

LACLEDE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN 2019



PREPARED BY:

LACLEDE COUNTY OFFICE OF EMERGENCY MANAGEMENT

186 N ADAMS AVENUE, LEBANON, MO 65536

&

LAKE OF THE OZARKS COUNCIL OF LOCAL GOVERNMENTS

985 E HWY 54 CAMDENTON, MO 65020

PARTICIPATING JURISDICTIONS:

LACLEDE COUNTY, CITY OF LEBANON,
CITY OF RICHLAND
LACLEDE COUNTY C-5 SCHOOL DISTRICT,
LACLEDE COUNTY R-1 SCHOOL DISTRICT,
LEBANON R-III SCHOOL DISTRICT,
RICHLAND R-IV SCHOOL DISTRICT,
STOUTLAND R-II SCHOOL DISTRICT





FEMA

July 31, 2019

Mr. Ron Walker, Director
State Emergency Management Agency
P. O. Box 116
Jefferson City, Missouri 65102

Subject: Review of the Laclede County, Missouri Hazard Mitigation Plan Update

Dear Mr. Walker:

The purpose of this letter is to provide the status of the above referenced Local Hazard Mitigation Plan, pursuant to the requirements of 44 CFR Part 201 - Mitigation Planning and the Local Multi-Hazard Mitigation Planning Guidance. The Local Hazard Mitigation Plan Review Tool documents the Region's review and compliance with all required elements of 44 CFR Part 201.6, as well as identifies the jurisdictions participating in the planning process. FEMA's approval will be for a period of five years effective starting with the approval date indicated below.

Prior to the expiration of the plan the jurisdictions will be required to review and revise their plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval in order to continue to be eligible for mitigation project grant funding.

Plan Name	Date Submitted	Date Approved	Date of Plan Adoption	Date of Plan Expiration	Review Status
Laclede County	June 27, 2019	July 31, 2019	August 23, 2018	July 31, 2024	Approved

If you have any questions or concerns, please contact Joe Chandler, Planning Team Lead, at (816) 283-7071.

Sincerely,

Michael Scott
Mitigation Division Director

CONTRIBUTORS

Laclede County Hazard Mitigation Planning Committee

Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Organization
Randy Rowe	Director	Emergency Management	Laclede County
Tina Chenault	Office Manager	Emergency Management	Laclede County
Charla Baker	Administrator	Health Department	Laclede County
Joe Pickering	Eastern Commissioner	County Commissioner	Laclede County
Rick Hobbs	Director	Emergency Management	City of Richland
Sam Schneider*	Fire Chief	Lebanon Fire Department	City of Lebanon
Tina Nolan*	Superintendent	Administration	Laclede County C-5 School District
Mark Hedger	Superintendent	Administration	Laclede County R-I School District
Brad Armstrong	Assistant Superintendent	Administration	Lebanon R-III School District
Doug Smith*	Superintendent	Administration	Richland R-IV School District
Charles Stockton*	Superintendent	Administration	Stoutland R-II School District

* These members of the planning team provided one-on-one interaction with the LOCLG planning team, and provided all the required information to participate in the plan. While they could not physically be at the four (4) meetings, their participation can be documented with numerous emails and phone calls and definitely participated in the planning process.

Stakeholder Representatives

Name	Title	Agency/Organization
Jake Bohannon	Deacon	Morgan Baptist Church Conway
Dennis Price	Owner	Dove Senior Citizens Home
John Lochner	Emergency Preparation Coordinator	Mercy Hospital
Victor Medlock	Office Manager	Conway Family Clinic
John Strowe	Trustee	Hillcrest Baptist Church
Neal Wilkinson	Senior Pastor	White Oak Pond Cumberland Presbyterian Church
Russ Rouse	Member/Concerned Citizen	Conway Catholic Church and Community
Paul Posey	Pastor	Faith Baptist Church
Judith Kile	Executive Director	COPE, Domestic Violence Shelter & Agency
Marilyn Kimbrell	Board Member	COPE, Domestic Violence Shelter & Agency
Steve Leonard	President	Conway Special Road District

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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. Laclede County and participating jurisdictions and school/special districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses from hazard events to Laclede County and its communities and school/special districts. The plan is an update of a plan that was approved on July 11, 2014. The plan and the update were prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 to result in 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 8 jurisdictions that participated in the planning process:

- Unincorporated Laclede County
- City of Lebanon
- City of Richland
- Laclede County C-5 School District - Joel E. Barber
- Laclede County R-I School District
- Lebanon R-III School District
- Richland R-IV School District
- Stoutland R-II School District

Local jurisdictions that were invited, but did not participate in the plan include:

- City of Conway
- City of Stoutland
- Village of Phillipsburg
- Bennett Springs Rural Fire Protection District
- Hazelgreen Rural Fire Protection District
- Lebanon Rural Fire Protection District
- Public Water District #1
- Public Water District #2
- Public Water District #3
- Laclede County Road District
- Lebanon Special Road District
- Phillipsburg Special Road District
- Conway Special Road District

Laclede County and the entities listed above developed a Multi-Jurisdictional Hazard Mitigation Plan that was approved by FEMA on July 11, 2014 (hereafter referred to as the *2014 Hazard Mitigation Plan*). This current planning effort serves to update that previously approved plan.

The plan update process followed a methodology prescribed by FEMA, which began with the

formation of a Mitigation Planning Committee (MPC) comprised of representatives from Laclede County and participating jurisdictions. The MPC updated the risk assessment that identified and profiled hazards that pose a risk to Laclede County and analyzed jurisdictional vulnerability to these hazards. The MPC also examined the capabilities in place to mitigate the hazard damages, with emphasis on changes that have occurred since the previously approved plan was adopted. The MPC determined that the planning area is vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Riverine and flash flooding, winter storms, severe thunderstorms/hail/lightning/high winds, and tornadoes are among the hazards that historically have had a significant impact.

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

1. Mitigate the effects of potential natural hazards in Laclede County to protect lives and assets
2. Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible
3. Encourage continuity of operations of government and emergency services in a disaster
4. Increase public awareness of natural hazards that have the potential to impact Laclede County

To advance 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, background information, ideas for implementation, responsible agency, timeline, cost estimate, potential funding sources, and more.

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

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

- Unincorporated Laclede County
- City of Lebanon
- City of Richland
- Laclede County C-5 School District
- Laclede County R-I School District
- Lebanon R-III School District
- Richland R-IV School District
- Stoutland R-II School District

Model Resolution

(LOCAL GOVERNING BODY/SCHOOL DISTRICT), Missouri RESOLUTION NO. _____

A RESOLUTION OF THE (LOCAL GOVERNING BODY /SCHOOL DISTRICT) ADOPTING THE (PLAN NAME)

WHEREAS the (local governing body/school district) recognizes the threat that natural hazards pose to people and property within the (local governing body/school district); and

WHEREAS the (local governing body/school district) has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the (plan name), hereafter referred to as the Plan, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the Plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the (local governing body/school district) from the impacts of future hazards and disasters; and

WHEREAS the (local governing body) recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the (local governing body/school district) will endeavor to integrate the Plan into the comprehensive planning process; and

WHEREAS adoption by the (local governing body/school district) demonstrates their commitment to hazard mitigation and achieving the goals outlined in the Plan.

NOW THEREFORE, BE IT RESOLVED BY THE (LOCAL GOVERNMENT/SCHOOL DISTRICT), in the State of Missouri, THAT:

In accordance with (local rule for adopting resolutions), the (local governing body/school district) adopts the final FEMA-approved Plan.

ADOPTED by a vote of __ in favor and ___ against, and ___ abstaining, this day of _____, _____.

By (Sig): _____
Print name: _____

ATTEST:
By (Sig.): _____
Print name: _____

APPROVED AS TO FORM:
By (Sig.): _____
Print name: _____

1 INTRODUCTION AND PLANNING PROCESS

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1.1 PURPOSE

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Laclede County, participating jurisdictions, and the school districts developed this multi-jurisdictional hazard mitigation plan update to reduce future losses from hazard events to the county, its communities, and school districts. The plan is an update of a plan that was approved on July 11, 2014. The plan and the update were prepared by following the requirements of the Disaster Mitigation Act of 2000 to result in eligibility for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant Programs. Jurisdictions that adopted the plan did so in part to fulfill a prerequisite for mitigation grant eligibility. Consequently, those communities that choose not to be part of the multi-jurisdictional plan are not eligible applicants for FEMA pre-disaster mitigation grants (FMA, PWM, HHPD and BRIC) and will not qualify for FEMA hazard mitigation grant funds when there is a declared disaster based on the following legislation: the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the *Federal Register* on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act or DMA). The regulations established the requirements for local hazard mitigation plans are in the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288).

1.2 BACKGROUND AND SCOPE

As required by 44 CFR 201.6(d)(3), a local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts and changes in priorities, and resubmit it for approval every five (5) years in order to continue to be eligible for mitigation project grant funding. The 2019 Laclede County Multi-Jurisdictional Hazard Mitigation Plan, from here on referred to as the Plan, is an update of the 2014 Laclede County Hazard Mitigation Plan that was approved on July 11, 2014.

Local jurisdictions that participated in the 2014 Plan as well as the update include:

- Laclede County

-
- City of Lebanon
 - City of Richland
 - Laclede County C-5 School District
 - Laclede County R-I School District
 - Lebanon R-III School District
 - Richland R-IV School District
 - Stoutland R-II School District

The City of Richland is shared between Laclede, Pulaski, and Camden Counties, and decided to participate in the 2019 Laclede County Hazard Mitigation Plan. All assets within the City of Richland were included in the plan update.

Local jurisdictions that were invited but did not participate in the Plan include:

- City of Conway
- City of Stoutland
- Village of Phillipsburg
- Bennett Springs Rural Fire Protection District
- Hazelgreen Rural Fire Protection District
- Lebanon Rural Fire Protection District
- Laclede County Special Road District
- Conway Special Road District
- Lebanon Special Road District
- Phillipsburg Special Road District

All jurisdictions received email notifications of upcoming meetings and their corresponding agendas, along with participation requirements. Additionally, press releases for each meeting were placed in local papers and announcements were made on radio stations to encourage participation. The County Office of Emergency Management also called many community contacts to encourage participation. Jurisdictions listed above were not represented during the planning process and did not meet the minimum participation requirements

This mitigation plan is the representation of participating jurisdictions' commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Information in the plan will be used to help guide and coordinate mitigation activities and decision for local land use policy in the future.

1.3 PLAN ORGANIZATION

The Plan is organized into five chapters. The 2014 Plan contained five sections, which closely resemble the five chapters in the updated Plan. The format of the Plan was slightly changed to conform to the local hazard mitigation plan outline released by the Missouri State Emergency Management Agency (SEMA) in September 2017. The plan chapters include:

- Chapter 1: Introduction to the Planning Process
- Chapter 2: Planning Area Profile and Capabilities
- Chapter 3: Risk Assessment
- Chapter 4: Mitigation Strategy

-
- Chapter 5: Plan Implementation and Maintenance
 - Appendices

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 Lake of the Ozarks Council of Local Governments (LOCLG) was contracted to facilitate the plan update process. LOCLG developed and updated contact information for the local jurisdictions and area stakeholder representatives since the 2014 Plan to establish the Mitigation Planning Committee (MPC). Meeting locations and schedules were discussed, and the most effective ways of informing the public were determined.

The Mitigation Planning Committee with the assistance of Lake of the Ozarks Council of Local Governments (LOCLG) staff and members of each participating jurisdiction the plan was updated using the following process.

- Assist in establishing a Mitigation Planning Committee (MPC) as defined by the Disaster Mitigation Act (DMA)
- Organization of Planning Committee Meeting locations and times
- Follow up with MPC interim meetings IAW the DMAC requirements as established by the federal regulations and follow the most current planning guidance for the Federal Emergency Management Agency (FEMA)
- Facilitate the entire plan development
- Participation in the planning process by providing requested information
- Conduct research and documentation necessary to augment the data
- Assist in soliciting the public input
- Produce and review draft and final copies of the plan update
- Coordinate with the Missouri State Emergency Management Agency and Federal Emergency Management Agency for the plan review and approval
- Assist jurisdictions with the formal adoption of the plan prior to submitting to FEMA

The planning process included the kick-off meeting and three subsequent MPC meetings. LOCLG staff members were responsible for producing the draft and the final plan update in a FEMA-approvable document, and coordinating with the SEMA and FEMA plan reviews.

LOCLG also promoted public involvement with the plan update by providing information to interested jurisdictions, stakeholders, and public media outlets. LOCLG Executive Director Linda Conner was interviewed by KJEL/KBNN News Director to share information on updating the plan that aired on the radio on September 11, 2018. The MPC meetings on August 27, October 11, November 27, and December 11 were sent via press release to newspapers and via agendas to local jurisdictions and stakeholder representatives. Drafts of the Plan were also posted on the website www.loclg.org for public comment during the drafting of the Plan and prior to the Plan being submitted for approval. A press release indicating the availability of the draft Plan for comment and review was shared with our press contacts on December 18, 2018.

LOCLG Executive Director Linda Conner again provided an exclusive interview with the local Lebanon radio station KJEL/KBNN in regard to the release of the draft Laclede County Hazard Mitigation Plan 2019 on December 19, 2018. Appendix B provides documentation of the planning process including public involvement solicitations and meeting notices.

The preliminary draft of the plan was posted on the LOCLG website www.loclg.org for public comment on December 11, 2018.

No public comments were submitted in writing, however all comments presented by the MPC during our planning meetings were incorporated into the final draft of the plan.

Table 1.1 shows the MPC members and the entities they represent, along with their titles.

Table 1.1. Jurisdictional Representatives - Laclede County Mitigation Planning Committee

Name	Title	Department	Jurisdiction/Agency/ Organization
Randy Rowe	Director	Emergency Management	Laclede County
Tina Chenault	Office Manager	Emergency Management	Laclede County
Charla Baker	Administrator	Health Department	Laclede County
Joe Pickering	Eastern Commissioner	County Commissioner	Laclede County
Rick Hobbs	Director	Emergency Management	City of Richland
Sam Schneider*	Fire Chief	Lebanon Fire Department	City of Lebanon
Tina Nolan*	Superintendent	Administration	Laclede County C-5 School District
Mark Hedger	Superintendent	Administration	Laclede County R-I School District
Brad Armstrong	Assistant Superintendent	Administration	Lebanon R-III School District
Doug Smith*	Superintendent	Administration	Richland R-IV School District
Charles	Superintendent	Administration	Stoutland R-II School District
Steve Leonard	President	Administration	Conway Special Road District
Stakeholders			
Jake Bohannon	Deacon		Morgan Baptist Church Conway
Dennis Price	Owner		Dove Senior Citizens Home
John Lochner	Emergency Preparation Coordinator		Mercy Hospital
Victor Medlock	Office Manager		Conway Family Clinic
John Strowe	Trustee		Hillcrest Baptist Church
Neal Wilkinson	Senior Pastor		White Oak Pond Cumberland Presbyterian Church
Russ Rouse	Member/Concerned Citizen		Conway Catholic Church and Community
Paul Posey	Pastor		Faith Baptist Church
Judith Kile	Executive Director		COPE, Domestic Violence Shelter & Agency
Marilyn Kimbrell	Board Member		COPE, Domestic Violence Shelter & Agency

* These members of the planning team provided one-on-one interaction with the LOCLG planning team, and provided all the required information to participate in the plan. While they could not physically be at the four (4) meetings, their participation can be documented with numerous emails and phone calls and definitely participated in the planning process.

1.4.1 Multi-Jurisdictional Participation

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

The Plan serves as a written document of the planning process. Active participation of local jurisdiction representatives and stakeholders in the hazard mitigation planning process is essential if the Plan is to have value and represent the community's needs. Local governments must adopt the FEMA-approved update of the Plan to be eligible for mitigation funding. Each jurisdiction that is seeking approval for the Plan must have its governing body adopt the updated plan. Appendix D contains adoption resolutions for jurisdictions adopting the plan.

Development of mitigation plans requires the active participation and leadership of the jurisdictions involved. County Commissioners, incorporated communities, public schools, special districts, and various other stakeholders in mitigation planning were invited to the kick-off meeting for the Plan update on August 27, 2018. This meeting covered the Disaster Mitigation Act (DMA) requirements that each participating jurisdiction must officially adopt the plan. The minimum criteria for participation that each jurisdiction must meet in order to be considered a "participant" was established by the LOCLG and the MPC, as these are smaller communities with limited government positions; These plan participation requirements were defined as:

- Representation from each participating jurisdiction to participate in the planning process. Attendance to public meetings was not required as long as the participating jurisdiction met with the project planner and provided the necessary information to be included in the plan
- Participation by jurisdiction designated representative, scheduled MPC meetings, emails, conference calls, one on one meetings, including centralized, planning area wide MPC meetings, by either direct participation or authorized representation
- Each participating jurisdiction must provide to the MPC sufficient information to support plan development by completion and return of Data Collection Questionnaires and validating/correcting critical facility inventories
- For plan updates, eliminate from further consideration those actions from the previously approved plan that were not implemented because they were impractical, inappropriate, not cost-effective, or were otherwise not feasible
- Review and comment on plan drafts; by final review meeting or online review
- Actively solicit input from the public, local officials, and other interested parties about the planning process and provide an opportunity for them to comment on the plan
- Provide documentation to show time donated to the planning effort (if a FEMA planning grant was awarded to the County)
- All participants should formally adopt the mitigation plan prior to submittal to SEMA and FEMA for final approval. Note that an "approval pending adoption" designation can be given without submittal of adoption documents. However, submittal of all adoption documentation with the final plan is the preferred methodology.

Table 1.2 shows the representation of each participating jurisdiction at the planning meetings. All participating jurisdictions provided responses to the Data Collection Questionnaire, the active critical facility validation, the update/development of mitigation actions, the documentation of donated time, and an adoption resolution. Meeting sign-in sheets are located in Appendix B.

Table 1.2. Jurisdictional Participation in Planning Process

Jurisdiction	Meetings Attended Either Public Meetings and or Individual Meetings, Phone Interviews, Email Correspondence	Provided Requested Information and Data Collection Survey	Provided Identified Action Item with Action Worksheet	HMP Draft Review	Adopted with Signed Resolution
Laclede County	Y	Y	Y	Y	Y
City of Lebanon	Y	Y	Y	Y	Y
City of Richland	Y	Y	Y	Y	Y
Laclede County C-5 School District	Y	Y	Y	Y	Y
Laclede County R-I School District	Y	Y	Y	Y	Y
Lebanon R-III School District	Y	Y	Y	Y	Y
Richland R-IV School District	Y	Y	Y	Y	Y
Stoutland R-II School District	Y	Y	Y	Y	Y

1.4.2 The Planning Steps

FEMA requires the Hazard Mitigation Plan be updated on a five-year cycle in order to remain relevant and current. Lake of the Ozarks Council of Local Governments began the updating process in June 2018 with all staff members contributing to the overall plan update in accordance with our memorandum of agreement with SEMA.

Lake of the Ozarks Council of Local Governments started out the planning process with the on-line training available at http://sema.dps.mo.gov/programs/mitigation_management.php. Members of the LOCLG staff also attended the live training provided by SEMA.

Collecting the necessary technical data became the next area of focus as we developed the base of which we would present the materials for the updating and redevelopment process. Databases were created to incorporate as many community organizations and individuals who would benefit from their participation in the planning process. Our databases consisted of Human Services Agencies, Public Schools, Private Schools, Colleges, Churches, Daycares, Cities and Municipalities, Humanities Organizations, Special Designated Districts, Fire Protection Districts, Ambulance Districts, Emergency Management, Veterans Groups, Insurance Companies, Communications Networks and Economic Development Partners.

Upon completion of a draft copy, we presented the updated Laclede County Hazard Mitigation Plan 2019 at a public meeting encouraging comments and insight on how to make the plan more functional and helpful for all participating jurisdictions.

Lake of the Ozarks Council of Local Governments presented a draft copy to SEMA according to our memorandum of agreement.

Adoptions of the final draft were encouraged, and SEMA indicated that all participating

jurisdictions needed to have it adopted prior to submitting to FEMA for the final approval.

The following resources were utilized for the plan update:

- FEMA’s *Local Mitigation Planning Handbook (March 2013)*, *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)*.
- Tools provided by SEMA, we tested the validity of the plan and made revisions as needed
- The plan followed the 10-step planning process adapted from FEMA’s Community Rating System (CRS) and Flood Mitigation Assistance programs. The 10-step process allowed the plan to meet funding eligibility requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System, and Flood Mitigation Assistance Program. Insert the following table showing how the CRS process aligns with the Nine Task Process outlined in the 2013 *Local Mitigation Planning Handbook*.

Table 1.3 is a summary of how LOCLG staff used the Nine Task Process to develop the update to the Plan.

Table 1.3. County Mitigation 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)(1)
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)(ii); and 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)

In June 2018, LOCLG staff identified prospective participant representatives and stakeholders and a contact list was prepared for mailing an invitation letter to the kick-off meeting. The list of invitees included local elected officials, municipal government staff, county government staff, emergency services personnel, public school administrators, members from health and social services organizations, utility providers, and volunteer organizations.

The MPC met on several occasions from August through December 2018 to collaborate on the development of the Plan update. Participants assisted in data collection, reviewed and revised the Plan's mitigation strategies, and provided reviews and comments on the Plan throughout the updating process. Communication with MPC members occurred throughout the planning process through phone calls, letters, and email correspondence in addition to committee meetings.

First Meeting Kick-Off Meeting

At the August 27, 2018 kick-Off meeting at the Laclede County OEM office in Lebanon, MO Project Planner Madison Kennedy presented information on the purpose and importance of Hazard Mitigation. The presentation also included the important changes in the new SEMA template and the requirements for adoption of the plan by participating jurisdictions. The jurisdictions were informed that their participation is critical to the success of the plan. LOCLG explained that hazard mitigation is essential in the reduction of loss of lives, property damage, loss of essential services, and loss of critical facilities, economic disruption, and elimination of cycles of repetitive losses and recover time. The results can save lives, time and money.

Second Meeting Hazard History and Risk Assessment

At the October 11, 2018 meeting at the Laclede County OEM office in Lebanon, MO Project Planner Madison Kennedy presented information on risk assessment measures of Probability and Severity to the public. The jurisdiction representatives reviewed the 2014 previous plan information. This included the review of all the hazards that impact Laclede County. Discussion on current incidents and any change in the probability and severity of these hazards were discussed. Jurisdictions were informed of the importance of the Community Assessment Surveys and the different types of FEMA mitigation funding available.

Third Meeting Mitigation Action Review

At the November 27, 2018 meeting at the Laclede County OEM office in Lebanon, MO a complete review of the action items identified in the 2014 Plan were shared with the planning committee. Project Planner Madison Kennedy explained that in order for any of these current actions to move forward into the 2019 Plan a participating jurisdiction would need to adopt it and complete an Action Worksheet for that particular action. Ms. Madison also shared with the committee that an Action Worksheet is required from each participating jurisdiction in order for them to be a participant in the 2019 Plan. There was also a discussion on how the STAPLEE works and how the action worksheets would be reflected in the STAPLEE.

Fourth Meeting Laclede County Hazard Mitigation Plan Draft Review

At the December 11, 2018 meeting at the Laclede County OEM Office in Lebanon, MO Project Planner Madison Kennedy explained the overall layout of the Laclede County Hazard Mitigation Plan 2019. Ms. Kennedy also shared the highlighted areas are where we still need some additional information to complete the planning and finalize the plan. Ms. Kennedy explained the adoption process and the need for a specific action worksheet for each participating jurisdiction. Ms. Kennedy concluded the meeting by stating how to submit comments during the 30 day comment period and provided a link to the draft plan on our website, www.loclg.org.

There were several meetings conducted on a one-on-one basis throughout the planning of the Laclede County Hazard Mitigation Plan update to make sure that all jurisdictions had the opportunity to participate in the plan update. Ongoing updates and constant communication took place via email, phone calls and news blasts on the planning progress and what was still needed to include in the plan update.

Table 1.4 shows the meeting schedule and items discussed for MPC meetings.

Table 1.4. Schedule of MPC Meetings

Meeting	Topic	Date
Kick-off Meeting # 1	<ul style="list-style-type: none"> • Introduction to Hazard Mitigation • 2014 Laclede County Hazard Mitigation Plan • Why the plan needs updated • Planning process • Benefits of Participation • How to Participate • FEMA's Mitigation Funding & Past Projects 	August 27, 2018
Hazard History & Risk Assessment Planning Meeting #2	<ul style="list-style-type: none"> • Reviewing risk assessments in 2014 Plan • Discussing natural hazard events since 2014, and probability of future occurrences • Mitigation examples for natural hazards identified • Laclede County Community Assessment Survey 	October 11, 2018
Current & New Action Items Planning Meeting #3	<ul style="list-style-type: none"> • 2014 Plan action items • STAPLEE Scoring • Discussion on keeping previous action items, adopting them into the plan update, and new action items 	November 27, 2018
Presentation of Draft 2019 Laclede County HMP Planning Meeting #4	<ul style="list-style-type: none"> • Presentation on Draft Plan 2019 • Questions and comment period • Discussion on plan maintenance • Discussion on action worksheets • Discussion on adoption process • 1st Draft to SEMA January 18, 2019 	December 11, 2018

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

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

Planning Participation

Participants were engaged in the planning process. With small rural communities, the resources are limited and often times individual meetings and calls are necessary to facilitate the participation of those communities. The MPC members were engaged throughout the entire update and provided valuable insight to the concerns in Laclede County. The planning team set out to understand the concerns and the potential natural hazards within the planning area, so that mitigation strategies could be developed that would have the most benefit to Laclede County.

Our planning team included a number of clergy and faith based organizations that offered support and input into the plan development. There was also input from the non-profit sector. See the list of key stakeholders on page 1.4 for a complete list of participation.

Our planning partners play a very important role in the development of the plan, while not all planning partners were able to attend the public meetings; every effort was made to keep them engaged throughout the planning process. Efforts included letters, personal emails including agendas for upcoming meetings, and phone calls.

During the planning process, we had considerable media coverage with press representation at all our planning meetings and several radio interviews with both KRMS and KJEL. All of our planning meetings were posted as public meetings and were posted in accordance with Missouri's Sunshine Law (RSMo 610.010, 610.020, 610.023, and 610.024). Copies of press coverage and press releases can be found in Appendix B.

A survey was developed to gain a better understanding of the past, present and potential future impacts of these natural hazards on Laclede County. The survey results were presented to the committee when the discussion on the risk assessment section was being considered and developed. The MPC incorporated all the responses when considering the risk analysis and when developing the mitigation strategies.

To encourage participation from surrounding communities and counties, all information in regard to the Laclede County Hazard Mitigation update was distributed to our entire region of Camden, Laclede, Miller and Morgan counties.

A draft copy of the updated Laclede County Hazard Mitigation Plan was publicly presented at our meeting December 11, 2018 and was posted on our website on December 11, 2018. Press releases were sent to all media partners encouraging public review and soliciting comments on the updated plan.

A notification of the availability of the draft copy of the Laclede County Hazard Mitigation Plan 2019 was distributed through email, direct mail, and all media outlets on December 18, 2018.

All information received from the public were considered, presented to the committee for review and incorporated into the plan where applicable.

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.

-
- The National Inventory of Dams (NID)
 - Wildland/Urban Interface and Intermix areas from the SILVIS Lab - Department of Forest Ecology and Management - University of Wisconsin
 - Local comprehensive plans
 - Economic development plans
 - U.S. Department of Agriculture (USDA) Risk Management Agency Crop Insurance Statistics
 - 2013 & 2018 Missouri State Hazard Mitigation Plans

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

At the second MPC meeting on October 11, 2018, profiles of identified hazards from the 2014 Plan were presented. The presentation incorporated data from studies, reports, and technical information available through internet research. During the process of identifying hazards the MPC reviewed:

- Previous disaster declarations in the county
- Hazards in the most recent State Hazard Mitigation Plan
- Hazards identified in the previously approved hazard mitigation plan

The MPC prioritized the identified hazards based on the probability of occurrence and severity of the impacts. Additional information about the conclusions drawn at this meeting can be found in the Risk Assessment chapter of the Plan.

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

To accurately estimate losses, resources available on the Internet, existing reports and plans, Data Questionnaires, and HAZUS data were used to compile information regarding impacts of each identified hazard. Each of the hazards was revised to include the most recent location data, previous occurrences, probability of future occurrence, and magnitude/severity. Losses were estimated using a combination of resources, including HAZUS data and information available from local resources. In cases where vulnerability estimates were unavailable, data from the 2013 and 2018 State Hazard Mitigation Plans were utilized.

Step 6: Set Goals (Handbook Task 6)

The kick-off meeting on August 27, 2018 included discussion on the goals of hazard mitigation. In the 2014 Plan, the first goal was to mitigate the effects of potential hazards in Laclede County, followed by protecting the assets and populace through cost-effective and tangible mitigation projects. It was decided that the existing goals were still important, but just needed to be reprioritized into the format below, where goals 3 and 4 remained the same:

1. Mitigate the effects of potential natural hazards in Laclede County to protect lives and assets
2. Reduce the potential impact of natural disasters to property, infrastructure, and the local

economy through cost-effective and tangible mitigation projects whenever financially feasible

3. Encourage continuity of operations of government and emergency services in a disaster
4. Increase public awareness of natural hazards that have the potential to impact Laclede County

Step 7: Review Possible Mitigation Actions and Activities

For a comprehensive range of mitigation actions to consider, each jurisdiction was sent a list of FEMA-funded mitigation actions in the beginning of the planning process. The FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards* (2013) was linked in the kick-off meeting presentation and everyone in attendance was encouraged to review this link. The focus of the MPC meeting on November 27, 2018 was to review and update mitigation actions. The MPC also reviewed the following information during the meeting:

- The natural hazards identified in meeting 2 and the vulnerability ranking
- A list of the mitigation actions from the 2014 Plan
- Mitigation Action Worksheet examples from newly approved 2018 Miller County Hazard Mitigation Plan and 2018 Morgan County Hazard Mitigation Plan
- STAPLEE Scoring System

During the meeting, some new actions were proposed by the committee, mostly including the construction of safe rooms within school districts and fixing low water crossings. Other jurisdictions showed eagerness towards using their action worksheets to support the construction of storm shelters at the school districts.

Step 8: Draft an Action Plan

At the meeting on November 27, 2018, the MPC reviewed the action items that were in the 2014 Laclede County Hazard Mitigation Plan. Project Planner Madison Kennedy explained that these actions are intended to be completed and if any of the current actions are no longer relevant, then they would not continue on into the 2019 plan. Ms. Kennedy also explained that in order to be a participating jurisdiction each would need to have at least one identified Action Worksheet, with a mitigation action that the participating jurisdiction has identified as priority. In addition to the 2014 actions, examples of possible FEMA funded mitigation projects were shared with the jurisdictions to give them ideas on viable projects that may be applicable to their jurisdiction.

Step 9: Adopt the Plan (Handbook Task 8)

At the meeting on December 11, 2018 the adoption process was explained and emphasized that in order to be considered a participating jurisdiction a signed adoption resolution would need to be submitted with the draft plan to SEMA on January 18, 2019. A sample resolution was emailed out to each of the participating jurisdictions.

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

Plan implementation was discussed at the fourth and final meeting, but was discussed in more detail with personal correspondence with the participating jurisdictions.

2 PLANNING AREA PROFILE AND CAPABILITIES

2	PLANNING AREA PROFILE AND CAPABILITIES	2.1
2.1	<i>Laclede County Planning Area Profile</i>	2.2
2.1.2	Geography, Geology and Topography.....	2.3
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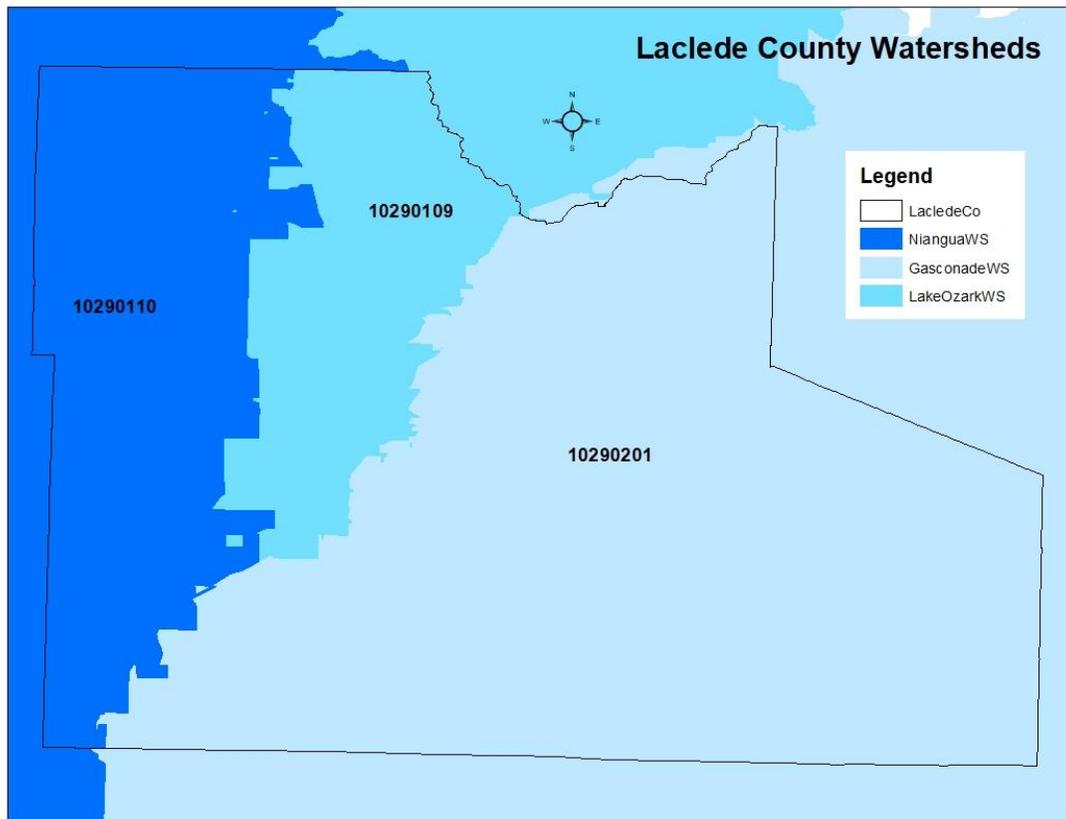
The ACS median home value in Laclede County for 2016 was \$105,500, lower than the statewide and national values of \$141,200 and \$184,700. Laclede County's median home value showed a 13 percent increase from the 2010 Census value, while the state showed a 2.5 percent increase, and the country showed a 2.0 percent decrease.

2.1.2 Geography, Geology and Topography

Laclede County is in the south central region of Missouri and is comprised of 765 square miles of land and 3 square miles of water. Although most of the county contains rural land primarily used for farming, about 41% of the county's population resides within the City of Lebanon. Lebanon is one of the two municipalities with populations over 1,000; the City of Richland is the other. Both communities have seen population growth from 2010 to 2016; Lebanon displayed a 1.2% population increase while Richland experienced a 7.9% population increase.

Laclede County lies within the Niangua, Lake Ozarks, and Gasconade River Watersheds, with the Gasconade River Watershed covering over half of the county. According to the Missouri Department of Conservation, the Gasconade River is 271 miles long, 263 of those miles maintain permanent flow, and drain into an area of about 2,806 square miles. **Figure 2.2** below shows a map of the watersheds within the county.

Figure 2.2. Watersheds within Laclede County



The entirety of Laclede County is located on the Ozarks Plateau of the Interior Highlands physiographic region. More specifically, the county lies on the Salem Plateau, which hosts the most extensive groundwater resource in the state. The combination of the vast groundwater province and the surrounding Ordovician dolostones, sandstones, and limestones leads to karst topography that displays itself across the region. Sinkholes, springs, and caves are all found within Laclede County and greatly contribute to the tourism economy. The geography of the county has also catapulted the agriculture industry in the area, since the soil is mostly comprised of silt, stony, and gravelly loam.

The Gasconade and Niangua Rivers both flow through Laclede County. The Gasconade River flows through the northeast region of the county then flows south into Wright County. The Niangua River winds in an out of the county along the northwestern border, ultimately leaving the county north of Bennett Springs. Both rivers, along with the Lake of the Ozarks to the north, flow into a plethora of creeks, springs, and other tributaries within the county.

2.1.3 Climate

Laclede County has a continental climate with cool winters and hot summers. According to the High Plains Regional Climate Center, Laclede County has an average annual temperature of 55.4 degrees Fahrenheit. The average high in July is 88.0 degrees Fahrenheit and the average low in January is 21.3 degrees Fahrenheit. The county receives approximately 45.2 inches of precipitation annually, including about 10 inches of snow.

2.1.4 Population/Demographics

Table 2.1 provides the total county population and the populations for each city, village, and the unincorporated county for 2010 and 2016 with the number and percent change. The City of Stoutland lost 33.6% of its population from 2010 to 2016. The City of Conway and the Village of Phillipsburg have seen the most growth in population, increasing by 33.9% and 35.2%. The City of Lebanon displayed the most increase in population change, increasing the population by 441 people from 2010 to 2016. The estimate for the unincorporated county is 17,548. Since the Cities of Richland and Stoutland overlap with Camden County and Pulaski County, the population shown in the table may not be exact.

Table 2.1. Laclede County Population 2010-2016 by Community

Jurisdiction	2010 Population	2016 Population	2010-2016 # Change	2010-2016 % Change
Laclede County	35,357	35,505	148	0.4%
City of Conway	699	936	237	33.9%
City of Lebanon	14,211	14,652	441	3.1%
City of Richland*	1,728	2,010	282	16.3%
City of Stoutland*	253	168	-85	-33.6%
Village of Phillipsburg	128	173	45	35.2%
Unincorporated	18,308	17,548	-760	-4.2%

Source: U.S. Bureau of the Census, Decennial Census, 2016 American Community Survey 5-year Estimates
 *population includes the portions of these cities in adjacent counties

In Laclede County, 6.3% of the population is under the age of 5, which is around the statewide and national percentages of 6.2. The population age 65 and over comprises 16.7% of Laclede County, which is higher than statewide and national percentages of 15.3 and 14.5, respectively. Laclede County has 15,773 housing units, 2,033 of these homes are vacant. The average household size in the county is around 2.5, which is just higher than the statewide average of 2.47 and just lower than the national average of 2.6.

The University of South Carolina developed an index to evaluate and rank U.S. counties' ability to respond to, cope with, recover from, and adapt to environmental hazards. The index synthesizes 29 socioeconomic variables which research literature suggests contribute to reduction in a community's ability to prepare for, respond to, and recover from hazards. The Social Vulnerability Index (SoVI®) data sources include primarily those from the United States Census Bureau.

The index is a comparative metric that evaluates the differences in social vulnerability among counties by observing uneven capacities for preparedness and response geographically. This is a valuable tool for policy makers and practitioners because it illustrates where resources might be used most effectively to reduce pre-existing vulnerability. SoVI® also is useful as an indicator in determining the differential recovery from disasters using empirically based information.

Laclede County's SoVI® score is 0.230000004, placing it in the 54.2nd percentile when compared to the country. This score means that 54.2 percent of the nation is more resilient to hazards and disasters. The main determinants of the score are qualities of the population based on race and class, wealth, elderly residents, Hispanic ethnicity, special needs individuals, Native American ethnicity, and the service industry employment.

Table 2.2 provides additional demographic and economic indicators for Laclede County and incorporated communities compared to the state of Missouri and the United States. The county as a whole had higher percentages of unemployed and families living below the poverty level compared to the statewide and nationwide percentages. In terms of education, the percentage of population in the county that is high school graduates was lower than Missouri and the U.S. The percentage of the county population that speaks a language other than English in the home was lower than Missouri and United States percentages.

Table 2.2. Unemployment, Poverty, Education, and Language Percentage Demographics, Laclede County, Missouri

Jurisdiction	Total in Labor Force	Percent of Population Unemployed	Percent of Families Below the Poverty Level	Percentage of Population (High School graduate)	Percentage of Population (Bachelor's degree or higher)	Percentage of population (spoken language other than English)
Laclede County	16,271	8.4%	15.8%	81.8%	13.7%	2.0%
Conway	359	11.4%	22.9%	71.1%	5.3%	0.4%
Lebanon	6,366	8.6%	22.3%	80.8%	12.2%	3.4%
Richland	853	12.3%	29.7%	88.4%	8.4%	2.6%
Stoutland	94	3.2%	6.5%	90.5%	14.2%	0.6%

Phillipsburg	74	13.5%	14.0%	82.4%	6.9%	0.0%
State	3,5055,025	6.6%	10.8%	88.8%	27.6%	6.0%
United States	160,818,740	7.4%	11.0%	87.0%	33.7%	21.1%

Source: U.S. Census, 2016 American Community Survey, 5-year Estimates.

2.1.5 History

Laclede County was organized February 24, 1849, and was named after Pierre Laclède, founder of St. Louis. The county was formed from parts of southern Camden County, southwestern Pulaski County, and a portion of, at that time was Crawford County, until it was divided into several other smaller counties. Wyota was chosen as the county seat but was eventually renamed Lebanon.

Laclede County, like many other counties in the area, was known as Osage territory; however, it did not take long for non-Native Americans to begin to move into the area, expanding from neighboring counties, such as Miller, Pulaski, and Dallas. The land was considered valuable since it is lush with river beds and creek bottoms, including the Gasconade River, the Niangua River, Dry Auglaize Creek, Mill Creek, and Panther Creek. The combination of these free flowing waters nourishes the area with ample, fertile soil for growing a number of crops that has kept the agricultural sector of the county growing strong for generations.

By the 1850 Federal Census, Laclede County's population had risen to almost 2,500 residents. Over the next ten years, the county's plentiful resources and prime location on the main route between St. Louis and Springfield had more than doubled the population to over 5,500. During the Civil War, many prominent families left due to varying sympathies, only to return after the war. This led to many businesses through the community either establishing with the innovation of growing urban-based businesses or expanding with confidence.

By the next Federal Census in 1870, the population of the county almost doubled once more, reaching over 9,400 residents. Since this time, the county has continued to grow and now has reached a population of 35,505 with ten school districts and five special districts, including health, water, and fire districts. Laclede County continues to maintain stability with the same abundance in resources, reverence for agriculture, and hard-working residents who nurtured this county more than 160 years ago.

2.1.6 Occupations

Table 2.3 contains occupation statistics for the incorporated cities and the county as a whole. Occupation information for Laclede County was sourced from the American Community Survey 5-year estimates 2012-2016. Management, Business, Science, and Arts Occupations includes education and healthcare practitioner and technician occupations among others. Service Occupation includes healthcare support and protective services, such as firefighters and law enforcement in addition to food preparation and personal care services. The other occupation classifications are well defined. The percentages represent the percent of workers within those occupations when compared to the total civilian employed population 16 years and over in the region.

Table 2.3. Occupation Statistics, Laclede 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
Laclede County	26.8%	17.7%	21.3%	8.5%	25.7%
Conway	23.0%	20.4%	15.1%	16.4%	25.1%
Lebanon	24.6%	15.5%	24.0%	9.4%	26.5%
Richland	20.2%	23.1%	22.9%	11.5%	22.3%
Stoutland	25.3%	9.9%	35.2%	6.5%	23.1%
Phillipsburg	10.9%	15.6%	32.8%	4.8%	35.9%

Source: U.S. Census, 2016 American Community Survey, 5-year Estimates

Conway, Lebanon, and Phillipsburg have the highest percentages of occupations within the Production, Transportation, and Material Moving sector. Richland hosts the highest percentage of occupations within the Service division, Stoutland within the Sales and Office area. Every incorporated city except for Conway has the lowest percentage of occupations within the Natural Resources, Construction, and Maintenance field. Laclede County as a whole holds the highest percentage of occupations within the Management, Business, Science, and Arts division, followed closely by the Production, Transportation, and Material Moving field.

2.1.7 Agriculture

According to the United States Department of Agriculture (USDA) 2012 Agricultural Census, Laclede County contained 1,398 farms covering around 320,136 total acres. The average farm size is 229 acres with an average market value of \$50,391,000, crop sales accounting for around 15% while livestock, poultry, and their products account for about 85% of market value. The top crop in Laclede County is corn, used for grain, silage, or greencrop. Around 41% of principal operators reported farming as their primary occupation and the percent of hired farm labor represents 4.3% of the total work force in the county.

2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area

Based on FEMA's dataset of Hazard Mitigation Assistance Grants awards, there were three HGMP projects within Laclede County.

Table 2.4. FEMA HMA Grants in County from 1993-2018

Project Type	Sub applicant	Award Date	Project Total
Safe Room	Laclede County R-I School District	September 26, 2016	\$1,957,500
Local Multihazard Mitigation Plan	Statewide	March 8, 2017	\$687,677
Safe Room	Laclede County C5 School District	March 16, 2017	\$1,611,500
Total			\$4,256,677

Source: Missouri State Emergency Management Agency, <https://fema.gov/openfema-dataset-hazard-mitigation-grants-v1>

2.2 Jurisdictional Profiles and Mitigation Capabilities

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

2.2.1 Unincorporated Laclede County

Laclede County's jurisdiction includes all unincorporated areas within the county boundaries. Laclede County is classified as a third class county in Missouri. The governing body of Laclede County is the three-member County Commission. The Commission consists of a presiding commissioner, a western commissioner, and an eastern commissioner and is responsible for these key aspects in Laclede County:

- Establishing Laclede County policies
- Approving and adopting an annual budget for all county operations
- Approving expenditures for each county department
- Supervising daily operations of Laclede County
- Ensuring compliance with all statutory requirements
- Working in partnership with County Boards, Commissions, and other Local and Regional Governmental parties

Laclede County supports the following departments:

- Assessor
- Circuit Court
- Collector
- County Clerk
- County Commission
- Coroner
- Emergency Management
- Maintenance
- Prosecuting Attorney
- Public Administrator
- Recorder
- Road and Bridge
- Sheriff
- Surveyor
- Treasurer

Mitigation Initiatives/Capabilities

Laclede County staff members possess capabilities that are beneficial for mitigation initiatives. The surveyor is capable of working on and producing boundary, topographic, and disputed boundary surveys, and is educated on flood insurance programs. In addition, the Public Works department encourages public participation in the storm water management plan and storm water committee. The Public Works department also equips crews not associated with the city to maintain a multitude of storm water situations.

