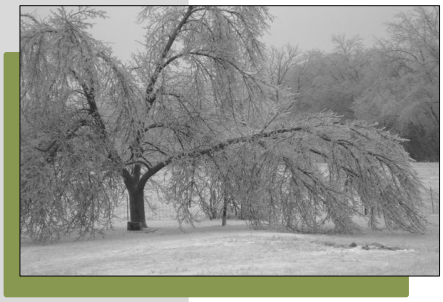

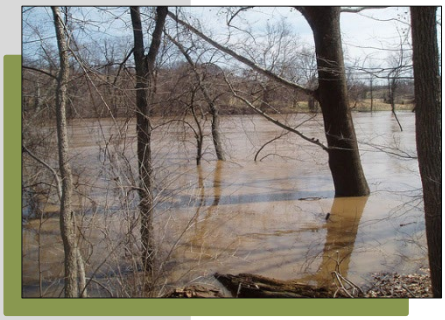

Crawford County Multi-Jurisdiction Natural Hazard Mitigation Plan

Meramec Regional Planning Commission • December 2022

4 Industrial Drive,
St. James, MO 65559

Phone: (573) 265-2993

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CONTRIBUTORS

Crawford County Hazard Mitigation Planning Committee

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

Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Organization
Leo Sanders	Presiding Commissioner	Administration	Crawford County
Rob Cummings	Associate Commissioner	Administration	Crawford County
Jared Boast	Associate Commissioner	Administration	Crawford County
Danny Brown	District 1 Foreman	Road and Bridge	Crawford County
Darin Layman	Sheriff	Sheriff's Department	Crawford County
Tracy Stover	Administrator	Health Department	Crawford County
Steve Kimker	Chief	Fire	Bourbon Fire District
Craig Bouse	Director	Public Works	City of Cuba
Rodney Neff	Director	Emergency Management	City of Cuba
Mike Plank	Chief	Fire	City of Cuba
Tamra Cape	Alderperson	Administration	City of Steelville
Jason Evans	Director	Public Works	City of Steelville
Curtis Crouch	Alderperson	Administration	City of Steelville
J.T. Hardy	Administrator	Administration	City of Sullivan
Kyle Gibbs	Superintendent	Administration	Crawford County R-I School District

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

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

Participating Stakeholder Representatives

Name	Title	Agency/Organization
N/a	N/a	N/a

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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. Crawford County and participating cities and school districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses to the county and its communities and schools resulting from hazard events. The plan is an update of a plan that was approved on June 7, 2018. The original plan was approved in 2005. The plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 and to achieve eligibility for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant Programs.

The county Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the following 10 jurisdictions that participated in the planning process:

- Crawford County
- City of Bourbon
- City of Cuba
- Village of Leasburg
- City of Steelville
- City of Sullivan
- Crawford Co. R-I School District
- Crawford Co. R-II School District
- Steelville R-III School District
- Sullivan School District

Crawford County and the jurisdictions listed above have developed a multi-jurisdictional Hazard Mitigation Plan that was originally approved by FEMA in 2005 with an update approved by FEMA on March 22, 2013 and five years later on June 7, 2018. This current planning effort serves as an update (hereafter referred to as the 2022 Hazard Mitigation Plan.)

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

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

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

Goal 2: Reduce the potential impact of natural disasters to [property, infrastructure, and the local economy.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

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

PREREQUISITES

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

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

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

- Crawford County
- City of Bourbon
- City of Cuba
- Village of Leasburg
- City of Steelville
- City of Sullivan
- Crawford Co. R-I School District
- Crawford Co. R-II School District
- Steelville R-III School District
- Sullivan School District

Model Resolution

RESOLUTION NO. _____

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, (Government/District) recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, (Government/District) fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, (Government/District) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of (Government/District) demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that (Government/District) adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

_____ _____

Certifying Official Date

_____ _____

Witness Date

Table of Contents

1.1 Purpose

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

The mission of the Crawford County Hazard Mitigation Plan is to substantially and permanently reduce the county's vulnerability to natural hazards. This plan demonstrates the communities' commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources for the next five years. The plan is intended to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property and the natural environment. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss prevention and identifying activities to guide the community towards the development of a safer, more sustainable community.

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

Handbook, March 2013 and FEMA's Local Mitigation Plan review Guide, October 1, 2011. Those jurisdictions within Crawford County that do not adopt the 2022 plan will not be eligible for funding through these grant programs.

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

1.2 Background and Scope

The 2022 Crawford Hazard Mitigation Plan is an update of the original plan developed and approved in April 2005. The first update of the 2004 plan was approved by FEMA in 2013. The second update of the plan was approved in June 2018. The revised document will be valid for five years from approval by FEMA. It is a multi-jurisdictional plan that covers the participating jurisdictions within the County's borders excluding the Village of St. Cloud and the Village of West Sullivan:

- Crawford County
- City of Bourbon
- City of Cuba
- Village of Leasburg
- City of Steelville
- City of Sullivan
- Crawford Co. R-I School District
- Crawford Co. R-II School District
- Steelville R-III School District
- Sullivan School District

The information and guidance in this plan document will be used to help guide and coordinate mitigation activities and decisions for local jurisdictions and organizations. Proactive mitigation planning will help reduce the cost of disaster response and recover to local communities and residents by protecting critical infrastructure, reducing liability exposure and minimizing overall community impacts and disruptions. Crawford County has been affected by natural disasters in the past and participating jurisdictions and organizations are committed to reducing the impacts of future incidents and becoming eligible for hazard mitigation-related funding opportunities.

1.3 Plan Organization

The plan contains a mitigation action listing, a discussion of the purpose and methodology used to develop the plan, a profile on Crawford County, as well as the hazard identification and vulnerability assessment of natural hazards. In addition, the plan offers a discussion of the community's current capability to implement the goals, objectives and strategies identified through the planning process.

The plan is organized as follows:

- Executive Summary

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

Changes made to the 2022 plan are detailed in Table 1.1.

Table 1.1. Changes Made in Plan Update

Plan Section	Summary of Updates
Chapter 1 – Introduction and Planning Process	Updated members of the Mitigation Planning Committee (MPC) and participating jurisdictions formally adopted the MPC.
Chapter 2 – Planning Area Profile and Capabilities	Noted new GIS capabilities for participating jurisdictions, updated demographics and information provided in jurisdictional questionnaires, updated jurisdictional capabilities.
Chapter 3 – Risk Assessment	Combined extreme heat and extreme cold into one hazard: extreme temperatures. Updated data on hazards, updated demographic data.
Chapter 4 – Mitigation Strategy	The mitigation category of each action was added to the action worksheets. Plan goals were reviewed and updated. The action items were reviewed and updated, and progress made updated in the action worksheets.
Chapter 5 – Plan Implementation and Maintenance	Updated MPC meetings for evaluating and updating the plan quarterly.

To assist in the explanation of the above identified contents, there are several appendices included which provide more detail on specific subjects. This plan is intended to improve the ability of Crawford County and the jurisdictions within to handle disasters and will document valuable local knowledge on the most efficient and effective ways to reduce loss.

1.4 Planning Process

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

The Crawford County Hazard Mitigation Planning Committee first organized in 2020 when the Missouri State Emergency Management Agency (SEMA) provided grant funds and contracted with the Meramec Regional Planning Commission (MRPC) to develop a hazard mitigation plan for the county. MRPC is a council of local governments in south central Missouri serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties.

MRPC's role in developing and updating the Crawford County Hazard Mitigation plan included assisting in the formation of the mitigation planning committee (MPC) and facilitating the planning meetings; soliciting public input; and producing the draft and final plan for review by the

MPC, SEMA and FEMA. Staff carried out the research and documentation necessary for the planning process. In addition, MRPC compiled and presented the data for the plan, helped the MPC with the prioritization process and insured that the final document met the DMA requirements established by federal regulations and the most current planning guidance.

In 2020, SEMA secured a grant to develop the Crawford County Multi-Hazard Mitigation Plan and contracted with MRPC to facilitate the planning process for the plan development. MRPC staff has followed the most current planning guidance provided by FEMA for the purpose of insuring that the plan meets all of the requirements of the Disaster Mitigation Act as established by federal regulations.

The Crawford County Multi-Hazard Mitigation Plan was developed as the result of a collaborative effort among Crawford County, the City of Bourbon, City of Cuba, Village of Leasburg, City of Steelville, City of Sullivan, Crawford County R-I School District, Crawford County R-II School District, Steelville R-III School District, Sullivan School District, public agencies, non-profit organizations, the private sector as well as regional, state and federal agencies. MRPC contacted and asked for volunteers to serve on the planning committee from the county and local city governments, school districts, the county health department, local businesses and utility companies. The mailing list is included in **Appendix B: Planning Process**. This cross-section of local representatives was chosen for their experience and expertise in emergency planning and community planning in Crawford County. Staff worked with the Crawford County MPC to collect and analyze information on hazards and disasters that have impacted the county as well as document mitigation activities that have occurred during the past five years.

Due to time and duty constraints, not all the jurisdictions that were invited to participate in the MPC were able to attend meetings. However, all of the jurisdictions except Village of West Sullivan and Village of St. Cloud provided information to develop the document, submitted questionnaires, reviewed the plan and provided input. Interviews were conducted with stakeholders from the community and several planning meetings were conducted during the plan development.

The 2022 planning process began with a meeting held at the Crawford County Courthouse on November 4th, 2021. MRPC staff provided an overview of the hazard mitigation planning process and review of the existing hazard mitigation plan. The group reviewed and discussed hazard mitigation goals and what progress had been made on hazard mitigation action items over the past four years. The second meeting was held on March 22, 2022. The MPC reviewed the revised list of goals and action items. The group then then applied the STAPLEE method (Social, Technical, Administrative, Political, Legal, Economic; Environmental) and a cost benefit analysis to best determine priorities. A full description of the prioritization process is included in Chapter 4. The group agreed to review plan chapters as they were completed through email or postings on the MRPC website. The third meeting of the MPC was held on September 20, 2022. The MPC reviewed the participation requirements and status of participation of jurisdictions; reviewed and discussed draft chapters; reviewed plan maintenance and the adoption process.

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

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

Crawford County further assisted in the planning process by issuing public notice of the planning meetings as well as scheduling meeting times at the County Courthouse in Steelville. County officials attended and participated in meetings.

The MPC contributed to the planning process by:

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

The MPC did not formally meet on a regular basis as recommended in the plan. However, mitigation has become a regular topic of discussion among the majority of jurisdictions included in the plan. A number of hazard mitigation projects have been completed in the county and hazard mitigation concepts are being incorporated into other planning projects
Table 1.2 provides information on who actively participated in the planning process and who they represented:

Cathy Bremer, Terry Beckham, Genifer Cape, Robert J. Schaffer, Curt Graves, Christina Hess, and Doug Cuneio all participated indirectly by providing information, completing the jurisdictional questionnaire, participating in phone calls and email discussions and assisting with adoption of the plan.

Table 1.2 Jurisdictional Representatives Crawford County Mitigation Planning Committee

Name	Title	Department	Jurisdiction/Agency/ Organization	Direct Participation	Indirect Participation
Leo Sanders	Presiding Commissioner	Administration	Crawford County	X	
Rob Cummings	Associate Commissioner	Administration	Crawford County	X	
Jared Boast	Associate Commissioner	Administration	Crawford County	X	
Danny Brown	District 1 Foreman	Road and Bridge	Crawford County	X	
Darin Layman	Sheriff	Sheriff's Department	Crawford County	X	
Tracy Stover	Administrator	Health Department	Crawford County	X	

Name	Title	Department	Jurisdiction/Agency/ Organization	Direct Participation	Indirect Participation
Cathy Bremer	City Clerk	Administration	City of Bourbon		X
Steve Kimker	Chief	Fire	Bourbon Fire District	X	
Craig Bouse	Director	Public Works	City of Cuba	X	
Rodney Neff	Director	Emergency Management	City of Cuba	X	
Mike Plank	Chief	Fire	City of Cuba	X	
Terry Beckham	Mayor	Administration	City of Steelville		X
Tamra Cape	Alderperson	Administration	City of Steelville	X	
Jason Evans	Director	Public Works	City of Steelville	X	
Curtis Crouch	Alderperson	Administration	City of Steelville	X	
Genifer Cape	City Clerk	Administration	Village of St. Cloud		X
J.T. Hardy	Administrator	Administration	City of Sullivan	X	
Robert J. Schaffer	City Engineer	Engineering	City of Sullivan		X
Kyle Gibbs	Superintendent	Administration	Crawford County R-I School District	X	
Curt Graves	Superintendent	Administration	Crawford County R-II School District		X
Christina Hess	Superintendent	Administration	Steelville R-III School District		X
Doug Cuneio	Superintendent	Administration	Sullivan School District		X

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

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

Community Department/Office	Preventive Measures	Structure and Infrastructure Projects		Natural Resource Protection	Public Information	Emergency Services
		Property Protection	Structural Flood Control Projects			
County Commission	✓	✓	✓	✓	✓	
County Road and Bridge	✓	✓	✓	✓		
Sheriff's Department	✓	✓			✓	✓
County Health Department	✓			✓	✓	

Community Department/Office	Preventive Measures	Structure and Infrastructure Projects		Natural Resource Protection	Public Information	Emergency Services
		Property Protection	Structural Flood Control Projects			
City of Bourbon Administration	✓	✓	✓	✓	✓	
Bourbon Fire District	✓	✓		✓	✓	✓
City of Cuba Public Works	✓	✓	✓	✓	✓	
City of Cuba Emergency Management	✓				✓	✓
City of Cuba Fire District	✓	✓		✓	✓	✓
Village of Leasburg Administration	✓	✓	✓	✓	✓	
Village of Leasburg Water and Sewer	✓	✓	✓	✓		
City of Steelville Administration	✓	✓	✓	✓	✓	
City of Steelville Public Works	✓	✓	✓	✓	✓	
City of Sullivan Administration	✓	✓	✓	✓	✓	
City of Sullivan Engineering	✓	✓	✓	✓		
Crawford County R-I School District Administration	✓	✓	✓		✓	
Crawford County R-II School District Administration	✓	✓	✓		✓	
Steelville R-III School District Administration	✓	✓	✓		✓	
Sullivan School District Administration	✓	✓	✓		✓	

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.

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

- Crawford County
- City of Bourbon
- City of Cuba
- Village of Leasburg
- Village of St. Cloud
- City of Steelville
- City of Sullivan
- Village of West Sullivan
- Crawford County R-I School District
- Crawford County R-II School District
- Steelville R-III School District
- Sullivan School District
- Crawford County Health Dept.
- Charter Communications
- Crawford Electric Co-Op Inc
- Intercounty Electric Co-Op, Inc.
- Ameren UE
- Crawford Medical Cinic
- Missouri Baptist Sullivan Hospital
- The Arbors at Victorian Place
- Cuba Manor
- Rock Springs Residential
- American Red Cross
- Stubble Field
- Sunshine Acres Residential
- Barnabas Redwood Manor
- Life Care of Sullivan
- Meramec Nursing Center
- Victorian Place of Sullivan
- Arbors at Dunsford Court
- Ridgeway Residential Care
- Steelville Senior Living
- Missouri Department of Conservation
- MO SEMA
- US Army Corp of Engineers
- US Fish and Wildlife Service
- US Dept. of Agriculture, NRCS
- MODOT
- Cuba Free Press
- Sullivan Independent News
- Steelville Star – Crawford Mirror

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

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

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

- Provide in-kind match documentation; and
- Formally adopt the plan prior to submittal of the final draft to SEMA and FEMA for final approval.

Not all jurisdictions were able to attend the MPC meetings. Most communities and school districts in Crawford County are small and understaffed. It was not always feasible for representatives to travel to the meetings. However, all jurisdictions met at least one of the participation criteria. All jurisdictions were contacted by phone and asked to complete the data collection questionnaire. In some cases, staff assisted jurisdictions with completion of the questionnaire. All jurisdictions were also contacted via email and phone regarding completion of in-kind match forms and if there were any questions regarding the information on the data collection questionnaires. The jurisdictions that participated in the process, as well as their level of participation in the process are shown in **Table 1.4**. Documentation of meetings, including sign-in sheets are included in Appendix B: Planning Process.

Table 1.4 Jurisdictional Participation in the Planning Process

Jurisdiction	Meeting #1	Meeting #2	Meeting #3	Interviews	Data Collection Questionnaire/Call	Update/Develop/ Prioritize Mitigation Actions	Review/ Comment on Plan
Crawford County	X	X	X	X	X	X	X
City of Bourbon	X			X	X		X
City of Cuba	X	X	X	X	X	X	X
Village of Leasburg				X	X		X
Village of St. Cloud				X	X		X
City of Steelville	X	X		X	X	X	X
City of Sullivan	X	X		X	X	X	X
Village of West Sullivan							X
Crawford County R-I		X		X	X	X	X
Crawford County R-II				X	X		X
Steelville R-III				X	X		X
Sullivan School District				X	X		X

1.4.2 The Planning Steps

Crawford County and MRPC worked together to develop the plan and based the planning process in FEMA's *Local Mitigation Planning Handbook (March 2013),* the *Local Mitigation Plan Review Guide (October 1, 2011),* and *Integrating Hazard Mitigation Into Local Planning: Case*

Studies and Tools for Community Officials (March 1, 2013). The planning process has included organizing the county's resources, assessing the risks to the county, developing the mitigation plan and implementing the plan and monitoring the progress of plan implementation.

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

Table 1.5 Crawford County Planning Process

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

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

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

The planning team was selected by contacting the leadership of each jurisdiction, explaining the process, and asking them to send appropriate representation to the planning meetings. In addition, they were asked to provide input on who they wanted to include on the planning committee. Stakeholders such as electric cooperatives and sewer districts were also contacted and invited. In addition, it was suggested that representatives of some of the local critical facilities be included on the planning committee, such as medical clinics and nursing homes. All meetings were also publicized to allow additional interested parties to attend and participate. Crawford County Commission offered to host the meetings at the courthouse and the first

meeting was held there on November 4th, 2021. The second meeting was convened on March 22, 2022, and the third on September 20, 2022.

At the first meeting on January 30, 2020, MRPC staff made introductions and provided an overview of the Crawford County Hazard Mitigation plan. The group reviewed and discussed the goals and objectives. A good deal of the meeting was spent sharing information on what progress had been made in five years and discussing current and future needs. Staff offered to help those jurisdictions present with completion of their data collection surveys. The group started working on reviewing and prioritizing the action items – using both the STAPLEE method and analyzing the cost benefit.

At the second meeting on March 22, 2022, the group reviewed the existing list of goals and provided feedback on their revision. The group then reviewed action items; determined which had been completed; which should be combined; which were no longer a high or medium priority; and determined if any needed to be added. The MPC then provided input on prioritizing each of the action items. Staff took those recommendations and developed a matrix of the action items with the STAPLEE and cost benefit scores. This matrix was emailed out to all of the individuals and organizations on the mailing list for the MPC with a request for feedback. All suggestions for changes were incorporated into the plan. MRPC staff shared the results of the public survey. It was decided that staff would share plan chapters with the MPC as they were completed.

At the third meeting on September 20, 2022, the group reviewed participation requirements and the status of all jurisdictions; reviewed and discussed those draft chapters that were completed; discussed plan maintenance; and the adoption process.

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

Table 1.6 Schedule of MPC Meetings

Meeting	Topics	Date
Planning Meeting #1	Overview of hazard mitigation planning purpose and Crawford County plan; grant programs linked to approved plan; participation requirements and public involvement; data collection questionnaires; discussion of hazards; critical facilities	November 4th, 2021
Planning Meeting #2	Overview of hazard mitigation planning and Crawford Co. HMP; discussion on the revision of plan goals, discussion of action items for the next 5 years; prioritization of action items; road and bridge projects; integration of other data, reports, studies, and plans	March 22, 2022
Planning Meeting #3	Review of participation requirements and status of	September 20, 2022

Meeting	Topics	Date
	jurisdictions, review and discussion of draft chapters, plan maintenance and adoption process and next steps for the planning process and completion of the plan.	

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

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

The MPC followed the same process for public involvement and input as suggested by SEMA and FEMA and as was followed during earlier planning processes. The first MPC meeting was held at the Crawford County Courthouse. Public notices were placed at the courthouse, and press releases were done prior to the meeting to make the public aware. Meetings were also posted on the MRPC webpage. The public was notified each time the plan or sections of the plan were presented for review and discussion. A public survey was conducted and the results shared with the MPC. A sample of the survey and the results of the survey are included in Appendix C: Public Survey. MPC members and public officials within the county as well as in surrounding counties were contacted, directed to the MRPC website (www.meramecregion.org) where a copy of the draft plan could be viewed or downloaded. The document was made available on the website on December 6, 2022. Hard copies of the final draft were placed at the Crawford County Courthouse. A hard copy of the draft could be obtained directly from MRPC by request. Members of the local media were invited to attend planning meetings. Information was shared by these media outlets with the public on the planning process and where to find draft copies of the plan. Copies of public notices and press release are included in Appendix B. Results of the public survey are included in Appendix C: Public Survey.

No comments were received from the public other than what was found in the public survey, which is included in the Appendices.

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

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

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

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

Lists of the people from the jurisdictions and stakeholders who were invited to participate in the planning process follows.

Jurisdictional Representatives Invited to Participate in the Planning Process

Name	Title	Department	Jurisdiction/Agency/Organization
Leo Sanders	Presiding Commissioner	County	Crawford County
Rob Cummings	Associate Commissioner	County	Crawford County
Jared Boast	Associate Commissioner	County	Crawford County
John Martin	County Clerk	County	Crawford County
Darin Layman	Sherriff	Sherriff's Dept.	Crawford County
Leza Mizell	Director	Emergency Management	Crawford County
Brad England	Director	911 Communications	Crawford County
Danny Brown	Foreman	Road and Bridges	Crawford County
Kenny McGraw	Foreman	Road and Bridges	Crawford County
Honor Evans	Administrator	Health	Crawford County
Dave Lafferty	Mayor	Admin.	City of Bourbon
Cathy Bremer	City Clerk	Admin.	City of Bourbon
Mark McEuen	Director	Water, Streets, Parks	City of Bourbon
Leroy Schebaum	Director	Emergency Management	City of Bourbon
Paul Satterfield	Chief	Police	City of Bourbon
Stephen Kimker	Chief	Fire	Bourbon Fire Protection District
Cody Leathers	Mayor	Admin	City of Cuba
Lainie Garbo	City Clerk	Admin	City of Cuba
Rodney Neff	Director	Emergency Management	City of Cuba
Mike Plank	Chief	Fire	City of Cuba
Doug Shelton	Chief	Police	City of Cuba
Dennis Chandler	Superintendent	Streets	City of Cuba
Craig Bouse	Director	Public Works	City of Cuba
Amy Simpson	Superintendent	Electric	City of Cuba
Glen Shockley	Superintendent	Water	City of Cuba
James Happel	Superintendent	Natural Gas	City of Cuba
A.J. Harmon	Superintendent	Sewer	City of Cuba
Jared West	Chairman	Admin.	Village of Leasburg
Della Bishop	City Clerk	Admin	Village of Leasburg
Kent Jones	Chief	Fire	Leasburg Comm. Vol. Fire Dept.

Name	Title	Department	Jurisdiction/Agency/Organization
Jared Boast	Supervisor	Water	Village of Leasburg
Terry Beckham	Mayor	Admin.	City of Steelville
Sandra Richter	City Clerk/Collector	Admin.	City of Steelville
Keith Young	Chief	Fire	Steelville Fire Protection District
Mike Sherman	Marshal	Police	City of Steelville
Jason Evans	Director	Public Works	City of Steelville
Jim Chambers	Superintendent	Sewer	City of Steelville
Robert Hicks	Superintendent	Water	City of Steelville
Roben Griggs	Comptroller	Admin.	City of Steelville
Genifer Cape	Village Clerk	Admin	Village of St. Cloud
Dennis Watz	Mayor	Admin.	City of Sullivan
Jan Koch	City Clerk	Admin.	City of Sullivan
J.T, Hardy	City Administrator	Admin.	City of Sullivan
Kevin Halbert	Director	Emergency Management	City of Sullivan
Eric Lewis	Chief	Fire	City of Sullivan
Patrick Johnson	Chief	Police	City of Sullivan
Billy Parker	Commissioner	Street	City of Sullivan
Joe Thurmond	Commissioner	Electric	City of Sullivan
John Garner	Commissioner	Water and Sewer	City of Sullivan
-	Board of Trustees	Admin.	Town of West Sullivan
Kyle Gibbs		Admin.	Crawford Co. R-I School District
Curt Groves	Superintendent	Admin.	Crawford Co. R-II School District
Christina Hess	Superintendent	Admin.	Steelville R-III School District
Jana Thornsberry	Superintendent	Admin.	Sullivan School District

Stakeholder Invited to Participate in the Planning Process

Name	Title	Agency/Organization
-	-	Crawford Co. PWSD #1
-	-	Crawford County Electric Cooperative
-	-	Charter Communications
-	-	Intercounty Electric Cooperative
-	-	Ameren UE
-	-	MO SEMA
-	-	MO Department of Conservation
-	-	MO Department of Transportation
Eddie Blaylock	Captain	MO Highway Patrol Troop I
Matt Shively	-	U.S. Army Corps of Engineers
Ken Sessa	-	U.S. FEMA
Karen Herrington	Field Supervisor	U.S. Fish and Wildlife Service
-	-	U.S. Department of Agriculture, NRCS
Melissa Wilding	-	American Red Cross
Lisa Lochner	-	Missouri Baptist Sullivan Hospital
-	-	Crawford Medical Clinic
Christine Young	Administrator	The Arbors of Victorian Place of Cuba
Mary Leija	Administrator	Cuba Manor
Tyler Kiersz	Administrator	Rock Springs Residential
Jessica Mabe	Administrator	Stubble Field

Name	Title	Agency/Organization
Tom Pataky	Administrator	Sunshine Acres Residential
Rebecca Elias	Administrator	Barnabas Redwood Manor
Mathew Taylor	Administrator	Lifecare of Sullivan
Donna Barns	Administrator	Meramec Nursing Center
Tracy Owens	Administrator	Victorian Place of Sullivan
Tracy Martin	Administrator	Arbors at Dunsford Court
Jacqueline Taylor	Administrator	Ridgeway Residential Care
Krystal McKellips	Administrator	Steelville Senior Living
-	-	Cuba Free Press
-	-	Sullivan Independent News
-	-	Steelville Star- Crawford Mirror

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

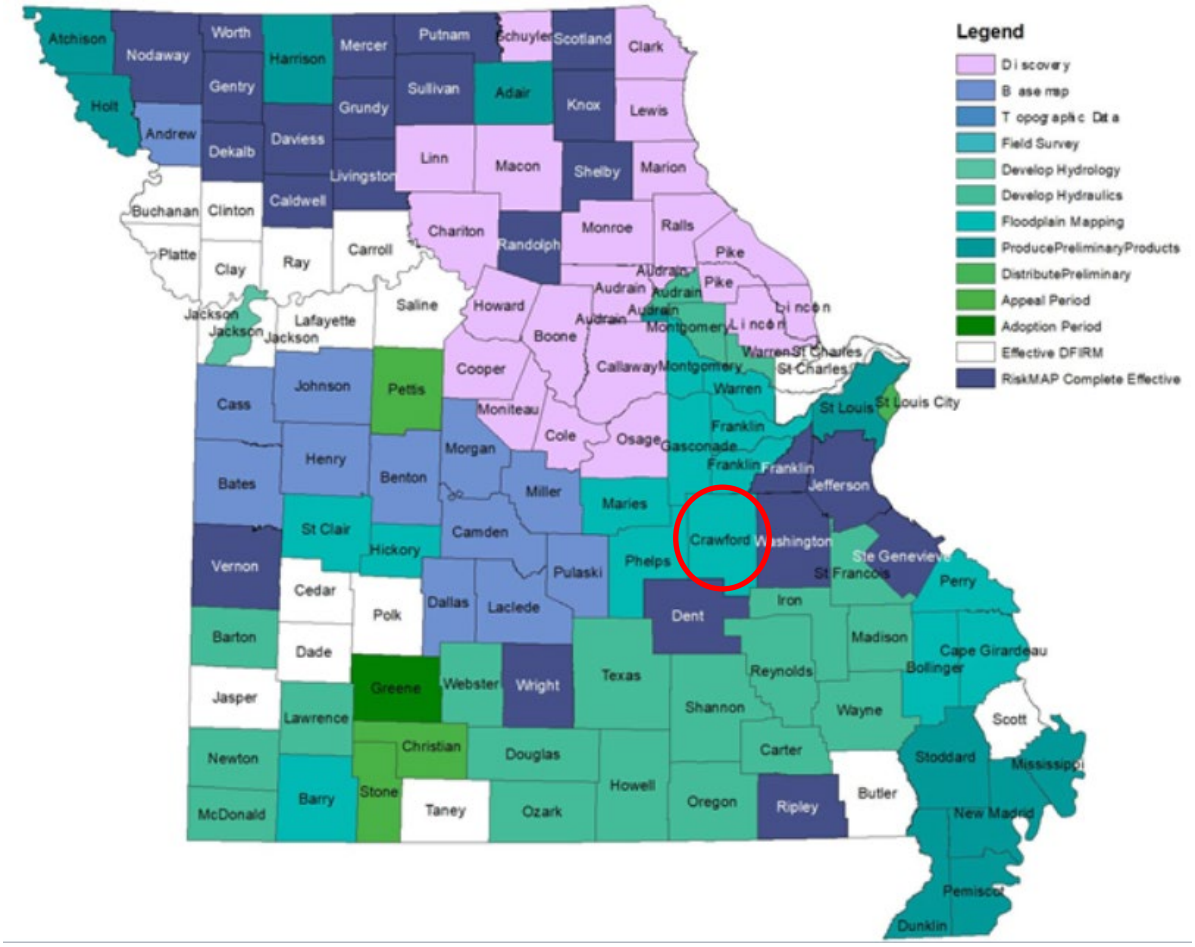
The questionnaire provided to every jurisdiction asked how mitigation actions were being incorporated into other planning documents. The county road and bridge department does a good job of incorporating mitigation projects into their regular maintenance program. Those projects have been incorporated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

Coordination with FEMA Risk MAP Project

The Risk MAP project has begun in Crawford County. As of September 2022, SEMA was working with the Wood Environment and Infrastructure Solutions to update the models used to develop the county's new flood risk data. Preliminary flood risk data was shared with the county in February 2022 with a community coordination and outreach meeting in planning. The county currently has DFIRM maps. Once completed, Risk MAP will provide mitigation planning support in a variety of ways including helping in the assessment of risks and identifying action items to reduce vulnerability. In addition, this project will provide tools to improve the understanding of risk by local officials and the general public.

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

Figure 1.1. Map of RiskMAP Projects



Integration of Other Data, Reports, Studies and Plans

The MPC researched available plans, studies, reports and technical information during development of the Update. The intent was to identify existing data and information, shared objectives and past and ongoing activities that would add to the Update. The goal was to identify the existing capabilities and planning mechanisms to implement the mitigation strategy. Crawford County is a rural area with the largest community's population at approximately 3,348 (Cuba). Not all of the participating communities have planning or zoning, subdivision regulations or other mechanisms for controlling the development of land. Some of the jurisdictions do have ordinances and planning documents. Following is a list of the documents that were reviewed:

- Local planning and zoning ordinances
- County EOP
- Crisis Plans (school districts)
- Comprehensive plans
- Economic development plans
- Capital improvement plans
- Regional Transportation Plan
- Floodplain management ordinances and flood Insurance Risk Maps (FIRMs)

In addition to information available from local jurisdictions, a number of data sources, reports, studies and plans were used in updating the plan. Every attempt was made to gather the best available data to develop the vulnerability assessment and identify assets in the county. The Missouri State Hazard Mitigation Plan (2018) was reviewed and referenced throughout the document. Other data sources included dam information from the Missouri Department of Natural Resources and National Inventory of Dams (NID); fire reports from state agencies; Wildland/Urban Interface and Intermix data from the SILVIS Lab – Department of Forest Ecology and Management – University of Wisconsin; the Community Economic Development Strategy (CEDS); capital improvement plans from the participating jurisdictions; historic weather data and damage estimates from the National Oceanic and Atmospheric Administration; the critical facilities inventory conducted by MRPC; and road and bridge department plans/budgets.

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

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

The MPC reviewed the hazards identified in the previous Hazard Mitigation Plan at the first planning meeting on November 4, 2021 including discussions of any hazard events that occurred during the last twenty years and all of the hazards included in the Missouri Hazard Mitigation plan. A variety of sources were used to identify and profile hazards. These included U.S. Census data, GIS data, HAZUS, the Missouri Spatial Data Information Service (MSDIS), statewide datasets compiled by state and federal agencies, existing plans and reports, personal interviews with MPC members and the questionnaire completed by each jurisdiction. Every effort was made to use the most current and best data available. Additional information on the risk assessment and the conclusions drawn from the available data can be found in Chapter 3.

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

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

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

Jurisdictions provided information on their regulatory, personnel, fiscal and technical abilities by completing the data collection questionnaire. The vulnerability assessment was completed using estimates from the 2018 State plan. For more information on planning area profiles and capabilities, please see Chapter 2.

Step 6: Set Goals (Handbook Task 6)

The goals from the initial hazard mitigation plan were reviewed at the first planning meeting on November 4, 2021. The MPC decided that all of the existing goals were still a priority but that

several goals were similar and had very similar action items in the prior plan. At the second planning meeting on March 22, 2022, the MPC discussed revision of the original goals to remove redundancy and improve coverage. The revised goals are as follows:

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Step 7: Review Possible Mitigation Actions and Activities

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

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

Staff received proposed road and bridge mitigation projects that needed to be addressed from the County Associate Commissioners on February 24, 2022.

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

STAPLEE stands for the following:

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

- **Environmental:** Will there be negative environmental consequences from the action? Does it comply with environmental regulations? Is it consistent with community environmental goals?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Step 8: Draft an Action Plan

The MPC reviewed the final list of action items and completed the prioritization process at the March 22, 2022, meeting. The final list was then mailed out to all jurisdictions and members of the MPC for review and approval as everyone was not able to attend the meeting. Staff was directed by the MPC to take the finalized list after allowing time for comments and draft an action plan. The action worksheets, including the plan for implementation, submitted by each jurisdiction for the updated Mitigation Strategy are included in Chapter 4.

Step 9: Adopt the Plan (Handbook Task 8)

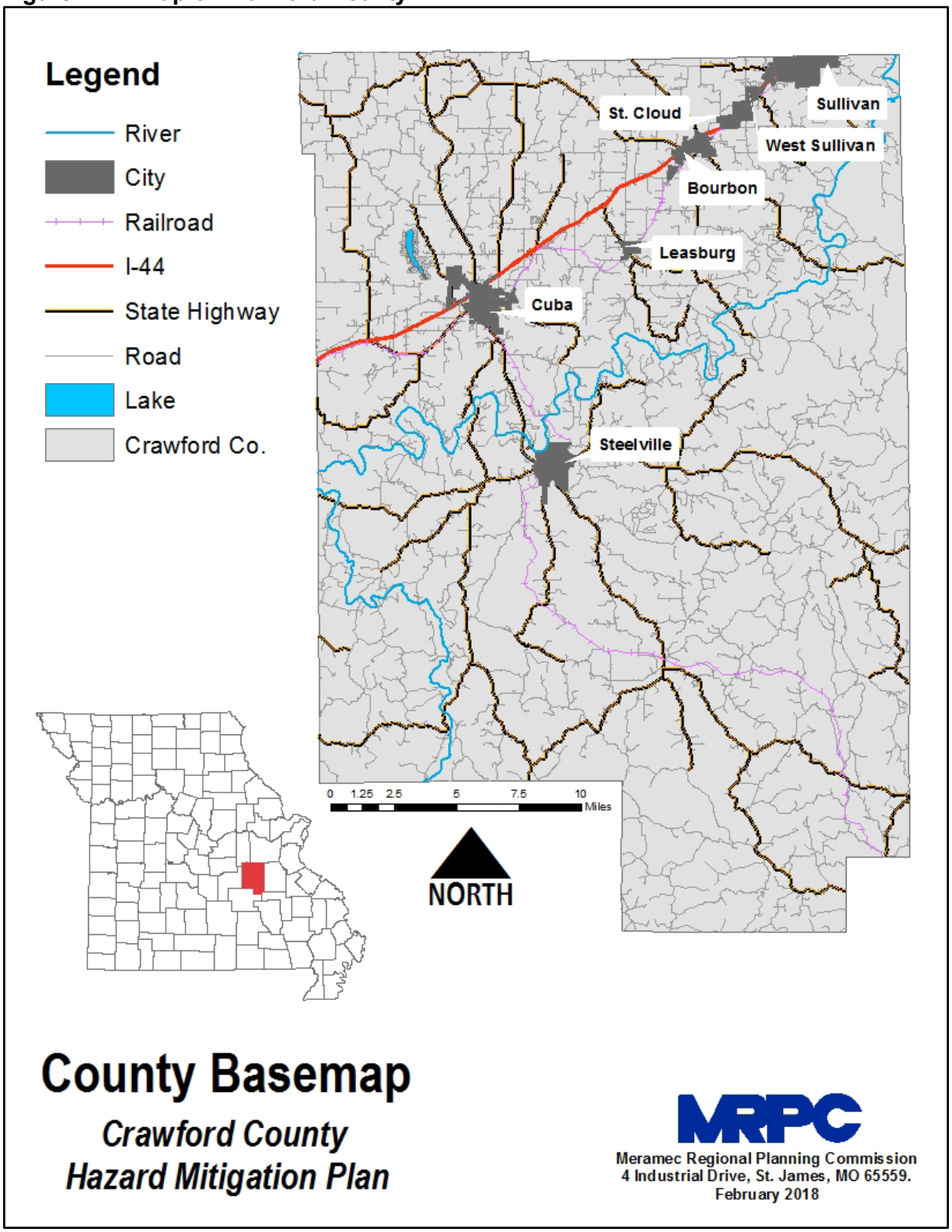
When the first draft of the plan was completed, staff posted the document on the MRPC website and provided a hard copy to the county courthouse. All MPC members, jurisdictions and surrounding jurisdictions were notified on where to find a copy of the plan to review. If requested, additional hard copies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

Step 10: Implement, Evaluate, and Revise the Plan (Handbook Tasks 7 & 9)
At all three planning meetings (November 4, 2021, March 22, 2022, and September 20, 2022) MRPC staff advised the MPC and participating jurisdictions of the importance of continuing to meet periodically to discuss implementation of the plan as well as monitoring and maintaining the plan into the future. Chapter 5 provides details on Crawford County's strategy for implementation, evaluation and revising the plan.

