mitigation projects
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.1.1
Name of Action or Project:	Dissemination of hazard mitigation project information by elected officials
Action or Project Description:	Encourage elected officials to disseminate information about hazard mitigation projects to the public to raise awareness and understanding of how hazard mitigation projects can reduce risks, save lives and protect property.
Applicable Goal Statement:	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
Estimated Cost:	$500 - $1,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, Gasconade County Commission, floodplain managers, city councils/boards and school district boards of education
Action/Project Priority:	27 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinances
Progress Report	
Action Status	Revised - continuing
Report of Progress	Some information is being distributed on hazard mitigation projects. However, this action item would benefit from a more focused effort to point out and explain the mitigation benefits of various projects, i.e. increasing the size of culverts; replacing low water crossings with bridges; beefing up building codes or ordinances; etc.

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: Provide information to all communities on the benefits and costs of developing storm water management plans.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with non-existent storm water management plans
Hazard(s) Addressed:	Flood, Severe Weather
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Inform all communities of the benefits of developing storm water management plans.
Action or Project Description:	Provide information to all communities on the benefits and costs of developing storm water management plans.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	$800 - $1,800
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local planners, economic developers
Action/Project Priority:	24 - H
Timeline for Completion:	N/A
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain Ordinance, Comprehensive Plans
Progress Report	
Action Status	Revised – continuing – no progress
Report of Progress	Currently the jurisdictions do not have the resources to address this issue.

Action 5.1.2: Coordinate and integrate hazard mitigation activities where appropriate with emergency operations plans and procedures.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud, Gasconade County R-I, R-II and Maries County R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Lacking knowledge of hazard mitigation activities among emergency operations and local officials.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	5.1.2
Name of Action or Project:	Coordinate and integrate hazard mitigation activities with emergency plans and procedures
Action or Project Description:	Coordinate and integrate hazard mitigation activities where appropriate with emergency operations plans and procedures.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	$1,000 – $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, Gasconade County Commission, city councils/boards
Action/Project Priority:	25 - H
Timeline for Completion:	Review and integration of hazard mitigation activities into existing emergency operations plans and procedures should be completed by 2021 as funding allows.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOPs, school emergency plans
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

Action 5.1.3: Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.

Action Worksheet	
Name of Jurisdiction:	Cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with non-existent storm water management plans
Hazard(s) Addressed:	Flood, Severe Weather
Action or Project	
Action/Project Number:	5.1.3
Name of Action or Project:	Encourage all communities to develop storm water management plans.
Action or Project Description:	Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	$1,800 - $3,800
Benefits:	Losses avoided by implementing this action include property damages and emergency management costs/community costs..
Plan for Implementation	
Responsible Organization/Department:	Local Planners, Local Governments
Action/Project Priority:	20 - H
Timeline for Completion:	Goal for completion is 2021.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain Ordinance, comprehensive plans, hazard mitigation plan
Progress Report	
Action Status	Continuing – no progress
Report of Progress	

Action 5.1.4: Encourage local government to purchase properties in the flood plain as funds become available and convert that land into public space/recreation area.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with floodplain properties
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.1.4
Name of Action or Project:	Government purchase of properties in the floodplain
Action or Project Description:	Encourage local governments to purchase properties in the floodplain as funds become available and convert that land into public space/recreation area.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	$3,500-$500,000
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Gasconade County Commission, city councils/boards, floodplain managers, EMDs
Action/Project Priority:	22 - H
Timeline for Completion:	N/A
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain Ordinance
Progress Report	
Action Status	Continuing – no progress
Report of Progress	To date there have been no floodplain buyouts in Gasconade County.

Action 5.1.5: Provide information to communities on the benefits of zoning repetitive loss properties in the floodplain as open space.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with repetitive loss properties.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.1.5
Name of Action or Project:	Zoning repetitive loss properties as open space.
Action or Project Description:	Provide information to communities on the benefits of zoning repetitive loss properties in the floodplain as open space.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	$1,500 - $5,500
Benefits:	Losses avoided by implementing this action include property damage, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Local Planners, EMDs, Floodplain Managers
Action/Project Priority:	21 - H
Timeline for Completion:	Completion by 2021
Potential Fund Sources:	Local general revenue funds
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain ordinances, Hazard Mitigation plan, comprehensive plans, strategic plans
Progress Report	
Action Status	Revised - Continuing Not Started
Report of Progress	

Action 5.1.6: Disseminate information on the importance of and funding sources for constructing storm shelters, especially tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud, Gasconade Co. R-I, Gasconade Co. R-II, Maries Co. R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the lack of storm shelters/tornado safe rooms near schools and large employment centers.
Hazard(s) Addressed:	Severe Weather, Tornadoes
Action or Project	
Action/Project Number:	5.1.6
Name of Action or Project:	Disseminate information on the importance of and funding sources for the construction of storm shelters and tornado safe rooms
Action or Project Description:	Disseminate information on the importance of and funding sources for constructing storm shelters, especially tornado safe rooms near schools and large employment centers that currently do not have access to safe rooms.
Applicable Goal Statement:	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
Estimated Cost:	$5,000 - $5 Million
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission, city councils/boards, school superintendents and principals, EMDs
Action/Project Priority:	21 - H
Timeline for Completion:	Dissemination of information should be completed by 2021.
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOPs, Hazard Mitigation plan, capital improvement plans, building plans, comprehensive plans
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Lack of financial resources for construction continues to be the main obstacle; however, school districts and communities are interested in building certified 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 and State Hazard Mitigation Officer to learn about new mitigation funding opportunities

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud, Gasconade Co. R-I, Gasconade Co. R-II, Maries Co. R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for natural hazard mitigation projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.1
Name of Action or Project:	Working with SEMA to learn about mitigation funding opportunities.
Action or Project Description:	Work with SEMA Region I coordinator and State Hazard Mitigation Officer to learn about new mitigation funding opportunities.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $1,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, City EMDs, local planners, Local Governments, school superintendents
Action/Project Priority:	24 - H
Timeline for Completion:	On-going
Potential Fund Sources:	General revenue funds
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation plan, capital improvement plans, comprehensive plans
Progress Report	
Action Status	Continuing in Progress
Report of Progress	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.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud
Risk / Vulnerability	
Problem being Mitigated:	Incorporating mitigation projects into road and bridge project funding development
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	6.1.2
Name of Action or Project:	Structuring grant proposals for road and bridge improvements to meet mitigation needs.
Action or Project Description:	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$1,500-$4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	City/County Engineers, County Commission, Local Governments, Local Grant Writers
Action/Project Priority:	24 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation plan, capital improvement plans, comprehensive plans, strategic plans
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Gasconade 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 & community development projects.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud
Risk / Vulnerability	
Problem being Mitigated:	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.3
Name of Action or Project:	Coordination with state/local/federal agencies to integrate mitigation into economic and community development projects
Action or Project Description:	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$2,500 - $9,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission, City Governments, Economic Developers, Community Development Organizations, County and City EMDs, local planners
Action/Project Priority:	24 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Hazard mitigation goals and actions have been incorporated into the regional Community Economic Development Strategy (CEDS). As mitigation awareness grows, additional efforts will be made to incorporate mitigation activities into economic and community development projects.