The Laclede County Office of Emergency Management defines its mission as protecting the lives and property of all residents when major disasters, either natural or man-made, threaten public safety in any part of the county. They are responsible for developing a County Emergency Operations Plan that coordinates the actions of the county's government departments and agencies in the event of any emergency requiring the use of resources and personnel. In addition to developing an Emergency Operations Plan, the Office of Emergency Management also tests the outdoor warning sirens each month and performs maintenance as needed.

Table 2.5 provides information on the County's mitigation capabilities based on the Data Collection Questionnaire.

Table 2.5. Unincorporated Laclede 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	Yes, current
County Emergency Operations Plan	Yes, current
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	No
County Mitigation Plan	Yes
Debris Management Plan	No
Economic Development Plan	LOCLG CEDS 2017
Transportation Plan	LOCLG Transportation Plan 2014
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
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program (NFIP)	Yes
Community Rating System (CRS) program under the National Flood Insurance Program	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	No

Capabilities	Status Including Date of Document or Policy
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)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	Yes
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Director	Randy Rowe
NFIP Floodplain Administrator	Robert Shots
Bomb and/or Arson Squad	No
Emergency Response Team	Yes
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes
County Emergency Management Commission	Yes
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	No
Planning Consultant	No
Regional Planning Agencies	Lake of the Ozarks Council of Local Governments
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Local Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.)	No
Local Funding Availability	
Apply for Community Development Block Grants	Yes
Fund projects through Capital Improvements funding	No

Capabilities	Status Including Date of Document or Policy
Authority to levy taxes for a specific purpose	No
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	No
Ability to incur debt through special tax bonds	No
Ability to incur debt through private activities	No
Withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire for Laclede County, 2018__

2.2.2 City of Conway

The City of Conway is located near the southwest corner of Laclede County. Conway has a Mayor/Board of Alderman form of government totaling five members. Since the 2010 Census, the population of Conway rose about 18.8% increasing from 788 people to 936 people. Specific mitigation initiatives include:

- Eleven multi-purpose storm shelters or "safe rooms"
- One FEMA-funded safe room within R-I School District
- Severe Weather Alert System triggers outdoor sirens
- All shelters and safe rooms are wired to the Severe Weather Alert System
- Doors to shelters and safe rooms are tested weekly

Conway has a high percentage of older housing units and population below poverty, both at 27%.

The City of Conway has not yet participated in this Plan update, and did not yet provide the completed mitigation capabilities questionnaire.

2.2.3 City of Lebanon

The City of Lebanon is located near the center of Laclede County right off of Interstate 44. Lebanon is the county seat and has a Mayor/Board of Aldermen form of government with two members from each of the four wards. Between the 2010 Census and the 2016 American Community Survey 5 year estimates, the population of Lebanon rose about 1.2% increasing from 14,474 people to 14,652 people. Specific mitigation initiatives include:

- FEMA-funded tornado shelter under construction in the Joel E. Barber School District- (Laclede County C-5)
- Outdoor warning sirens for tornado, thunderstorm, wind warnings, tested once a month

Lebanon has the highest population out of all cities, and has a relatively high percent of people below the line of poverty, at 27%, which contributes to the vulnerability to natural disasters.

Table 2.6 provides information on Lebanon's mitigation capabilities based on the Data Collection Questionnaire.

Table 2.6. City of Lebanon Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	

Comprehensive Plan	Yes, 2005
Builder's Plan	No
Capital Improvement Plan	Yes, active, updating 2013
Local Emergency Plan	Yes
County Emergency Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	Yes
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes
Transportation Plan	Yes, 2018
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	Yes
Watershed Plan	No
Firewise or other fire mitigation plan	Yes, Firewise 2011, update 2014
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	Status Including Date of Document or Policy
Zoning Ordinance	Yes, active ordinance #3197, 1985
Building Code	Yes, 2006 IBC, IFC, Property Code, 2005 Nat. Elec. Code
Floodplain Ordinance	Yes, active ordinance #3288, 1988
Subdivision Ordinance	Yes, active ordinance #3197, 1985
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes, active
Storm Water Ordinance	Yes, active ordinance #4617, 2009
Drainage Ordinance	No
Capability	Status Including Date of Document or Policy
Site Plan Review Requirements	Yes, active code official policy
Historic Preservation Ordinance	No
Landscape Ordinance	No
Iowa Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	Status Including Date of Document or Policy
Zoning/Land Use Restrictions	Yes, ordinance #1256, 1952
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant	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	Yes, 4
Economic Development Program	Yes
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes, active ordinance #1256, 1952
Stream Maintenance Program	No
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes, Law, Fire, Public Works
Studies/Reports/Maps	Status Including Date of Document or Policy
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	Yes, 2017

Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	Status Including Date of Document or Policy
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	Yes, active
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Coordinator	No
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	Yes
Economic Development Department	Yes
Housing Department	No
Planning Consultant	No
Regional Planning Agencies	Lake of the Ozarks Council of Local Governments
Historic Preservation	No
Non-Governmental Organizations (NGOs)	Status Including Date of Document or Policy
American Red Cross	Yes
Salvation Army	Yes
Capability	Status Including Date of Document or Policy
Veterans Groups	SOP
Environmental Organization	No
Homeowner Associations	Yes
Neighborhood Associations	No
Chamber of Commerce	Yes, active
Community Organizations (Lions, Kiwanis, etc.)	Yes, active, multiple in community
Local Funding Availability	Status Including Date of Document or Policy
Ability to apply for Community Development Block Grants	Yes, active ordinance #3113, 1982
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	No
Ability to incur debt through special tax bonds	No
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire for the City of Lebanon, 2018

2.2.4 Village of Phillipsburg

The Village of Phillipsburg is located in the southwest region of the county off of Interstate 44. Phillipsburg has a Board of Trustees form of government. Between the 2010 Census and the 2016 American Community Survey 5 year estimates, the population of Phillipsburg declined 14.4%, lowering from 202 people to 173 people. Phillipsburg has the highest percent of unemployment out of all cities and villages at 5.8%. Phillipsburg currently has no mitigation initiatives or actions within the village.

The Village of Phillipsburg has not yet participated in the Plan update, and did not yet provide a completed mitigation capabilities data questionnaire.

2.2.5 City of Richland

The City of Richland is located at the northeast edge of the county. Richland has a Mayor/Board of Aldermen form of government with two members from each of the three wards. Between the 2010 Census and the 2016 American Community Survey 5 year estimates, the population of Richland rose about 7.9% increasing from 1,863 people to 2,010 people. As of 2016, Richland has the highest percentage of people below the poverty line, at 30.7%. Richland does not currently have any mitigation actions or initiatives within the city.

Table 2.7 shows information on Richland's mitigation capabilities based on the Data Collection Questionnaire.

Table 2.7. City of Richland Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Plan	No
County Emergency Plan	Yes
Local Recovery Plan	No
County Recovery Plan	Yes
Local Mitigation Plan	No
County Mitigation Plan	Yes, participating in Laclede Hazard Mitigation Plan
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	LOCLG CEDS 2017
Transportation Plan	LOCLG Transportation Plan 2014
Land-use Plan	Yes, planning and zoning flood plain
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No, burn ban only
School Mitigation Plan	N/A
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	Status Including Date of Document or Policy
Zoning Ordinance	Yes
Building Code	Yes, 1998 Boca
Floodplain Ordinance	Yes
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Capability	Status Including Date of Document or Policy
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	Yes
Landscape Ordinance	No, Nuisance Ordinance covers some landscaping policies
Iowa Wetlands and Riparian Areas Conservation Plan	N/A
Debris Management Plan	Yes, 2007, designated dump/burn site
Program	Status Including Date of Document or Policy
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant	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	Yes, 5 class
Economic Development Program	No, Richland Community Development (not city)
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	Yes, annual event in park
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes, utilities, county law and roads
Studies/Reports/Maps	Status Including Date of Document or Policy
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	N/A
FEMA Flood Insurance Study (Detailed)	N/A
Evacuation Route Map	No
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	Yes
Land Use Map	No
Staff/Department	Status Including Date of Document or Policy
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	Contract Basis
Development Planner	No
Public Works Official	Yes
Emergency Management Coordinator	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	No
County Emergency Management Commission	Yes
Sanitation Department	Contract Basis
Transportation Department	No
Economic Development Department	No
Housing Department	No
Planning Consultant	N/A
Regional Planning Agencies	Lake of the Ozarks Council of Local Governments
Historic Preservation	No
Non-Governmental Organizations (NGOs)	Status Including Date of Document or Policy
American Red Cross	No
Salvation Army	No
Capability	Status Including Date of Document or Policy
Veterans Groups	Yes, American Legion
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes, Masons
Local Funding Availability	Status Including Date of Document or Policy
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	No
Authority to levy taxes for a specific purpose	No
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No

Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	Yes, lease purchase agreement
Ability to withhold spending in hazard prone areas	Yes

Source: Data Collection Questionnaire for the City of Richland, 2018

2.2.6 City of Stoutland

The City of Stoutland is located on the northeast border of the county. Stoutland has a Mayor/Board of Aldermen form of government. Between the 2010 Census and the 2016 American Community Survey 5 year estimates, the population of Stoutland declined 12.5%, lowering from 192 people to 168 people. Phillipsburg has the highest percent of vacant housing units, at 28.6% and the second highest percentage of homes built before 1960, at 58.3%. Stoutland does not currently have any mitigation actions or initiatives within the city.

The City of Stoutland has not yet participated in the Plan update, and did not yet provide a completed mitigation capabilities data questionnaire.

Table 2.8 below summarizes the mitigation capabilities of the unincorporated areas of Laclede County, as well as each of the participating cities and villages. When relevant, the date of the most recent version is provided.

Table 2.8. Mitigation Capabilities Summary Table

CAPABILITIES	Uninc. Laclede County	City of Conway	City of Lebanon	Village of Phillipsburg	City of Richland	City of Stoutland
Planning Capabilities						
Comprehensive Plan			X			
Builder's Plan						
Capital Improvement Plan			X			
Local Emergency Plan	X		X			
County Emergency Plan	X		X		X	
Local Recovery Plan						
County Recovery Plan					X	
Local Mitigation Plan						
County Mitigation Plan	X	X	X	X	X	X
Local Mitigation Plan (PDM)						
County Mitigation Plan (PDM)						
Debris Management Plan					X	
Economic Development Plan			X			
Transportation Plan			X		X	
Land-use Plan					X	
Flood Mitigation Assistance (FMA) Plan			X			
Watershed Plan						
Firewise or other fire mitigation plan			X			
School Mitigation Plan						

CAPABILITIES	Uninc. Laclede County	City of Conway	City of Lebanon	Village of Phillipsburg	City of Richland	City of Stoutland
Critical Facilities Plan (Mitigation/Response/Recovery)						
Policies/Ordinance						
Zoning Ordinance			X		X	
Building Code			X		X	
Floodplain Ordinance	X		X		X	
Subdivision Ordinance			X		X	
Tree Trimming Ordinance						
Nuisance Ordinance			X		X	
Storm Water Ordinance			X			
Drainage Ordinance						
Site Plan Review Requirements			X		X	
Historic Preservation Ordinance					X	
Landscape Ordinance						
Iowa Wetlands and Riparian Areas Conservation Plan						
Program						
Zoning/Land Use Restrictions			X		X	
Codes Building Site/Design					X	

CAPABILITIES	Uninc. Laclede County	City of Conway	City of Lebanon	Village of Phillipsburg	City of Richland	City of Stoutland
National Flood Insurance Program (NFIP) Participant	X		X		X	
NFIP Community Rating System (CRS) Participating Community						
Hazard Awareness Program						
National Weather Service (NWS) Storm Ready						
Building Code Effectiveness Grading (BCEGs)						
ISO Fire Rating					X	
Economic Development Program						
Land Use Program						
Public Education/Awareness						
Property Acquisition						
Planning/Zoning Boards			X		X	
Stream Maintenance Program					X	
Tree Trimming Program			X		X	
Engineering Studies for Streams (Local/County/Regional)						
Mutual Aid Agreements	X		X		X	
Studies/Reports/Maps						
Hazard Analysis/Risk Assessment (Local)						
Hazard Analysis/Risk Assessment (County)						
Flood Insurance Maps			X			
FEMA Flood Insurance Study (Detailed)						
Evacuation Route Map	X		X			
Critical Facilities Inventory					X	

CAPABILITIES	Uninc. Laclede County	City of Conway	City of Lebanon	Village of Phillipsburg	City of Richland	City of Stoutland
Vulnerable Population Inventory					X	
Land Use Map						
Staff/Department						
Building Code Official			X		X	
Building Inspector			X		X	
Mapping Specialist (GIS)			X			
Engineer						
Development Planner						
Public Works Official			X		X	
Emergency Management Coordinator	X				X	
NFIP Floodplain Administrator	X		X		X	
Bomb and/or Arson Squad						
Emergency Response Team	X					
Hazardous Materials Expert						
Local Emergency Planning Committee	X		X			
County Emergency Management Commission	X				X	
Sanitation Department						
Transportation Department			X			
Economic Development Department			X			
Housing Department						
Planning Consultant						
Regional Planning Agencies						
Historic Preservation						
Non-Governmental Organizations (NGOs)						
American Red Cross	X		X			
Salvation Army	X		X			
Veterans Groups	X				X	

CAPABILITIES	Uninc. Laclede County	City of Conway	City of Lebanon	Village of Phillipsburg	City of Richland	City of Stoutland
Environmental Organization						
Homeowner Associations			X			
Neighborhood Associations						
Chamber of Commerce	X		X		X	
Community Organizations (Lions, Kiwanis, etc.)			X		X	
Financial Resources						
Apply for Community Development Block Grants	X		X		X	
Fund projects through Capital Improvements funding			X			
Authority to levy taxes for specific purposes						
Fees for water, sewer, gas, or electric services			X		X	
Impact fees for new development			X			
Incur debt through general obligation bonds					X	
Incur debt through special tax bonds					X	
Incur debt through private activities					X	
Withhold spending in hazard prone areas					X	

Source: *Data Collection Questionnaires, 2018*

2.2.7 Public School District Profiles and Mitigation Capabilities

This section provides general information about the participating school districts within Laclede County. There are six school districts with facilities in the county and five participated in the plan update. Several school districts extend into Laclede County from surrounding counties, but no facilities are located within Laclede County. **Figure 2.3** is a map of school district boundaries in Laclede County.

Figure 2.3. School Districts within Laclede County

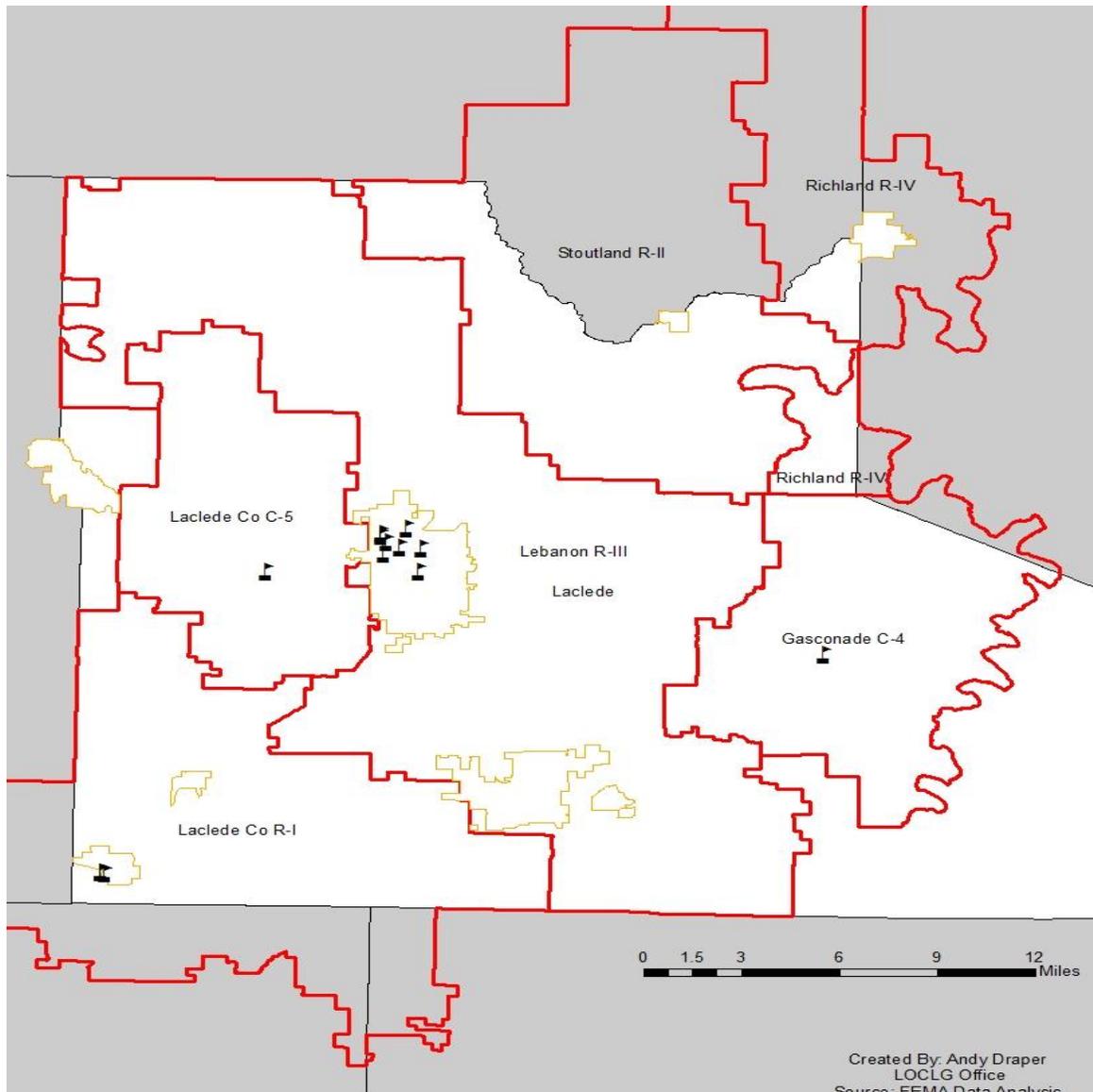


Table 2.9. School District Buildings and Enrollment Data*, 2018

District Name	Building Name	Building Enrollment
Laclede Co C-5	Joel E. Barber Elementary	448
Laclede Co R-I	Conway High Schools	344
Laclede Co R-I	Ezard Elementary	416
Lebanon R-III	Boswell Elementary	659
Lebanon R-III	Hillcrest Education Center	0
Lebanon R-III	Joe D. Esther Elementary	826
Lebanon R-III	Lebanon Middle School	1040
Lebanon R-III	Lebanon Senior High	1220
Lebanon R-III	Lebanon Tech. & Career Center	0
Lebanon R-III	Maplecrest Elementary	625
Richland R-IV	Richland Elementary	311
Richland R-IV	Richland High	76
Stoutland R-II	Stoutland Elementary	228
Stoutland R-II	Stoutland High	209

Missouri Department of Elementary & Secondary Education, <http://mcds.dese.mo.gov/quickfacts/Pages/District-and-School-Information.aspx>, *Data for Laclede County R-I, Gasconade C-4, Richland R-IV, and Stoutland R-II school districts cover more than one county and represent enrollment data for the entire school and not just the portion in the planning area

Mitigation capabilities can vary drastically in Laclede County due to the diverse enrollments across the county and the natural hazard impacts that have already been experienced. **Table 2.10** displays the five participating school districts' planning processes, personnel, fiscal, and other capabilities related to mitigation programs.

Table 2.10. Summary of Mitigation Capabilities Laclede County School Districts

Capability	Gasconade C-4	Laclede Co C-5	Laclede Co R-I	Lebanon R-III	Richland R-IV	Stoutland R-II
Planning Elements						
Master Plan/ Date	No	Yes / 2017	Yes	Yes / 2013	Yes / 2017	No
Capital Improvement	No	N/A	Yes	Yes / 2018	Yes / 2017	No
School Emergency Plan / Date	Yes	Yes / 2018	Yes / 2017	Yes / 2018	Yes / 2018	Yes, March 2015
Weapons Policy/Date	Yes / 2017	Yes / 2018	Yes	Yes / 2004	Yes / 2010	Yes
Personnel Resources						
Full-Time Building Official (Principal)	Yes	Yes	Yes	Yes	Yes	Yes
Emergency Manager	No	No	No	Yes	Yes	No
Grant Writer	No	No	No	No	No	No
Public Information Officer	Yes	Yes	No	Yes	Yes	Yes
Financial Resources						
Capital Improvements	Yes	No	Yes	Yes	Yes	No
Local Funds	Yes	No	Yes	Yes	Yes	No
General Obligation Bonds	No	No	Yes	Yes	Yes	Yes
Special Tax Bonds	No	No	Yes	No	Yes	No
Private Activities/Donation	Yes	No	Yes	Yes	Yes	Yes
State and Federal Funds/Grants	Yes	No	Yes	Yes	Yes	No
Other						

Public Education Programs	N/A	N/A	N/A	N/A	N/A	N/A
Privately or Self-Insured?	N/A	N/A	N/A	N/A	N/A	N/A
Fire Evacuation Training	N/A	N/A	N/A	Yes	Yes	Yes
Tornado Sheltering Exercises	N/A	N/A	Yes	Yes	Yes	Yes
Public Address/Emergency Alert System	Yes	Yes	Yes	Yes	Yes	Yes
NOAA Weather Radios	Yes	Yes	Yes	Yes	Yes	Yes
Lock-Down Security Training	N/A	N/A		Yes	N/A	N/A
Mitigation Programs	No	No	Yes	Yes	N/A	N/A
Tornado Shelter/Saferoom	No	Yes	Yes	Yes	No	Yes
Campus Police	No	Yes	Yes	Yes	No	Yes

Source: Data Collection Questionnaires, 2018

3 RISK ASSESSMENT

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

The goal of the risk assessment is to estimate the potential loss in Laclede County, 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 Laclede County 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 is an update of the previous Laclede County Hazard Mitigation Plan adopted in June of 2014. According to the U.S. Census Bureau's 2010 Census and 2016 American Community Survey population estimates, the population of Laclede County fell from 35,571 to 35,505. The population has decreased by approximately 39 since the Laclede County Hazard Mitigation Plan was adopted in 2014, where the population was 35,544. Although the population for the county overall has decreased, the population for the city of Lebanon has grown from 14,474 people in 2010 to 14,652 people in 2016. According to the U.S. Census Bureau, there were 83 building permits issued and less than 100 new housing units in 2017.

Laclede County is a third class county in Missouri. According to the Missouri Revised Statutes (MORS 48.020), "All counties having an assessed valuation of less than the assessed valuation necessary for that county to be in the second classification shall automatically be in the third classification."

This chapter is divided into four main parts:

- **Section 3.1 Hazard Identification** identifies the hazards that threaten Laclede County and provides a factual basis for elimination of hazards from further consideration;
- **Section 3.2 Assets at Risk** provides Laclede County'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 Laclede County. For each hazard, there are three sections:
 - 1) Hazard Profile provides a general description and discusses the threat to Laclede County, 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.

Natural hazards are any naturally occurring geophysical, hydrological, climatological, meteorological, or biological phenomenon that might have a negative effect on humans or the environment. This update of the 2014 Laclede County Hazard Mitigation Plan only addresses natural hazards that can affect Laclede County. The natural hazards identified include:

- Dam Failure
- Drought
- Earthquake
- Extreme Heat
- Land Subsidence/Sinkholes
- Riverine or Flash Flood
- Severe Thunderstorm/High Winds/Lightning/Hail
- Tornado
- Wildfire
- Winter Weather/Snow/Ice/Severe Cold

No new natural hazards have been identified since the adoption of the previous plan. The 2018 Missouri State Plan also addresses human-caused and technological hazards that are not included in this plan.

3.1.1 Review of Existing Mitigation Plans

The hazards identified in the 2014 Laclede County Hazard Mitigation Plan and the State Plan were reviewed at the second meeting, held on October 11, 2018. All hazards identified from the 2014 plan are identified in the 2018 Missouri State Hazard Mitigation Plan. Hazards that are included in the State Plan but not the Laclede County Plan include:

- Levee Failure
- Scour Critical Bridges
- Attack (Nuclear, Conventional Chemical, and Biological)
- Civil Disorder
- Cyber Disruptions
- Hazardous Materials Release (Fixed Facility Accidents)
- Mass Transportation Accidents
- Nuclear Power Plants (Emergencies and Accidents)

-
- Public Health Emergencies/Environmental Issues
 - Special Events
 - Terrorism
 - Utilities (Interruptions and System Failures)

In Missouri, local plans customarily include only natural hazards, as only natural hazards are required by federal regulations to be included. Since this is the requirement, and Laclede County is mostly rural, it was determined to only include natural hazards.

Natural hazards not included in this plan update include:

- Levee Failure
- Landslides
- Coastal Storms
- Hurricanes
- Tsunamis
- Avalanche
- Volcanic Activity

Levee failure was not included in the plan update because the National Levee Database, maintained by the U.S. Army Corps of Engineers (USACE), shows no federal levees located within Laclede County. Although there may be levees in the planning area, no records indicate that a breach in these levees would affect property other than that of the levee owner. Damage to residential or commercial structures is unlikely. Landslides were not included in the plan either, because the soil profile, geology, and climate factors in Laclede County make this hazard unlikely, and there are no records of landslide occurrence in Laclede County. Hurricane Katrina caused one disaster declaration for Laclede County; however, it was decided to exclude the hazard of hurricanes in the plan because the incident was isolated. Lastly, coastal storms, tsunamis, avalanche, and volcanic activity were not included in the Laclede County Plan because there are very little to no direct impacts from these hazards because of the county's location in the central United States.

3.1.2 Review Disaster Declaration History

Laclede County has experienced FEMA declarations from severe storms, floods, severe winter storms, and drought. Federal and/or state declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. If the disaster is so severe that both the local and state governments' capacities are exceeded; a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

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

Since 1973, Laclede County has experienced nineteen (19) hazard events that triggered federal

disaster declarations. The most recent occurred on January 21, 2016. Almost all disaster declarations involve severe storms, with 13 including flooding and 8 including tornadoes.

Table 3.1 lists the federal FEMA disaster declarations that included the planning area from 1976 to present.

Table 3.1. FEMA Disaster Declarations that included Laclede County, Missouri, 1976-Present

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
4250	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding	January 21, 2016	Individual & Public Assistance
3374	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding	January 2, 2016	Neither
4238	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding	August 7, 2015	Public Assistance
4144	Severe Storms, Straight-Line Winds, and Flooding	September 6, 2013	Public Assistance
1961	Severe Winter Storm and Snowstorm	March 23, 2011	Public Assistance
3317	Severe Winter Storm	February 3, 2011	Neither
1847	Severe Storms, Tornadoes, and Flooding	June 19, 2009	Individual & Public Assistance
3303	Severe Winter Storm	January 30, 2009	Neither
1749	Severe Storms and Flooding	March 19, 2008	Individual & Public Assistance
1742	Severe Storms, Tornadoes, and Flooding	February 5, 2008	Public Assistance
3281	Severe Winter Storms	December 12, 2007	Neither
1728	Severe Storms and Flooding	September 21, 2007	Public Assistance
1676	Severe Winter Storms and Flooding	January 15, 2007	Public Assistance
3232	Hurricane Katrina Evacuation	September 10, 2005	Public Assistance
1463	Severe Storms, Tornadoes, and Flooding	May 6, 2003	Individual & Public Assistance
1412	Severe Storms, Tornadoes, and Flooding	May 6, 2002	Public Assistance
995	Severe Storms and Flooding	July 9, 1993	Neither
3017	Drought	September 24, 1976	Neither
372	Heavy Rains, Tornadoes, and Flooding	April 19, 1973	Neither

Source: Federal Emergency Management Agency, <https://www.fema.gov/data-visualization-summary-disaster-declarations-and-grants>

3.1.3 Research Additional Sources

Many resources were used to find data on natural hazards. Primary sources included FEMA, SEMA, and National Oceanic and Atmospheric Administration (NOAA). Other information sources included county and local officials, and regional and state plans. Additional sources of data on locations and past impacts of hazards in Laclede County include:

- Missouri Hazard Mitigation Plans (2013 and 2018)
- Previously approved Laclede County Hazard Mitigation Plan (2014)
- 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
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA)
- National Centers for Environmental Information (NCEI)
- 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 (citations to sources will be in the body of the plan)

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

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

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

The database currently contains data from January 1950 to September 2017, 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.

- Tornado: From 1950 through 1954, only tornado events were recorded.
- 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.
- All Event Types (48 from Directive 10-1605): From 1996 to present, 48 event types are recorded as defined in NWS Directive 10-1605.

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

3.1.4 Hazards Identified

The natural hazards that can or have had a significant impact on Laclede County are profiled in alphabetical order below. All hazards may not affect every jurisdiction participating in the plan. **Table 3.2** provides a summary of the jurisdictions that may be affected by each hazard. An "x" in the table indicates that jurisdictions are impacted by the hazard, and a "-" indicates the hazard is not applicable to that jurisdiction.

Table 3.2. Hazards Identified for Each Jurisdiction

	Dam Failure	Drought	Earthquake	Extreme Heat	Flooding (Riverine and Flash)	Land subsidence/Sinkholes	Severe Winter Weather	Thunderstorm/Lightning /Hail/High Winds	Tornado	Wildfires
Laclede County	X	X	X	X	X	X	X	X	X	X
City of Lebanon	X	X	X	X	X	X	X	X	X	X
City of Richland	-	X	X	X	-	-	X	X	X	X
Schools and Special Districts										
Laclede County R-I School District	-	-	X	X	-	-	X	X	X	X
Laclede County C-5 School District	-	-	X	X	-	X	X	X	X	X
Lebanon R-III School District	-	-	X	X	X	X	X	X	X	X
Richland R-IV School District	-	-	X	X	-	-	X	X	X	X
Stoutland R-II	-	-	X	X	X	X	X	X	X	X

3.1.5 Multi-Jurisdictional Risk Assessment

This hazard mitigation plan is an update of the 2014 Laclede County Hazard Mitigation Plan. This is a multi-jurisdictional plan that applies to the participating jurisdictions of the unincorporated area of Laclede County, the two communities, and five school districts within. Each hazard has a profile in which the risks are assessed on a planning area wide basis since the hazards identified have the same probability of occurrence throughout the county. The hazards that vary across Laclede County in terms of risk include dam failure, flash flood, grass or wildland fire, levee failure, river flood, flash flood, and sinkholes/land subsidence. These differences are detailed in each hazard profile under geographic location and vulnerability.

The climate within Laclede County is uniform, with high temperatures in the summer and mild winters. The topography is also uniform, with most of the county having hills, streams, and rivers.

Lebanon is the most urbanized area and experiences more construction than the rest of the communities in the county. The city plans to continue growing, increasing the population and amount of assets, and thus increasing the vulnerability to all weather-related hazards. The rest of the communities within Laclede County experience very little to no growth and development, however it is possible that certain communities near Lebanon will experience some growth because of expansion. However, even if these communities experience no growth, they are still vulnerable to natural hazards since agriculture is a prime industry in the county. Hazards such as drought and hail especially threaten the rural regions. The differences in vulnerability across the jurisdictions will be discussed in greater detail within 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. If there have been any changes in Laclede County since the previous plan, the changes will be summarized including how they impact the risk. The inventory of assets for each jurisdiction was derived from census block exposure data out of HAZUS, Missouri GIS Database, and local jurisdiction data questionnaires.

3.2.1 Total Exposure of Population and Structures

Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2016 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 **Table 3.3**. Land values have been purposely excluded from consideration because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Another

reason for excluding land values is that state and federal disaster assistance programs generally do not address loss of land (other than crop insurance). It should be noted that the total valuation of buildings is based on county assessors' data which may not be current. In addition, government-owned properties are usually taxed differently or not at all, and so may not be an accurate representation of true value. Note that public school district assets and special districts assets are included in the total exposure tables assets by community and county.

Table 3.3 shows the total population, building count, estimated value of buildings, estimated value of contents and estimated total exposure to parcels for the unincorporated Laclede County and each incorporated city. **Table 3.4** that follows provides the building value exposures for the county and each city in the planning area broken down by usage type. Finally, **Table 3.5** provides the building count total for the county and each city in the planning area broken out by building usage types (residential, commercial, industrial, and agricultural).

Table 3.3. Maximum Population and Building Exposure by Jurisdiction-

Jurisdiction	2016 Population	Building Count	In *1000's Building Exposure (\$)	In *1000's Contents Exposure (\$)	In *1000's Total Exposure (\$)
City of Conway	936	398	\$66,816	\$41,148	\$108,362
City of Lebanon	14,652	6,672	\$1,642,118	\$1,132,095	\$2,780,885
City of Richland	2,010	69	\$7,466	\$3,733	\$11,268
City of Stoutland	168	153	\$21,040	\$13,179	\$34,372
Village of Phillipsburg	173	84	\$11,331	\$5,732	\$17,147
Unincorporated Laclede County	17,566	8,148	\$1,330,401	\$803,508	\$2,142,057
Totals	35,505	15,524	\$3,079,172	\$1,999,395	\$5,094,091

Sources: Population, 2016 U.S. Census Bureau American Community Survey; Building Count and Building Exposure, Missouri GIS Database: http://sema.dps.mo.gov/programs/mitigation_management.php; Contents Exposure derived by applying multiplier to Building Exposure based on HAZUS MH 2.1 standard contents multipliers per usage type as follows: Residential (50%), Commercial (100%), Industrial (150%), Agricultural (100%). For purposes of these calculations, government, school, and utility were calculated at the commercial contents rate.

Table 3.4. Building Values/Exposure by Usage Type

Jurisdiction	In *1000's Residential	In *1000's Commercial	In *1000's Industrial	In *1000's Agricultural	In *1000's Total
City of Conway	\$52,746	\$10,523	\$1,410	\$2,137	\$66,816
City of Lebanon	\$1,145,038	\$369,445	\$124,991	\$2,644	\$1,642,118
City of Richland	\$7,466	\$0	\$0	\$0	\$7,466
City of Stoutland	\$15,795	\$4,855	\$73	\$317	\$21,040
Village of Phillipsburg	\$11,199	\$132	\$0	\$0	\$11,331
Unincorporated Laclede County	\$1,118,020	\$127,793	\$64,233	\$20,355	\$1,330,401
Totals	\$2,350,264	\$512,748	\$190,707	\$25,453	\$3,079,172

Source: Missouri GIS Database, http://sema.dps.mo.gov/programs/mitigation_management.php;

Table 3.5. Building Counts by Usage Type

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Total
City of Conway	357	24	6	4	391
City of Lebanon	6,068	443	85	12	6,608
City of Richland	68	0	0	0	68
City of Stoutland	145	4	0	2	151
Village of Phillipsburg	82	1	0	0	83
Unincorporated Laclede County	7,581	294	127	100	8,102
Totals	14,301	766	218	118	15,403

Source: Missouri GIS Database, http://sema.dps.mo.gov/programs/mitigation_management.php; Public School Districts and Special Districts

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 3.6** 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 3.6. Population and Building Exposure by Jurisdiction-Public School Districts

Public School District	Enrollment	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Gasconade C-4 School District	65	1	\$1,607,000	\$1,607,000	\$3,214,000
Joel E. Barber Laclede County C-5	448	3	\$11,035,000	\$11,035,000	\$22,070,000
Laclede County R-I School District	760	2	\$1,715,000	\$1,715,000	\$3,430,000
Lebanon R-III School District	4,370	17	\$22,198,000	\$22,457,000	\$44,655,000
Richland R-IV School District*	467	0	\$0	\$0	\$0
Stoutland R-II School District	438	2	11,349,470	3,060,741	14,410,211

Source: <http://mcds.dese.mo.gov/quickfacts/Pages/District-and-School-Information.aspx>, Data Collection Questionnaires from Public School Districts. In general, the school districts obtain this information from their insurance coverage amounts. *HAZUS values for Richland R-IV are 0 because none of the Richland R-IV education buildings are located within Laclede County; this district is still included in the Plan since the district covers part of Laclede County.

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 3.7 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 information.

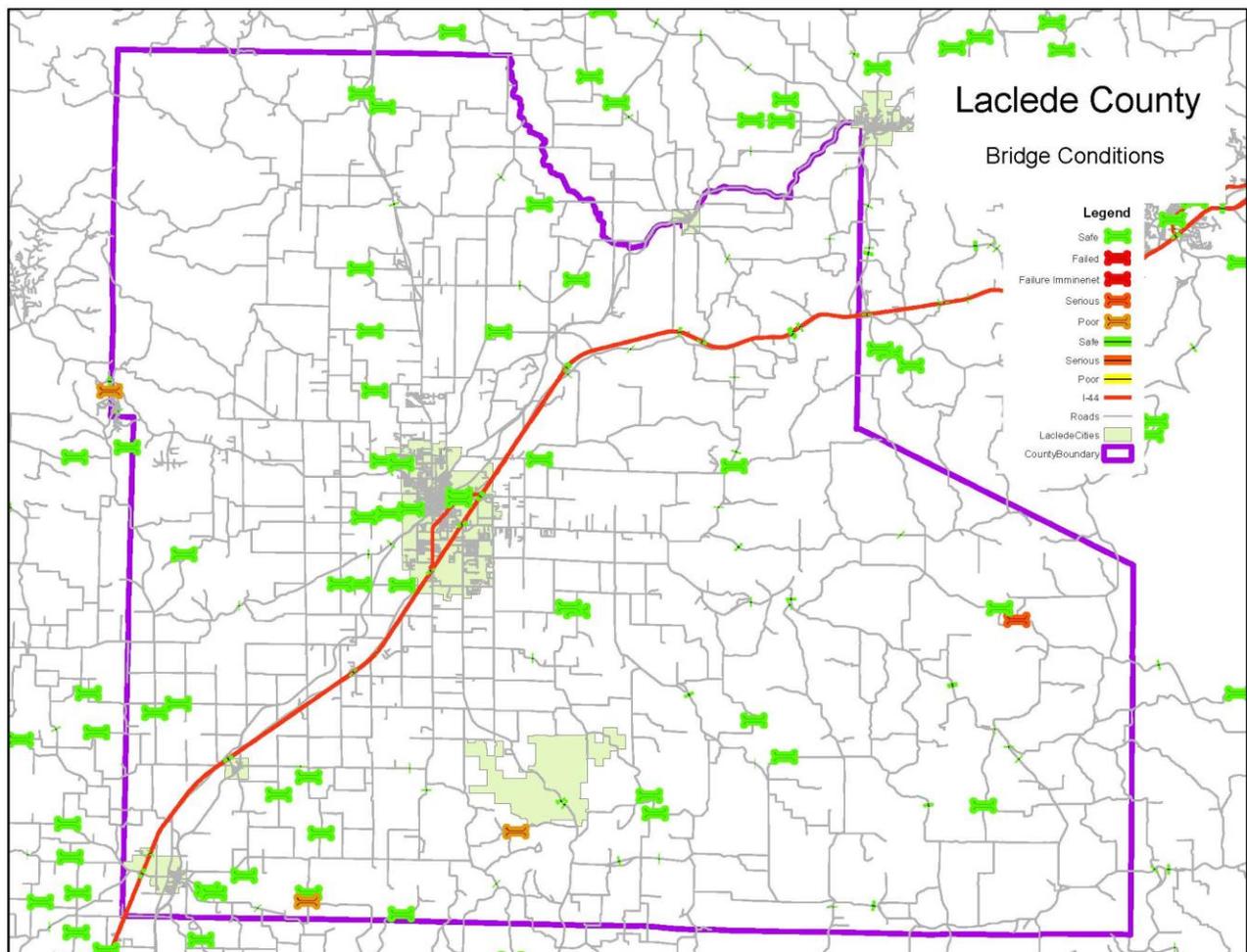
Table 3.7. Inventory of Critical/Essential Facilities and Infrastructure by Jurisdiction

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						1		1			5			1				1						9
City of Conway				5			1			1	1				1	1		1	1	4	1		1	18
City of Lebanon	1	1	18	4		1	1	1	1		1	1						1	1	1	1		1	35
City of Richland	1		1	1	1	1	1	2	1			2		1	2	1		1		4				20
Village of Phillipsburg				1			1				1							1	1	1				6
City of Stoutland							1				1				1			1	1	1				6
Totals	2	1	19	11	1	3	5	4	2	1	9	3	0	2	4	2	0	6	4	11	2	0	2	94

Source: Data Collection Questionnaires; HAZUS, etc.

Bridges: **Figure 3.1** below shows the locations of bridges in Laclede County. Most of the bridges are shown as being in good condition, however there are three labeled as being in poor condition, and one as being in serious condition. According to the 2013 Missouri State Hazard Mitigation Plan, there is one state-owned scour critical bridge in Laclede County. The term "scour critical" refers to a bridge that upon inspection, was determined to be unstable due to erosion, or scouring, of its foundation. This element is quantified using a "scour index", which is a number indicating the vulnerability of a bridge to scour during a flood. This scour critical bridge is not shown in **Figure 3.1**, but can be seen in **Figure 3.2** below.

Figure 3.1. Laclede County Bridges



Source: Lake of the Ozarks Council of Local Governments

Figure 3.2. Scour Critical Bridge in Laclede County



Source: 2013 Missouri State Hazard Mitigation Plan

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 3.8** shows Federally Threatened, Endangered, Proposed and Candidate Species in Laclede County.

Table 3.8. Threatened and Endangered Species in Laclede County

Common Name	Scientific Name	Status
Gray Bat	<i>Myotis grisescens</i>	Endangered
Indiana Bat	<i>Myotis sodalis</i>	Endangered
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Threatened
Niangua Darter	<i>Etheostoma nianguae</i>	Threatened
Scaleshell Mussel	<i>Leptodea leptodon</i>	Endangered
Spectaclecase (mussel)	<i>Cumberlandia monodonta</i>	Endangered

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

Natural Resources: The Missouri Department of Conservation (MDC) provides a database of lands the MDC owns, leases, or manages for public use. **Table 3.9** provides the names and locations of parks and conservation areas in Laclede County.

Table 3.9. Parks in Laclede County

Area Name	Address	City
Anna M Adams Access	Off of Dawn Road	Richland
Bear Creek Conservation Area	Off of County Road MM-325	Lebanon
Bennett Springs State Park	26250 MO-64A	Lebanon
Coffin Cave Conservation Area	Off of County Road 64-999	Lebanon
Coleman Memorial Conservation Area	Off of Coach Road	Lebanon
Davis Ford Access	Off of State Highway AC	Lebanon
Goose Creek Conservation Area	Off of State Highway CC	Phillipsburg
Hazelgreen Access	Off of Heartwood Road	Richland
Hull Ford Access	Off of State Highway N	Richland
Long Ford Access	Off of State Highway 8	Lebanon
Osage Fork Conservation Area	Off of State Highway C	Lebanon
Prosperine Access	Off of Kinfolk Road	Eldridge

Source: <http://mdc7.mdc.mo.gov/applications/moatlas/AreaList.aspx?txtUserID=guest&txtAreaNm=s>

Park Name	Address	City
Atchley Park	1805 Lynn Street	Lebanon
Boswell Park	1205 Kent Drive	Lebanon
Gasconade Park	Fourth Street and Van Buren Street	Lebanon
Harke Park	2901 National Street	Lebanon
Nelson Park	1523 Maple Lane	Lebanon
Palmer Park	500 E. Elm Street	Lebanon
Spiller Park	488 Spiller Street	Lebanon
Wallace Park	325 Harwood Avenue	Lebanon
W.T. Vernon Park	Mayfield Street	Lebanon

Source: <https://www.lebanonmissouri.org/263/Parks-Recreation>

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.

The properties in Laclede County that are on the National Register of Historic Places are listed in **Table 3.10**.

Table 3.10. Laclede County Properties on the National Register of Historic Places

Property	Address	City	Date Listed
Bennett Spring State Park Hatchery-Lodge Area Historic District	Off MO 64	Lebanon	3/04/1985
Ralph E. Burley House	389 S Adams Avenue	Lebanon	7/07/1994
Joe Knight Building	201 W. Commercial Street	Lebanon	9/06/2005
Laclede County Jail	Adams and 3rd Streets	Lebanon	3/27/1980
Ploger-Moneymaker Place	291 Harwood Avenue	Lebanon	9/23/1982
Wallace House	230 Harwood Avenue	Lebanon	3/22/1984

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

Economic Resources: Most manufacturing companies and businesses in Laclede County are located within the City of Lebanon. **Table 3.11** lists the employers with the largest work forces.

Table 3.11. Major Non-Government Employers in Laclede County

Employer Name	Main Locations	Product or Service	Employees
Tracker Marine	Lebanon	Aluminum Fishing and Pleasure Boats	425
Detroit Tool Metal Products	Lebanon	Metal stamping, fabrication, and robotic welding	275
Regal-Beloit	Lebanon	Electric Motors	340
Lowe Boats	Lebanon	Aluminum Fishing and Pleasure Boats	325
Independent Stave Company	Lebanon	White oak barrels for wine and spirits industry	350
Marine Electrical Products	Lebanon	Fiberglass assemblies and wiring harnesses for the boating industry	300
The Durham Company	Lebanon	Electric metering bases and devices	263
Detroit Tool Engineering	Lebanon	Metal stamping, tool design, and automation systems	120
Lebanon Publishing Company	Lebanon	Newspaper and other print media publishing	37
Sign-Fab	Stoutland	Outdoor advertising signage	60
Carmeco, Inc.	Lebanon	Metal fabrication, stamping, and welding	40
Metaltech Products, Inc.	Lebanon	Metal fabrication, stamping, and welding	80

Source: Lebanon Regional Economic Development, Inc.

Agriculture: **Table 3.12** provides a summary of agriculture in Laclede County. Agriculture is an important industry within Laclede County and the surrounding areas however; most farms employ a small number of workers, and a high number of those workers report working less than 150 days of the year.

Table 3.12. Agriculture-Related Jobs in Laclede County

Employment Information	Farms	Workers	\$1,000 Payroll
Hired Farm Labor	264	633	1,687
Farms with One Worker	137	137	-
Farms with Two Workers	50	100	-
Farms with Three or Four Workers	58	203	-
Farms with Five to Nine Workers	11	71	-
Farms with 10 Workers or More	8	122	-
Reported Only Workers Working 150 Days or More	39	63	787
Reported Only Workers Working Less Than 150 Days	198	390	355
Reported Both	27	180	545
Unpaid Workers	560	1,311	-

Source: Census of Agriculture, 2012

3.3 Land Use and Development

3.3.1 Development Since Previous Plan Update

Laclede County as a whole has experienced a slight decrease in population since 2010, dropping about 0.2% from 35,571 to 35,505. Although the county overall shows a population decline, three of the cities, Conway, Lebanon, and Richland, have seen population increase since 2010. **Table 3.13** provides the population growth statistics for all cities in Laclede County as well as the county as a whole.