2 PLANNING AREA PROFILE AND CAPABILITIES

2.1 Crawford County Planning Area Profile

Figure 2.1. Map of Crawford County



Crawford County has a population of approximately 23,056 according to the most recent census data[1]. Error! Reference source not found. illustrates the percentage population growth since 2010 as compared to the statewide and national population growth. The median household income and percentage growth since 1999, as compared to statewide and national figures can be found in **Table 2.2.** Furthermore**,** median house value percentage growth for Crawford County, Missouri, and the United States is provided in **Table 2.3**.

Table 2.1. Percent Population Growth for County, State, and Nation 2010 - 2020

	Total Population		Change Over Period	
Demographic Region	**2010**	**2020**	**Change**	**Percent**
Missouri	5,814,785	6,154,913	340,128	5.85
United States	300,758,215	331,449,281	30,691,066	10.2
Crawford County	24,364	23,056	-1,308	-5.37

Source: U.S. Census Bureau, Census 2010 Summary File 1; U.S. Census Bureau, Census 2020 Redistricting Data

Table 2.2. Median Household Income and Percentage Growth for County, State, and Nation 2010 - 2020

	Median Household Income (USD)		Change Over Period	
Demographic Region	**2010**	**2020**	**Change**	**Percent**
United States	$51,914	$64,994	$13,080	20.1
Missouri	$46,262	$57,290	$20,972	19.2
Crawford County	$34,506	$44,380	$9,874	28.6

Source: U.S. Census Bureau, 2006-2010 and 2016-2020 5-Year American Community Survey

Table 2.3. Median House Value Percentage Growth for County, State, and Nation 2010 - 2020

	Median House Value (USD)		Change Over Period	
Demographic Region	**2010**	**2020**	**Change**	**Percent**
United States	$188,400	$229,800	$41,400	18.02
Missouri	$137,700	$163,600	$25,900	15.8
Crawford County	$105,400	$124,400	$19,000	18.03

Source: U.S. Census Bureau, 2006-2010 and 2016-2020 5-Year American Community Survey

2.1.2 Geography, Geology and Topography

Crawford County has a total land area of 744 square miles with 1.2 square miles of total water area. Over 60 percent of the county is covered by forest land. The area has karst terrain, which is characterized by springs, caves, losing streams, and sinkholes. Incorporated jurisdictions within the county include the City of Bourbon, City of Cuba, Village of Leasburg, Village of St. Cloud, City of Steelville, City of Sullivan, and City of West Sullivan.

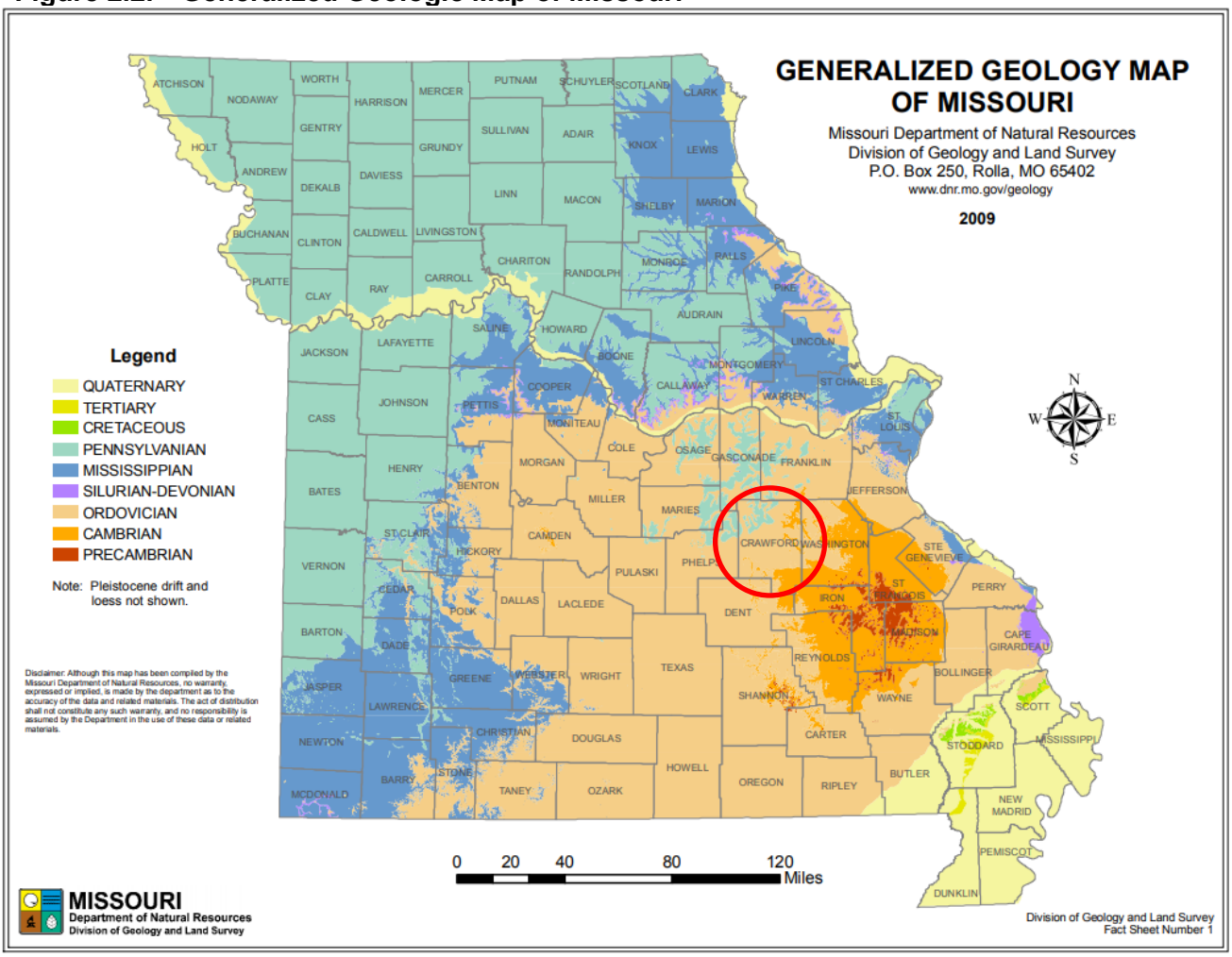
The county seat, Steelville, is located in central portion of the county, approximately, approximately 80 miles southeast of the state capital of Jefferson City, approximately 141 miles

[1] U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates

northeast of Springfield, Mo., and approximately 92 miles south west of St. Louis, Mo. The county is bordered on the north by Gasconade and Franklin Counties. On the east side the county is bordered by Washington County. To the south the county is bordered by Dent and Iron Counties. Phelps County shares a border with Crawford to the west.

Located within the Ozark Mountains, Crawford County is located in the Ozark Plateau – the largest outcrop area of Ordovician-age rocks in the United States[2]. This rock is 505 to 441 million years old and made up primarily of carbonates and thin shales with three distinctive sandstone layers: the Gunter at the base of the column, the red and white Roubidoux which is often used as a building stone and the St. Peter glass sand. This stone is the result of a time period when Missouri was covered by a shallow sea and the stone frequently produces aquatic fossils from that time period[3]. Portions of this formation contain rock that dissolves and fractures over time from rainwater, thus resulting in the karst features found throughout the Ozarks. **Figure 2.2** depicts a generalized geologic map of Missouri and its counties.

Figure 2.2. Generalized Geologic Map of Missouri



Source: https://dnr.mo.gov/document-search/generalized-geologic-map-missouri-pub2514/pub2514 **Red circle indicates Crawford County*

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

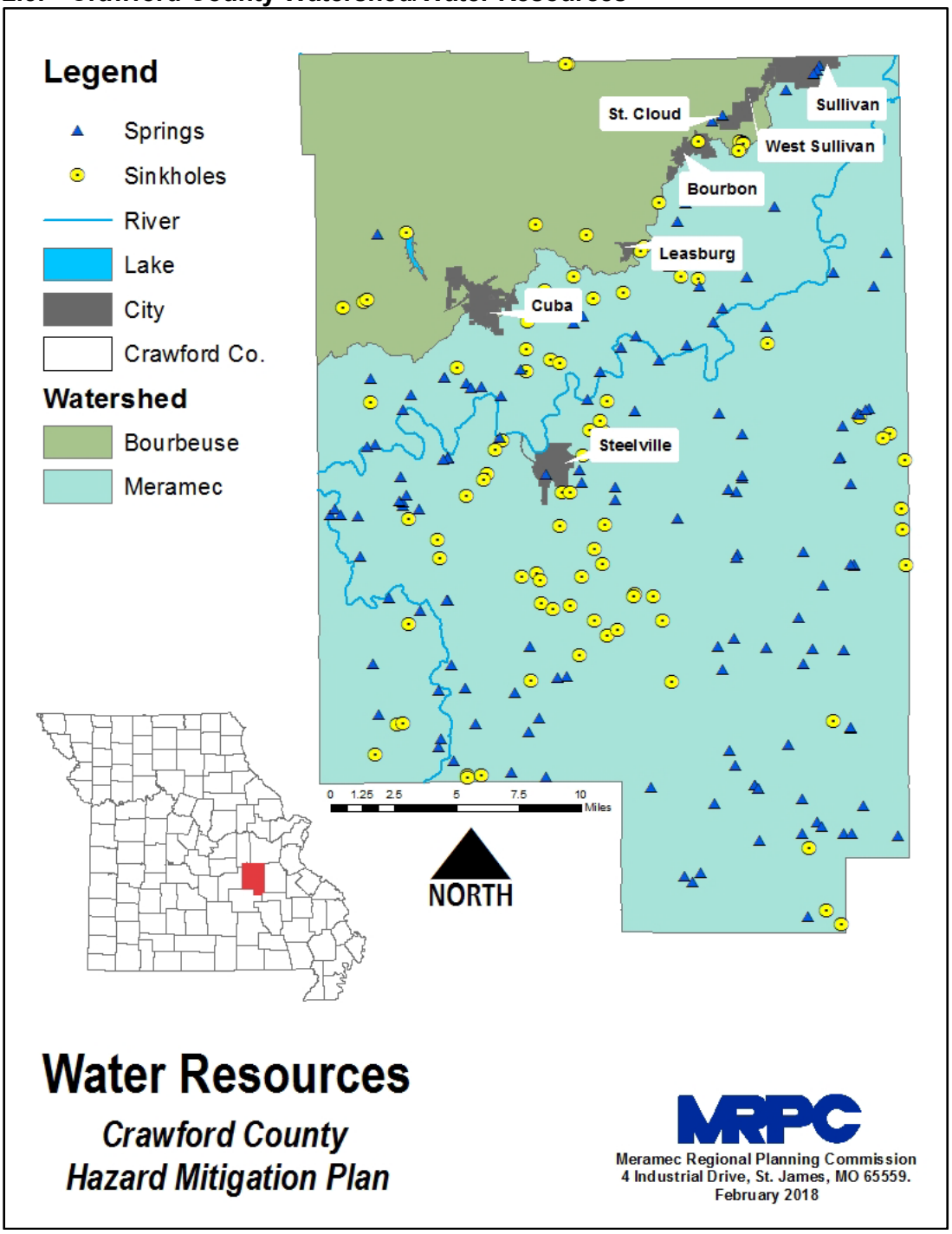
[3] http://members.socket.net/~joschaper/ordo.html

The topography of Crawford County is divided by a ridge between the Bourbeuse Watershed to the north and the Meramec Watershed to the south. Interstate Highway 44 runs along this ridge. The Bourbeuse Watershed is characterized by gently rolling hills, with only a few steep slopes in the area. Most of Crawford County lies in the Meramec Basin. This area has rugged terrain with steep sloping hills and narrow valleys. The maximum relief in the county is approximately 600 feet, with the lowest point at the northeast corner of the county, and the highest point in the southeast corner. Two basic soil types are found in Crawford County – The Ozark Border soils and Ozarks soils. The Ozark Border soils are located in an area of dissected plateau characterized by narrow ridge tops and narrow valleys. A thin mantle of loess caps the ridge tops. The steep side slopes contain deep cherty, clayey, reddish-colored soils developed over dolomite or limestone. Sandy, loamy and gravelly alluvial soils are in the bottom lands. These soils are found throughout most of northeastern Crawford County. The Ozark Border soils include the Union-Goss-Gasconade Peridge and Hobson-Clarksville-Gasconade soil associations.

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

Crawford County is located in two river basins: Bourbeuse and Meramec. The Meramec River includes the following tributaries: Bourbeuse River, Dry Creek, Huzzah Creek, Courtois Creek, Hazel Creek, Big River and Mineral Fork. The watersheds located in Osage County can be seen in Error! Reference source not found..

Figure 2.3. Crawford County Watershed/Water Resources



The Bourbeuse River watershed is located within the northeastern quarter of the Ozark Highlands. The main stem of the Bourbeuse River winds northeasterly through Phelps, Gasconade, and Franklin counties to join the Meramec River, and its watershed additionally encompasses portions of Maries, Osage, and Crawford counties. The Bourbeuse River is 147 miles from mouth to headwaters, and the lower 132 miles have permanent flow. The Bourbeuse River watershed drains 843 square miles and is composed of a number of smaller watersheds including Spring Creek, Boone Creek, Brush Creek, Red Oak Creek, Dry Fork, Little Bourbeuse River, and the Lower Bourbeuse River. The gradient of the main stem is low compared to other

streams of the Ozark Highlands, and gradients of the tributaries are slightly higher in the lower watershed compared to the upper watershed. The Bourbeuse River has fewer springs with smaller discharges compared to the Meramec River.

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

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

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

During the last 100 years, stream channels in the Ozarks have become wider and shallower and deep-water fish habitat has been lost. Historical data indicate that channel disturbances have resulted most directly from clearing of vegetation along stream channels, which decreases bank strength. Historical and stratigraphic data show that after 1830, Ozarks streams responded to

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

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

2.1.3 Climate

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

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

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

2.1.4 Population/Demographics

Table 2.4 provides population/demographic data for Crawford County between 2000 and 2020 by jurisdiction. The unincorporated area of Crawford County was determined by subtracting the populations of the incorporated areas from the overall county population.

Table 2.4. Crawford County Population 2000-2020 by Jurisdiction

Jurisdiction	2000 Population	2010 Population	2020 Population	2010-2020 # Change	2010-2020 % Change
Unincorporated Crawford County	9,978	10,542	9,276	-1,266	-12.01%
Bourbon	1,348	1,632	1,567	-65	-3.98%
Cuba	3,230	3,284	3,181	-103	-3.14%
Leasburg	324	338	326	-12	-3.55%
***St. Cloud**	56	41	43	-2	-4.65%
Steelville	1,429	1,500	1,472	-28	-1.87%
Sullivan	6,351	6,908	6,905	-3	-0.04%
***West Sullivan**	88	119	285	166	139.5

Source: U.S. Census Bureau, Census 2000 Summary File 1; Census 2010 Summary File 1; Census 2020 Redistricting Data, *Not included in the 2022 Crawford Co. HMP

Table 2.5 provides information in regard to the percent of individuals under the age of 5, and over 65 for the county, State, and Nation. In addition, average household size is illustrated in **Table 2.6** including figures for Crawford County, Missouri, and the U.S. In 2020 there were an estimated 11,378 households within the county[4].

Table 2.5. Percent of Individuals Under the Age of 5, and Over 65 for County, State, and Nation (2020)

Location	% Under Age of 5	% Over Age of 65
Crawford County	5.7	19.5
Missouri	6.1	16.9
United States	6.0	16.0

Source: U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates

Table 2.6. 2020 Average Household Size for County, State, and Nation

Location	Average Household Size
Crawford County	2.39
Missouri	2.44
United States	2.60

Source: U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates

[4] U.S. Census Bureau, 2020 Decennial Redistricting Data

Social Vulnerability Index (SoVI ®)

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

Table 2.7. Social Vulnerability Index (SoVI ®)

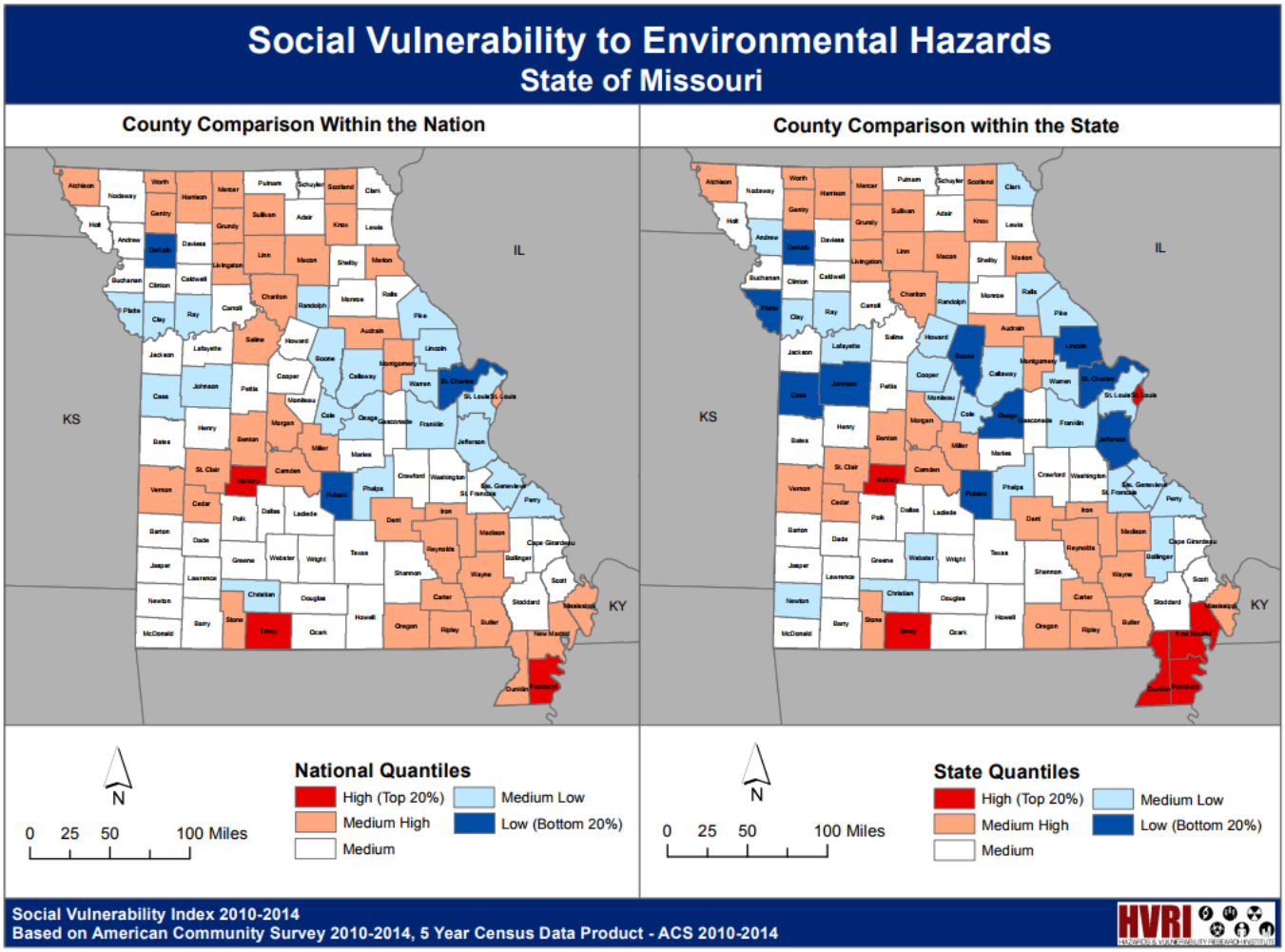
State	County	SoVI Score (10 - 14)	National Percentile (10 - 14)
Missouri	Crawford County	1.379999995	72.7%

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

The analysis of 30 socioeconomic variables includes the standardization of data, and reduction of variables into a condensed set of statistically optimized components; positive component loadings (+) are linked with amplified vulnerability, and negative component loadings (-) are linked with diminished vulnerability. Scores are represented as a numeric value, but have no inherent mathematical properties. To simplify the metrics of the SoVI ® Score, a negative number illustrates a county's resiliency to hazard events, and a positive number illustrates a decrease in resiliency[5]. Crawford County's SoVI ® Score illustrates an amplified vulnerability to cope with natural disasters. Additionally, Crawford County is ranked 72.7 percent nationally, for counties most vulnerable to environmental hazards. **0** depicts Missouri's SoVI ® to environmental hazards between 2010 and 2014. Furthermore, **Figure 2.5** depicts the Nation's SoVI ® to environmental hazards between 2010 and 2014.

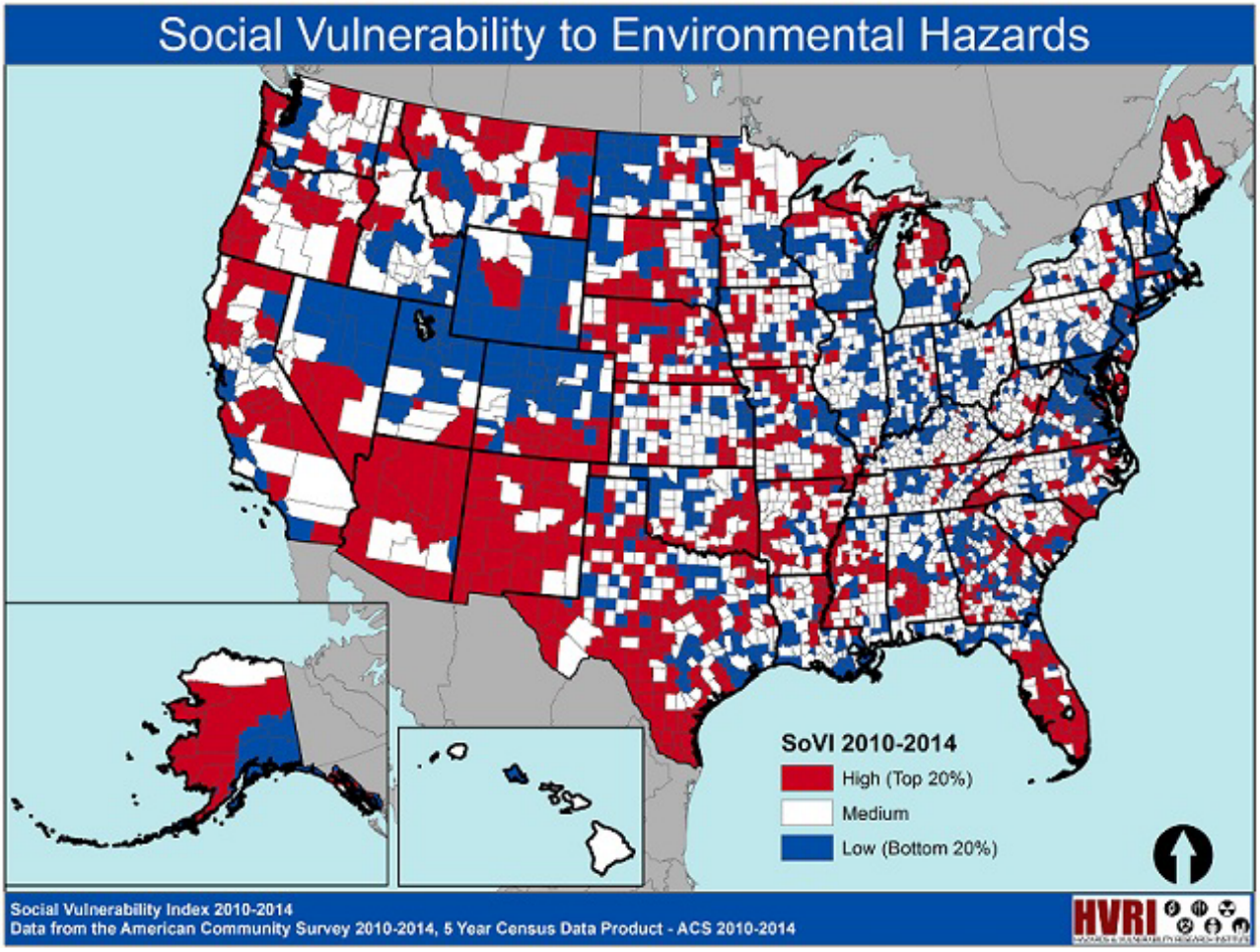
[5] http://webra.cas.sc.edu/hvri/products/sovifaq.aspx

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



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

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



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

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

Table 2.8. 2020 Unemployment, Poverty, Education, and Language Percentage Demographics, Crawford County, Missouri

Jurisdiction	% in Labor Force	% of Population Unemployed	% of Families Below the Poverty Level	High School Diploma ONLY, ages 25+ (%)	Bachelor's degree or higher, ages 25+ (%)	% of population language spoken at home other than English
Crawford County	23.9	7.7	13.2	40.8	11.9	2.0
Bourbon	55.1	3.9	16.6	36.6	11.8	3.8
Cuba	52.9	2.2	21.6	37.7	10.7	6.8
Leasburg	58.0	25.6	32.9	38.2	7.7	0

Jurisdiction	% in Labor Force	% of Population Unemployed	% of Families Below the Poverty Level	High School Diploma ONLY, ages 25+ (%)	Bachelor's degree or higher, ages 25+ (%)	% of population language spoken at home other than English
*St. Cloud	75.9	18.2	12.5	34.6	19.2	0
Steelville	54.7	11.0	19.8	35.2	12.5	2.3
Sullivan	56.0	3.3	12.4	29.6	21.0	2.3
*West Sullivan	54.3	12.7	13.4	38.2	2.9	0.4

Source: U.S. Census Bureau, 2016-2020 American Community Survey, 5-Year American Community Survey

2.1.5 History

Crawford County was organized on Jan. 23, 1829, and was named after William H. Crawford of Georgia, who was a candidate for the presidency in 1824. Although the early records of the county court have been lost, it is believed that William Montgomery, Barney Lowe and John Duncan were the first justices of the court, commissioned on the same day the act organizing the county was approved. The first courthouse, a two-story brick and stone structure, was ordered to be built in 1857 and was used until 1873, when it burned.

The outbreak of the civil war caused considerable excitement in the county, and lines between those favoring the Union and the Confederacy were sharply drawn. A meeting was held at Cuba by some of those favoring the Confederacy at which resolutions were passed in support of the Confederacy. The only dissenting voice at the meeting was that of E.W. Pinnell, who later entered the regular service of the Confederate States

The first settler on the town site of Steelville, the county seat, was William Britton, who arrived in 1833. He was responsible for building a small log house and a grist mill. James Steel, for whom the town was later named, was the next settler in the area. Having purchased 40 acres of land from the government, he sold it to the county court for $50 in 1835. By this time, he had opened a small store, and a small settlement had sprung up in the area. The deed was recorded in December 1835 and the town was platted and lots sold soon afterward.

Other town sites in the county included Sullivan, Cuba, Leasburg, St. Cloud, Bourbon and West Sullivan. Cuba was laid out and surveyed in December 1857 by M.W. Trask and W.H. Ferguson. At the time the town was surveyed, there were no houses within half a mile of the town site.

Leasburg is situated on the Burlington Northern Railroad approximately 82 miles west of St. Louis. The town was originally named Harrison Station for William Harrison. The name was changed in 1859 in honor of Samuel Lea, who built the first residence on the town site. Lea was also the first merchant to open a general store in the area and became the first postmaster.

Bourbon is also situated on the Burlington Northern Railroad about 75 miles west of St. Louis. The town was named for an old post office, which had existed in the vicinity some years before the town was founded. The post office had been named after bourbon whiskey, which was a new product being introduced in the area at that time.

The City of Sullivan is located on Old Highway 66 and the St. Louis and San Francisco Railroad, 68 miles southwest of St. Louis. It has long been known as the "Gateway to the Ozarks." Sullivan was

founded in the early 1800's by Stephen Sullivan who, with his wife, accompanied Daniel Boone on his return trip from Kentucky to get settlers to populate the territory around the Meramec River. When the railroad reached the small settlement in 1858, a town was laid out that the railroad company named "Sullivan." Only part of the incorporated area of Sullivan lies within the boundaries of the Meramec Region. The balance is in Franklin County.

The Village of St. Cloud was formed in the 1970's. The community has a board of trustees but no city services or employees. Unincorporated areas of Crawford County include Dillon and Cherryville.

2.1.6 Occupations

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

Table 2.9. Occupation Statistics, Crawford County, Missouri

Place	% in Management, Business, Science, and Arts Occupations	% in Service Occupations	% in Sales and Office Occupations	% in Natural Resources, Construction, and Maintenance Occupations	% in Production, Transportation, and Material Moving Occupations
Crawford County	25.7	19.8	18.9	13.4	22.1
Bourbon	20.9	19.4	22.1	8.1	29.4
Cuba	17.3	21.0	23.4	7.5	30.8
Leasburg	13.4	29.4	21.8	14.3	21.0
*St. Cloud	27.8	11.1	16.7	27.8	16.7
Steelville	19.5	19.5	29.2	8.2	23.5
Sullivan	30.7	13.9	17.0	14.1	24.3
*West Sullivan	7.9	14.6	31.5	3.4	42.7

Source: U.S. Census, 2016-2020 American Community Survey, 5-year Estimates, displayed in percent of the labor force.

2.1.7 Agriculture

Due to the rural nature of the area, agriculture and timber are significant factors in the local economy. According to the 2012 Census of Agriculture, the number of farms in the County was 679 encompassing 194,380 total acres[6]. In addition, the average farm was 286 acres. According to the 2017 Census of Agriculture, Crawford County had reduced to 628 farms encompassing 160,093 acres, with an average farm size of 255 acres[7]. Furthermore, there are only approximately 23 farms with 1,000 or more acres in the County. Due to the rugged nature of the region, row crop farming is for the most part limited to the river valleys. In 2017, over 27,210 acres of cropland were harvested, with forage (hay, haylage, grass silage, and greenchop) being the top crop in the County. Moreover, 26,609 cattle and calves were raised[8]. The average sale per farm was $23,556. Lastly, the total number of hired workers in the County was 233[9] individuals comprising 2.44%[10] of the total workforce.

[6] https://www.nass.usda.gov/Publications/AgCensus/2012/Online_Resources/County_Profiles/Missouri/index.php
[7] https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Missouri/index.php
[8] 2012 Census of Agriculture, Missouri Farm Commodity Sales, USDA, National Agriculture Statistics Service
[9] http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Missouri/st29_2_007_007.pdf
[10] U.S. Census Bureau, 2016-2020 American Community Survey

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

2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area

FEMA's Hazard Mitigation Assistance (HMA) grant program provides funding for mitigation activities which have the potential to reduce disaster losses and protect life and property from future disaster damages[11]. Previous FEMA HMA Grants issued in the planning area can be found in **Table 2.10**.

Table 2.10. FEMA HMA Grants in County from 1993-2020

Project Type	Sub applicant	Declaration	Project Total ($)
-	-	-	-
Total			$0

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

2.1.9 FEMA Public Assistance (PA) Grants in Planning Area

The purpose of the Public Assistance (PA) Grant Program is to support communities' recovery from major disasters by providing them with grant assistance for debris removal, life-saving emergency protective measures, and restoring public infrastructure. Local governments, states, tribes, territories and certain private nonprofit organizations are eligible to apply. Public Assistance is FEMA's largest grant program. **Table 2.11** below gives information about all Public Assistance Grants for the Planning area. It gives the Declaration number, project type and size, the applicant, and the project total. Total PA grants is $2,204,315.06.