Action 6.1.4: Provide information to local governments on the benefits of budgeting for and implementing hazard mitigation projects.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud, Gasconade Co. R-I, Gasconade Co. R-II, Maries Co. R-II school districts
Risk / Vulnerability	
Problem being Mitigated:	Lack of funding for mitigation projects among local jurisdictions
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.4
Name of Action or Project:	Budgeting for mitigation projects
Action or Project Description:	Provide information to local governments on the benefits of budgeting for and implementing hazard mitigation projects.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$500 - $1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, County Commission, Local City Governments, School Districts, local planners
Action/Project Priority:	26 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvements plans, comprehensive plans, CEDS, strategic plans, LEOPs
Progress Report	
Action Status	Continuing in Progress
Report of Progress	As awareness of the importance of mitigation grows, more local jurisdictions are seeing the long-term benefits and working toward budgeting for mitigation activities.

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Action 6.1.5: Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud
Risk / Vulnerability	
Problem being Mitigated:	Lack of cost-share programs with private property owners for hazard mitigations projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.5
Name of Action or Project:	Encourage local mitigation cost-share programs
Action or Project Description:	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$5,000 - $500,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, County Commission, Local City Governments
Action/Project Priority:	26 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plans, comprehensive plans
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Some of the communities will work with developers to cost-share projects that deal with storm water run-off. In some situations a community or the county will install a culvert if the individual pays for the culvert to insure that installation is done correctly and the culvert is sized appropriately. This is a program that could benefit from more organized guidelines and focused efforts if additional funding could be secured.

Action 6.1.6: Implement public awareness programs on the benefits of hazard mitigation projects, both public and private.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud
Risk / Vulnerability	
Problem being Mitigated:	Lack of public knowledge of the importance/benefit of hazard mitigation projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.6
Name of Action or Project:	Public awareness program on benefits of public and private hazard mitigation projects.
Action or Project Description:	Implement public awareness programs on the benefits of hazard mitigation projects, both public and private.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$750 - $2,750
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, County Commission, Local Governments
Action/Project Priority:	28 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, comprehensive plans, capital improvements plans, strategic plans
Progress Report	
Action Status	Continuing in Progress
Report of Progress	There has been some progress on this activity. Press releases on the hazard mitigation plan raise awareness. Press releases and activities following the 2013 and 2015 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 6.1.7: Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

Action Worksheet	
Name of Jurisdiction:	Gasconade County, cities of Bland, Gasconade, Hermann, Morrison, Owensville, Rosebud
Risk / Vulnerability	
Problem being Mitigated:	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	6.1.7
Name of Action or Project:	Prioritizing mitigation projects
Action or Project Description:	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$1,500 - $4,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County and city EMDs, County Commission, Local Governments, Local Planners, City/County Engineers, MPC
Action/Project Priority:	28 - H
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan
Progress Report	
Action Status	Continuing in Progress
Report of Progress	Hazard mitigation projects were prioritized in the initial plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

5 PLAN MAINTENANCE PROCESS

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

5.1 Monitoring, Evaluating, and Updating the Plan

44 CFR Requirement 201.6(c)(4): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

5.1.1 Responsibility for Plan Maintenance

Periodic revisions and updates of the Plan are required by Missouri SEMA to ensure that the goals and objectives for Gasconade 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 Gasconade 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 Gasconade 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 Gasconade 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 Gasconade 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;
- Gasconade 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 Gasconade 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 Gasconade County	County Emergency Operations Plan Local Mitigation Plan County Mitigation Plan. Economic Development Plan Regional Transportation Plan
Bland	Capital Improvement Plan City Emergency Operations Plan County Emergency Operations Plan Local Mitigation Plan County Mitigation Plan Economic Development Plan Regional Transportation Plan
Gasconade	City Emergency Operations Plan County Emergency Operations Plan Local Mitigation Plan County Mitigation Plan Economic Development Plan Regional Transportation Plan
Hermann	City Emergency Operations Plan County Emergency Operations Plan Local Mitigation Plan County Mitigation Plan Economic Development Plan Regional Transportation Plan
Morrison	City Emergency Operations Plan County Emergency Operations Plan Local Mitigation Plan County Mitigation Plan Economic Development Plan Regional Transportation Plan
Owensville	Comprehensive Plan

Jurisdiction	Planning Mechanisms
	City Emergency Operations Plan County Emergency Operations Plan Local Mitigation Plan County Mitigation Plan Economic Development Plan Regional Transportation Plan Land-Use Plan
Rosebud	City Emergency Operations Plan County Emergency Operations Plan Local Mitigation Plan County Mitigation Plan Economic Development Plan Regional Transportation Plan Land-Use Plan
Gasconade Co. R-I	Master Plan Capital Improvements Plan School Emergency Plan Weapons Policy
Gasconade R-II	Capital Improvements Plan School Emergency Plan Weapons Policy
Maries R-II	School Emergency Plan Weapons Policy

Source: Jurisdiction surveys 2016

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

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B: Planning Process

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For Immediate Release

March 1, 2016

For more information contact

Ryan Dunwoody at (573) 265-2993 or rdunwoody@meramecregion.org

Public Meeting Scheduled for Gasconade County Hazard Mitigation Plan Update

HERMANN, Mo.—City and county officials, school leaders, emergency management agencies and interested residents are invited to attend a public meeting March 24 to discuss updates to the Gasconade County Hazard Mitigation Plan.

The meeting will be held at 10 a.m. at the Gasconade County Courthouse in the basement meeting room in Hermann. This will be the initial planning meeting to start the update of the county's plans.

Meramec Regional Planning Commission (MRPC) is updating the plan in partnership with the Gasconade County Commission with partial funding from the State Emergency Management Agency.

The last plan was done in 2012 and is available for review at www.meramecregion.org. Plans are updated every five years.

The county must have an approved hazard mitigation plan in order for Gasconade 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. For questions, contact MRPC Environmental Programs Specialist Ryan Dunwoody at rdunwoody@meramecregion.org or 573-265-2993.

Formed in1969, 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 or on Facebook at www.facebook.com/meramecregion.