Table 3.13. County Population Growth, 2000-2010

Jurisdiction	Total Population 2016	Total population 2010	2010-2016 # Change	2010-2016 % Change
Laclede County	35,505	35,571	-66	-0.2%
City of Conway	936	788	148	18.8%
City of Lebanon	14,652	14,474	178	1.2%
City of Richland	2,010	1,863	147	7.9%
City of Stoutland	168	192	-24	-12.5%
Village of Phillipsburg	173	202	-29	-14.4

Source: U.S. Bureau of the Census, Decennial Census, American Community Survey 2016

Population growth or decline is generally accompanied by increases or decreases in the number of housing units. This trend was followed for Lebanon, increasing in population and housing units, Stoutland and Laclede County as a whole, decreasing slightly in both population and housing units. However, this trend did not apply to Conway or Richland, both experiencing an increase in population with a decrease in housing units. Phillipsburg decreased in population but showed no change in housing units. **Table 3.14** provides the change in numbers of housing units in the planning area from 2010 to 2016.

Table 3.14. Change in Housing Units, 2010-2016

Jurisdiction	Housing Units 2016	Housing Units 2010	2010-2016 # Change	2010-2016 % Change
Laclede County	15,773	15,778	-5	0.03%
City of Conway	339	362	-23	-6.4%
City of Lebanon	6,907	6,728	179	2.7%
City of Richland	915	926	-11	-1.2%
City of Stoutland	91	104	-13	-12.5%
Village of Phillipsburg	82	82	0	0.0%

Source: U.S. Bureau of the Census, Decennial Census, American Community Survey 2016

Overall, the jurisdictions within Laclede County have shown varying degrees of growth and decline since the last plan. The city of Lebanon has experienced most of the growth and development, and the cities of Conway and Richland have experienced some growth. The city of Stoutland and village of Phillipsburg have seen no growth and mostly decline. A summary for each jurisdiction is provided below.

City of Conway

Conway has experienced an increase in population since the last plan. However, there was no reported significant residential, commercial, or industrial development since the previous plan, and housing units have decreased according to the U.S. Census Bureau.

City of Lebanon

Lebanon has seen the most growth overall out of all of the communities; both population and housing units in the area have increased. As previously stated, Lebanon holds most of the employment for Laclede County. Lebanon also sits just off Interstate-44 and has three exits, which can pull in the industrial and tourist traffic. In 2017 alone, there were 14 new commercial/industrial building permits and 56 multi-family unit permits issued. The development of new businesses leads to increased population, which can overall increase vulnerability and potential damage from natural hazards.

City of Richland

Although Richland has experienced an increase in population since the previous plan, no new development has been reported in the city.

City of Stoutland

Stoutland has experienced a decrease in population as well as number of structures since the previous plan. According to the U.S. Census Bureau, the city has seen a decrease in most industries since 2015, so there is no expected development in the future.

Village of Phillipsburg

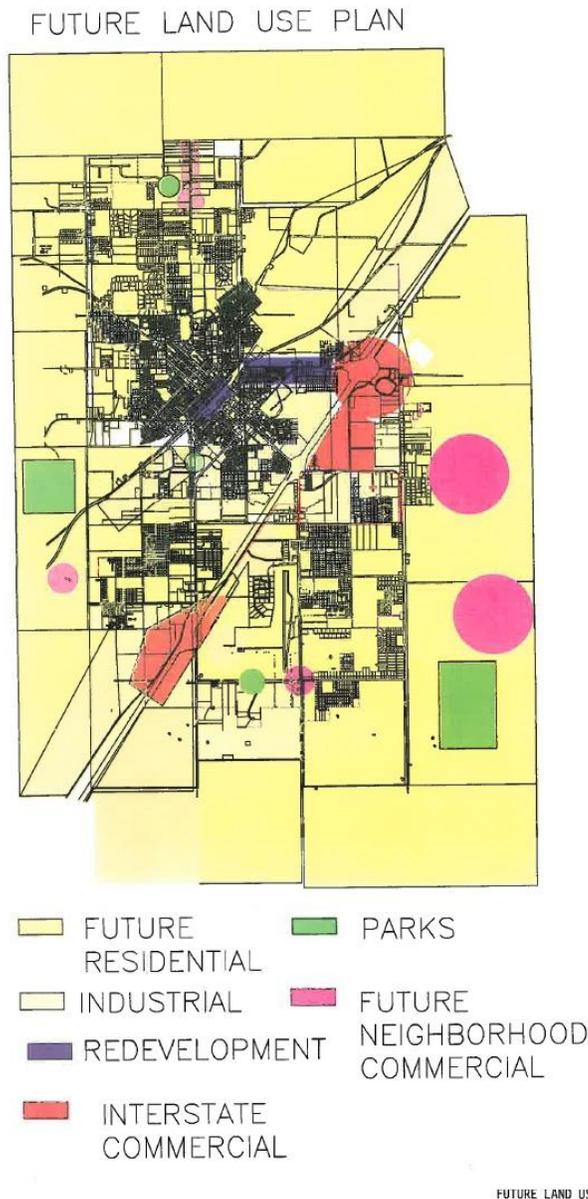
The Village of Phillipsburg has seen a decline in population and no new development since the last plan. Since this area of the county is rural, there is no growth expected in the near future.

is possible that this city could continue growing in the future.

City of Lebanon

Lebanon has experienced the most growth out of all jurisdictions and hosts the largest amount of industry in the county. Although the population increase has been minor, the addition of new businesses and homes could lead to additional growth in population. The existing development along with the proximity to Interstate 44 makes the City of Lebanon a hub for growth in Laclede County. According to Lebanon's 2005 Comprehensive Plan, future land use includes mostly residential and industrial development, with zones of redevelopment, interstate commercial, park, and future neighborhood commercial identified. **Figure 3.4** below shows the diagram used in the 2005 Comprehensive Plan.

Figure 3.4. City of Lebanon Future Land Use Plan, 2005



Source: City of Lebanon Comprehensive Plan, 2005

City of Richland

Richland has seen an 8% population increase according to the 2010 Census and the 2016 American Community Survey. Richland's proximity to Fort Leonard Wood and Interstate 44 allows some military members to reside in this town, which could lead to slow growth over time. However, no comprehensive plans are known, and there are no plans for future development at this time.

City of Stoutland

Stoutland's population has decreased from 192 to 168 between 2010 and 2016. The city is also close to Fort Leonard Wood and Interstate 44, however, the lack of growth, combined with the small population allows little room for development for the city.

Village of Phillipsburg

Similar to Stoutland, Phillipsburg has also seen a decline in population since 2010. Phillipsburg sits right off of Interstate 44 and is about 10 miles southwest of Lebanon; however, it is not likely that Phillipsburg will experience any growth in the near future.

School District's Future Development

Gasconade C-4 School District

The district expects the enrollment to remain around the same, and does not have any ongoing projects or plans for construction in the future. No new construction has occurred since the last plan completion in 2014.

Laclede County C-5 School District

The school district recently received a FEMA-funded storm shelter, which was recently completed. Otherwise, the district has no plans for future construction, and expects enrollment to see little or no change within the next five years.

Laclede County R-1 School District

This school district plans to see a 0-5% increase in enrollment over the next five years. Since the last plan, there have been elementary additions and a FEMA cafeteria/kitchen addition. They also have future plans of construction within the next 5 years.

Lebanon R-III School District

Since the last plan, this school district has constructed Lebanon Middle School, equipped with a saferoom. The saferoom however was not constructed in accordance with FEMA standards. Currently, the district has plans to construct a storm shelter gym and classroom addition at Maplecrest Elementary. The district is expecting to see enrollment increase by about 1% within the next five years.

Richland R-IV School District

This district plans on seeing little or no change with enrollment over the next five years. The district has a 10-year plan, which can include building upgrades and improvements; however, there are no specific plans for construction in the near future.

Stoutland R-II School District

The Stoutland R-II School District three items they would like to work on in the next five years. They would like to explore the possibility of building a storm shelter to provide adequate protection to the district and surrounding community. There is also a pressing need to fix the leaking roof that is causing damage and destruction to parts of the existing building. Also during a flooding event, it is dangerous and often times areas of the district that are not accessible by the buses because of low

water crossings being flooded and not safe to cross. The school district would like to develop and alternate route for each of the county roads that have a high tendency to flood during most heavy rain events.

3.4 Hazard Profiles, Vulnerability, and Problem Statements

Each hazard will be analyzed individually in a hazard profile. 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.

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

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

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

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

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

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

Vulnerability Assessments

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

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

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

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

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

Following the hazard profile for each hazard will be the vulnerability assessment. The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to damages from natural hazards. The vulnerability assessments will be based on the best available county-level data, which is in the Missouri Hazard Mitigation Plan (2018). 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 County A 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

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

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

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

Problem Statements

Each hazard analysis must conclude with a brief summary of the problems created by the hazard in the planning area, and possible ways to resolve those problems. Include jurisdiction-specific information in those cases where the risk varies across the planning area.

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/>
- National Inventory of Dams
- MO DNR Dam & Reservoir Safety Program;
- National Resources Conservation Service <http://www.nrcs.usda.gov>
- DamSafetyAction.org, <http://www.damsafetyaction.org/MO/>

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

According to the Missouri Department of Natural Resources National Inventory of Dams, as of July 2017, Laclede County holds eighteen dams. Out of those eighteen dams, only one is state regulated. Dams that fall under state regulation are non-federally regulated dams that are more than 35 feet in height. The Department maintains the Dam and Reservoir Safety Program in Missouri, which ensures that dams over 35 feet in height are safely constructed, operated, and maintained pursuant to Chapter 236 of Revised Statutes of Missouri. Whether regulated or unregulated, the Department of Natural Resources provides information about both types of dams, including dam dimensions, date of construction, approximate reservoir volume, and more.

Table 3.15 below shows the system of classification used by the Missouri Department of Natural Resources. A hazard classification is assigned to each dam during the initial permit process. Out of the eighteen dams listed by MDNR, seven are ranked as Class II and eleven are ranked as Class III.

Table 3.15. MDNR Dam Hazard Classification Definitions

Hazard Class	Definition
Class I	The area downstream from the dam that would be affected by inundation contains ten (10) or more permanent dwellings or any public building. Inspection of these dams must occur every two years.
Class II	The area downstream from the dam that would be affected by inundation contains one to nine permanent dwelling, or one (1) or more campgrounds with permanent water, sewer, and electrical services or one (1) or more industrial buildings. Inspection of these dams must occur once every three years.
Class III	The area downstream from the dam that would be affected by inundation does not contain any of the structures identified for Class I or Class II dams. Inspection of these dams must occur once every five years.

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

In addition, U.S. Army Corps of Engineers maintains the National Inventory of Dams (NID) for the United States. This inventory includes all dams meeting at least one of the following criteria:

1. High hazard classification - loss of human life is likely if the dam fails
2. Significant hazard classification - no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns
3. Equal or exceed 25 feet in height and exceed 15 acre-feet in storage
4. Equal or exceed 50 acre-feet storage and exceed 6 feet in height

The goal is to include all dams in the United States, however, is limited due to lack of information and funding. Although the NID also provides a hazard classification for dams, the classification system differs than the one provided by the Department of Natural Resources. There is not a direct correlation between the State Hazard classification and the NID classifications; however, most dams that are in the State's Classes I and II are considered NID High Hazard Dams. **Table 3.16** displays the hazard classifications for the National Inventory of Dams.

Table 3.16. NID Dam Hazard Classification Definitions

Hazard Class	Definition
Low Hazard	Where dam failure or operational errors result in no probable loss of human life and low economic and/or environmental losses
Significant Hazard	Where dam failure or operational errors result in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns
High Hazard	Where dam failure or operational errors will likely result in the loss of at least one human life

Source: National Inventory of Dams

Geographic Location

Dams in Planning Area

There are eighteen dams recorded in Laclede County in both the MDNR and the NID database. Seven of the dams are classified as high hazard, zero are classified as significant hazard, and eleven are classified as low hazard. The U.S. Army Corps of Engineers own none of the dams in Laclede County.

Table 3.17 provides the names, locations, and other pertinent information for all high hazard dams in the planning area. An acre-foot is defined as the volume of one acre of surface area to the depth of one foot.

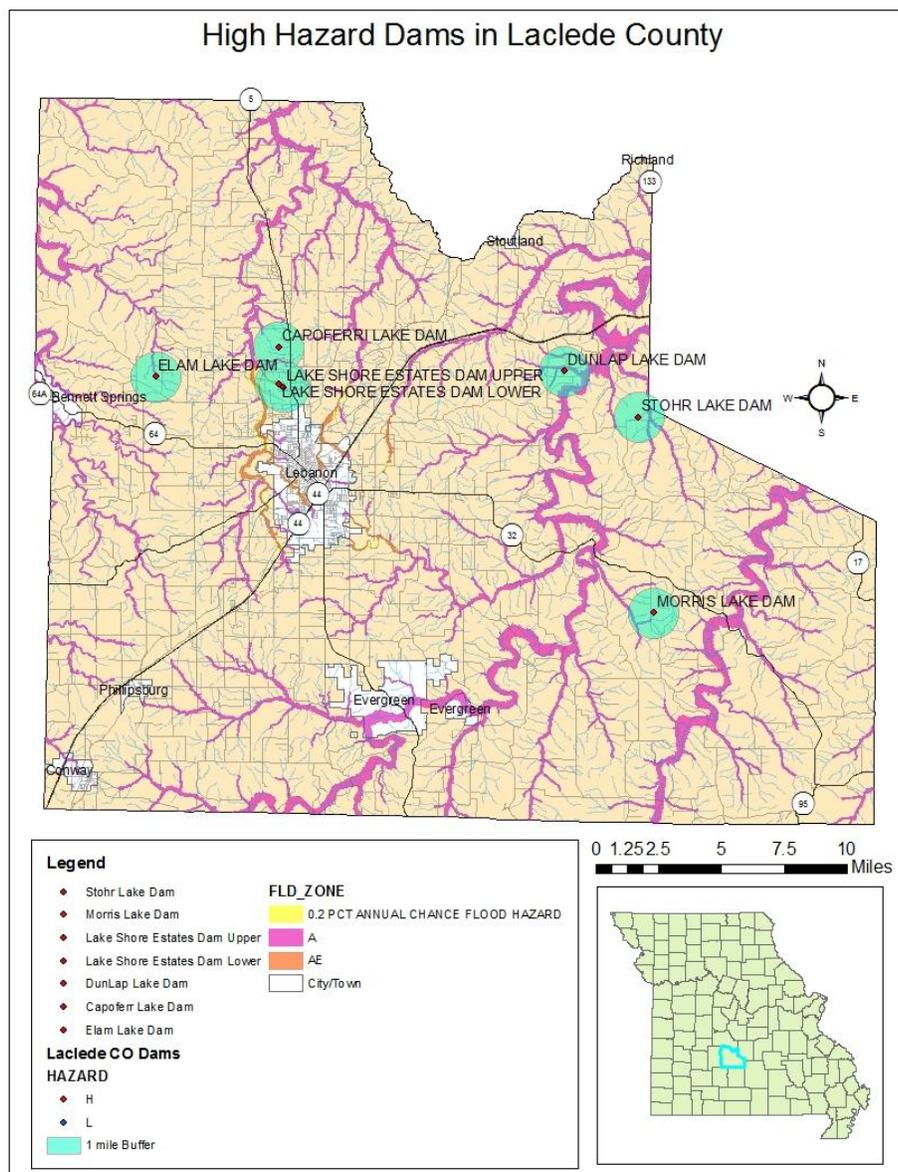
Table 3.17. High Hazard Dams in Laclede County

Dam Name	Emergency Action Plan (EAP) AP	Dam Height (Ft)	Normal Storage (Acre-Ft)	Last Inspection Date	River	Nearest Downstream City	Distance To Nearest City (Miles)	Dam Owner
Capoferri Lake Dam	NR	16	128	-	Goodwin Hollow Creek	Lebanon	6	E. L. Capoferri
Elam Lake Dam	NR	30	144	-	Mountain Creek	Eldridge	8	William J. Elam
Lake Shore Estates Dam Lower	NR	20	160	-	Goodwin Hollow Creek	Lebanon	4	Rec Assc of Lake Shore Est.
Lake Shore Estates Dam Upper	NR	15	120	-	Goodwin Hollow Creek	Lebanon	4	Rec Assc of Lake Shore Est.
Dunlap Lake Dam	NR	25	107	-	Similin Creek	Stoutland	6	Paul D. Dunlap
Stohr Lake Dam	NR	25	67	-	Praire Creek	Stoutland	9	Paul E. Stohr
Morris Lake Dam	NR	25	107	-	Gasconade River	Falcon	0	Darrell E. Morris

Sources: Missouri Department of Natural Resources, <http://dnr.mo.gov/env/wrc/dam-safety/statemap.htm> and National Inventory of Dams, http://nid.usace.army.mil/cm_apex/f?p=838:12 By the end of 2015, the Missouri DNR anticipates having Emergency Action Plans, including inundation maps for all state-regulated Class 1 and Class 2 dams. Contact the DNR Dam and Reservoir Safety Program at 800-361-4827 to request the inundation maps for your county to show geographic locations at risk, extent of failure and to perform GIS analysis of those assets at risk to dam failure.

Figure 3.5 provides the locations of NID high hazard dams located in the planning area. The figure shows that the dams have a considerable distance between them and any of the communities, school districts, and special districts within the county. It is unlikely that any of the cities, schools, or special districts would be impacted by dam failure in Laclede County. However, three of the dams are located within a mile of Route 5, which is a common road traveled for work and tourism, so the failure of these dams would lead to flooding on these roads and potential injury or loss of life. There will be information on the assets that would be impacted by a dam failure in the vulnerability assessment section.

Figure 3.5. High Hazard Dam Locations in Laclede County and Areas Impacted in the Event of Breach

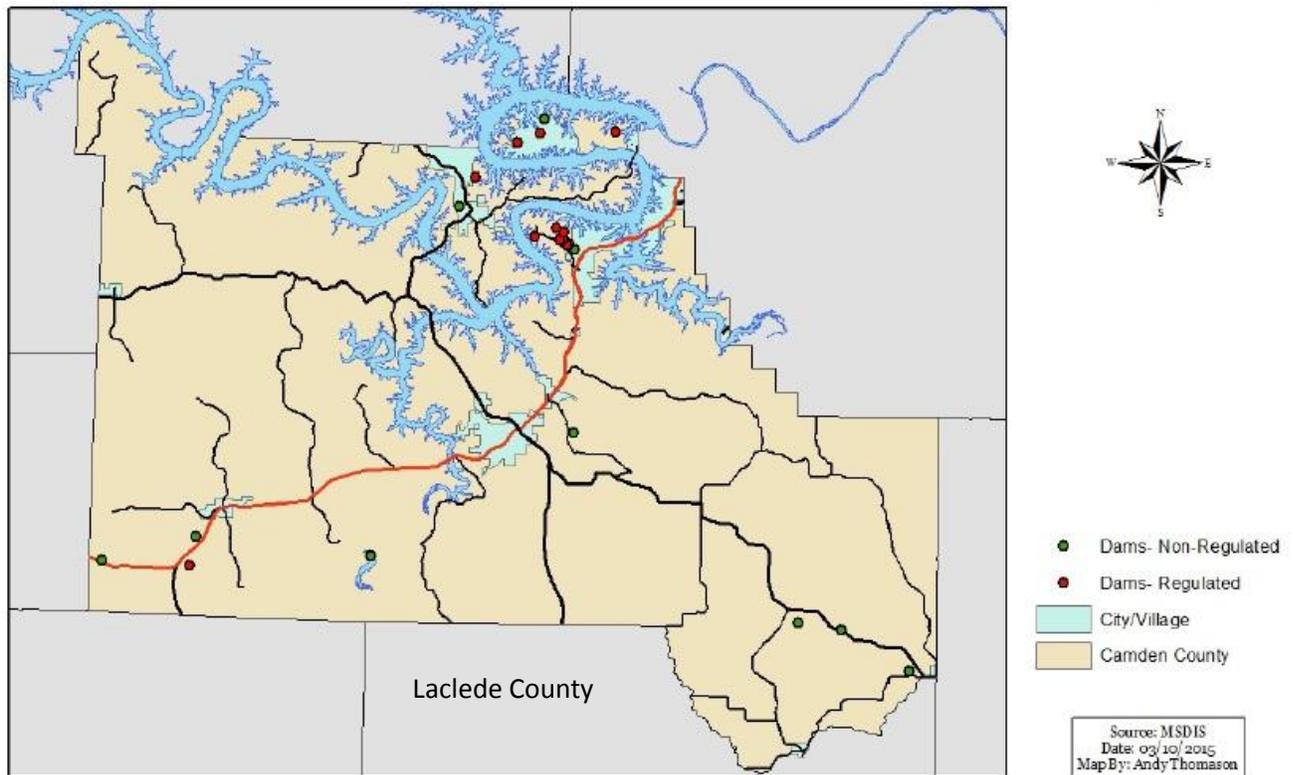


Source: Lake of the Ozarks Council of Local Governments

Upstream Dams Outside the Planning Area

Camden County sits just north of Laclede County, and has 22 dams that are either regulated or inventoried by the Missouri Department of Natural Resources (DNR). **Figure 3.6** below shows the regulated and inventoried dams. Four dams are relatively close to Laclede County and are non-regulated; however, the risk is low because of the dam sizes and lack of infrastructure immediately surrounding. Overall, the threat of upstream dam failure is minor, if not non-existent, for Laclede County.

Figure 3.6. Upstream Dams Outside Laclede County



Source: Camden County Hazard Mitigation Plan, 2015

Severity/Magnitude/Extent

The severity/magnitude of dam failure is similar in some aspects 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. Note that for this reason, dam failures could flood areas outside of mapped flood hazards.

Previous Occurrences

Dam failure incidents in the United States have caused death, injury, and billions of dollars in property damage. Missouri has been subjected to these impacts multiple times with incidents including dam failure at Lawrenceton in 1968, Washington County in 1975, and Fredericktown in 1977, and more recently Taum Sauk in 2005. Failed sensors at the Taum Sauk Hydroelectric Plant led to overflowing and eventual collapse of a restrictive wall. The flood was stopped by the lower reservoir, however, homes were still damaged and a family of five suffered injuries. Fortunately, there have been no recorded incidents of dam failure in Laclede County which caused injury, loss of life, or significant property damage.

Probability of Future Occurrence

Currently, there are no records of dam failure in Laclede County, making the probability 0% (0 events/100 years = 0% probability). All of the dams were constructed in the 1960's and 1970's, so lack of regulation and maintenance could possibly lead to dam failure. For the purposes of this assessment, dam failure and its associated impacts cannot be neglected. The probability of this event will be placed as less than 10% to allow for a risk assessment.

Vulnerability

Vulnerability Overview

There is only one state regulated dam in Laclede County, which is a Class 3, and according to the 2018 Missouri State Hazard Mitigation Plan, there are no structures or populations at risk if this dam was to fail. As for the other six high hazard dams, the possibility of failure still does not threaten much infrastructure or population. Both the Lake Shore Estates upper and lower dams are four miles from the City of Lebanon. These two dams are the closest to city limits compared to the other five high-hazard dams within Laclede County. However, most damage from failure would most likely be in residential areas and on major roads, including Route 5.

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

Information from the 2018 State Plan was used in completing **Table 3.18** below. There is only one state-regulated dam in Laclede County, ranked a Class 3. This means that for 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.

Average values for residential structures were obtained for each county from HAZUS-MHMR4. 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% the value of the structure. Actual losses will vary based on the depth of inundation.

Table 3.18. Laclede County Dam Failure Vulnerability

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 (\$)
Laclede	0	0	1	1	0	86,388	0	0	0

Impact of Previous and Future Development

The main area of Laclede County that will likely see the most growth in the future is the City of Lebanon. Three high risk dams sit directly north of the city, so any residential or industrial growth north of the city may be placing itself at risk of dam failure. **Figure 3.4** above shows that most of the growth will be in or directly around Lebanon, and so far, the only growth that may spread north of the

city is residential. Currently, the building permit data on Lebanon's website shows permit information for within the city limits. Although it seems that most growth and development will take place within city limits, it is possible that future development will start to spread farther north of the city, which could put any new infrastructure at risk of dam failure.

Hazard Summary by Jurisdiction

The jurisdiction that is most at risk for dam failure is Lebanon. As **Figure 3.5** shows, if the three high hazard dams north of Lebanon failed, there could be some minor flooding in the extreme north region of Lebanon. There are no schools located in this area, so most damage, if any, would be to residences or businesses.

Problem Statement

Overall, dam failure is a relatively low risk to Laclede County and incorporated communities. Regular inspections and maintenance of dams may reduce likelihood of a dam failure event. Although the probability of dam failure is low, there is still potential damage that could occur if a dam in the county was to fail.

The dams that could cause the most risk are Capoferri Lake Dam, Lake Shore Estates Upper Dam, and Lake Shore Estates Lower Dam since they are high risk and sit just north of Lebanon. The residents, business owners, and schools that may have buses travel in this area should be familiar with a dam emergency action plan in case of failure. If an emergency action plan is not available, then there should at least be a notification system in place for local law enforcement, government agencies, and residents. It would be beneficial for jurisdictions, especially Lebanon, to work closely with dam operators and participate in emergency exercises.

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, https://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/index.asp and http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/
- USDA Risk Management Agency, Insurance Claims, <https://www.rma.usda.gov/data/cause>
- 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 State 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.

Geographic Location

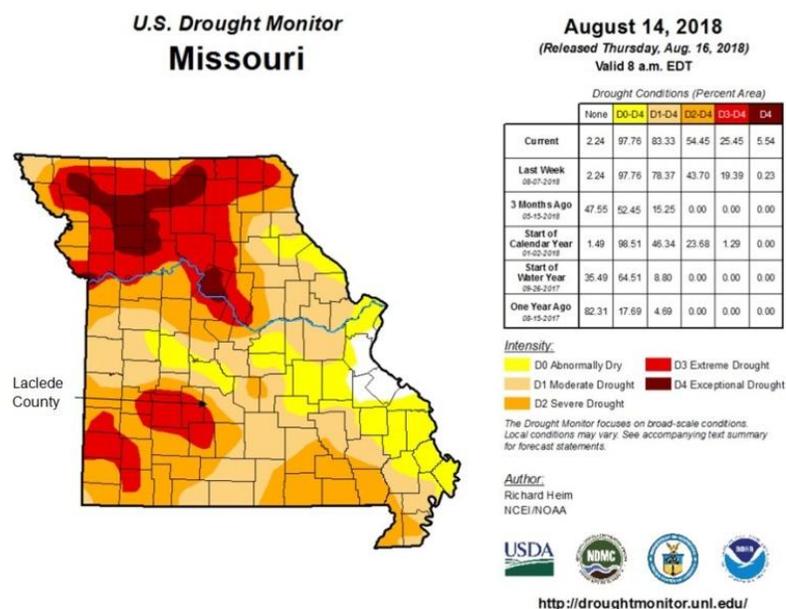
All of Laclede County is at risk to drought. Drought most directly impacts the agricultural sector, which possessed 320,136 acres, approximately 65% of land, in the county as of 2012. The farms are not geographically concentrated in one area in the county, and land used for farming increased by 11% since 2007. The market value of products also increased since 2007, crops by 15% and livestock by 85%. Since the land use for agriculture and market value of products have all increased since 2007, it is logical to assume that the agriculture sector in Laclede County will at least remain the same, or may continue to grow, which would keep the vulnerability to drought the same or increase.

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.

Figure 3.7 below shows drought conditions for Missouri as of August 14, 2018. Laclede County was subject to drought conditions ranging in moderately dry to extreme drought.

Figure 3.7. U.S. Drought Monitor Map of Missouri on August 14, 2018



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

Drought conditions over the last five years in Laclede County have led to crop indemnities. The year with the highest losses was 2014, when a prolonged drought caused a total of \$150,443.88 in crop indemnities. The crops that have been most vulnerable to these drought conditions are corn and soybeans. **Table 3.19** shows the amount of drought losses for each of the past five years.

Table 3.19. USDA Indemnity Payments for Losses due to Drought 2014-2018

Year	Crop	Losses
2014	Corn	\$10,749.00
2014	Corn	\$517.00
2014	Corn	\$84,918.88
2014	Corn	\$4,490.00
2014	Corn	\$1,913.00
2014	Soybeans	\$18,274.00
2014	Soybeans	\$29,582.00
2015	Soybeans	\$10,729.00
2016	Corn	-\$2,668.00
2016	Corn	\$7,670.00
2017	Corn	\$4,675.00
2017	Corn	\$87,187.87
2017	Corn	\$7,340.00
2017	Soybeans	\$23,306.00
2017	Soybeans	\$8,103.60
2018	Corn	\$40,838.00
2018	Corn	\$9,129.92
2018	Corn	\$71,597.78
2018	Soybeans	\$914.00
Total		\$419,267.05

Source: USDA Risk Management Agency
<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.

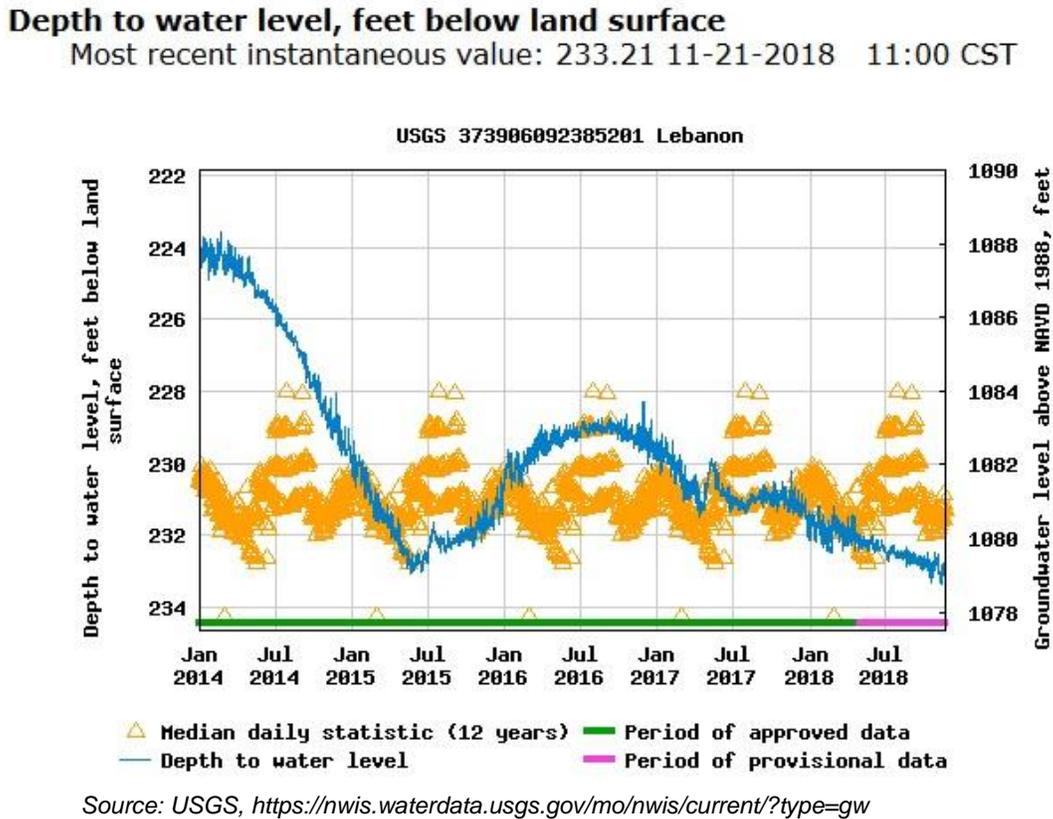
The Palmer Index has proven most effective in identifying long-term drought of more than several months. However, the Palmer Index has been less effective in determining conditions over a matter of weeks. It uses a “0” as normal, and drought is shown in terms of negative numbers; for example, negative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

According to the Department of Natural Resources 2017 Annual Water Quality Report for Laclede

County, water in the area comes mostly from eight ground water wells. **Figure 3.8** below shows the depth to water level from January 2014 to August 2018. The figure shows a dramatic drop in ground water depth from January 2014 to July 2015, where it rises again until July 2016, and has been dropping since. Laclede County experienced extended drought conditions in 2014, from March until October, which most likely had a significant impact on the groundwater level. The dramatic drop in water level during 2014 and the first half of 2015 coincides with the county's 2014 drought conditions and the highest losses in crops in 2015.

Figure 3.8. Depth to Water Level in Laclede County from January 2014 - August 2018



Previous Occurrences

The NOAA Storm Events Database includes eight drought events occurring in Laclede County since 1999. Many of these are multiple reports from one prolonged drought event. In the 1999 drought event, dry weather and above average temperatures reduced crop and milk yield for farmers, and started affecting the winter wheat crop yield. Stock ponds also dried up which forced farmers to pump or transport water; some farmers were forced to sell their cattle or livestock. In addition, there were a few reports of a few shallow wells running dry.

During the August 2012 drought event that received most damage, a high-pressure ridge over central parts of the county led to dry conditions. Drought conditions reached severe and exceptional levels, and 50-75% of combined corn, soybeans, and hay acreage were lost across the Ozarks and southwest regions.

Table 3.20. Previous Drought Occurrences in Laclede County 1998-2018

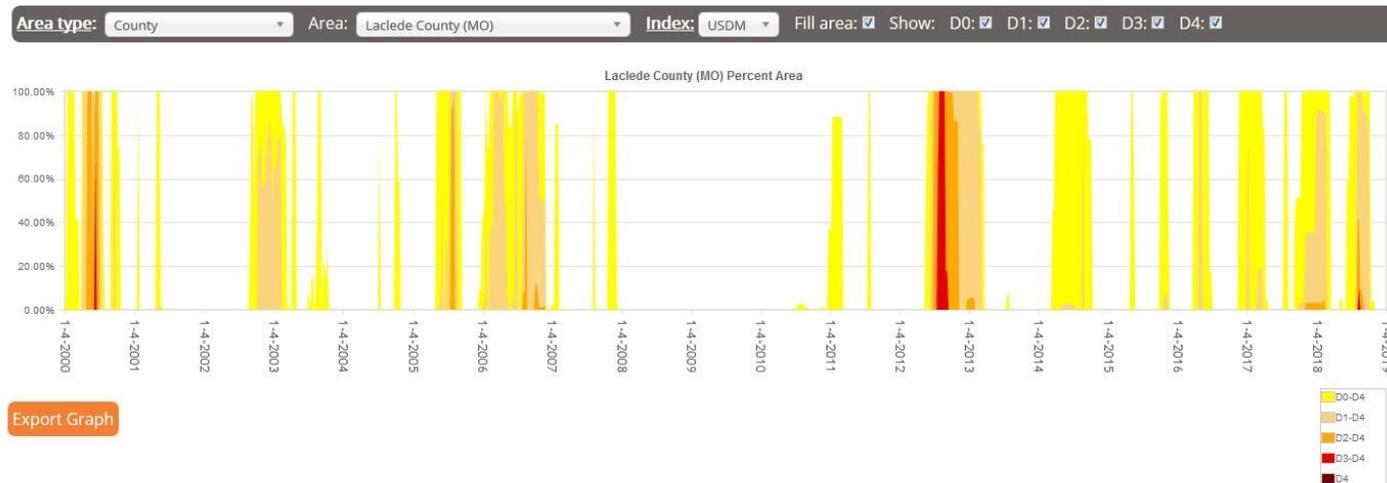
Duration	Property Damage	Crop Damage	Event Description
October 1, 1999 - October 31, 1999	\$0	\$20,000	Drought conditions existed across central, south central and southwest Missouri from early July through October. The hardest hit areas were in south central Missouri where Spring rainfall was also below normal.
August 10, 2000 - August 31, 2000	\$0	\$0	Drought conditions worsened across central, south central and southwest Missouri in early August, and maintained its intensity through the month. Very abnormally high temperatures by the end of the month, averaging 6 to 12 degrees above normal.
September 1, 2000 - September 15, 2000	\$0	\$0	Drought conditions continued from August through the second week of September before much needed rainfall began to relieve the drought during the middle part of the month, very high temperatures continued through beginning of month.
July 1, 2012 - July 31, 2012	\$0	\$0	The U.S Drought Monitor continued to report Severe Drought (D2) to Extreme Drought (D3) throughout the month of July. While the region received some rainfall during the month, the coverage was very limited and sparse. The COOP station near Lebanon reported 0.59 of rainfall for the month of July.
August 1, 2012 - August 31, 2012	\$0	\$2,920,000	The U.S Drought Monitor continued to report Extreme Drought (D3) to Exceptional Drought (D4) throughout the month of August. The region started seeing some rainfall by the end of the month. The COOP station near Lebanon reported 3.46 of rainfall for the month of August.
September 1, 2012 - September 30, 2012	\$0	\$0	The U.S Drought Monitor continued to report Severe Drought (D2) throughout the month of September. The region saw more rainfall than previous months, which helped the rainfall deficit. The COOP station near Lebanon reported 5.25 of rainfall for the month of September.
October 1, 2012 - October 31, 2012	\$0	\$0	The U.S Drought Monitor continued to report Moderate Drought (D1) to Severe Drought (D2) throughout the month of October. The COOP station near Lebanon reported 3.65 of rainfall for the month of October.
November 1, 2012 - November 30, 2012	\$0	\$0	The U.S Drought Monitor continued to report Severe Drought (D2) throughout the month of November. The COOP station near Lebanon reported 1.17 of rainfall for the month of November.

Source: NOAA Storm Events Databas, <https://www.ncdc.noaa.gov/stormevents/>

Probability of Future Occurrence

Drought severity data for Laclede County was available from a near nineteen-year period on the National Drought Mitigation Center website. A graph of the drought severity within the county is shown in **Figure 3.9** below. Using this data, there were 55 months out of the 227 month period where half or more of Laclede County was experiencing at least D1 conditions, or moderate drought. This means that there is around a 24% chance that that at least half of the county will experience moderate drought conditions in any given month.

Figure 3.9. Drought Severity in Laclede County, 2000-2018



Source: National Drought Mitigation Center, <http://droughtmonitor.unl.edu/Data/Timeseries.aspx>

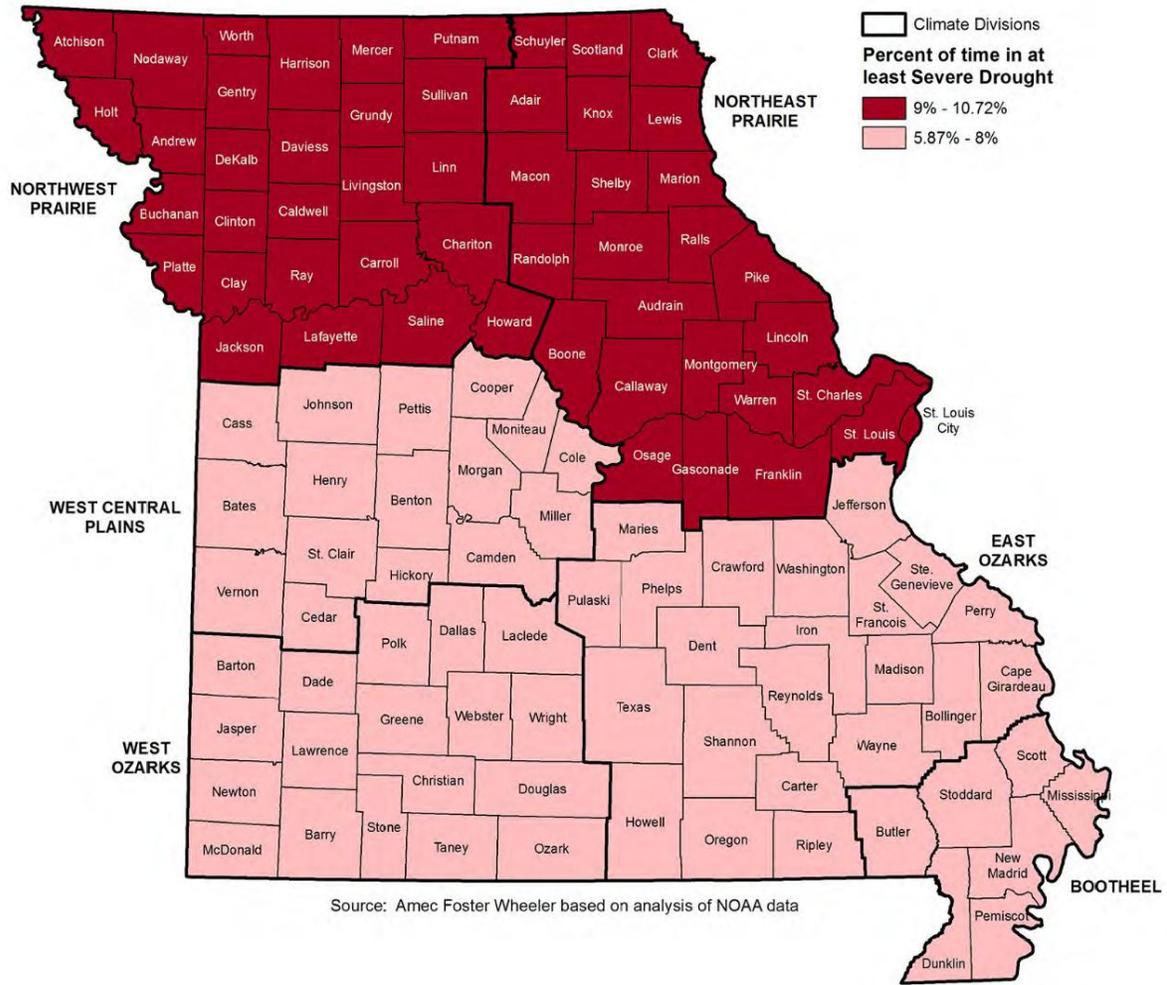
The intensity of the drought conditions in **Figure 3.9** are shown in the bottom right corner. The colors range from yellow to dark red, the lightest, D0 represents "abnormally dry", D1 represents moderate drought, D2 represents severe drought, D3 is extreme drought, and D4 is exceptional drought. Laclede County has not experienced any D4 drought conditions in the last nineteen years.

Vulnerability

Vulnerability Overview

Figure 3.10 below was included in the 2018 Missouri State Hazard Mitigation Plan to show the different regions of vulnerability based on the Palmer Drought Severity Index. Laclede County is included within the "West Ozarks" region and borders the "East Ozarks" and "West Central Plains" regions. The Plan states that most southern portions of Missouri are less susceptible to the impacts of prolonged dry periods because of abundant groundwater resources.

Figure 3.10. Palmer Drought Severity Index Regions in Missouri



Source: 2018 Missouri State Hazard Mitigation Plan,

Potential Losses to Existing Development

In Laclede County, the agricultural sector experiences most damage from drought events. Because of this, determining the costs associated with drought and potential losses are dominantly based on agricultural losses. According to data from the USDA Risk Management Agency, there was \$419,267.05 in insured crop loss payments in Laclede County between 2014 and 2018, with an annualized value of \$83,853.41. Based on the losses since 2014, there is potential that future droughts could result in additional crop losses. There are no anticipated structural losses, loss of life, or injuries associated with this hazard.

Impact of Previous and Future Development

According to the 2012 Census of Agriculture County Profile for Laclede County, the number of farms and land in farms have increased by 11% between 2007 and 2012. This increase of agricultural activity leads to an increase in drought-related agricultural losses. In addition, increases in

population, specifically in Lebanon, will increase the demand for treated water and increase waste water discharge, adding additional strain on water systems.

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.

The Natural Resources Defense Council water sustainability index is based on the following criteria:

- Projected water demand as a share of available precipitation
- Groundwater use as a share of projected available precipitation
- Susceptibility to drought
- Projected increase in freshwater withdrawals
- Projected increase in summer water deficit

The risk to water sustainability for counties meeting less than two criteria are considered to have low risk, those meeting two criteria are considered to have moderate risk, those meeting three criteria are considered high risk, and those meeting four or more are classified as at extreme risk. Without considering climate change impacts, Laclede County is classified as at low risk. However, when the Natural Resources Defense Council factors in climate change impacts, the risk to water sustainability in Laclede County is increased to at moderate risk.

Hazard Summary by Jurisdiction

The probability of drought is the same for the entire county, and the drought conditions experienced in the cities would be the same as those experienced in rural areas. There are three public water districts that cover the county, and those that receive water from these sources are less likely to feel the impacts of drought compared to those who rely on private wells. Laclede County PWSD #1, #2, and #3 serve the Cities of Lebanon and Stoutland. The unincorporated areas of Laclede County rely on private wells for water. Smaller communities do not have public water and also rely on private wells for water. Agricultural croplands and pastures of the area are the most vulnerable when it comes to drought and water shortages.

Problem Statement

Drought is a moderate risk overall to Laclede County, mostly within the agricultural sector. Drought damage has occurred in the past and is most likely going to occur in the future, especially when impacts from climate change are taken into consideration. Currently, crop insurance is the best way to provide protection from crop losses in times of drought. Planting drought-resistant hybrid crops and utilizing moisture-preserving farming methods could help conserve the water supply and reduce crop loss for farms. Potential actions to mitigate the impacts of drought within the county could include public information campaigns regarding how and when to save water, and restricting use of public water for non-essential usage.