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

Disaster Declaration	Project Type	Project Size	Applicant	Project Total
1412	PUBLIC UTILITIES	Small	CRAWFORD ELECTRIC CO-OP	$27,182.58
1412	LOW WATER CROSSING BRIDGE	Large	CRAWFORD COUNTY ROAD DISTRICT 1 & 2	$34,189.14
1412	LOW WATER CROSSING	Small	CRAWFORD COUNTY ROAD DISTRICT 1 & 3	$45,535.85
1412	LOW WATER CROSSING	Large	CRAWFORD COUNTY ROAD DISTRICT 1 & 4	$52,518.31
1412	ROAD REPAIR	Small	CRAWFORD COUNTY ROAD DISTRICT 1 & 5	$2,417.70
1412	ROAD, CULVERT & BRIDGE REPAIR	Small	CRAWFORD COUNTY ROAD DISTRICT 1 & 6	$35,542.08

[11] https://www.fema.gov/media-library/assets/documents/103279

1412	ROAD REPAIR	Small	CRAWFORD COUNTY ROAD DISTRICT 1 & 7	$2,554.06
1412	COUNTY ROAD REPAIR	Small	CRAWFORD COUNTY ROAD DISTRICT 1 & 8	$2,279.47
1412	ROADWAY, CULVERT WASHOUT REPAIR	Small	CRAWFORD COUNTY ROAD DISTRICT 1 & 9	$6,579.76
1412	REPAIR WASHED OUT ROADS AND LWC	Small	CRAWFORD COUNTY ROAD DISTRICT 1 & 10	$1,235.68
1412	LOW WATER BRIDGE DAMAGE	Small	STEELVILLE, CITY OF	$4,485.00
1412	WATER MAIN & SEWER REPAIR	Small	STEELVILLE, CITY OF	$8,208.07
1412	BRIDGE REMOVAL/REPLACE	Large	STEELVILLE, CITY OF	$60,330.00
1463	DEBRIS REMOVAL	Small	CRAWFORD COUNTY	$9,968.00
1676	DONATED RESOURCES	Small	STEELVILLE FIRE PROTECTION DISTRICT	$1,052.80
1676	EMERGENCY PROTECTIVE MEASURES	Small	STEELVILLE FIRE PROTECTION DISTRICT	$3,158.40
1676	EMERGENCY PROTECTIVE MEASURES	Small	LEASBURG VOLUNTEER FIRE DEPT	$1,992.95
1676	DONATED RESOURCES	Small	LEASBURG VOLUNTEER FIRE DEPT	$664.32
1676	DEBRIS REMOVAL	Small	BOURBON, CITY OF	$13,370.42
1676	PUBLIC UTILITIES	Small	CUBA, CITY OF	$41,727.77
1676	DEBRIS REMOVAL	Small	CUBA, CITY OF	$13,995.30
1676	DEBRIS REMOVAL	Small	CUBA, CITY OF	$0.00
1676	DEBRIS REMOVAL	Large	LEASBURG, VILLAGE OF	$65,750.00
1676	DEBRIS REMOVAL	Small	STEELVILLE, CITY OF	$1,614.00
1676	DEBRIS REMOVAL	Small	STEELVILLE, CITY OF	$0.00
1676	PUBLIC UTILITIES	Small	STEELVILLE, CITY OF	$11,379.53
1676	DEBRIS REMOVAL	Small	CRAWFORD COUNTY	$10,139.88
1676	EMERGENCY PROTECTIVE MEASURES	Small	CUBA COMMUNITY FIRE DEPARTMENT	$2,138.50
1676	DONATED RESOURCES	Small	CUBA COMMUNITY FIRE DEPARTMENT	$712.83
1749	EMERGENCY PROTECTIVE MEASURES	Small	CRAWFORD COUNTY	$5,730.77
1749	EMERGENCY PROTECTIVE MEASURES	Small	CRAWFORD COUNTY	$7,437.20
1749	ROAD WASHOUT	Small	CRAWFORD COUNTY	$19,973.55
1749	CULVERT/ROAD/EMBANKMENT WASHOUT -REVISED 7/23/08	Large	CRAWFORD COUNTY	$84,801.21

1749	ROAD / CULVERT WASHOUT - REVISED 7/28/08	Large	CRAWFORD COUNTY	$22,319.34
1749	EMBANKMENT WASHOUT	Small	CRAWFORD COUNTY	$2,805.49
1749	ROAD / LOW WATER CROSSING WASHOUT	Small	CRAWFORD COUNTY	$6,778.97
1749	ROAD EROSIONS	Small	CRAWFORD COUNTY	$24,756.60
1749	ROADS & CULVERT WASHOUTS	Small	CRAWFORD COUNTY	$32,581.33
1749	EROSION AND SCOURING OF ROAD	Small	CRAWFORD COUNTY	$18,382.90
1749	ROADS & CULVERT WASHOUTS	Small	CRAWFORD COUNTY	$15,896.70
1749	LOW WATER CROSSING DAMAGES	Small	CRAWFORD COUNTY	$6,000.00
1749	ROAD / CULVERT WASHOUT	Small	CRAWFORD COUNTY	$17,351.30
1749	ROAD WASHOUT	Small	CRAWFORD COUNTY	$11,421.63
1749	ROAD WASHOUTS	Small	CRAWFORD COUNTY	$13,943.73
1749	ROAD EROSION	Small	CRAWFORD COUNTY	$11,324.60
1749	ROAD EROSION	Small	CRAWFORD COUNTY	$30,727.10
1749	LOW WATER CROSSING WASHOUT	Small	CRAWFORD COUNTY	$6,000.00
1749	ROAD EROSION (REVISED 7-26-08)	Small	CRAWFORD COUNTY	$33,339.98
1749	ROAD WASHOUT	Small	CRAWFORD COUNTY	$15,222.38
1749	ROAD WASHOUT	Small	CRAWFORD COUNTY	$20,839.39
1749	ROAD WASHOUT	Small	CRAWFORD COUNTY	$22,208.56
1749	ROAD WASHOUT	Small	CRAWFORD COUNTY	$2,688.00
1749	ROAD WASHOUT	Small	CRAWFORD COUNTY	$2,375.00
1749	ROAD EROSION (REVISED 7-30-08)	Small	CRAWFORD COUNTY	$11,950.48
1809	EPM CC-B-01	Small	CRAWFORD COUNTY	$1,641.21
1809	Roads-CC-C-01	Small	CRAWFORD COUNTY	$47,530.41
1809	Road & Culvert Washout CC-C-02	Small	CRAWFORD COUNTY	$32,352.67
1809	Road & Culvert Washout CC-C-03	Large	CRAWFORD COUNTY	$180,841.27
1847	GW201C / Roads and Culverts	Small	CRAWFORD COUNTY	$22,328.99
1847	GW202C / Road Washout	Small	CRAWFORD COUNTY	$14,718.61
1847	GW203C / Road washouts & Scouring	Small	CRAWFORD COUNTY	$9,939.80
1847	GW104C / Road washout & Scouring Dist1 East	Small	CRAWFORD COUNTY	$34,113.26
1847	GW103C-Road washout and scouring Dist 1	Small	CRAWFORD COUNTY	$16,734.67
1847	SA 298 -1 - Low Water Crossing Washout	Small	CRAWFORD COUNTY	$8,602.63

1847	GW101C - Road washout and scouring	Small	CRAWFORD COUNTY	$42,263.83
1847	GW105C / Road Washout & Scouring Dist1 East	Small	CRAWFORD COUNTY	$41,634.19
1847	GW107C / Big Shoal Creek Low Water Crossing	Small	CRAWFORD COUNTY	$10,890.33
1847	GW106C / Road washout and scouring Dist1 East	Small	CRAWFORD COUNTY	$50,600.90
4238	JDP007F - Cedar Street Power Line	Small	STEELVILLE, CITY OF	$6,715.30
4238	JDP002G - Bridges Damaged at City Park	Small	STEELVILLE, CITY OF	$14,890.83
4238	JDP001C - FOUR BRIDGES	Small	STEELVILLE, CITY OF	$4,656.35
4238	JDP008C- Roads- (District # 1)	Small	CRAWFORD COUNTY	$25,203.98
4238	JDP006C - Roads- (District # 1)	Small	CRAWFORD COUNTY	$65,872.45
4238	JDP009C - Roads- (District # 2)	Small	CRAWFORD COUNTY	$11,517.76
4238	JDP007C - Big Shoal Creek Crossing- (Dist # 1)	Small	CRAWFORD COUNTY	$15,504.00
4238	JDP010C - Low Water Crossing -2 sites (Dist. # 2)	Small	CRAWFORD COUNTY	$25,447.33
4250	055SB41C - Road Washouts & Thatcher Bridge	Small	CRAWFORD COUNTY	$22,906.08
4250	055SB44C- Bridge Repair	Small	CRAWFORD COUNTY	$38,748.45
4250	055SB43C - Adams Bridge	Small	CRAWFORD COUNTY	$36,836.13
4250	055SB42C - Cedar Ford Bridge	Small	CRAWFORD COUNTY	$35,033.13
4250	055SB45 - PAAP Debris Removal	Small	CRAWFORD COUNTY	$3,325.08
4250	055SB40 - District #1 County Roads	Small	CRAWFORD COUNTY	$40,380.74
4317	SP01914 - City of Steelville Wastewater Treatment Plant	Small	STEELVILLE, CITY OF	$41,919.60
4317	ST02278 - Steelville, City of - Hickory and Midas Roads	Small	STEELVILLE, CITY OF	$6,481.86
4317	CP01647 - Community Walking Bridges	Small	STEELVILLE, CITY OF	$3,118.58
4317	CP01891 - PAAP First 30 Days	Small	STEELVILLE, CITY OF	$13,437.89
4317	ST01913 - Clean water pipe (goes across a creek)	Small	STEELVILLE, CITY OF	$7,159.55
4317	CP02298 - Dist 1 Roads - Cook Station/Wesco	Small	CRAWFORD COUNTY	$66,941.45
4317	CP01312 - Disrtict 1 Roads and Valley Side Culvert - Ch	Small	CRAWFORD COUNTY	$26,013.32
4317	CP02300 - Dist 2 Roads, LWC and Culverts	Small	CRAWFORD COUNTY	$66,474.07
4317	CP02297 - Dist 1 Roads, LWC & Culverts - Davisville	Small	CRAWFORD COUNTY	$78,617.89
4317	CP02268 - Dist 1 Roads, Culverts and LWC - Steelville	Large	CRAWFORD COUNTY	$125,341.86
			TOTAL	**$2,204,315.06**

Source: Federal Emergency Management Agency, 06/09/2022

2.2 Jurisdictional Profiles and Mitigation Capabilities

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

2.2.1 Unincorporated Crawford County

Overview

The jurisdiction of Crawford County includes all unincorporated areas within the county boundaries. Crawford County is governed by a three-member County Commission. The Commission is composed of a presiding commissioner, representing all of the county's population who is elected for a four-year term. Two associate commissioners representing roughly half the county's population each, are elected for four-year terms. The commission meets on Tuesday of each week. Other elected county officials include the County Clerk, Prosecuting Attorney, Sheriff, Circuit Clerk, Recorder of Deeds, Collector of Revenue, Treasurer, Assessor, County Surveyor, Coroner, and Public Administrator.

Crawford County operates as a third-class county. The county government has the authority to administer county structures, infrastructures, and finances as well as floodplain regulations. Third class counties do not have building regulations. Other county officials include the Emergency Management Director/Floodplain Administrator, 911 Director, Health Dept. Administrator, and Road and Bridge Supervisor.

Technical and Fiscal Resources

There are four fire departments located in the county. Three are volunteer departments. Those departments include Cuba Volunteer Fire Department., Leasburg Volunteer Fire Dept., Bourbon Fire Protection Dist., and Steelville Fire Protection District. The county is served by the Crawford Co. Sheriff's Department. The county has a 911 Central Dispatch Center located at PO Box 1313, Steelville, MO. The county is served by two ambulance districts – North Crawford County Ambulance District and Steelville Ambulance District. The Missouri Baptist Sullivan Hospital is located within the county. One privately owned siren is located in the county. The county utilizes Smart 911 system and app that is free to access by anyone in the county. The county does not own fixed or portable generators but participates in joint ownership/maintenance/operation with local jurisdictions.

Fiscal tools or resources that the county could potentially use to help fund mitigation activities include Community Development Block Grants, Capital Improvements project funding, levy taxes for specific purposes, incur debt through general obligation bonds, and incur debt through special tax bonds.

Existing Plans and Policies

The county has a County Emergency Operations Plan, County Mitigation Plan, Economic Development Plan, Regional Transportation Plan, Critical Facilities Plan, and Floodplain Ordinance. The Meramec Regional Planning Commission serves as the floodplain coordinator for the county.

Other Mitigation Activities

The Office of Emergency Management, local fire departments, Sheriff's Department and the Crawford County Health Department have conducted public education campaigns to raise awareness and increase preparedness among the county's population. Those programs have included Ready-In-3 emergency preparedness, fire safety, storm preparedness/weather spotter training, weather radio education, dissemination of SEMA brochures, and other health/safety trainings. Bicycle and car seat safety education is provided regionally by the Coalition for Roadway Safety.

The roads department has ongoing road upgrades to reduce disaster damages.

Of participating jurisdictions, the unincorporated county has the highest percentage of population 65 and over and with disabilities at 24.4 and 27.1 respectively, which increases the risk of injury and death during hazard events. The jurisdiction also has the highest percentage of mobile homes which increases the likelihood of damage to structures and injury to occupants during hazard events.

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

Jurisdiction	Total Population	People With a Disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Unincorporated Crawford County	10,153	2,755	0	1,372	439	2,479	155	1,383

Source: U.S. Census Bureau, 2016-2020 5-Years American Community Survey

Table 2.13. Unincorporated Crawford County Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	N/A
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	Yes
City Mitigation Plan	N/A
County Mitigation Plan	Yes - 2017
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018
Transportation Plan	Yes – Regional 2021
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No

Capabilities	Status Including Date of Document or Policy
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	Yes
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes – 4/26/2010
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	Yes
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
FireWise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	Varies
Economic Development Program	MRPC
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	N/A
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	Yes
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Director	Yes

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

Source: Data Collection Questionnaire, 2022

2.2.2 City of Bourbon

Overview

Bourbon is located in the northern portion of Crawford County. Bourbon is located on U.S. Interstate I-44. As a fourth class city, Bourbon's government consists of an elected mayor, four alderman. City personnel include City Collector, City Clerk, Attorney, Deputy City/Billing Clerk, Engineer, Police Chief, Fire Chief, and Public Works Director. The city population from the 2020 5-year ACS data is 1,866, in 2010 it was 1,632, which shows a population growth of 14 percent.

Technical and Fiscal Resources

Bourbon is a participating community in the National Flood Insurance Program. Law enforcement in the community is provided by the Bourbon Dept. of Public Safety. The North Crawford County

Ambulance District provides ambulance service for the city and surrounding area. There is a Rural Fire Protection District located in Bourbon, which serves the city and the surrounding area as well. The city has two warning sirens which are activated by the police department and does not own any generators. The city employs a EMD and Floodplain Administrator.

Fiscal tools or resources that the city could potentially use to help fund mitigation activities include Community Development Block Grants, Capital Improvements project funding, taxes for specific purposes, fees for water, sewer, gas, and electric services, debt through special tax bonds, debt through private activities, and withholding spending in hazard prone areas.

Other Mitigation Activities

The city educates citizens on responsible water use and provides environmental education flyers at city hall offices. Floodplain brochures are available at banks and real esate offices. Bicycle and car seat safety education is provided regionally by the Coalition for Roadway Safety.

Of participating jurisdictions, Bourbon has the highest percentage of population under the age of five at 7.9 percent. Higher percentages of vulnerable populations increase the risk of injury or death during hazard events.

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

Table 2.14. Demographic and Structure Risk Parameters For Bourbon

Jurisdiction	Total Population	With a disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Bourbon	1,866	419	66	360	148	293	82	86

Source: U.S. Census Bureau, 2016-2020 5-Years American Community Survey

Table 2.15. City of Bourbon Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	No
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	No
County Mitigation Plan	Yes – 2017
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018
Transportation Plan	Yes – Regional 2021
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No

Capabilities	Status Including Date of Document or Policy
Watershed Plan	No
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	No
Floodplain Ordinance	No
Subdivision Ordinance	Yes
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	Yes
Landscape Ordinance	Yes
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	Yes
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	5
Economic Development Program	Yes
Land Use Program	Yes
Public Education/Awareness	Yes
Property Acquisition	Yes
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	Yes
Land Use Map	Yes
Staff/Department	
Building Code Official	No
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	Yes
Development Planner	No
Public Works Official	Yes
Emergency Management Director	Yes

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

Source: Data Collection Questionnaire, 2022

2.2.3 City of Cuba

Overview

Cuba is located on U.S. Interstate 44, just over eighty miles west of downtown St. Louis, in the north central portion of Crawford County. The city is bisected by Highway 19, which runs north / south. Cuba is incorporated as a fourth class city with five aldermen and the mayor. Other city personnel include a City Clerk, Treasurer, Attorney, Collector, Police Chief, Fire Chief, Public Works Director, Street Supt., Water Supt., Sewer Supt., Street Supt., Natural Gas Supt., Municipal Judge, and Court Clerk. The city population from the 2020 5-year ACS data is 3,305, in 2010 it was 3,284, which shows a population growth of less than one percent.

Technical and Fiscal Resources

Cuba currently participates in the National Flood Insurance Program. Law enforcement in the community is provided by the Cuba Police Dept. The North Crawford County Ambulance District provides ambulance service for the city and surrounding area. The city is served by the Cuba Volunteer Fire Dept. The city has five warning sirens. The city utilizes I-PAWS and EAS for mass notification. The city owns and operates three fixed generators. The city also employs a EMD.

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

The city currently provides education/awareness and emergency preparedness programs for severe weather including National Weather Service Storm Ready. Public education programs are provided regionally by the Coalition for Roadway Safety.

The City of Cuba has the highest percent of the population that are non-English speakers and below poverty levels, with 6 percent and 25 percent respectively. High percentages of vulnerable populations increase the risk of injury and death during natural disasters.

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

Table 2.16. Demographic and Structure Risk Parameters For Cuba

Jurisdiction	Total Population	With a disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Cuba	3,305	806	216	580	141	544	36	25

Source: Source: U.S. Census Bureau, 2016-2020 5-Years American Community Survey

Table 2.17. City of Cuba 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 – 11/2021
County Emergency Operations Plan	N/A
Local Recovery Plan	Yes – 11/2021
County Recovery Plan	N/A
City Mitigation Plan	No
County Mitigation Plan	Yes – 2017
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018
Transportation Plan	Yes – Regional 2021
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No

Capabilities	Status Including Date of Document or Policy
Watershed Plan	No
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes – ICC 2018
Floodplain Ordinance	Yes – 09/01/2021
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	Yes
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	Yes
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	4
Economic Development Program	Yes
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	Yes
Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes

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

Source: Data Collection Questionnaire, 2022

2.2.4 Village of Leasburg

Overview

Leasburg is located in the north central portion of Crawford County approximately two miles south of U.S. Interstate I-44. There is a four member board of trustees and a chairperson. The city employs a City Clerk, attorney and water and street superintendents. The city population from the 2020 5-year ACS data is 360, in 2010 it was 338, which shows a population increase of over six percent.

Technical and Fiscal Resources

Leasburg participates in the National Flood Insurance Program but is not in a flood plain therefore the village does not have a Flood Insurance Study nor maintains certificates of elevation. The village is in the process of determining the need of a Flood Plain Management Ordinance and will

adopt one if it is needed.

Law enforcement in the community is provided by Crawford County Sherriff. The village does not have a Central Communications Center. 9-1-1 dispatch is provided by the county. The North Crawford County Ambulance District provides ambulance service for the northern portion of the county, including the Village of Leasburg. The Leasburg Volunteer Fire Department provides fire protection. The village has one warning siren which is controlled by the fire department.

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

Public education programs are provided regionally by the Coalition for Roadway Safety.

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

Table 2.18. Demographic and Structure Risk Parameters For Leasburg

Jurisdiction	Total Population	With a Disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Leasburg	360	116	0	108	23	42	19	17

Source: U.S. Census Bureau, 2016-2020 5-Years American Community Survey

Table 2.19. Village of Leasburg Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	No
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A
City Mitigation Plan	No
County Mitigation Plan	Yes - 2017
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018
Transportation Plan	Yes – Regional 2021
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	

Capabilities	Status Including Date of Document or Policy
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program	No
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	7
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Director	No
NFIP Floodplain Administrator	No
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes - MLEPD

Capabilities	Status Including Date of Document or Policy
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	Yes
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	No
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation bonds	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, 2022

2.2.5 City of Steelville

Overview

Steelville is located in the center of Crawford County approximately eight miles south of U.S. Interstate I-44. Steelville is the county seat. There is a four member city council and a mayor. The city employs a City Clerk/Collector, Comptroller/Treasurer, Attorney, Police Chief, City Supervisor, Assistant Supervisor/Chief Water Utilities Operator, Chief Wastewater Operator. The city population from the 2020 5-year ACS data is 3,305, in 2010 it was 3,284, which shows a slight population increase of over half a percent.

Technical and Fiscal Resources

Steelville is a participating community in the National Flood Insurance Program. Law enforcement in the community is provided by the Steelville Police Department. The Steelville Ambulance District provides ambulance service for the city and surrounding area. The city is served by the Steelville Fire Protection District. The city has six warning sirens; activated by the police department. The city utilizes social media for mass notification. The city also employs a Floodplain Administrator.

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

Public education programs are provided regionally by the Coalition for Roadway Safety.

Steelville has the highest percent of houses built prior to 1939 (14.9 percent). A greater percent of pre-1939 homes increases the city's risk to damages from several hazards.

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

Table 2.20. Demographic and Structure Risk Parameters For Steelville

Jurisdiction	Total Population	With a disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Steelville	1,485	247	32	318	112	253	81	73

Source: U.S. Census Bureau, 2016-2020 5-Years American Community Survey

Table 2.21. City of Steelville Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	Yes
City Emergency Operations Plan	No
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A
City Mitigation Plan	No
County Mitigation Plan	Yes - 2017
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018
Transportation Plan	Yes – Regional 2021
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes – BOLA 1995
Floodplain Ordinance	Yes – 2010
Subdivision Ordinance	Yes – 2014
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes – 2021

Capabilities	Status Including Date of Document or Policy
Storm Water Ordinance	Yes
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	FEMA 2.0
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	Yes
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	6
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	Yes
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	Yes
Engineer	Yes
Development Planner	No
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes - MLEPD
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC

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

Source: Data Collection Questionnaire, 2022

2.2.6 City of Sullivan

Overview

Sullivan is located in the north east corner of Crawford County and is also a part of Franklin County. Sullivan is located on U.S. Interstate I-44. There is a six member city council and a mayor. The city employs a City Clerk, City Administrator, Attorney, Police Chief, Street Commissioner, Light Commissioner, Water and Sewer Commissioner, Municipal Judge, City Court Clerk, Park & Recreation Director, EMD, Engineer, and Code Administrator. The city population from the 2020 5-year ACS data is 6,499, in 2010 it was 6,351, which shows a population growth of two percent.

Technical and Fiscal Resources

Sullivan is a participating community in the National Flood Insurance Program. Law enforcement in the community is provided by the Sullivan Police Department. The Missouri Baptist Ambulance District provides ambulance service for the city and surrounding area. The city is served by the Sullivan Fire Protection District, located in Franklin County. The city has four warning sirens; activated by the police department. The city utilizes Nixle for mass notifications. The city owns and operates one portable generator and four fixed generators. The city also employs a Building Inspector, Mapping Specialist, and Floodplain Administrator.

Fiscal tools or resources that the city could potentially use to help fund mitigation activities include Community Development Block Grants, Capital Improvements project funding, levy taxes for specific purposes, fees for water, sewer, gas, and electric services, impact fees for new

development, debt through general obligation bonds, and debt through special tax bonds.

Public education programs are provided locally through the city website electric department page, including “Ready in 3” and regionally by the Coalition for Roadway Safety.

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

Table 2.22. Demographic and Structure Risk Parameters For Sullivan

Jurisdiction	Total Population	With a disability	Non-English Speaking Populations	People Below Poverty Level	Population Under 5 Yrs.	Population 65 Yrs. and Over	Residences Built Prior to 1939	Mobile Homes
Sullivan	6,499	1,119	138	1,114	468	1,310	399	22

Source: U.S. Census Bureau, 2016-2020 5-Years American Community Survey

Table 2.23. Village of Caledonia Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	Yes - 2003
Builder's Plan	No
Capital Improvement Plan	Yes – 9/2021
City Emergency Operations Plan	Yes – 3/1988
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A
City Mitigation Plan	No
County Mitigation Plan	Yes – 2017
Debris Management Plan	No
Economic Development Plan	Yes – Regional CEDS 2018
Transportation Plan	Yes – Regional 2021
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
FireWise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes – 2018 ICC
Floodplain Ordinance	Yes – 4/2004
Subdivision Ordinance	Yes
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	Yes
Program	

Capabilities	Status Including Date of Document or Policy
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	3
ISO Fire Rating	4
Economic Development Program	Yes
Land Use Program	Yes
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (City)	Yes
Hazard Analysis/Risk Assessment (County)	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Evacuation Route Map	No
Critical Facilities Inventory	Yes – Hazard Mitigation (2017) & Hazardous Materials (annual) Plans
Vulnerable Population Inventory	No
Land Use Map	Yes
Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	Yes
Engineer	Yes
Development Planner	No
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes – MLEPD
County Emergency Management Commission	N/A
Sanitation Department	No
Transportation Department	Yes
Economic Development Department	Yes
Housing Department	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Environmental Organization	No

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

Source: Data Collection Questionnaire, 2022

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

Table 2.25. Mitigation Capabilities Summary Table

CAPABILITIES	Unincorporated Crawford County	Bourbon	Cuba	Leasburg	Steelville	Sullivan
	Planning Capabilities					
Comprehensive Plan	No	Yes	No	No	No	Yes – 3/2000
Builder's Plan	No	No	No	No	No	No
Capital Improvement Plan	No	No	No	No	Yes	Yes – 9/2021
City Emergency Operations Plan	N/A	Yes	Yes – 11/2021	No	No	Yes – 3/1988
County Emergency Operations Plan	Yes	Yes	N/A	No	N/A	N/A
Local Recovery Plan	No	No	Yes – 11/2021	No	No	No
County Recovery Plan	No	N/A	N/A	No	N/A	N/A
City Mitigation Plan	N/A	No	No	No	No	No
County Mitigation Plan	Yes – 2017	Yes – 2017	Yes – 2017	No	Yes – 2017	Yes – 2017
Debris Management Plan	No	Yes	No	No	No	No
Economic Development Plan	Yes – CEDS 2018	Yes – CEDS 2018	Yes – CEDS 2018	Yes – CEDS 2018	Yes – CEDS 2018	Yes – CEDS 2018
Transportation Plan	Yes – Regional 2021	Yes – Regional 2021	Yes – Regional 2021	Yes – Regional 2021	Yes – Regional 2021	Yes – Regional 2021
Land-use Plan	No	Yes	No	No	No	Yes – 8/2020
Flood Mitigation Assistance (FMA) Plan	No	No	No	No	No	No
Watershed Plan	No	Yes	No	No	No	No
Firewise or other fire mitigation plan	Yes	No	No	No	No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	Yes	Yes	No	No	No	No
	Policies/Ordinances					
Zoning Ordinance	No	Yes	Yes	No	Yes	Yes
Building Code	No	No	Yes – 2018 ICC	No	Yes – BOLA 1995	Yes - ICC 2018

CAPABILITIES	Unincorporated Crawford County	Bourbon	Cuba	Leasburg	Steelville	Sullivan
Floodplain Ordinance	Yes – 4/26/2010	No	Yes – 09/01/2021	No	Yes - 2010	Yes – 4/2004
Subdivision Ordinance	No	Yes	No	No	Yes – 2004	Yes
Tree Trimming Ordinance	No	Yes	No	No	No	Yes
Nuisance Ordinance	No	Yes	Yes	Yes	Yes – 2021	Yes
Storm Water Ordinance	No	Yes	No	No	Yes	Yes
Drainage Ordinance	No	Yes	No	No	No	Yes
Site Plan Review Requirements	No	Yes	Yes	No	Yes	Yes
Historic Preservation Ordinance	Yes	Yes	Yes	No	No	No
Landscape Ordinance	No	Yes	No	No	No	Yes
	Program					
Zoning/Land Use Restrictions	No	Yes	Yes	No	Yes	Yes
Codes Building Site/Design	No	Yes	Yes	No	Yes	Yes
Hazard Awareness Program	No	Yes	No	No	No	No
National Flood Insurance Program	Yes	Yes	Yes	No	Yes	Yes
NFIP Community Rating System (CRS) Participating Community	No	No	No	No	FEMA 2.0	No
National Weather Service (NWS) Storm Ready	No	No	Yes	No	No	No
Firewise Community Certification	No	No	No	No	Yes	No
Building Code Effectiveness Grading (BCEGs)	No	No	No	No	No	Yes – 3
ISO Fire Rating	Varies	5	4	7	6	4
Economic Development Program	Yes	Yes	Yes	No	No	Yes
Land Use Program	No	Yes	No	No	No	Yes
Public Education/Awareness	No	Yes	No	No	Yes	Yes
Property Acquisition	No	Yes	No	No	No	No
Planning/Zoning Boards	No	Yes	Yes	No	Yes	Yes

CAPABILITIES	Unincorporated Crawford County	Bourbon	Cuba	Leasburg	Steelville	Sullivan
Stream Maintenance Program	No	No	No	No	No	No
Tree Trimming Program	No	Yes	Yes	Yes	Yes	Yes
Engineering Studies for Streams (Local/County/Regional)	No	No	No	No	Yes	No
Mutual Aid Agreements	Yes	Yes	Yes	No	Yes	Yes
	Studies/Reports/Maps					
Hazard Analysis/Risk Assessment (City)	N/A	Yes	No	No	No	Yes
Hazard Analysis/Risk Assessment (County)	Yes – 2017, 2021	Yes – 2017, 2021	Yes – 2017, 2021	Yes – 2017, 2021	Yes – 2017, 2021	Yes – 2017, 2021
Evacuation Route Map	No	No	Yes	No	No	No
Critical Facilities Inventory	Yes – 2017, 2021	Yes – 2017, 2021	Yes – 2017, 2021	Yes – 2017, 2021	Yes – 2017, 2021	Yes – 2017, 2021
Vulnerable Population Inventory	No	Yes	No	No	No	No
Land Use Map	No	Yes	Yes	No	No	Yes
	Staff/Department					
Building Code Official	No	No	Yes	No	Yes	Yes
Building Inspector	No	Yes	Yes	No	Yes	Yes
Mapping Specialist (GIS)	Yes	No	No	No	Yes	Yes
Engineer	No	Yes	No	No	Yes	Yes
Development Planner	No	No	No	No	No	No
Public Works Official	No	Yes	Yes	No	Yes	Yes
Emergency Management Director	Yes	Yes	Yes	No	Yes	Yes
NFIP Floodplain Administrator	Yes	Yes	Yes	No	Yes	Yes
Bomb and/or Arson Squad	No	No	No	No	No	No
Emergency Response Team	No	No	No	No	No	No
Hazardous Materials Expert	No	No	No	No	No	No
Local Emergency Planning Committee	Yes - MLEPD	Yes - MLEPD	Yes - MLEPD	Yes - MLEPD	Yes - MLEPD	Yes - MLEPD
County Emergency Management Commission	No	No	No	No	No	No

CAPABILITIES	Unincorporated Crawford County	Bourbon	Cuba	Leasburg	Steelville	Sullivan
Sanitation Department	No	Yes	Yes	Yes	No	No
Transportation Department	No	Yes	Yes	No	No	Yes
Economic Development Department	No	No	Yes	No	No	Yes
Housing Department	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA	Yes - Phelps Co. PHA
Regional Planning Agencies	Yes - MRPC	Yes - MRPC	Yes -MRPC	Yes -MRPC	Yes - MRPC	Yes - MRPC
Historic Preservation	No	No	Yes	No	Yes	No
	Non-Governmental Organizations (NGOs)					
American Red Cross	Yes	Yes	Yes	Yes	No	Yes
Salvation Army	No	Yes	Yes	No	No	Yes
Veterans Groups	Yes	Yes	Yes	No	Yes	Yes
Environmental Organization	Yes	Yes	No	No	Yes	No
Homeowner Associations	No	No	No	No	No	Yes
Neighborhood Associations	No	No	No	No	No	No
Chamber of Commerce	No	No	Yes	No	Yes	Yes
Community Organizations (Lions, Kiwanis, etc.)	No	Yes	Yes	Yes	Yes	Yes
	Financial Resources					
Ability to apply for Community Development Block Grants	Yes	Yes	Yes	Yes	Yes	Yes
Ability to fund projects through Capital Improvements funding	Yes	Yes	Yes	No	Yes	Yes
Authority to levy taxes for a specific purpose	Yes	Yes	Yes	Yes	No	Yes
Fees for water, sewer, gas, or electric services	No	Yes	Yes	Yes	Yes	Yes
Impact fees for new development	No	No	Yes	No	Yes	Yes
Ability to incur debt through general obligation bonds	Yes	Yes	Yes	No	Yes	Yes

CAPABILITIES	Unincorporated Crawford County	Bourbon	Cuba	Leasburg	Steelville	Sullivan
Ability to incur debt through special tax bonds	Yes	Yes	Yes	No	Yes	Yes
Ability to incur debt through private activities	No	Yes	Yes	No	No	No
Ability to withhold spending in hazard prone areas	No	Yes	No	No	No	No

Source: Data Collection Questionnaires, 2022

2.2.7 Public School District Profiles and Mitigation Capabilities

The following school districts are participating jurisdictions in this plan: Crawford County R-I, Crawford County R-II, Steelville R-III, and Sullivan School District. As public institutions responsible for the care and education of the county's children, these school districts share an interest with Crawford County in public safety and hazard mitigation planning. **Figure 2.6** provides the boundaries of the school districts participating in this planning process.

Technical and Fiscal Resources

All school districts have NOAA all hazard radios on site to provide early warning of hazard events, not every school building in Crawford County R-II has one. In addition, each school district has fire alarms and intercom systems capable of providing specific instructions in the event of an emergency.

Existing Plans and Policies

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

Other Mitigation Activities

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

New Construction

Crawford County R-I completed an addition to the high school since the last plan update. In the future they plan on remodeling the shop/ag building into a science lab and weight room facility. Necessary safety features will be added to the building.

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

Since the last plan update the Steelville R-III School District added a new Middle School and gymnasium, parking lot and driveway, bus barn/mechanic shed, elementary gymnasium, elementary and middle school playgrounds to the west of the elementary gym and finalized the new elementary and middle school playgrounds to the east of the middle school entrance. The district also completed the demolition of the old junior high building. In the next five years the district intends to add a pig floor and cattle pavilion.

Sullivan School District completed the addition of classrooms, administrative offices, and a gymnasium in the primary elementary buildings since the last plan revision. In the next five years the intend to complete additions to the high school and middle school.

None of the districts have buildings or construction projects within known hazard areas.

Table 2.26. School District Buildings and Enrollment Data, 2022

District Name	Building Name	Enrollment
Crawford County R-I		
	Bourbon High School	274
	Bourbon Middle School	280
	Bourbon Elementary	352
Crawford County R-II		
	Cuba High School	410
	Cuba Middle School	435
	Cuba Elementary	446
Steelville R-III		
	Steelville High School	302
	Steelville Middle School	295
	Steelville Elementary School	381
Sullivan School District		
	Sullivan High School	708
	Sullivan Middle School	431
	Sullivan Elementary	443
	Sullivan Primary	482

Source: https://dese.mo.gov/directory

Figure 2.6. Crawford County School Districts

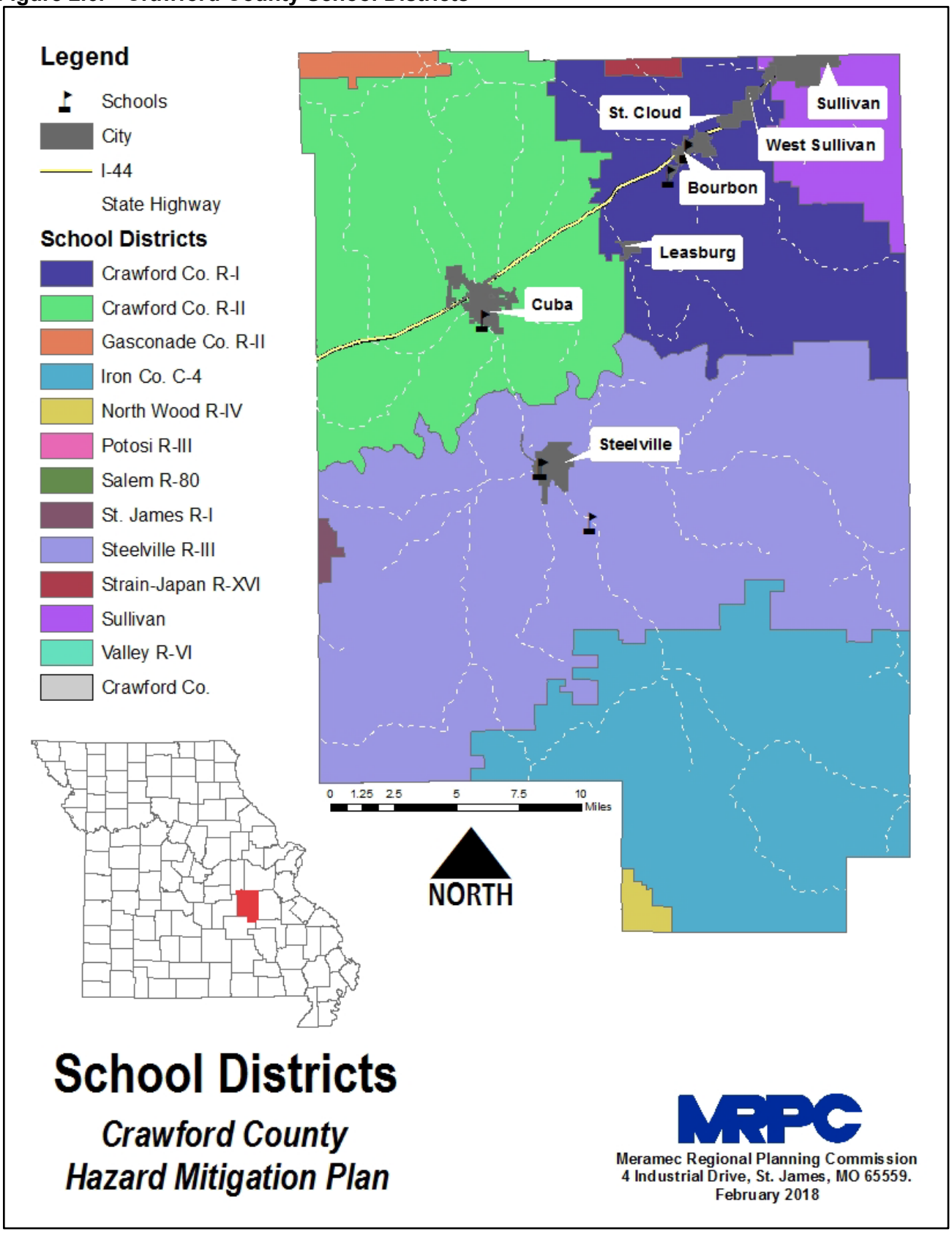


Table 2.27. Summary of Mitigation Capabilities for School Districts

Capability	Crawford County R-I	Crawford County R-II	Steelville R-III	Sullivan School District
Planning Elements				
Master Plan/Date	No	Yes – 9/2021	No	Yes – 8/22/22
Capital Improvement	Yes – 9/2020	Yes – 10/21/2021	Yes – 2020	Yes – 7/2021
School Emergency Plan/Date	Yes – 2022	Yes – 9/2021	Yes – 2020	Yes – 7/2021
Weapons Policy/Date	Yes – 1/11/2001	Yes – 4/2014	Yes – Annual	Yes – March 2010
Personnel Resources				
Full-Time Building Official (Principal)	No	Yes	Yes	Yes
Emergency Manager	No	Yes	Yes	No
Grant Writer	No	No	No	No
Public Information Officer	Yes	Yes	Yes	No
Financial Resources				
Capital Improvements Project Funding	Yes	Yes	Yes	Yes
Local Funds	Yes	Yes	Yes	Yes
General Obligation	Yes	No	No	Yes
Special Tax Bonds	No	No	No	No
Private Activities/Donations	Yes	Yes	Yes	No
State and Federal Funds/Grants	No	Yes	Yes	Yes
Other				
Privately or Self-Insured?	MUSIC	MUSIC	MUSIC	Private
Fire Evacuation Training	2x per year minimum	Quarterly	Annually	Monthly
Tornado Sheltering Exercises	2x per year minimum	Quarterly	Annually	Monthly
Public Address/Emergency Alert System	Intercom System	Intercom System	PA System	School Messenger
NOAA Weather Radios	Yes	Some Buildings	Yes	Yes

Capability	Crawford County R-I	Crawford County R-II	Steelville R-III	Sullivan School District
Lock-Down Security Training	2x per year minimum	Quarterly	Annually	Monthly
Mitigation Programs	Sprinklers in New Buildings	Long-range facilities & spending development	Annual safety professional development	No
Tornado Shelter/Safe-room	No	Yes – FEMA Tornado Shelter	No	No
Campus Police	No	2 School Resource Officers	No	3 School Resource Officers

Source: Data Collection Questionnaires, 2022

There are no colleges/universities located in the planning area.