MEMORANDUM

TO: Gasconade County Hazard Mitigation Planning Committee

FROM: Ryan Dunwoody, MRPC Environmental Programs Specialist

DATE: March 4, 2016

SUBJECT: Hazard mitigation planning meeting March 24, 2016

MRPC has been contracted by Gasconade County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Gasconade County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Gasconade 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 **Gasconade County Hazard Mitigation Planning Committee** is **scheduled** for **Thursday, March 24 at 10:00 a.m.** in the basement meeting room of the **Gasconade County Courthouse in Hermann**. The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. This can include activities such as improvements to roads and bridges that were prone to flooding, new programs that have reduced risk to residents and/or businesses and new tornado shelters that have been constructed in the past five years. Additionally, we request that **each jurisdiction and school district bring a filled out Hazard Mitigation Plan Questionnaire** (included). After the meeting we will answer questions and assist with filling out the questionnaire.

As the county, each city and school district will be asked to formally approve and adopt the Gasconade County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from emergency management offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups. If you are not able to attend, please send a representative from your organization. It is very important that we have good participation from all stakeholders in Gasconade County.

Thank you for your assistance in addressing hazard mitigation for Gasconade County. If you have any questions, contact me at (573) 265-2993, or via e-mail: rdunwoody@merameregion.org. I look forward to seeing you at the meeting.

RD

Enclosures

Advisory Committee Meeting
Gasconade County Hazard Mitigation Plan Update
AGENDA
10:00 a.m. ~ March 24, 2016
Gasconade County Courthouse

I. Welcome and Introductions – Tammy Snodgrass

II. Overview of Hazard Mitigation Planning and Gasconade County Hazard Mitigation Plan

Staff will provide an overview of the planning process and a brief review of the existing hazard mitigation plan

III. Discussion of Goals and Objectives and Progress Made in Five Years

Staff will lead the review of existing goals and a group discussion on what progress has been made in addressing hazard mitigation over the past five years.

IV. Discussion of Possible Changes to Goals and Action Items for Next Five Years

After reviewing the plan document and looking at what has been accomplished, the group will be asked to discuss if needs have changed and what, if any changes need to be made to goals and action items for the revised plan.

V. Integration of Other Data, Reports, Studies, Plans

What other information is available locally that could be included in the hazard mitigation plan? What other plans need to incorporate aspects of the hazard mitigation plan?

VI. Review of Disasters/Deaths/Injuries over the Past Five Years

Staff will provide data on disaster declarations for the past five years. Participants are asked to share any additional information on specific damage that occurred to infrastructure, critical infrastructure, neighborhoods, etc. Of particular interest is any information on deaths or injuries attributed to natural disasters.

VII. Setting of Date and Time for Next Meeting

VIII. Adjourn

NOTICE OF PUBLIC MEETING

Date and time of posting: **March 7, 2:00 p.m.**
Notice is hereby given that the **Gasconade County Hazard Mitigation Planning Committee** will meet at 10:00 a.m. on **Thursday, March 24, 2016** at the Gasconade County Courthouse located in Hermann, Mo.

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Overview of Hazard Mitigation Planning and Gasconade County Hazard Mitigation Plan
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Discussion of Possible Changes to Goals and Action Items for Next Five Years
- Integration of Other Data, Reports, Studies, Plans
- Review of Disasters/Deaths/Injuries over the Past Five Years
- Setting of Date and Time for Next Meeting
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

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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

Gasconade County Hazard Mitigation Plan Review Meeting
March 24, 2016 ~ 10:00 a.m.

Name	Representing	Email Address	Phone #	Address
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Mark Wallace	City of Hermann	hermannadmin@centurytel.net	573-486-5400	1902 Jefferson St Hermann Mo 65041
Kris Bayless	Gasconade County	KBay@rescueteam.org	314-420-7686	119 E 1st Rm 2 Hermann, MO 65041

MARCH/24/2016 GASCONADE COUNTY HAZARD MITIGATION MEETING

Name	Representing	Email Address	Phone #	Address
DAN DYER	OWENSVILLE EMA	owensemal@gmail.com	(573) 564-2449	
Donielle Farrar	American Red Cross	doniellefarrar@gmail.com	(573) 619-0390	PO Box 172 Owensville Mo
Dan McKinney	Hermann Area District Hospital	dan@hadh.org	573-301-9709	PO Box 470 Hermann, MO 65041
Bud Gauer	Hermann Advertiser-Courier	monews@lcs.net	573-486-5418	
Larry Miskel	Gasconade County	"	486-9169	
Jim Holland	"	jtsub@hotmail.com	486-3508	
Jerry Lairmore	County Commission	County Commissioners Gasconade [illegible]		

For Immediate Release

April 19, 2016

For more information contact

Ryan Dunwoody at (573) 265-2993

Second Public Meeting Scheduled for Gasconade County Hazard Mitigation Plan Update

HERMANN, MO. – City and County officials, school leaders, emergency management agencies and interested residents are invited to attend the second public meeting May 5 to discuss updates to the Gasconade County Hazard Mitigation Plan.

The meeting will be held at the Gasconade County Courthouse in the basement meeting room at 10 a.m in Hermann, MO.

The county must have an approved hazard mitigation plan in order for Gasconade 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 Gasconade County Commission. Questions may be directed to MRPC Environmental Programs Specialist Ryan Dunwoody at rdunwoody@meramecregion.org or 573-265-2993.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. A professional staff of 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 or on Facebook at www.facebook.com/meramecregion.

MEMORANDUM

TO: Gasconade County Hazard Mitigation Planning Committee

FROM: Ryan Dunwoody, MRPC Environmental Programs Specialist

DATE: April 19, 2016

SUBJECT: Second Hazard Mitigation Planning Meeting May 5, 2016

MRPC has been contracted by Gasconade County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Gasconade County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Gasconade County. We need your help to successfully complete this project.

The county must submit an approved, updated hazard mitigation plan to SEMA and FEMA by the end of this year in order to continue to be eligible for some hazard mitigation grants, so it is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

A **second meeting** of the **Gasconade County Hazard Mitigation Planning Committee** is **scheduled** for **Thursday, May 5 at 10:00 a.m.** in the basement meeting room of the **Gasconade County Courthouse in Hermann**. The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. This can include activities such as improvements to roads and bridges that were prone to flooding, new programs that have reduced risk to residents and/or businesses and new tornado shelters that have been constructed in the past five years. Additionally, we request that **each jurisdiction and school district bring a filled out Hazard Mitigation Plan Questionnaire**. After the meeting we will answer questions and assist with filling out the questionnaire.

As the county, each city and school district will be asked to formally approve and adopt the Gasconade County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from emergency management offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups. If you are not able to attend, please send a representative from your organization. It is very important that we have good participation from all stakeholders in Gasconade County.