3.4.3 Earthquakes

Some specific sources for this hazard are:

- U.S. Seismic Hazard Map, United States Geological Survey, https://earthquake.usgs.gov/hazards/hazmaps/conterminous/2014/images/HazardMap2014_lg.jpg;
- 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone map, <http://www.igsb.uiowa.edu/Browse/quakes/quakes.htm>;

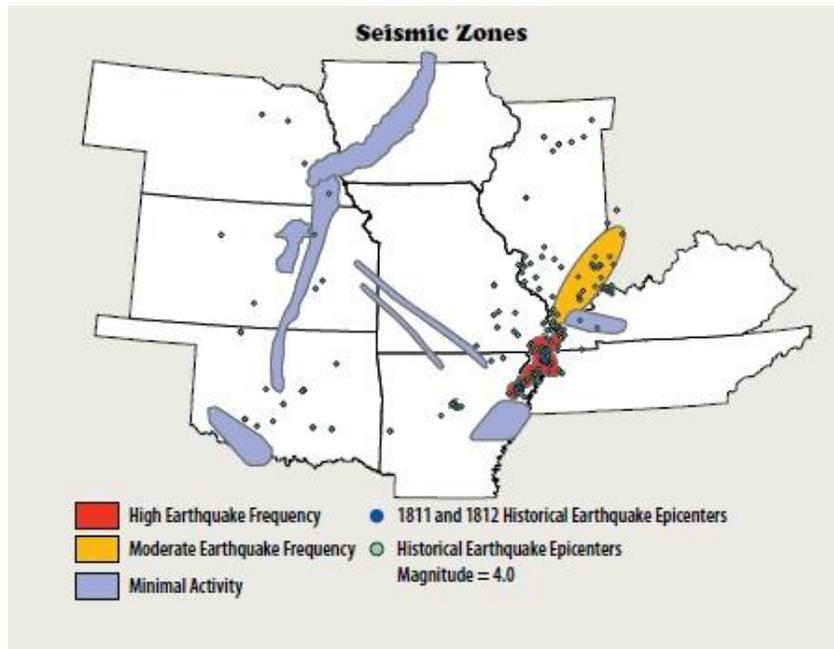
Hazard Profile

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.

According to the Missouri Department of Natural Resources, Missouri experiences small earthquakes nearly every day. Most of these earthquakes are too small to be felt, but are still recorded on seismographs. In Missouri, the most common seismic zone is the New Madrid Seismic Zone in southeast Missouri. This seismic zone was responsible for the 1811-1812 New Madrid earthquakes, which was a series of earthquakes that began with an earthquake of magnitude 7.5-7.9 and was followed by a 7.4 aftershock on December 16, 1811. Although this is the largest earthquake we have recorded from this seismic zone, smaller earthquakes have continued to occur since. **Figure 3.11** shows the seismic zones in and around Missouri, the only moderate and high earthquake frequencies lie along the New Madrid Seismic Zone. Smaller seismic zones cut through southwest Missouri, relatively close to Laclede County, however are only minimally active.

Figure 3.11. Seismic Zones Surrounding Laclede County



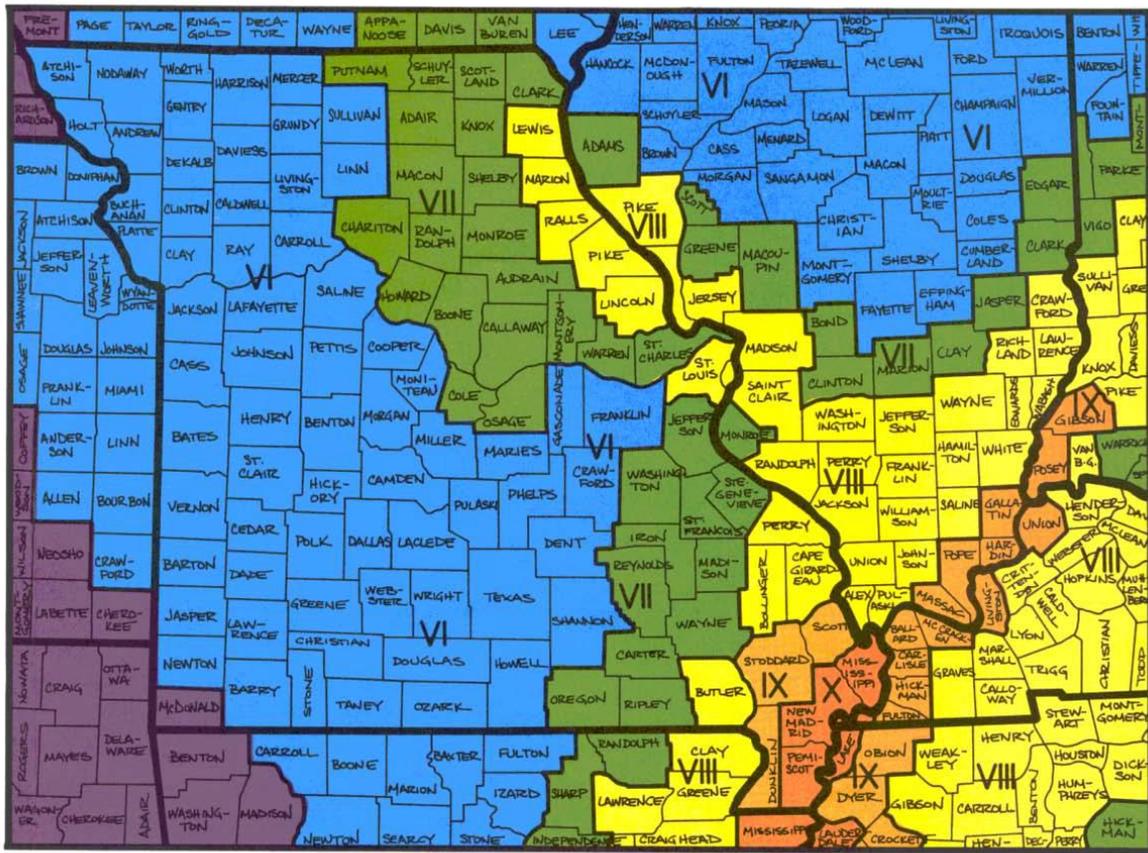
Source: DNR Publication Geologic Hazards, <https://dnr.mo.gov/pubs/pub2467.pdf>

Geographic Location

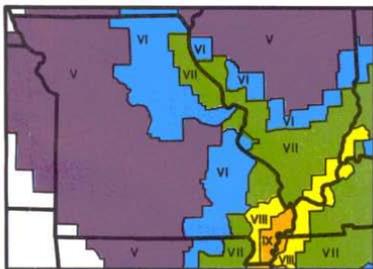
The greatest earthquake hazard to Laclede County comes from the New Madrid Seismic Zone located at the southeast corner of Missouri. The potential of high magnitude earthquakes and the high frequency of earthquakes present uniform risk across the county. The Nemaha Ridge runs through Kansas and Oklahoma, but does not produce enough high magnitude earthquakes to present considerable risk to Laclede County.

Figure 3.12 shows the highest projected Modified Mercalli intensities by county from a potential magnitude 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid Seismic Zone. The secondary maps in **Figure 3.12** show the same regional intensities for 6.7 and 8.6 earthquakes, respectively. Laclede County is located in Zone VI for a potential magnitude 7.6 earthquake along the New Madrid Seismic Zone. According to the Modified Mercalli Intensity Scale, regions within Zone VI would experience physical movement, objects falling from shelves, minor to moderate damage to buildings, fallen tree limbs, isolated rockfalls and landslides, and isolated liquefaction.

Figure 3.12. Impact Zones for Earthquake Along the New Madrid Fault

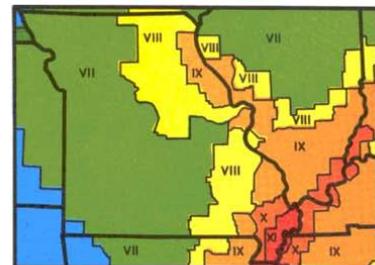


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.



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

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



Source:
http://sema.dps.mo.gov/docs/programs/Planning,%20Disaster%20&%20Recovery/State%20of%20Missouri%20Hazard%20Analysis/2012-State-Hazard-Analysis/Annex_F_Earthquakes.pdf

PROJECTED EARTHQUAKE INTENSITIES

MODIFIED MERCALLI INTENSITY SCALE

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

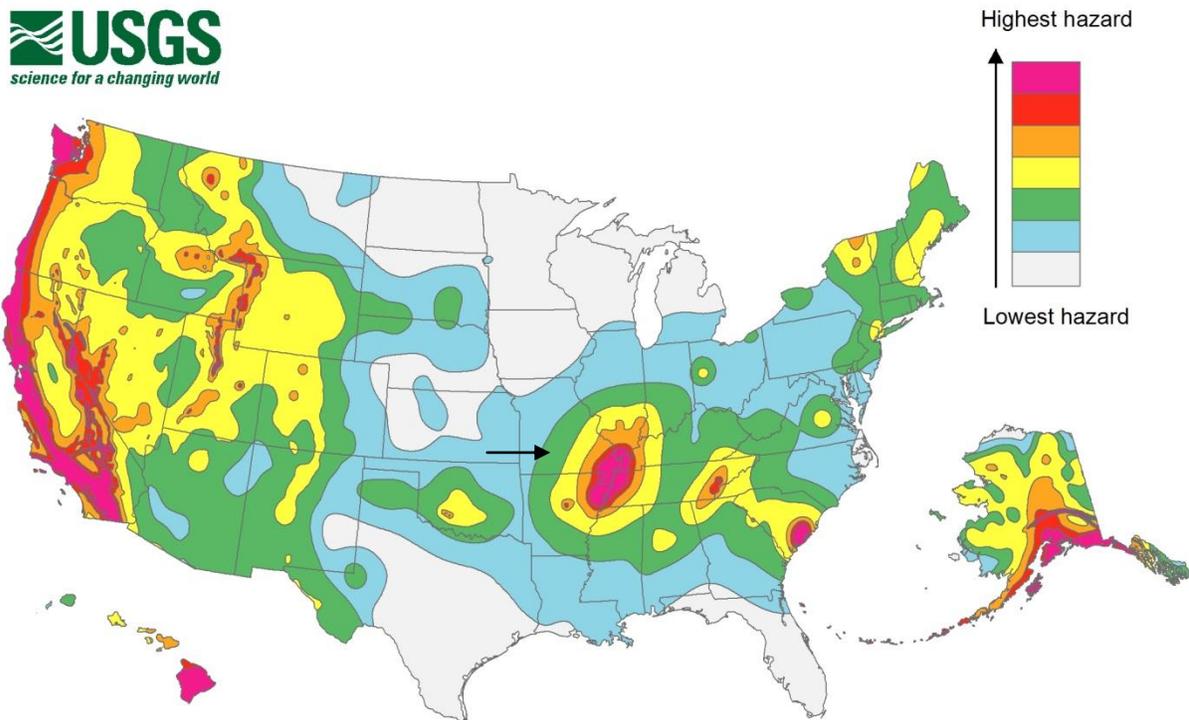
Intensity is a numerical index describing the effects of an earthquake on the surface of the Earth, on man, and on structures built by man. The intensities shown in these maps are the highest likely under the most adverse geologic conditions. There will actually be a range in intensities within any small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

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EMERGENCY MANAGEMENT AGENCY
P.O. BOX 116
JEFFERSON CITY, MO 65102
Telephone: 573-526-9100

The United States Geological Survey updated maps in 2014 to represent an assessment of the best available science in earthquake hazards and incorporate new findings on earthquake ground shaking, faults, seismicity, and geodesy. The USGS National Seismic Hazard Mapping Project developed the maps by using information from interaction in science and engineering workshops involving hundreds of participants, review by several science organizations, and State surveys, and advice from expert panels and a Steering Committee.

Figure 3.13 shows the updated map illustrating seismicity across the United States. The black arrow shows the location of Laclede County has been added.

Figure 3.13. United States Seismic Hazard Map 2014



Source: United States Geological Survey at http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lq.jpg

Severity/Magnitude/Extent

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

Richter Magnitude Scale

The Richter Magnitude Scale was developed in 1935 as a device to compare the size of earthquakes. The magnitude of an earthquake is measured using a logarithm of the maximum extent of waves recorded by seismographs. Adjustments are made to reflect the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter

Scale, magnitude is expressed in whole numbers and decimal fractions. For example, comparing a 5.3 and a 6.3 earthquake shows that the 6.3 quake is ten times bigger in magnitude. Each whole number increase in magnitude represents a tenfold increase in measured amplitude because of the logarithm. Each whole number step in the magnitude scale represents a release of approximately 31 times more energy.

Modified Mercalli Intensity Scale

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

Previous Occurrences

There have only been two earthquakes in Laclede County since 1931. The largest earthquake event within 30 miles of Laclede County occurred in 1988 when a 3.3 magnitude earthquake was recorded. On April 29, 2018, a 2.5 magnitude earthquake registered about ten miles south to southeast of Lebanon. Little or no damage was reported since the magnitude of both earthquakes was small.

Probability of Future Occurrence

Since there have been two earthquakes felt in Laclede County since 1931, the probability of a future earthquake event occurring in Laclede County is 2.3% (2 earthquakes/ 89 years = 2.3% probability in a given year). The USGS database shows that there is a 0.49% chance of a major earthquake within 50km of Laclede County, MO within the next 50 years. Although these calculated probabilities are low, it is still important to consider the unpredictability of earthquakes and the proximity to the New Madrid Seismic Zone. According to a fact sheet prepared by SEMA in 2003, the probability for a magnitude 6.0 to 7.5 or greater earthquake along the New Madrid Fault is 25 to 40 percent over the next 50 years. Overall, the probability of an earthquake occurring along the New Madrid Fault and affecting Laclede County is greater than an earthquake occurring within the county itself.

Vulnerability

Vulnerability Overview

Overall, the vulnerability for Laclede County is low since the probability of damaging earthquake in the county is low. As previously mentioned, the greatest earthquake risk to Laclede County is the New Madrid Fault in Southeast Missouri. As stated by SEMA, the probability for a magnitude 6.0 to 7.5 or greater earthquake along the New Madrid Fault is 25 to 40 percent over the next 50 years. A magnitude 6.7 earthquake at the New Madrid Fault would cause minor physical movement and little damage. A 7.6 magnitude earthquake would cause more violent movement and damage in poorly constructed buildings and an 8.6 magnitude earthquake would cause considerable damage in poorly built, badly designed or older structures, broken windows, the falling of loose bricks from buildings, and other structural damage. This could lead to some injuries, but fatalities are unlikely.

Potential Losses to Existing Development

The HAZUS building inventory counts are based on the 2000 census data adjusted to 2006 numbers using the Dun & Bradstreet Business Population Report. Inventory values reflect 2006 valuations, based on RSMeans (a supplier of construction cost information) replacement costs. Population counts are 2008 estimates from the U.S. Census Bureau.

Table 3.21 is from the 2018 Missouri State Hazard Mitigation plan and shows loss estimates to Laclede County from an earthquake along the New Madrid Seismic Zone and Laclede County estimated total loss ratio is 57 million.

Table 3.21. HAZUS-MH Earthquake Loss Estimates for Laclede County: 2% Probability of Exceedance in 50 Years Scenario Results

County	Total Loss in 1000's	Per Capita in 1000's	Loss Ratio in Millions
Laclede	\$182	\$.0051	57

*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 ***Total economic loss to buildings includes inventory loss, relocation loss, capital-related loss, wage 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*

Impact of Previous and Future Development

Future development, which would most likely occur within Lebanon, will only be at greater risk to earthquakes if construction does not adhere to building codes. Future development overall is not expected to increase the risk other than contributing to the overall exposure of what could become damaged as a result of an event.

Hazard Summary by Jurisdiction

Earthquake intensity is not likely to vary greatly throughout the county; the risk of occurrence is the same throughout. However, damages will differ in some jurisdictions based on the age of the structures, if one community has older buildings than another community, that community is likely to experience more damage. **Table 3.22** shows the number of housing units built in 1939 or earlier for each jurisdiction.

Table 3.22. Number and Percent of Units Built in 1939 or Earlier

Jurisdiction	# Units Built 1939 or Earlier	% Units Built 1939 or Earlier
Unincorporated Laclede County	1448	9.8%
City of Conway	84	24.8%
City of Lebanon	754	10.9%
City of Richland	51	5.6%
City of Stoutland	35	38.5%
Village of Phillipsburg	25	30.5%

Source: U.S. Census Bureau; 2016 American Community Survey 5-Year Estimates

Problem Statement

The history of earthquake events within Laclede County is scarce, with only two minor events on record. The risk for damages from earthquakes is possible, the New Madrid Seismic Zone is the most active area that could threaten Laclede County. If a higher magnitude earthquake within the New Madrid Seismic Zone occurred, the City of Stoutland and the Village of Phillipsburg could experience severe damage due to the high percentage of older buildings. Potential damages to future infrastructure can be mitigated by utilizing and enforcing proper building codes. Earthquake education and preparedness should also be practiced by school districts as well as within the communities since earthquakes are unpredictable and can happen at any time.

3.4.4 Extreme Heat

Hazard Profile

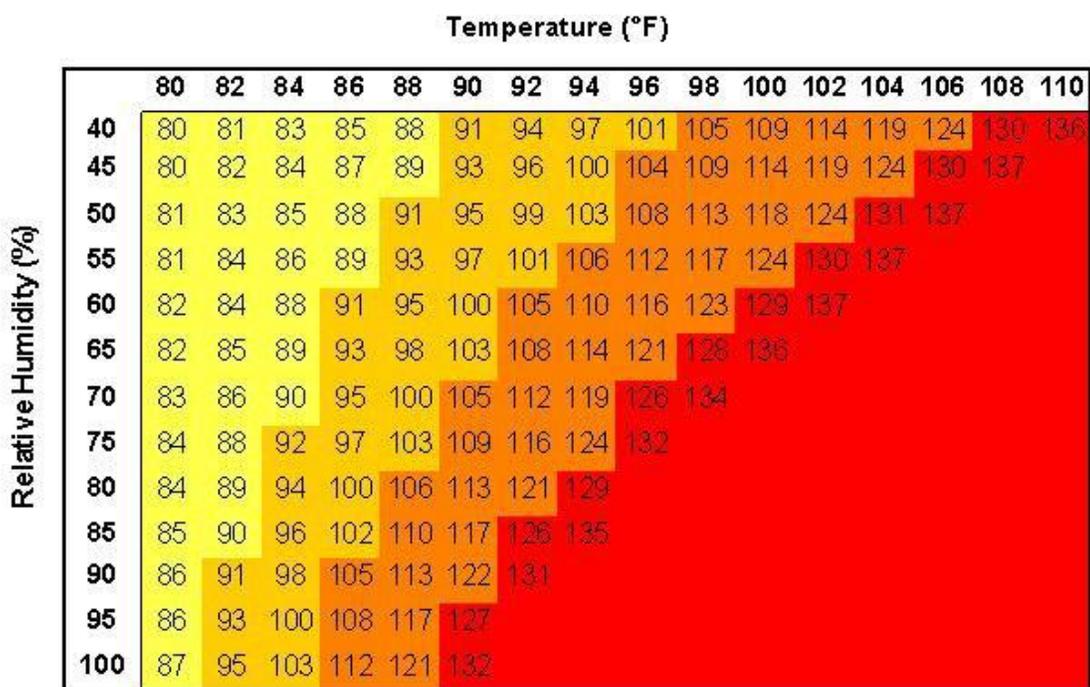
Some specific sources for this hazard are:

- 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://climod.unl.edu/>;
- Hyperthermia mortality, Missouri; Missouri Department of Health and Senior Service, <http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper1.pdf>;
- Hyperthermia mortality by Geographic area, Missouri Department of Health and Senior Services, <http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2.pdf>;

Hazard Description

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. The remainder of this section profiles extreme heat. Extreme cold events are profiled in combination with Winter Storm in **Section 3.4.10**. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. 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 3.14** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

Figure 3.14. Heat Index (HI) Chart



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

 Caution
 Extreme Caution
 Danger
 Extreme Danger

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

Explain that extreme heat is an area-wide hazard event, and that the risk of extreme heat does not vary across the planning area.

Severity/Magnitude/Extent

Extreme heat can cause stress to crops and animals. According to USDA Risk Management Agency, losses to insurable crops during the 5-year time period from 2014 to 2018 were \$15,847.60. Extreme heat can also strain electricity delivery infrastructure overloaded during peak use of air conditioning during extreme heat events. Another type of infrastructure damage from extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

From 1988-2011, there were 3,496 fatalities in the U.S. attributed to summer heat. This translates to an annual national average of 146 deaths. During the same period, zero deaths were recorded in the planning area, according to NCEI data. The National Weather Service stated that among natural hazards, no other natural disaster—not lightning, hurricanes, tornadoes, floods, or earthquakes—causes more deaths.

Those at greatest risk for heat-related illness include infants and children up to five years of age,

people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather. In agricultural areas, the exposure of farm workers, as well as livestock, to extreme temperatures is a major concern.

Table 3.23 lists typical symptoms and health impacts due to exposure to extreme heat.

Table 3.23. 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

There are nine (9) heat events in Laclede County recorded by the National Centers for Environmental Information (NCEI) between 1998 and 2018. There were fatalities reported in surrounding counties for some events, however no fatalities occurred in Laclede County. There was also no crop or property damage reported from any of these events in Laclede County. Some of these events coincide chronologically as a single event, with separate reports for different months. **Table 3.24** displays information about these events.

Table 3.24. Recorded Heat Events from 1998-2018 for Laclede County

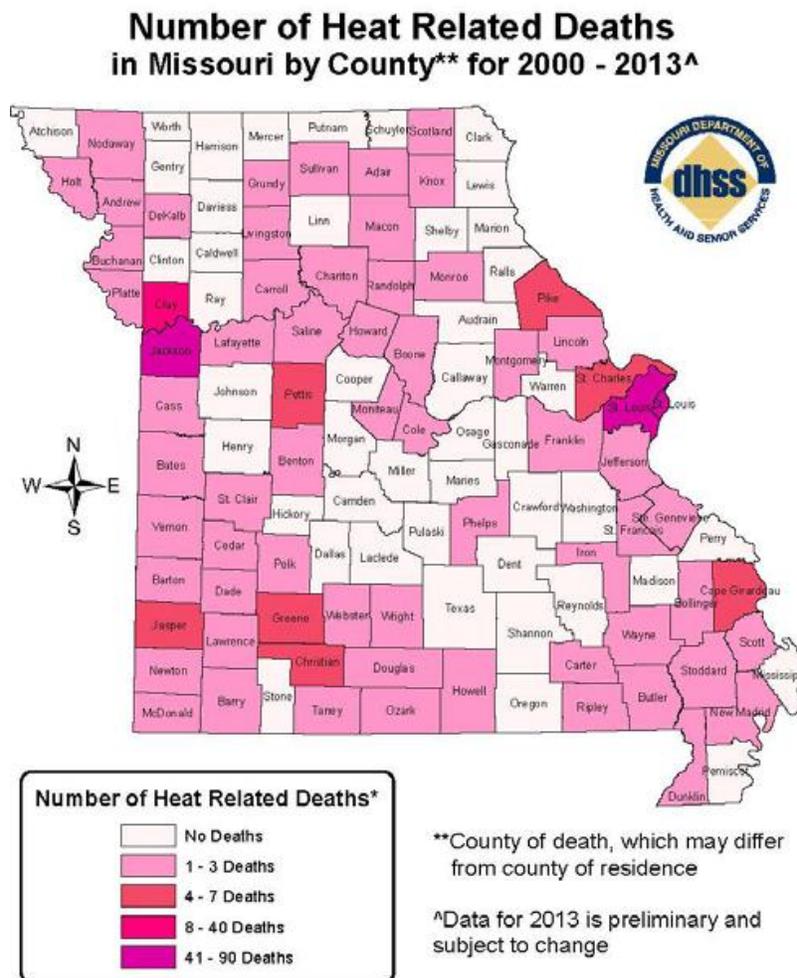
Start of the Event	Duration in Days	Details
07/23/1999	8	High temperatures averaged 95 degrees F or higher with heat index values of 105 to 115 degrees F; six deaths were attributed to heat in Jasper, Greene, McDonald, and Vernon Counties
08/01/1999	17	Temperatures exceeded 95 degrees F on 8 non-consecutive days; daytime heat index values frequently reached 100 degrees F or greater; two deaths were attributed to heat in Ozark County
08/27/2000	4	Afternoon high temperatures during this period averaged 100 degrees F or higher; heat index values of 100 to 110 degrees F; 29 people were treated for heat related illnesses; one death was attributed to heat in Lawrence County
09/01/2000	3	Afternoon temperature averaged around 100 degrees F for the first three days of September; record high temperatures continued to be broken in Springfield and Joplin; approximately a dozen people were treated for heat related problems
07/17/2001	14	High temperatures combined with increased humidity levels to produce very high heat indices of 100 to 100 degrees F for several

		consecutive days; 23 heat related illnesses were received from the Department of Health; one heat related death in Dade County
08/01/2001	8	Heat and humidity continued with heat indices between 100 and 100 degrees F for 9 consecutive days; two heat related deaths occurred in the Ozarks
06/01/2012	30	Several record highs were broken and high temperatures reach above 100 degrees F; four days with maximum temperature reached over 100 degrees F
07/01/2012	31	Several record highs were broken and high temperatures reached above 100 degrees F for 10 days; heat advisories and warnings were issued for portions of the area
08/01/2012	31	Three days had temperatures exceeding 100 degrees F; heat advisories and warnings were issued for portions of the area

Source: NCEI Storm Events Database

Figure 3.15 is a map created by The Missouri Department of Health and Senior Services (DHSS) for heat related fatalities by county. The map shows that there have been zero heat related fatalities in Laclede County from 2000 to 2013.

Figure 3.15. Heat Related Deaths in Missouri 2000 - 2013



*Source: Bureau of Environmental Epidemiology

Date: 6/5/2014

Probability of Future Occurrence

Limited data indentifying such events prior to 1999 makes it difficult to calculate reliable probability results; however, the probability of future occurrence for heat events in Laclede County is likely. Based on data available, the probability of an event in any given year is 47% (9 events / 19 years = 47% probability in a given year).

Vulnerability

Vulnerability Overview

All jurisdictions within the county are susceptible to risk from extreme heat conditions, as these events tend to be regional. However, those who may not have access to air conditioned houses or shelters, will be especially at risk, along with children under the age of five, the elderly, and those who work outdoors. The agricultural sector is also especially vulnerable to extreme heat, since high temperatures can affect crop yields and lead to crop damage or loss.

Potential Losses to Existing Development

Since 2014, Laclede County has experienced \$15,847.60 in crop losses, with one event in 2014 and one event in 2017. This amounts to an average annual cost of \$3,169.52, meaning that future extreme heat events could potentially lead to more crop losses.

Impact of Previous and Future Development

Population growth can result in increases in the age groups that are most vulnerable to extreme heat. Population growth also increases the strain on electricity infrastructure, as more electricity is needed to accommodate the growing population. Lebanon has the highest populations under 5 years of age and over 65. Laclede County as a whole has experienced a slight decrease in population since 2010, however, the population projections for the county are expected to increase leading up to 2030. It is possible that the population for the county as a whole will increase, especially since the population and development in Lebanon has increased and is expected to continue growing.

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 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 3.25 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. The City of Lebanon has the highest population under 5 years old and 65 years old and over.

Table 3.25. County Population Under Age 5 and Over Age 65, 2010 Census Data

Jurisdiction	Population Under 5 yrs	Population 65 yrs and over
Laclede County	2,525	5,556
City of Conway	60	120
City of Lebanon	1,271	2,284
City of Richland	123	344
City of Stoutland	7	44
Village of Phillipsburg	20	21

Source: U.S. Census Bureau, 2010 Census

Problem Statement

All jurisdictions within the county are equally susceptible to damage caused by extreme heat since these events occur regionally. However, the populations that are particularly at risk include children under the age of five, the elderly over the age of 65, those living below the poverty line, and those that work outside.

Laclede County does include mitigation strategies for extreme heat including the opening of cooling stations for those who may not have air-conditioning. The county should continue to spread awareness of these cooling stations to ensure all who need to use them know where to go. A notification system for citizens could also help spread awareness of potential extreme heat events and provide citizens with more time to find cooling stations or shelter.

3.4.5 Wildfires

The specific sources for this hazard are:

- Missouri Department of Conservation Wildfire Data Search at <http://mdc7.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://dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.php> <http://www.dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.asp>
- Firewise, www.firewise.org
- University of Wisconsin Slivis Lab, <http://silvis.forest.wisc.edu/maps/wui/2010/download>

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.

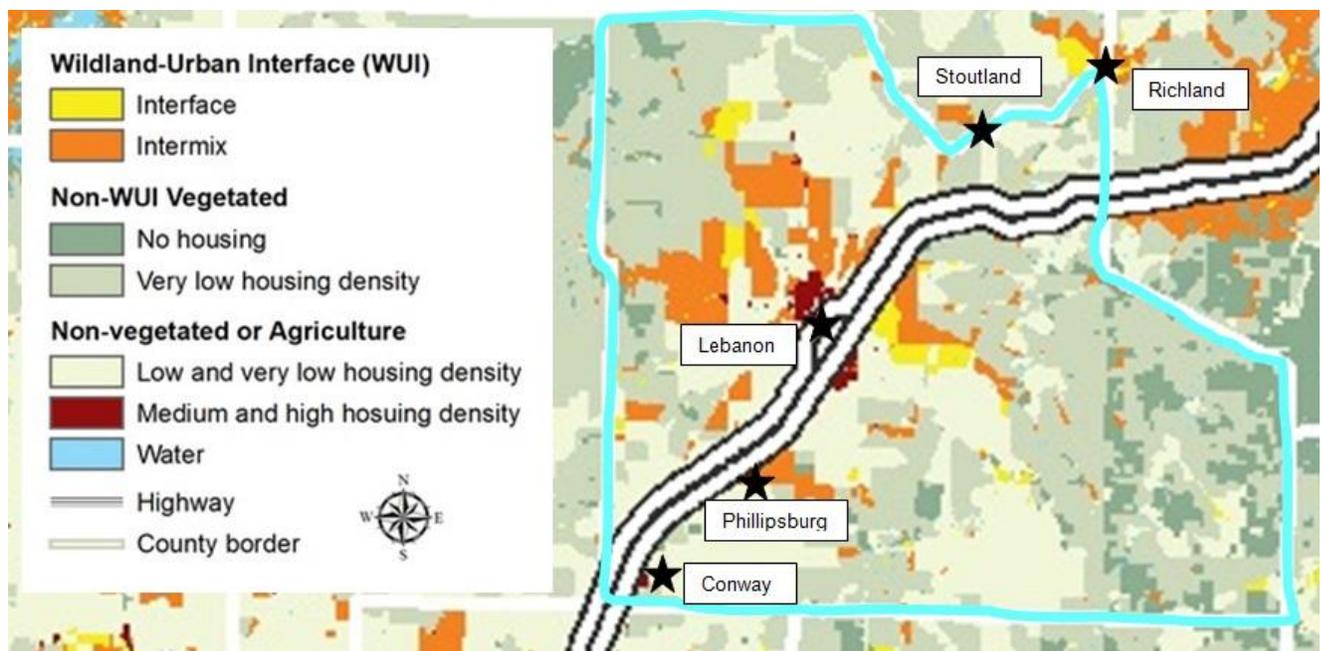
Most of Missouri fires occur during the spring season between February and May. The length and severity of both structural and wildland fires depend largely on weather conditions. Spring in Missouri is usually characterized by low humidity and high winds. These conditions result in higher fire danger. 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 term wildland-urban interface (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 3.16 below shows the Wildland-Urban Interface for Laclede County. The jurisdictions that are most at risk to damage from wildfires are Lebanon and Richland. Lebanon has medium to high housing density, and is surrounded by both interface and intermix zones. Richland does not have as much housing density but also has interface and intermix zones surrounding the area. Stoutland and Phillipsburg have intermix zones near their communities as well, but smaller portions and not as much infrastructure or housing is at risk.

Figure 3.16. Wildland-Urban Interface for Laclede County, 2010



Source: Silvis Labs, University of Wisconsin,
http://silvis.forest.wisc.edu/GeoData/WUI_cp12/maps/gifs/white/Missouri_WUI_cp12_white_2010.gif

Severity/Magnitude/Extent

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

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

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

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.

Previous Occurrences

According to MDC Wildfire Data, there have been 416 wildfires reported in Laclede County from 2008 to November 2018. A total of about 19,632 acres were burned because of these wildfires. Arson and debris are two of the most common causes of the fires. Only four fires were reported as being caused by lightning. The remaining causes were classified as equipment, smoking, campfire, miscellaneous, not reported or unknown. **Table 3.26** shows the number of wildfires reported per year.

Table 3.26. Laclede County Wildfires Per Year, 2008-2018

Year	Number of Wildfires
2008	21
2009	65
2010	29
2011	21
2012	98
2013	15
2014	48
2015	43
2016	36
2017	32
2018	8

*Source: Missouri Department of Conservation,
<http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx>*

No schools or special districts in Laclede County reported any fire incidents that impacted their facilities.

Probability of Future Occurrence

There were a total of 416 wildfires over 11 years, meaning there is a 100% probability of future wildfire events in any given year in Laclede County. The average number of wildfire events per year is 37.8.

Vulnerability

Vulnerability Overview

In the 2018 Missouri State Hazard Mitigation Plan, values from the Missouri Department of Natural

Resources, MSDIS Structure Inventory, and HAZUS were used to estimate the numbers and values of structures and population vulnerable to wildfire. Each county in Missouri was evaluated, the values for Laclede County are shown in **Table 3.27** below.

Table 3.27. Estimated Numbers and Values of Structures and Population Vulnerable to Wildfires in Laclede County

Sector	Number of Structures	Value of Structures	Population
Agriculture	1,355	\$294,988,920	
Commercial	59	\$39,124,574	
Education	1	\$1,499,286	
Government	2	\$1,575,556	
Industrial	14	\$12,032,215	
Residential	3,024	\$496,139,500	
Total	4,455	\$845,360,050	7,651

Potential Losses to Existing Development

The 2018 State Plan also provides information about estimates of potential losses for each county. The factors considered in determining future potential loss estimates from wildfires included the average acreage burned each year because of wildfire and the average value of structures per acre in WU-Interface/Intermix areas. **Table 3.28** below shows the values of these factors along with the total estimate of potential loss.

Table 3.28. Wildfire Potential Loss Estimates for Laclede County

Total WUI Acreage	Total Structure Value Within WUI	Average Value/Acre within WUI	Average Annual Acreage Burned	Potential Loss
58,622.15	\$845,360,050	\$14,420	1,769	\$25,509,846

Impact of Previous and Future Development

It is anticipated that the city of Lebanon will be the jurisdiction hosting the most growth in the near future. The future land use plan shows residential areas spreading outside of city limits and further into the interface and intermix zones. It is expected that any WUI developments in this area will follow all necessary regulations and hopefully reduce the risk to wildfire hazards.

Hazard Summary by Jurisdiction

As discussed previously, the jurisdiction that is most likely going to grow the most in the near future is Lebanon. The city is located almost in the middle of a large region of intermix area, with interface area included as well. Further development in Lebanon will increase the exposure to wildfires, thus increase the risks associated with wildfires. Since the interface and intermix regions around Lebanon are widespread, all school districts near Lebanon are at higher risk of wildfire impacts as well. Richland is another jurisdiction that is surrounded by both interface and intermix zones. However, the greater area of interface and intermix zones surrounding Lebanon compared to Richland makes them more vulnerable, especially since this increases the chances of a fire spreading once it has been started.

Problem Statement

Wildfire events occur frequently in Laclede County and have caused significant damage in the past. Populations and structures in WUI areas of the county have an increased risk of wildfires due to the higher amount of material present. Because Lebanon sits in large interface and intermix zones, and contains the most development within the county, they are most vulnerable to wildfire hazards.

County officials and local fire departments can promote fire resistant construction materials and landscape design techniques to help mitigate the risk to wildfire in development that will most likely occur in the near future. Information about these materials and techniques are included in the MDC publication, *Living with Wildfire*. Education, outreach, and communication between government officials, emergency services, school districts, and residents can also help reduce the risks associated with wildfires.

3.4.6 Flooding (Flash and River)

Some specific sources for this hazard are:

- Watershed map, Environmental Protection Agency, <https://cfpub.epa.gov/surf/locate/index.cfm>
- 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, <https://www.rma.usda.gov/data/cause>
- FEMA Data Visualization Tool, <https://www.fema.gov/data-visualization-floods-data-visualization>

Hazard Profile

Hazard Description

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

Flooding caused by dam failure is discussed in **Section 3.4.1** and 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.

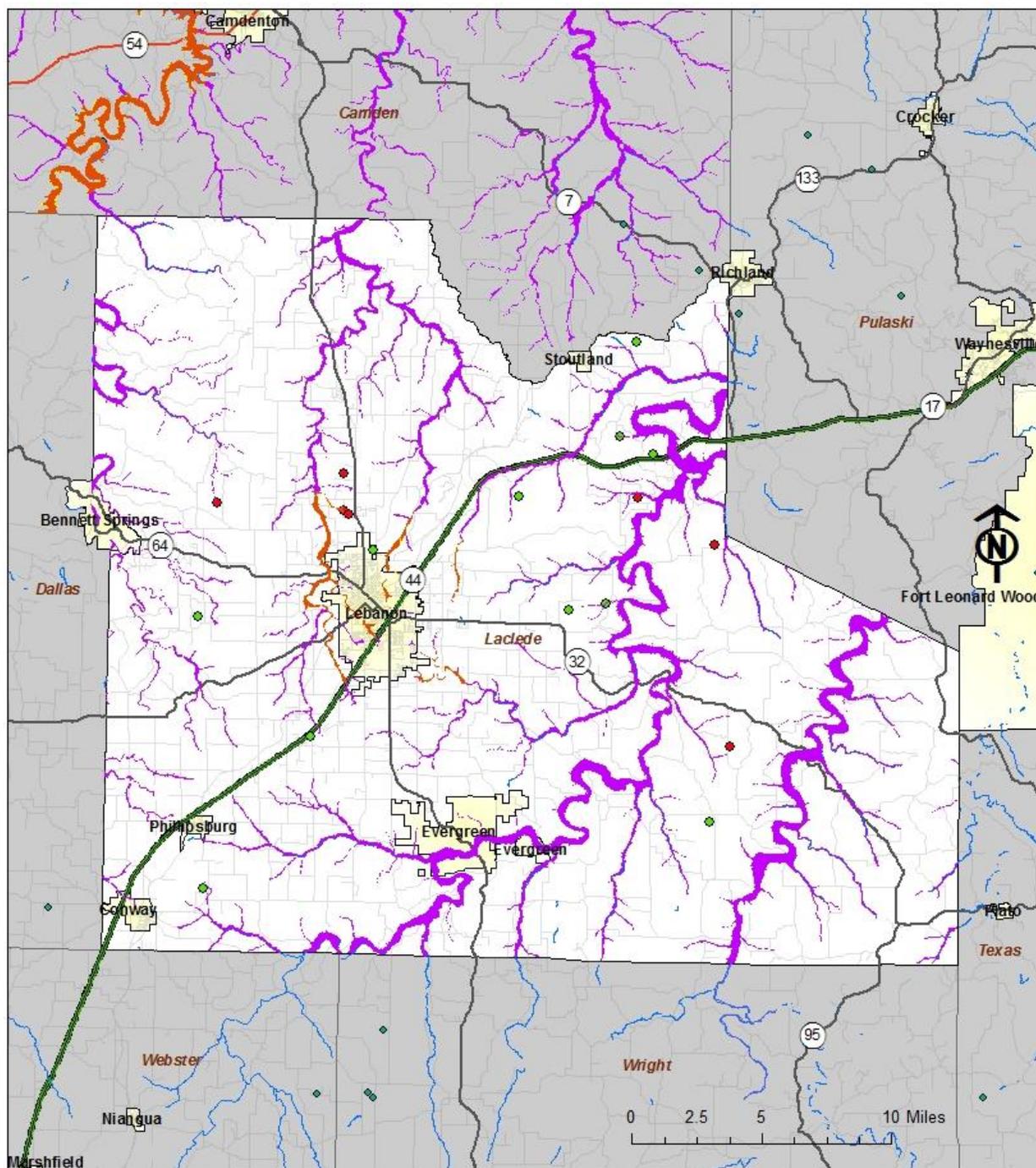
Geographic Location

Floodplain mapping and participation in the National Flood Insurance Program (NFIP) both play a major role in flood mitigation. The objectives of flood mitigation are to keep people, property, and possessions out of the floodplain area where reasonably achievable.

Participation in the NFIP requires that floodplain ordinances, which regulate development in the floodplain, be adopted and enforced by each community. The standard regulations require that buildings be constructed at least 1 foot above the Base Flood Elevation (BFE). [The BFE is the flood level associated with the 1% flood (formerly known as the “100 year flood”).]

Below are maps of the county and each individual jurisdiction showing either the Natural Hazard Flood Layer (NFHL) from September 29, 2010 datasets or the Digital Flood Insurance Rate Maps from November 14, 2017 datasets (DFIRM). Participating jurisdictions in the National Flood Insurance Program (NFIP) are labeled as DFIRM (with the exception of Conway, see note on the map) and ones who do not participate to show the natural hazard flood layer labeled as NFHL. Within these maps, BFE stands for base flood elevations, Zone A represents the area inundated by 100-year flooding for which no BFE's have been established, and Zone AE represents the area inundated by 100-year flooding which BFE's have been established.

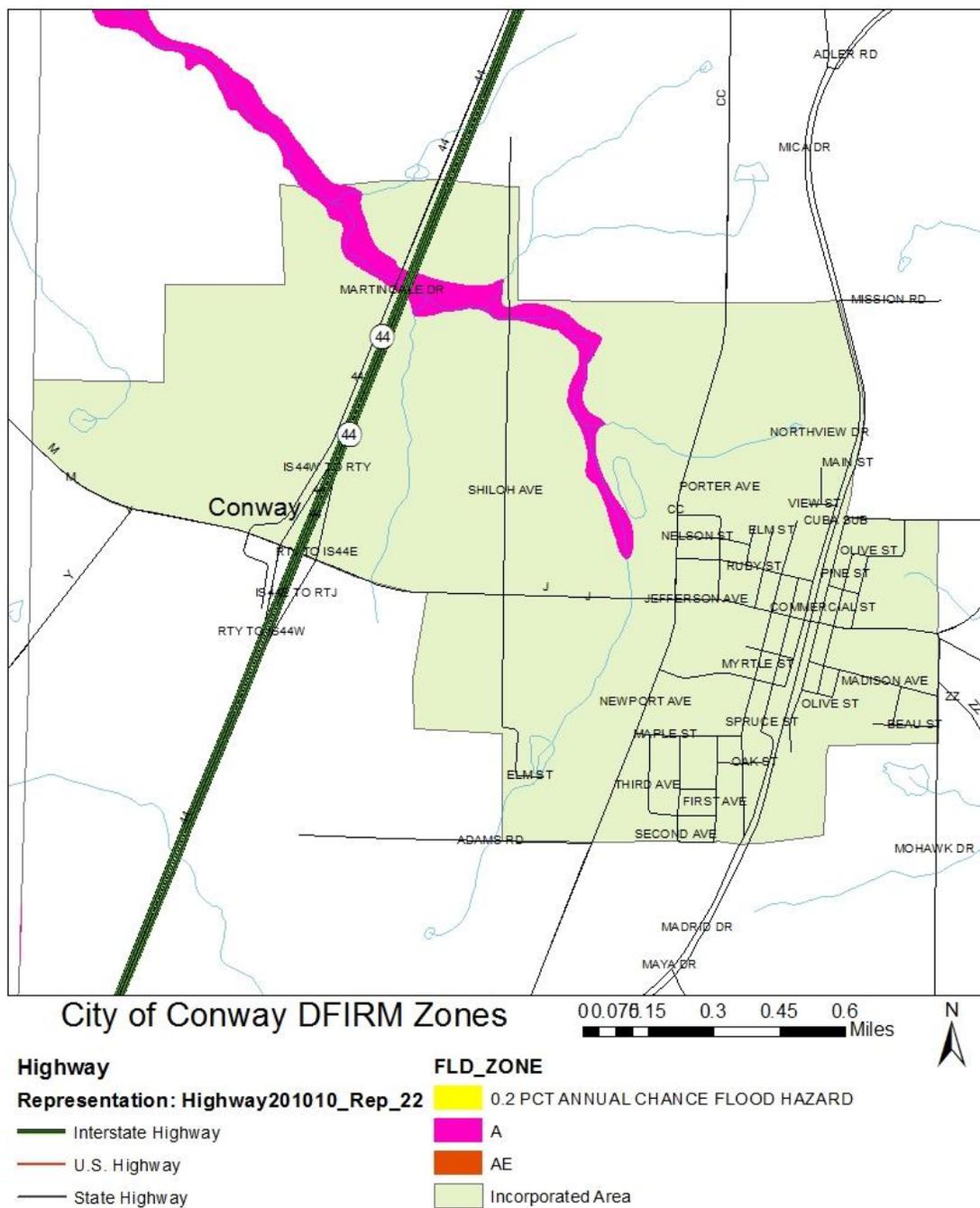
Figure 3.17. Laclede County NFHL Flood Map



NFHL Zones		DAM HAZARD		Major Roadways		Incorporated Area
	0.2 PCT ANNUAL CHANCE FLOOD HAZARD		High	Representation: Highway201010_Rep_2		River or Lake
	A		Low		Interstate Highway	
	AE				U.S. Highway	
					State Highway	

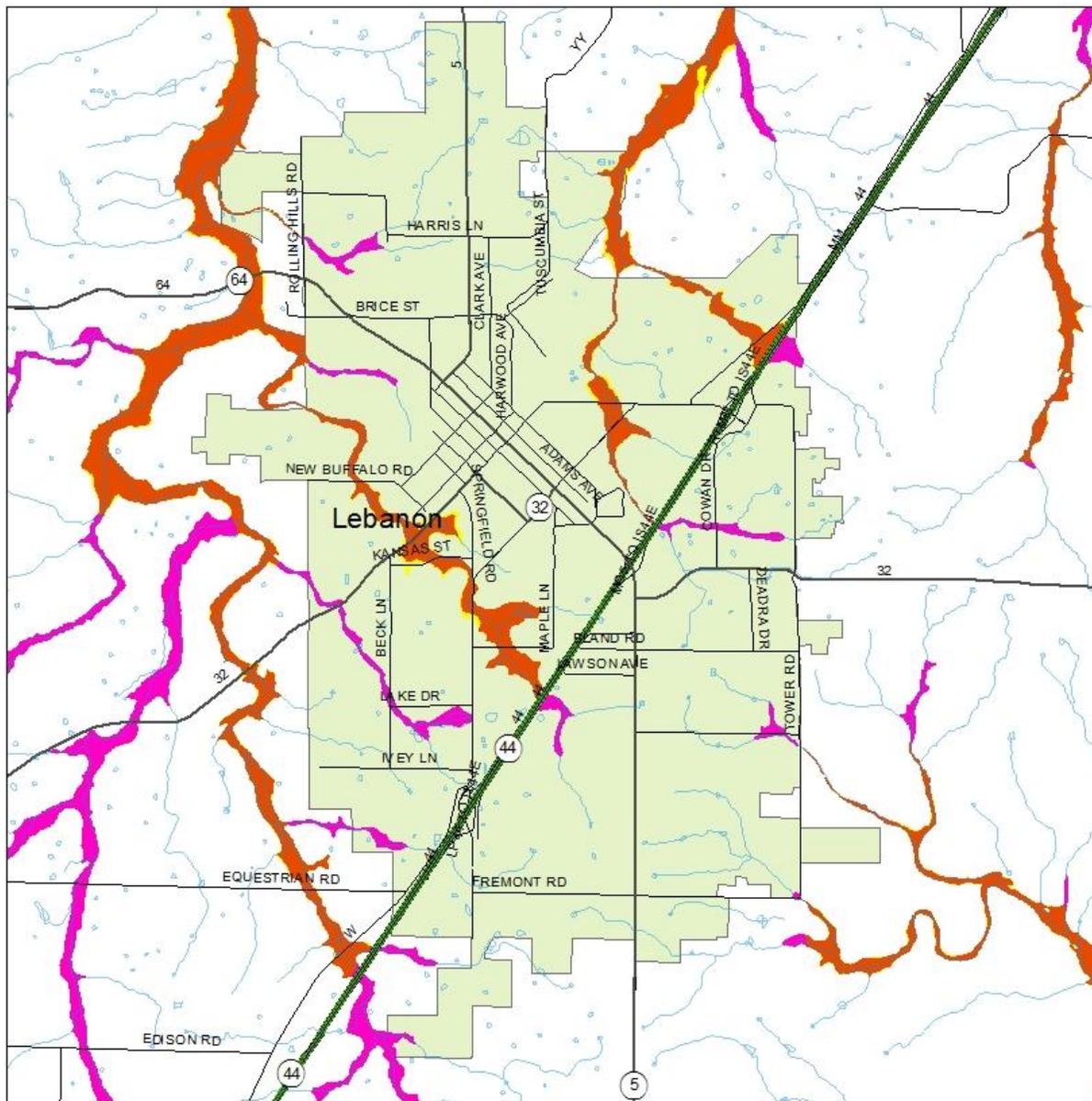
Created by Andy Draper
LOCLG
Source: FEMA Maps

Figure 3.18. City of Conway DFIRM Map*



*The city of Conway has DFIRM maps available and was provided information about the National Flood Insurance Program from SEMA, but chose not to participate.