3 RISK ASSESSMENT

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

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

This chapter is divided into four main parts:

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

3.1 Hazard Identification

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

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

3.1.1 Review of Existing Mitigation Plans

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

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

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

Table 3.1. Table 3.1 Hazards Not Profiled in the Plan

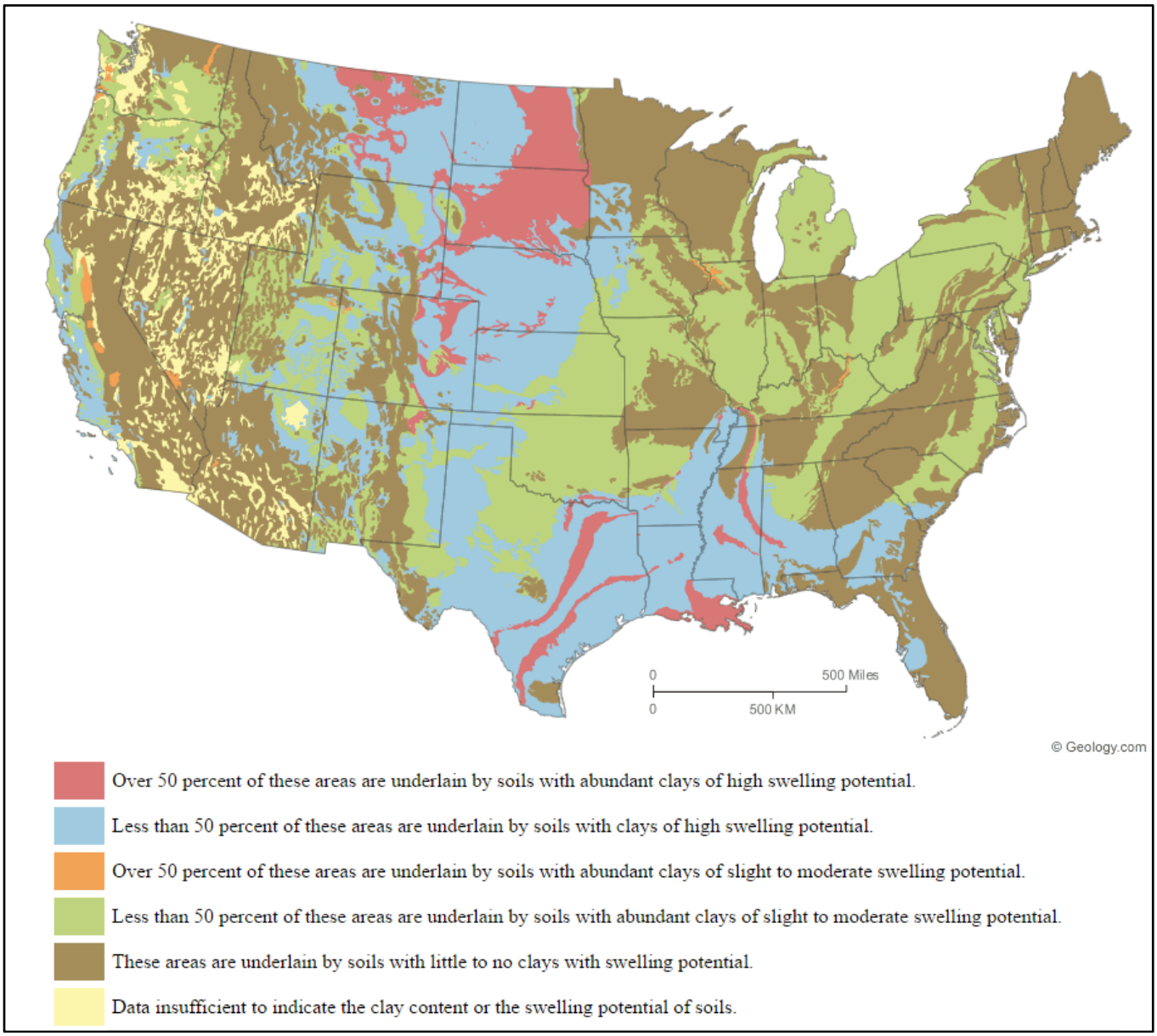
Hazard	Reason for Omission
Avalanche	No mountains in the planning area.
Coastal Erosion	Planning area is located in the Midwest, not on any coast.
Coastal Storm	Planning area is located in the Midwest, not on any coast.

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

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

[2] http://nld.usace.army.mil/egis/f?p=471:1:0::NO

Figure 3.1. Swelling clays map of the conterminous United States



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

3.1.2 Review Disaster Declaration History

In order to assess risk, it was logical to review the disaster declaration history for the State of Missouri and specifically for Crawford County. Federal and State disaster declarations are granted when the severity and magnitude of a hazard event surpasses the ability of local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. If the disaster is so severe that both the local and state governments' capacities are exceeded; a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

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

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

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

Missouri has been especially hard hit by natural disasters in the recent past. The state has had 72 federally declared disasters since 1953. Of those, 35 have occurred since 2002. Most of these disasters have been weather related – severe wind and rainstorms, tornadoes, flooding, hail, ice storms and winter storms. **Table 3.2** lists the federal disaster declarations for Crawford County from 2001 through 2020.

Table 3.2. FEMA Disaster Declarations that included Crawford County, Missouri, 2001-2020

Disaster Number	Description	Incident Period & Declaration Date	Individual Assistance (IA) Public Assistance (PA)
DR-1412	Missouri Severe Storms & Tornadoes	Incident Period: April 24, 2002-June 10, 2002 Declaration Date: May 06, 2002	IA, PA
DR-1463	Missouri Severe Storms, Tornadoes, and Flooding	Incident Period: May 04, 2003-May 30, 2003 Declaration Date: May 06, 2003	IA, PA
EM-3232	Missouri Hurricane Katrina Evacuation	Incident Period: August 29, 2005-October 01, 2005 Declaration Date: September 10, 2005	PA

Disaster Number	Description	Incident Period & Declaration Date	Individual Assistance (IA) Public Assistance (PA)
DR-1631	Missouri Severe Storms, Tornadoes, and Flooding	Incident Period: March 08, 2006-March 13, 2006 Declaration Date: March 16, 2006	IA
EM-3281	Missouri Severe Winter Storms	Incident Period: December 08, 2007-December 15, 2007 Declaration Date: December 12, 2007	PA
DR-1676	Missouri Severe Winter Storms & Flooding	Incident Period: January 12, 2007-January 22, 2007 Declaration Date: January 15, 2007	PA
DR-1749	Missouri Severe Storms & Flooding	Incident Period: March 17, 2008-May 09, 2008 Declaration Date: March 19, 2008	PA
DR-1809	Missouri Severe Storms, Flooding, and a Tornado	Incident Period: September 11, 2008-September 24, 2008 Declaration Date: November 13, 2008	PA
DR-1847	Missouri Severe Storms, Tornadoes, and Flooding	Incident Period: May 08, 2009-May 16, 2009 Declaration Date: June 19, 2009	IA, PA
EM-3303	Missouri Severe Winter Storms	Incident Period: January 26, 2009-January 28, 2009 Declaration Date: January 30, 2009	PA
EM-3317	Missouri Severe Winter Storm	Incident Period: January 31, 2011-February 05, 2011 Declaration Date: February 03, 2011	PA
DR-4238	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Incident Period: May 15, 2015-July 27, 2015 Declaration Date: August 07, 2015	PA
EM-3374	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Incident Period: December 22, 2015-January 09, 2016 Declaration Date: January 02, 2016	PA
DR-4250	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Incident Period: December 23, 2015-January 09, 2016 Declaration Date: January 21, 2016	IA, PA

Disaster Number	Description	Incident Period & Declaration Date	Individual Assistance (IA) Public Assistance (PA)
DR-4317	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Incident Period: April 28, 2017-May 11, 2017 Declaration Date: June 02, 2017	IA, PA
EM-3482	Missouri COVID-19	Incident Period January 20, 2020 and continuing Declaration Date: March 13, 2020	PA
DR-4490	Missouri COVID-19 Pandemic	Incident Period: January 20, 2020 and continuing Declaration Date: March 26, 2020	IA, PA

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

3.1.3 Research Additional Sources

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

- Missouri Hazard Mitigation Plans (2013, 2018)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources (MDNR)
- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- National Agricultural Statistics Service (Agriculture production/losses)
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Environmental Protection Agency
- Flood Insurance Administration
- Hazards US (HAZUS)
- Missouri Department of Transportation
- Missouri Division of Fire Marshal Safety
- Missouri Public Service Commission
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI);
- Pipeline and Hazardous Materials Safety Administration
- County and local Comprehensive Plans to the extent available
- County Emergency Management
- County Flood Insurance Rate Map, FEMA

- Flood Insurance Study, FEMA
- SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin
- U.S. Army Corps of Engineers
- U.S. Department of Transportation
- United States Geological Survey (USGS)
- Various articles and publications available on the internet (sources are cited in the body of the Plan)

Remarkably, the only centralized source of data for many of the weather-related hazards is the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI). Although it is usually the best and most current source, there are limitations to the data which should be noted. The NCEI documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. In addition, it is a partial record of other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occurs in connection with another event. Some information appearing in the NCEI may be provided by or gathered from sources outside the National Weather Service (NWS), such as the media, law enforcement and/or other government agencies, private companies, individuals, etc. An effort is made to use the best available information but because of time and resource constraints, information from these sources may be unverified by the NWS. Those using information from NCEI should be cautious as the NWS does not guarantee the accuracy or validity of the information.

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

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

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

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

3.1.4 Hazards Identified

Table 3.3 lists the hazards that significantly impact each jurisdiction within the planning area and were chosen for further analysis in alphabetical order. “X” indicates the jurisdiction is impacted by the hazard, and a "-" indicates the hazard is not applicable to that jurisdiction. As Crawford County is predominately rural, limited variations occur across the county. However, jurisdictions with a high percentage of housing comprised of mobile homes, for example, could be more at risk to damages from a tornado.

Table 3.3. Hazards Identified for Each Jurisdiction

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme Temperature	Fires (Urban/Structural and wild)	Flooding (River and Flash)	Land Subsidence/Sinkholes	Thunderstorms/High Winds/ Lightning/Hail	Tornado	Severe Winter Weather
Crawford County	x	x	x	x	x	x	x	x	x	x
Bourbon	x	x	x	x	x	x	x	x	x	x
Cuba	x	x	x	x	x	x	x	x	x	x
Leasburg	x	x	x	x	x	x	x	x	x	x
Steelville	x	x	x	x	x	x	x	x	x	x
Sullivan	x	x	x	x	x	x	x	x	x	x
School Districts										
Crawford Co. R-I	x	x	x	x	x	x	x	x	x	x
Crawford Co. R-II	x	x	x	x	x	x	x	x	x	x
Steelville R-III	x	x	x	x	x	x	x	x	x	x
Sullivan School District	x	x	x	x	x	x	x	x	x	x

3.1.5 Multi-Jurisdictional Risk Assessment

For this multi-jurisdictional hazard mitigation plan, each hazard is profiled in which the risks are assessed on a planning area wide basis. Some hazards, such as dam failure, vary in risk across the county. If variations exist within the planning area, discussion is included in each profile. Crawford County is uniform across the county in terms of climate, topography, and building construction characteristics. Weather-related hazards will impact the entire county in much the same fashion, as do topographical/geological related hazards such as earthquake. Sinkholes appear in throughout the county and are localized in their effects. The focal area of urbanization includes the cities of Bourbon, Cuba, Leasburg, St. Cloud, Steelville, Sullivan, and West Sullivan. Urbanized areas have more assets at a greater density, and therefore have greater vulnerability to weather-related hazards. Rural areas include agricultural assets (livestock/crops) that are also vulnerable to damages. Differences among jurisdictions for each hazard will be discussed in greater detail in the vulnerability section of each hazard.

3.2 Assets at Risk

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

3.2.1 Total Exposure of Population and Structures

Unincorporated County and Incorporated Cities

In the following four tables, population data is based on 2020 Census Bureau data. Building counts values are based on parcel data provided by the 2018 Missouri State Hazard Mitigation Plan, which can be found at the following website, https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf.

Table 3.4. Maximum Population and Building Exposure by Jurisdiction

Jurisdiction	2020 Population	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Unincorporated Crawford County	9,276	12,461	$987,097,000	$538,162,000	$1,525,259,000
Bourbon	1,567	688	$87,871,000	$48,961,000	$136,832,000
Cuba	3,181	1,512	$208,449,000	$137,520,000	$345,970,000
Leasburg	326	145	$17,883,000	$9,852,000	$627,734,000
St. Cloud*	43	74	$8,721,000	$8,572,000	$17,293,000
Steelville	1,472	702	$97,221,000	$61,566,000	$158,787,000
Sullivan	6,906	575	$71,663,000	$38,938,000	$110,601,000
West Sullivan*	285	68	$8,716,000	$6,291,000	$15,007,000
Total	23,056	16,225	$1,487,620,000	$849,863,000	$2,337,483,000

Sources: U.S. Census Bureau, 2020 DEC Redistricting Data, *2018 Missouri State Hazard Mitigation Plan, *not included in Crawford County 2022 HMP*

Table 3.5 calculates the total value of buildings and contents within each jurisdiction of the County.

The total exposure values for the County were derived from the inventory data associated with FEMA's loss estimation software HAZUS. Content values were also included and were estimated as a percentage of building value based on their property type, using FEMA HAZUS estimated content replacement values. Those content values are 50 percent for residential, 100 percent for commercial and governmental and 150% for industrial.

Table 3.5. Building Values/Exposure by Usage Type

Jurisdiction	Agriculture	Commercial	Education	Government	Industrial	Residential	Total
Crawford County	$14,344	$104,235	$3,758	$4,670	$66,096	$1,332,157	$1,525,259
Bourbon	$12	$24,313	$2,505	$824	$0	$109,178	$136,832
Cuba	$36	$65,955	$7,516	$1,099	$50,769	$220,595	$345,970
Leasburg	$6	$3,104	$0	$549	$0	$24,075	$27,734
St. Cloud**	$53	$7,759	$0	$0	$5,747	$3,733	$17,293
Steelville	$12	$28,193	$5,010	$3,022	$19,158	$103,392	$158,787
Sullivan	$3	$12,156	$0	$275	$0	$98,167	$110,601
West Sullivan**	$3	$6,208	$0	$0	$958	$7,838	$15,007
Total	**$14,469**	**$251,924**	**$18,789**	**$10,438**	**$142,728**	**$1,899,135**	**$2,337,483**

Source: FEMA HAZUS, Missouri State Hazard Mitigation Plan
** All values in 1,000s of dollars. ** not included in Crawford County 2022 HMP*

Table 3.6. Building Counts by Usage Type

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Other (Gov't/Edu)	Total
Crawford County	7,138	403	0	4,831	20	12,461
Bourbon city	585	94	69	4	3	688
Cuba city	1,182	255	53	12	10	1,512
Leasburg village	129	12	0	2	2	145
St. Cloud village*	20	30	6	18	0	74
Steelville city	554	109	20	4	15	702
Sullivan city	526	47	0	1	1	575
West Sullivan town*	42	24	1	1	0	68
TOTAL:	**10,176**	**974**	**149**	**4,873**	**53**	**16,225**

*Source: Missouri GIS Database (MSDIS) *not included in Crawford County 2022 HMP*

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

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

Public School District	Enrollment	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Crawford County R-I	906	10	$37,538,704	$4,756,925	$42,295,629
Crawford County R-II	1,291	13	$42,041,136	$8,521,658	$50,562,794
Steelville R-III	978	10	$33,245,600	$6,418,600	$39,664,200
Sullivan School District	2,064	15	$97,780,951	$10,615,696	$108,396,647

Source: https://apps.dese.mo.gov/MCDS/Reports/SSRS_Print.aspx?ReportId=152b1d45-e617-4184-acf3-82b9287ae2b4 *; 2022 Data Collection Questionnaire*

3.2.2 Critical and Essential Facilities and Infrastructure

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

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

The table below (**Table 3.8**) provides information for critical facilities in the planning area. Specific information includes a Hazus ID if applicable, jurisdiction, building name/owner, and address. Facilities addressed include emergency, fire department, law enforcement, medical, and schools.

Table 3.8 Crawford County Critical Facilities by Type and Jurisdiction

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Emergency Facilities						
	Crawford Co.	Crawford Co. E-911	PO Box 1314	Steelville	MO	65565
	Crawford Co.	Emergency Management Director	904 W. Washington	Cuba	MO	65453
Fire Department Facilities						
MO000684	Bourbon	Bourbon Fire Prot. Dist.	6 Industrial Park Dr.	Bourbon	MO	65441
MO000426	Cuba	Cuba Fire Dept.	600 South Franklin Street	Cuba	MO	65453
MO000427	Leasburg	Leasburg Comm. Vol. Fire Dept.	205 E Cedar Ave.	Leasburg	MO	65535
	Sullivan	Sullivan Fire Prot. Dist. Station 1	PO Box 475, 6 S Church St	Sullivan	MO	63080
	Sullivan	Sullivan Fire Prot. Dist. Station 4	11890 Mine Road	Sullivan	MO	63080
	Sullivan	Sullivan Fire Prot. Dist. Station 5	1230 N Church Street	Sullivan	MO	63080
MO000685	Steelville	Steelville Fire Prot. Dist. Station 1	PO Box 403, 421 Pine St.	Steelville	MO	65565
	Cherryville	Steelville Fire Prot. Dist. Station 2	Cherryville	Cherryville	MO	65565
	Berryman	Steelville Fire Prot. Dist. Station 3	Berryman	Berryman	MO	65665
Law Enforcement Facilities						
MO000579	Crawford County	Crawford County Sheriff's Dept.	212 3rd St. PO Box BE	Steelville	MO	65565
MO000415	Bourbon	Bourbon Police Dept.	355 East Pine St., PO Box 984	Bourbon	MO	65441
MO000394	Cuba	Cuba Police Dept.	602 S Franklin St.	Cuba	MO	65453
MO000026	Steelville	Steelville Police Dept.	895 Frisco St. PO Box M	Steelville	MO	65565
	Sullivan	Sullivan Police Dept.	106 Progress Dr.	Sullivan	MO	63080

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Medical Facilities						
MO000132	Sullivan	Missouri Bapt. Hospital of Sullivan	751 Sappington Bridge Rd.	Sullivan	MO	63080
	Crawford	Crawford Co. Health Dept.	202 W. Main St.	Steelville	MO	65565
School Facilities						
	Bourbon	Bourbon Elem.	357 Jost Street	Bourbon	MO	65441
	Bourbon	Bourbon Middle	363 Jost Street	Bourbon	MO	65441
	Bourbon	Bourbon High	1500 S Old Hwy 66	Bourbon	MO	65441
	Cuba	Cuba Elem.	1 Wildcat Pride Drive	Cuba	MO	65453
	Cuba	Cuba Middle	1 Wildcat Pride Drive	Cuba	MO	65453
	Cuba	Cuba High	1 Wildcat Pride Drive	Cuba	MO	65453
	Steelville	Steelville Elem.	868 W Main St.	Steelville	MO	65565
	Steelville	Steelville Middle	810 W Main St.	Steelville	MO	65565
	Steelville	Steelville High	17154 Hwy 19	Steelville	MO	65565
	Sullivan	Sullivan Elem.	104 W Washington	Sullivan	MO	63080
	Sullivan	Sullivan Primary	1132 Elmont Road	Sullivan	MO	63080
	Sullivan	Sullivan Middle	1156 Elmont Road	Sullivan	MO	63080
	Sullivan	Sullivan High	1073 E Vine St.	Sullivan	MO	63080
Childcare Facilities						
	Cuba	All Aboard Learning Center	201 Rutz Subdivision Rd.	Cuba	MO	65453
	Steelville	Cardinal Care Daycare of Steelville	317 Pine St.	Steelville	MO	65565
	Steelville	Cardinal Clubhouse Daycare of Steelville LLC	319 Pine St.	Steelville	MO	65565
	Steelville	Community Child Care Center Inc.	209 N First St	Steelville	MO	65565
	Sullivan	Hines, Kristi	1151 Lilac Dr.	Sullivan	MO	63080
	Cuba	Killeen, Carleen Ann	10 Northwood Dr	Cuba	MO	65453
	Cuba	Missouri Ozark Community Action, Inc.	100 Hood Drive	Cuba	MO	65453
	Bourbon	Missouri Ozarks Community Action, Inc.	357 Jost St.	Bourbon	MO	65441
	Bourbon	Pasch, Brenda Lea	754 Marlette Dr.	Bourbon	MO	65441
	Cuba	St. Pauls Lutheran Early Childhood Center	760 Fleenor Rd.	Cuba	MO	65453
	Cuba	Wise Little Owls Preschool & Child Care Center LLC	401 W Washington	Cuba	MO	65453

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Nursing Homes						
	Cuba	Arbors Victorian Place	903 Highway DD	Cuba	MO	65453
	Bourbon	Barnabas Redwood Manor	1194 Landon Road	Bourbon	MO	65441
	Cuba	Cuba Manor, Inc.	210 Eldon Dr	Cuba	MO	65453
	Sullivan	Arbors at Dunsford Court-Assisted Living	775 Dunsford Road	Sullivan	MO	63080
	Sullivan	Life Care Center of Sullivan	875 Dunsford Drive	Sullivan	MO	63080
	Sullivan	Meramec Nursing Center	940 Mattox Drive	Sullivan	MO	63080
	Sullivan	Ridgeway Residential Care	431 Russell, PO Box 267	Sullivan	MO	63080
	Cuba	Rock Springs Residential, LLC	81 Pilkenton Lane	Cuba	MO	65453
	Steelville	Steelville Senior Living	311 N. Springfield St.	Steelville	MO	65565
	Steelville	Steelville Senior Living	311 N. Spring Street	Steelville	MO	65565
	Cuba	Stubblefield Retirement Home	5349 Highway P	Cuba	MO	65453
	Bourbon	Sunshine Acres	541 Rock Road	Bourbon	MO	65441
	Cuba	Victorian Place of Cuba	901 Highway DD	Cuba	MO	65453
	Sullivan	Victorian Place of Sullivan	1250 East Springfield Rd.	Sullivan	MO	63080

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

Table 3.9 includes a summary of the inventory of critical and essential facilities and infrastructure in the planning area. The list was compiled from the 2021 Data Collection Questionnaire, the Meramec Regional Hazardous Materials Emergency Response Plan and the National Bridge Inventory.

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

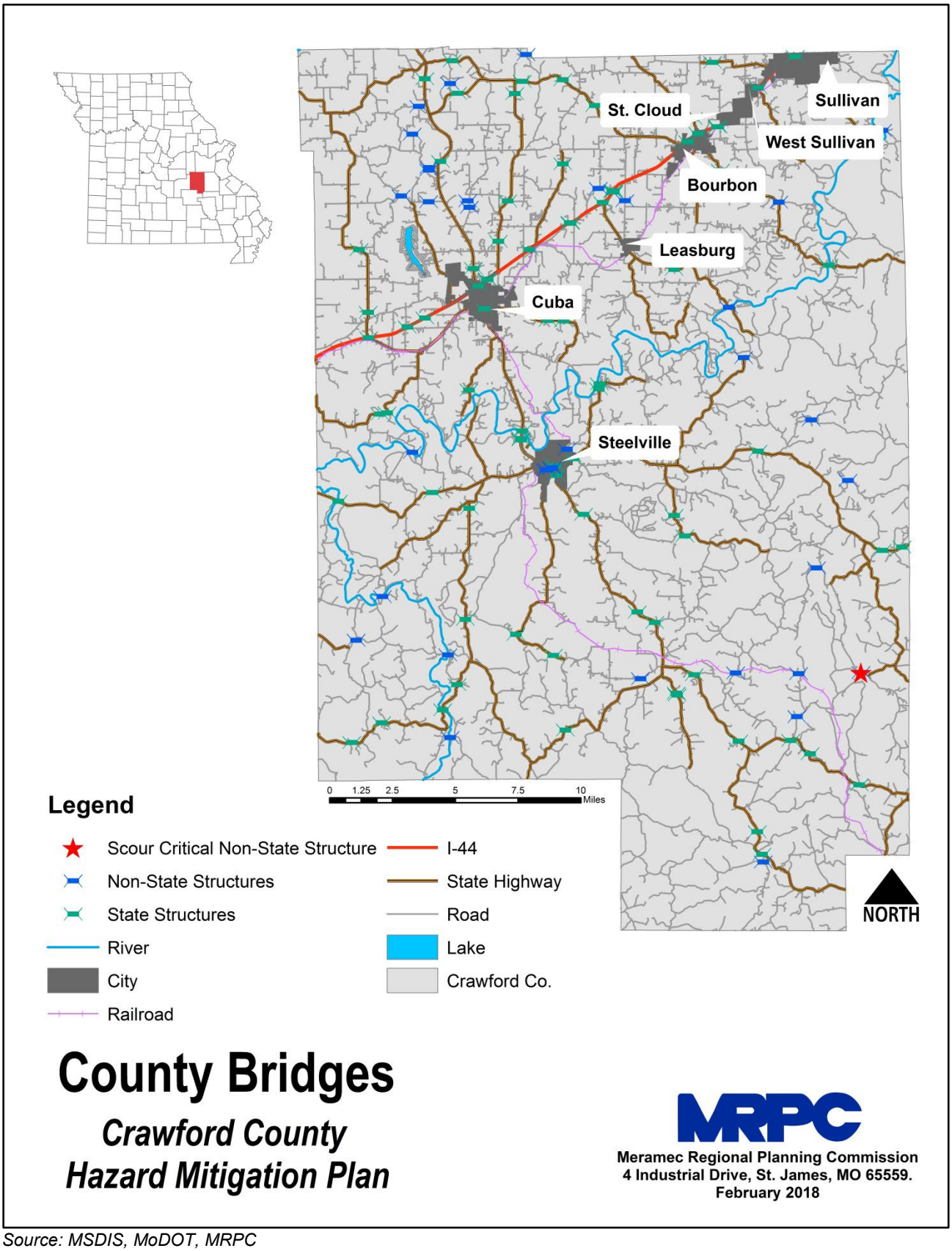
	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	State & Non-State Structures (Bridge)	Hospital/Health Care	Military	Pipeline/Pump Station	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	Total
Unincorporated Crawford County	0	0	0	-	-	1	1	17	0	1	70	0	0	-	0	1	-	1	-	0	-	6	-	98
Bourbon	0	0	0	2	0	3	1	1	2	0	0	2	0	0	2	1	3	1	7	4	0	9	1	39
Cuba	1	1	3	1	1	1	1	5	5	1	2	0	1	2	1	0	0	1	1	2	2	24	1	57
Leasburg	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	2	1	8
Steelville	0	0	3	3	1	1	1	2	60	2	8	2	0	0	1	2	3	1	6	3	0	14	1	114
Sullivan	1	0	4	2	2	1	2	1	0	0	3	2	0	1	4	1	10	1	70	4	-	7	1	117
Totals	2	1	10	9	4	7	7	27	67	4	83	6	1	3	8	5	17	5	85	13	2	62	5	433

Source: 2022 Data Collection Questionnaires, National Bridge Inventory, 2021 MLEPD Hazardous Materials Emergency Response Plan

According to the National Bridge Inventory there are a total of 120 bridges in Crawford County[3]. **Figure 3.2** shows the locations of State regulated bridges and non-State bridges in the planning area. Scour critical bridges were also examined. Scour critical refers to one of the database elements in the National Bridge Inventory. This element is quantified using a "scour index", which is a number indicating the vulnerability of a bridge to scour during a flood. Bridges with a scour index between 1 and 3 are considered "scour critical", or a bridge with a foundation determined to be unstable for the observed or evaluated scour condition. There are no scour critical bridges within Crawford County[4].

[3] http://www.fhwa.dot.gov/bridge/nbi/no10/county.cfm
[4] https://infobridge.fhwa.dot.gov/Data/SelectedBridges#!#OverviewTab

Figure 3.2. Crawford County Bridges



Source: MSDIS, MoDOT, MRPC

3.2.3 Other Assets

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

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

Threatened and Endangered Species: **Table 3.8** depicts Federally Threatened, Endangered, Proposed and Candidate Species in the county.

Table 3.8. Threatened and Endangered Species in Crawford County

Common Name	Scientific Name	Status
Amphibians		
Eastern Hellbender	*Cryptobranchus alleganiensis*	Endangered (F) (S)
Clams		
Pink Mucket	*Lampsilis abrupta*	Endangered (F)
Scaleshell Mussel	*Leptodea leptodon*	Endangered (F) (S)
Snuffbox Mussel	*Epioblasma triquetra*	Endangered (F)
Spectaclecase	*Cumberlandia monodonta*	Endangered (F)
Sheepnose Mussel	*Plethobasus cyphyus*	Endangered (F) (S)
Winged Mapleleaf	*Quadrula fragosa*	Endangered (F)
Insects		
Hine's Emerald Dragonfly	*Somatochlora hineana*	Endangered (F)
Birds		
Bachman's Sparrow	*Peucaaea aestivalis*	Endangered (S)
Northern Harrier	*Circus cyaneus*	Endangered (S)
Peregrine Falcon	*Falco peregrinus*	Endangered (S)
Flowering Plants		
Eastern prairie fringed orchid	*Plantanthera leucophaea*	Threatened (F) Endangered (S)
Mammal		
Gray bat	*Myotis grisescens*	Endangered (F) (S)
Indiana bat	*Myotis sodalis*	Endangered (F) (S)
Northern long-eared bat	*Myotis septentrionalis*	Threatened (F)
Eastern spotted skunk	*Spilogale putorius*	Endangered (S)

Note: S = State, F = Federal
Source: U.S. Fish and Wildlife Service, https://ecos.fws.gov/ecp/;
MDC, https://nature.mdc.mo.gov/status/endangered

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

Table 3.9. Conservation Areas in Crawford County

Area Name	Address	City
Anderson (John N and Melba S) Mem CA	From Steelville, take Highway 19 south 2 miles, then Valleyside Road east 1 mile to the parking lot.	Steelville
Blue Springs Creek CA	From Bourbon, take Route N south 2.50 miles to Blue Springs Road. There is parking available off of Route N as well as Blue Springs Road.	Bourbon
Campbell Bridge Access	From Bourbon, take Route N south 10 miles.	Bourbon
Crawford County (Bird's Nest Access)	From Steelville, take Highway 19 north approximately 1.50 miles, then Grand Drive east, then Bird's Nest Road north (left) and stay left, following Bird's Nest Road to the access.	Steelville
Crooked Creek CA	From Cherryville take Route 19 south approximately 7 miles, then take Route VV northwest 5 miles	Cherryville
Huzzah CA	From Leasburg, take Route H south 5 miles to the area.	Leasburg
Keysville Towersite	From Steelville, take Route AA south 5 miles, then east on Tower Road.	Steelville
Mint Spring Access	From Owensville, take Route EE south 9.50.	-
Onyx Cave CA	From Bourbon, take Route N south 6.50 miles, then Thickety Ford Road east 3 miles.	Bourbon
Riverview Access	From Cuba, take Highway 19 south 1.50 miles, then Route O west 4 miles and continue 0.25 mile past the end of state maintenance.	Cuba
Sappington Bridge Access	From Sullivan, take Route D south, then Sappington Bridge Road east to the river.	Sullivan
Scotts Ford Access	From Steelville, take Highway 8 west 4 miles, and Thurman Lake Road north 2 miles.	Steelville
Sizemore (Pearl G and John J) Mem CA	From Steelville, take Highway 19 south 2 miles, then Valleyside Road east-southeast (left) 2.50 miles.	Steelville

Woodson K. Woods Memorial	From Steelville, take Highway 8 west 9 miles.	Steelville

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

Table 3.10 provides information pertaining to community owned/operated parks within Crawford County.

Table 3.10. Community Owned Parks in Crawford County

Park Name	Address	City
Bourbon City Park	Park Street, Bourbon, MO 65441	Bourbon
Hood Park	1 Hood Dr., Cuba, MO 65453	Cuba
Cuba City Municipal Pool	500 Beldon Ave, Cuba, MO 65453	Cuba
Mapleshade Park	N Mapleshade Rd., Cuba, MO 65453	Cuba
Tangle Creek Park	Beldon Ave., Cuba, MO 65453	Cuba
Paul Bryan Park	Vance St., Cuba, MO 65453	Cuba
Hoppe Spring Park	Church St, Steelville, MO 65565	Steelville
Steelville City Park	101 Hwy 8, Steelville, MO 65565	Steelville
City Lake Park	Mattox Dr, Sullivan, MO 63080	Sullivan

Source: Google Search

Historic Resources: The National Register of Historic Places is the official list of registered cultural resources worthy of preservation. It was authorized under the National Historic Preservation Act of 1966 as part of a national program. The purpose of the program is to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. The National Register is administered by the National Park Service under the Secretary of the Interior. Properties listed in the National Register include districts, sites, buildings, structures and objects that are significant in American history, architecture, archeology, engineering, and culture. **Table 3.11** provides information in regards to properties on the National Register of Historic Places in Crawford County.

Table 3.11. Crawford County Properties on the National Register of Historic Places

Property	Address	City	Date Listed
Big Bend Rural School	MO 19, Steelville	Steelville	12/12/78
Cuba City Jail	Prairie St. & 300 blk. of S. Main St., Cuba	Cuba	10/29/14
Cuba High School Annex	308 N. Smith St., Cuba	Cuba	5/1/13
Cuba Lodge No. 312 A.F. and A.M.	201 N. Smith St., Cuba	Cuba	10/29/14
Dillard Mill Historic District	142 Dillard Mill Rd., Davisville	Davisville	1/14/15
Hamilton, George B., House	401 E. Washington St., Cuba	Cuba	10/29/14
Harney, Maj. Gen. William S., Summer Home	332 S Mansion Ave., Sullivan	Sullivan	4/19/84
Hotel Cuba	600 E. Main St., Cuba	Cuba	10/29/14
Munro, John Manson, House	305 W. Washington Ave., Cuba	Cuba	10/29/14

Scotia Iron Furnace Stack	6.3 mi. SE of Leasburg on CR H	Leasburg	5/21/69
Snelson-Brinker House	(Cherokee Trail of Tears MPDF), MO 8, Steelville vicinity	Steelville	6/21/07
Uptown Cuba Historic District	roughly W. Main Ave., N. & S. Smith & S. Hickory Sts., W. Washington Blvd., Cuba	Cuba	3/13/13
Wagon Wheel Motel, Café and Station	901-905 E. Washington St., Cuba	Cuba	4/07/03

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

Economic Resources: **Table 3.12** provides major non-government employers in the planning area. There are approximately 487 employer establishments within the county, employing on average 11.5 individuals each[5].

Table 3.12. Major Non-Government Employers in Crawford County

Employer Name	Product or Service	Employees
Missouri Baptist Sullivan Hospital	Hospital	250-499
Steelville Telephone Exchange	Communications	10-99
Mar-Bal Inc.	Injection Molding	100-249
McGinnis Wood Products	Manufacturing	100-249
Ozark Mountain Technologies	Aircraft Components Manufacturers	100-249
Paramount Apparel Int. Inc.	Apparel	250-499
Steelville Manufacturing Co.	Manufacturing	100-249
Meramec Instrument Transformer Company	Manufacturing	100-249

Source: https://meric.mo.gov/industry/business-locator, 2022 Data Collection Questionnaires

Agriculture plays an important role in Crawford County. However, the Agribusiness Employment Location Quotient for the county is 1.15; meaning that there is a relatively equal share of agribusiness employment to its share of total national employment[6]. In addition, there were 106 individuals working in the agriculture industry, comprising 1.43% of the total workforce in 2020[7]. Furthermore, the market value of products sold in 2017 was $14,793,000; 75% from livestock sales and 25% from crop sales.[8]

[5] https://www.census.gov/quickfacts/fact/table/crawfordcountymissouri/HSG650219
[6] Missouri Economic Research and Information Center
[7] Missouri Economic Research and Information Center
[8] https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/2/table/1/state/MO/county/055/year/2017

3.3 Land Use and Development

3.3.1 Development Since Previous Plan

Table 3.13 provides population growth statistics for Crawford County.

Table 3.13. Crawford County Population Growth, 2010-2020

Jurisdiction	2010 Population	2020 Population	2010-2020 # Change	2010-2020 % Change
Unincorporated Crawford County	10,542	9,276	-1,266	-12.01%
Bourbon	1,632	1,567	-65	-3.98%
Cuba	3,284	3,181	-103	-3.14%
Leasburg	338	326	-12	-3.55%
St. Cloud*	41	43	2	4.88%
Steelville	1,500	1,472	-28	-1.87%
Sullivan	6,908	6,906	-2	-0.03%
West Sullivan*	119	285	166	139.50%

Source: U.S. Bureau of the Census 2020 Decennial Redistricting Data, Census 2010 Summary File 1 * *not included in Crawford County 2022 HMP*

Typically, population growth or decline is generally accompanied by an increase or decrease in the number of housing units. **Table 3.14** provides the change in numbers of housing units in the planning area from 2010-2019.

Table 3.14. Change in Housing Units, 2010-2020

Jurisdiction	Housing Units 2010	Housing Units 2020	2010-2020 # Change	2010-2020 % change
Unincorporated Crawford County	5,581	5,007	-574	-10.28%
Bourbon	718	720	2	2.79%
Cuba	1,542	1,539	-3	-1.95%
Leasburg	155	161	6	3.87%
St. Cloud*	21	21	0	0%
Steelville	753	634	-120	-15.80%
Sullivan	3,136	3,174	38	1.21%
West Sullivan*	49	122	73	148.98%

Source: U.S. Census Bureau 2020 Decennial Redistricting Data, U.S. Bureau of the Census, Census 2010 Summary File 1 * *not included in Crawford County 2022 HMP*

3.3.2 Future Land Use and Development

Jurisdictions reported anticipated future developments within the next five years (2021-2026). Crawford County and the cities of Leasburg, Steelville and Bourbon did not anticipate any major future developments within the next five years.

The City of Sullivan is planning an upgrade of the watermain along Vine Street from Warren to Highway 185 South to balance the water distribution system in the area. The City of Cuba is also planning some improvements to the city's water distribution system.

Crawford County R-I School District has recently finished a large renovation project to the high school. A new metal prefabricated building with drywall and cinderblock walls that will be used by the Agriculture and STEM Departments. The district is planning a remodel of the former Agriculture/Shop building to convert to science labs and a weight room. Projects to improve fire suppression systems and alarm systems are ongoing. Additional safety features will be added as needed and as funding allows.

Crawford County R-II School District will be continuing with roofing projects including a 10/21 infrared roof analysis. The district is planning some building improvements to include constructing some additional restrooms, installing a new intercom system, and expanding wireless internet coverage. This school district has a FEMA certified tornado saferoom at the high school located in the locker rooms and weight room.

Steelville R-III School District is planning to construct a livestock pavilion equipped with appropriate cattle and pig stalls for the Agriculture Department. The district does not have any certified tornado safe rooms at this time.