Thank you for your assistance in addressing hazard mitigation for Gasconade County. If you have any questions, contact me at (573) 265-2993, or via e-mail: rdunwoody@merameregion.org. I look forward to seeing you at the meeting.

RD

Enclosures

Advisory Committee Meeting
Gasconade County Hazard Mitigation Plan Update
AGENDA
10:00 a.m. ~May 5, 2016
Gasconade County Courthouse

I. Welcome and Introductions – Tammy Snodgrass

II. Overview of Hazard Mitigation Planning and Gasconade County Hazard Mitigation Plan

Staff will provide an overview of the planning process and a brief review of the existing hazard mitigation plan

III. Discussion of Action Items and Progress Made in Five Years

Staff will lead the review of existing action items from the plan and ask the attendees to provide information on any progress that has been made on each action item. A list of action items was distributed at the last meeting and is attached to this email.

IV. Discussion of Possible Changes to Action Items for Next Five Years

After reviewing action items and looking at what has been accomplished, the group will be asked to discuss if needs have changed and what, if any changes need to be made to goals and action items for the revised plan.

V. Prioritization of Action Items

Attendees will be asked to provide input on the prioritization of action items in the plan.

VI. Review of Disasters/Deaths/Injuries over the Past Five Years

Staff will provide data on disaster declarations for the past five years. Participants are asked to share any additional information on specific damage that occurred to infrastructure, critical infrastructure, neighborhoods, etc. Of particular interest is any information on deaths or injuries attributed to natural disasters.

VII. Setting of Date and Time for Next Meeting

VIII. Adjourn

NOTICE OF PUBLIC MEETING

Date and time of posting: **April 19, 2:00 p.m.**
Notice is hereby given that the **Gasconade County Hazard Mitigation Planning Committee** will meet at 10:00 a.m. on **Thursday, May 5, 2016** at the Gasconade County Courthouse located in Hermann, Mo.

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Integration of Other Data, Reports, Studies, Plans
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Review and Prioritize Action Items
- Jurisdiction and School District Questionnaire Assistance
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Ryan Dunwoody
#4 Industrial Drive
St. James, MO 65559
(573) 265-2993
rdunwoody@meramecregion.org

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

Gasconade County Hazard Mitigation Plan Review Meeting
May 5, 2016 ~ 10:00 a.m.

Name	Representing	Email Address	Phone #	Address
GARY STAFFORD	HERMANN HOSPITAL	glstafford@charter.net	636-583-8774	7744 MEADOW VIEW CIRCLE UNION, MO. 63084
Jennifer Miinch	Gasconade County Health Dept	jennifer.miinch@gasconadecountyhealth.com	573-486-3129	300 Schiller St. Hermann MO 65041
Greg Lara	" "	greg.lara@gasconadecountyhealth.com	573-486-3129	300 Schiller St. Hermann, MO. 65041
Kris Bayless	GASCONADE CO EMA	[illegible]	573-486-3621	119 EAST 1st Hermann MO. 65041

MEMORANDUM

TO: Gasconade County Hazard Mitigation Plan Jurisdictions

FROM: Ryan Dunwoody, Environmental Programs Specialist, MRPC

DATE: March 7, 2016

SUBJECT: Questionnaire to update the Gasconade County Hazard Mitigation Plan

Attached please find a questionnaire and in-kind match form. We are currently updating the Gasconade 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 hazard mitigation grants. These grants can be utilized to build certified tornado safe rooms, upgrade low water crossings and flood prone roads, purchase floodplain properties, etc. The purpose of this plan is to help jurisdictions become less vulnerable to natural hazards such as tornadoes, flooding, and winter storms.

It is very important that you complete the attached questionnaire **ASAP** and bring it with you to the first **Hazard Mitigation Planning Committee meeting** on **March 24th**. Each jurisdiction is **required** to participate in the planning process. Completing and returning this questionnaire is one way that your jurisdiction can meet this requirement. 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 Gasconade 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.

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.

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. Your assistance is greatly appreciated.

RD

Enclosures

Action Item Review

+ parcel

Table 4.3 Summary of Mitigation Programs and Action Items Developed for Gasconade County and All Jurisdictions

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	1. Implement an education program on personal emergency preparedness.	Reducing Vulnerability	1	High	All Hazards
	2. Promote the development of emergency plans by businesses.		1	High	All Hazards
	3. Encourage cities to obtain early warning systems and improved communications systems and updating existing warning systems. → Bolla + Warrington		1	High	All Hazards
	4. Promote the use of weather radios by local residents and schools in ensure advanced warning about threatening weather.		1	High	All Hazards
	5. Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Gasconade County and all jurisdictions through local, state, and federal agencies.	→ Levee plan channel 95 - Fidelity - Mediacom - depends on service provider	1	Medium	Levee failure, Dam failure, Tornados, Sinkholes, Land Subsidence and Wildfire
Gasconade County	6. Partner with local radio stations to assure that appropriate warning of impending disasters is provided to all residents in the countywide listening area.		1	High	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	7. Work with cable companies to get early warnings on local access channels.		1	High	All Hazards
	8. Continue tree trimming and dead tree removal programs.	Owensville Ameren UE - Hermann has their own	1	Medium	Severe Weather
	9. Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.	Hermann - right of way maintenance then - aggressive	1	High	Flood Earthquake
Gasconade County Bland Gasconade	10. Purchase generators in smaller communities for backup power to critical facilities & add more generators in larger communities. 65k Mobile belongs to County		1	High	All Hazards

remove

Hospital back → 850k, Health Dept., Hermann (2) mobile
- All nursing homes have generators (1), Comm. center has 1 stationary (portables) - many, 911 fixed, Sherif mobile
60,000 → Dohmse county for flooding → Command post

Mitigation Strategy 4.50

What can we take off the list, accomplished, No longer needed

Next meeting, walk through,

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Hermann Morrison Owensville Rosebud	Disseminate				
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud Gasconade Co. R-I Gasconade Co. R-II Maries Co. R-II	11. ~~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.	Not aware of	1	High	Severe Weather Tornado
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud Gasconade Co. R-I Gasconade Co. R-II Maries Co. R-II	1. Encourage a self-inspection program at critical facilities to assess earthquake and tornado resistance. Share info w/ local chambers	Property & Infrastructure Protection Hospital after incident response	2	High / w/ Communities	Tornado Earthquake
Gasconade County Bland Gasconade Hermann Morrison Owensville	2. Encourage businesses to develop emergency plans. - Most partners have own store alone plan - Hospital → school → fire – etc. Middle school = Shelter + decontamination		2	Medium	All Hazards

Get from Kris

Cliff Ross Levee District in Morrison – 250 ft breach – protects new + community – Bank Rd
✓ Gasconade + Zumstes Rd – protecting farmers crop land
18 house affected in Gasconade Dec. 2015 flood