Figure 3.19. City of Lebanon DFIRM Map



City of Lebanon DFIRM Flood Zones 0.0 0.22 0.45 0.9 1.35 1.8 Miles

Highway201010_Clip23

Representation: Highway201010_Rep_22

-  Interstate Highway
-  U.S. Highway
-  State Highway

FLD_ZONE

-  0.2 PCT ANNUAL CHANCE FLOOD HAZARD
-  A
-  AE
-  Incorporated Area

Figure 3.20. City of Richland DFIRM Map

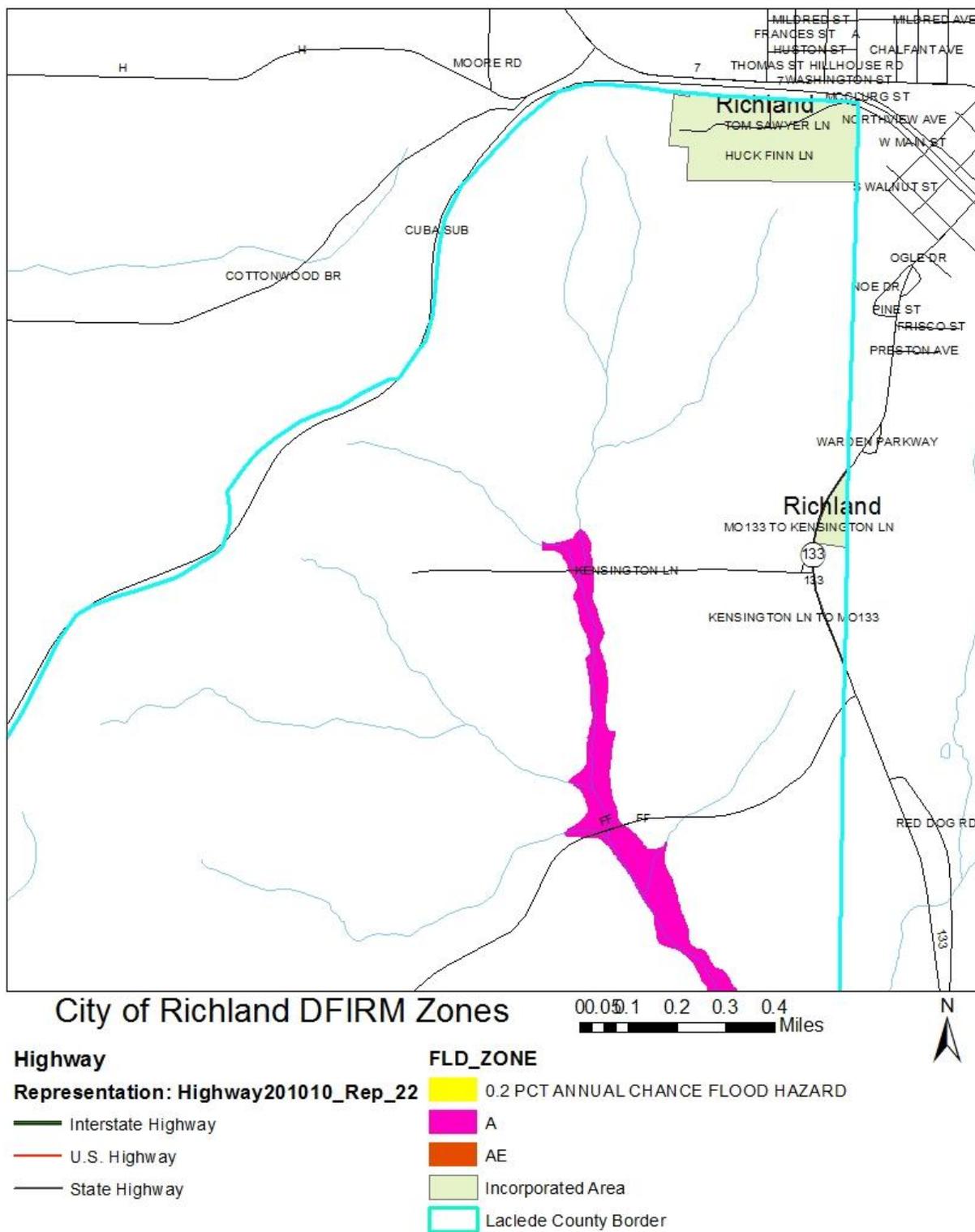
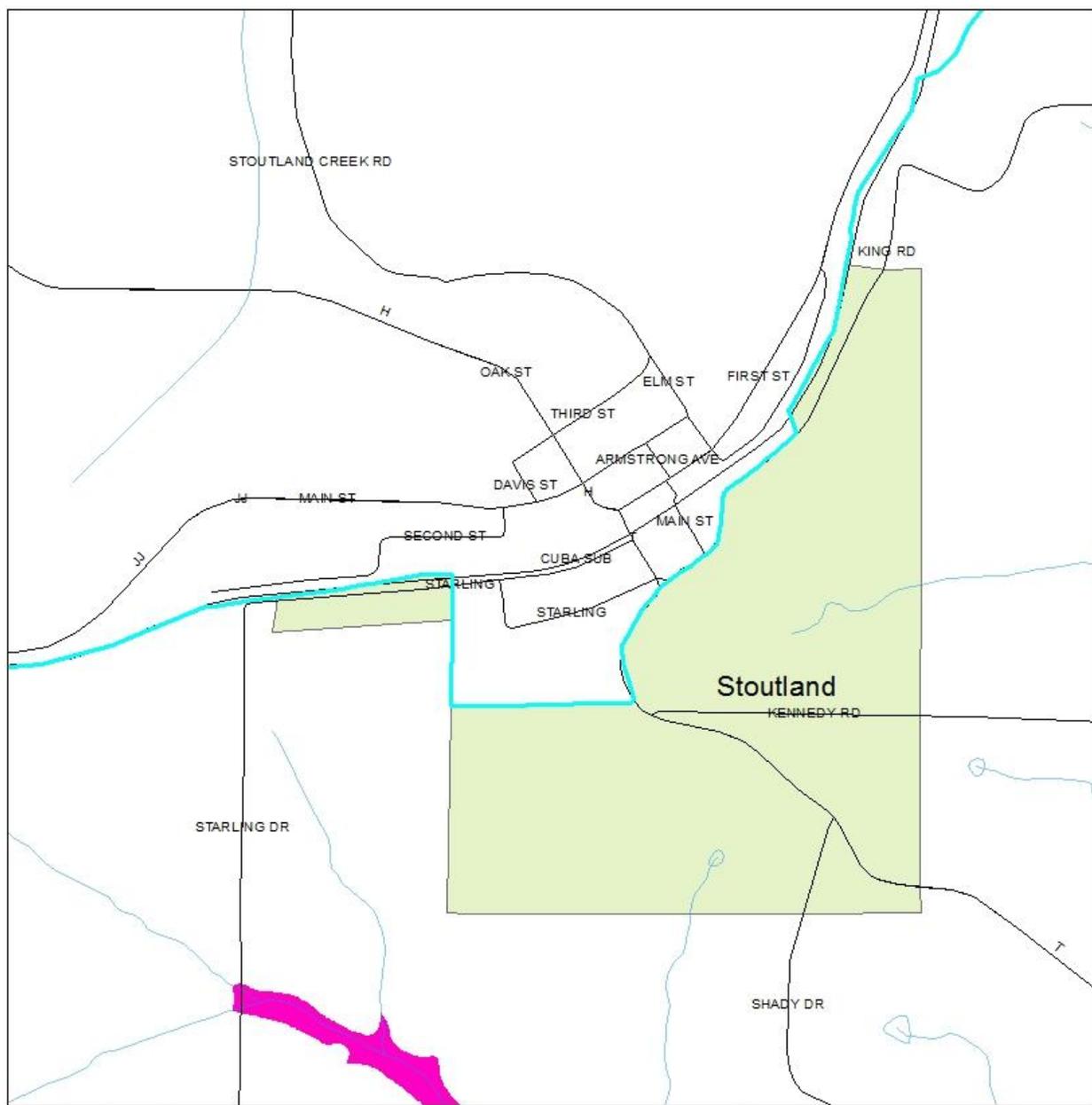


Figure 3.21. City of Stoutland NFHL Map



City of Stoutland NFHL Zones

Highway

Representation: Highway201010_Rep_22

- Interstate Highway
- U.S. Highway
- State Highway

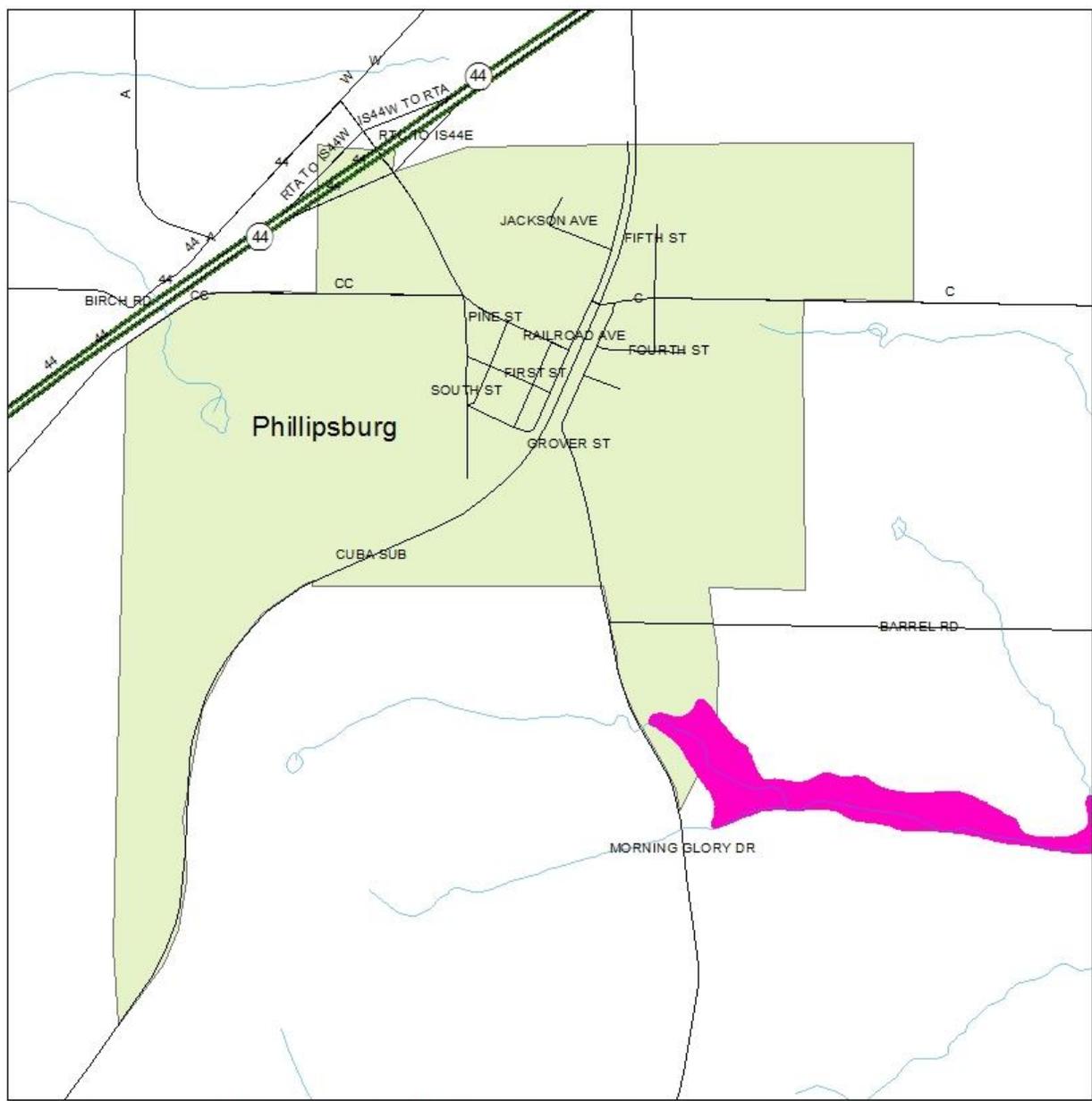
FLD_ZONE

- 0.2 PCT ANNUAL CHANCE FLOOD HAZARD
- A
- AE
- Incorporated Area
- Laclede County Border

0 0.05 0.1 0.2 0.3 0.4 Miles

N

Figure 3.22. Village of Phillipsburg NFHL Map



Village of Phillipsburg NFHL Zones 0 0.05 0.1 0.2 0.3 0.4 Miles

<p>Highway</p> <p>Representation: Highway201010_Rep_22</p> <ul style="list-style-type: none"> Interstate Highway U.S. Highway State Highway 	<p>FLD_ZONE</p> <ul style="list-style-type: none"> 0.2 PCT ANNUAL CHANCE FLOOD HAZARD A AE Incorporated Area Laclede County Border 	
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Laclede County is prone to both flooding and flash flooding events. A review of the NCEI Storm Event Database determined which jurisdictions and regions are most prone to flooding and flash flooding from January 1999 to November 2018 and are listed below. **Table 3.29** lists all of the flooding events recorded in the NCEI storm event database over the last 20 years. All events occurred in unincorporated parts of Laclede County.

Table 3.29. Laclede County NCEI Flood Events by Location, 1999-2018

Location	# of Events
Unincorporated Laclede County	40
- Laclede County (Zone): (05/08/2002); (05/12/2002); (01/05/2005); (01/13/2005)	4
- Abo: (04/25/2011) - Garrett Road Bridge over the Osage Fork River closed	1
- Agnes: (11/17/2015) - low water crossing at Route B closed due to flooding at South Cobb Creek; Highway O closed due to flooding of Big Cobb Creek	2
- Dove: (03/19/2008) - Poor drainage areas continued to flood roadways and lowlands; (02/24/2011) - Route BB 3 miles south of Laclede County flooded; (03/14/2011) - Route BB closed; (03/17/2013) - Route BB closed due to flooding of Dry Auglaize Creek; (11/17/2015) - Route BB closed due to flooding at Dry Auglaize Creek	5
- Dryknob: (04/25/2011) - Highway B closed; (02/24/2018) - Highway B closed	2
- Falcon: (04/24/2011) - Evacuations at several resorts along Gasconade River; (03/21/2012) - Flooding of Gasconade River caused flooding in a home and on Highway 35	2
- Hazelgreen: (05/20/2010) - Low water crossing on state Highway FF closed; (05/20/2010) - Low water crossing on state Highway FF closed; (03/14/2011) - Route FF closed due to flooding; (04/25/2011) - Flooding on Jeffries Road; (03/17/2013) - Route FF closed near Bear Creek due to flooding; (11/17/2015) - Route FF closed due to flooding near Bear Creek; (05/03/2017) - State Highway FF closed; (02/20/2018) - State Highway FF closed due to water over roadway at Bear Creek low water crossing; (02/20/2018) - Flooding of Highway FF near Bear Creek; (02/24/2018) - Highway FF flooded and closed at Bear Creek	10
- Jacksonville: (09/04/2008) - Cobb Creek flooded section of Highway B; (03/27/2018) - Road closed due to flooding near Scenic Drive	2
- Pease: (04/25/2011) - Highway J closed due to flooding; (06/01/2013) - Route J closed; (05/29/2015) - Highway H closed northwest of Stoutland; (05/30/2015) - Highway J closed at Parks Creek; (07/03/2015) - Route J closed at Osage Fork of Gasconade River; (02/24/2018) - Highway J flooded at Parks Creek	6
- Russ: (03/17/2013) - Route B closed near Cobbs Creek; (07/01/2015) - Route B at North Cobb Creek closed; (03/27/2018) - Road closed due to flooding near Creek Road and Rush Drive	3
- Sleeper: (02/24/2011) - Low water crossing at Grandview and Pacific flooded; (02/24/2018) - Highway F flooded and closed at Dry Auglaize Creek	2
- Winnipeg: (10/30/2009) - Gasconade River flooded areas along Highway 32	1

Source: NCEI Storm Events Database

Flash flooding occurs in low-lying areas and in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. Flash flooding events pose the most pervasive hazard of the two flood types because they are caused by a large amount of rainfall over a small period of time. Permeability of soils, slopes, increasing urban development, and extensive stream networks all contribute to flash flood vulnerability. **Table 3.30** shows the number of flash flood events by location recorded in NCEI Storm Event Database over the last 20 years.

Table 3.30. Laclede County NCEI Flash Flood Events by Location, 1999-2018

Location	# of Events
Unincorporated Laclede County	56
- Countywide: (05/04/1999); (01/12/2005)	2
- South Portion: (07/28/2001)	1
- Abo: (06/06/2008) - Section of Highway 32 flooded; (09/16/2016) - Water rescue performed to remove two occupants from vehicle on Salem Drive	2

- Agnes: (08/08/2013) - Route B closed	1
- Bennett Springs: (04/25/2011) - Rapidly rising water in Bennett Springs State Park	1
- Brush Creek: (08/03/2016) - Flash flooding along Normandy and Dunklin Roads	1
- Competition: (05/10/2006) - Numerous roads became impassable; (07/07/2015) - Low water crossing near Highway O and Arthur Road flooded	2
- Dove: (05/08/2009) - Several county roads, low water crossings, and drainage culverts were washed out; (05/19/2011) - Highway BB south of Highway H impassable due to high water; (08/06/2013) - Route BB near Dry Auglaize Creek closed; (08/08/2013) - Route BB closed	4
- Dryknob: (04/29/2017) - Route B closed	1
- Eldridge: (05/29/2006) - Road became impassable; (04/10/2008) - All low areas that typically flood were flooded; (09/14/2008) - Niangua River flooded low lying areas, two water rescues occurred; (07/01/2015) - Highway E between Highway 5 and Eldridge was impassable	4
- Falcon: (07/07/2015) - Low water crossing flooded, numerous roads, bridges, and low water crossings were heavily damaged	1
- Hazelgreen: (06/09/2009) - Section of Highway T flooded; (06/09/2009) - Section of Highway FF flooded; (06/16/2009) - Section of Highway FF flooded by Bear Creek; (08/06/2013) - One foot of flowing water over Interstate 44 between mile markers 144 and 145; (07/01/2015) - Route FF closed; (04/30/2017) - Several homes and roads damaged, Gasconade River hit a new record river level, section of Interstate 44 damaged and closed, Bennett Spring State Park suffered flood damage	6
- IRA: (01/08/2008) - Numerous roads and low water crossings washed away, Highway PP to County Road J638 flooded from Brush Creek, section of Highway J flooded, low water crossing flooded, section of Highway 32 flooded	1
- Jacksonville: (08/05/2008) - Section of Highway B flooded by Cobb Creek, one water rescue performed; (04/29/2017) - Route B closed	2
- Jones Lebanon ARPT: (04/13/2007) - Low water crossings along Grindstone Road and Snowberry Road were impassable	1
- Lebanon Jones FLD AR: (09/21/2009) - West Elm Street closed; (06/19/2015) - Swift water rescue near Route 5 and Dove Street; (06/15/2016) - Low water crossing in Lebanon flooded, two cars and a fire truck stalled out in flood water; (06/16/2016) - High water rescue of three people	4
- Morgan: (07/10/2006) - Flash flooding along Parks Creek, quickly flowing water over Highway J; (08/10/2013) - Highway J closed; (08/10/2013) - Highway PP closed; (08/03/2016) - Portion of Nickel Drive and low water crossing were washed out	4
- Pease: (08/05/2013) - Highway J closed; (07/01/2015) - Route J at Osage Fork Gasconade River and Parks Creek was closed; (07/07/2015) - High water over State Route J at Osage Fork Gasconade River; (12/26/2015) - Highway J closed; (07/14/2016) - Eastbound lane of route J closed	5
- Prosperine: (03/18/2008) - Widespread flooding over county roads; (03/31/2008) - Some regions experienced record rainfalls, widespread flash flooding of low water crossings, county, roads, and low lying areas near creeks and rivers	2
- Russ: (07/07/2015) - Highway B impassable; (07/07/2015) - State Route B closed, Boswell Park in Lebanon heavily damaged; (12/2/6/2015) - Route B closed, nearly all low water crossings across county flooded, extensive damage to campgrounds at Bennett Spring State Park	3
- Sleeper: (05/03/2006) - Flash flooding over low water crossing along Riley Drive, a van with eight passengers was swept downstream, two suffered from hypothermia, one fatality occurred; (09/10/2007) - Section of Pelican Drive impassable; (02/16/2008) - Section of Amethyst Road, Pacific Road, intersection of Green Hills and Park Road, low lying roads in Lebanon, section of Highway B, low water crossings on Highway FF, section of Highway BB, several low areas along the Osage Fork River flooded; (06/02/2008) - Areas near the intersection of Hackberry Road and Pacific Road flooded; (07/08/2010) - Interstate 44 east bound exit ramp at mile marker 135 flooded and made road impassable; (09/02/2010) - Water rescue performed; (07/01/2015) - Highway BB closed; (12/26/2015) - Highway F closed between Interstate 44 and town of Sleeper	8
- Southard: (08/03/2016) - Property near Norris Creek flooded	1

<p>-City of Conway: (07/10/2006) - Section of Highway J impassable; (02/05/2008) - Storm shelter flooded, street flooding in Lebanon, bridge flooded along Highway J, section of Highway FF flooded, Brush Creek north of Morgan flooded all low areas near channel; (06/16/2013) - Several low water crossings on secondary roads flooded; (08/10/2013) - Flash flooding of small streams and roadways; (08/10/2013) - Three feet of water reported over Interstate 44 near mile marker 112; (08/10/2013) - Several homes flooded along Highway J, several high water rescues performed, several low water crossings and roadways damaged; (07/01/2015) - Highway J at Interstate 44 impassable; (07/14/2016) - Portion of Interstate 44 briefly flooded, Interstate briefly closed, three swift water rescues</p>	8
<p>-City of Lebanon: (05/12/2002); (01/05/2005) - Numerous roads and low lying areas flooded and impassable, sections of Highways B & J, numerous sections of Highways PP & FF, Interstate 44 exit ramp 118, intersection Ripley and Evanston Road flooded; (07/10/2006) - Several low water crossings flooded; (03/30/2007) - Portion of Interstate 44 flooded, along with several low water crossings; (08/20/2007) - Closures to section of Highway 32, West Elm Road, section of Route BB, intersection of Highway 32 and Highway K, intersection of Route BB and Highway F, intersection of Route T and Highway FF, outer road of Interstate 44 at Route N, and section of secondary road near Sleeper, a United States Postal employee swept away by flood water; (12/27/2008) - Section of Highway 32 flooded; (07/13/2011) - Numerous streets flooded; 05/31/2013) - High water up to a foot deep was over east bound lane of Highway 32; (06/19/2015) - High water rescue, several roads, bridges, and low water crossings were damaged; (07/01/2015) - Highway 64 at Goodwin Hollow Bridge closed; (07/01/2015) - Water reported over portion of Interstate 44 near mile marker 136</p>	11
<p>-Village of Phillipsburg: (08/21/2005) - Sections of Highway C & J flooded; (08/24/2007) - Section of Interstate 44 at mile marker 120 flooded; (07/14/2016) - Highway 32 damaged and closed</p>	3

Source: NCEI Storm Event Database

The NCEI Storm Event Database lists flash flood events according to the nearest community or place. Most of these events cover larger areas than smaller geographic areas reported in the data. Some specific locations are listed within the narratives. Although some of these events may not be inside corporate limits of the community identified, they are in such proximity that the community named would be the most affected by impassable roads.

Severity/Magnitude/Extent

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

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

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

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

onto roadways. These damages can cause costly repairs for state, county, and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard.

National Flood Insurance Program (NFIP) Participation

Table 3.31 provides details on NFIP participation for the communities in Laclede County. **Table 3.32** shows the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction, where applicable.

Table 3.31. NFIP Participation in Laclede County

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	Regular- Emergency Program Entry Date
290811	Laclede County	Y	09/29/2010	02/24/1993
290197	City of Lebanon	Y	09/29/2010	06/01/1982
290656	City of Richland	Y	05/03/2010	09/10/1984

Source: NFIP Community File Updates, <https://nfipservices.floodsmart.gov/home/reports>

Table 3.32. NFIP Policy and Claim Statistics as of September 20, 2018

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Laclede County	22	\$3,428,000	11	\$531,752.22
City of Lebanon	20	\$3,566,000	13	\$118,702.51

Source: NFIP HUDEX Report, Policy and Loss Data by Community, <https://nfipservices.floodsmart.gov/home/reports>

Lebanon is the only community with insurance payments of 13 closed losses with total payments of \$118,702.51. The unincorporated areas of Laclede County had 11 closed losses with total payments of \$531,752.22.

Repetitive Loss/Severe Repetitive Loss Properties

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

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

Records indicated there are two residential Repetitive Loss properties in the Unincorporated Laclede County and two residential Repetitive Loss properties in the City of Lebanon, all of which are currently non-mitigated.

Previous Occurrences

Since 2007, Laclede County has been included in nine disaster declarations that involve flooding. These flooding events can often be accompanied by straight-line winds and in certain cases, tornadoes, leading to extensive damage and dangerous conditions. Flooded roads create hazardous situations and can lead to damaged roads, car accidents, injuries, and death.

According to NCEI Storm Event data, there were 79 flash flood events recorded in Laclede County from 1999 to 2018. Eighteen of these events led to property damage, four of which caused at least \$1,000,000 in property damage. The most recent flash flood event causing property damage, occurred in Hazelgreen when \$1,000,000 in property damage was caused by multiple rounds of severe thunderstorms and extremely heavy rainfall. The most damaging year was in 2007, when remnants of Tropical Storm Erin caused \$5,500,000 in property damage in the Lebanon area. **Table 3.33** summarizes flash flood events by year from 1999 to 2018. If certain years are not listed, this means that there was no flash flood events recorded that year.

Table 3.33. NCEI Laclede County Flash Flood Events Summary, 1999 to 2018

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
1999	1	0	0	\$0	\$0
2001	1	0	0	\$0	\$0
2002	1	0	0	\$0	\$0
2005	3	0	0	\$0	\$0
2006	6	1	2	\$10,000	\$0
2007	5	1	0	\$5,500,000	\$0
2008	11	0	0	\$1,755,000	\$0
2009	5	0	0	\$100,000	\$0
2010	2	0	0	\$0	\$0
2011	3	0	0	\$10,000	\$0
2013	12	0	0	\$750,000	\$0
2015	17	0	0	\$1,570,000	\$0
2016	9	0	0	\$63,000	\$0
2017	3	0	0	\$1,000,000	\$0
Total	79	2	2	\$10,758,000	\$0

Source: NCEI Storm Event Database

Table 3.34 summarizes riverine flood events in Laclede County by year from 1999 to 2018.

Table 3.34. NCEI Laclede County Riverine Flood Events Summary, 1999 to 2018

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
2002	2	0	0	\$170,000	\$0
2005	2	0	0	\$0	\$0
2008	2	0	0	\$0	\$0
2009	1	0	0	\$0	\$0
2010	2	0	0	\$0	\$0
2011	9	0	0	\$250,000	\$0
2012	1	0	0	\$50,000	\$0
2013	4	0	0	\$0	\$0
2015	8	0	0	\$250,000	\$0
2017	1	0	0	\$0	\$0
2018	8	0	0	\$0	\$0
Total	40	0	0	\$720,000	\$0

Source: NCEI Storm Event Database

Probability of Future Occurrence

There have been 79 flash flood events recorded over the last 20 years in Laclede County. The events occurred during 14 of the 20 years, with 6 years seeing no flash flood events at all. This means the probability of a flash flood event occurring in a given year is around 70%, with an average of 5.6 events per year. Of the 79 events, 18 resulted in property damages totaling \$10,758,000, or \$597,667 per damaging event. During the same period, there were 40 riverine flood events reported in the county. These events only occurred during 11 of the 20 years, meaning there is a 55% chance in a given year that a riverine flood event will occur, with an average of 3.6 events per year. Of the 40 events, five caused \$720,000 in property damage, averaging about \$144,000 per damaging event.

Vulnerability

Vulnerability Overview

Flooding has been included in most of the disaster declarations involving Laclede County. Riverine flooding occurs less frequently than flash flooding in Laclede County and usually causes less damage. Flooding, especially flash flooding, in the area leads to the washing out of low-lying crossings, roads, and bridges, and creates a severe threat to motorists, especially those that attempt to cross a flooded roadway. The threat of flooding to roadways is not limited, as seen in **Tables 3.27** and **3.28** above, roadways of all classifications have been flooded in the past, putting all motorists at risk during flood events.

Potential Losses to Existing Development

Since Phillipsburg, Richland, and Stoutland have little existing development and do not lie along a floodplain, the potential losses to existing development for these jurisdictions are low. Conway faces more risk to existing development since the floodplain extends into the city. The floodplain ends outside of the more populated downtown area, and misses any critical infrastructure. Lebanon is the city that faces the highest potential losses to existing development from riverine flooding since they have the most development and floodplains extend through the city. The floodplains could impact one critical facility, as identified during the planning process which is the school building located at 695 Millcreek Road in the City of Lebanon. The remainder of the infrastructure within the City that could potentially be impacted and cause significant damage are residential properties and businesses within the city. Since the City of Lebanon participates in the NFIP program these home owners and business owners have the opportunity to purchase flood insurance if the property is located in a flood zone.

The agricultural sector faces potentially high risk from flooding in the future based on past events. According to the USDA Risk Management Agency, Laclede County experienced crop indemnities in 2017 and 2015, losing \$1,001 and \$303,893.80, respectively. These values total \$304,894.80 in crop losses since 2015, averaging about \$76,223.70 annually. This means that crops and the agriculture sector are at risk to future flooding events and potential losses to their existing development.

Impact of Previous and Future Development

Future development could impact flash and riverine flooding in all areas of Laclede County. Development in low-lying areas near rivers and streams or where interior drainage systems are not adequate during heavy rainfall events will be at risk to flooding. Future development would also increase impervious surfaces causing additional water run-off and drainage problems during heavy rainfall events.

Hazard Summary by Jurisdiction

According to the DFIRM maps located above for each jurisdiction, Phillipsburg, Richland, and Stoutland face few risks for riverine flooding. Risk is low since there are no floodplains that extend into the community. Conway is more at risk to riverine flooding, since there is a section of the floodplain that extends into the city from the northwest corner. An in-depth look at each property location within all the school districts was conducted using the FEMA Map Service Center and the school building location addresses. All the school building in Laclede County state that the area in which the school buildings are located are in “an area of minimal flood hazard” with the exception on one building in the Lebanon R-III School system which is the Boswell Elementary School located at 695 Millcreek Road in Lebanon. This property is in a Zone AE floodplain. A quick call to the Superintendent of the school he shared with the LOCLG team that there is indeed a creek that flows to the south of the building and with heavy rains the soccer field and the outdoor public restrooms have occasionally flooded but there is really nothing that can be damaged with the flooding. The school building built in 1950 is up on a “drastic slope” with significant swale that diverts the water away from the building. According to Dr. Brad Armstrong minimal flooding damages would occur if any at all within Lebanon R-III School District. The floodplain extends across the City of Lebanon and there is more exposure in Lebanon than any other jurisdiction in Laclede County. The major damages experienced in unincorporated areas of Laclede County are on the gravel roads which often experience significant damage during flooding events.

Problem Statement

Both riverine and flash floods are frequent events in Laclede County and have been included in most of the disaster declarations thus far. The greatest risks from flooding stem from rivers and creeks quickly overflowing on roadways, putting a large population of the county at risk of being stranded or swept away. Riverine and flash flooding events in Laclede County over the last 20 years has caused a total of \$2,478,000 in property damage, injury, and loss of life. To reduce the damage of floods to infrastructure and human life, several strategies can be implemented, such as raising low water crossings, having an efficient alert system in place, and improving storm water management. Laclede County is a participant in the NFIP along with the City of Lebanon and the City of Richland. Participation in the NFIP enables residents to purchase flood insurance, which can help mitigate the impacts of flooding. Projects focused on the improvements to river/stream embankments can also reduce flooding to surrounding properties.

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 others have vertical walls. Some hold water and form natural ponds.

According to the 2018 Missouri State Hazard Mitigation Plan, Laclede County has four mineral mines, and 74 total mine occurrences and prospects. Mineral deposits in Laclede County include lead, iron,

and zinc deposits.

Geographic Location

There are sinkholes present throughout Laclede County, however, there is a large concentration of sinkholes extending through the entire county on the central and western regions. **Figure 3.23** below shows the location of all known sinkholes according to the Missouri Department of Natural Resources. According to the 2013 Missouri State Hazard Mitigation Plan, there are 328 known sinkholes in Laclede County.

Figure 3.23. Sinkholes in Laclede County



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.

<http://www.foundation-repair-guide.com/expansive-soil.html>

http://www.ehow.com/list_6880295_properties-expansive-soils.html

Previous Occurrences

Sinkholes are a regular occurrence in Missouri, but rarely are the events of any significance. Sinkhole incidents are not officially recorded, and no occurrences of sinkholes or land subsidence have been recorded in local news.

Probability of Future Occurrence

Since there are no records of previous event dates in the planning area, probabilities cannot be calculated. However, with the karst topography present in Laclede County, it is likely that there will be an event at some point in the future.

Vulnerability

Vulnerability Overview

Sinkholes in Missouri are a common feature where limestone and dolomite outcrop. Dolomite is a rock similar to limestone with magnesium as an additional element, along with the calcium normally present in the minerals that form the rocks. Sinkholes can be considered a slow changing nuisance; sudden, catastrophic collapse can destroy property, delay construction projects, contaminate ground water resources, and damage underground utilities. Laclede County mostly consists of sandstone and dolomite.

Potential Losses to Existing Development

The city of Lebanon is situated on a large concentration of sinkholes. The large population and concentration of infrastructure in Lebanon means that a sinkhole event in this area would lead to large losses. Sinkholes lie under the entire city, so a catastrophic event, although unlikely, could lead to damage of residences, schools, roads, power lines, gas lines, and critical facilities.

Impact of Previous and Future Development

Future development over abandoned mines and in areas of known risk to sinkhole formation in Laclede County will increase vulnerability to this hazard. Population and development in these areas will increase exposure to sinkhole occurrence. There are currently no regulations prohibiting construction over or near known sinkholes. It is possible that future development will affect storm water runoff patterns and lead to expansion or formation of sinkholes.

Hazard Summary by Jurisdiction

The risk of sinkhole damage for individual communities and school districts is limited to the amount of exposure of buildings and infrastructure. Phillipsburg and Lebanon sit on the region of concentrated

sinkholes, so they are both at risk. However, the risk of damage is much greater in Lebanon than Phillipsburg because of the higher population and infrastructure. Gasconade C-4, Laclede County C-5, and Lebanon R-III School Districts are all at risk of being impacted by sinkholes, as they are located in the central-western region of the county with the high concentration of sinkholes. The unincorporated areas in Laclede County are also vulnerable to sinkholes. In the unincorporated areas of the county, there are farms and large tracts of land that are not publically owned and sinkholes are not often reported, but it is known to have sinkholes. There is a large sink hole called the Goodwin Hollow Sink Hole that has been a large trash dump for many years and there is a local group that is trying to clean it up to protect the sink hole and the water that flows to Ha Ha Tonka Spring. Richland has indicated they are not aware of any sinkholes within the city limits.

Problem Statement

It is likely that the amount of sinkholes will increase as development increases within the county. This makes an already at-risk Lebanon even more likely to be at risk of sinkholes and their impacts. The potential damage from a sinkhole event in the area could be disastrous; however, this situation is unlikely. In the event of a sinkhole, remediation is possible with fill material. Building on top of sinkhole sites can be prohibited, however, this is highly unlikely since Lebanon is the county's largest city and has already experienced the most development with no plans of slowing.

It is important to keep the knowledge and mapping of the areas prone to sinkholes up to date, certain regulations can be made for properties that lie on sinkholes. Information about identifying potential sinkhole formation and promoting Missouri FAIR plan sinkhole insurance can be included in public outreach and hazard awareness programs. Undeveloped land that is in a sinkhole prone area can be used for park space or other recreational purposes.

3.4.8 Thunderstorm/High Winds/Lightning/Hail

Some Specific Sources for this hazard are:

- FEMA 320, Taking Shelter from the Storm, 3rd edition, http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf
- Lightning Map, National Weather Service, <http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx>
- Death and injury statistics from lightning strikes, National Weather Service.
- Wind Zones in the U.S. map, FEMA, https://www.fema.gov/pdf/library/ism2_s1.pdf ;
- 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/hyscale.php>;
- NCEI data;
- USDA Risk Management Agency, Insurance Claims, <https://www.rma.usda.gov/data/cause>
- 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 (discussed separately in **Section 3.4.6**) and tornadoes (discussed separately in **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 is 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.

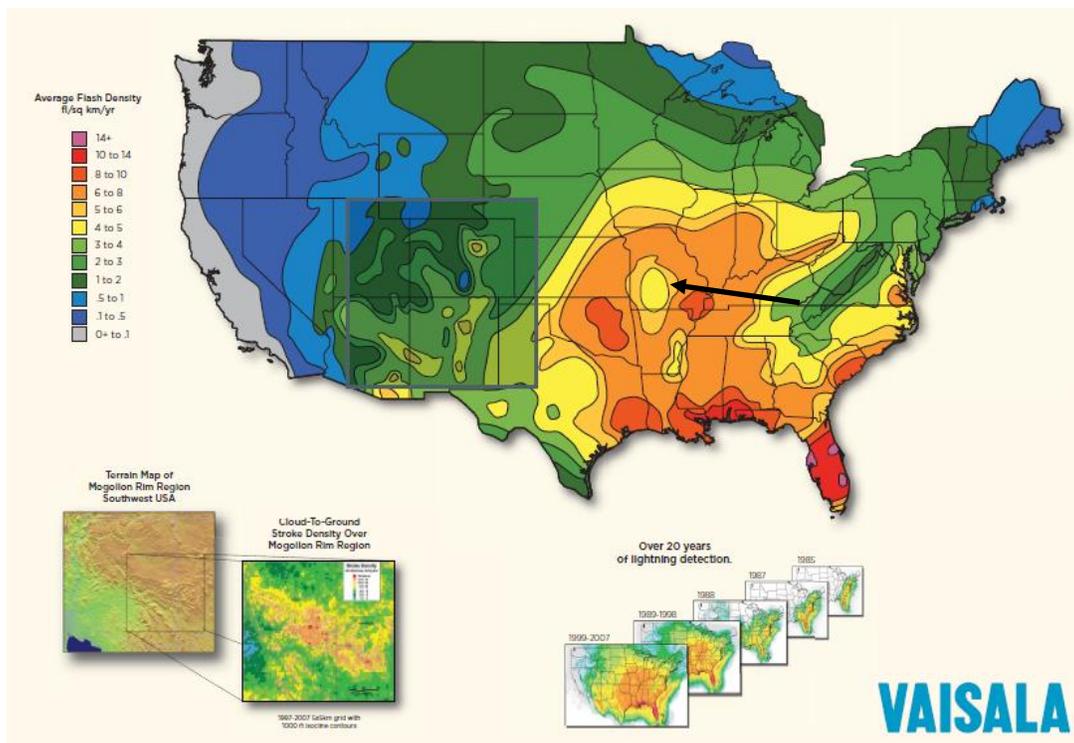
At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼” diameter or pea sized hail requires updrafts of 24 miles per hour, while a 2 ¾” diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest 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/lightning events are an area-wide hazard that can happen anywhere in Laclede County. Although these events occur similarly throughout Laclede County, they are more frequently reported in more urbanized areas. In addition, damages are more likely to occur in more densely developed urban areas.

Figure 3.24 shows lightning frequency in the United States. Laclede County is shown with a black arrow, and appears to lie on the region that could fall under an average flash density of 4 to 5 or 5 to 6.

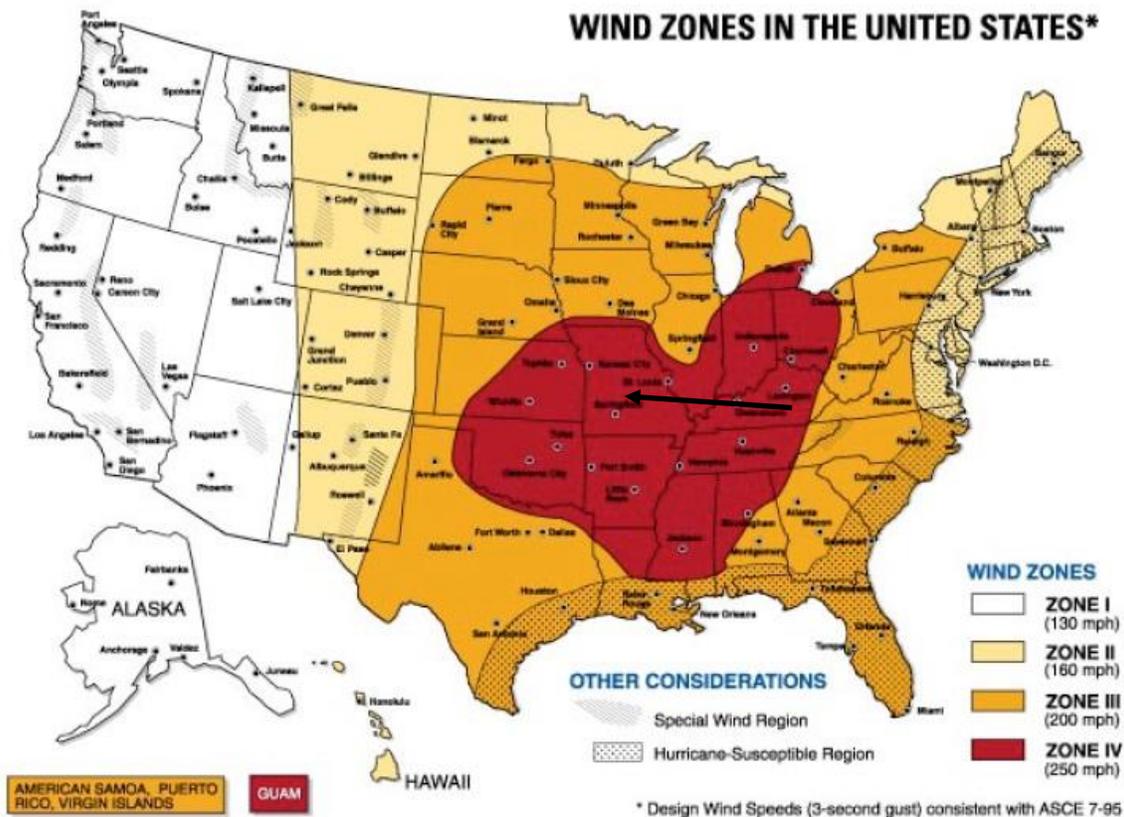
Figure 3.24. Location and Frequency of Lightning in the United States



Source: National Weather Service, <http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx>. Note: indicate location of planning area with a colored square or arrow.

Figure 3.25 showing wind zones in the United States. Laclede County is shown with a black arrow and lies in Zone IV, the zone with the highest possible wind speeds in the country.

Figure 3.25. Wind Zones in the United States



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

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 3.35** below describes typical damage impacts of the various sizes of hail.

Table 3.35. 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 and 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/hyscale.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.

Even though agriculture is bountiful in Laclede County, there are no recorded past crop damages as indicated by crop insurance claims in the USDA documents available.

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

The following four tables show the reported thunderstorm wind, hail, high winds, and lightning events that occurred in Laclede County in the last ten years according to the National Centers for Environmental Information. Limitations to using NCEI data for these events are that NCEI reported lightning events include the only lightning events that result in fatality, injury, and/or property and crop

damage.

Thunderstorm Winds

There were 140 thunderstorm wind events reported to the NCEI from 1999 to 2018 in Laclede County. There were 48 events reported that caused property damage and zero that caused crop damage. The property damaged \$1,716,000 total. There were no reported injuries or deaths.