Since the last Hazard Mitigation Plan the Sullivan School District completed construction of a new administrative office as well as a gymnasium and additional classrooms in the elementary building. The district plans to construct additions in both the high school and middle school in the next five years. The district does not have any tornado safe rooms at this time.

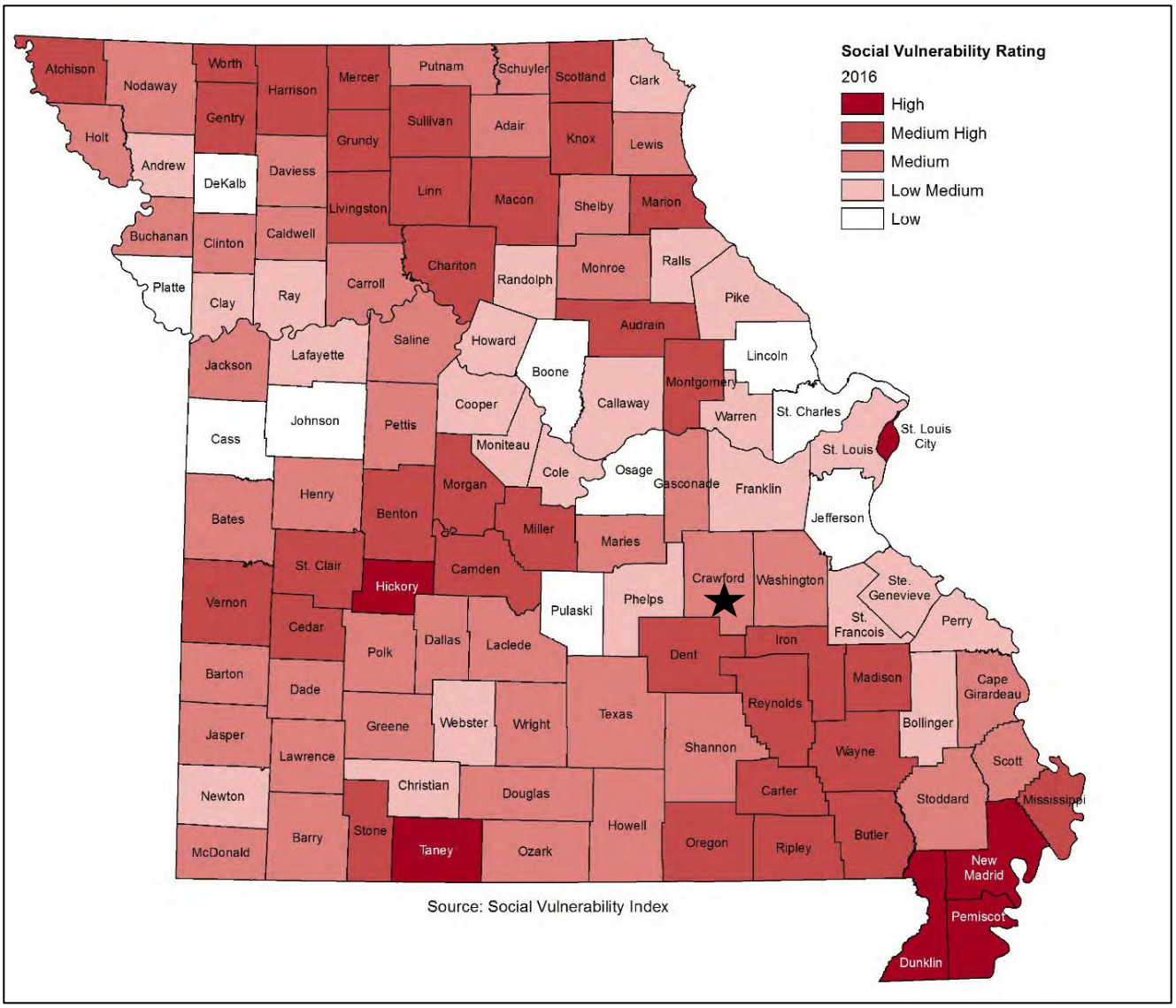
New development can impact a jurisdiction's vulnerability to natural hazards. As the number of buildings, critical facilities, and assets increase, vulnerability increases as well. For example, real estate development can increase storm water runoff, which often increases localized flooding. However,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

Socioeconomic Profile

The Missouri State Hazard Mitigation Plan provides ratings for social vulnerability for each of the counties in the state based on 42 socioeconomic and built environment variables that research suggests contribute to a community's ability to prepare for, respond to and recover from hazards. Based on that data, Crawford County has a "medium" social vulnerability rating (**Figure 3.3**). Furthermore, business incentives are available in the County including Missouri Works, a program for qualified job creators which enables the retention of withholding tax or tax credits that can be transferrable, refundable and/or saleable; BUILD, a financial incentive for the location or expansion of large business projects; sales tax exemptions exist for qualified manufacturers; and industrial infrastructure grants are available up to $2 million or $20,000 per job created[9].

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

Figure 3.3. Social Vulnerability Rating for Crawford County



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

3.4 Hazard Profiles, Vulnerability, and Problem Statements

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

Hazard Profiles

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

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

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

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

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

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

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

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

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

Vulnerability Assessments

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

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

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

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

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

Following the hazard profile for each hazard will be the vulnerability assessment. The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to damages from natural hazards. The vulnerability assessments will be based on the best available county-level data, which is in the Missouri Hazard Mitigation Plan (2018). With the 2018 Hazard Mitigation Plan Update, SEMA is pleased to provide online access to the risk assessment data and associated mapping for the 114 counties in the State. Through the web-based Missouri hazard Mitigation Viewer, local planners or other interested parties can obtain all State Plan datasets. This effort removes from local mitigation planners a barrier to performing all the needed local risk assessments by providing the data developed during the 2018 State Plan Update. The Missouri Hazard Mitigation viewer can be found at this link: http://bit.ly/MoHazardMitigationPlanViewer2018.

The county-level assessments in the State Plan were also based on the following additional sources:

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

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

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

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

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

Potential Losses to Existing Development: This section will describe the potential impacts of each hazard – the consequences of the effect of the hazard on the jurisdiction and its assets (including types and numbers, of buildings, critical facilities, etc.).

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

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

Problem Statements

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

3.4.1 Dam Failure

Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.3, Page 3.148 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- Missouri Department of Natural Resources, Dam and Reservoir Safety, https://dnr.mo.gov/land-geology/dam-reservoir-safety
- Stanford University's National Performance of Dams Program; http://npdp.stanford.edu/
- National Inventory of Dams, https://nid.usace.army.mil/#/
- National Resources Conservation Service http://www.nrcs.usda.gov
- DamSafetyAction.org, http://www.damsafetyaction.org/MO/
- Missouri Spatial Data Information Service, http://msdis.missouri.edu
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
    - Total number of Missouri NID dams by County
    - Total number of High, Significant, and Low Hazard dams by County
    - Total number of State Regulated dams by County
    - Total number of Class 1, Class 2, and Class 3 dams by County
    - Total number of structures impacted by USACE dams by County
    - Total number of structures impacted by State dams by County
    - Total value of structures impacted by USACE dams by County
    - Total value of structures impacted by State dams by County
    - Total population impacted by USACE dams by County
    - Total population impacted by State dams by County

Hazard Profile

Hazard Description

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

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

Information regarding dam classification systems under both the Missouri Department of Natural Resources (MDNR) and the National Inventory of Dams (NID), which differ, are provided in **Table 3.15** and **Table 3.16**, respectively.

Table 3.15. MDNR Dam Hazard Classification Definitions

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

Source: Missouri Department of Natural Resources, Missouri Geological Survey Rolla Office

Table 3.16. NID Dam Hazard Classification Definitions

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

Source: National Inventory of Dams

Geographic Location

Dams in Planning Area

According to the National Inventory of Dams there are 75 recorded dams in Crawford County; including 26 high hazard dams; three significant hazard dams; and 46 low hazard dams. The Missouri Department of Natural Resources also tracks dams in the state and has identified eight Class 1 dams, thirty six Class 2 dams and one hundred and forty eight Class 3 dam. **Table 3.17** provides the name of the dam, DNR hazard class and NID hazard class for each of the identified dams in Crawford County. There are eight state-regulated dams in Crawford County. None of the dams are owned or operated by the United States Army Corps of Engineers (USACE). County dams are privately or commercially owned. **Table 3.18** provides the names, locations, and other pertinent information for all NID High Hazard Dams in the planning area.

Table 3.17. Crawford County Dams Hazard Risk

Name of Dam	DNR Hazard Class	NID Hazard Class
ALEXANDER LAKE DAM	3	Low
ASHER LAKE DAM (SHALLOW)	3	Low
BALLARD LAKE SECT 14 DAM	2	High
BALLARD LAKE-SECT 13 DAM	3	Low
BARNETT LAKE DAM	3	Low
BIG LAKE DAM	1	High
BOYS AND GIRLS TOWN DAM	3	Low
BRUMMET LAKE DAM (DRY)	2	High
BUDGET BUSTER DAM	3	Low
CARDON LAKE DAM	3	Low
CASTANIS LAKE DAM	3	Low
CATTINARI LAKE DAM	3	Significant
CITY PARK LAKE DAM	1	High
COBINE'S FOLLY DAM	2	High
CUBA FISH FARM DAM	3	Low
DAM VERA	3	Low
DURBIN LAKE DAM	2	High
EICKHOFF LAKE DAM	2	High
ELDERS LAKE DAM \(DRY)	2	High
FIELD LAKE DAM	2	High
FORD LAKE DAM	3	Low
FORESTER LAKE DAM	2	High
FOX SPRING LAKE DAM	3	Low
FRERICHS SEC-22 LAKE DAM	3	Low
FRERICHS SECT-4 LAKE DAM	2	High
FRUMAR LAKE DAM	3	Low
GEISZ LAKE DAM	1	High
GOULD LAKE DAM	3	Low
GREEN DAM	2	High
HAAS, R. & HECK, A. DAM	1	High
HEDRICK LAKE DAM	3	Low
HELMERING FARMS DAM	3	Low
HOLIDAY LAKE DAM	1	High
HOLIFIELD LAKE DAM	3	Low
HOLMSTROM NORTH LAKE DAM	3	Low

Name of Dam	DNR Hazard Class	NID Hazard Class
HOLMSTROM SOUTH LAKE DAM	3	Low
HUBBMAN LAKE DAM	3	Low
INDIAN HILLS LAKE DAM	3	Low
J. BRISTOW LAKE DAM	1	High
JELLYSTONE PARK DAM	2	High
KEENEY LAKE DAM	3	Low
KEEVEN DAM	2	High
KEMP LAKE DAM	1	High
KLONTZ LAKE DAM	3	Low
KOZLOWSKI LAKE DAM	3	Low
KREKELER LAKE DAM	3	Low
LERWICK LAKE DAM	3	Low
MATTHEWS LAKE DAM	3	Low
MONONAME 133	3	Low
MONONAME 352	3	Low
MONONAME 410	3	Low
MONONAME 717	3	Low
MONONAME 718	3	Low
MONONAME 845	3	Low
MONONAME 846	3	Low
MONONAME 852	3	Low
MONONAME 860	3	Low
NEILL LAKE DAM	3	Low
NOLIE LAKE NORTH DAM	3	Low
NOLIE LAKE SOUTH DAM	3	Low
PAPIN LAKE DAM	2	High
PINE LAKE DAM	2	High
PLOCH LAKE DAM	2	High
POSSUM HOLLOW DAM	3	Low
RAMSTEIN LAKE DAM	3	Low
REED LAKE DAM	3	Significant
REILLY LAKE DAM	3	Low
RIVER OAKS RANCH DAM	3	Significant
RUTZ LAKE DAM	2	High
SEIDL LAKE DAM	3	Low
SKINNER-SORTH-KOCH-KREIDER LAKE DAM	3	Low
SMITH LAKE(TOO SMALL)	3	Low
STUBBLEFIELD LAKE DAM	1	High
SUTTER LAKE DAM	2	High

Name of Dam	DNR Hazard Class	NID Hazard Class
THUNDER VALLEY FARM DAM	2	High
WEISEL LAKE DAM	3	Low

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

Table 3.18. NID High Hazard Class Dams in the Crawford County Planning Area

Dam Name	NIDID	Hazard Potential *	NID Height (Ft.)	NID Storage	River	Nearest City *	Distance To City (Mi.) *
BALLARD LAKE SECT 14 DAM	MO30742	High	30	449	YANKEE BR-CROOKED CREEK	KEYSVILLE	5
BIG LAKE DAM	MO30987	High	34	127	TRIB-CHERRY VALLEY CREEK	CHERRYVILLE	6
BRUMMET LAKE DAM (DRY)	MO30033	High	37.3	228	TR-LICK CREEK	TWIN SPRINGS	28
CITY PARK LAKE DAM	MO30588	High	53	159	TRIBUTARY TO STATER CREEK	SULLIVAN	0
COBINE'S FOLLY DAM	MO30982	High	25	40	TR- DRY CREEK	STEELVILLE	7
DURBIN LAKE DAM	MO31287	High	25	54	TR-LICK CREEK	SULLIVAN	30
EICKHOFF LAKE DAM	MO31312	High	25	40	TR-SOUDER CREEK	OAK HILL	0
ELDERS LAKE DAM \(DRY)	MO30592	High	29	217	TR-MERAMEC RIVER	STEELVILLE	4
FIELD LAKE DAM	MO30983	High	25	67	TR-CHERRY VALLEY CREEK	STEELVILLE	6
FORESTER LAKE DAM	MO31317	High	30	80	TR-HAMBY BR BOURBEUSE RIVER	NOSER MILL	0
FRERICHS SECT-4 LAKE DAM	MO30594	High	20	86	BRUSH CREEK	OAK HILL	8
GEISZ LAKE DAM	MO30741	High	37	93	TR-YANKEE BR CROOKED CREEK	KEYSVILLE	0

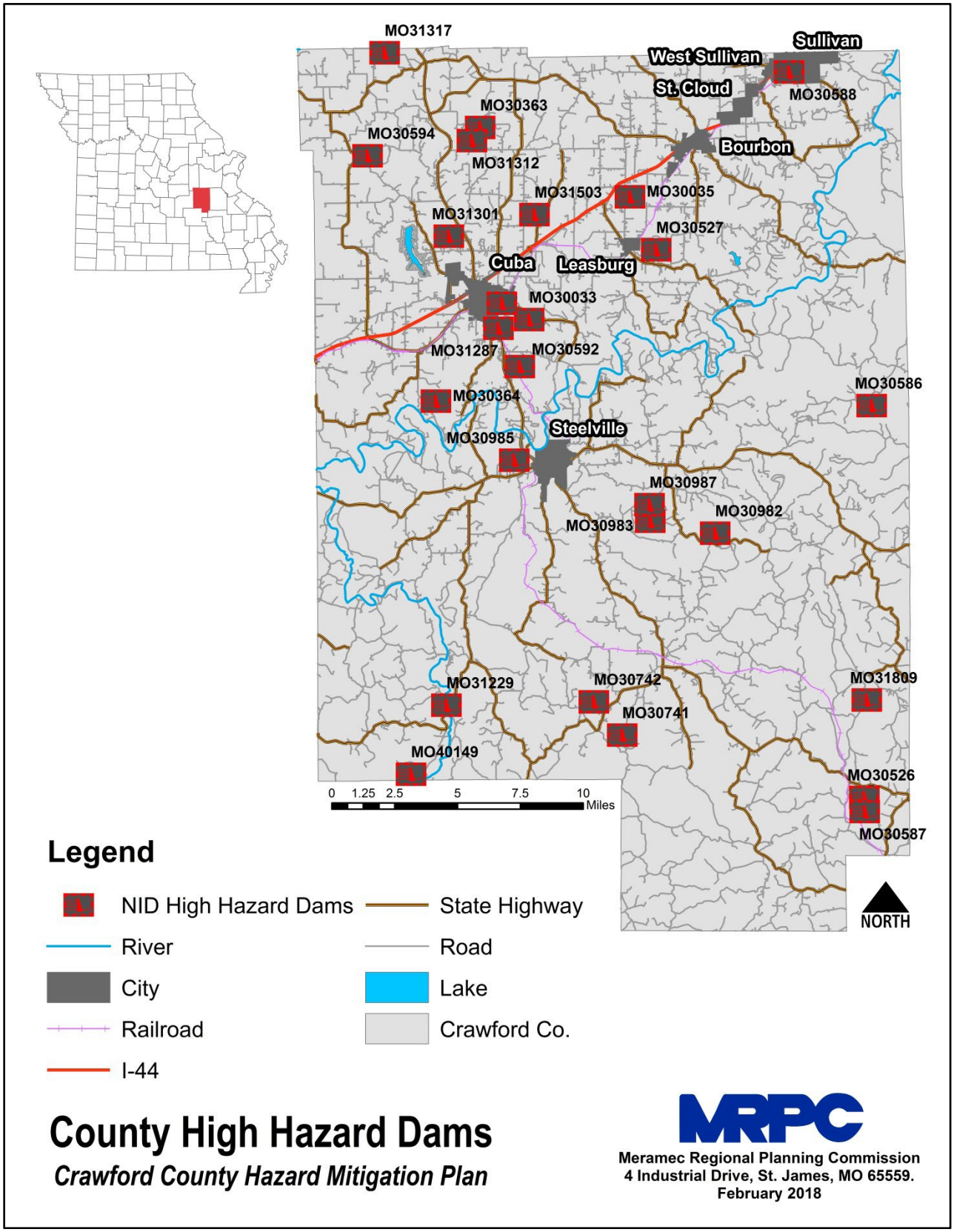
Dam Name	NIDID	Hazard Potential *	NID Height (Ft.)	NID Storage	River	Nearest City *	Distance To City (Mi.) *
GREEN DAM	MO31809	High	51	223	TRIB SHOAL CREEK	DAVISVILLE	58
HAAS, R. & HECK, A. DAM	MO30526	High	16	43	TRIBUTARY TO SHOAL CREEK	DAVISVILLE	4
HOLIDAY LAKE DAM	MO30587	High	24	141	SHOAL CREEK	DAVISVILLE	5
J. BRISTOW LAKE DAM	MO30985	High	30	106	TR-MERAMEC	STEELVILLE	2
JELLYSTONE PARK DAM	MO31503	High	27	87	TR-LITTLE BOURBEUSE RIVER	CUBA	5
KEEVEN DAM	MO40149	High	38	455	TRIBUTARY TO TAFT CREEK	COOK STATION	3
KEMP LAKE DAM	MO30035	High	22	212	TRIBUTARY OF LITTLE BOURBEUSE	CHAMPION CITY	0
PAPIN LAKE DAM	MO30364	High	33	141	TR-MERAMEC RIVER	CUBA	6
PINE LAKE DAM	MO30527	High	38	375	TR MERAMEC RIVER	LEASBURG	1
PLOCH LAKE DAM	MO31229	High	25	40	TR-MERAMEC RIVER	WESCO	3
RUTZ LAKE DAM	MO31292	High	25	40	TR-LICK CREEK	TWIN SPRINGS	0
STUBBLEFIELD LAKE DAM	MO30363	High	30	289	TR-BRUSH CREEK	OAK HILL	3
SUTTER LAKE DAM	MO31301	High	32	154	TR-PLEASANT VALLEY CREEK	OAK HILL	13
THUNDER VALLEY FARM DAM	MO30586	High	30	353	TR-COURTOIS CREEK	STEELVILLE	15

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

Figure 3.4 depicts locations of NID high hazard dams located in the planning area. If a dam failure were to occur in Crawford County, depending upon dam and location, the severity would range between negligible to life threatening. Road infrastructure, residential structures, commercial buildings, and public buildings are all vulnerable to losses. There are two areas of assembly in dam inundation zones within the county. First, Cuba Headstart and All Aboard Learning Center in Cuba, MO is located 230 yards from Rutz Lake Dam. Also, Interstate 44 is 0.7 miles away from Kemp Lake Dam and could be compromised during a failure event.

Five dam inundation maps were available from the Missouri Department of Natural Resources. These Regulated Dams include Brummet Lake Dam, City Park Lake Dam, Green Dam, Haladale (Pine Lake) Dam, and Keevan Dam (**Figure 3.5** to **Figure 3.9**). No other dam inundation maps were available for the remaining NID High Hazard Dams in the county.

Figure 3.4. NID High Hazard Dam Locations in Crawford County



Source: MSDIS, MRPC

Figure 3.5. Brummet Lake Dam Inundation Zone

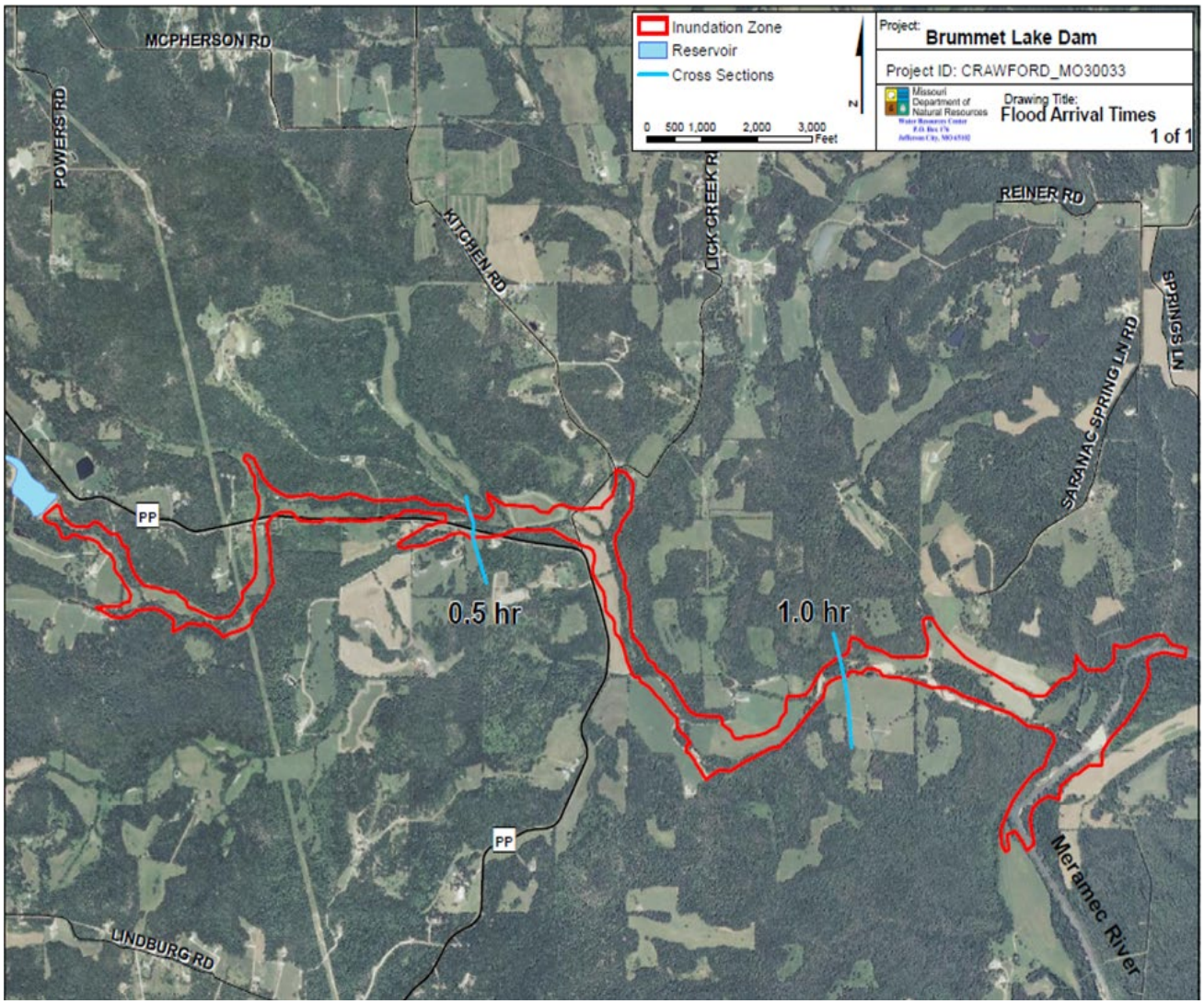


Figure 3.6. City Park Lake Dam Inundation Zone

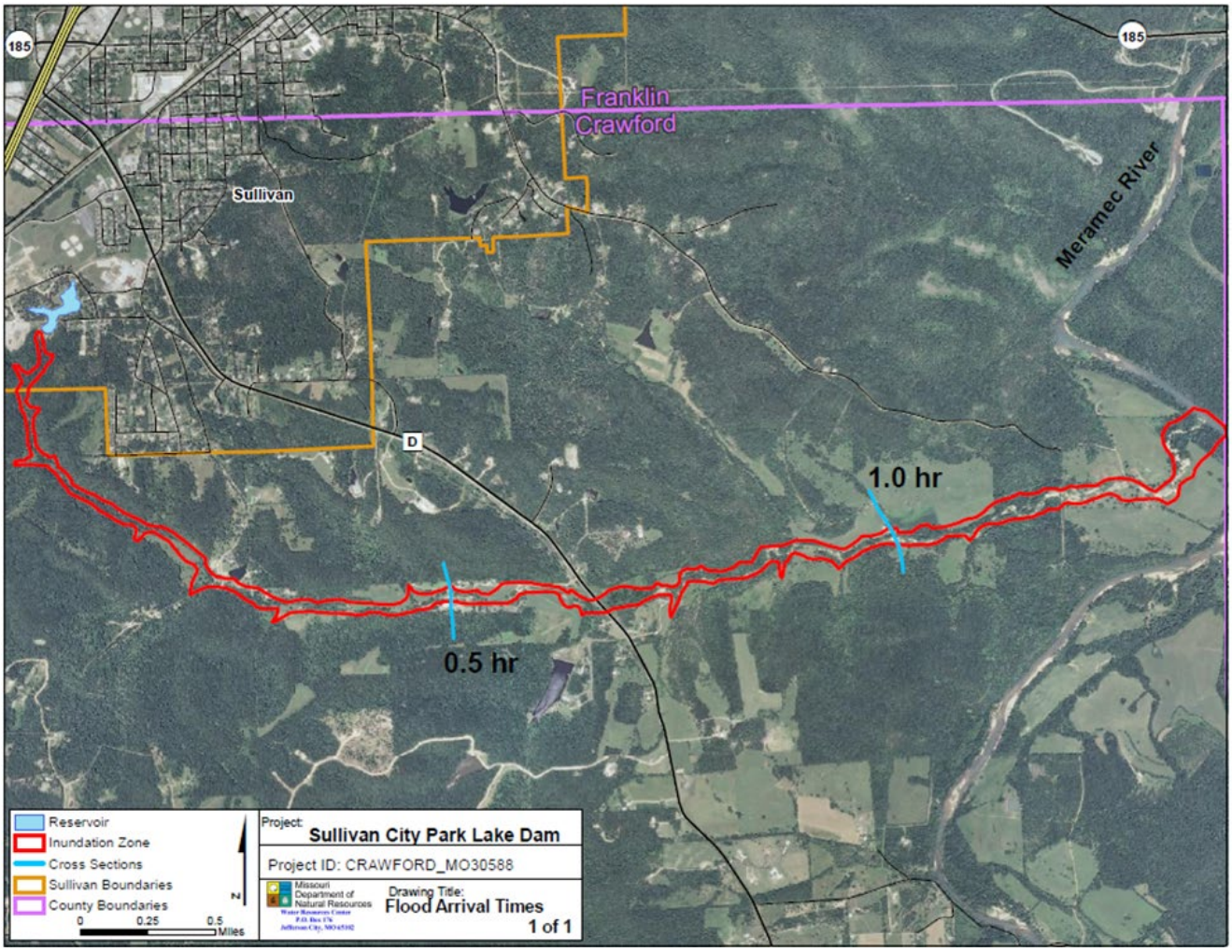


Figure 3.7. Green Dam Inundation Zone

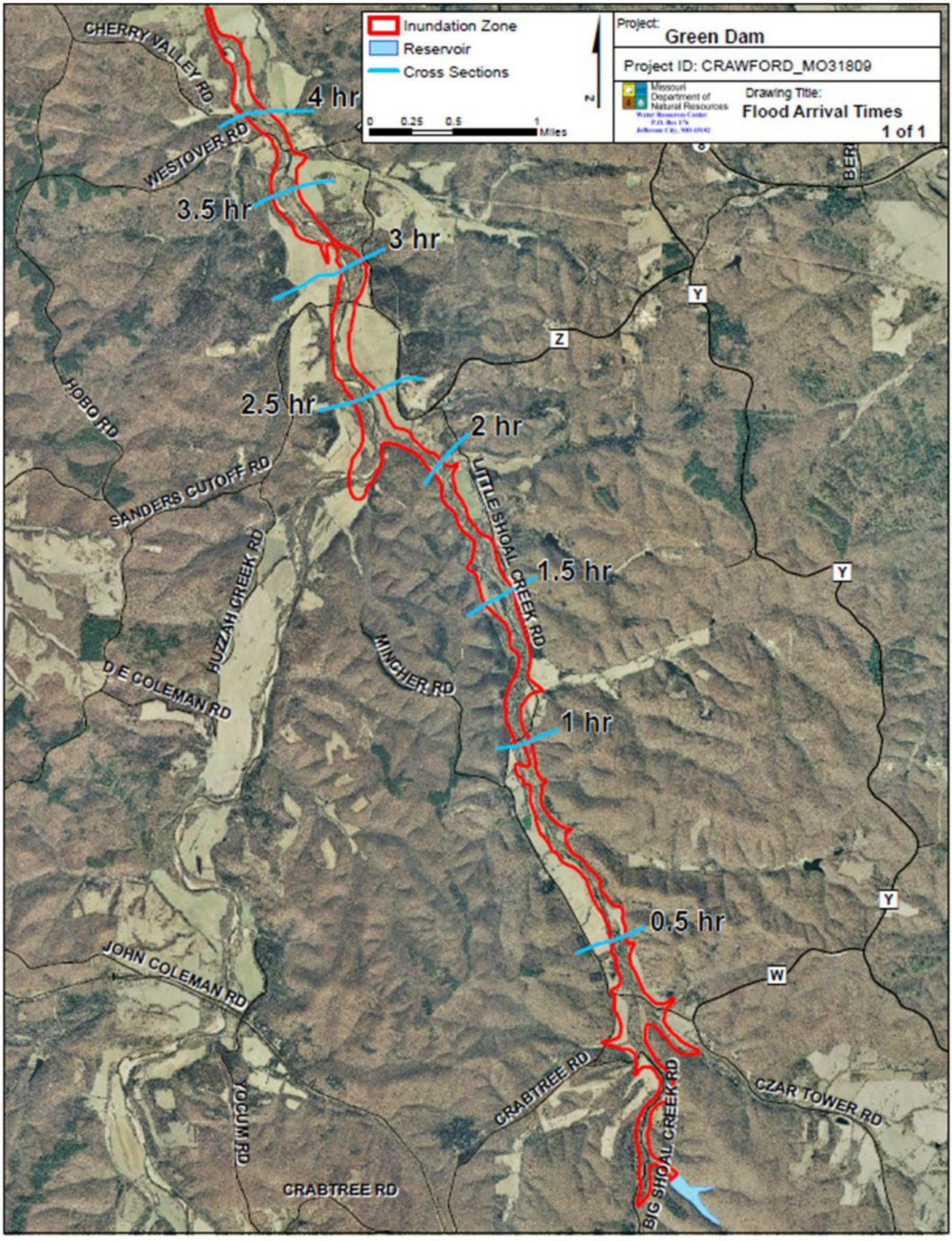


Figure 3.8. Haladale (Pine Lake) Dam Inundation Zone

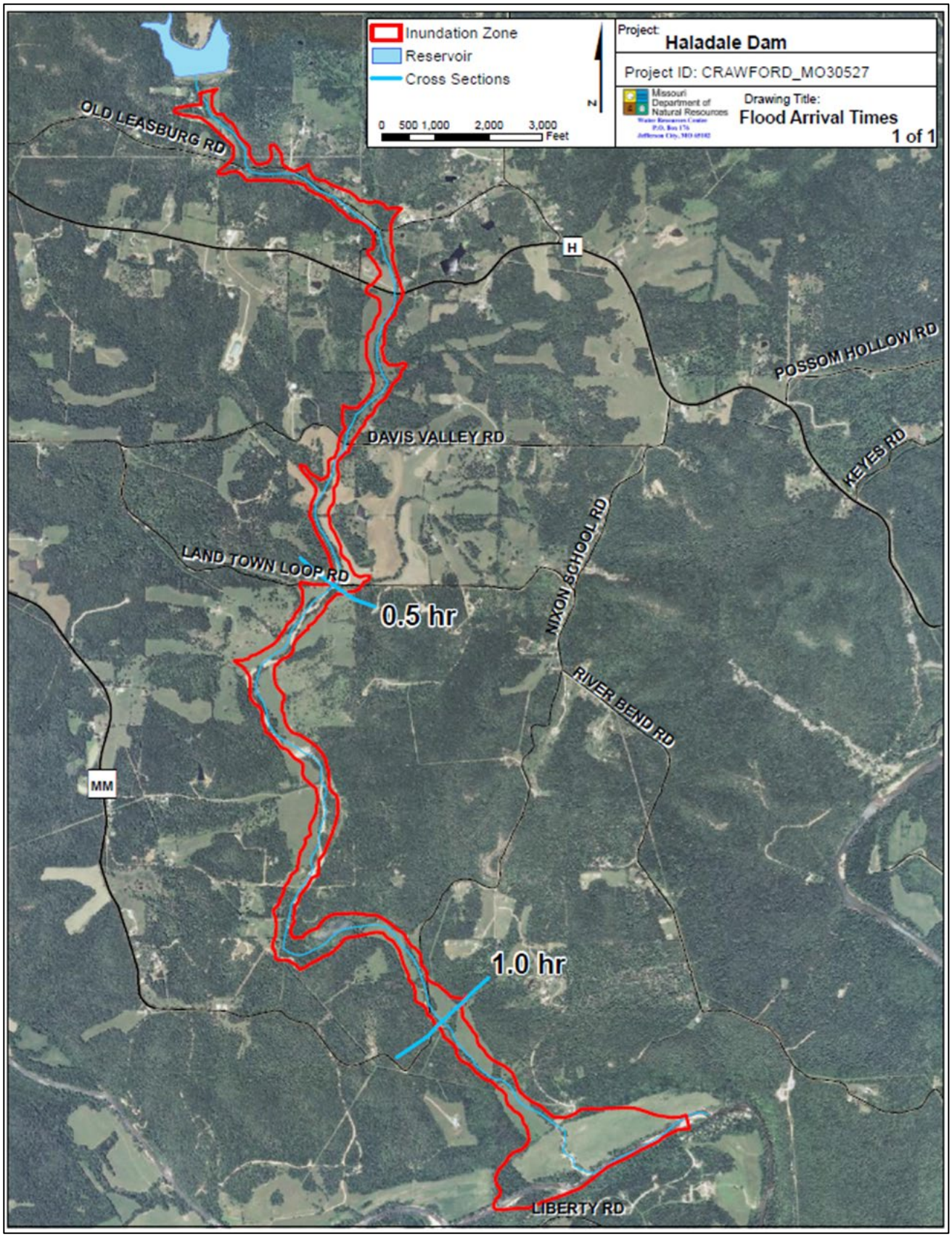
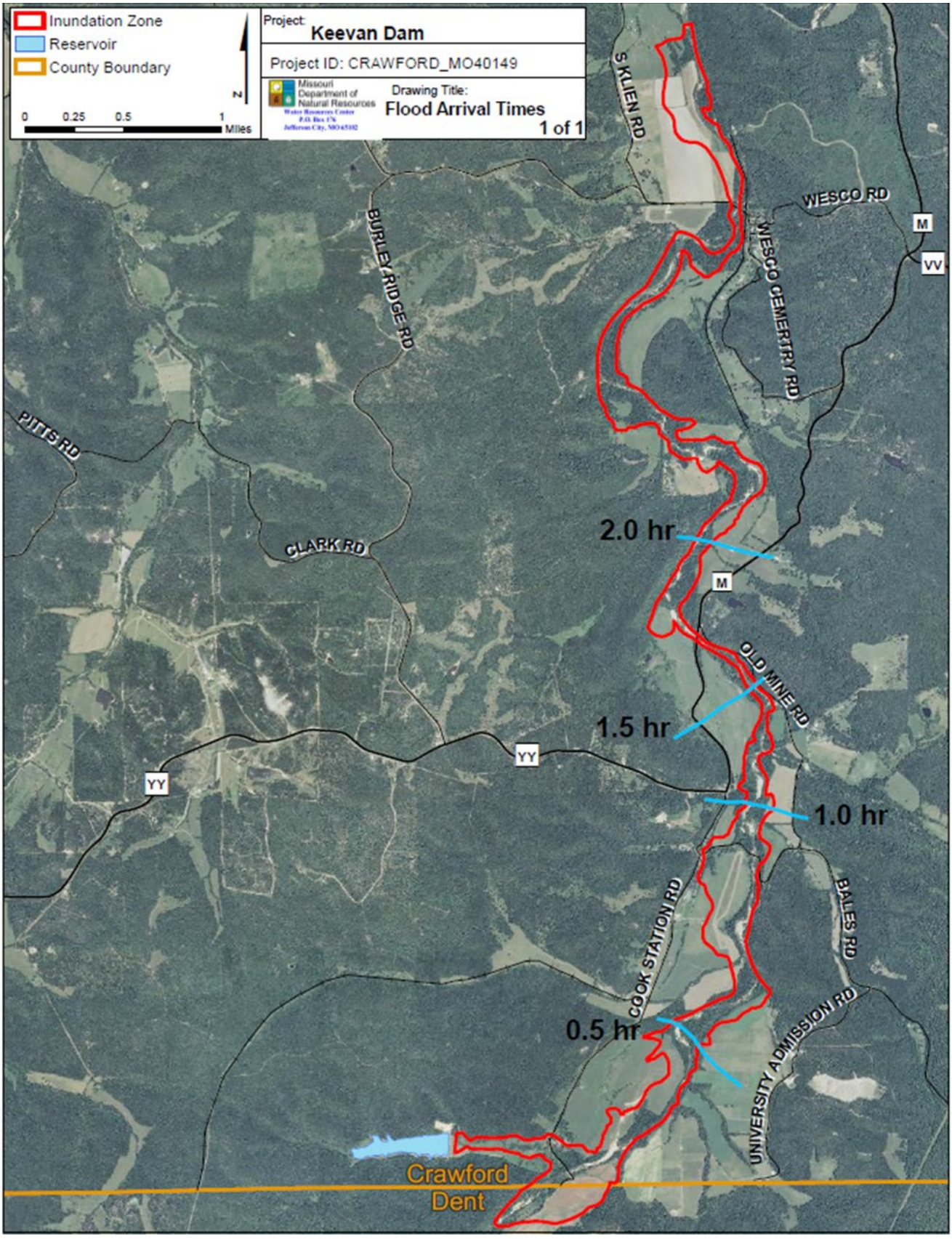