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Rosebud					
Morrison	3. Maintain and upgrade levee in Morrison. – Good shape (on going mess)		2	Medium	Flood
Gasconade County Bland Gasconade Hermann Morrison Owensville	4. Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program. Ready in 3 / Press release / New mobile – / – Flyers / – Citizen education program		2	High	Flood
Bland Gasconade Hermann Morrison Owensville Rosebud	5. Encourage minimum standards of building codes in all cities. IBC 2013 – Owensville Hermann – IBC – 2009-2013 Gerald – IBC Others – Do not have code No county		2	Medium	All Hazards
remove Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	6. Educate the public on self-inspection of homes and businesses and use schools and realtors as an outlet.		2	Low	All Hazards
Bland Gasconade Hermann Morrison Owensville Rosebud	7. Encourage local governments to develop and implement regulations for securing hazardous materials tanks & mobile homes to reduce hazards during storms & flooding. Check w/ Kris		2	Medium	Flood Severe Weather Tornado
Gasconade County Bland Gasconade	8. Monitor developments in data availability concerning the impact of levee failure, dam failure, tornados, sinkholes, land subsidence and wildfire upon Gasconade County and		2	Medium	Levee failure, Dam failure, Tornados, Sinkholes, Land

Floodplain admin – Kris Bryless County
– Hermann – city does physical inspection Base Flood certificates

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Hermann Morrison Owensville Rosebud	all jurisdictions through local, state, and federal agencies.				Subsidence and Wildfire
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	1. Distribute SEMA brochures at public facilities & events Keep doing or preparing to do	Outreach & Education	3	High	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	2. Distribute regular press releases on hazards, vulnerable areas, frequency and preparedness Health Dept. Facebook, paper, Ready u S, River + lights festival, • city employees - Hospital safety bulletin board		3	High	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	3. Establish outreach directory of elderly residents who may need assistance during temperature extremes. 911 has a list completed Awesome!		3	High	Extreme Heat Severe Winter Storm
Gasconade County Bland Gasconade Hermann Morrison Owensville	4. Encourage local residents to purchase weather radios thru press releases & brochures ↳ give away		3	High	Severe Weather Flash Flood

remove

- Replacement possibly next year, Much better
Everbridge
County wide- Emergency Response alert
Complicated to use program
DNE

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Rosebud					
remove Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	5. Ask SEMA mitigation specialists to present info to city councils, county commission & local planning organizations. Brenda currently		3	High	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	6. Re-evaluate the hazard mitigation plan and merge with other community planning activities and documents		3	Medium	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	7. Distribute press releases by cities/county regarding adopted mitigation measures to keep public aware of changes and/or new regulations. currently being done, Newspaper, FB, Radio		3	Medium	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	8. Encourage county health department and local American Red Cross Chapter to use publicity campaigns to make residents aware of proper measures to take during times of threatening conditions. Ready n 3, booth @ events, River + Lights festival		3	High	All Hazards
Remove Gasconade County Bland	9. Publicize county-wide or city-wide drills currently doing		3	High	All Hazards

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Gasconade Hermann Morrison Owensville Rosebud					
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	1. Encourage joint meetings of organizations/agencies for mitigation planning Region F Region F HSOC + RSOC Drills- quarterly meeting w/ Ameren	Communication Enhancement	4	Medium	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	2. Establish joint training/drills between agencies, public and private entities (including schools/businesses). - Reception + car- drill - Tornado drills Due to Ameren UE - School drills - Ambulance, district, hospital Table top- every 6 months - bus rollover drill every other year removal + exercise - participate offsite		4	Medium	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud Gasconade Co. R-I Gasconade Co. R-II Maries Co. R-II	3. Pool different agency resources to achieve widespread mitigation results. generators for example WebEOC goal MOU w/agency + county		4	High	All Hazards
Gasconade County	4. Establish partnerships to coordinate more shelters with		4	Medium	All Hazards

remove completed

Done w/ Red Cross - ON going

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Bland Gasconade Hermann Morrison Owensville Rosebud	kitchen facilities, generators, beds, first aid supplies, etc. - Osage Co. Reception + care trailer - strategic pods in Owensville + Hermann - cots - Nurse con train on closed pods, meds, ect.				
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	5. Encourage meetings between EMD, City/county officials and SEMA to familiarize officials with mitigation planning and implementation and budgeting for mitigation projects. - talked about		4	High	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	6. Encourage elected officials to instigate public relations information about hazard mitigation projects. talked about			Medium	All Hazards
Bland Gasconade Hermann Morrison Owensville Rosebud	1. Encourage communities to budget for enhanced warning systems. Gasconade Co. is working on Hwy 50 Gasconade River Bridge - River monitor station - gauge - SOK	Long Term Planning	5	High	All Hazards
Bland Gasconade Hermann Morrison Owensville	2. Encourage all communities to develop storm water management plans.		5	Low	Flood Severe Weather

remove

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Rosebud					
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	3. Coordinate and integrate hazard mitigation activities where appropriate with emergency operations plans and procedures. Keep update every 2 yrs Done		5	Medium	All Hazards
remove Bland Gasconade Hermann Morrison Owensville Rosebud	4. Encourage cities to require contractor storm water management plans in all new development – both residential and commercial properties.		5	Low	Flood Severe Weather
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	5. Encourage local government to purchase properties in the flood plain as funds become available and convert that land into public space/recreation area. - Co. has not done lately		5	Medium	Flood
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	6. Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.		5	High	Flood
Gasconade County Bland Hermann	7. 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.		5	High	Severe Weather Tornado

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Owensville Rosebud Gasconade Co. R-I Gasconade Co. R-II Maries Co. R-II					
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	8. Encourage the designation of public buildings as safe shelters and develop accessibility plans for the public during times of need.		5	Medium	Severe Weather Tornado
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	1. Work with SEMA Region I coordinator to learn about new mitigation funding opportunities	Finding Funding	6	High	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	2. Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.		6	Medium	Flood Earthquake
Gasconade County Bland Gasconade Hermann Morrison	3. Work with state/local/federal agencies to include mitigation in all economic & community development projects.		6	Medium	All Hazards

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Owensville Rosebud					
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	4. Encourage local governments to budget for mitigation projects.		6	Medium	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	5. Encourage cities and counties to implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole. No cost share (Kriss aware of)		6	Medium	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	6. Implement public awareness program on the benefits of hazard mitigation projects, both public and private. Press release + brochure		6	High	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	7. Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property. on-going		6	High	All Hazards

C: Adoption Resolutions

Adoption resolutions have been mailed out to the jurisdictions and will be included in the final draft submitted to FEMA.

D: Critical/Essential Facilities

The table below (**Table 6.1**) provides information for critical facilities in the planning area. Specific information includes a Hazus ID if applicable, jurisdiction, building name/owner, and address.