Table 3.36. Thunderstorm Wind Events in Laclede County, 1999-2018

Location	# of Events	Deaths	Injuries	Property Damage	Crop Damage
Unincorp.	75	0	0	\$397,000	\$0
Conway	7	0	0	\$1,012,000	\$0
Lebanon	51	0	0	\$282,000	\$0
Richland	0	0	0	\$0	\$0
Stoutland	0	0	0	\$0	\$0
Phillipsburg	7	0	0	\$25,000	\$0

Source: NCEI Storm Event Database

Hail

There were 149 hail events reported in Laclede County between 1999 and 2018. Six events caused a total of \$300,500 in property damage, and zero caused crop damage. There were no reported injuries or deaths.

Table 3.37. Hail Events in Laclede County, 1999-2018

Location	# of Events	Deaths	Injuries	Property Damage	Crop Damage
Unincorp.	88	0	0	\$50,500	\$0
Conway	11	0	0	\$250,000	\$0
Lebanon	42	0	0	\$0	\$0
Richland	0	0	0	\$0	\$0
Stoutland	0	0	0	\$0	\$0
Phillipsburg	8	0	0	\$0	\$0

Source: NCEI Storm Event Database

High Winds

There were only two high wind events recorded in Laclede County since 1999. This event did not cause any death, injury, property damage or crop damage.

Table 3.38. High Wind Events in Laclede County, 2009-2018

Location	# of Events	Deaths	Injuries	Property Damage	Crop Damage
Unincorp.	2	0	0	\$0	\$0

Source: NCEI Storm Event Database

Lightning

There are five recorded lightning events for Laclede County since 1999. One fatality was recorded, along with \$544,500 in property damage.

Table 3.39. Lightning Events in Laclede County, 1999-2018

Location	# of Events	Deaths	Injuries	Property Damage	Crop Damage
Unincorp.	3	0	0	\$43,500	\$0
Lebanon	1	0	0	\$500,000	\$0
Phillipsburg	1	1	0	\$1,000	\$0

Source: NCEI Storm Event Database

Probability of Future Occurrence

Thunderstorm Winds

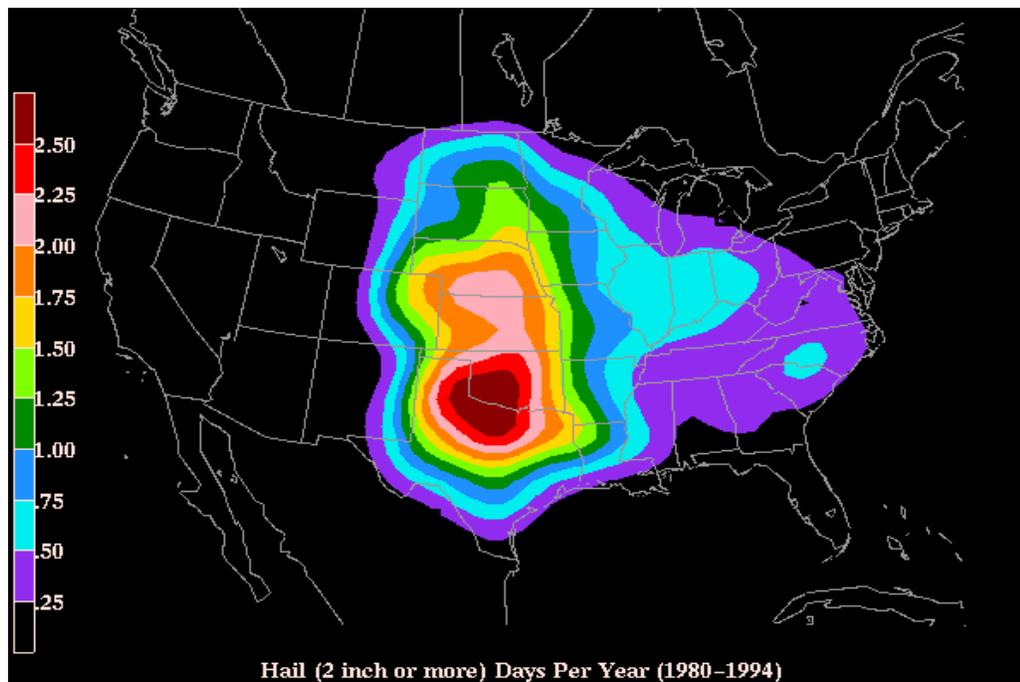
There were 140 thunderstorm wind events recorded in the NCEI Storm Event Database in the last twenty years. This means that there is a 100% probability that Laclede County will experience a thunderstorm wind event in any given year, with an average of around 7 events per year. Out of the 140 events, 48 caused \$1,716,000 in property damage; this averages between 2 and 3 (2.4) damaging events per year with \$85,800 of annualized losses.

Hail

There have been 149 hail events over the 20 year period from 1999-2018. This is an average of about 7.5 hail events in any given year, yielding a 100% probability. Six of the hail events caused \$300,500 in property damage. This means that there is one hail event causing property damage around every three to four years, with average losses of \$50,083 per damaging event.

Figure 3.26 is 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. Laclede County is bisected by the dark green and dark blue zones, meaning that the county can experience hail greater than 2" in diameter 0.75 to 1.25 days per year.

Figure 3.26. Annual Hailstorm Probability (2" diameter or larger), U 1980- 1994



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

High Winds

There were only two high wind events recorded in Laclede County since 1999. This yields only a 10% probability of a high wind event in Laclede County in any given year. None of the events caused property damage, making the probability of a damaging event impossible to calculate.

Lightning

There are five lightning events recorded for Laclede County since 1999, meaning there is a 25% probability that Laclede County can experience a lightning event in any given year. Every lightning event recorded caused property damage, which means that a damaging lightning event can be expected about once every four years, averaging \$108,900 per damaging event.

Vulnerability

Vulnerability Overview

Thunderstorms, high winds, hail, and lightning events pose varying risks for Laclede County. All have been recorded in Laclede County, however the number of events and resulting damage varies widely for all events. Thunderstorm winds are the event that has caused the most property damage in the last 20 years (\$1,716,000), and has the second highest number of events (140), after hail events (149). Although hail has the highest number of events recorded in Laclede County in the last 20 years, and has led to \$300,500 in property damage, lightning events put the county more at risk. With only five lightning events recorded in the last 20 years, there has still been \$544,500 worth of property damage and one recorded fatality. Every recorded lightning event has caused property damage, with an average of \$108,900 per event. Although the number of recorded events for lightning is low, the events recorded have caused the most devastating damage to the county per event. High wind events occur least often, and have not caused any injury, fatality, property damage, or crop damage.

Poorly built structures, barns, and older buildings are more vulnerable to thunderstorm winds, high winds, and hail damage. Hail can lead to damage of structures, crops, and vehicles. Lightning events can lead to wildfires, damaged electrical utilities, and occasionally, injuries or fatalities.

Potential Losses to Existing Development

The average annual losses that are determined from historical losses for thunderstorms, high winds, hail, and lightning are indicators of the potential losses to existing development. Potential annual losses throughout Laclede County are: Thunderstorm - \$85,800; Hail - \$15,025; Lightning - \$27,225. Potential annual losses from high winds cannot be calculable because there is no recorded damage in the last 20 years; but damages from these events should be expected in the future.

The 2013 State Plan used data from several sources to determine vulnerability to existing development from severe thunderstorms across Missouri by county. This data was collected by the following sources: National Climatic Data Center (NCDC) storm events data (1993 to July 2009) (now NCEI), Crop Insurance Claims data from USDA's Risk Management Agency (2004-2008), U.S. Census Data (2000), USDA's Census of Agriculture (2007), and the calculated Social Vulnerability Index of Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina. **Table 3.40** below shows the housing units, total building exposure, crop exposure, and social vulnerability index values for severe thunderstorm events in Laclede County.

Table 3.40. Laclede County Vulnerability to Severe Thunderstorm, 2010

County	Housing Units /sqmi	Total Building Exposure (\$)	Crop Exposure (\$)	Social Vulnerability Index (1-5)
Laclede	18.7	\$1,807,901,000	\$3,754,000	2

Source: Missouri State Hazard Mitigation Plan, 2013

Previous and Future Development

Growth in Laclede County is occurring at a slow rate, with Lebanon seeing the most growth in terms of population, business, and housing. Additional development in these areas results in the exposure of more households and structures vulnerable to damages from high winds, hail, and lightning.

Hazard Summary by Jurisdiction

Although thunderstorms/high winds/lightning/hail events are area-wide, communities with a greater percentage of structures built prior to 1939 are considered to be more vulnerable to the impact of high wind and hail damage. Laclede County has four jurisdictions with structures built before 1939 accounting for at least 10% of all structures, Conway, Lebanon, Stoutland, and Phillipsburg. New construction and population growth as seen in Lebanon would increase the exposure and risk to this hazard; however, the new construction following building code requirements will assist in mitigating the effects of strong storms.

School district facilities are at risk to the damages of thunderstorms, high winds, hail, and lightning as well. However, risk to student populations has been decreased in both Laclede County R-I Schools and the Joel E. Barber School (Laclede County C-5) due to construction of storm shelters.

Problem Statement

Poorly built and older structures are more vulnerable to the impacts of high winds during thunderstorms. High winds and lightning can lead to problems with electrical utilities and can cause power outages. Both high winds and hail can damage roofs; and hail can damage crops and vehicles. People are also at risk of injury or death from high wind, hail, and lightning events.

The risk of property damage, injury, and death from thunderstorms, high winds, lightning, and hail in Laclede County can be mitigated by identifying safe refuge areas in public buildings, nursing homes, and other facilities that house vulnerable populations. The purchasing and installation of NOAA weather radios in schools, government buildings, and public areas may assist in providing early warning to allow for the public to seek shelter during these events. A text notification system may also benefit the public and vulnerable populations and reduce the risk of injury and death. Education and hazard awareness programs in public schools would help increase public safety in the event of severe thunderstorm events.

3.4.9 Tornado

Some specific sources for this hazard are:

- Enhanced F Scale for Tornado Damage, NWS, www.spc.noaa.gov/faq/tornado/ef-scale.html;
- 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>

Hazard Profile

Hazard Description

The NWS defines a tornado as “a violently rotating column of air extending from a thunderstorm to the ground.” It is usually spawned by a thunderstorm and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. Often, vortices remain suspended in the atmosphere as funnel clouds. When the lower tip of a vortex touches the ground, it becomes a tornado.

High winds not associated with tornadoes are profiled separately in this document in **Section 3.4.8**, Thunderstorm/High Wind/Hail/Lightning.

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

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

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

The average forward speed of a tornado is 30 miles per hour but may vary from nearly stationary to 70 miles per hour. The average tornado moves from southwest to northeast, but tornadoes have

been known to move in any direction. Tornadoes are most likely to occur in the afternoon and evening, but have been known to occur at all hours of the day and night.

Geographic Location

There are no specific likely locations for future occurrences as the threat from tornadoes is county-wide.

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 (see **Table 3.41**) 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 3.41. Enhanced F Scale for Tornado Damage

FUJITA SCALE			DERIVED EF SCALE		OPERATIONAL EF SCALE	
F Number	Fastest ¼-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	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 3.42**. 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. Information on the Enhanced Fujita Scale’s damage indicators and degrees of damage is located online at www.spc.noaa.gov/efscale/ef-scale.html.

Table 3.42. 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
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

Since 1993, Laclede County has experienced 18 tornado events with EF/F Scale ratings ranging from EF0 to EF2 in magnitude. Half of the 18 events had a rate of EF1, four had a rank of EF2, and only one had a rank of EF3. Collectively, the 18 events caused \$14,700,000 in property damage.

The most destructive tornado since 1993 occurred on 01/07/2008 in Conway when an unusual mid winter tornado outbreak occurred and caused \$8,000,000 in property damage and injured 12. This tornado was an extension of a tornado from Webster County, and destroyed numerous homes and outbuildings south of Lebanon.

Table 3.43 includes NCEI reported tornado events and damages since 1993 in Laclede County. There are limitations to the use of NCEI tornado data that must be noted. For example, one tornado may contain multiple segments as it moves geographically. A tornado that crosses a county line or state line is considered a separate segment for the purposes of reporting to the NCEI. Also, a tornado that lifts off the ground for less than 5 minutes or 2.5 miles is considered a separate segment. If the tornado lifts off the ground for greater than 5 minutes or 2.5 miles, it is considered a separate tornado. Tornadoes reported in Storm Data and the Storm Events Database are in segments.

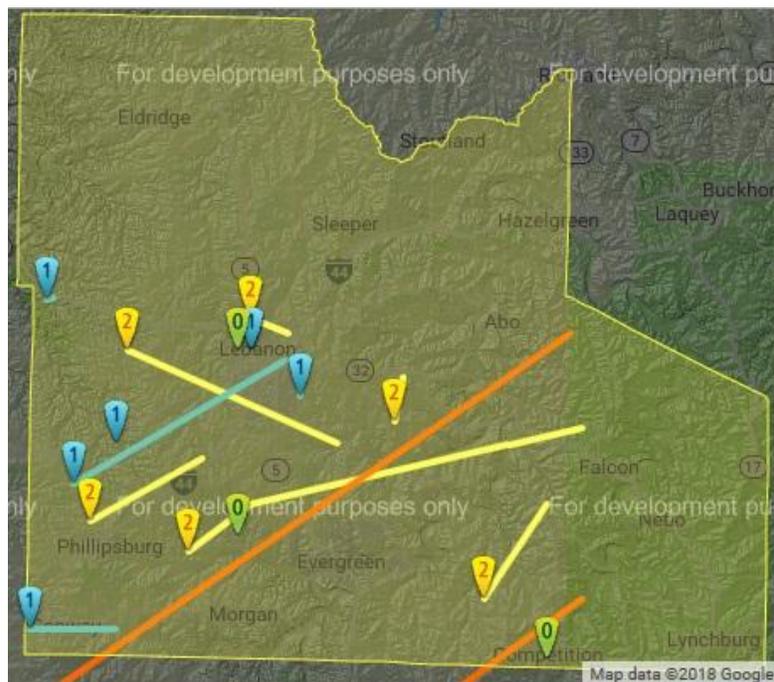
Table 3.43. Recorded Tornadoes in Laclede County, 1993 – Present

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
04/24/1993	Competition	Competition	0.50	45	F0	0	2	\$500,000	\$0
04/26/1994	Lebanon	Lebanon	2.50	50	F1	0	0	\$50,000	\$0
11/10/1995	Lebanon	Lebanon	10.00	200	F2	0	0	\$3,000,000	\$0
05/05/1996	Conway	Conway	4.00	100	F1	0	1	\$500,000	\$0
05/06/2003	Lebanon	Lebanon	0.20	20	F0	0	0	\$0	\$0
05/30/2004	Lebanon	Lebanon	1.00	200	F1	0	0	\$10,000	-
03/12/2006	Competition	Competition	3.00	35	F0	0	0	\$80,000	-
10/17/2007	Morgan	Morgan	0.10	35	EF0	0	0	\$10,000	\$0
01/07/2008	Conway	Abo	24.68	300	EF3	0	12	\$8,000,000	\$0
01/07/2008	Phillipsburg	Brush Creek	5.44	300	EF2	0	0	\$100,000	\$0
03/31/2008	Lebanon	Lebanon	1.79	75	EF2	0	0	\$500,000	\$0
05/08/2009	Jones Lebanon ARPT	Jones Lebanon ARPT	2.00	440	EF2	0	0	\$500,000	\$0
02/29/2012	Phillipsburg	Lebanon	11.00	150	EF1	0	5	\$750,000	\$0
02/29/2012	Bennett Springs	Bennett Springs	0.25	75	EF1	0	0	\$500,000	\$0
05/27/2017	Brush Creek	Russ	9.00	100	EF1	0	0	\$100,000	\$0
05/27/2017	Nebo	Winnipeg	4.97	400	EF1	0	0	\$100,000	\$0
05/27/2017	Dryknob	Dryknob	2.07	100	EF1	0	0	\$0	\$0
05/27/2017	Winnipeg	Winnipeg	0.01	100	EF1	0	0	\$0	\$0
Total						0	20	\$14,700,000	\$0

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

Figure 3.27 shows historic tornado paths in Laclede County.

Figure 3.27. Laclede County Map of Historic Tornado Events



Source: Missouri Tornado History Project, <http://www.tornadohistoryproject.com/tornado/Missouri>

There are no records in the USDA Risk Management Agency Database that refer to crop damages as a result of tornado events since 1993.

Probability of Future Occurrence

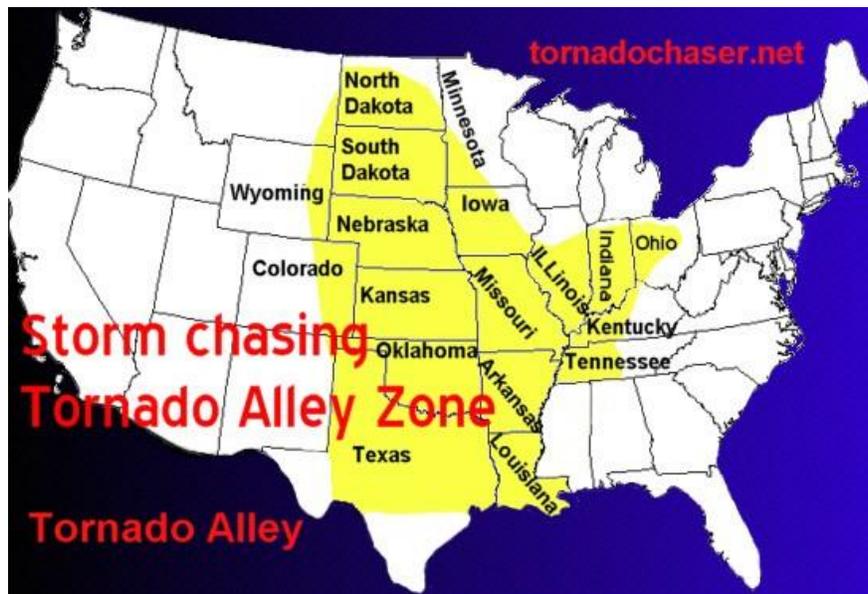
Since 1993, or the past 25 years, there have been 18 tornado events in Laclede County as recorded by the NCEI. This means that during any given year, there is a 72% probability of a tornado event occurring. Out of the 18 events, 12 led to property damage, meaning the annual probability of a damaging tornado event is 48% in any given year.

Vulnerability

Vulnerability Overview

Laclede County, along with the rest of Missouri, is located in a region of the U.S. with high frequency of dangerous and destructive tornadoes referred to as “Tornado Alley”. **Figure 3.28** illustrates areas where dangerous tornadoes historically have occurred.

Figure 3.28. Tornado Alley in the U.S.



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

Within the 2013 State Plan, vulnerability summaries were composed for each county within Missouri based on likelihood of tornado occurrence, loss ratio, population change, housing change, and overall vulnerability rating. Laclede County was ranked as having moderate vulnerability. While this approach attempts to prioritize tornado vulnerable counties, it does not identify any particular geographic patterns to tornado risk. This is consistent with the random nature of tornadoes.

Potential Losses to Existing Development

Potential losses were calculated in the 2013 State Plan for each county based on the total building exposure value divided by average annualized historic losses. For Laclede County, this value is \$2,898,589,000.

As stated previously, Laclede County has experienced 18 tornado events over the last 25 years causing a total of \$14,700,000 in property damage. This means that over 25 years, the average annual loss from tornado damage is \$588,000. Out of the 18 tornado events recorded, 14 events were ranked as at least an EF1 tornado. With probability of a tornado event during a given year being 48%, it is logical to assume that a tornado event would most likely be ranked at least an EF1, which could cause an average of \$233,333 in damage.

Previous and Future Development

Development across the county and within incorporated jurisdictions increases the potential for losses. The average annual loss over the 25 year period to date is \$588,000, which would stay the same if there was no additional development. Future development and population increase will increase exposure to damage.

Hazard Summary by Jurisdiction

A tornado event could occur anywhere in Laclede County, but some jurisdictions would suffer heavier damages because of the age of the housing or the high concentration of mobile homes. Lebanon is a jurisdiction at risk because it is already the most populated city with the largest amount of infrastructure. With future development plans, they face more risk to tornado events. Jurisdictions with high percentages of mobile homes will also be more at risk. According to the 2016 U.S. Census Bureau's American Community Survey, four jurisdictions have at least 10% of housing as mobile homes; Conway with 18%, Phillipsburg with 17%, Stoutland with 14%, and Richland with 11%. Communities with structures built before 1939 are also more vulnerable to tornadoes because of high winds. Refer to the ***Hazard Summary by Jurisdiction*** part of **Section 3.4.8** for discussion on jurisdictions with homes built before 1939.

Problem Statement

Tornadoes are the most violent of all atmospheric storms and can happen quickly within any part of the county. Wind speeds can exceed 250 miles per hour and tornado paths can be miles long, causing complete destruction of anything within the path. Tornado events in Laclede County have caused 20 injuries and over \$14,000,000 in damages since 1993.

The risk of injury, death, and property damage can be mitigated by the construction of FEMA safe rooms in new schools, daycares, and nursing homes. Joel E. Barber (Laclede County C-5) and Laclede County R-I School District have already constructed FEMA safe rooms to help protect the community. Any safe rooms that are open to the public will also help protect the populations living in mobile homes. Additionally, NOAA weather radios, alert applications, and public education can provide early warnings and prepare the public for what to do in case of a tornado.

3.4.10 Winter Weather/Snow/Ice/Severe Cold

Some specific sources for this hazard are:

- Wind chill chart, National Weather Service, http://www.nws.noaa.gov/om/cold/wind_chill.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, <https://www.rma.usda.gov/data/cause>
- 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

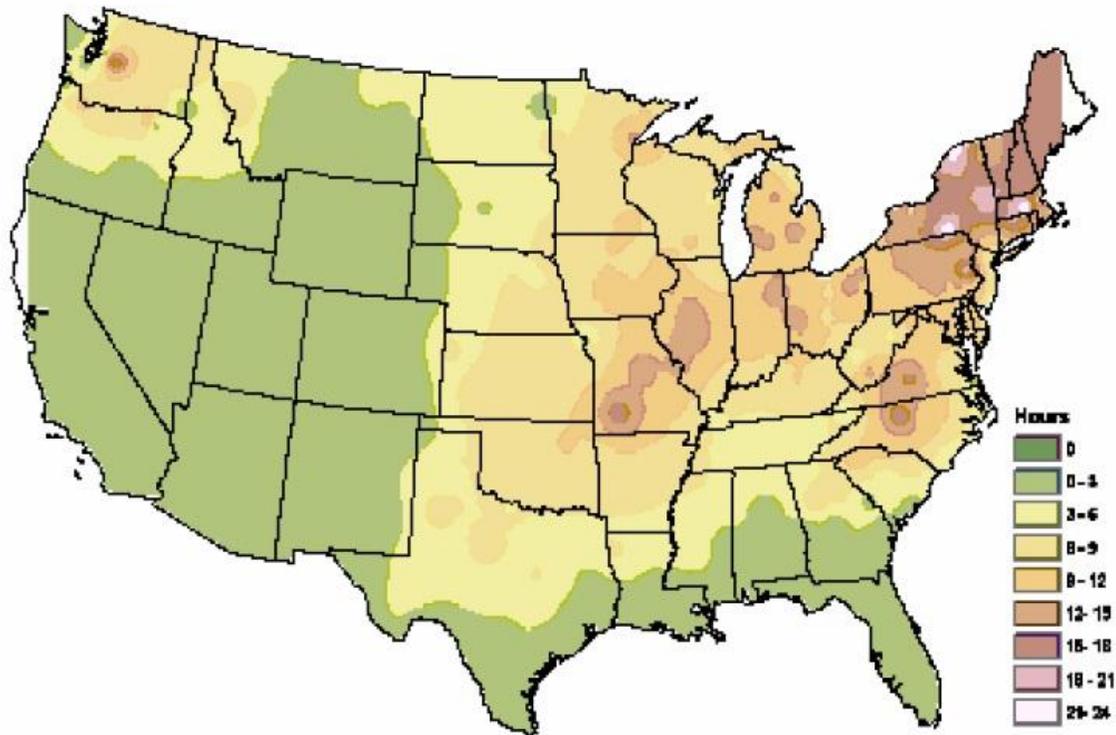
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows.

- **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

The entire county is vulnerable to heavy snow, ice, extreme cold temperatures and freezing rain. **Figure 3.29** shows the average number of hours per year that freezing rain occurs. Laclede County is in a zone that can expect 12-15 hours of freezing rain per year.

Figure 3.29. NWS Statewide Average Number of Hours per Year with Freezing Rain



Source: American Meteorological Society. "Freezing Rain Events in the United States." <http://ams.confex.com/ams/pdfpapers/71872.pdf>

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.

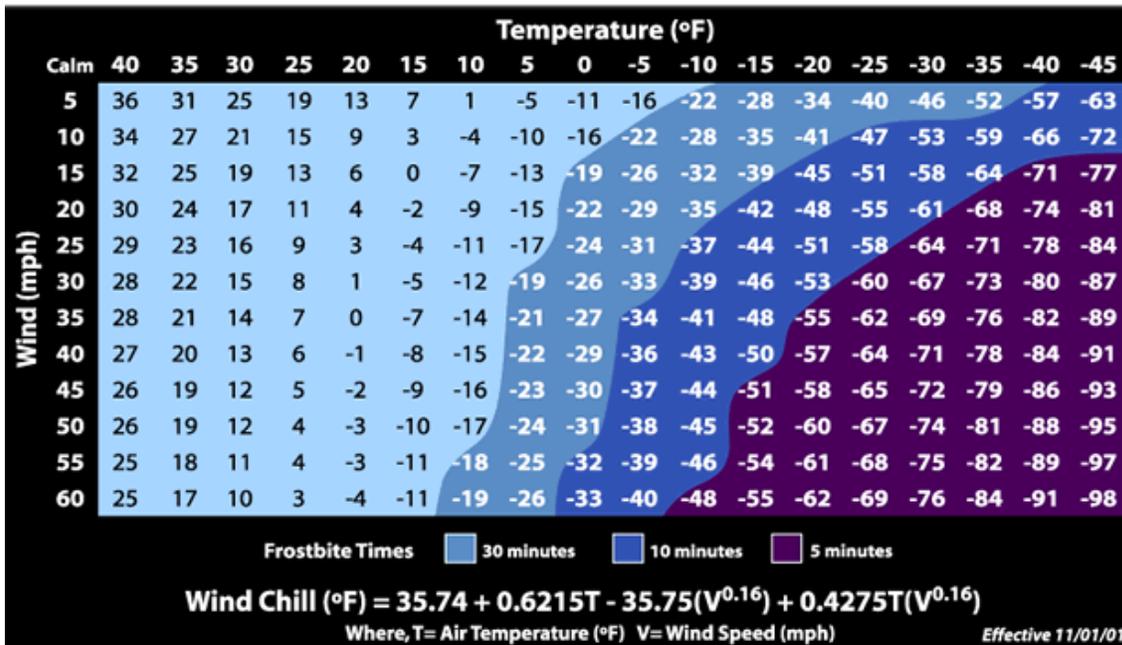
Buildings with overhanging tree limbs are more vulnerable to damage during winter storms when limbs fall. Businesses experience loss of income as a result of closure during power outages. In general heavy winter storms increase wear and tear on roadways though the cost of such damages is difficult to 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 storm events damage to power lines due to the ice weight on the lines and equipment. Damages also occur to lines and equipment from falling trees and tree limbs weighted down by ice. Potential losses could include cost of repair or replacement of damaged facilities, and lost economic opportunities for businesses.

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

Wind can greatly amplify the impact of cold ambient air temperatures. Provided by the National Weather Service, **Figure 3.30** below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Figure 3.30. Wind Chill Chart



Source: National Weather Service, http://www.nws.noaa.gov/om/cold/wind_chill.shtml

Previous Occurrences

There were 35 winter weather events in Laclede County between 1999 and 2018. The events included blizzards, cold/wind chill, heavy cold/wind chill, heavy snow, ice storm, winter storm, and winter weather. **Table 3.44** includes the events in chronological order, so that it is apparent when one event manifested itself in more than one type of weather.

Table 3.44. NCEI Laclede County Winter Weather Events Summary, 1999-2018

Date	Type of Event	# of Deaths	# of Injuries	Property Damages	Crop Damages
01/01/1999	Winter Storm	0	0	\$0	\$0
01/23/1999	Winter Storm	0	0	\$0	\$0
12/12/2000	Extreme Cold/Wind Chill	0	0	\$0	\$0
12/12/2000	Heavy Snow	0	0	\$0	\$0
12/15/2000	Ice Storm	0	0	\$0	\$0
01/01/2001	Extreme Cold/Winter Chill	0	0	\$0	\$0
02/21/2001	Ice Storm	0	0	\$0	\$0
03/02/2002	Winter Storm	0	0	\$0	\$0
12/04/2002	Winter Storm	0	0	\$0	\$0
12/24/2002	Winter Storm	0	0	\$0	\$0
02/23/2003	Winter Storm	0	0	\$0	\$0
03/05/2003	Winter Storm	0	0	\$0	\$0
12/10/2003	Heavy Snow	0	0	\$0	\$0
01/25/2004	Ice Storm	0	0	\$0	\$0
02/05/2004	Winter Storm	0	0	\$0	\$0
11/30/2006	Winter Storm	0	0	\$25,000	\$0
01/12/2007	Ice Storm	0	0	\$50,000,000	\$0
01/20/2007	Winter Storm	0	0	\$0	\$0
12/10/2007	Ice Storm	0	0	\$10,000	\$0

02/11/2008	Ice Storm	0	0	\$0	\$0
02/21/2008	Ice Storm	0	0	\$0	\$0
03/04/2008	Heavy Snow	0	0	\$0	\$0
01/26/2009	Winter Storm	0	0	\$0	\$0
02/28/2009	Winter Storm	0	0	\$0	\$0
02/01/2011	Blizzard	0	0	-	\$0
02/21/2013	Winter Storm	0	0	\$0	\$0
12/05/2013	Winter Storm	0	0	\$0	\$0
01/05/2014	Winter Storm	0	0	\$0	\$0
03/02/2014	Winter Storm	0	0	\$0	\$0
02/20/2015	Winter Storm	0	0	\$0	\$0
02/28/2015	Winter Storm	0	0	\$0	\$0
12/16/2016	Winter Weather	0	0	\$100,000	\$0
01/13/2017	Ice Storm	0	0	\$0	\$0
01/01/2018	Cold/Wind Chill	1	0	\$0	\$0
02/04/2018	Winter Weather	0	0	\$0	\$0
Total		1	0	\$50,135,000	\$0

Source: NCEI Storm Event Database

Winter Storm (11/30/2006)

A major winter storm caused a combination of freezing rain, sleet, and heavy snow to fall over Laclede County. Ice accumulations totaled up to four inches in some areas. A second wave of precipitation caused large amounts of snow to accumulate over the ice. The combination of ice and snow weighed down all exposed objects.

Ice Storm (01/12/2007)

One of the greatest disasters to ever impact Missouri was the ice storm that occurred on 01/12/2007 when ice accumulated up to two and a half inches, causing \$50,000,000 in property damage. Power outages and catastrophic tree damage were the main impacts resulting from this event. Several indirect fatalities due to extreme elements were documented, and carbon monoxide poisoning occurred within a few homes as generators were being used in garages.

Ice Storm (12/10/2007)

A major ice storm impacted Laclede County when ice accumulations ranged from one quarter of an inch to three quarters of an inch occurred across the entire county. Some power outages occurred from tree and power line damage.

Winter Weather (12/16/2016)

Freezing drizzle conditions caused numerous car accidents in Laclede County. There was one indirect fatality near Phillipsburg. Missouri Highway Patrol reported another accident involving several cars on I-44 near Conway. This accident caused major traffic problems on I-44 and closure of the eastbound lane for over 2 hours.

Cold/Wind Chill

Extreme cold temperatures were responsible for the death of a 52-year old woman walking home in Lebanon.

Probability of Future Occurrence

The probability for all of the different types of winter weather are included as one probability, since one storm generally includes multiple types of events. A total of 35 winter events over 20 years equates to a 100% probability of occurrence in any given year.

Vulnerability

Vulnerability Overview

In the 2013 State Plan, seven factors were considered in determining overall severe winter storm vulnerability: housing density, likelihood of occurrence, building exposure, crop exposure, average annual property loss ratio, average annual crop insurance claims, and social vulnerability. The state ranked each of these factors using a vulnerability scale from one to five, following these descriptive terms:

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

Table 3.46 and **Table 3.47** below show the rating values of all factors considered and assigned, and how Laclede County Scored. Based on the following criteria, the 2013 State Plan ranked Laclede County as having low vulnerability to severe winter weather hazards.

Table 3.45. 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 (\$)	<\$10M	\$10M-\$24M	\$25M-\$49M	\$50M-\$99M	>\$100M
Social Vulnerability	1	2	3	4	5
Likelihood of Occurrence (# of events/years 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

Table 3.46. Vulnerability Analysis for Severe Weather Hazard for Laclede County

County	Housing Density Rating	Likelihood Rating	Property Loss Ratio Rating	Crop Exposure	Crop Loss Ratio Rating	Social Vulnerability Index	Total Score and Vulnerability	Vulnerability Rating
Laclede	1	1	2	1	1	3	9	Low

Source: 2013 Missouri State Hazard Mitigation Plan

Potential Losses to Existing Development

During the 20 year period from 1999 to 2018, \$50,135,000 in property damage equates to \$2,506,750 in average annual losses countywide. However, this may not be the most accurate representation of losses, since all of the property damage occurred as a result of just four winter weather events. The average property damage per damaging winter weather event equals \$12,533,750, with an average of about one damaging event occurring every five years. Ice storms are responsible for most of the property damage, and threaten power lines, trees, roads, and the

public that uses them.

The 2013 State Plan provides information on total building exposure and total property loss. The total property loss represents a combination of NCDC (now NCEI) and FEMA PA funds. For declared events, the PA damage figures were used in lieu of the NCEI data. NCEI damages represent early estimates and the FEMA PA funds represent actual expenditure. For Laclede County, total building exposure totaled \$2,898,589,000, and total property loss amounted to \$6,362,976. These values represent the absolute potential damage that could be caused by severe winter weather in Laclede County.

Previous and Future Development

Increased development and any resulting increase in population will increase exposure to damage from severe winter weather. As mentioned previously, Lebanon is the only jurisdiction experiencing significant growth and currently plans to expand in the future. Future construction of facilities that will serve vulnerable populations will need to be prepared for extreme weather conditions. New roads will require increased snow removal and salt trucks to ensure the safety of the public. Any increases in agriculture crop production will subsequently increase the risk of exposure.

Hazard Summary by Jurisdiction

The jurisdictions that are most at risk to severe winter weather include those living below the poverty line, those aged 65 years or older, and those living in mobile homes. Those living below the poverty line are more vulnerable to winter weather because heat may not be available or affordable. Those aged 65 years or older are more vulnerable to winter weather because of potential health problems or lack of ability to endure the cold. Percentages of mobile homes within each jurisdiction is discussed in the section above. **Table 3.48** includes information on populations over 65 and the percent living below poverty level by jurisdiction.

Table 3.47. Percent Living Below the Poverty Level and Population over 65 by Jurisdiction

Jurisdiction	% of Families Living Below Poverty Level	Percent of Population Aged 65 or Older
City of Conway	22.9%	10.9%
City of Lebanon	22.3%	17.5%
City of Richland	29.7%	17.9%
City of Stoutland	6.5%	17.3%
Village of Phillipsburg	14.0%	15.6%

Source: U.S. Census Bureau's 2016 ACS, <http://factfinder.census.gov/>

As seen in the table above, Richland is the most vulnerable jurisdiction based on poverty and elderly population, with the highest values in both categories. Lebanon is also vulnerable based on these criteria with the third highest poverty percent and second highest elderly percent.

Problem Statement

Severe winter weather can include blizzards, heavy snow, ice storms, sleet, and extreme cold/wind chill that can be devastating to communities. Traffic accidents, damaged utility lines, structural collapse, and extremely low temperatures put the public and infrastructure at risk. People over 65 years old and those living in poverty or in areas with insufficient heat are especially at risk to hypothermia and frostbite.

Organizing outreach to at-risk populations, including establishing and promoting heating centers can help reduce risk of exposure to severe winter weather. Having an alert system in place can also allow the public time to avoid driving or other dangerous scenarios. Communities should also be sure to have sufficient snow removal and salt trucks prepared as the winter months arrive.

4 MITIGATION STRATEGY

4	MITIGATION STRATEGY	4.1
4.1	Goals.....	4.1
4.2	Identification and Analysis of Mitigation Actions.....	4.2
4.3	Implementation of Mitigation Actions	4.6

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 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 Laclede County’s existing hazard mitigation plan approved by FEMA on July 11, 2014. Therefore, the goals from the 2014 Laclede County Hazard Mitigation Plan were reviewed to see if they were still valid, feasible, practical, and applicable to the defined hazard impacts. The MPC conducted a discussion session during their second meeting to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the 2018 State Hazard Mitigation Plan goals were reviewed. The MPC also reviewed the goals from current surrounding county plans.

Discussion of the previously approved goals involved determining the most important assets in the county. It was determined that the goals from the 2014 Plan were still important, but just needed to be rearranged. The Plan update goals and objective are as follows:

Goal 1: Mitigate the effects of potential natural hazards in Laclede County to protect lives and assets

Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible

Goal 3: Encourage continuity of operations of government and emergency services in a disaster

Goal 4: Increase public awareness of natural hazards that have the potential to impact Laclede County

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 second MPC meeting, the results of the risk assessment update were provided to the MPC members for review and the key issues were identified for specific hazards. Changes in risk since adoption of the previously approved plan were discussed. The second meeting concluded with the distribution of a list of possible mitigation actions to prompt discussions within and among the jurisdictions. The discussions also occurred during jurisdictional specific meetings. The list included possible new mitigation actions, as well as actions from the previously approved plan. 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. Use of the problem statements allowed the MPC to recognize new and innovative strategies for mitigate risks in the planning area.

The focus of Meeting three was to update of the mitigation strategy. For a comprehensive range of mitigation actions to consider, the MPC reviewed the following information during Meeting three:

- A list of actions proposed in the previous mitigation plan, the current State Plan, and approved plans in surrounding counties,
- Key issues from the risk assessments, including the Problem Statements concluding each hazard profile and vulnerability analysis,
- State priorities established for Hazard Mitigation Assistance grants, and
- Public input during meetings, responses to Data Collection Questionnaires, and other efforts to involve the public in the plan development process.

For Meeting three, individual jurisdictions, including school and special districts, developed final mitigation strategy for submission to the MPC. They were encouraged to review the details of the risk assessment vulnerability analysis specific to their jurisdiction. They were also 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.

The MPC reviewed the actions from the previously approved plan for progress made since the plan had been adopted. Prior to Meeting three, the list of actions for each jurisdiction was emailed to that jurisdiction’s MPC representative along with the worksheets. Each jurisdiction was instructed to provide information regarding the “Action Status” with one of the following status choices:

- 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 5 completed actions, 19 deleted actions, and 6 continuing actions.

Table 4.1 provides a summary of the action statuses from the 2014 Laclede Hazard Mitigation Plan:

Table 4.1. Action Status Summary

Jurisdiction	Completed Actions	Deleted Actions	Continuing Actions
All	5	19	6

Table 4.2 provides a summary of the completed and deleted actions from the previous plan.

Table 4.2. Summary of Completed and Deleted Actions from the Previous Plan

Completed Actions		Completion Details (date, amount, funding source)
2.1.6	With the help of LOCLG, map all of the low water crossings, culverts, and bridges.	Completed 5/27/2016 with funding from CDBG Disaster Planning Grant it was part of several projects. Exact \$ not specific to just this task.
2.1.7	With the help of LOCLG by purchasing ESRI and HAZUS flood software to improve flood hazard assessments and flood mapping to ensure the safety of the Laclede County citizens.	Completed 5/27/2016 with funding from CDBG Disaster Planning Grant it was part of several projects. Exact \$ not specific to just this task.
3.1.3	Analysis the data collected from LOCLG in the HAZUS software.	Data has been entered into HAZUS.
4.1.7	Express the need for Laclede County Emergency Management to collaboration with other public safety agencies to conduct emergency response exercises.	Completed on an annual basis and is part of the normal SOP.
4.1.8	Allow Laclede County Emergency Management to present at least two community awareness presentations annually.	Completed on an annual basis and is part of the normal SOP.

Deleted and Changed Actions		Reason for Deletion
1.1.1	Encourage public facilities to have shelters to accommodate staff and visitors during tornadoes and any other natural hazard.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
1.1.2	Seek funding to add shelters or updates to existing public facilities to ensure adequate protection from tornadoes and strong winds. Also seek funding on installing early warning systems.	Changed to specific jurisdiction Action Worksheets
1.1.3	Encourage and educate citizens on the importance of registering their storm shelters on the centralized website.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
1.1.4	Examine low water crossing, culvert, bridges, and repetitive flood loss properties to determine feasible and practical mitigation opportunities to ensure community safety.	Changed to specific jurisdiction Action Worksheets
1.1.5	Create a network of community partners, including public health agencies, emergency management agencies, volunteer organizations, to designate community locations with adequate air conditioning that can be used as heat emergency shelters during a heat wave.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.1	Increase public awareness and understanding of the benefits of a FEMA Safe Room 361 and seek funding for the building of Safe Rooms wherever needed.	Changed to specific jurisdiction Action Worksheets
2.1.2	Encourage construction of community tornado shelters in office buildings, manufacturing facilities, multi-family rental units, schools, mobile home parks, and other large population congregation centers.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.3	As funding allows, repetitive flood loss properties and structures will be targeted for buyout.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.4	Participate in and ensure compliance with, flood mitigation and floodplain management programs.	Changed to specific jurisdiction Action Worksheets See Each Participating NFIP
2.1.5	Participate in the National Flood Insurance Program (NFIP)	Changed to specific jurisdiction Action Worksheets See Each Participating NFIP
2.1.8	Create public awareness of the Laclede County Emergency Operation Plan in regard to heat-related mitigation.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.9	Work with community groups to sponsor a program to encourage neighbors to check on at risk people within their communities. Such as neighborhood watch or CERT.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.10	Incorporate GIS Mapping into Laclede County Emergency Management Operations, with regard to wildfire history and potential high risk areas for wildfires.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.11	Maintain mapping in the Laclede County Emergency Operations Plan for Dam Failure.	Not feasible as no jurisdiction completed an Action Worksheet for this

		action.
3.1.1	Encourage the use of tempered or shatter-resistant glass in the windows and doors of new public and private facilities where large numbers of people may congregate.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
3.1.2	Develop a plan for upgrading and or prioritize low water crossing based on findings from LOCLG.	Some of the data was used to identify the action that has been adopted by Laclede County in the 17 low water crossing.
3.1.4	Encourage Fire Department, Fire Districts, and Ambulance Districts to have alternate routes developed in the event a low water crossing is impassable.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
3.1.5	Encourage both government agencies and businesses that have employees that must work outside during the day to have an alternate start and end time during the extreme heat.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
3.1.6	Encourage local governments and businesses to have a water conservation plan.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.1	Work with our Chamber of Commerce, school districts, builders associations, and communities in educating our communities on the potential natural hazards and promoting the benefits of Safe Rooms.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.2	Work with builders, developers, and manufacturers of building materials that are tornado and wind damage resistant to demonstrate the benefits of these materials as well as building techniques that have been proven affective.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.3	With brochures provided by both FEMA and SEMA concerning flood mitigation, flood preparedness, and flood response and recovery work with local volunteers and civic organizations to distribute them to current homeowners and businesses in the area.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.4	Educational materials in regard to low water crossing and the dangers of driving over them during a flooding incident, distributed through the school districts for new drivers who may not be aware of the dangers.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.5	Create public awareness and distribute educational materials to increase awareness of severe flooding and winter weather dangers.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.6	Disseminate information to the public as to locations for heat relief, and heat shelters available within the region.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.9	Provide maps where sinkholes are located and educational materials in regard to the dangers of them being next to or near critical infrastructure. Also the dangers of throwing hazardous waste into a sinkhole.	Maps were included in the 2014 HMP plan and no further action was taken. Not feasible to move to 2018 plan based on the fact that no participating jurisdiction identified this as an action item by completing the

		Action Worksheet.
4.1.10	Encourage marking and fencing around located sinkholes on public and private property.	Not feasible as no jurisdiction completed an Action Worksheet for this action. Encourage, was not an actionable item from previous plan.

Source: Previously approved County Hazard Mitigation Plan; Data Collection Questionnaires and Maintenance Meetings from 2014-2018.

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 finalize the actions to be submitted for 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.

During the prioritization process, the MPC used worksheets to assign scores. The worksheets 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?

The final scores are listed below in the analysis of each action. The STAPLEE final score for each action, absent other considerations, such as a localized need for a project, determined the priority. Low priority action items were those that had a total score of between 0 and 5. Moderate priority actions were those scoring between 6 and 11. High priority actions scored 12 or above. The STAPLEE worksheet is shown in **Figure 4.1**.

Figure 4.1. STAPLEE Worksheet

Laclede County Actions (2018)		Social	Technical	Administrative	Political	Legal	Economic	Environmental	Staplee Totals	Benefit	Cost	Totals Staplee and B/C	Priority
Mitigation Actions													
+ Favorable = (2) - Less Favorable = (1) N Not Applicable = (0)													
All Hazards		S	T	A	P	L	E	E					
Laclede County R-I School District 1.1.1	Secure large propane tank at school	2	1	1	2	2	0	2	10	2	0	12	H
Laclede County 1.1.2	Low water crossings repair, replace and improve	2	2	1	2	2	1	1	11	1	-1	11	M
Richland R-IV School District 2.1.1	Seek funding to add FEMA funded storm shelter at the School District	2	2	2	2	2	1	1	12	2	-1	13	H
Lebanon R-III School District 2.1.2	Seek funding to add FEMA funded storm shelter at the School District	2	2	2	2	2	2	2	14	2	-1	14	H
City of Lebanon 2.1.3	Participate in the National Flood Insurance Program (NFIP)	1	2	1	1	2	1	2	10	2	-1	11	M
City of Richland 2.1.4	Seek funding to add community FEMA funded storm shelter	2	2	2	2	2	1	2	11	2	-1	11	M
City of Richland 2.1.5	Participate in the National Flood Insurance Program (NFIP)	1	2	1	1	2	1	2	10	2	-1	11	M
Laclede County 2.1.6	Participate in the National Flood Insurance Program (NFIP)	1	2	1	1	2	1	2	10	2	-1	11	M
City of Richland 2.1.7	Repair storm water drainage issues	2	2	1	2	2	1	1	11	1	-1	11	M
Stoutland R-II School District 2.1.8	Roof Repairs and or Roof Replacement	2	2	2	2	2	2	2	14	2	-1	14	H
Stoutland R-II School District 2.1.9	Seek funding to add FEMA funded storm shelter at the School District	2	2	2	2	2	2	2	14	2	-1	14	H
City of Lebanon and COPE 2.1.10	Seek funding to add on a storm shelter to the local domestic violence shelter	2	2	2	2	2	2	2	14	2	-1	14	H
City of Lebanon 4.1.1	Lebanon Fire Department Safety and Education Program	2	2	1	2	2	2	2	11	2	0	13	H
Joel E. Barber Laclede County C-5 School District 4.1.2	Replacement of Damaged Roof on School Building	2	2	2	2	2	2	2	14	2	-1	14	H
Stoutland R-II School District 4.1.3	Data collection and education on the potential hazards of flooding and roadways within the county	2	2	1	2	2	2	2	11	2	0	13	H

Action worksheets were used to develop the implementation of the plan. The action worksheet format is shown in **Table 4.3**.