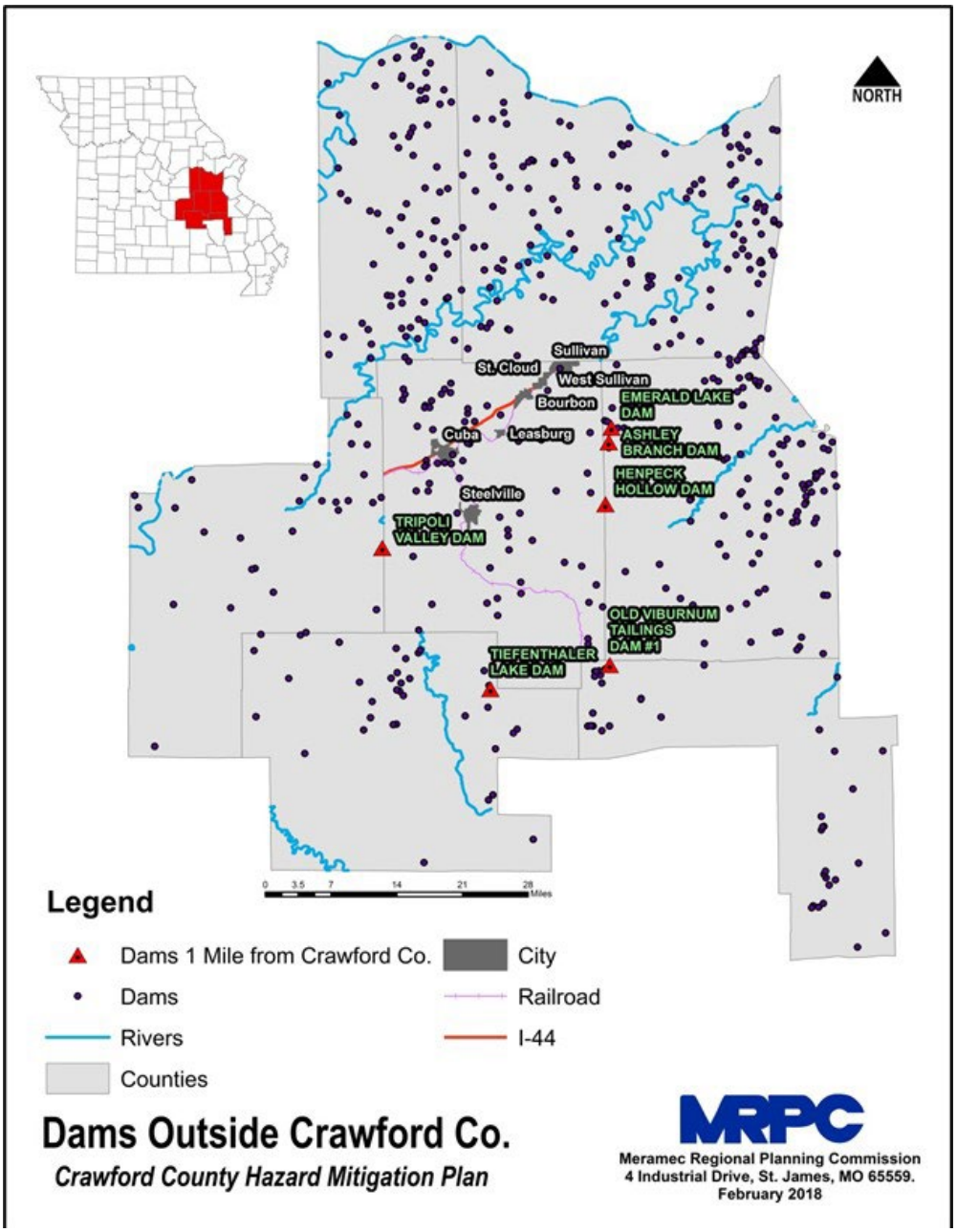
Figure 3.9. Keevan Dam Inundation Zone



Upstream Dams Outside the Planning Area

Figure 3.10 depicts dams outside of Crawford County. Six High Hazard dams (4 regulated) are located within a 1-mile buffer of the county. According to the Missouri Department of Natural Resources, Missouri Geological Survey, Water Resources Center, there is one regulated high hazard dam that would flow into Crawford County from surrounding counties during a failure event; Ashely Branch Dam in Washington County (Regulated, High Hazard, Class 2) resides approximately 0.6 miles from the county (**Figure 3.11**). Additionally, Henpeck Hollow Dam in Washington County (Unregulated, High Hazard, Class 1) resides approximately 151 yards from the county (**Figure 3.12**).

Figure 3.10. Upstream Dams Outside of Crawford County



Source: MSDIS, MRPC

Figure 3.11. Ashely Branch Dam

Figure 3.12. Henpeck Hollow Dam

Strength/Magnitude/Extent

The severity/magnitude of dam failure would be similar in some cases to the impacts associated with flood events (see the flood hazard vulnerability analysis and discussion). Based on the hazard class definitions, failure of any of the High Hazard/Class I dams could result in a serious threat of loss of human life, serious damage to residential, industrial or commercial areas, public utilities, public buildings, or major transportation facilities. Catastrophic failure of any high hazard dams has the potential to result in greater destruction due to the potential speed of onset and greater depth, extent, and velocity of flooding. Worst case scenario would be a catastrophic failure at any of the high hazard class dams designated in **Table 3.18**.

Previous Occurrences

According to Stanford University's National Performance of Dams Program and the Missouri State Emergency Management Agency, there were 86 recorded dam incidents in Missouri between 1917 and 2008. For the 42-year period from 1975 to 2016 for which dam failure statistics are available, 19 dam failures and 68 incidents are recorded. Fortunately, only one drowning has been associated with a dam failure in the state. The problem of unsafe dams in Missouri was underscored by dam failures

at Lawrenceton in 1968, Washington County in 1975, Fredricktown in 1977, and a near failure in Franklin County in 1979. A severe rainstorm and flash flooding in October 1998 compromised about a dozen small, unregulated dams in the Kansas City area. But perhaps the most spectacular and widely publicized dam failure in recent years was the failure of the Taum Sauk Hydroelectric Power Plant Reservoir atop Profitt Mountain in Reynolds County, MO.

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

Despite the significance of the immediate damage done by the Taum Sauk Reservoir dam failure, the incident also highlights the long-term environmental and economic impacts of an event of this magnitude. Four years later, the toll of the flooding and sediment on aquatic life in the park and Black River is still being investigated. Even after the removal of thousands of dump truck loads of debris and mud, the river is still being affected by several feet of sediment left in the park. The local economy, heavily reliant upon the tourism from the park and Black River, has also been hit hard[12].

Event Description

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

Probability of Future Occurrence

Since it is unknown which dams, if any might fail at any given time, determining the probability of future occurrence is not possible[13]. In addition, dam failure within the county has not occurred according to available data.

Changing Future Conditions Considerations

According to the Missouri State Hazard Mitigation Plan, studies have been conducted to investigate the impact of climate change scenarios on dam safety. Dam failure is already tied to flooding and the increased pressure flooding places on dams. The impacts of changing future conditions on dam failure will most likely be those related to changes in precipitation and the likelihood of flooding. Projections of changes in future conditions suggest that precipitation may increase and occur in more extreme events, which may increase risk the flooding, putting stress on dams and increasing the likelihood of dam failure.[i][14]

[10] United States Geological Survey. Damage Evaluation of the Taum Sauk Reservoir Failure using LiDAR. https://www.researchgate.net/publication/268325451_Damage_Evaluation_of_the_Taum_Sauk_Reservoir_Failure_using_LiDAR

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

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

[13] 2018 Missouri State Hazard Mitigation Plan

[14] Ibid.

The safety of dams in the future can be based on an evaluation of changes in design floods and the freeboard available to accommodate an increase in flood levels. The results from the studies indicate that the design floods with the corresponding outflow floods and flood water levels will increase in the future. This increase will affect the safety of the dams in the future. Studies concluded that the total hydrological failure probability of a dam will increase in the future climate and that the extent and depth of flood waters will increase by the future dam break scenario.[15]

Vulnerability

Vulnerability Overview

Data was obtained from the 2018 Missouri State Hazard Mitigation Plan for the vulnerability analysis of dam failure for Crawford County. There are however data limitations regarding dams unregulated by the State of Missouri due to height requirements. These limitations hinder vulnerability analysis; nonetheless, failure potential still exists. **Table 3.19** provides vulnerability analysis data for the failure of State-regulated dams in Missouri.

Table 3.19. Vulnerability Analysis for Failure of State-regulated Dams in Missouri

County	Class 1	Class 2	Class 3	Total	Estimated # of Buildings Vulnerable	Average Exposure Value per Structure ($)	Estimated Total Potential Building Exposure ($)	Estimated Total Population Exposure	Estimated Building Losses ($)
Crawford	1	4	4	9	30	$193,725	$5,811,747	50	$1,162,349

Source: 2018 Missouri State Hazard Mitigation Plan

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

- Class 1 dams: the number of structures in the inundation area was estimated to be 10 or more permanent dwellings or any public building. Inspection of these dams must occur every two years.
- Class 2 dams: the area downstream from the dam that would be affected by inundation contains one to nine permanent dwellings, or one or more campgrounds with permanent water, sewer and electrical services or one or more industrial buildings. Inspection of these dams must occur once every three years.
- Class 3 dams: the area downstream from the dam that would be affected by inundation does

[15] 2018 Missouri State Hazard Mitigation Plan

not contain any of the structures identified for Class 1 or Class 2 dams. Inspection of these dams must occur once every five years.

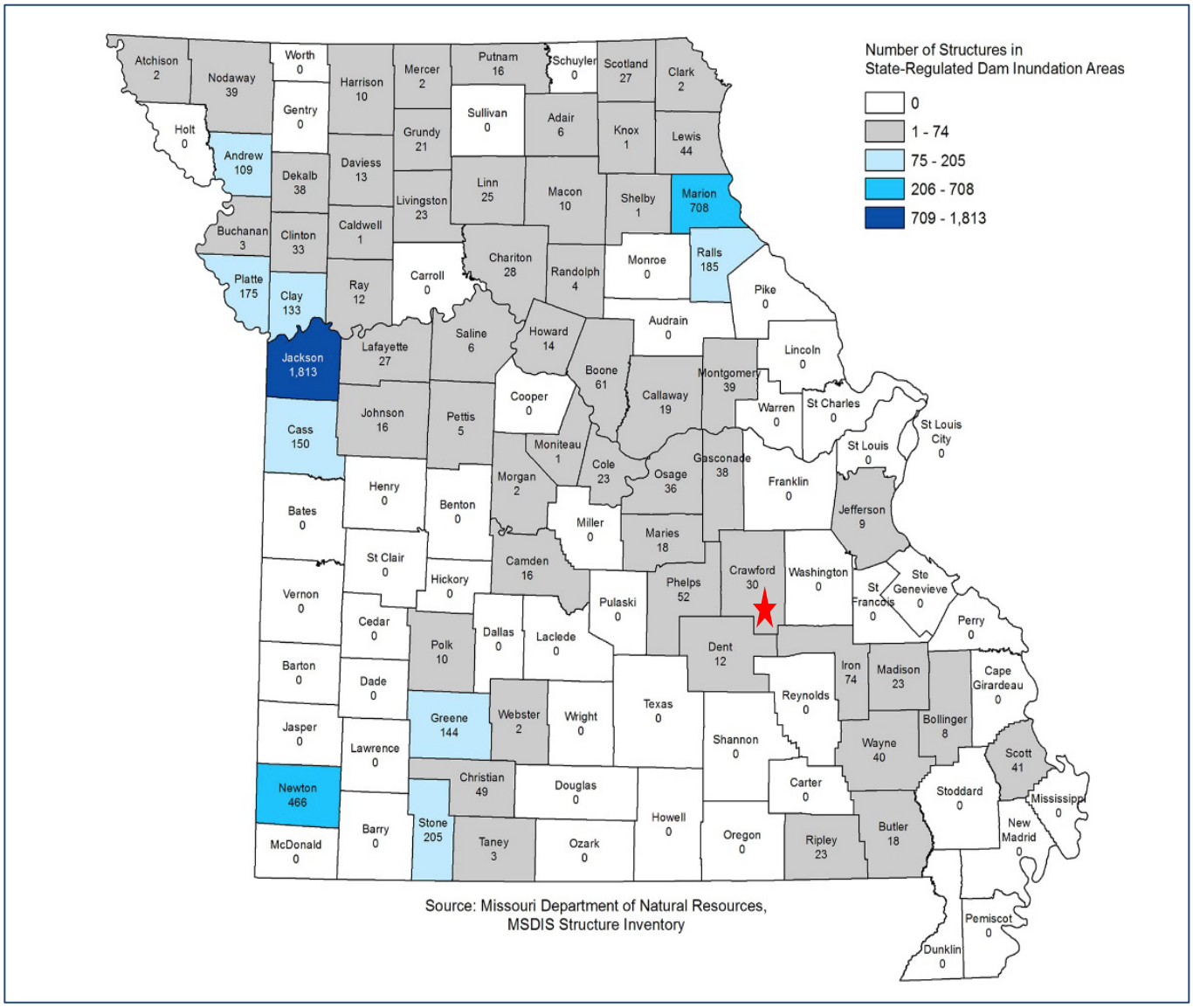
According to the 2018 Missouri State Hazard Mitigation Plan, there is an estimated 30 buildings vulnerable to failure of State-regulated dams (**Figure 3.13**) in Crawford County. Furthermore, the state quantified potential loss estimates in terms of property damages. To execute the analysis, the following assumptions were utilized.

- For State-regulated Class 1 and Class 2 dams that have available inundation maps as well as USACE dams for which inundation maps were made available, GIS comparative analysis was accomplished against the building exposure data to determine the types, numbers and estimated values of buildings at risk to dam failure.
- The building exposure data was based on the structure inventory data layer available from the Missouri Spatial Data Inventory Service (MSDIS). The available dam inundation areas were compared against the structure inventory to determine the numbers and types of structures at risk to dam failure.
- To calculate estimated values of buildings at risk, buildings values available in the HAZUS census block data were used to determine an average value for each property type. This average value per property type was then applied to the number of structures in dam inundation areas by type to calculate an overall estimated value of buildings at risk by type.[16]

Figure 3.14 and **Figure 3.15** depict the total estimated building losses and population exposure by county, respectively. The estimated building losses from failure of State-regulated dams is $1.1 million. The estimated population exposure to failure of State-regulated dams ranges between 1 and 104.

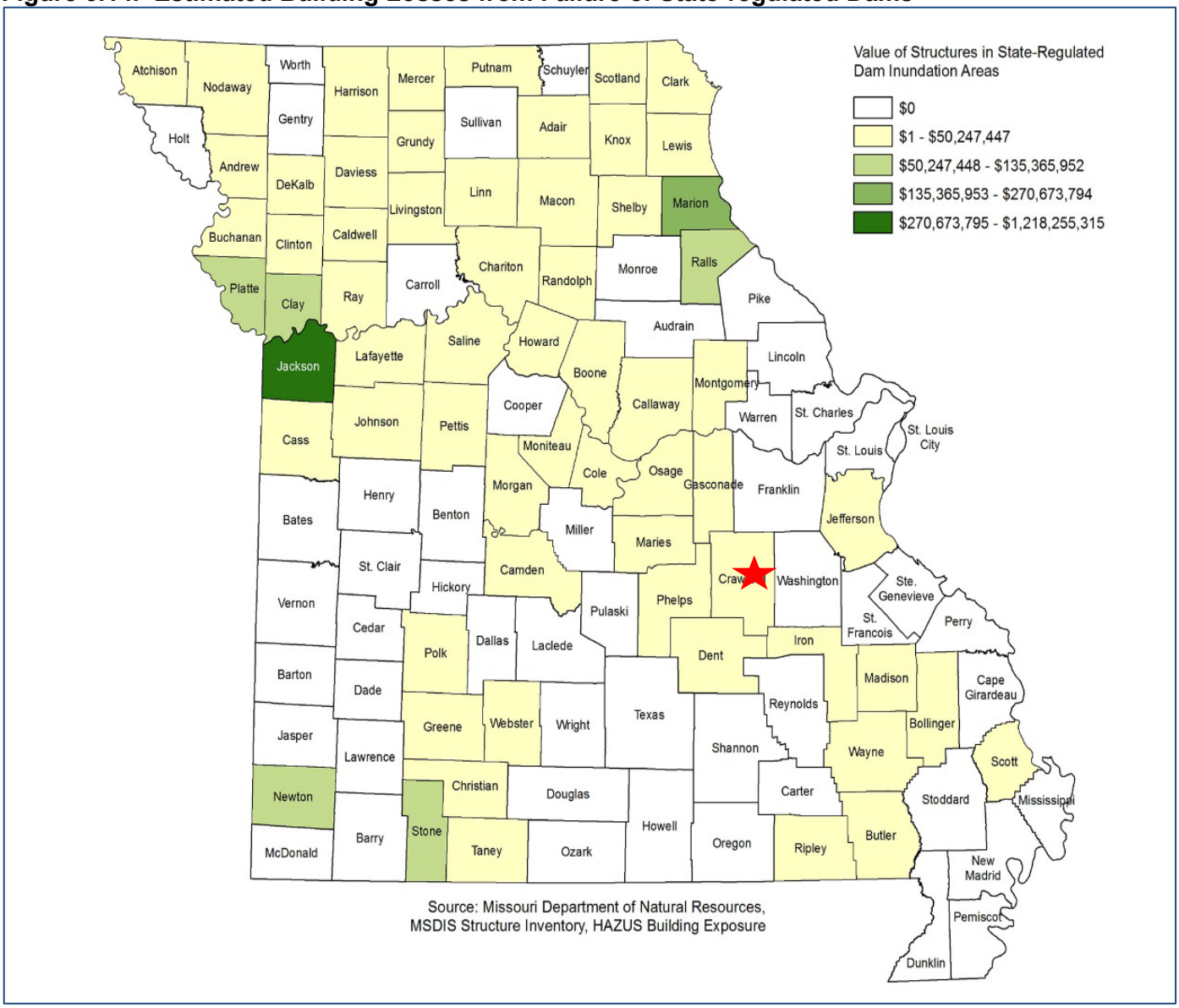
[16] 2018 Missouri State Hazard Mitigation Plan

Figure 3.13. Estimated Number of Buildings Vulnerable to Failure of State-regulated Dams



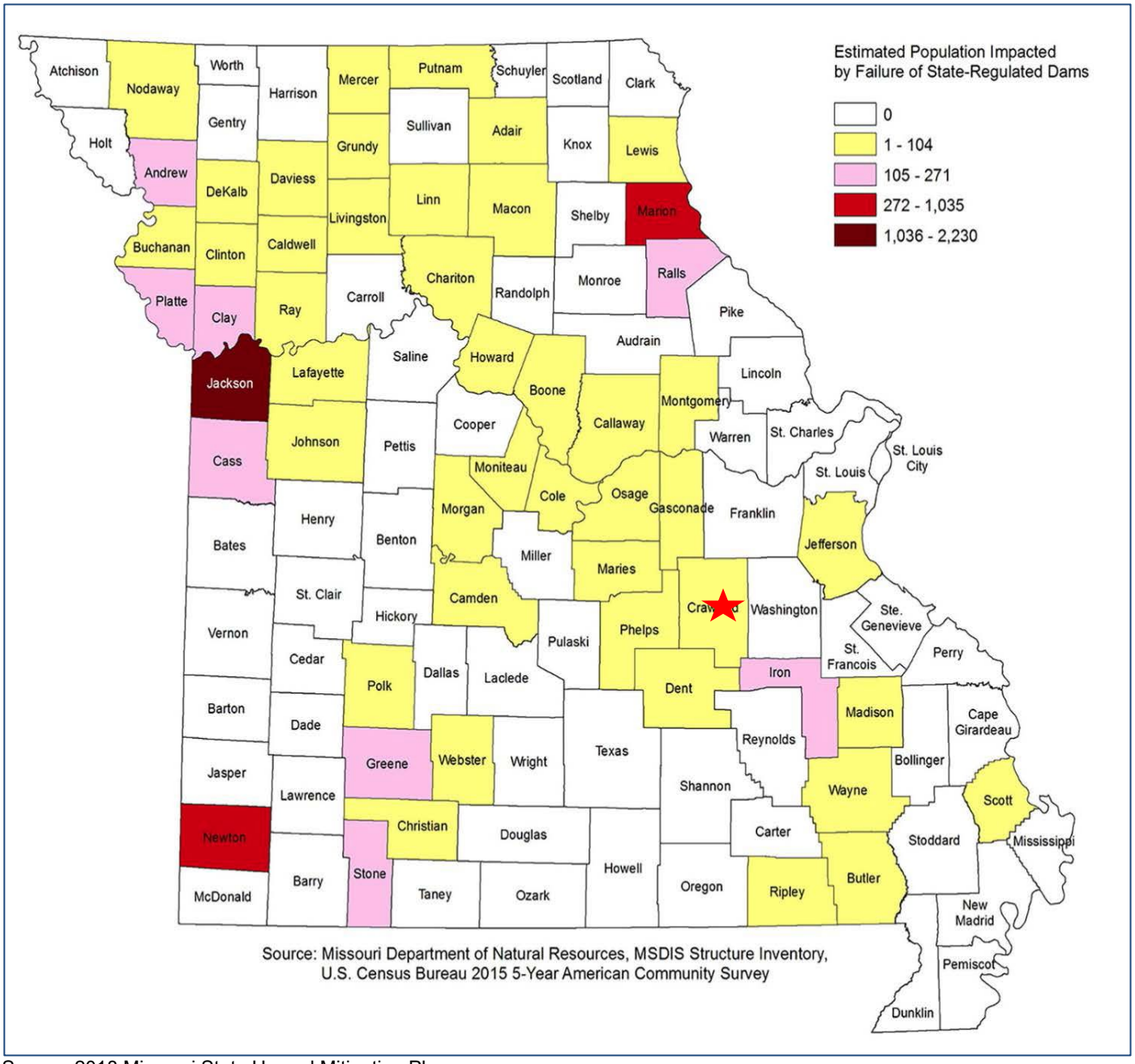
Source: 2018 Missouri State Hazard Mitigation Plan
*Red star indicates Dent County

Figure 3.14. Estimated Building Losses from Failure of State-regulated Dams



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

Figure 3.15. Estimated Population Exposure to Failure of State-regulated Dams



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

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

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

Brummet Lake Dam Downstream Crossings

- Marisa Ln
- Rte. PP
- Lost Acres Ln
- Sunset Ridge Ln
- Lick Creek Rd
- Saranac Springs Rd

Sullivan City Park Lake Dam Downstream Crossings

- Rte. D
- State Hwy 8

Green Dam Downstream Crossings

- Big Shoal Creek Rd
- Little Shoal Creek Rd
- Crabtree Rd
- Huzzah Creek Rd
- Westover Rd

Haladale (Pine Lake) Dam Downstream Crossings

- Old Leasburg Rd
- Old Leasburg Cuttoff
- Rte H
- Davis Valley Rd
- Land Town Loop Rd
- Nixon School Rd

Keevan Dam Downstream Crossings

- Delcour Rd
- Bales Beach Rd
- Bales Rd
- Old Mine Rd
- Rte. M
- Burley Ridge Rd

Impact of Previous and Future Development

Previous and future development within the County that has potential to be influenced by dam failure includes any areas downstream of a dam within the 100 Year Floodplain. No development is planned in any floodplain or areas downstream of dams in the county or cities.

Hazard Summary by Jurisdiction

Variations in vulnerability across the planning area depend upon multiple variables. For example, with just 8 state-regulated dams and 26 NID high hazard dams, conclusions can be drawn that many of the high hazard dams in the county are un-regulated and may not be inspected/maintained appropriately. Nonetheless, Crawford County school districts and special districts do not have assets located in dam breach inundation areas. Rutz Lake Dam in Cuba seems to be most vulnerable to losses during the event of failure due to nearby childcare facilities. Additionally, Kemp Lake Dam would be vulnerable to losses during the event of failure due to nearby Interstate 44.

Problem Statement

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

3.4.2 Drought

Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.6, Page 3.235
- Maps of effects of drought, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln; http://www.drought.unl.edu/.
- Historical drought impacts, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln; at http://droughtreporter.unl.edu/ .
- Recorded low precipitation, NOAA Regional Climate Center, (http://www.hprcc.unl.edu).
- Water shortages, Missouri's Drought Response Plan, Missouri Department of Natural Resources, https://dnr.mo.gov/water/hows-water/state-water/drought
- Populations served by groundwater by county, USGS-NWIS, http://maps.waterdata.usgs.gov/mapper/index.html
- Census of Agriculture, https://agcensus.library.cornell.edu/census_parts/2012-missouri/
- USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/en/Information-Tools/Summary-of-Business/Cause-of-Loss
- Natural Resources Defense Council, http://www.nrdc.org/globalWarming/watersustainability/
- Missouri Department of natural Resources (MDNR), Drought News, Conditions and Resources
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
    - Vulnerability to drought by County
    - Crop insurance claims due to drought by County

Hazard Profile

Hazard Description

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

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

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

- Agricultural drought focus is on soil moisture deficiencies, differences between actual and potential evaporation, reduced ground water or reservoir levels, etc. Plant demand for water depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil.
- Socioeconomic drought refers to when physical water shortage begins to affect people[17] - which impacts supply and demand of some economic commodity.

Geographic Location

All areas and jurisdictions in Crawford County are susceptible to drought, but particularly cities where thousands of residents are served by the same source of water. These cities use deep hard rock wells that are 1,100 to 1,800 feet deep and can experience drought when recharge of these wells is low. The majority of individuals living in Crawford County rely on groundwater resources for drinking water. Approximately 34% of the land in the county is utilized for agricultural purposes. Furthermore, livestock sales comprise 75% of the market of agricultural products sold in Crawford County. A drought would directly impact livestock production and the agriculture economy in Crawford County[18].

Strength/Magnitude/Extent

The National Drought Monitor Center at the University of Nebraska at Lincoln summarized the potential severity of drought as follows. Drought can create economic impacts on agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to losses in yields in crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and disease to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn place both human and wildlife populations at higher levels of risk. Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Finally, while drought is rarely a direct cause of death, the associated heat, dust and stress can all contribute to increased mortality[19].

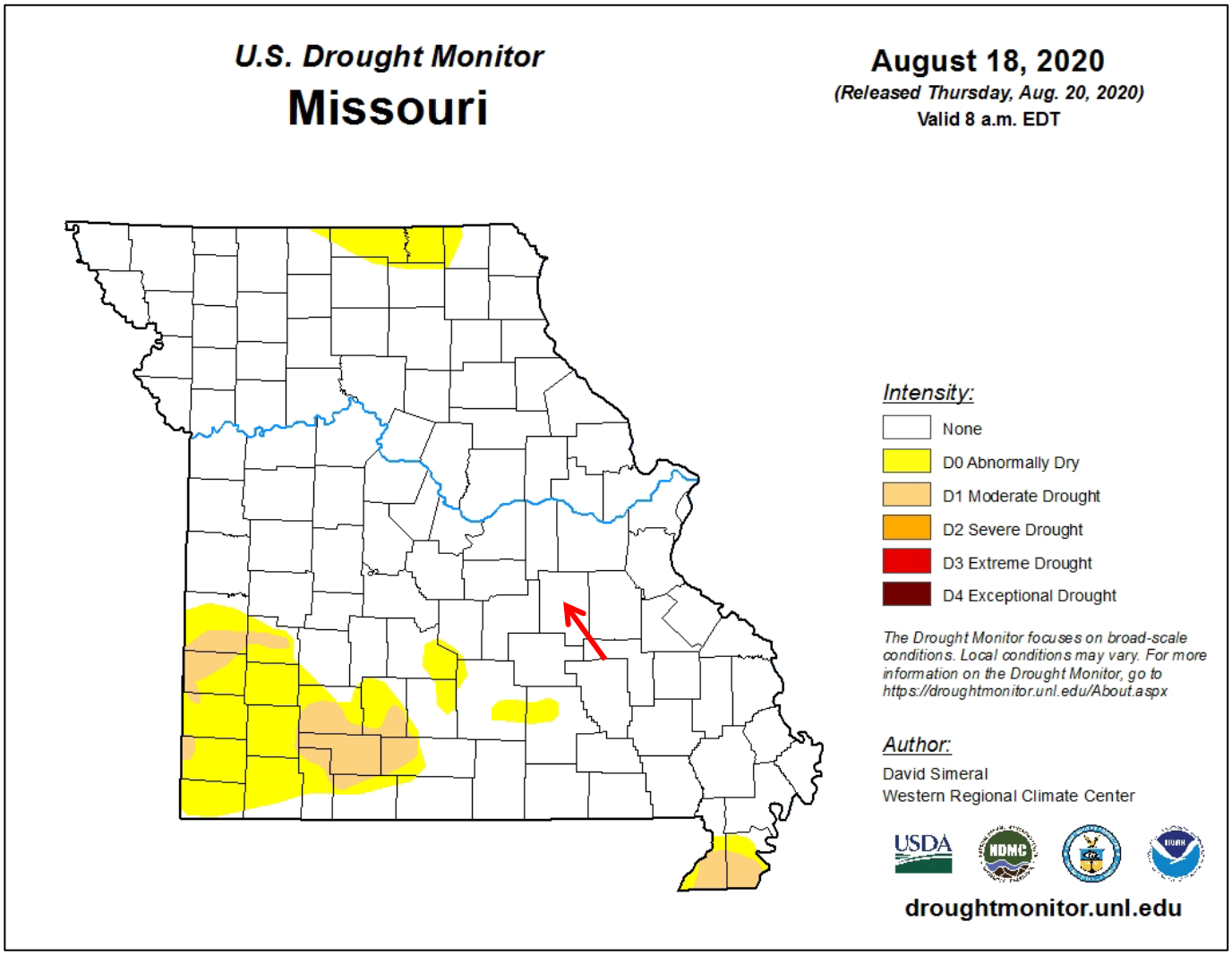
Figure 3.16 depicts a U.S. Drought Monitor map of Missouri on August 18, 2020. This map illustrates the planning area, which could be in drought at any given moment in time. A red arrow indicates the location of the planning area (Crawford County).

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

[18] https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/2/table/1/state/MO/county/055/year/2017

[19] https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/2/table/1/state/MO/county/055/year/2017

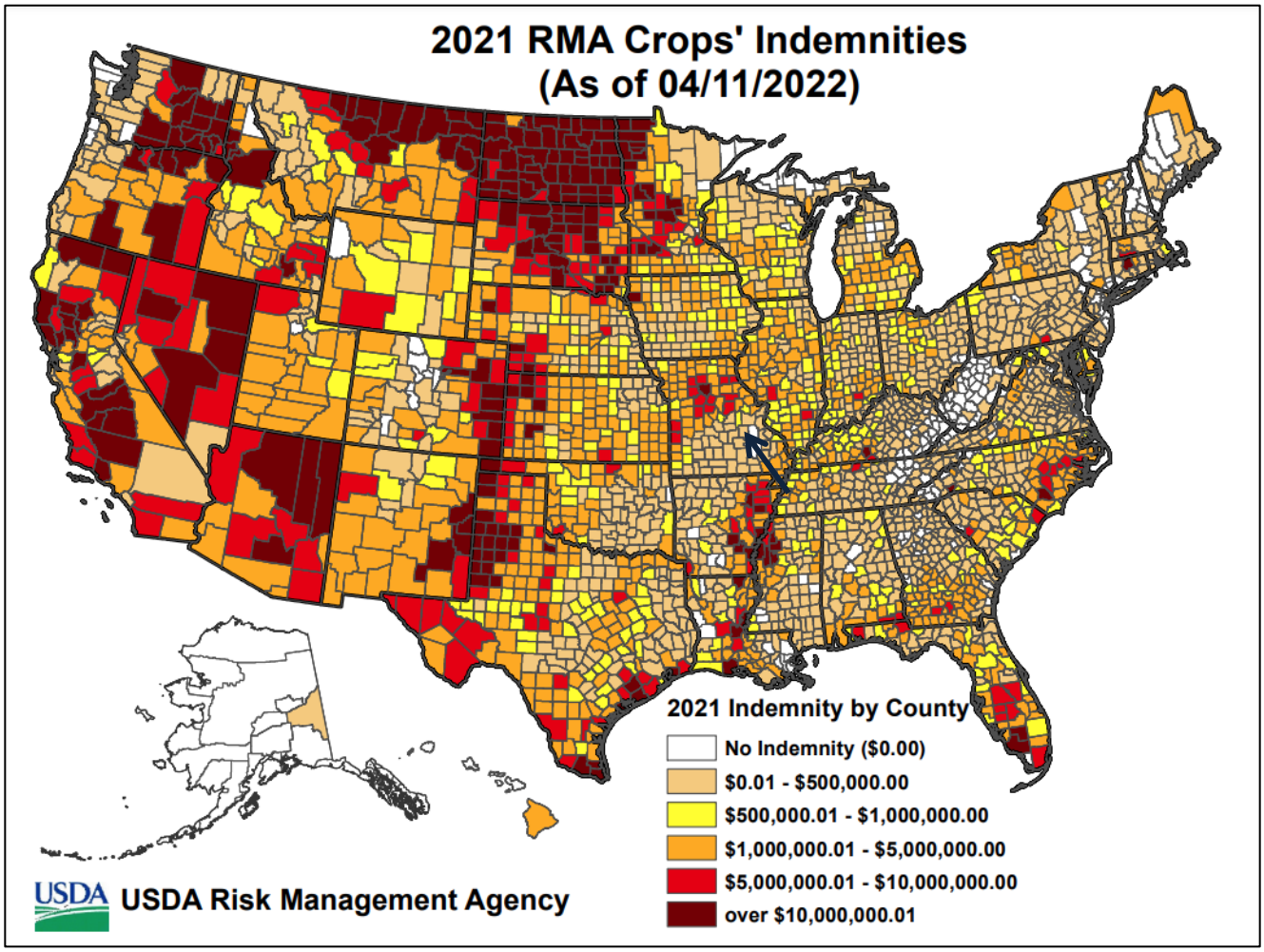
Figure 3.16. U.S. Drought Monitor Map of Missouri on August 18, 2020



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

Figure 3.17 illustrates RMA crop indemnities for 2021 across the United States. Crawford County fell in the $0.01-500,000 category for crop indemnities.

Figure 3.17. 2021 RMA Crop Indemnities for the United States



Source: https://www.rma.usda.gov/-/media/RMA/Maps/Total-Crop-Indemnity-Maps/Crop-Year-2021/041122map.ashx
*Black arrow indicates Crawford County

According to the USDA's Risk Management Agency, there have been 9 crop insurance payments due to drought in Crawford County since 2001, totaling $257,768.80. **Table 3.20** illustrates the year, number of payments, and total amount of crop insurance payments.