Table 6.1 Gasconade County Critical Facilities by Type and Jurisdiction

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Emergency Facilities						
	Gasconade Co.	Gasconade Co. E-911	405A E. Lincoln Ave.	Owensville	MO	65066
	Gasconade Co.	Emergency Management Director	Courthouse, PO Box 295	Hermann	MO	65041
Fire Department Facilities						
MO000260	Morrison	Morrison Volunteer Fire Dept. #1	524 Hwy 100	Morrison	MO	65061
MO000261	Owensville	Owensville Fire Dept. #1	819 Franklin Ave.	Owensville	MO	65066
MO000754	Bland	Bland Fire Protection Dist. #1	206 Kansas City	Bland	MO	65014
	Hermann	Hermann Volunteer FD #1	214 E. 2nd St.	Hermann	MO	65041
	Hermann	Hermann Volunteer FD #2	103 Hwy. 100	Hermann	MO	65041
	Hermann	Hermann Volunteer FD #3	2063 Hwy 19	Hermann	MO	65041
	Gasconade	Morrison Volunteer Fire Dept. #2	480 Oak St.	Gasconade	MO	65063
	Bland	Bland Fire Protection Dist. #2	4604 Gorrell Rd	Bland	MO	65014
	Mt. Sterling	Owensville Fire Dept. #2	2710 Hwy. A	Mt. Sterling	MO	65062
	Owensville	Owensville Fire Dept. #3	600 Springfield Rd.	Owensville	MO	65066
Law Enforcement Facilities						
MO000095	Owensville	Owensville City Police Dept.	109 N 2nd St.	Owensville	MO	65066
MO000150	Gasconade Co.	Gasconade Co. Sheriff	119 E 1st St. #22	Hermann	MO	65041
MO000189	Hermann	Hermann Police Dept.	129 E 4th St.	Hermann	MO	65041
MO000453	Gasconade	Gasconade City Police Dept.	480 Oak St.	Morrison	MO	65061
	Rosebud	Rosebud Police Dept.	307 N. Cedar	Rosebud	MO	63091
Medical Facilities						
MO000001	Hermann	Hermann Area Dist. Hospital	509 West 18th St.	Hermann	MO	65041
	Gasconade	Gasconade Co. Health Dept.	300 Schiller St.	Hermann	MO	65041

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
School Facilities						
MO000491	Hermann	Hermann Elem.	328 W Seventh St.	Hermann	MO	65041
MO000492	Hermann	Hermann High	176 Bearcat Crossing	Hermann	MO	65041
MO001007	Owensville	Owensville K-2 CTR.	2000 Dutchmen Dr.	Owensville	MO	65066
MO001009	Owensville	Owensville High	3336 Highway 19	Owensville	MO	65066
MO001010	Owensville	Owensville Middle	3340 Highway 19	Owensville	MO	65066
MO001676	Hermann	St. George School	133 W 4th St.	Hermann	MO	65041
MO001677	Rosebud	Immanuel Lutheran School	300 1st St. N	Rosebud	MO	63091
MO002562	Hermann	Hermann Middle	164 Blue Pride Dr.	Hermann	MO	65041
MO002776	Bland	Maries Co. R2 Middle School	300 S Main	Bland	MO	65014