Table 4.3. Mitigation Action Worksheet

Action Worksheet	
Name of Jurisdiction:	Laclede Co. R-1 School District
Risk / Vulnerability	
Problem Being Mitigated:	Potential Hazard to School Staff and School Students
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1.1 Laclede County R-I School District Security Project
Name of Action or Project:	Laclede County R-I School District Security Project
Action or Project Description:	Need to secure large propane tank exterior with fencing as well as interior barrier. Security of large propane tank for the safety of the school staff and school students, in the event of a natural or manmade disaster the propane tank could cause severe damage
Applicable Goal Statement:	Provide more secure barrier to potential of threat to propane tank
Estimated Cost:	\$5,000-\$10,000
Benefits:	Security of large propane tank
Plan for Implementation	
Responsible Organization/Department:	Laclede Co. R-1 School District Superintendent and Propane Company
Action/Project Priority:	STAPLEE 12 HIGH
Timeline for Completion:	1 year
Potential Fund Sources:	Laclede Co. R-1 School District
Local Planning Mechanisms to be Used in Implementation:	Laclede Co. R-1 Safety Plan
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Laclede County
Risk / Vulnerability	
Problem being Mitigated:	Approximately four times each year over the past 10 years there has been significant investment by Laclede County to continually repair 17 of the low water crossings that are critical to the safety of the residents of Laclede County
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.1.2 Laclede County Low Water Crossings Repair, Replacement and Potential Improvements
Name of Action or Project:	Low Water Crossing Improvements
Action or Project Description:	Prioritize and systematically repair 17 low water crossings with improved crossings to avoid future incidents where the low water crossings are damaged lives are endangered and the area becomes impassable during flooding events.
Applicable Goal Statement:	Mitigate the effects of potential natural hazards in Laclede County to protect lives and assets
Estimated Cost:	\$150,000 to \$350,000 per each low water crossing upgraded
Benefits:	Safety of residents and motorists during flooding events
Plan for Implementation	
Responsible Organization/Department:	Laclede County Road and Bridge
Action/Project Priority:	STAPLEE 11 MEDIUM
Timeline for Completion:	5-10 years
Potential Fund Sources:	Pre-disaster mitigation funding and county road and bridge funds when available.
Local Planning Mechanisms to be Used in Implementation, if any:	County Road and Bridge Priorities- Annual Budget Process
Progress Report	
Action Status	Updated
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Richland R-IV School District
Risk / Vulnerability	
Problem Being Mitigated:	Storm Shelter / Safe Room construction
Hazard(s) Addressed:	Safety for District students, faculty and community members
Action or Project	
Action/Project Number:	2.1.1 Richland R-IV School District seek funding to add a FEMA 361 Safe Room-Storm Shelter at the School District
Name of Action or Project:	Storm Shelter / Safe Room Project
Action or Project Description:	Possible construction of a safe room or safe rooms at either or both the elementary school or high school locations of the Richland R-IV School District
Applicable Goal Statement:	Reduce the potential impact of natural disaster to property infrastructure, and local economy through cost-effective and tangible mitigation projects whenever financially feasible
Estimated Cost:	\$1,500,000 to \$3,500,000
Benefits:	Provide safe conditions during a potential weather concern.
Plan for Implementation	
Responsible Organization/Department:	Richland R-IV School District Superintendent
Action/Project Priority:	STAPLEE 13 HIGH
Timeline for Completion:	5-10 Years
Potential Fund Sources:	Mitigation and District funds
Local Planning Mechanisms to be Used in Implementation:	District Planning Committee and Board of Education
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Lebanon R-III School District
Risk / Vulnerability	
Problem Being Mitigated:	Safe Room shelter to accommodate student and staff safety
Hazard(s) Addressed:	Tornado/Severe Storm
Action or Project	
Action/Project Number:	2.1.2 Lebanon R-III Storm Shelter/Safe Room Construction
Name of Action or Project:	Lebanon R-III FEMA Safe Room
Action or Project Description:	Construct FEMA 361 Safe Room shelter at Maplecrest Elementary School
Applicable Goal Statement:	Reduce the potential impact of natural disaster to property infrastructure, and local economy through cost-effective and tangible mitigation projects whenever financially feasible
Estimated Cost:	\$5,000,000
Benefits:	Provide safe shelter in the event of a tornado or severe storm
Plan for Implementation	
Responsible Organization/Department:	Lebanon R-III School District Superintendent
Action/Project Priority:	STAPLEE 14 HIGH
Timeline for Completion:	1-2 years
Potential Fund Sources:	FEMA and Lebanon R-III District
Local Planning Mechanisms to be Used in Implementation:	District Planning Committee and Board of Education
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	City of Lebanon
Risk / Vulnerability	
Problem Being Mitigated:	Potential Flooding and Access to Flood Insurance
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.1.3 City of Lebanon
Name of Action or Project:	National Flood Insurance Program (NFIP)
Action or Project Description:	Continue to enforce floodplain management regulation in accordance with the NFIP and comply with the requirements of the program
Applicable Goal Statement:	Mitigate the effects of potential natural hazards in Laclede County to protect lives and assets
Estimated Cost:	\$0-\$1,000
Benefits:	Allowing our residents access to flood insurance is an important way for us to provide security to our county residents. Not allowing them to build in a floodplain or floodway is also a preventative measure to ensure the safety of our county residents.
Plan for Implementation	
Responsible Organization/Department:	City of Lebanon Floodplain Manager
Action/Project Priority:	STAPLEE 11 MEDIUM
Timeline for Completion:	On-going
Potential Fund Sources:	Part of the City's Annual Budget
Local Planning Mechanisms to be Used in Implementation:	Floodplain Management
Progress Report	
Action Status	Continuing
Report of Progress	The City of Lebanon's Floodplain Manager has continued to do the necessary actions needed to maintain the NFIP within the county

Action Worksheet	
Name of Jurisdiction:	City of Richland
Risk / Vulnerability	
Problem Being Mitigated:	Potential disaster/tornado would be dangerous to the resident of Richland
Hazard(s) Addressed:	Tornado/Storms
Action or Project	
Action/Project Number:	2.1.4 City of Richland Storm Shelter
Name of Action or Project:	City of Richland Community Storm Shelter
Action or Project Description:	Build a tornado storm shelter/FEMA 361 Safe Room
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible
Estimated Cost:	\$1,500,000 to \$3,500,000
Benefits:	Provide safe place for citizens during a tornado or strong storm events
Plan for Implementation	
Responsible Organization/Department:	City of Richland City Administrator and Richland R-IV School District Superintendent
Action/Project Priority:	STAPLEE 11 MEDIUM
Timeline for Completion:	5-10 years
Potential Fund Sources:	Mitigation
Local Planning Mechanisms to be Used in Implementation:	City of Richland Annual Budget Process and Richland R-IV District Planning Committee and Board of Education
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	City of Richland
Risk / Vulnerability	
Problem Being Mitigated:	Potential Flooding and Access to Flood Insurance
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.1.5 City of Richland
Name of Action or Project:	National Flood Insurance Program (NFIP)
Action or Project Description:	Continue to enforce floodplain management regulation in accordance with the NFIP and comply with the requirements of the program
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible
Estimated Cost:	\$0-\$1,000
Benefits:	Allowing our residents access to flood insurance is an important way for us to provide security to our county residents. Not allowing them to build in a floodplain or floodway is also a preventative measure to ensure the safety of our county residents.
Plan for Implementation	
Responsible Organization/Department:	City of Richland Floodplain Manager
Action/Project Priority:	STAPLEE 11 MEDIUM
Timeline for Completion:	On-going
Potential Fund Sources:	Part of the City's Annual Budget
Local Planning Mechanisms to be Used in Implementation:	Floodplain Management
Progress Report	
Action Status	Continuing
Report of Progress	The City of Richland's Floodplain Manager has continued to do the necessary actions needed to maintain the NFIP within the county

Action Worksheet	
Name of Jurisdiction:	Laclede County
Risk / Vulnerability	
Problem Being Mitigated:	Potential Flooding and Access to Flood Insurance
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.1.6 Laclede County
Name of Action or Project:	National Flood Insurance Program (NFIP)
Action or Project Description:	Continue to enforce floodplain management regulation in accordance with the NFIP and comply with the requirements of the program
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible
Estimated Cost:	\$0-\$1,000
Benefits:	Allowing our residents access to flood insurance is an important way for us to provide security to our county residents. Not allowing them to build in a floodplain or floodway is also a preventative measure to ensure the safety of our county residents.
Plan for Implementation	
Responsible Organization/Department:	Laclede County Floodplain Manager
Action/Project Priority:	STAPLEE 11 MEDIUM
Timeline for Completion:	On-going
Potential Fund Sources:	Part of the County Annual Budget
Local Planning Mechanisms to be Used in Implementation:	Floodplain Management
Progress Report	
Action Status	Continuing
Report of Progress	The Laclede County Floodplain Manager has continued to do the necessary actions needed to maintain the NFIP within the county

Action Worksheet	
Name of Jurisdiction:	City of Richland
Risk / Vulnerability	
Problem Being Mitigated:	City of Richland storm water runoff
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.1.7 City of Richland Storm Water Drainage Improvements
Name of Action or Project:	City of Richland Storm Water Improvements
Action or Project Description:	Repair storm water drains and flooding issues
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible.
Estimated Cost:	\$400,000
Benefits:	Increase property values by protecting property
Plan for Implementation	
Responsible Organization/Department:	City of Richland Flood Plain Manager
Action/Project Priority:	STAPLEE 11 MEDIUM
Timeline for Completion:	1-5 years
Potential Fund Sources:	Mitigation grant funding
Local Planning Mechanisms to be Used in Implementation:	City of Richland Annual Budget Process
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Stoutland R-II School District
Risk / Vulnerability	
Problem Being Mitigated:	Leaking roof
Hazard(s) Addressed:	Flooding, Severe Storm, Winter Weather
Action or Project	
Action/Project Number:	2.1.8 Stoutland R-II Roof Repairs and or Roof Replacement
Name of Action or Project:	Stoutland R-II Roof Repairs and or Roof Replacement
Action or Project Description:	Identify and prioritize roofs in need of repair. Develop a five year plan based on priority and cost
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible.
Estimated Cost:	\$500,000 to \$1,500,000
Benefits:	Prevent damage to school and potential danger to students
Plan for Implementation	
Responsible Organization/Department:	Stoutland R-II School District Superintendent
Action/Project Priority:	STAPLEE 14 HIGH
Timeline for Completion:	1-6 Years
Potential Fund Sources:	Mitigation grant funding needed
Local Planning Mechanisms to be Used in Implementation:	District Planning Committee and Board of Education
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Stoutland R-II School District
Risk / Vulnerability	
Problem Being Mitigated:	Potential disaster/tornado would be dangerous to the resident of Stoutland and the School Students and Staff
Hazard(s) Addressed:	Tornado/Storms
Action or Project	
Action/Project Number:	2.1.9 Stoutland R-II School District Storm Shelter
Name of Action or Project:	Stoutland R-II School District Storm Shelter
Action or Project Description:	Build a tornado storm shelter/FEMA 361 Safe Room
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible
Estimated Cost:	\$1,500,000 to \$3,500,000
Benefits:	Provide safe place for citizens, students and staff during a tornado or strong storm events
Plan for Implementation	
Responsible Organization/Department:	Stoutland R-II School District Superintendent
Action/Project Priority:	STAPLEE 14 HIGH
Timeline for Completion:	5-10 years
Potential Fund Sources:	Mitigation
Local Planning Mechanisms to be Used in Implementation:	Stoutland R-II School District Building Plan
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	City of Lebanon in collaboration with COPE
Risk / Vulnerability	
Problem Being Mitigated:	Emergency shelter available to residents of the City of Lebanon and COPE
Hazard(s) Addressed:	Tornado/Storms/Flooding/Fire/Earthquake
Action or Project	
Action/Project Number:	2.1.10 City of Lebanon in collaboration with COPE
Name of Action or Project:	City of Lebanon/COPE Emergency Shelter
Action or Project Description:	Build a tornado storm shelter/FEMA 361 Safe Room at the current location of COPE with the capacity to use the shelter as a gym and community facility and provide shelter during an hazard event.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible
Estimated Cost:	\$1,200,000 to \$1,750,000
Benefits:	Provide safe place for citizens during a tornado or strong storm events
Plan for Implementation	
Responsible Organization/Department:	COPE, Shelter and Resource Center governing Board (Creating Opportunities for Personal Empowerment)
Action/Project Priority:	STAPLEE 14 HIGH
Timeline for Completion:	5-10 years
Potential Fund Sources:	NAP Grant, Local Donations, and FEMA Grant
Local Planning Mechanisms to be Used in Implementation:	COPE Shelters Facilities Plan
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	City of Lebanon
Risk / Vulnerability	
Problem Being Mitigated:	Loss of life due to fire.
Hazard(s) Addressed:	Fire and Life Safety
Action or Project	
Action/Project Number:	4.1.1 City of Lebanon
Name of Action or Project:	Lebanon Fire Dept. Safety & Education Program
Action or Project Description:	Provide and install free smoke detectors in homes throughout the City of Lebanon. Educate the general public on fire safety. Provide escape ladders and fire extinguishers to homes when funds allow.
Applicable Goal Statement:	Increase public awareness of natural hazards that have the potential to impact Laclede County
Estimated Cost:	\$5000-\$10,000 annually
Benefits:	Early notification of a fire in a structure increases the chances of getting out of the building. Thereby reducing the loss of life and allowing occupants to notify the fire department early.
Plan for Implementation	
Responsible Organization/Department:	City of Lebanon Fire Department Fire Chief
Action/Project Priority:	STAPLEE 13 HIGH
Timeline for Completion:	1-3 years then continuous
Potential Fund Sources:	City of Lebanon General Fund, Private Donations
Local Planning Mechanisms to be Used in Implementation:	City of Lebanon Council Goals, City of Lebanon Fire Department Special Operations policy.
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Joel E. Barber Laclede County C-5 School District
Risk / Vulnerability	
Problem Being Mitigated:	Roof on School Building Improvements High Wind Resistant Measures Incorporated when New Roof Installed
Hazard(s) Addressed:	Tornado Hazard-High Winds-Heavy Rains
Action or Project	
Action/Project Number:	4.1.2 Joel E. Barber Laclede County C-5 School District
Name of Action or Project:	Laclede County C-5 Roof Replacement
Action or Project Description:	Joel E. Barber, (Laclede C-5) foresees the need to install a new roof in the next 3-5 years and will incorporate wind resistant measures that will protect the school from potential tornado and high wind events in the future.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy through cost-effective and tangible mitigation projects whenever financially feasible
Estimated Cost:	\$300,000 to \$350,000
Benefits:	New roof will protect the building from water and wind damage and keep the staff and children safe and well protected from the elements.
Plan for Implementation	
Responsible Organization/Department:	Joel E. Barber, (Laclede C-5) Superintendent and Staff
Action/Project Priority:	STAPLEE 14 HIGH
Timeline for Completion:	1 to 5 years
Potential Fund Sources:	Local funds, and FEMA funds
Local Planning Mechanisms to be Used in Implementation:	Joel E. Barber, (Laclede C-5) School Building Plan
Progress Report	
Action Status	New
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Stoutland R-II School District
Risk / Vulnerability	
Problem Being Mitigated:	Community of operations of government/emergency services in a disaster
Hazard(s) Addressed:	Flooding, Severe Storm, Winter Weather
Action or Project	
Action/Project Number:	4.1.3 Data collection and education on the potential hazards of flooding and roadways within the county
Name of Action or Project:	Awareness and preparedness for potential hazards that impact eh school district.
Action or Project Description:	Develop a list of alternate routes for county roads within the district that usually close due to high water
Applicable Goal Statement:	Provide quick and safe response to emergency situations
Estimated Cost:	\$150,000 to \$300,000
Benefits:	Faster response times
Plan for Implementation	
Responsible Organization/Department:	Stoutland R-II School District Superintendent
Action/Project Priority:	STAPLEE 13 HIGH
Timeline for Completion:	1-6 Years
Potential Fund Sources:	Need to seek funding opportunities
Local Planning Mechanisms to be Used in Implementation:	District Planning Committee and Board of Education
Progress Report	
Action Status	New
Report of Progress	

5 PLAN MAINTENANCE PROCESS

5 PLAN MAINTENANCE PROCESS	5.1
<i>5.1 Monitoring, Evaluating, and Updating the Plan.....</i>	<i>5.1</i>
5.1.1 Responsibility for Plan Maintenance	5.1
5.1.2 Plan Maintenance Schedule	5.3
5.1.3 Plan Maintenance Process.....	5.3
<i>5.2 Incorporation into Existing Planning Mechanisms</i>	<i>5.4</i>
<i>5.3 Continued Public Involvement</i>	<i>5.5</i>

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

The Mitigation Planning Committee (MPC) has served as an advisory committee during the plan update process, but is not a standing committee. Many MPC representatives and stakeholders are also representing their own jurisdictions within Laclede County. Oversight responsibility could fall to such entities as the county emergency management agency, each jurisdictions identified representative, LOCLG staff, and Local Emergency Operations Committee members. The MPC is not a standing committee; responsibility for maintenance is delegated to local emergency management officials and the Laclede County Emergency Management Director.

The maintenance agreement is the responsibility of the participating jurisdictions, including school districts and special districts, to:

- 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 recommend changes to the governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

The MPC 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 agrees to meet annually and after a state or federally declared hazard event as appropriate to monitor progress and update the mitigation strategy. The Laclede County Emergency Management Director will be responsible for initiating the plan reviews and will invite members of the MPC 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 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 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 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 deems appropriate and necessary. Changes will be approved by the Laclede County 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. 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 Laclede 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:

- General or master plans of participating jurisdictions;
- Ordinances of participating jurisdictions;
- Laclede County Emergency Operations Plan;
- Capital improvement plans and budgets;
- 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.

Jurisdictional representatives involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The MPC 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 Laclede County Emergency Management Director will provide the updated Mitigation Strategy with current status of each mitigation action to the County Commission as well as all Mayors, City Clerks, and School District Superintendents. The Emergency Manager Director will request that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms.

0 below lists the planning mechanisms by jurisdiction into which the Hazard Mitigation Plan will be integrated.

Table 5.1 Planning Mechanisms Identified for Integration of Hazard Mitigation Plan

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
Unincorporated County	Annual Budget Process	Annual Budget Process	Annual Budget Process
City of Lebanon	Annual Budget Process	Annual Budget Process	Annual Budget Process

City of Richland	Annual Budget Process	Annual Budget Process	Annual Budget Process
Joel E Barber (Laclede County C-5) School District	Laclede County C-5 District Planning Committee and Board of Education	Laclede County C-5 District Planning Committee and Board of Education	Laclede County C-5 District Planning Committee and Board of Education
Lebanon R-I School District	Laclede R-I School Safety Plan	Laclede R-I School Safety Plan	Laclede R-I School Safety Plan
Lebanon R-III School District	Lebanon R-III School District Planning Committee and Board of Education	Lebanon R-III School District Planning Committee and Board of Education	Lebanon R-III School District Planning Committee and Board of Education
Richland R-IV School District	Richland R-IV District Planning Committee and Board of Education	Richland R-IV District Planning Committee and Board of Education	Richland R-IV District Planning Committee and Board of Education
Stoutland R-II School District	Stoutland R-II School District Planning Committee and Board of Education	Stoutland R-II School District Planning Committee and Board of Education	Stoutland R-II School District Planning Committee and Board of Education

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 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.

Appendix A

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Appendix B

Planning Meetings

Agendas

Press Releases

Presentation Materials

Sign-In Sheets

Media Coverage

FIRST MEETING

AUGUST 27, 2018

Agenda

Press Release

Presentation

Sign-In Sheets



SERVING CAMDEN, LACLEDE, MILLER AND MORGAN COUNTIES

**LAKE OF THE OZARKS COUNCIL OF LOCAL GOVERNMENTS
LACLEDE COUNTY HAZARD MITIGATION PLAN UPDATE
MEETING NOTICE & AGENDA**

Monday, August 27, 2018

6:00 pm

Laclede County Office of Emergency Management
200 North Adams Avenue
Lebanon, MO 65536

AGENDA

- I. CALL TO ORDER
- II. INTRODUCTION AND SIGN-IN SHEET
- III. HAZARD MITIGATION PLAN
 - a. Purpose of the Hazard Mitigation Plan
 - i. What is Hazard Mitigation?
 - ii. Why the plan is necessary
 - iii. Important changes from previous planning process
 - b. Involvement in the plan
 - i. Why community involvement is important
 - ii. Technical Steering Committee
 - iii. What will be included in the plan?
 - c. Review of the planning process
 - i. Community assessments
 - ii. Asset assessments
 - iii. Mitigation actions
 - iv. Draft plan
 - v. Adoption process
- IV. OPEN DISCUSSION
- V. CONCLUSION
- VI. ADJOURN

Lake of the Ozarks Council of Local Governments
P.O. Box 3553 Camdenton, MO 65020
Phone: 573-346-5692 Fax: 573-346-9686

PRESS RELEASE

For Immediate Release

August 9, 2018



SERVING CAMDEN, LACLEDE, MILLER AND MORGAN COUNTIES

Public Workshop -- Meeting Notice
Date: August 27, 2018
Time: 6:00PM
Location: Laclede County Office of Emergency Management
200 North Adams Avenue
Lebanon, MO 65536

LACLEDE COUNTY MISSOURI HAZARD MITIGATION PLAN UPDATE

Lake of the Ozarks Council of Local Governments (LOCLG) will be hosting a series of public meetings to gain public input into the local multi-jurisdictional hazard mitigation plan for Laclede County.

Missouri has experienced thirty-four natural disaster declarations in the past twenty years. These natural disasters can lead to loss of life, property damages, loss of essential services, loss of critical facilities and economic disruption. The time and money spent on recovering from a natural disaster can also exhaust additional resources both personally and community wide. Laclede County recognizes the impact of these disasters on our communities and is taking a proactive approach to updating our Hazard Mitigation Plan. Through the planning process, we hope to make our communities more resilient.

Hazard Mitigation by definition is any actions taken to reduce or eliminate the long-term risk to human life and property from natural hazards.

It is very important that we have a good representation from across the county to ensure we have the support for the plan update in each local community.

We look forward to developing a comprehensive and effective Hazard Mitigation plan to serve our local needs.

More information about the planning process or copies of our current plan, please call LOCLG at 573-346-5692.

If you have any questions, or need any special accommodations for the meeting, please call us.

Lake of the Ozarks Council of Local Governments
P.O. Box 3553 Camdenton, MO 65020
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Laclede County Hazard Mitigation Plan Update



MONDAY, AUGUST 27, 2018
6:10 PM
OFFICE OF EMERGENCY MANAGEMENT
LEBANON, MO

Introduction to Hazard Mitigation

Natural Hazards Include

- Dam Failure
- Drought
- Earthquakes
- Extreme Heat
- Fires (Urban/Structural and Wild)
- Flooding (River and Flash Flood)
- Land Subsidence/Sinkholes
- Levee Failure
- Thunderstorm/High Winds/Lightning/Hail
- Tornado
- Winter Weather/Snow/Ice/Severe Cold

Introduction to Hazard Mitigation

- According to SEMA, Missouri received more than 35 federal major disaster declarations since 1990
- April 2017 – Record-breaking flooding at Gasconade River shut down both directions of I-44 northeast of Lebanon
- February 2018 – Rainfall led to distressed pavement on I-44
 - Emergency repairs by MoDOT

Introduction to Hazard Mitigation

- Efforts to reduce loss of life and property can be made through hazard mitigation planning
 - Lessen impacts of natural disasters
 - Greatly reduce or completely break the cycle of disaster damage, reconstruction and repeated damage
 - Build and strengthen a safer, resilient community
- “Society saves \$6 for every \$1 spent through mitigation grants funded through select federal agencies” – Multihazard Mitigation Council, National Institute of Building Sciences 2017 Interim Report

Introduction to Hazard Mitigation

REDUCES

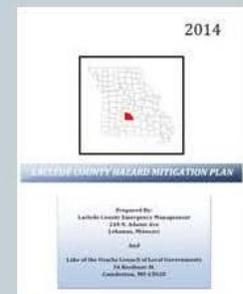
- Loss of life
- Property damage
- Loss of essential services & critical facilities
- Economic disruption
- Repetitive loss
- Recovery time
- Money spent
- Financial impact on Treasury, State, and community

CREATES

- Plan for natural disasters
- Disaster resilient community
- Safer environment
- Opportunity for eligibility of FEMA Mitigation Grant Funds

Current Hazard Mitigation Plan

- Approved on July 11, 2014
- Jurisdictions
 - Laclede County
 - City of Conway
 - City of Lebanon
 - Village of Phillipsburg
 - City of Richland
 - City of Stoutland
 - Conway R-1 School District
 - Gasconade C-4 School District
 - Joel E. Barber C-5 School District
 - Lebanon R-III School District
 - Richland R-IV School District
 - Stoutland R-2 School District
- Expires July 11, 2019



Updating the Plan

- **Why update?**
 - Having an approved plan in place is a condition for receiving certain SEMA and FEMA grants
- **Changes since last plan**
 - An adoption resolution will be required as a participating jurisdiction
 - In order to be a participating jurisdiction, you will need to adopt the plan **prior** to the submission to SEMA and FEMA
 - Each participating jurisdiction must identify at least **"one"** FEMA funded action item
 - Action items will now have more impact on future funding - FEMA and SEMA will make sure that mitigation projects applying for grant funding were identified within the plan
 - **If you intend to apply for grant funds from FEMA, make sure your community identifies projects or mitigation actions**

The Planning Process

- **Organization**
 - Defining the planning area & identifying individuals, agencies, neighboring jurisdictions, businesses, and/or other stakeholders
- **Assess Risks**
 - Identify characteristics and potential consequences of natural hazards
 - Consider which geographic areas, people, property, or other assets may be vulnerable
- **Develop Mitigation Strategy**
 - Set priorities and develop long-term strategies to minimize the impacts of disasters
 - Address how mitigation actions will be carried out
- **Adopt and Implement Plan**
 - Plan needs to remain relevant through routine maintenance
 - Conduct periodic evaluations in case of changing risks and priorities
 - Revise as needed

Benefits of Participating

- **Increased awareness of potential hazards and risks**
- **Opportunity to work with the community, share resources, build partnerships and collaborate**
- **Exercise communication with government officials on local priorities**
- **Promotion of cost-effective measures that reduce or eliminate short and long term risks to life and property**
- **Create a safer and more resilient community**

How to Participate

- **To be a participating jurisdiction, you must:**
 - Participate in the planning process
 - Provide an asset inventory
 - Provide at least one mitigation action
 - Review the draft of the plan
 - Formally adopt the plan

How to Participate

- **Technical Steering Committee**
 - Goal: To provide technical direction to the overall plan update to achieve a community developed comprehensive plan
 - Encourage local governments and private sectors to prepare and submit pre-disaster mitigation plans
 - Review the current plan
 - Assist and update mitigation goals, objectives, and actions
 - Review draft of the updated plan
- **The more participation we have for the overall plan and the Technical Steering Committee, the more the updated plan will reflect the needs of the community**

FEMA's Mitigation Funding

- **Hazard Mitigation Grant Program (HGMP)**
- **Pre-Disaster Mitigation Program (PDM)**
- **Flood Mitigation Assistance (FMA)**
- **Repetitive Flood Claims (RFC)**
- **Severe Repetitive Loss (SRL)**



FEMA's Mitigation Funding

• Projects

- Tornado safe rooms
- Flooding mitigation (purchasing flood plain properties, buyouts)
- Infrastructure projects (low water crossing, culvert replacements)
- Stream bank stabilization
- Underground utility lines

FEMA's Mitigation Funding

• Laclede County R-I School District Safe Room



FEMA's Mitigation Funding

• Laclede County C-5 School District, Joel E. Barber K-8 Community Safe Room



December 2017

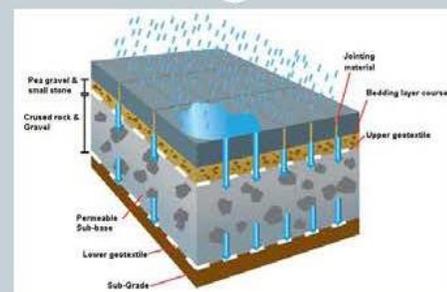
FEMA's Mitigation Funding

- Storm water retention ponds (Butler County)
- Provide backup generators for all water towers and wastewater treatment facilities (Butler County)
- Retrofitting existing critical buildings and infrastructures (Lawrence County)
- Increasing amount of vegetation along river banks and flood prone areas (Lawrence County)
- Acquire, elevate or flood-proof properties and critical infrastructure within flood hazard areas (Stone County)
- Maintaining outdoor warning sirens (Stone County)
- Green infrastructure
- https://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf

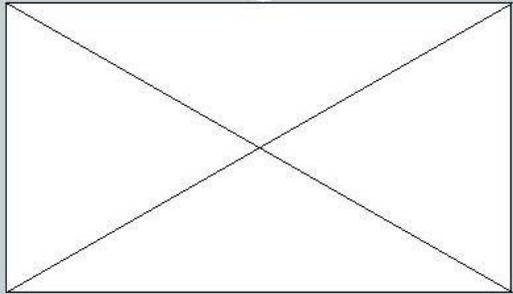
Pervious Concrete

- High porosity – allows water from precipitation and other sources to pass directly through (15-20% void content)
- Reduces runoff, flood damage, and pressure on storm water draining systems
- Allows groundwater recharge at an appropriate rate
- “Natural” filter
- Parking areas, light traffic areas, residential streets, pedestrian walkways, low lying roads and bridges

Pervious Concrete



Pervious Concrete



Pervious Concrete



Seaside, CA - awarded from American Society of Concrete Contractors' Concrete Concrete Council, American Concrete Institute, American Public Works Association, Council on Smart Cities



Waltersburg, Missouri - Pervious concrete can be used using the same mix that is used in other concrete

Conclusion

- Overall, participation in hazard mitigation plans can reduce loss of life and property by reducing impacts of natural disasters
- Create a safer, resilient community
- Provides an opportunity to work with local government and members within your community
- Opens doors to funding to improve the safety, economy and aesthetic of community

Conclusion

- **NEXT MEETINGS**
- Thursday, October 11 @ 6:00pm
- Thursday, November 15 @ 6:00pm
- Tuesday, December 11 @ 6:00pm

Lake of the Ozarks Council of Local Governments



P.O. Box 3553 Camdenon, MO 65020
Phone: 573-346-5692
Fax: 573-346-9686



Lake of the Ozarks Council of Local Governments Laclede County Hazard Mitigation Plan, Monday, August 27, 2018 6:00 p.m. Laclede County Office of Emergency Management 186 N. Adams Avenue, Lebanon MO 65536

Name of Attendee	Representing	Title	Contact Phone #	Email Address	Miles Driven To Meeting (Round Trip)
1 Linda Conner	LOCLG	Executive Director	573-346-5692	linda.conner@loclg.org	59
2 Pam Gilbert	LOCLG	Admin. ASST.	573-346-5692	pam.gilbert@loclg.org	49
3 Madison Kennedy	LOCLG	Planner 1	573-346-5692	madison.kennedy@loclg.org	65
4 John Bohannon	Conway Mo. Morgan Baptist Church	Deacon	479-381-2401 417-589-8482	johabohannon4@gmail.com	
5 Dennis Price	Dave Senior Citizens Home	OWNER	417-718-2718	KENDNS1@Yahoo.com	10
6 STEVE LEONARD	Conway Special Rd Dist	PRESIDENT	417 664 0481	LEONARD CONST. & BLDG. INC.	24
7 John Lochner	Mercy Hospital	Em. Prep. Coord.	417-718-5614	john.lochner@mercy.net	3
8 Rick Hobbs	City of Richland	E.M.D.	573-512-0066		25
9 Victor J Medlock	Conway Family Clinic	office Manager	417-589-2050	conwayfamilyclinic@centurytel.net	
10 Tina Chenault	DEM	Office Manager	417-532-6992	tchenault@laclede.com.net	
11 Charla Baker	Laclede Co. Health Dept.	ADMINISTRATOR	417.532.2134	Charla.Baker@lphd.mo.gov	2



Lake of the Ozarks Council of Local Governments Laclede County Hazard Mitigation Plan, Monday, August 27, 2018 6:00 p.m. Laclede County Office of Emergency Management 186 N. Adams Avenue, Lebanon MO 65536

	Name of Attendee	Representing	Title	Contact Phone #	Email Address	Miles Driven To Meeting (Round Trip)
12	John Stowe	Hillcrest Baptist	Trustee	573 649 0201	jstowe66@gmail.com	
13	Brad Armstrong	Lebanon R-III	Asst. Supt.	(417) 664-6310	barms@lebanon.mo.us	5
14	Neal Wilkinson	White Oak Pond Cumberland Presbyterian	Senior Pastor	615 934-7382	nwilkinson@whiteoakpond.org	4
15	Russ Rouse	CONWAY CATHOLIC CHURCH and COMMUNITY	MEMBER OF BOYS	(417) 761 2878	GINAROUSE203@hotmail.com	15
16	Paul Posey	Faith Baptist Church	Pastor	417-260-1891	pauldposey@yahoo.com	6
17	Randy Rowe	OEM	Director	417-532-6992	rrowe@lacledeoem.net	
18	Judith (Judy) Kile	COPE	Executive Director	417-533-5201	cope Shelter@gmail.com	
19						
20						
21						
22						

SECOND MEETING

OCTOBER 11, 2018

Agenda

Press Release

Presentation

Sign-In Sheet



SERVING CAMDEN, LACLEDE, MILLER AND MORGAN COUNTIES

**LAKE OF THE OZARKS COUNCIL OF LOCAL GOVERNMENTS
LACLEDE COUNTY HAZARD MITIGATION PLAN UPDATE
MEETING NOTICE AND AGENDA**

Thursday, October 11, 2018

6:00 p.m.

Laclede County Office of Emergency Management
200 North Adams Avenue
Lebanon, MO 65536

AGENDA

- I. CALL TO ORDER
- II. INTRODUCTIONS AND SIGN-IN SHEET
- III. HAZARD MITIGATION PLAN (HMP)
 - a. Update of the Current Hazard Mitigation Plan
 - i. Evaluate natural hazards as identified in the original HMP 2014
 - ii. Identify current natural hazards
 - iii. Risk Assessment-Measures of Probability and Severity
 - b. Laclede County Hazard Mitigation Survey 2018
 - i. Public Survey in regard to impacts of natural disasters
 - ii. Deadline for completion
 - c. Planning Process Continues
 - i. Next Meeting Date - Thursday, November 15, 2018
 - ii. Review Action Items from 2014 to determine status
- IV. OPEN DISCUSSION
- V. CONCLUSION
- VI. ADJOURN

Lake of the Ozarks Council of Local Governments
P.O. Box 3553 Camdenton, MO 65020
Phone: 573-346-5692 Fax: 573-346-9686

PRESS RELEASE

For Immediate Release

September 25, 2018



SERVING CAMDEN, LACLEDE, MILLER AND MORGAN COUNTIES

Public Workshop – Meeting Notice

Date: October 11, 2018

Time: 6:00PM

Location: Laclede County Office of Emergency Management, 200 North Adams Avenue Lebanon, MO 65536

LACLEDE COUNTY MISSOURI HAZARD MITIGATION PLAN UPDATE

Lake of the Ozarks Council of Local Governments (LOCLG) will be hosting the second meeting in a series of public meetings to gain public input into the updating of the local multi-jurisdictional hazard mitigation plan for Laclede County. Each jurisdiction is encouraged to attend, as well as participate in the discussion of risk assessment and measurement.

Hazard Mitigation by definition is any actions taken to reduce or eliminate the long-term risk to human life and property from natural hazards. Missouri has experienced thirty-four natural disaster declarations in the past twenty years. These natural disasters can lead to loss of life, property damages, loss of essential services, loss of critical facilities and economic disruption. The time and money spent on recovering from a natural disaster can also exhaust additional resources both personally and community wide.

In an effort to reduce these impacts in Laclede County, the potential natural hazards will be identified and measured for probability and severity. Laclede County recognizes the impact of these disasters on our communities and is taking a proactive approach to updating our Hazard Mitigation Plan. Through the planning process, we hope to make our communities more resilient.

It is very important that we have a good representation from across the county to ensure we have the support for the plan update in each local community.

We look forward to developing a comprehensive and effective Hazard Mitigation plan to serve our local needs.

For more information about the planning process or copies of our current plan, please call LOCLG at 573-346-5692.

If you have any questions, or need any special accommodations for the meeting, please call us.

Lake of the Ozarks Council of Local Governments
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Phone: 573-346-5692 Fax: 573-346-9686

Laclede County Hazard Mitigation Plan Update



THURSDAY, OCTOBER 11, 2018
6:00PM
OFFICE OF EMERGENCY MANAGEMENT
LEBANON, MO

Jurisdictions

- Laclede County
- City of Conway
- City of Lebanon
- City of Richland
- City of Stoutland
- Village of Phillipsburg
- Conway R-I School District
- Gasconade C-4 School District
- Joel E. Barber C-5 School District
- Lebanon R-III School District
- Richland R-IV School District
- Stoutland R-II School District

Community Capability Assessment Surveys

- Each jurisdiction has a unique set of capabilities including authorities, policies, programs, staff, funding, and other resources to approach mitigation and reduce long-term vulnerabilities
- As the planning team, we need to review these capabilities that currently reduce losses and how they could be used to reduce future losses as well as capabilities that inadvertently increase risk in our communities
- Do the jurisdictions have the primary types of capabilities?
 - **Planning and Regulatory**
 - **Administrative and Technical**
 - **Financial**
 - **Education and Outreach**
- Understanding these capabilities allows our planning team to enhance strengths and address any shortfalls

Meeting 1 Recap

- **Why update the hazard mitigation plan?**
 - Exposure to natural hazards is unavoidable
 - Mitigation can save lives, property, time, and money
 - Create a safer, more resilient community
 - Improve eligibility for FEMA grant opportunities

Hazards to Mitigate

- Dam Failure
- Drought
- Earthquakes
- Extreme Heat
- Fires
- Flooding
- Land Subsidence
- Levee Failure
- Thunderstorm/High Winds/Lightning/Hail
- Tornado
- Winter Weather
- Terrorism?
- Attack (Nuclear, Conventional, Chemical, and Biological)?
- Civil Disorder?
- Cyber Disruption?

Laclede County HMP 2014 Reflection

- **Risk Analysis**
 - Understand how each community is susceptible to a natural hazard in both
 - **Probability - the frequency of occurrence in planning area**
 - Number of events / number of years
 - HIGH - 10%-100% chance of occurrence
 - MODERATE - 1%-10%
 - LOW - less than 1%
 - **Severity - the magnitude of impact, and/or geographic extent within your community**
 - Total cost / total years
 - HIGH - includes severe injury and death, extensive equipment loss, extended recovery time, high economic loss and long term environmental effect.
 - MODERATE - includes injury, average equipment loss, moderate recovery time, moderate economic loss, and medium term environmental effect.
 - LOW - includes minor injury, minimal equipment loss, short recovery time, minimal economic loss, and nominal environmental effect.
 - Consider the geographic location, historical data, and measures listed above

Laclede County HMP 2014 Reflection

- Risk Assessment – Vulnerability Ranking Key
 - HIGH RANK
 - Probability is over 75%, OR Severity is over \$25,000/year
 - MODERATE RANK
 - Probability is 25%-75%, OR Severity is \$2,500-\$25,000/year
 - LOW RANK
 - Probability is less than 25%, OR Severity is less than \$2,500/year

Dam Failure

- SEMA references three most common reasons
 - Internal erosion caused by embankment leakage, foundation leakage and deterioration of pertinent structures appended to the dam
 - Inadequate spillway capacity causing overtopping of dam, flow erosion, and inadequate slope protection
 - Earthquakes, slope instability or faulty construction
- Intense storms/floods
- Flash floods
- Debris jam
- Accumulation of melting snow
- Department of Natural Resources (2007 & 2017)
 - 18 dams in Laclede County
 - 7 dams ranked a 2 in hazard class, 11 ranked a 3 (where 1 represents greatest hazard)
- Before 2014
 - None of the Major Disaster Declarations have been from Dam Failure

Dam Failure

- Vulnerability Assessment
 - Impacted area: countywide
 - Probability: unlikely
 - Severity: N/A
 - Vulnerability Ranking: Low
- Probability of Future Occurrences
 - Federal and State Dam Classification and Inspection
 - Dams will be inspected every 2, 3 or 5 years based on federal and state classifications
- Mitigation
 - Missouri Department of Natural Resources
 - Dam regulation keeps dams in safe conditions, increasing number of dams that are regulated can ensure safer dams
 - Website provides information for creating the required Emergency Action Plans for all regulated dams

Dam Failure

Questions to consider

- Is there any anticipated future development that can affect the amount of damages such as:
 - Residential development?
 - Special districts?
 - School district impacts?

Drought

- Meteorological drought
 - Defined on the basis of the degree of dryness, in comparison to a normal and average amount, and duration of the dry period
 - Region-specific (ex: Bali – a period of six days without rain)
- Agricultural drought
 - Meteorological drought link to agricultural impacts – precipitation shortages, evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, etc.
- Hydrological drought
 - Refers to persistently low discharge and/or volume of water in streams and reservoirs, lasting months or years
- Socioeconomic drought
 - Associate the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought
 - Occurs when the demand for an economic good exceeds the supply as a result of a weather-related shortfall in water supply

Drought

- Before 2014
 - October 2006 – Laclede County declared one of eighty five Missouri counties designated as “primary” disaster counties
 - Primary county is one that has experienced 30% crop loss
- Vulnerability Assessment
 - Impacted area: countywide
 - Probability: 7 events in 13 years (7/13) = 54%
 - Severity: \$2,920,000 in 13 years (\$2,920,000/13) = \$224,615.38
 - Vulnerability Ranking: High

Drought

- **Probability of Future Occurrences**
 - University of Missouri Climate Center
 - "Statewide average temperature for August was 0.3 degrees above the long-term average"
 - "Fourth consecutive month with above average temperatures"
- **Mitigation**
 - 2017 – FEMA 'Innovative Drought and Flood Mitigation Projects'
 - Aquifer Storage and Recovery: "taking water when it is abundant, storing the water in subsurface aquifers, and recovering the water when needed"
 - Crop insurance: Crop insurance protects farmers from losses due to natural disasters, including drought
 - Can be purchased through private insurance companies or agents

Drought

Questions/things to consider

- Could potential future development impact the risk of damages?
- Increases in acreage planted with crops would add to exposure to drought-related agricultural losses
- Increases in population result in increased demand for treated water, adding additional strain on water supply systems

Earthquake

- When energy in the Earth's lithosphere suddenly releases and creates seismic waves, shaking the surface of the Earth
- Typically occur on tectonic plate boundaries
- Before 2014
 - New Madrid Seismic Zone
 - Major seismic zone in southeast Missouri that causes intraplate earthquakes
 - Largest earthquake of the 20th century – 5.4 magnitude on November 9, 1968 near Dale, Illinois
 - Largest earthquake within 30 miles of Laclede County was 3.3 magnitude in 1988

Earthquake

- **New Madrid Seismic Zone – FEMA reports & studies**
 - November 2008 – FEMA report stating that a 7.7 magnitude earthquake along the NMSZ could result in the "highest economic losses due to natural disaster in the United States"
 - October 2009 – FEMA funded team of University of Illinois and Virginia Tech researchers composed scenario of magnitude 7.7 earthquake
 - Alabama, Arkansas, Illinois, Indiana, Kentucky, Mississippi, Missouri & Tennessee would experience significant damage, Tennessee (Memphis), Arkansas, and Missouri (St. Louis) would be most severely impacted
 - Estimated 86,000 casualties, 715,000 damaged buildings, 7.2 million people displaced, and at least \$300 billion in economic losses

Earthquake

- **2009**
 - Two studies based on eight years of GPS measurements showed fault system moving no more than 0.2 millimeters a year
 - Research group out of Northwestern University and Purdue University reported that the system may be "shutting down"
- **Vulnerability Assessment**
 - Impacted area: county wide
 - Probability: unlikely
 - Severity: N/A
 - Vulnerability Ranking: Low

Earthquake

- **Probability of Future Occurrences**
 - Laclede County
 - April 2018 – 2.5 magnitude with epicenter about ten miles south/southeast of Lebanon
 - USGS – 0.49% chance of a major earthquake within 50km of Laclede County
- **Mitigation**
 - Missouri has designated February as Earthquake Awareness Month
 - Educate public on what to do in case of earthquakes
 - Tornado shelters can also be used for earthquake shelter
 - Usually not enough time or warning

Earthquake

Things to consider

- Building inventory counts
- Inventory values
- Population counts
- Data from state plan

Extreme Heat

- Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks
- Can trigger heat stress conditions
 - Dizziness/fainting
 - Confusion
 - Excessive sweating
 - Nausea/vomiting
 - Rapid and weak pulse
 - Heat stroke
 - Asthma attacks
- Before 2014
 - August 2007 – Missouri experienced heat wave lasting 21 days and resulted in 34 hyperthermia deaths
 - LaGrange County Office of Emergency Management – Excessive Heat Warning on Monday, August 1st, 2011

Extreme Heat

- Vulnerability Assessment
 - Impacted area: county wide
 - Probability: 8 events recorded in 13 years = 62%
 - Severity: data limits, no value recorded
 - Vulnerability Ranking: Moderate
- Probability of Future Occurrences
 - According to NOAA, Missouri experienced a 0.5-1.0 degree F increase in temperature between 1991 and 2012 compared to 1901 to 1960 averages
 - Currently, Missouri averages 15 days a year with temperatures reaching extreme levels
 - Number could reach 60 days a year by 2050

Extreme Heat

- Mitigation
 - Educating the public about concerns, hazards, and potential health risks
 - Identifying or developing a network of cool stations or locations for those who do not have AC or another cool location
 - Center for Climate and Energy Solutions
 - Cool roofing – made of highly reflective and emissive materials, can remain 50-60 degrees cooler than traditional materials during peak summer weather
 - Increasing canopy cover and vegetation – more trees and vegetation can reduce heat by shading buildings, pavement, and other surfaces

Extreme Heat

Questions/things to consider

- Are there any schools without air conditioning?
- Strategic buildings without air conditioning
- Assets susceptible to loss or damage from extreme heat
- Information about schools mandating closure due to extreme heat

Fires

- Urban/Structural Fires
 - General fires
 - Structure fires
 - Fire in mobile property used as a fixed structure
 - Mobile property (vehicle) fire
- Wildfires
 - Natural vegetation fire
 - Outside rubbish fire
 - Special outside fire
 - Cultivated vegetation, crop fire

Fires

- **Before 2014**
 - March 2009 – over 5,000 acres in Laclede County caught on fire
 - Mostly rural, one home destroyed
 - Around 50 fires within a few days, all but one were intentionally set
 - “Wildfires in Southwest Missouri are the worst they’ve been in nearly ten years”
 - March 2012 – wildfires burned hundreds of acres, people evacuated from homes
- **Vulnerability Assessment**
 - Impacted area: county wide
 - Probability: 3 events in 13 years = 23%
 - Severity: \$560,000 in 13 years = \$43,077 a year
 - Vulnerability Ranking: Moderate

Fires

- **Probability of Future Occurrence**
 - Higher temperatures can lead to higher chances of drought and wildfires
 - Higher temperatures can also cause both urban and wildfires to spread more rapidly
- **Mitigation**
 - Toll-free hotline called Operation Forest Arson allows concerned citizens to call in reports anonymously
 - Burn bans inform when conditions are unsafe for burning
 - Retrofit at-risk structures with ignition-resistant materials

Fires

Questions/things to consider

- Any difference in vulnerability including school districts and special districts?
- Any jurisdiction at greater risk for structural or wildfire than others?