Table 3.20. Crawford County Crop Indemnity Payments (2001-2020)

Year	Number of Payments	Total
2001	-	-
2002	-	-
2003	-	-
2004	-	-
2005	-	-
2006	-	-
2007	-	-
2008	-	-

Year	Number of Payments	Total
2009	-	-
2010	-	-
2011	-	-
2012	4	$240,520.00
2013	-	-
2014	2	$4,773.00
2015	-	-
2016	-	-
2017	1	$4,544.00
2018	1	$3,652.80
2019	-	-
2020	1	$4,279.00
TOTAL	**9**	**$257,768.80**

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

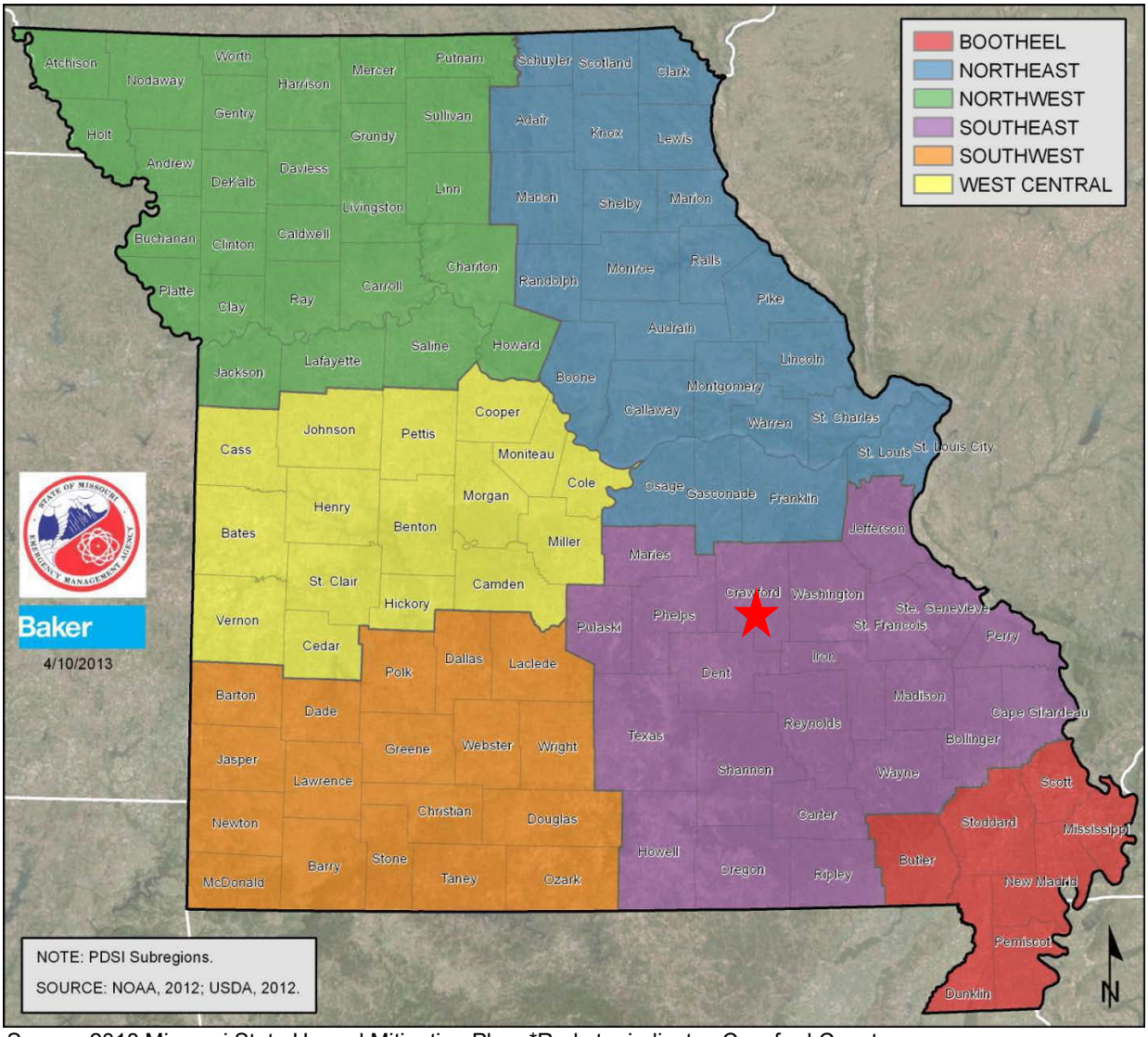
The Palmer Drought Indices measure dryness based on recent precipitation and temperature. The indices are based on a "supply-and-demand model" of soil moisture. Calculation of supply is relatively straightforward, using temperature and the amount of moisture in the soil. However demand is more complicated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

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

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

Figure 3.18 illustrates the Palmer Drought Severity Index sub-regions of Missouri. Crawford County is categorized under the Southeast sub-region.

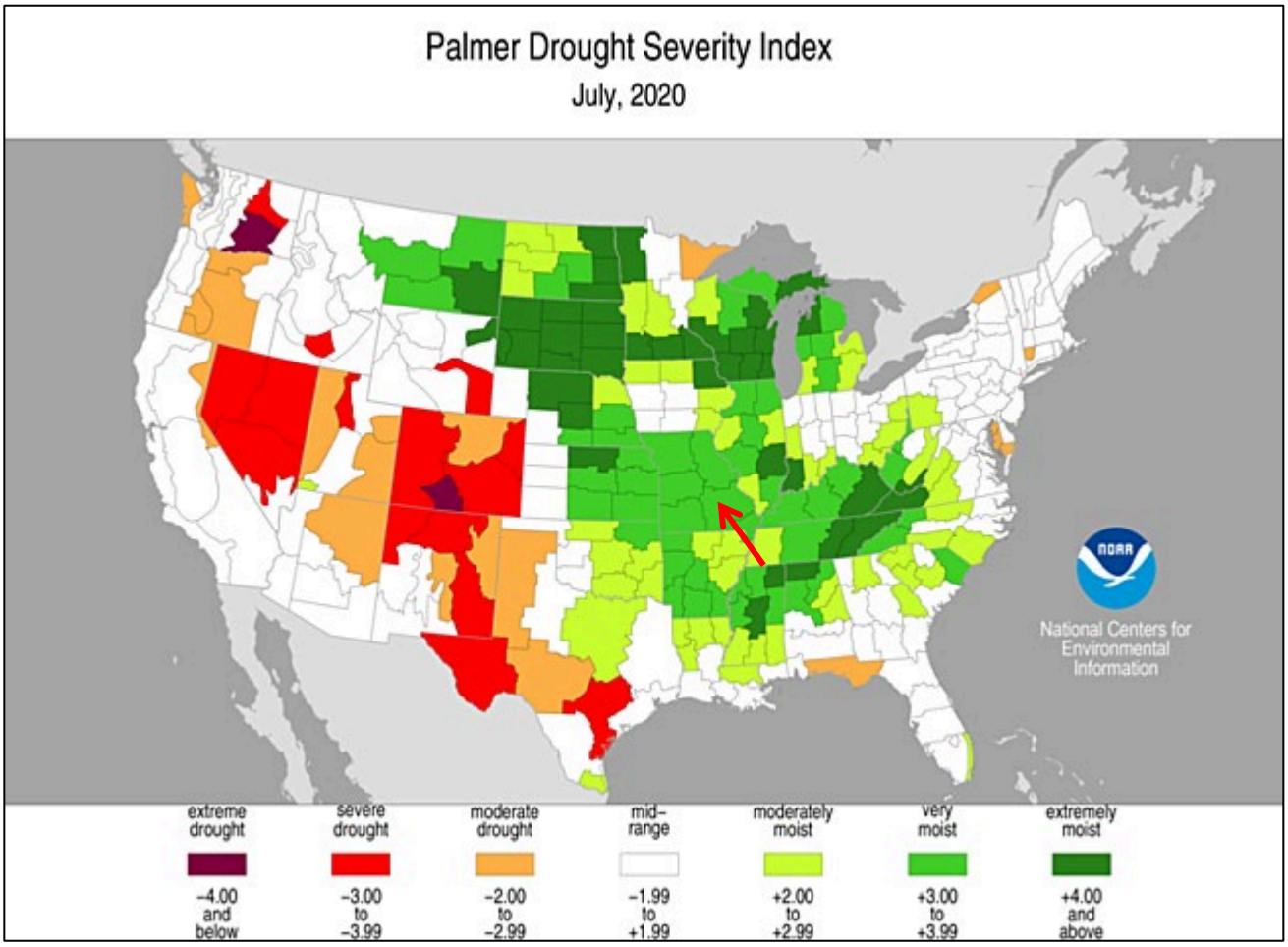
Figure 3.18. Palmer Drought Severity Index: Missouri Sub-regions



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

Figure 3.19 is an example of the Palmer Modified Drought Index for the United States on July, 2020.

Figure 3.19. Palmer Modified Drought Index National Map July, 2020



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

Data was collected from the Missouri Department of Natural Resources (2021 Census of Missouri Public Water Systems) to determine water source by jurisdiction. Crawford County and the cities of Bourbon, Cuba, Leasburg, Steelville, and Sullivan utilize well water as their sole source of water (**Table 3.21**). Communities that exclusively depend upon ground water could experience hardship in the event of a long term drought.

Table 3.21. 2020 Water Source by Jurisdiction

Jurisdiction	% of source that is groundwater
Crawford County	100
Bourbon	100
Cuba	100
Leasburg	100
Steelville	100
Sullivan	100

Source: Missouri Dept. of Natural Resources, 2022 Census of Missouri Public Water Systems

Previous Occurrences

Table 3.22 offers Palmer Drought Severity Index data for Crawford County between 2011 and 2020. This information exemplifies drought conditions on a monthly basis for Missouri's Southeast sub-region within the United States.

Table 3.22. Palmer Drought Severity Index for Crawford County, MO (2011 – 2020)

	Year									
Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Jan.	Extremely moist	Mid-range	Mid-range	Moderate Drought	Moderately moist	Extremely moist	Mid-range	Moderate drought	Mid-range	Extremely moist
Feb.	Extremely moist	Mid-range	Mid-range	Moderate Drought	Moderately moist	Very moist	Mid-range	Mid-range	Moderately moist	Very moist
March	Extremely moist	Mid-range	Mid-range	Moderate Drought	Mid-range	Very moist	Mid-range	Mid-range	Moderately moist	Very moist
April	Very moist	Mid-range	Moderately moist	Mid-range	Mid-range	Moderately moist	Mid-range	Mid-range	Moderately moist	Very moist
May	Very moist	Mid-range	Very moist	Mid-range	Mid-range	Moderately moist	Mid-range	Mid-range	Very moist	Very moist
June	Very moist	Moderate drought	Very moist	Mid-range	Very moist	Mid-range	Mid-range	Mid-range	Very moist	Very moist
July	Mid-range	Severe drought	Mid-range	Mid-range	Extremely moist	Mid-range	Mid-range	Moderate drought	Very moist	Very moist
Aug.	Mid-range	Extreme drought	Mid-range	Mid-range	Extremely moist	Very moist	Mid-range	Mid-range	Extremely moist	Very moist
Sept.	Mid-range	Severe drought	Mid-range	Moderately moist	Very moist	Very moist	Mid-range	Mid-range	Very moist	Very moist
Oct.	Moderate drought	Severe drought	Mid-range	Very moist	Moderately moist	Moderately moist	Mid-range	Mid-range	Very moist	Moderately moist
Nov.	Mid-range	Severe drought	Mid-range	Very moist	Very moist	Mid-range	Mid-range	Mid-range	Very moist	Moderately moist
Dec.	Mid-range	Severe drought	Moderate drought	Moderately moist	Extremely moist	Mid-range	Moderate drought	Mid-range	Very moist	Mid-range

Source: https://www.ncei.noaa.gov/access/monitoring/historical-palmers/maps/psi/201101-202012

Probability of Future Occurrence

To calculate the probability of future occurrence of drought in Crawford County, historical climate data was analyzed. There were 32 months of recorded drought (**Table 3.23**) over a 20-year span (January, 2001 to December, 2020). The number of months in drought (32) was divided by the total number of months (240) and multiplied by 100 for the annual average percentage probability of drought (**Table 3.24**). Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increase change of drought.

Table 3.23. Palmer Drought Severity Index for Crawford County, MO (2001 – 2020)

	Year											
Month	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
2001												
2002												
2003	x	x	x									
2004												
2005							x				x	x
2006	x	x	x	x	x	x	x	x	x			
2007										x	x	
2008												
2009												
2010												
2011										x		
2012						x	x	x	x	x	x	x
2013												x
2014	x	x	x									
2015												
2016												
2017												x
2018	x						x					
2019												
2020												

Source: https://www.ncei.noaa.gov/access/monitoring/historical-palmers/maps/psi/200101-202012
*x indicates drought

Table 3.24. Annual Average Percentage Probability of Drought in Crawford County, MO

Location	Annual Avg. % P of Drought
Crawford County	13.3%

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

Changing Future Conditions Considerations

According to the 2018 Missouri Hazard Mitigation Plan, severe drought is a natural part of Missouri's climate and is a risk to agriculture. Future increases in evaporation rates due to higher temperatures may increase the intensity of naturally occurring droughts. Although it is believed that springs will be wetter, summer droughts are likely to be more severe. Higher evaporation and lower summer rainfall are likely to reduce river flows. The number of heavy rainfall events is predicted to increase, with the overall total rainfall amounts to remain the same. This indicates that there will be periods of heavy rainfall followed by longer periods of dry days. Higher temperatures and increased evapotranspiration increase the likelihood of drought and its negative impact on agriculture.[20]

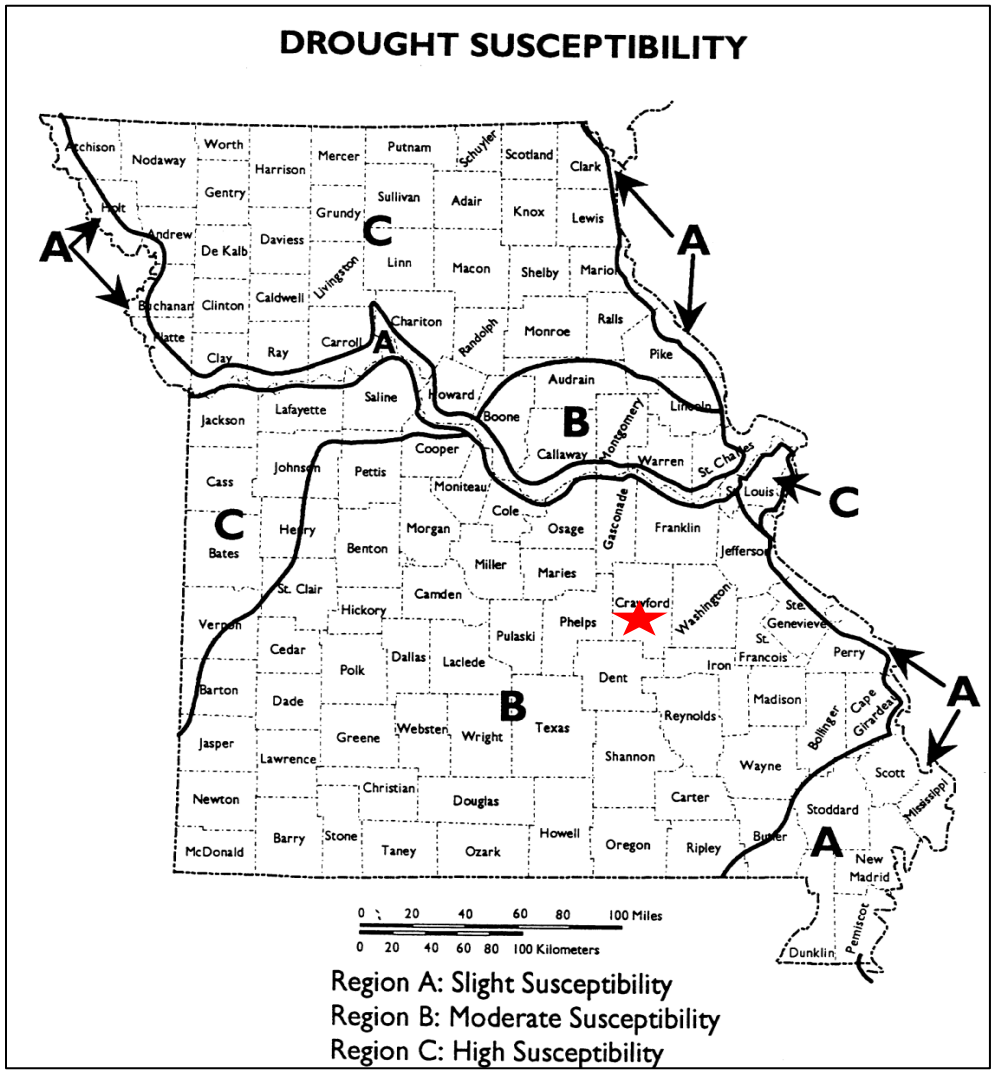
Vulnerability

Vulnerability Overview

Data was obtained from the 2018 Missouri State Hazard Mitigation Plan for the drought vulnerability analysis. **Table 3.25** depicts the ranges for drought vulnerability factor ratings created by SEMA. The array ranges between 1 (low) and 5 (high). The factors considered include social vulnerability, crop exposure ratio, annualized crop claims paid and likelihood of occurrence. Once the ranges were determined and applied to all factors considered in the analysis, the ratings were combined to determine an overall vulnerability rating for drought. Crawford County is determined as having a low vulnerability to crop loss (**Table 3.26**) as a result of a drought. Additionally, SEMA has divided the State into 3 regions in regards to drought susceptibility (**Figure 3.20**). Crawford County is included in Region B (Moderate Susceptibility). Region B is described as having groundwater sources that are suitable in meeting domestic and municipal water needs, but due to required well depths, irrigation wells are very expensive. Also, the topography is commonly unsuitable for row-crop irrigation[21].

[20] 2018 Missouri State Hazard Mitigation Plan
[21] 2018 Missouri State Hazard Mitigation Plan

Figure 3.20. Drought Susceptibility in Missouri



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

Table 3.25. Ranges for Drought Vulnerability Factor Ratings

Factors Considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Social Vulnerability Index	1	2	3	4	5
Crop Exposure Ratio Rating	$866,000 - $10,669,000	$10,669,001 - $33,252,000	$33,252,001 - $73,277,000	$73,277.001 - $155,369,000	$155,369,001 - $256,080,000
Annualized USDA Crop Claims Paid	<$340,000	$340,000 - $669,999	$670,000 – $999,999	$1M - $1,299,999	>$1,300,000
Likelihood of Occurrence of Severe or Extreme Drought	1-1.9%	2-3.9%	4-5.9%	6-8.9%	9-10.72%
Total Drought Vulnerability Rating	7-8	9-10	11-12	13-14	15-17

Source: 2018 Missouri State Hazard Mitigation Plan

Table 3.26. Vulnerability of Crawford County to Drought

SOVI index rating	USDA RMA Total Drought Crop Claims	Avg Annualized Crop Claims	USDA Claims Rating	2012 Crop Exposure	Crop Exposure Rating	Likelihood of severe drought %	Drought occurrence rating	Total Rating	Total rating (text) drought
2	$245,293	$27,255	1	$3,112,000	1	6.42	4	8	Low

Source: 2018 Missouri State Hazard Mitigation Plan

Potential Losses to Existing Development

Drought is not limited to a hazard that affects just agriculture but can extend to encompass the nation's whole economy. Its impact can adversely affect a small town's water supply, the corner grocery store, commodity markets, or tourism. Additionally, extreme droughts have the ability to damage roads, water mains, and building foundations. On average, drought costs the U.S. economy about $7 billion to $9 billion a year, according to the National Drought Mitigation Center. Moreover, drought prone regions are also prone to increased fire hazards[22].

Impact of Future Development

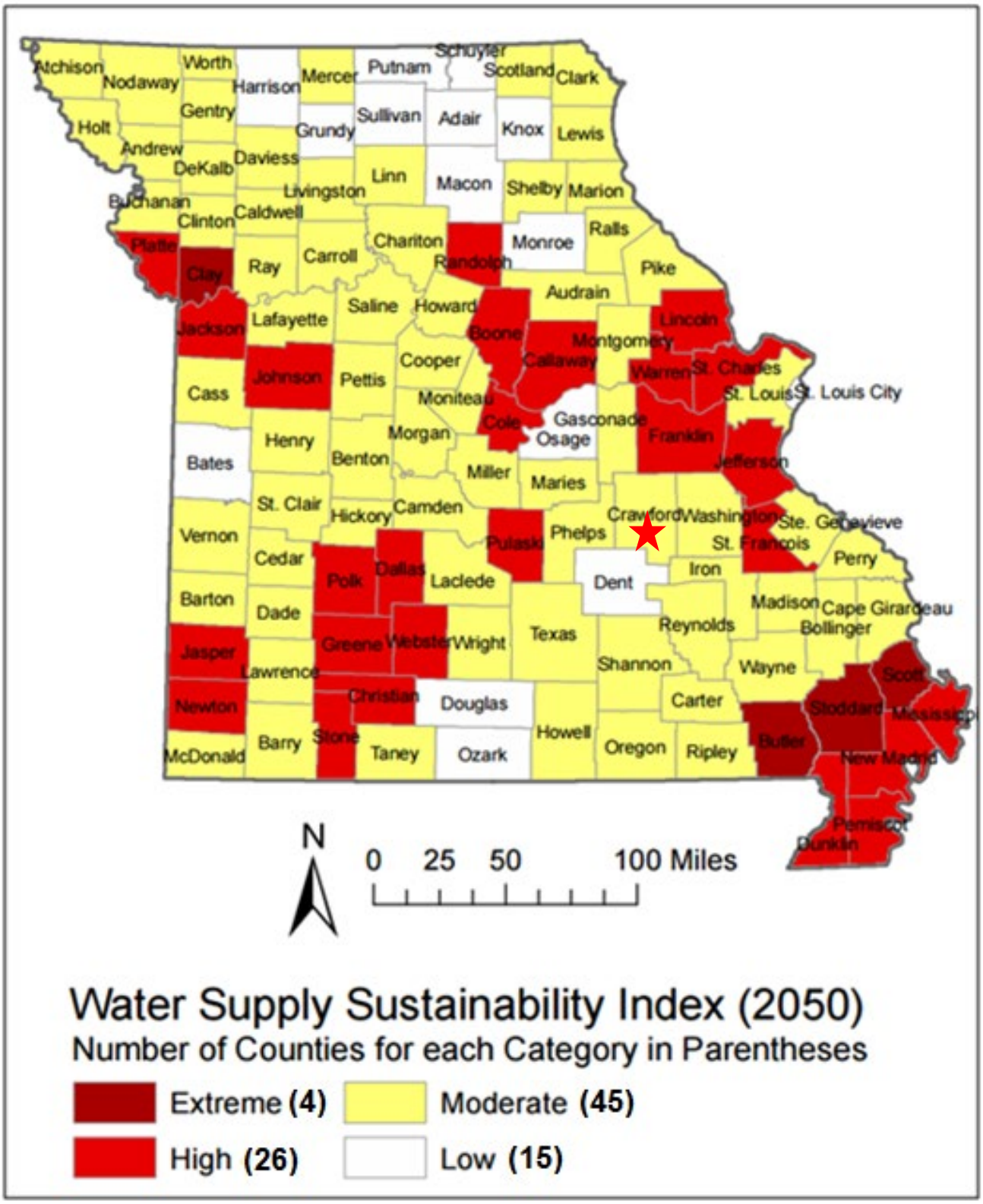
Impacts of drought on future development within Crawford County would be negligible. Population projections as provided by the Missouri Office of Administration suggest that Crawford County will increase by approximately 4,000 individuals by 2030[23]. Moreover, with an increasing population, water use and demand would be expected to increase as well; potentially straining the water supply systems. Long term drought could expose vulnerabilities during construction/upgrades of water distribution and sewer infrastructures. Furthermore, any agriculture related development in terms of crop or livestock production would also be at risk.

Impact of Climate Change

A new analysis, performed for the Natural Resources Defense Council, examined the effects of climate change on water supply and demand in the contiguous United States. The study found that more than 1,100 counties will face higher risks of water shortages by mid-century as a result of climate change. Two of the principal reasons for the projected water constraints are shifts in precipitation and potential evapotranspiration (PET). Climate models project decreases in precipitation in many regions of the U.S., including areas that may currently be described as experiencing water shortages of some degree. Crawford County is predicted to experience moderate water shortages as a result of global warming (**Figure 3.21**) by the year 2050.

[22] https://drought.unl.edu/
[23] Missouri Office of Administration https://mcdc.missouri.edu/applications/MO-county-factsheets/?c=29055

Figure 3.21. Water Supply Sustainability Index (2050) with Climate Change Impacts



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

Hazard Summary by Jurisdiction

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

Problem Statement

In summary, drought within Crawford County is considered low risk. Climate change predictions suggest moderate risks by the year 2050. Crawford County has some agricultural economy. Drought would impact commodities, specifically livestock and crops. Potential impacts to local economies and infrastructures are foreseeable in the event of a long-term drought.

The county and all cities should develop water monitoring plans as an early warning system. Each sector should inventory and review their groundwater operation plans. A water conservation awareness program should be presented to the public either through pamphlets, workshops or a drought information center. Voluntary water conservation should be encouraged to the public. The county and both cities should continually look for and fund water system improvements, new systems, and new wells.

3.4.3 Earthquakes

Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.4, Page 3.192
- U.S. Seismic Hazard Map, United States Geological Survey, https://www.usgs.gov/programs/earthquake-hazards/maps;
- Impact of Earthquakes on the Central USA http://www.cusec.org/documents/aar/NMSZ_CAT_PLANNING_SCENARIO.pdf
- Missouri Hazard Mitigation Viewer http://bit.ly/MoHazardMitigationPlanViewer2018 - Website https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Total population impacted by earthquakes by County
  - Total number of structures impacted by earthquakes by County
  - Total value of structures impacted by earthquakes by County
  - Property loss ratio to earthquakes by County
- 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone map, https://iowageologicalsurvey.org/;
- Facts about the New Madrid Seismic Zone, https://dnr.mo.gov/land-geology/hazards/earthquakes/science/facts-new-madrid-seismic-zone

Hazard Profile

Hazard Description

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

The closest fault to Crawford County is the New Madrid Seismic Zone (NMSZ). The NMSZ is the most active seismic area in the United States east of the Rocky Mountains. Unfortunately, the faults in the NMSZ are poorly understood due to concealment by alluvium deposits. Moreover, the NMSZ is estimated to be 30 years overdue for a 6.3 magnitude earthquake[24].

Geographic Location

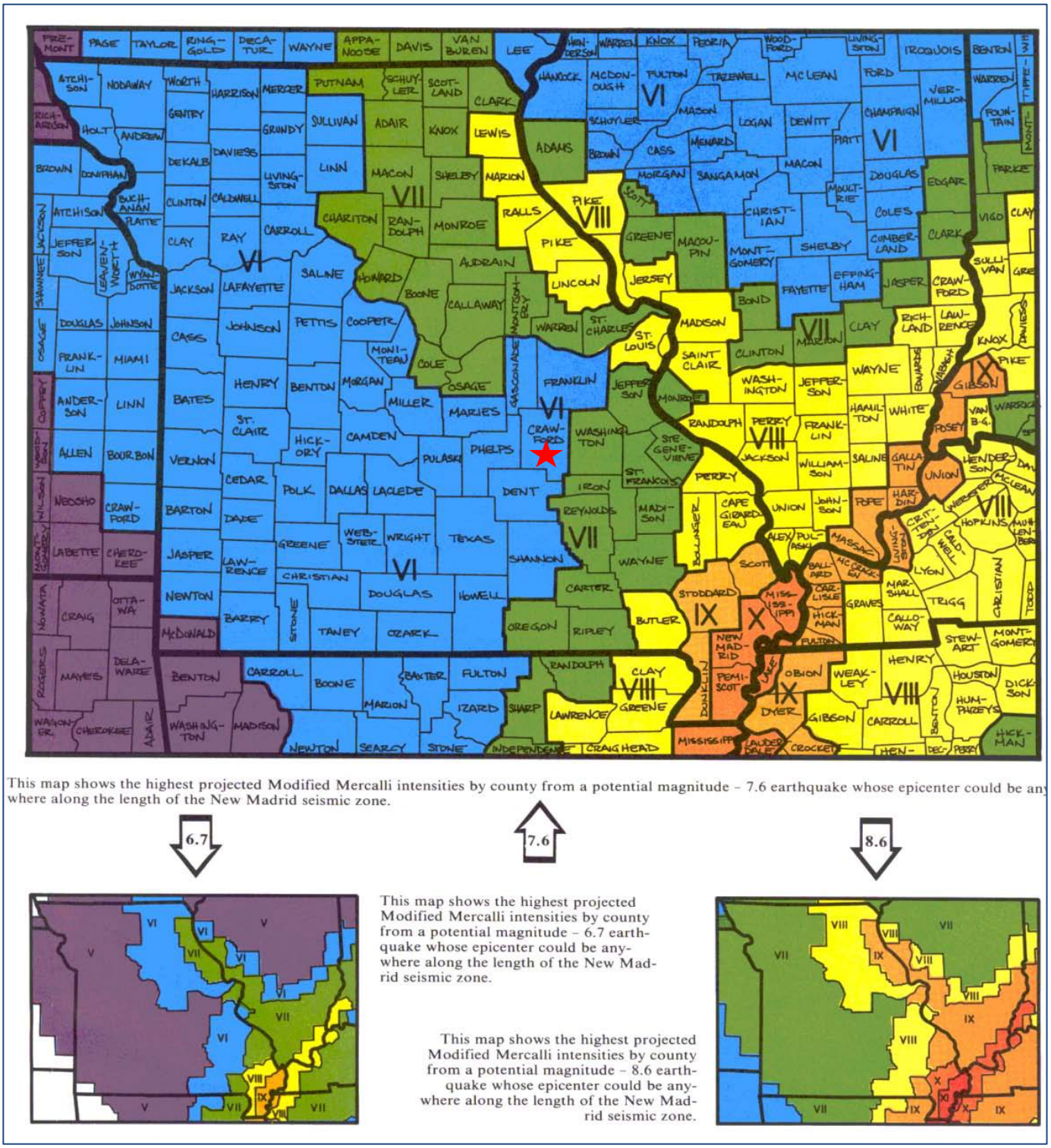
There are eight earthquake source zones in the Central United States, one of which is located within the state of Missouri—the New Madrid Fault. Other seismic zones, because of their close proximity, also affect Missourians. These are the Wabash Valley Fault, Illinois Basin, and the Nemaha Uplift. The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

Figure 3.22 depicts impact zones for a magnitude 7.6 earthquake along the New Madrid Fault along with associated Modified Mercalli Intensities. Crawford County is indicated by a red star. Furthermore,

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

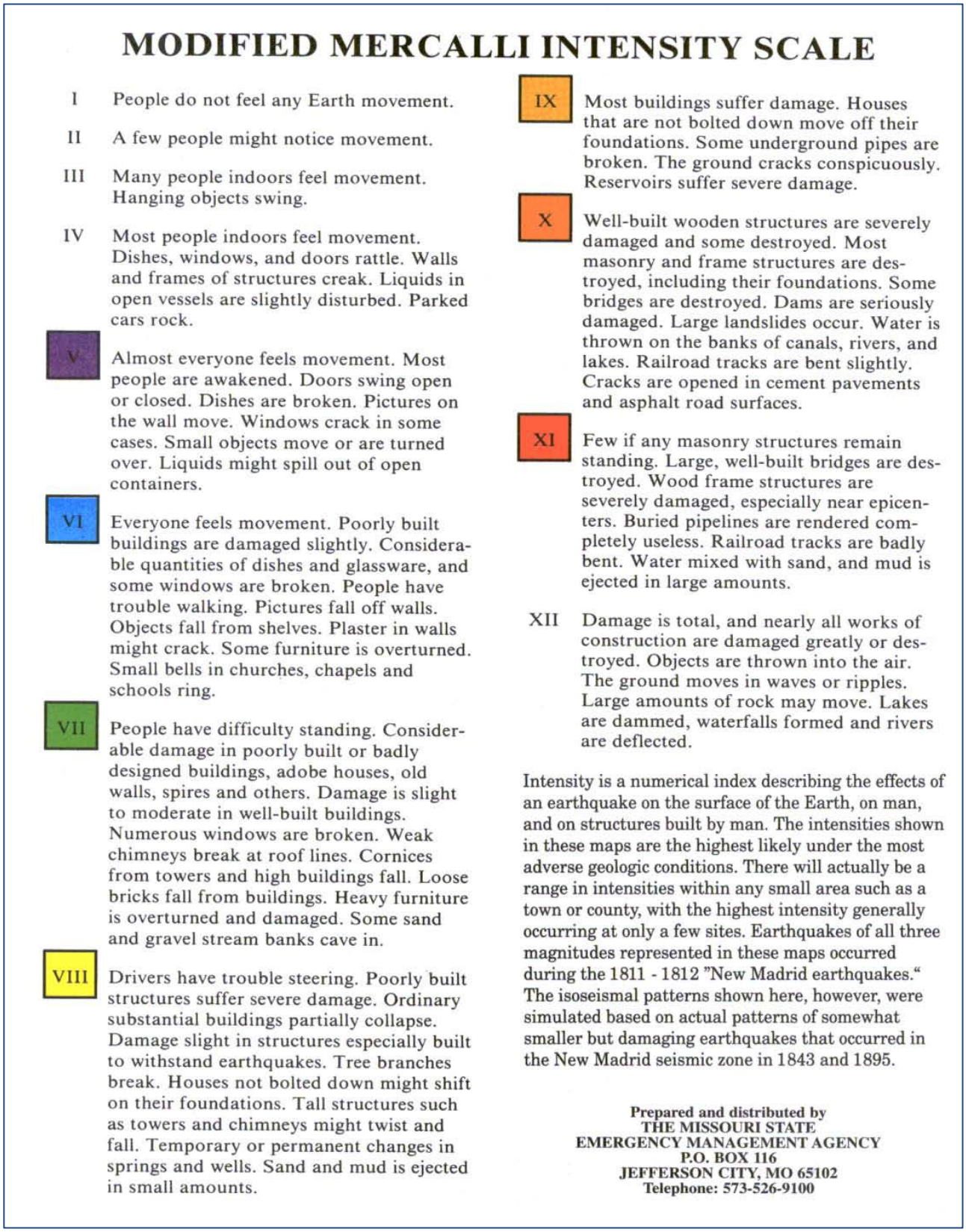
the Modified Mercalli Intensities for potential 6.7 and 8.6 magnitude earthquakes are illustrated. In the event of a 6.7 magnitude earthquake, Crawford County would experience a Modified Mercalli Intensity of V (**Figure 3.23**). This intensity is categorized as being almost felt by everyone. Most people are awakened. Doors swing open or closed. Dishes are broken. Pictures on the wall move. Windows crack in some cases. Small objects move or are turned over. Liquids might spill out of open containers. Additionally, in the occurrence of 7.6 and 8.6 magnitude earthquakes; the county would experience Modified Mercalli Intensities of VI and VII respectively. There will be a range in intensities within any small area such as a town or county, with the highest intensity generally occurring at only a few sites. **Figure 3.23** and **Table 3.27** further define Richter Scale intensities.

Figure 3.22. Impact Zones for Earthquake Along the New Madrid Fault



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

Figure 3.23. Projected Earthquake Intensities



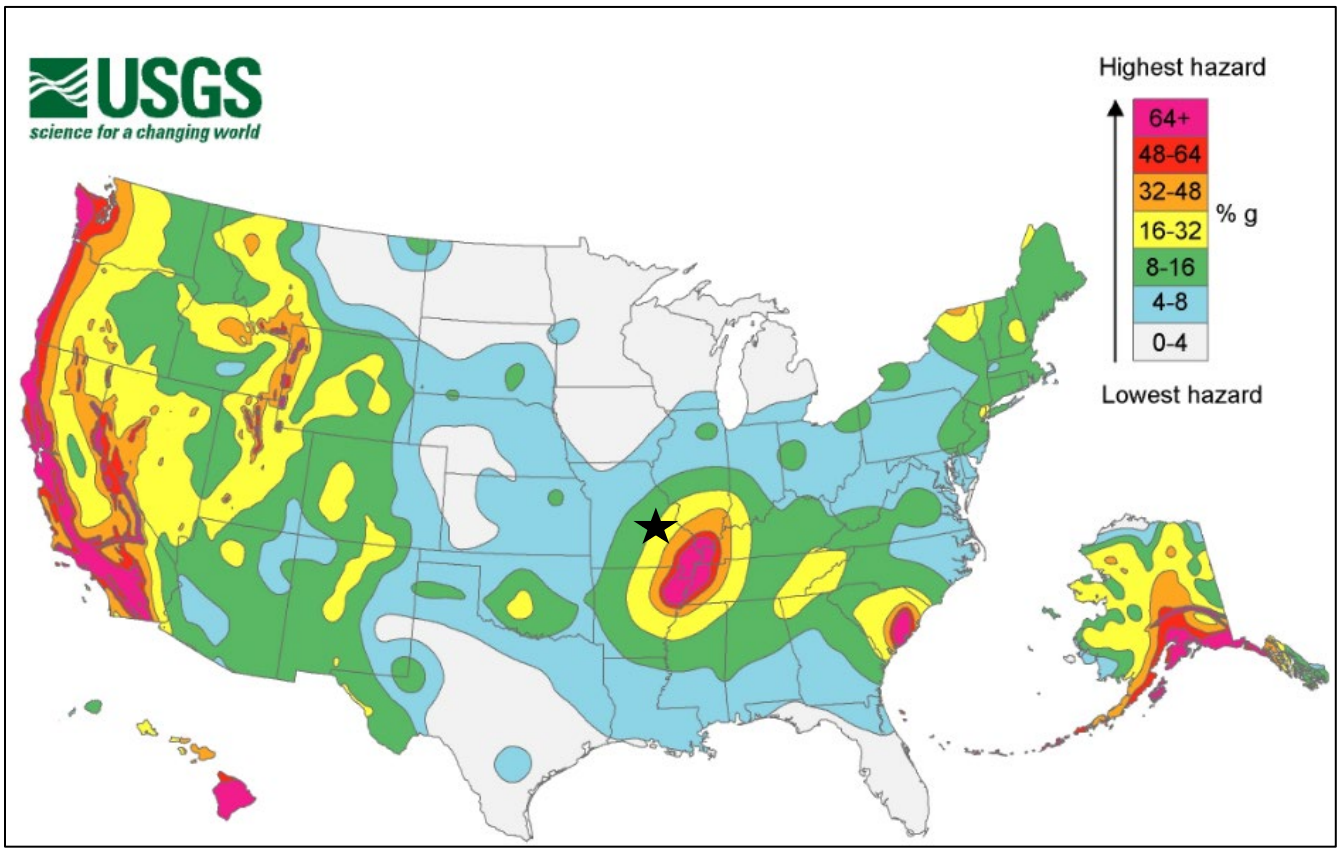
Source: sema.dps.mo.gov

Table 3.27. Richter Scale of Earthquake Magnitude

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

Figure 3.24 illustrates the seismicity in the United States. A black star indicates the location of Crawford County. The seismic hazard map displays earthquake peak ground acceleration (PGA) that has a 2% chance of being exceeded in 50 years, which has a value between 16-32% g.