E: MDC Wildfire Data Search

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Date Fire Discovered	County	City	Region	Cause	Acres Burn	Residences Damage	Outbuildings Damage	Commercial Damage	Residences Threatene	Outbuildings Threatenec	Commercial Threatenec	Residences Destroye	Outbuildings Destroyed	Commercial Destroyed	Reported By	Response Type	Station	
2	7/27/2002 7:45	Gasconade	Hermann	Central	Unknown	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
3	7/27/2002 12:48	Gasconade	Hermann	Central	Unknown	0	0	0	0	0	0	0	0	0	0	wagonp		HERMANN FIRE CO	
4	11/8/2002 16:15	Gasconade	Redbird	Central	Unknown	1	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	BLAND FIRE DEPT	
5	11/8/2002 19:22	Gasconade	Redbird	Central	Arson	0.5	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	BLAND FIRE DEPT	
6	11/8/2002 21:40	Gasconade	Redbird	Central	Arson	1	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	BLAND FIRE DEPT	
7	12/15/2002 13:32	Gasconade	Bland	Central	Debris	2	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	BLAND FIRE DEPT	
8	1/1/2003 16:30	Gasconade	Hermann	Central	Unknown	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
9	1/8/2003 0:00	Gasconade	Rosebud	Central	Debris	2.5	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	GERALD/ROSEBUD FPD	
10	1/31/2003 1:08	Gasconade	Bland	Central	Debris	1	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	BLAND FIRE DEPT	
11	1/31/2003 1:08	Gasconade	Bland	Central	Debris	1	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	BLAND FIRE DEPT	
12	3/17/2003 10:57	Gasconade	Redbird	Central	Debris	1	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	BLAND FIRE DEPT	
13	3/22/2003 9:48	Gasconade	Hermann	Central	Miscellaneous	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
14	3/22/2003 13:32	Gasconade	Bland	Central	Debris	1	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	BLAND FIRE DEPT	
15	3/22/2003 23:00	Gasconade	Gerald	Central	Debris	1	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	GERALD/ROSEBUD FPD	
16	3/29/2003 12:45	Gasconade	Hermann	Central	Unknown	0	0	0	0	0	0	0	0	0	0	wagonp	Mutual Aid	HERMANN FIRE CO	
17	4/1/2003 9:58	Gasconade	Hermann	Central	Debris	1	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
18	4/1/2003 14:28	Gasconade	Hermann	Central	Debris	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
19	4/2/2003 12:40	Gasconade	Hermann	Central	Debris	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
20	4/12/2003 13:12	Gasconade	Hermann	Central	Miscellaneous	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
21	5/23/2003 11:16	Gasconade	Hermann	Central	Debris	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
22	7/25/2003 12:55	Gasconade	Hermann	Central	Equipment	4	0	0	0	0	0	0	0	0	0	PriceT	Primary Responder	GASCONADE VFD	
23	8/15/2003 13:44	Gasconade	Hermann	Central	Debris	0	0	0	0	0	0	0	0	0	0	PriceT	Primary Responder	GASCONADE VFD	
24	8/19/2003 19:14	Gasconade	Hermann	Central	Unknown	0	0	0	0	0	0	0	0	0	0	PriceT	Primary Responder	GASCONADE VFD	
25	8/26/2003 15:48	Gasconade	Hermann	Central	Debris	4	0	0	0	0	0	0	0	0	0	PriceT	Primary Responder	GASCONADE VFD	
26	10/22/2003 0:00	Gasconade	Albany	Central	Unknown	15	0	0	0	0	0	0	0	0	0	Heerly		ALBANY FIRE DEPT	
27	12/4/2003 10:15	Gasconade	Hermann	Central	Unknown	1.5	0	0	0	0	0	0	0	0	0	PriceT	Primary Responder	HERMANN FIRE CO	
28	2/16/2004 15:08	Gasconade	Hermann	Central	Miscellaneous	35	0	0	0	0	0	0	0	0	0	PriceT	Primary Responder	HERMANN FIRE CO	
29	2/19/2004 14:14	Gasconade	Hermann	Central	Debris	2	0	0	0	0	0	0	0	0	0	PriceT	Primary Responder	HERMANN FIRE CO	
30	2/28/2004 13:13	Gasconade	Hermann	Central	Miscellaneous	3	0	0	0	0	0	0	0	0	0	PriceT	Primary Responder	HERMANN FIRE CO	
31	3/15/2004 15:15	Gasconade	Hermann	Central	Debris	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
32	3/17/2004 20:30	Gasconade	Hermann	Central	Debris	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
33	3/19/2004 14:32	Gasconade	Hermann	Central	Unknown	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
34	3/21/2004 12:48	Gasconade	Hermann	Central	Debris	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
35	3/23/2004 15:40	Gasconade	Hermann	Central	Debris	0	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
36	4/4/2004 12:55	Gasconade	Swiss	Central	Debris	50	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
37	4/5/2004 19:45	Gasconade	Swiss	Central	Debris	90	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
38	4/6/2004 7:00	Gasconade	Swiss	Central	Debris	100	0	0	0	0	0	0	0	0	0	wagonp	Primary Responder	HERMANN FIRE CO	
39	4/16/2004 14:30	Gasconade	Owensvil	Central	Unknown	30	0	0	0	0	0	0	0	0	0	BakamJ	Mutual Aid	MDC REPORTING REGION - ST. LOUIS	
40	9/23/2004 15:10	Gasconade	Hermann	Central	Miscellaneous	1	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
41	11/3/2004 13:04	Gasconade	Hermann	Central	Unknown	1	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
42	3/6/2005 11:40	Gasconade	Hermann	Central	Debris	10	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
43	3/12/2005 15:30	Gasconade	Hermann	Central	Debris	5	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
44	3/19/2005 2:30	Gasconade	Hermann	Central	Debris	6	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
45	5/6/2005 23:30	Gasconade	Hermann	Central	Unknown	1	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
46	5/16/2005 8:10	Gasconade	Hermann	Central	Unknown	2	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
47	7/30/2005 15:33	Gasconade	ROSEBU	Central	Unknown	2	0	0	0	0	0	0	0	1	0	carrol	Mutual Aid	BEAUFORT-LESLIE FPD	
48	1/8/2006 13:33	Gasconade	Hermann	Central	Miscellaneous	6	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
49	1/13/2006 18:05	Gasconade	Hermann	Central	Unknown	1	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
50	2/15/2006 20:05	Gasconade	Hermann	Central	Debris	1	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
51	3/2/2006 14:45	Gasconade	Fredricks	Central	Unknown	12	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
52	3/2/2006 17:50	Gasconade	Fredricks	Central	Unknown	1	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
53	3/12/2006 9:55	Gasconade	Swiss	Central	Miscellaneous	1	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
54	3/12/2006 17:38	Gasconade	Hermann	Central	Miscellaneous	1	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
55	3/16/2006 13:16	Gasconade	Bland	Central	Unknown	10	0	0	0	1	0	0	0	0	0	wagonp	Mutual Aid	VICHY VFPA	
56	3/26/2006 13:15	Gasconade	Hermann	Central	Unknown	2	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
57	4/1/2006 12:18	Gasconade	Hermann	Central	Miscellaneous	3	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
58	4/13/2006 10:10	Gasconade	Hermann	Central	Miscellaneous	4	0	2	0	0	20	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
59	4/14/2006 14:21	Gasconade	Hermann	Central	Unknown	2	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
60	4/21/2006 20:35	Gasconade	Swiss	Central	Miscellaneous	1	0	0	0	0	0	0	0	0	0	holsaa	Primary Responder	HERMANN FIRE CO	
61	2/11/2007 11:05	Gasconade	Hermann	Central	Not Reported	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO	
62	2/11/2007 11:05	Gasconade	Hermann	Central	Not Reported	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
63	2/11/2007 11:05	Gasconade	Hermann	Central	Not Reported	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
64	2/11/2007 11:05	Gasconade	Hermann	Central	Not Reported	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