Flooding

- **Fluvial (River Flood)**
 - When excessive rainfall, snow melt, or ice jams over an extended period of time causes a river to exceed its capacity
 - Two types
 - Overbank flooding – water rises overflows over the edges of a river or stream (most common)
 - Flash flooding – intense, high velocity torrent of water that occurs in an existing river channel with little to no notice (most powerful)
- **Pluvial (Surface Flood)**
 - When heavy rainfall creates a flood event independent of an overflowing water body
 - Two types
 - Intense rain saturating an urban drainage system
 - Run-off or flowing water from rain falling on hillsides that are unable to absorb the water

Flooding

- **Before 2014**
 - 6 major disaster declarations for flooding in Laclede County between 2007 and 2013
- **Vulnerability Assessment**
 - Impacted area: county wide
 - Probability: 60 events in 13 years = 462%
 - Severity: \$4,345,000 in 13 years = \$334,230.76
 - Vulnerability Ranking: High

Flooding

- **Probability of Future Occurrences**
 - 2 major disaster declarations since 2014
 - June 2015 – Remains of Tropical Storm Bill brought 5-8" of rain to Laclede County, major to record flooding along James River
 - December 2015 – Floodwaters from the Gasconade River closed the eastbound lanes of I-44 near Hazelgreen, detour of around 49 miles
 - July 2016 – Niangua River rose ten feet in ten minutes, forcing evacuation of campers, several homes, water rescues, and roads damaged in Conway

Flooding

- **Mitigation**
 - Floodplain mapping and participation in the National Flood Insurance Program (NFIP)
 - Raising low-lying roads or bridges
 - Improving interior drainage systems
 - Floodwater diversion and storage
 - Floodplain and stream restoration
 - Low impact development/green infrastructure

Flooding

Questions/things to consider

- **Is there potential for development that could impact flash and riverine flooding?**
 - Low lying areas near rivers or streams
 - Near areas where interior drainage systems are not adequate to provide drainage
- **Any variation between jurisdictions?**
 - List those that may be at greater risks
- **Any repetitive loss areas?**

Land Subsidence

- **Gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials**
 - Principal causes: aquifer-system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost
- **Before 2014**
 - 1964 – Laclede County sinkhole collapse, possibly triggered by Alaskan earthquake

Land Subsidence

- **Vulnerability Assessment**
 - Impacted area: county wide
 - Probability: no events recorded
 - Severity: data limits, no value recorded
 - Vulnerability ranking: Moderate
- **Probability of Future Occurrence**
 - Karst topography – topography formed from the dissolution of soluble rocks including limestone, dolomite, and gypsum
 - **Sinkholes and caves**
 - Iron, lead, and zinc mines in Laclede County

Land Subsidence

- **Mitigation**
 - Field surveys and geomorphologic mapping
 - Detailed sinkhole maps can be constructed from sequential historical maps, recent topographical maps, and digital elevation models (DEMs)
 - Aquifer recharge
 - Groundwater monitoring and management policies and measures

Land Subsidence

Questions/things to consider

- **Issues with sinkholes, caves, and/or mines**
- **Mining activities within planning area**
- **Has there been any development over known caves, abandoned mines, and sinkholes?**
- **Are there any risks to special districts such as schools?**
 - If so, are they uniform across the planning area?

Levee Failure

- Often occur during flood events, can cause destruction in addition to flooding damage alone
 - Can lead to increased potential for loss of life due to the speed of onset and greater depth, extent, and velocity
- Not included within 2014 plan - There are no levees shown in Laclede County according to the U.S. Army Corps of Engineers Levee Inventory Maps
- Does anyone know of any private levees that may exist and if they may present any issues?

Levee Failure

- Before 2014
 - N/A
- Vulnerability Assessment
 - Levee Failure was not included within the 2014 plan
 - Since no major levees are listed, we can assume the probability and severity of levee failure within Laclede County are low
- Probability of Future Occurrences
 - N/A
- Mitigation
 - None required at this time

Severe Winter Weather

- Severe winter weather is an event in which the main types of precipitation are snow, sleet, or freezing rain
 - Can also include dangerously low temperatures, ice, strong winds, white-out conditions, and flooding
- Before 2014
 - 2 disaster declarations between 2007 and 2011
- Vulnerability Assessment
 - Impacted area: county wide
 - Probability: 26 events in 13 years = 200%
 - Severity: \$55,755,000 in 13 years = \$4,288,846 a year
 - Vulnerability Ranking: High

Severe Winter Weather

- Mitigation
 - Preservation of critical power sources
 - Back up generators
 - Early warning systems
 - Using designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system
 - Faster restoration
 - Reduce impacts to roadways
 - "Living snow fences" – row of trees or other vegetation
 - Installing roadway heating or anti-icing technology

Severe Winter Weather

Questions/things to consider

- Are there any jurisdictions that would suffer heavier damages during winter events?
- Damages to schools
- Special district assets
- Which buildings have the highest occupancies?
- Mobile home parks

Thunderstorms, High Winds, Lightning, Hail

- Before 2014
 - 5 major disaster declarations in Laclede County between 2007 and 2013
 - May 2009 – High winds snapped trees, power lines, and even destroyed a few homes
- Vulnerability Assessment
 - Impacted area: county wide
 - Probability: 109 events recorded over 13 years = 839%
 - Severity: \$1,592,000 in 13 years = \$122,461 a year
 - Vulnerability Ranking: High

Thunderstorms, High Winds, Lightning, Hail

- Probability of Future Occurrences
 - 1 major disaster declaration from severe storms since 2014
 - May 2017 – severe storms across central U.S. caused damage in Laclede County
- Mitigation
 - Early-warning systems and public information
 - Safe rooms
 - Structural bracing and other building protections

Thunderstorms, High Winds, Lightning, Hail

Questions/things to consider

- Possible solutions to reduce the impact of property damage and how to save lives
- Which areas/assets are most vulnerable?

Tornado

- A mobile, destructive vortex of violently rotating winds having the appearance of a funnel-shaped cloud and advancing beneath a large storm system
- Before 2014
 - Tornado History Project – 18 tornadoes in Laclede County between November 15, 1960 and February 29, 2012
 - 3 fatalities, 29 injured
 - Longest path: 50.39 miles
 - Widest path: 440 yards

Tornado

- Vulnerability Assessment
 - Impacted area: county wide
 - Probability: 10 events in 13 years = 77% probability
 - Severity: \$10,450,000 in 13 years = \$803,846.15 a year
 - Vulnerability Ranking: High
- Probability of Future Occurrences
 - May 2017 – National Weather Service confirmed at least three tornadoes hit Laclede County
 - Maximum winds estimated to be 90 mph

Tornado

- Mitigation
 - Safe rooms
 - Wind-resistant buildings
 - Warning sirens
 - Awareness activities and outreach

Tornado

Questions/things to consider

- Is there any anticipated developments that would result in an increase of exposed population?
- Which buildings in the area have highest occupancies?
- Mobile home parks

Terrorism?

- SEMA rates terrorism
 - Probability: Low
 - Severity: High
 - Acknowledged as a reason for dam failure and fires

Attack (Nuclear, Conventional, Chemical, and Biological)?

- SEMA rates attack
 - Probability: Low
 - Severity: High

Civil Disorder?

- SEMA rates civil disorder
 - Probability: Low
 - Severity: Low to High

Cyber Disruption?

- SEMA rates cyber disruption
 - Probability: Moderate to High
 - Severity: Moderate to High

Laclede County Hazard Mitigation Survey 2018

- <https://www.surveymonkey.com/r/LacledeHMP2018>
- Please share the link with family, friends, neighbors, etc. – We want as much public feedback as possible!

Conclusion

- NEXT MEETINGS
- Thursday, November 15 @ 6:00pm
- Tuesday, December 11 @ 6:00pm

Lake of the Ozarks Council of Local Governments



P.O. Box 3553 Camdenon, MO 65020
Phone: 573-346-5692
Fax: 573-346-9686



Lake of the Ozarks Council of Local Governments Laclede County Hazard Mitigation Plan, Thursday, October 11, 2018 6:00 p.m. Laclede County Office of Emergency Management 186 N. Adams Avenue, Lebanon MO 65536

	Name of Attendee	Representing	Title	Contact Phone #	Email Address	Miles Driven To Meeting (Round Trip)
1	Pam Gilbert	LOCLG	Admin. Asst.	573-346-5692	pam.gilbert@loclg.org	49
2	Linda Conner	LOCLG	Executive Director	573-346-5692	linda.conner@loclg.org	
3	Madison Kennedy	LOCLG	Planner I	724-831-7713	madison.kennedy@loclg.org	60
4	Charla Baker	Laclede Co. Health Dept.	Administrator	417-532-2134	Charla.Baker@lpha.mo.gov	4
5	Steve Leonard	Conway Specimen Rd Dist	President	417-664-0481	LEONARD CONST @ GMAIL	35
6	Reak Hobbs	City of Richland		573-512-0066		26
7	Neal Wilkinson	Laclede County Ministerial Alliance	Minister	615-934-7382	neal.wilkinson@whiteoakpond.org	
8	Tina Chenault	OEM	Office manager	417-532-6492	tchenault@lacledeoem	14
9	Joe Parker	LACLEDE Co Commission	ASSOCIATE COMMISSIONER	532-4897	COMMISSION@LACLEDE COUNTY MISSOURI.ORG	-
10	Brad Armstrong	Lebanon R-III	Asst. Supt.	657-6001	barms@lebanon.kenn.mo.us	4
11	Stacy Kile	COPE	Executive Director	(417)533-5201	copestelter@gmail.com	6 ?



Lake of the Ozarks Council of Local Governments Laclede County Hazard Mitigation Plan, Thursday, October 11, 2018 6:00 p.m. Laclede County Office of Emergency Management 186 N. Adams Avenue, Lebanon MO 65536

	Name of Attendee	Representing	Title	Contact Phone #	Email Address	Miles Driven To Meeting (Round Trip)
12	John Lochner	Mercy Hospital	EM Coordinator	417-718-5614	john.lochner@mercy.net	2.0
13	Randy S. Rowe	OEM	Dir	417-650-7069	rrowe@lacledeOzark.net	16
14						
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MEETING 3

NOVEMBER 27, 2018

Agenda

Press Release

Presentation

Sign-In Sheet



SERVING CAMDEN, LACLEDE, MILLER AND MORGAN COUNTIES

**LAKE OF THE OZARKS COUNCIL OF LOCAL GOVERNMENTS
LACLEDE COUNTY HAZARD MITIGATION PLAN UPDATE
MEETING NOTICE AND AGENDA**

Tuesday, November 27, 2018
6:00 pm
Laclede County Office of Emergency Management
200 North Adams Avenue
Lebanon, MO 65536

AGENDA

- I. CALL TO ORDER
- II. INTRODUCTIONS AND SIGN-IN SHEET
- III. HAZARD MITIGATION PLAN (HMP)
 - a. Update of the Current Hazard Mitigation Plan
 - i. Briefly review hazard ranks from 2014 plan
 - ii. Discuss status of current Mitigation Actions
 - b. Laclede County Hazard Mitigation Survey 2018
 - i. Review of Public Results of the Hazard Mitigation Survey
 - ii. Discuss new ideas for Mitigation Actions
 - iii. Discuss deadline for completion of Draft
 - c. Planning Process Continues
 - i. Next Meeting Date - Thursday, December 11, 2018 at 6:00pm
- IV. OPEN DISCUSSION
- V. CONCLUSION
- VI. ADJOURN



We need your feedback! Scan the QR Code
on your smart phone to take our survey!

Lake of the Ozarks Council of Local Governments
P.O. Box 3553 Camdenton, MO 65020
Phone: 573-346-5692 Fax: 573-346-9686

PRESS RELEASE

For Immediate Release

October 31, 2018



SERVING CAMDEN, LACLEDE, MILLER AND MORGAN COUNTIES

Public Workshop -- Meeting Notice

Date: November 15, 2018

Time: 6:00PM

Location: Laclede County Office of Emergency Management, 200 North Adams Avenue Lebanon, MO 65536

LACLEDE COUNTY MISSOURI HAZARD MITIGATION PLAN UPDATE

Lake of the Ozarks Council of Local Governments (LOCLG) will be hosting the third meeting in a series of public meetings to gain public input into the updating of the local multi-jurisdictional hazard mitigation plan for Laclede County. Each jurisdiction is encouraged to attend, as well as participate in the discussion of risk assessment and measurement.

Hazard Mitigation by definition is any actions taken to reduce or eliminate the long-term risk to human life and property from natural hazards. Missouri has experienced thirty-four natural disaster declarations in the past twenty years. These natural disasters can lead to loss of life, property damages, loss of essential services, loss of critical facilities and economic disruption. The time and money spent on recovering from a natural disaster can also exhaust additional resources both personally and community wide.

In an effort to reduce these impacts in Laclede County, the third meeting will include reviewing mitigation actions from the 2014 Hazard Mitigation Plan and proposing new actions. Laclede County recognizes the impact of these disasters on our communities and is taking a proactive approach to updating our Hazard Mitigation Plan. Through the planning process, we hope to make our communities more resilient.

It is very important that we have a good representation from across the county to ensure we have the support for the plan update in each local community.

We look forward to developing a comprehensive and effective Hazard Mitigation plan to serve our local needs.

For more information about the planning process or copies of our current plan, please call LOCLG at 573-346-5692. If you have any questions, or need any special accommodations for the meeting, please call us.

Lake of the Ozarks Council of Local Governments
P.O. Box 3553 Camdenton, MO 65020
Phone: 573-346-5692 Fax: 573-346-9686

Laclede County Hazard Mitigation Plan Update



THURSDAY, NOVEMBER 27, 2018
6:00PM
OFFICE OF EMERGENCY MANAGEMENT
LEBANON, MO

Jurisdictions

- Laclede County
- City of Conway
- City of Lebanon
- **City of Richland**
- City of Stoutland
- Village of Phillipsburg
- Conway R-I School District
- **Gasconade C-4 School District**
- **Joel E. Barber C-5 School District**
- **Lebanon R-III School District**
- Richland R-IV School District
- Stoutland R-II School District

Jurisdictions in bold are those who have completed questionnaire thus far

Meeting 2 Recap

- **Risk Analysis**
 - Understand how each community is susceptible to a natural hazard in both
 - **Probability - the frequency of occurrence in planning area**
 - Number of events / number of years
 - HIGH = 10%-100% chance of occurrence
 - MODERATE = 1%-10%
 - LOW = less than 1%
 - **Severity - the magnitude of impact, and/or geographic extent within your community**
 - Total cost / total years
 - HIGH = includes severe injury and death, extensive equipment loss, extended recovery time, high economic loss and long term environmental effect
 - MODERATE = includes injury, average equipment loss, moderate recovery time, moderate economic loss, and medium term environmental effect
 - LOW = includes minor injury, minimal equipment loss, short recovery time, minimal economic loss, and normal environmental effect
 - Consider the geographic location, historical data, and measures listed above

Meeting 2 Recap

- **HIGH**
 - Drought
 - Flooding
 - Severe Winter Weather
 - Thunderstorms, High Winds, Lightning, Hail
 - Tornado
- **MODERATE**
 - Extreme Heat
 - Land Subsidence/Sinkholes
 - Wildfire
- **LOW**
 - Earthquake
 - Dam Failure

Action Items

- Review action items from 2014 Plan
- To keep a previous item in plan update, a jurisdiction **MUST** adopt
- Group discussion
 - Things to consider
 - STAPLEE

STAPLEE

- FEMA methodology used to assess the costs, benefits, and overall feasibility of mitigation actions
- **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?

STAPLEE

- Rank questions on scale from 0-3 points
 - Definitely yes = 3 points
 - Maybe yes = 2 points
 - Probably no = 1 point
 - Definitely no = 0
- Will the implemented action result in saved lives?
- Will the implemented action result in a reduction of disaster damage?

Laclede County Hazard Mitigation Survey 2018

- <https://www.surveymonkey.com/r/LacledeHMP2018>
- Please share the link with family, friends, neighbors, etc. – We want as much public feedback as possible!



Conclusion

- NEXT MEETING
- Tuesday, December 11 @ 6:00pm



P.O. Box 3553 Camdenton, MO 65020
Phone: 573-346-5692
Fax: 573-346-9686



Lake of the Ozarks Council of Local Governments Laclede County Hazard Mitigation Plan, Tuesday, November 27, 2018 6:00 p.m. Laclede County Office of Emergency Management 186 N. Adams Avenue, Lebanon MO 65536

	Name of Attendee	Representing	Title	Contact Phone #	Email Address	Miles Driven To Meeting (Round Trip)
1	Renee Berman	LOCLG	Admin Asst			50
2	Marilyn Kimbrell	COPE	Board Member			
3	Madison Kennedy	LOCLG	Planner I			60
4	Tina Chenault	OEM	Office manager			14
5	Paul Posey	Faith B.C.	Pastor	417-260-1891	pauld.posey@yaho	3
6	Randy Rowe	OEM	Dir.	417-650-7069	rrowe@lacledeoem	14
	Paul Armstrong	Lebanon R. III	Asst Supt.	417-657-6001	barms@lebanon.kemur	4
8	Linda Conner	LOCLG	Executive Director	513-346-5692	linda.conner@lodge.org	
9						
10						
11						

FOURTH MEETING

DECEMBER 11, 2018

Agenda

Presentation

Sign-In Sheet



SERVING CAMDEN, LACLEDE, MILLER AND MORGAN COUNTIES

**LAKE OF THE OZARKS COUNCIL OF LOCAL GOVERNMENTS
LACLEDE COUNTY HAZARD MITIGATION PLAN UPDATE
MEETING NOTICE AND AGENDA**

Tuesday, December 11, 2018

6:00 p.m.

Laclede County Office of Emergency Management
200 North Adams Avenue
Lebanon, MO 65536

AGENDA

- I. CALL TO ORDER
- II. INTRODUCTIONS AND SIGN-IN SHEET
- III. HAZARD MITIGATION PLAN (HMP)
 - a. Present Draft Copy of Laclede County Hazard Mitigation Plan Update 2018
 - i. Open discussion of HMP Sections
 - ii. Participating Jurisdictions Review Important Information
 - b. Present Laclede County Hazard Mitigation Survey 2018
 - i. How the Survey Responses Compared to Data Available
 - c. Public Comment Period 30-Days
 - i. Draft Copy Review
 - ii. Submit Comments, Phone, Fax or Email
 - iii. Adoption Resolutions Submitted with Draft to SEMA
 - iv. Draft Copy to SEMA & FEMA
- IV. OPEN DISCUSSION
- V. CONCLUSION
- VI. ADJOURN

Lake of the Ozarks Council of Local Governments
P.O. Box 3553 Camdenton, MO 65020
Phone: 573-346-5692 Fax: 573-346-9686

Laclede County Hazard Mitigation Plan Update



TUESDAY, DECEMBER 11, 2018
6:00PM
OFFICE OF EMERGENCY MANAGEMENT
LEBANON, MO

Jurisdictions

- Laclede County
- City of Conway
- **City of Lebanon**
- **City of Richland**
- City of Stoutland
- Village of Phillipsburg
- **Gasconade C-4 School District**
- **Laclede County C-5 School District**
- **Laclede County R-1 School District**
- **Lebanon R-III School District**
- **Richland R-IV School District**
- Stoutland R-II School District

Jurisdictions in boldface those who have completed questionnaires thus far

Jurisdictions just with Completed Questionnaires

- City of Richland
- Gasconade C-4 School District
- Laclede County C-5 School District
- **NEXT: Complete Action Item Worksheet, Review Draft Plan, Complete Resolution**

Jurisdictions with Completed Action Item Worksheets

- City of Lebanon
- Laclede County R-1 School District
- Lebanon R-III School District
- Richland R-IV School District
- **NEXT: Review Draft Plan, Complete Resolution**

Review for Action Items

- **List of action items from 2014 Plan**
 - If you want to keep an action item from 2014 plan, you must re-adopt!
 - Complete worksheet with selected action item
 - Need at least one, more are welcome
- **Examples are provided**
- **Other examples found: FEMA's Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)**
 - <https://www.fema.gov/media-library/assets/documents/30627>

Draft Review

- **Chapter 1: Introduction and Planning Process**
 - Purpose
 - Background and Scope
 - Plan Organization
 - Planning Process
 - Multi-jurisdictional Participation
 - The Planning Steps

Draft Review

- Chapter 2: Planning Area Profile and Capabilities
 - LaClede County Planning Area Profile
 - × Geography, Geology, Topography
 - × Climate
 - × Population/Demographics
 - × History
 - × Occupations
 - × Agriculture
 - × FEMA Hazard Mitigation Assistance Grants in Planning Area
 - Jurisdictional Profiles and Mitigation Capabilities
 - × Unincorporated LaClede County
 - × Cities and Villages
 - × Special Districts
 - × Public School District Profiles and Mitigation Capabilities

Draft Review

- Chapter 3: Risk Assessment
 - Hazard Identification
 - Assets at Risk
 - Land Use and Development
 - Hazard Profiles, Vulnerability, and Problem Statements
 - × Dam Failure
 - × Drought
 - × Extreme Heat
 - × Wildfires
 - × Flooding (Riverine and Flash)
 - × Land Subsidence/Sinkholes
 - × Thunderstorm/High Winds/Lightning/Hail
 - × Tornado
 - × Winter Weather/Snow/Ice/Severe Cold

Draft Review

- Chapter 4: Mitigation Strategy
 - Goals
 - Identification and Analysis of Mitigation Actions
 - Implementation of Mitigation Actions

Where to Find Draft

• www.loclg.org

Conclusion

- **NEXT MEETING**
- **TBD**



P.O. Box 3553 Camdenon, MO 65020
Phone: 573-346-5692
Fax: 573-346-9686



Lake of the Ozarks Council of Local Governments Laclede County Hazard Mitigation Plan, Tuesday, December 11, 2018 6:00 p.m. Laclede County Office of Emergency Management 186 N. Adams Avenue, Lebanon MO 65536

	Name of Attendee	Representing	Title	Contact Phone #	Email Address	Miles Driven To Meeting (Round Trip)
1	Tina Chenault	OEM	Office manager	417-532-6992	tchenault@lacledeoem.net	
2	Linda Conner	LOCLG	Executive Director	573-346-5692	linda.conner@lodge.org	
3	Tracee Brown	LOCLG	Adm Asst	573-346-5692		
4	Mark D. Hedger	Laclede Co. R-1	Supervisor	417-664-3317	mhedger@lcs1.org	50
5	Madi Kennedy	LOCLG	Planner	573-346-5692		
6	Judy Kite	COPE	Executive Director	(417)533-5201	copesthelter@gmail.com	6-10?
7						
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MEDIA COVERAGE

Draft Plan Availability Press Release

Radio Interview

PRESS RELEASE

For Immediate Release

December 18, 2018



SERVING CAMDEN, LACLEDE, MILLER AND MORGAN COUNTIES

LACLEDE COUNTY MISSOURI DRAFT HAZARD MITIGATION PLAN 2019 AVAILABLE FOR REVIEW

The update of the Laclede County Hazard Mitigation Plan is now available for a public 30-day comment period. It is very important that we receive valuable feedback from across the county to ensure we have the representation of each local community for the plan update.

The draft copy of the 2019 Laclede County Hazard Mitigation Plan is an update of the 2014 Laclede County Hazard Mitigation Plan and is available on our website, at www.loclg.org under the Publications tab. Comments and feedback can be sent to Lake of the Ozarks Council of Local Governments (LOCLG) Executive Director, Linda Conner at linda.conner@loclg.org or to the Planner, Madison Kennedy at madison.kennedy@loclg.org.

Hazard Mitigation by definition is any actions taken to reduce or eliminate the long-term risk to human life and property from natural hazards. Missouri has experienced thirty-four natural disaster declarations in the past twenty years. These natural disasters can lead to loss of life, property damages, loss of essential services, loss of critical facilities and economic disruption. The time and money spent on recovering from a natural disaster can also exhaust additional resources both personally and community wide.

Laclede County recognizes the impact of these disasters on our communities and has taken a proactive approach to updating our Hazard Mitigation Plan. Through the updating of the plan, we hope to make our communities more resilient.

We look forward to receiving your feedback for developing a comprehensive and effective Hazard Mitigation plan to serve our local needs.

For more information about the planning process or the draft, please call LOCLG at 573-346-5692.

If you have any questions, please call us.

Lake of the Ozarks Council of Local Governments
P.O. Box 3553 Camdenton, MO 65020
Phone: 573-346-5692 Fax: 573-346-9686

Laclede County Hazard Mitigation Plan
Interview between Linda Conner, Executive Director, Lake of the Ozarks Council of Local Governments
and
Patty Burns, News Director, KJEL/KBNN

Linda Conner stated at the October 11, 2018 meeting we will actually look at the number of incidents that have happened with the 11 hazards that have been identified. So, we will look at how many flooding events have happened in Laclede County. We will look at how many tornadoes have hit Laclede County. We will look at the number of droughts that were in Laclede County. So, we will look at the actual number of events that have happened and the impact. We will look at insurance, crop insurance information to see if there were large payouts for crop insurance. We will also look to see if there was any kind of FEMA funded projects that insurance was paid out for. We look at the number of incidents and the impact that happened, so we can determine the probability and the vulnerability of Laclede County in regard to each hazard.

Patty Burns
News Director KJEL/KBNN
18553 Gentry Road Lebanon Mo
office: 417-532-7043
Fax: 417-532-3365
cell: 417-288-1436
www.myozarksonline.com

Per Patty Burns, this aired on September 11, 2018.

**Laclede County Hazard Mitigation Plan
Interview
Linda Conner, Executive Director, Lake of the Ozarks Council of Local Governments
and
Patty Burns, News Director, KJEL/KBNN**

Linda Conner stated the Hazard Mitigation Plan needs to be updated every 5 years in order for it to be valid and for the participating jurisdictions to be able to access FEMA funded grants. So, if we don't update the plan the entities will not be able to access those grant funds and apply for those grant funds.

Patty Burns
News Director KJEL/KBNN
18553 Gentry Road Lebanon Mo
office: 417-532-7043
Fax: 417-532-3365
cell: 417-288-1436
www.myozarksonline.com

Per Patty Burns, this aired on September 11, 2018.

Pam Gilbert (Pam.gilbert@locig.org) - Fri, 10-26-2018 10:33:13 -0500

[Show Full Headers](#) | [Print](#) | [Close Printer View](#)

From: Patty Burns <patty.burns@alphamediausa.com>
To: pam.gilbert@locig.org
Subject: news story about meeting
Date: Fri 10-26-2018 10:25 AM

The Lake of the Ozarks Council of Local Governments has begun the process of updating Laclede County's Hazard Mitigation Plan. Executive Director Linda Conner says to have an updated Hazard Mitigation Plan in place benefits all entities within Laclede County. She says a plan is only good for 5 years...

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When updating a Haz-Mit plan, they use historical data and current data....

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The plan will allow the entities to see what steps they can take to prevent additional damage in the future. The update will require at least 3 more meetings which the various entities in Laclede County will participate. Each of the meetings will be held at the Laclede County Office of Emergency Management, in Lebanon. For exact times and dates, call 573-346-5692.

=====

Respectfully
Patty Burns
News Director KJEL/KBNN
18553 Gentry Road Lebanon Mo
office: 417-532-7043
Fax: 417-532-3365
cell: 417-288-1436
www.myozarksonline.com

Per Missouri open records law, I request that the record(s) responsive to my request be emailed to this address or faxed to 417-532-3365 within 72 hours or less. I request that all fee's for

locating and copying the records be waived. The information I obtain through this request will be used for providing information to the public through Regional Radio News.

Attachment: Save View Name: pb09101805.wav Type: audio/wav

Attachment: Save View Name: pb09101804.wav Type: audio/wav

Pam Gilbert (Pam.gilbert@locig.org) - Fri, 10-26-2018 10:33:13 -0500

Appendix C

Completed/Deleted Mitigation Actions

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

Completed Actions		Completion Details (date, amount, funding source)
2.1.6	With the help of LOCLG, map all of the low water crossings, culverts, and bridges.	Completed 5/27/2016 with funding from CDBG Disaster Planning Grant it was part of several projects. Exact \$ not specific to just this task.
2.1.7	With the help of LOCLG by purchasing ESRI and HAZUS flood software to improve flood hazard assessments and flood mapping to ensure the safety of the LaCledde County citizens.	Completed 5/27/2016 with funding from CDBG Disaster Planning Grant it was part of several projects. Exact \$ not specific to just this task.
3.1.3	Analysis the data collected from LOCLG in the HAZUS software.	Data has been entered into HAZUS.
4.1.7	Express the need for LaCledde County Emergency Management to collaboration with other public safety agencies to conduct emergency response exercises.	Completed on an annual basis and is part of the normal SOP.
4.1.8	Allow LaCledde County Emergency Management to present at least two community awareness presentations annually.	Completed on an annual basis and is part of the normal SOP.
Deleted and Changed Actions		Reason for Deletion
1.1.1	Encourage public facilities to have shelters to accommodate staff and visitors during tornadoes and any other natural hazard.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
1.1.2	Seek funding to add shelters or updates to existing public facilities to ensure adequate protection from tornadoes and strong winds. Also seek funding on installing early warning systems.	Changed to specific jurisdiction Action Worksheets
1.1.3	Encourage and educate citizens on the importance of registering their storm shelters on the centralized website.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
1.1.4	Examine low water crossing, culvert, bridges, and repetitive flood loss properties to determine feasible and practical mitigation opportunities to ensure community safety.	Changed to specific jurisdiction Action Worksheets
1.1.5	Create a network of community partners, including public health agencies, emergency management agencies, volunteer organizations, to designate community locations with adequate air conditioning that can be used as heat emergency shelters during a heat wave.	Not feasible as no jurisdiction completed an Action Worksheet for this action.

2.1.1	Increase public awareness and understanding of the benefits of a FEMA Safe Room 361 and seek funding for the building of Safe Rooms wherever needed.	Changed to specific jurisdiction Action Worksheets
2.1.2	Encourage construction of community tornado shelters in office buildings, manufacturing facilities, multi-family rental units, schools, mobile home parks, and other large population congregation centers.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.3	As funding allows, repetitive flood loss properties and structures will be targeted for buyout.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.4	Participate in and ensure compliance with, flood mitigation and floodplain management programs.	Changed to specific jurisdiction Action Worksheets See Each Participating NFIP
2.1.5	Participate in the National Flood Insurance Program (NFIP)	Changed to specific jurisdiction Action Worksheets See Each Participating NFIP
2.1.8	Create public awareness of the Laclede County Emergency Operation Plan in regard to heat-related mitigation.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.9	Work with community groups to sponsor a program to encourage neighbors to check on at risk people within their communities. Such as neighborhood watch or CERT.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.10	Incorporate GIS Mapping into Laclede County Emergency Management Operations, with regard to wildfire history and potential high risk areas for wildfires.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
2.1.11	Maintain mapping in the Laclede County Emergency Operations Plan for Dam Failure.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
3.1.1	Encourage the use of tempered or shatter-resistant glass in the windows and doors of new public and private facilities where large numbers of people may congregate.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
3.1.2	Develop a plan for upgrading and or prioritize low water crossing based on findings from LOCLG.	Some of the data was used to identify the action that has been adopted by Laclede County in the 17 low water crossing.
3.1.4	Encourage Fire Department, Fire Districts, and Ambulance Districts to have alternate routes developed in the event a low water crossing is impassable.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
3.1.5	Encourage both government agencies and businesses that have employees that must work outside during the day to have an alternate start and end time during the extreme heat.	Not feasible as no jurisdiction completed an Action Worksheet for this action.

3.1.6	Encourage local governments and businesses to have a water conservation plan.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.1	Work with our Chamber of Commerce, school districts, builders associations, and communities in educating our communities on the potential natural hazards and promoting the benefits of Safe Rooms.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.2	Work with builders, developers, and manufacturers of building materials that are tornado and wind damage resistant to demonstrate the benefits of these materials as well as building techniques that have been proven effective.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.3	With brochures provided by both FEMA and SEMA concerning flood mitigation, flood preparedness, and flood response and recovery work with local volunteers and civic organizations to distribute them to current homeowners and businesses in the area.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.4	Educational materials in regard to low water crossing and the dangers of driving over them during a flooding incident, distributed through the school districts for new drivers who may not be aware of the dangers.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.5	Create public awareness and distribute educational materials to increase awareness of severe flooding and winter weather dangers.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.6	Disseminate information to the public as to locations for heat relief, and heat shelters available within the region.	Not feasible as no jurisdiction completed an Action Worksheet for this action.
4.1.9	Provide maps where sinkholes are located and educational materials in regard to the dangers of them being next to or near critical infrastructure. Also the dangers of throwing hazardous waste into a sinkhole.	Maps were included in the 2014 HMP plan and no further action was taken. Not feasible to move to 2018 plan based on the fact that no participating jurisdiction identified this as an action item by completing the Action Worksheet.
4.1.10	Encourage marking and fencing around located sinkholes on public and private property.	Not feasible as no jurisdiction completed an Action Worksheet for this action. Encourage, was not an actionable item from previous plan.

Appendix D

Laclede County Hazard Mitigation Plan Adoption Resolutions 2019

Laclede County

City of Lebanon

City of Richland

Laclede County R-I School District

Laclede County C-5 School District

Lebanon R-III School District

Richland R-IV School District

Stoutland R-II School District

RESOLUTION NO. 440

A RESOLUTION BY THE CITY COUNCIL OF THE CITY OF LEBANON, LACLEDE COUNTY, MISSOURI, ADOPTING THE 2019 LACLEDE COUNTY HAZARD MITIGATION PLAN.

- WHEREAS* the City of Lebanon recognizes the threat that natural hazards pose to people and property within the City of Lebanon; *and*
- WHEREAS* the City of Lebanon has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the 2019 Laclede County Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; *and*
- WHEREAS* the Plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the City of Lebanon from the impacts of future hazards and disasters; *and*
- WHEREAS* the City of Lebanon recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the City of Lebanon will endeavor to integrate the Plan into the comprehensive planning process; *and*
- WHEREAS* adoption by the City of Lebanon demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LEBANON, LACLEDE COUNTY, MISSOURI, AS FOLLOWS:

SECTION 1: That the City Council of the City of Lebanon, Laclede County, Missouri, (hereinafter referred to as "City") hereby adopts the 2019 Laclede County Hazard Mitigation Plan. Said *Plan* is hereby attached and incorporated herewithin as marked "Exhibit A."

SECTION 2: That the City Council hereby instructs Staff to review and update Said Plan every five years and to present updates for further adoption by the City Council.

Passed and Approved by the City Council of the City of Lebanon, Laclede County, Missouri, on this 28th day of January 2019.

(Seal)

Attest:



City Clerk Laina Starnes



Mayor Jared Carr

The following resolution was adopted by Laclede County, Missouri on

January 14, 2019

RESOLUTION NO. 2019-1

WHEREAS, the Laclede County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and,

WHEREAS, Laclede County participated in the preparation of the Laclede County Hazard Mitigation Plan; and

WHEREAS, the citizens of Laclede County have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, Laclede County has reviewed the Plan and affirms that the Plan will be updated no less than every five years

NOW THEREFORE, BE IT RESOLVED by the County Commission that Laclede County adopts the Laclede County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to work with Laclede County Emergency Management to implement the Plan.

ADOPTED this 14 day of January, 2019 at the meeting of the County Commission.

Thomas A. Hill PRESIDENT COMMISSIONER JAN 14, 2019
Signature Position Date

Joe Superior ASSOCIATE COMMISSIONER 1-14-2019
Signature Position Date

Debbie ASSOC. VESTER JAN 14, 2019
Signature Position Date

Signature Position Date

City of Richland, Missouri

RESOLUTION NO. 947

A RESOLUTION OF THE CITY OF RICHLAND ADOPTING THE 2019 LACLEDE COUNTY HAZARD MITIGATION PLAN

WHEREAS the City of Richland recognizes the threat that natural hazards pose to people and property within the City of Richland; and

WHEREAS the City of Richland has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the 2019 Laclede County Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the City of Richland from the impacts of future hazards and disasters; and

WHEREAS the City of Richland recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the City of Richland will endeavor to integrate the *Plan* into the comprehensive planning process; and

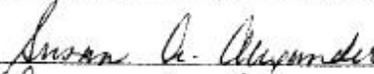
WHEREAS adoption by the City of Richland demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY THE CITY OF RICHLAND, in the State of Missouri, THAT:

In accordance with the Mayor and the Board of Aldermen, the City of Richland adopts the final FEMA-approved *Plan*.

ADOPTED by a vote of 5 in favor and _____ against, and _____ abstaining, this 15 day of January 2014.

By (Sig): 
Print name: Eldon L. Haur

ATTEST:
By (Sig.): 
Print name: Susan A. Alexander

APPROVED AS TO FORM:
By (Sig.): 
Print name: Eldon L. Haur

Laclede County R-I School District, Laclede County, Missouri, Missouri RESOLUTION NO. _

A RESOLUTION OF THE LACLEDE COUNTY R-I SCHOOL DISTRICT, LACLEDE COUNTY, MISSOURI ADOPTING THE 2019 LACLEDE COUNTY HAZARD MITIGATION PLAN

WHEREAS the Laclede County R-I School District, Laclede County, Missouri recognizes the threat that natural hazards pose to people and property within the Laclede County R-I School District, Laclede County, Missouri; and

WHEREAS the Laclede County R-I School District, Laclede County, Missouri has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the 2019 Laclede County Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Laclede County R-I School District, Laclede County, Missouri from the impacts of future hazards and disasters; and

WHEREAS the Laclede County R-I School District, Laclede County, Missouri recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the Laclede County R-I School District, Laclede County, Missouri will endeavor to integrate the *Plan* into the comprehensive planning process; and

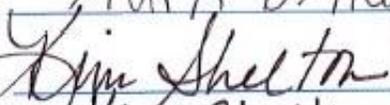
WHEREAS adoption by the Laclede County R-I School District, Laclede County, Missouri demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

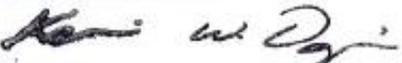
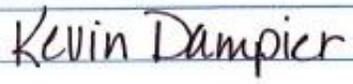
NOW THEREFORE, BE IT RESOLVED BY THE LACLEDE COUNTY R-I SCHOOL DISTRICT, LACLEDE COUNTY, MISSOURI, in the State of Missouri, THAT:

The Laclede County R-I School District, Laclede County, Missouri adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 7 in favor and 0 against, and 0 abstaining, this 17th day of Dec., 2018.

By (Sig): 
Print name: Mark D. Hedges

ATTEST:
By (Sig.): 
Print name: Kim Shelton

APPROVED AS TO FORM: 
By (Sig.): 
Print name: Kevin Dampier

Laclede County C-5 School District, Laclede County, Missouri, Missouri RESOLUTION NO. _____

A RESOLUTION OF THE LACLEDE COUNTY C-5 SCHOOL DISTRICT, LACLEDE COUNTY, MISSOURI
ADOPTING THE 2019 LACLEDE COUNTY HAZARD MITIGATION PLAN

WHEREAS the Laclede County C-5 School District, Laclede County, Missouri recognizes the threat that natural hazards pose to people and property within the Laclede County C-5 School District, Laclede County, Missouri; and

WHEREAS the Laclede County C-5 School District, Laclede County, Missouri has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the 2019 Laclede County Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Laclede County C-5 School District, Laclede County, Missouri from the impacts of future hazards and disasters; and

WHEREAS the Laclede County C-5 School District, Laclede County, Missouri recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the Laclede County C-5 School District, Laclede County, Missouri will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by the Laclede County C-5 School District, Laclede County, Missouri demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY THE LACLEDE COUNTY C-5 SCHOOL DISTRICT, LACLEDE COUNTY, MISSOURI, in the State of Missouri, THAT:

The Laclede County C-5 School District, Laclede County, Missouri adopts the final *FEMA-approved Plan*.

By (Signature): Tina R. Nolan
Print name: Tina R. Nolan

ATTEST:
By (Signature): Melissa Angst
Print name: Melissa Angst

APPROVED AS TO FORM:
By (Signature): _____
Print name: _____

The following resolution was adopted by the Lebanon R-III School District, Laclede County, Missouri on

August 23, 2018

RESOLUTION NO. N/A

WHEREAS, the Laclede County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and,

WHEREAS, Lebanon R-III School District participated in the preparation of the Laclede County Hazard Mitigation Plan; and

WHEREAS, the Lebanon R-III School District has been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the Lebanon R-III School District has reviewed the Plan and affirms that the Plan will be updated no less than every five years

NOW THEREFORE, BE IT RESOLVED by the Superintendent of the Lebanon R-III School District adopts the Laclede County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to work with Laclede County Emergency Management to implement the Plan.

ADOPTED this 23 day of August, 2019 by the Superintendent of the Lebanon R-III School District

David Schuyf
Signature

9/23/18
Date

Richland R-IV School District, Laclede County, Missouri, Missouri RESOLUTION NO. _____

A RESOLUTION OF THE RICHLAND R-IV SCHOOL DISTRICT, LACLEDE COUNTY, MISSOURI ADOPTING THE 2019 LACLEDE COUNTY HAZARD MITIGATION PLAN

WHEREAS the Richland R-IV School District, Laclede County, Missouri recognizes the threat that natural hazards pose to people and property within the Richland R-IV School District, Laclede County, Missouri; and

WHEREAS the Richland R-IV School District, Laclede County, Missouri has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the 2019 Laclede County Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Richland R-IV School District, Laclede County, Missouri from the impacts of future hazards and disasters; and

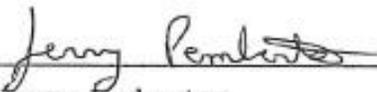
WHEREAS the Richland R-IV School District, Laclede County, Missouri recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the Richland R-IV School District, Laclede County, Missouri will endeavor to integrate the *Plan* into the comprehensive planning process; and

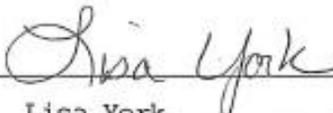
WHEREAS adoption by the Richland R-IV School District, Laclede County, Missouri demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY THE RICHLAND R-IV SCHOOL DISTRICT, LACLEDE COUNTY, MISSOURI, in the State of Missouri, THAT:

In accordance with *{local rule for adopting resolutions}*, the Richland R-IV School District, Laclede County, Missouri adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 7 in favor and 0 against, and 0 abstaining, this day of Jan. 21 2019.

By (Sig): 
Print name: Jerry Pemberton

ATTEST:
By (Sig.): 
Print name: Lisa York

APPROVED AS TO FORM:
By (Sig.): 
Print name: Doug Smith

Stoutland R-II School District, Laclede County, Missouri, Missouri RESOLUTION NO. 01172019-01
A RESOLUTION OF THE STOUTLAND R-II SCHOOL DISTRICT, LACLEDE COUNTY, MISSOURI ADOPTING THE
2019 LACLEDE COUNTY HAZARD MITIGATION PLAN

WHEREAS the Stoutland R-II School District, Laclede County, Missouri recognizes the threat that natural hazards pose to people and property within the Stoutland R-II School District, Laclede County, Missouri; and

WHEREAS the Stoutland R-II School District, Laclede County, Missouri has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the 2019 Laclede County Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Stoutland R-II School District, Laclede County, Missouri from the impacts of future hazards and disasters; and

WHEREAS the Stoutland R-II School District, Laclede County, Missouri recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the Stoutland R-II School District, Laclede County, Missouri will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by the Stoutland R-II School District, Laclede County, Missouri demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY THE STOUTLAND R-II SCHOOL DISTRICT, LACLEDE COUNTY, MISSOURI, in the State of Missouri, THAT:

In accordance with regulation and policy 1420, the Stoutland R-II School District, Laclede County, Missouri adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 7 in favor and 0 against, and 0 abstaining, this 17th day of January 2019.

By (Sig):



Print name: Lyle Gray, Board President

ATTEST:

By (Sig.):



Print name: Chuck Stockton, Superintendent