65	2/11/2007 11:05	Gasconade	Hermann	Central	Not Reported	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
66	2/11/2007 13:00	Gasconade	Hermann	Central	Not Reported	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
67	3/9/2007 1:26	Gasconade	Hermann	Central	Miscellaneous	1	0	0	0	1	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
68	3/12/2007 13:06	Gasconade	Hermann	Central	Miscellaneous	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
69	6/26/2007 15:20	Gasconade	swiss	Central	Unknown	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
70	7/2/2007 16:00	Gasconade	King City	Central	Equipment	5	0	0	0	0	0	0	0	0	0	cundid	Primary Responder	KING CITY VFD
71	8/11/2007 13:01	Gasconade	Hermann	Central	Unknown	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
72	9/18/2007 19:53	Gasconade	Hermann	Central	Unknown	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
73	1/21/2008 17:45	Gasconade	Hermann	Central	Unknown	3	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
74	3/1/2008 14:21	Gasconade	Hermann	Central	Unknown	2	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
75	3/12/2008 14:16	Gasconade	BLAND	Central	Not Reported	32	0	0	0	0	0	0	0	0	0	cubafd	Mutual Aid	CUBA CFD
76	4/7/2008 21:07	Gasconade	Hermann	Central	Unknown	15	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
77	4/7/2008 21:07	Gasconade	Hermann	Central	Unknown	15	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
78	4/8/2008 7:27	Gasconade	Hermann	Central	Miscellaneous	2	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
79	11/23/2008 15:49	Gasconade	Swiss	Central	Unknown	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
80	1/19/2009 12:30	Gasconade	owensvill	Central	Debris	1	0	0	0	1	1	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
81	1/20/2009 12:20	Gasconade	Hermann	Central	Not Reported	15	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
82	1/21/2009 15:35	Gasconade	drake	Central	Debris	2	0	0	0	0	0	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
83	1/22/2009 12:14	Gasconade	owensvill	Central	Debris	1	0	0	0	1	0	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
84	1/22/2009 16:22	Gasconade	Hermann	Central	Not Reported	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
85	1/22/2009 22:06	Gasconade	Hermann	Central	Not Reported	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
86	1/24/2009 13:03	Gasconade	Hermann	Central	Miscellaneous	3.5	0	0	0	0	1	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
87	1/26/2009 17:40	Gasconade	owensvill	Central	Debris	1	0	0	0	0	0	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
88	2/19/2009 11:33	Gasconade	HERMAN	Central	Debris	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
89	2/22/2009 10:57	Gasconade	HERMAN	Central	Debris	1.5	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
90	2/22/2009 13:19	Gasconade	mt sterlin	Central	Debris	10	0	0	0	0	0	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
91	2/24/2009 12:40	Gasconade	owensvill	Central	Equipment	1	0	0	0	1	0	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
92	2/25/2009 10:59	Gasconade	owensvill	Central	Debris	1	0	1	0	1	1	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
93	2/25/2009 13:36	Gasconade	owensvill	Central	Debris	20	0	0	0	1	1	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
94	2/25/2009 15:35	Gasconade	drake	Central	Debris	5	0	0	0	0	1	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
95	3/4/2009 11:43	Gasconade	owensvill	Central	Debris	1	0	0	0	0	0	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
96	3/5/2009 14:59	Gasconade	drake	Central	Debris	5	0	0	0	2	0	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
97	3/7/2009 17:54	Gasconade	cuba	Central	Debris	350	0	0	0	0	0	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
98	3/17/2009 16:13	Gasconade	owensvill	Central	Debris	1	0	0	0	0	0	0	0	0	0	owensfd	Primary Responder	OWENSVILLE FD
99	4/22/2009 17:59	Gasconade	Berger	Central	Debris	10	0	0	0	0	0	0	0	0	0	newhafd	Primary Responder	NEW HAVEN/BERGER VFD
100	10/31/2009 11:26	Gasconade	Swiss	Central	Unknown	2	0	0	0	0	0	0	0	0	0	hermafd	Aid to MDC response	HERMANN FIRE CO
101	12/1/2009 10:56	Gasconade	Hermann	Central	Unknown	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
102	2/24/2010 15:06	Gasconade	Hermann	Central	Unknown	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
103	4/11/2010 17:26	Gasconade	Swiss	Central	Unknown	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
104	5/9/2010 19:21	Gasconade	Hermann	Central	Unknown	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
105	11/12/2010 15:43	Gasconade	Hermann	Central	Unknown	1	0	0	0	0	1	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
106	11/21/2010 17:04	Gasconade	Hermann	Central	Miscellaneous	10	0	0	0	0	1	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
107	11/28/2010 11:58	Gasconade	Swiss	Central	Miscellaneous	1	0	0	0	0	0	0	0	0	0	hermafd	Primary Responder	HERMANN FIRE CO
108	1/25/2014 11:58	Gasconade	Rosebud	Central	Miscellaneous	1	0	0	0	1	0	0	0	0	0	geralfd	Primary Responder	GERALD/ROSEBUD FPD
109	2/28/2014 14:11	Gasconade	Rosebud	Central	Miscellaneous	1.5	0	0	0	0	0	0	0	0	0	geralfd	Primary Responder	GERALD/ROSEBUD FPD
110	3/1/2014 14:48	Gasconade	Drake	Central	Debris	8	0	0	0	0	0	0	0	0	0	geralfd	Primary Responder	GERALD/ROSEBUD FPD
111	3/9/2014 15:23	Gasconade	Rosebud	Central	Debris	2	0	0	0	0	0	0	0	0	0	geralfd	Primary Responder	GERALD/ROSEBUD FPD
112	3/10/2014 13:27	Gasconade	Rosebud	Central	Debris	0.5	0	0	0	1	0	0	0	0	0	geralfd	Primary Responder	GERALD/ROSEBUD FPD
113	3/11/2014 12:41	Gasconade	GERALD	Central	Debris	20	0	0	0	0	0	0	0	0	0	beaulfd	Mutual Aid	BEAUFORT-LESLIE FPD
114	3/12/2014 12:40	Gasconade	Bland	Central	Miscellaneous	60	0	0	0	0	2	0	0	0	0	vichyfd	Mutual Aid	VICHY VFPA
115	3/15/2014 17:28	Gasconade	Bland	Central	Debris	50	0	0	0	0	0	0	0	0	0	baileb	Mutual Aid	CUBA CFD
116	3/21/2014 14:33	Gasconade	Rosebud	Central	Unknown	50	0	0	0	0	0	0	0	0	0	geralfd	Primary Responder	GERALD/ROSEBUD FPD
117	3/21/2014 17:21	Gasconade	ROSEBU	Central	Unknown	20	0	0	0	0	0	0	0	0	0	beaulfd	Mutual Aid	BEAUFORT-LESLIE FPD
118	3/23/2014 12:49	Gasconade	Rosebud	Central	Unknown	0.5	0	0	0	1	1	0	0	0	0	geralfd	Primary Responder	GERALD/ROSEBUD FPD
119	3/26/2014 15:33	Gasconade	Rosebud	Central	Debris	12	0	0	0	1	0	0	0	0	0	geralfd	Primary Responder	GERALD/ROSEBUD FPD
120	1/19/2015 12:31	Gasconade	Bland	Central	Unknown	1.5	0	0	0	0	2	0	0	0	0	bellefd	Mutual Aid	BELLE VFD
121	1/29/2015 14:58	Gasconade	Bland	Central	Unknown	0.02	0	0	0	0	2	0	0	0	0	bellefd	Mutual Aid	BELLE VFD
122	3/11/2015 15:17	Gasconade	Bland	Central	Unknown	1	0	0	0	0	0	0	0	0	0	bellefd	Mutual Aid	BELLE VFD
123	3/22/2015 13:38	Gasconade	Rosebud	Central	Miscellaneous	2	0	0	0	0	0	0	0	0	0	geralfd	Primary Responder	GERALD/ROSEBUD FPD
124	3/30/2015 16:43	Gasconade	Bland	Central	Unknown	0.5	0	0	0	0	0	0	0	0	0	bellefd	Mutual Aid	BELLE VFD

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
125	4/1/2015 11:32	Gasconade	GERALD	Central	Debris	12	0	0	0	0	0	0	0	0	0	beaulfd	Mutual Aid	BEAUFORT-LESLIE FPD
126	10/2/2015 13:43	Gasconade	Bland	Central	Unknown	0.25	0	0	0	0	0	0	0	0	0	bellefd	Mutual Aid	BELLE VFD
127	10/13/2015 14:40	Gasconade	Owensvil	Central	Unknown	5	0	0	0	0	0	0	0	0	0	geralfd	Mutual Aid	GERALD/ROSEBUD FPD
128	11/14/2015 13:18	Gasconade	Bland	Central	Unknown	40	0	0	0	1	0	0	0	0	0	bellefd	Mutual Aid	BELLE VFD
129																		
130																		