Figure 3.24. United States Seismic Hazard Map



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

Strength/Magnitude/Extent

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

Richter Magnitude Scale

The Richter Magnitude Scale was developed in 1935 as a device to compare the size of earthquakes. The magnitude of an earthquake is measured using a logarithm of the maximum extent of waves recorded by seismographs. Adjustments are made to reflect the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. Each whole number increase in magnitude represents a tenfold increase in measured amplitude, an estimate of energy. For example, comparing a 5.3 and a 6.3 earthquake shows that a 6.3 earthquake is ten times bigger than a magnitude 5.3 earthquake on a seismogram, but is 31.622 times stronger (energy release)[25].

Modified Mercalli Intensity Scale

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

Previous Occurrences

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

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

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

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

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

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

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

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

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

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

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

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

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

The Nov. 9, 1968, earthquake centered in southern Illinois was the strongest in the central United States since 1895. The magnitude 5.5 shock caused moderate damage to chimneys and walls at Hermann, St. Charles, St. Louis, and Sikeston, Missouri. The felt areas include all or portions of 23 states[ii].

Small earthquakes continue to occur frequently in Missouri. Averages of 200 earthquakes are detected every year in the New Madrid Seismic Zone alone. Most are detectable only with sensitive instruments, but on an average of every 18 months, southeast Missouri experiences an earthquake strong enough to crack plaster in buildings[26].

Probability of Future Occurrence

One earthquake has been reported in Crawford County since 2001. A 2.9 magnitude earthquake was measured originating 1 km north of Leasburg. No damages were reported[27]. The county, located in south central Missouri, is a good distance from the southeast corner of the state where the New Madrid Fault resides. Should a significant earthquake occur, it would have the potential to cause moderate damage within the county.

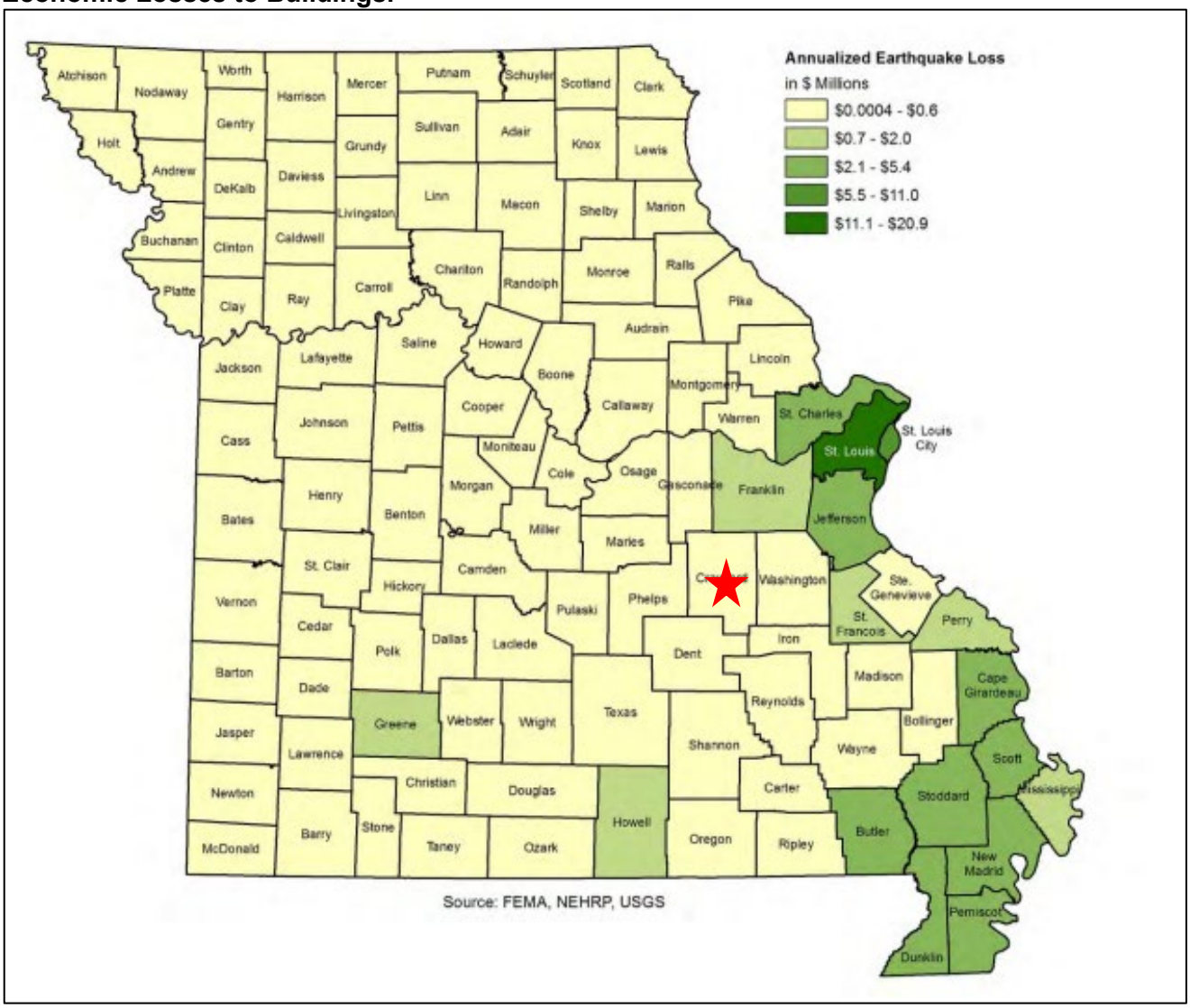
The 2018 Missouri Hazard Mitigation Plan states that there have been 31 recorded earthquake events greater than or equal to M 4.0 in the 43-year period from 1973 to 2018. According to this data, annual probability calculates to 72 percent. Additionally, the USGS estimated in 2006 that the probability of a repeat of the 1811-1812 earthquakes (magnitude 7.5 – 8.0) was seven to ten percent in a 50-year time period (Source: http://pubs.usgs.gov/fs/2006/3125). Given the historical frequency of earthquake events, this hazard is determined to have a high probability of occurrence within the State.

SEMA utilized Hazus V 3.2 to analyze vulnerability and estimate losses to earthquakes. Hazus is a program developed by FEMA which is a nationally applicable standardized methodology that encompasses models for assessing potential losses from earthquakes, floods, and hurricanes. All Hazus analyses were run using Level 1 building inventory database comprised of updated demographic and aggregated data based on the 2010 census. An annualized loss scenario that enabled an "apples to apples" comparison of earthquake risk for each county was synthesized from a FEMA nationwide annualized loss study (FEMA 366 Hazus Estimated Annualized Earthquake Losses for the United States, April 2017). A second scenario, based on an event with a two percent probability of exceedance in 50 years, was done to model a worst case earthquake using a level of ground shaking recognized in earthquake-resistant design.

Annualized loss is the maximum potential annual dollar loss resulting from eight return periods (100, 200, 500, 750, 1,000, 1,500, 2,000, and 2,500 years) averaged on a 'per year' basis[28]. This is the scenario that FEMA uses to compare relative risk from earthquakes and other hazards at the county level nationwide. The Hazus earthquake loss estimation is depicted in **Figure 3.25** which shows annualized loss scenario direct economic losses to buildings. In this scenario, the annualized earthquake loss for buildings in Crawford County in any one year is estimated to be $4,000 to $600,000. **Table 3.28** provides information on total estimated losses, estimated losses per capita and loss ratio. This results in the county being ranked 29th in the state for expected loss with low vulnerability for this hazard. This loss ratio indicates impacts on local economies in the event of an earthquake, and the difficulty for jurisdictions to recover from said event.[29]

[26] Missouri State Hazard Mitigation Plan 2018
[27] https://earthquake.usgs.gov/earthquakes/search/
[28] 2018 Missouri State Hazard Mitigation Plan
[29] 2018 Missouri State Hazard Mitigation Plan

Figure 3.25. HAZUS-MH Earthquake Loss Estimation: Annualized Loss Scenario –Direct Economic Losses to Buildings.



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

Table 3.28. HAZUS-MH Earthquake Loss Estimation-Crawford County: Annualized Loss Scenario

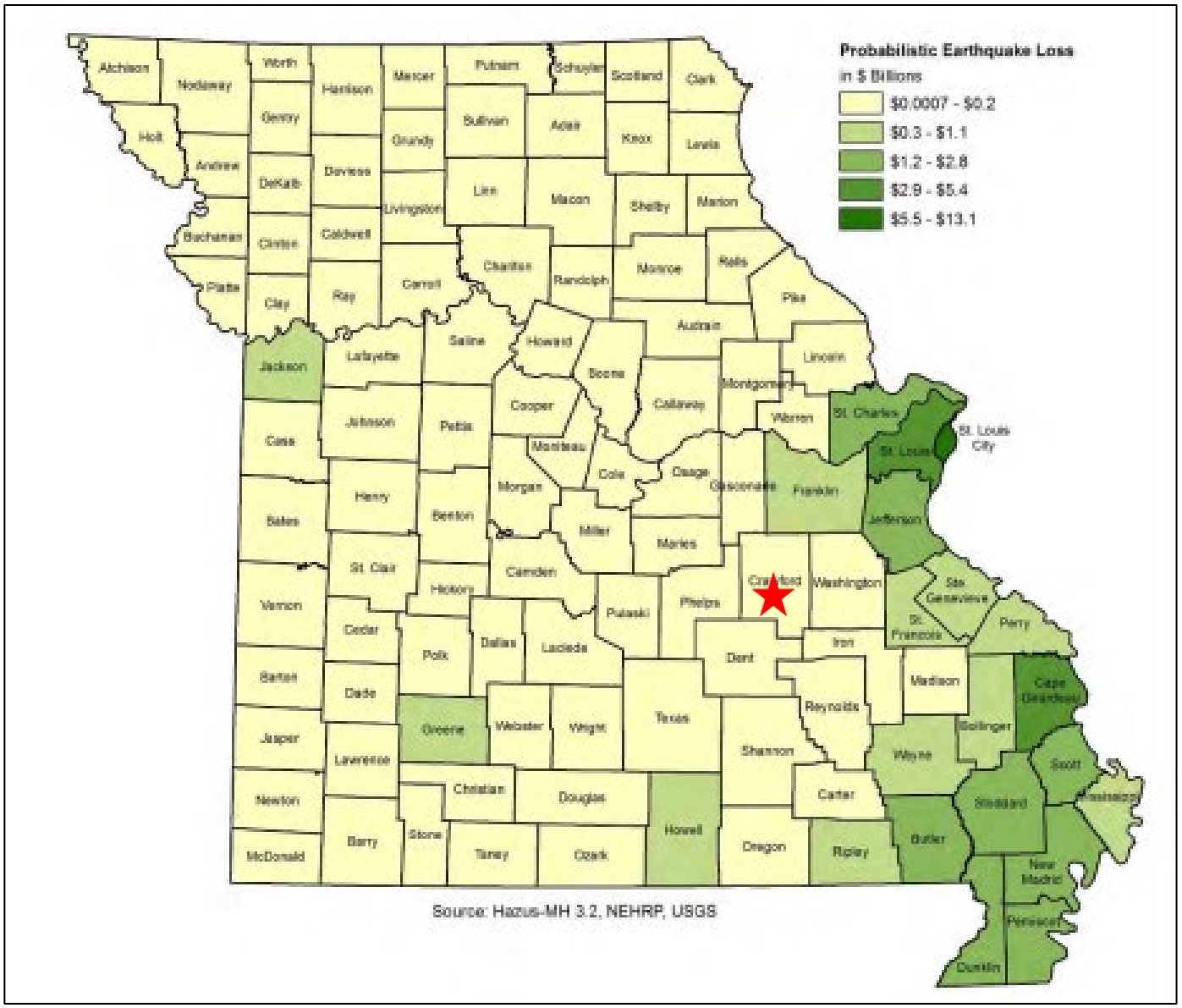
Total Losses in $ Thousands	Loss Per Capita, In $ Thousands	Loss Ratio in $ Per Million	Statewide Ranking for Expected Losses
$260	$0.0105	$109	29th

Source: Hazus 2.1
**All $values are in thousands*
***Loss ratio is the sum of structural and nonstructural damage divided by the entire building inventory value within a county*

Likewise, SEMA developed a second scenario which incorporated a 2% probability of exceedance in 50 years. This model was to demonstrate a worst-case scenario. This scenario is equivalent to the 2,500-year earthquake scenario in HAZUS-MH. The methodology is based on probabilistic seismic hazard shaking grids developed by the U.S. Geological Survey (USGS) for the National Seismic Hazard

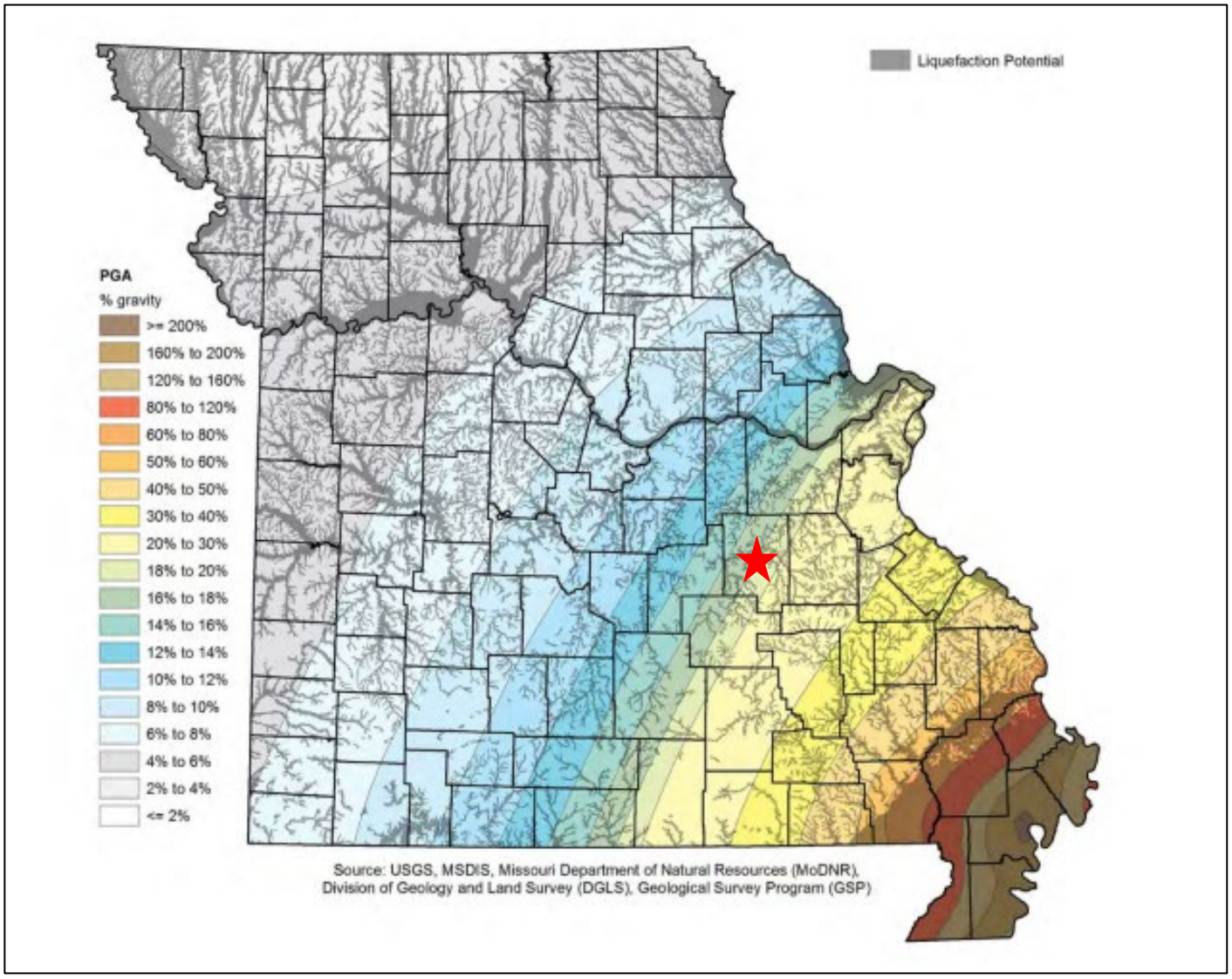
Maps that are included with HAZUS-MH. The USGS updated this mapping in 2014. **Figure 3.26** illustrates direct economic loss to buildings. Crawford County is anticipated to lose between $700,000 and $200,000,000 in a 50-year scenario. **Figure 3.27** provides estimates of peak ground acceleration and spectral acceleration (ground shaking potential) at intervals of 0.3 and 1.0 seconds, respectively which have a two percent probability of exceedance in the next 50 years. These acceleration events have a 2% probability of exceedance in the next 50 years. A 7.7 magnitude earthquake was utilized in this scenario, which is typically utilized for New Madrid fault planning scenarios in Missouri. Furthermore, this pattern of shaking can be seen in with corresponding potential for damage and areas with soils potentially susceptible to liquefaction. Crawford County is estimated to have peak ground acceleration between 16 percent and 30 percent.

Figure 3.26. HAZUS-MH Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Total Building Loss



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

Figure 3.27. Hazus Earthquake 2% Probability of Exceedance in 50 Years – Ground Shaking and Liquefaction Potential



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

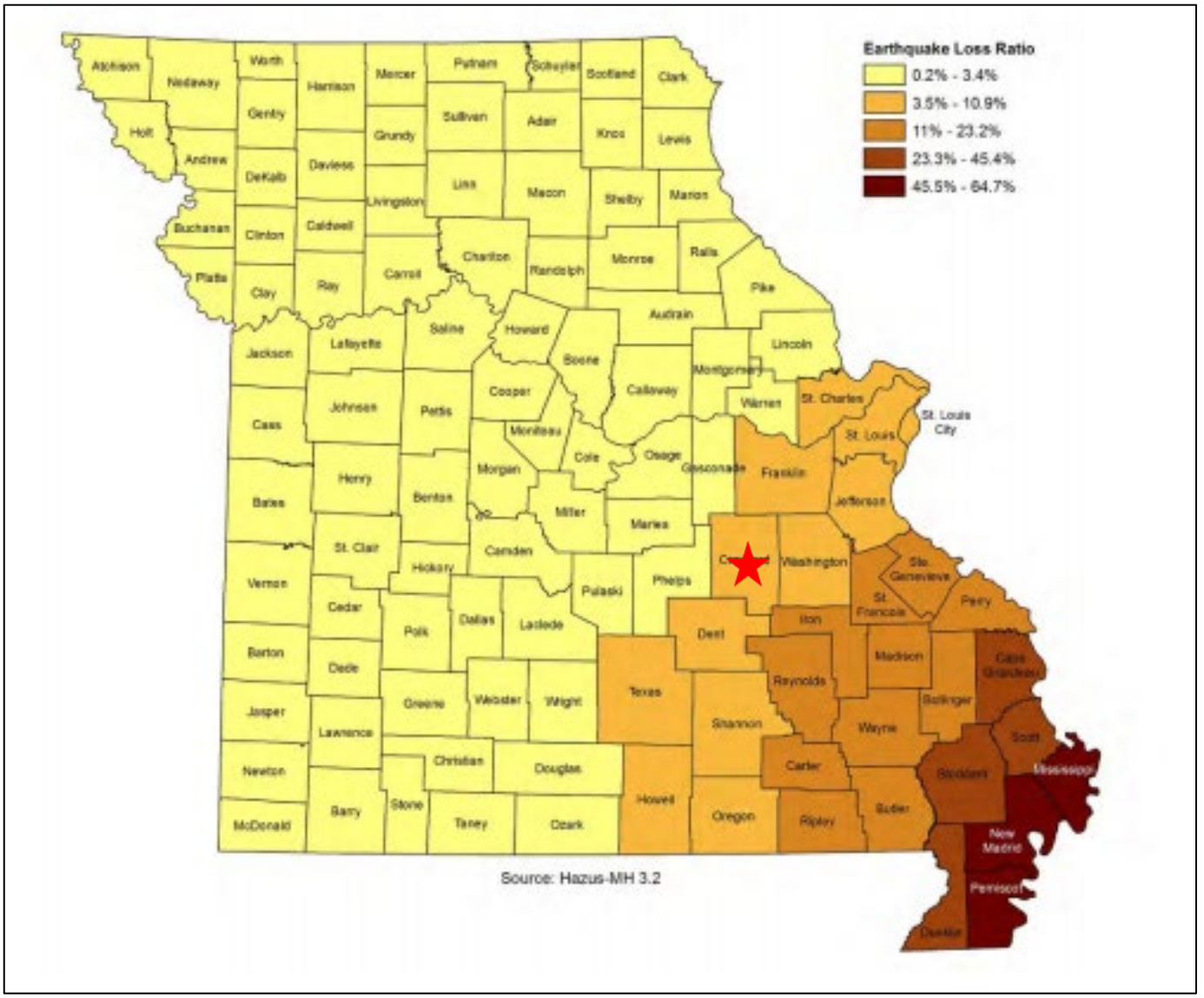
Figure 3.28 depicts a map of the modeled earthquake impacts by county based on building losses, including structural and nonstructural damage, content and inventory loss, and wage and income loss. Crawford County shows a loss ratio of 3.5 percent to 10.9 percent. **Figure 3.28** depicts loss ratio by county, which is the ratio of the building structure and nonstructural damage to the value of the entire building inventory. The loss ratio is a measure of the disaster impact to community sustainability, which is generally considered at risk when losses exceed 10 percent of the built environment (FEMA). **Table 3.29** provides information on estimated direct economic losses for Crawford County, including structural, nonstructural, inventory, contents, relocation costs, capital related loss, wages and rental income loss. According to the 2018 Missouri Hazard Mitigation Plan, Crawford County's loss ratio is 4.37 percent. Crawford County ranks 31st in the state for direct economic losses in this scenario.

Table 3.29. HAZUS-MH Earthquake Loss Estimation 2% Probability of Exceedance in 50 Years Scenario Direct Economic Losses Results Summary for Crawford County*

Cost Structural Damage	Cost Non-Structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
$27,361	$77,077	$28,333	$904	4.37	$17,082	$4,787	$6,210	$6,205	$167,959

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

Figure 3.28. Hazus Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario – Loss Ratio



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

Changing Future Conditions Considerations

Scientists are beginning to believe that there may be a correlation between changing climate conditions and earthquakes. Changing ice caps and sea-level redistribute weight over fault lines, which could potentially have an influence on earthquake occurrences. However, currently no studies quantify the relationship to a high level of detail, so recent earthquakes should not be linked with climate change. While not conclusive, early research suggests that more intense earthquakes and tsunamis may eventually be added to the adverse consequences that are caused by changing future conditions.[30]

Vulnerability

Vulnerability Overview

As stated in the 2018 Missouri Hazard Mitigation Plan, the impacts and severity of earthquakes on Missouri can be significant. The New Madrid earthquakes of 1811-1812 are among the largest that have happened on the North American continent. Losses at the time were limited due to low population and little development. However, a similar quake at this time would result in devastating damage.

The most important direct earthquake hazard is ground shaking, which affects structures close to the earthquake epicenter. However, ground shaking can also affect structures located great distances from epicenters, particularly where thick clay-rich soils can amplify ground motions. Certain types of buildings are more vulnerable to ground shaking than others. Unreinforced masonry structures, tall structures without adequate lateral resistance and poorly maintained structures are specifically susceptible to large earthquakes.

According to MDNR's Missouri Geological Survey, damage from earthquakes in the New Madrid Seismic Zone will vary depending on the earthquake magnitude, the character of the land and the degree of urbanization. Crawford County is rural with few clusters of population. Infrastructure in the region such as highways, bridges, pipelines, communication lines and railroads might suffer damage, which would adversely affect Crawford County, even if the county itself did not suffer heavy damage. Infrastructure could take a significant time to repair.

An important tool for homeowners to address the risk of earthquake damage to property is the purchase of earthquake insurance coverage. The Missouri Department of Insurance, Financial Institutions and Professional Registration (DIFP) prepared a report in 2020 on the state of earthquake insurance coverage in Missouri. The report notes that earthquake coverage has become less available and less affordable over the last 15 years. The cost of earthquake insurance has increased from an average of $50 per year to $209 per year. In high-risk counties the increases have been more substantial – from $57 per year in 2000 to $490 per year in 2020. The number of residences covered by earthquake insurance has dropped over the last 15 years – likely due to the increased cost of premiums. In 2020 the percentage of residential policies with earthquake coverage in Crawford County was 25.2 percent with the average cost of coverage at $103 per year.[31]

Potential Losses to Existing Development

Crawford County's buildings are suggested to lose between $4,000 and $600,000 in any one year, thus ranking the County as being ranked as 29th in the state for expected losses. In the HAZUS

[30] Missouri State Hazard Mitigation Plan 2018

[31] The State of Earthquake Coverage Report, https://insurance.mo.gov/earthquake/documents/OverviewofResidentialEarthquakeInsurancein2020.pdf

scenario illustrated in **Figure 3.28**, Crawford County has a loss ratio of 3.5 percent to 10.9 percent. The loss ratio indicates impacts on local economies in the event of an earthquake, and the difficulty for jurisdictions to recover from said event. According to the 2018 Missouri State Hazard Mitigation Plan, Crawford would suffer total building losses of $700,000 - $200,000,000 in a two percent HAZUS-MH 50-year scenario.

Impact of Previous and Future Development

Future development is not expected to increase the risk other than contributing to the overall exposure of what could be damaged as a result of an earthquake. As new development arises, minimum standards of building codes should be established in all jurisdictions to decrease the potential damage/loss should an earthquake occur.

The Revised Statutes of MO, Section 160.451 require that: The governing body of each school district which can be expected to experience an intensity of ground shaking equivalent to a Modified Mercalli Intensity of VII or above from an earthquake occurring along the New Madrid Fault with a potential magnitude of 7.6 on the Richter Scale shall establish an earthquake emergency procedure system in every school building under its jurisdiction[32].

Hazard Summary by Jurisdiction

There will be a range in intensities within any small areas such as a town or county, with the highest intensity generally occurring at only a few sites. Crawford County is not near the New Madrid Seismic Zone, but it will most likely endure mild secondary effects from the earthquake, such as fire, structure damage, utility disruption, environmental impacts, and economic disruptions/losses. However, damages could differ if there are structural variations in the planning area's built environment. For example, if one community has a higher percentage of residences built prior to 1939 than the other participants, that community is likely to experience higher damages. **Table 3.30** depicts the percent of residences built prior to 1939 in Crawford County. In addition, if school districts have buildings built prior to 1939, those facilities may be at higher risk of damage should an earthquake occur. If a major earthquake should occur, Crawford County would likely be impacted by the number of refugees traveling through the area seeking safety and assistance.

Table 3.30. Crawford County Residences Built Prior to 1939

Jurisdiction	Number of Residences Built Prior to 1939	% of Residences Built Prior to 1939
Unincorporated Crawford County	155	4.1%
Bourbon	82	11.1%
Cuba	36	2.4%
Leasburg	19	14.7%
Steelville	81	14.9%
Sullivan	399	17.9%

Source: US Census Bureau 2016-2020 ACS Data

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

Problem Statement

In a worst-case scenario, the county is expected to encounter $167,959,000 in total economic losses to buildings. Steelville has a higher risk of damage to buildings due to over 23 percent of the homes having been built prior to 1939.

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

3.4.4 Extreme Temperatures

Some specific sources for this hazard are:

- 2018 Missouri State hazard Mitigation Plan, Chapter 3, Section 3.3.7, Page 3.253 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- National Centers for Environmental Information, Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
- Heat Index Chart & typical health impacts from heat, National Weather Service; National Weather Service Heat Index Program, https://www.weather.gov/safety/heat-index;
- Wind Chill chart, National Weather Service, http://www.nws.noaa.gov/om/cold/wind_chill.shtml ;
- Daily temperatures averages and extremes, High Plains Regional Climate Summary, https://hprcc.unl.edu/climate_extremes.php, http://climod.unl.edu/;
- Hyperthermia mortality, Missouri; Missouri Department of Health and Senior Service, http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper1.pdf;
- Hyperthermia mortality by Geographic area, Missouri Department of Health and Senior Services,
- http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2.pdf;
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
    - Average annual occurrence for extreme heat by County
    - Vulnerability to extreme heat by County
    - Average annual occurrence for extreme cold by County
    - Vulnerability to extreme cold by County

Hazard Profile

Hazard Description

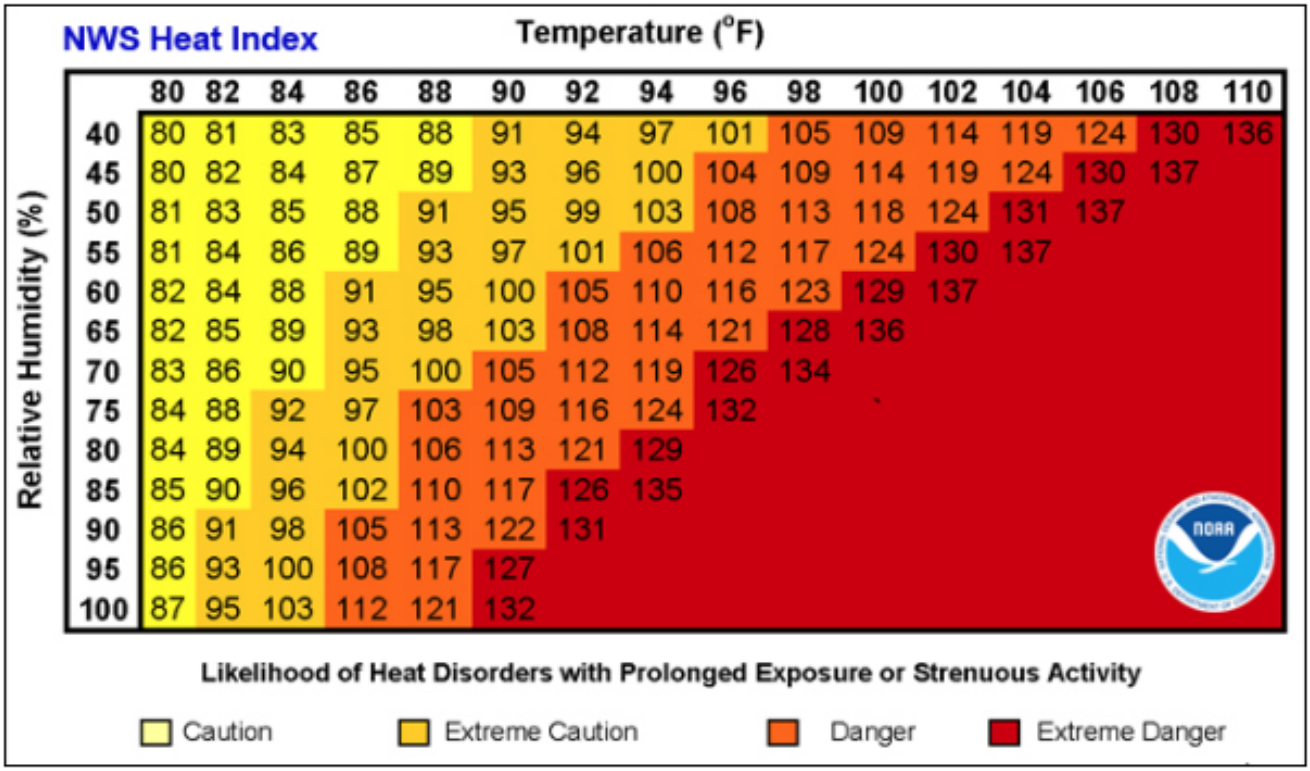
Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several days. Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index chart shown in **Figure 3.29** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions. Other factors that should be taken into account include duration of exposure to high temperatures, wind and activity.

The NWS has increased its efforts to more effectively alert the general public and local authorities on the hazards of heat waves. The Heat Index (HI) is an effective tool in helping people understand the dangers of high temperatures and how temperature and relative humidity together provide a more accurate gauge of heat intensity. The HI, provided in degrees Fahrenheit, is an accurate measure of how hot it actually feels when the relative humidity is added to the air temperature. For example – using the Heat Index Chart in **Figure 3.29** - if the air temperature is 96 degrees Fahrenheit, (found in the top of the table), and the relative humidity is 55 percent (found on the left of the table), the Heat Index is 112 degrees Fahrenheit (the intersection of the 96 degree row and the 55 percent column). Because HI values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15 degrees Fahrenheit. Also, strong winds, particularly with very hot, dry air, can be

extremely dangerous.

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

Figure 3.29. Heat Index (HI) Chart



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

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

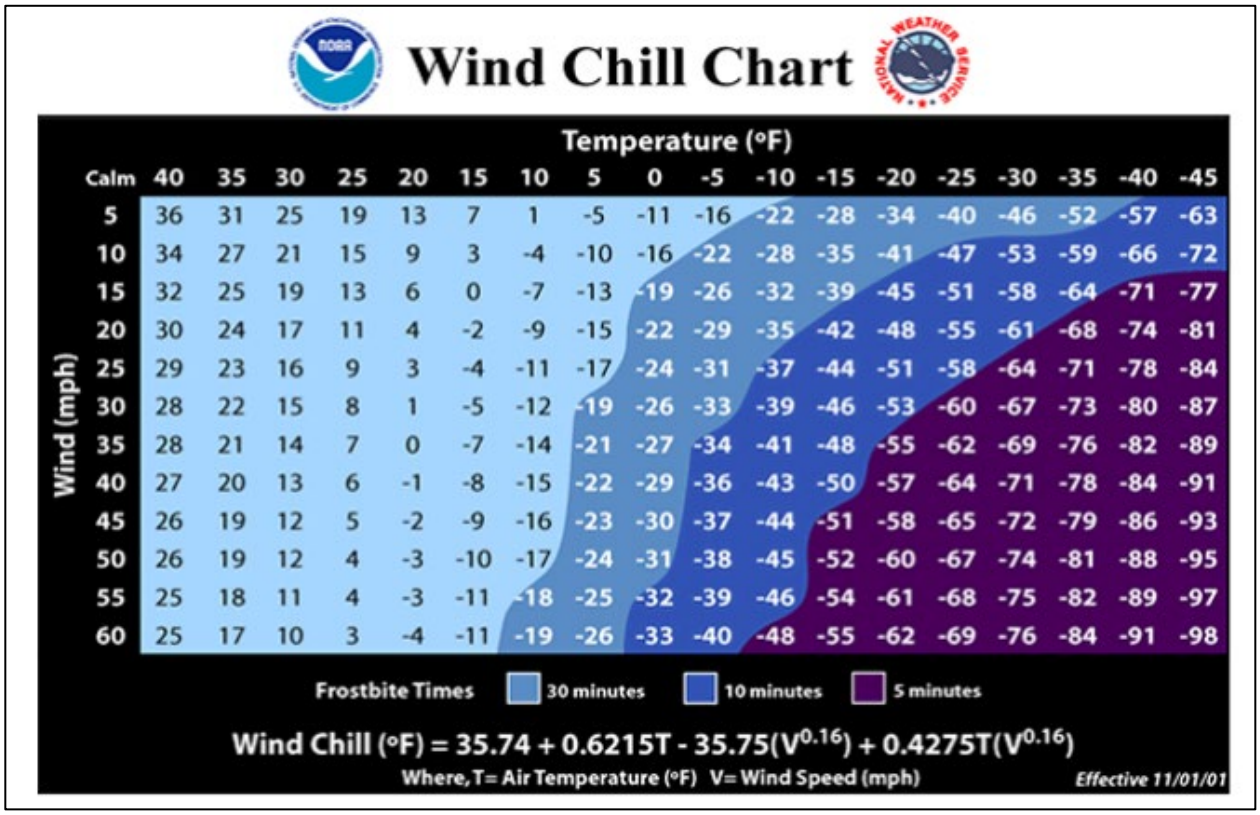
The National Institute on Aging estimates that more than 2.5 million Americans are elderly and especially vulnerable to hypothermia, with those who are isolated being most at risk. About 10 percent of people over the age of 65 have some kind of bodily temperature-regulating defect, and three to four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

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

The NWS Wind Chill Temperature (WCT) index, shown in **Figure 3.30,** uses advances in science,

technology and computer modeling to provide an accurate understandable and useful formula for calculating the dangers from winter winds and freezing temperatures. The figure below presents wind chill temperatures which are based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 3.30. Wind Chill Chart



Source: https://www.weather.gov/safety/cold-wind-chill-chart

Geographic Location

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

Strength/Magnitude/Extent

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

The NWS Wind Chill Temperature (WCT) index uses advances in science, technology, and computer

modeling to provide an accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures. **Figure 3.30** presents wind chill temperatures which are based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Extreme heat can cause stress to crops and animals. However, according to the NOAA Storm Events Data Base and USDA Risk Management website, there were no reported agricultural losses for Crawford County during that 20 year time period. Extreme heat can also strain electricity delivery infrastructure overloaded during peak use of air conditioning during extreme heat events. Another type of infrastructure damage from extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

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

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

Table 3.31 lists typical symptoms and health impacts due to exposure to extreme heat.

Table 3.31. 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, https://www.weather.gov/safety/heat-index

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

Previous Occurrences

Table 3.32 provides data in relation to record heat events between 2001 and 2020 in Crawford County. Maximum heat index values and temperatures are shown for each extreme temperature event. There were ten recorded injuries but fortunately there were no fatalities during this time. In addition, **Figure**

3.31 illustrates heat related deaths by county in Missouri between 1980 and 2016.

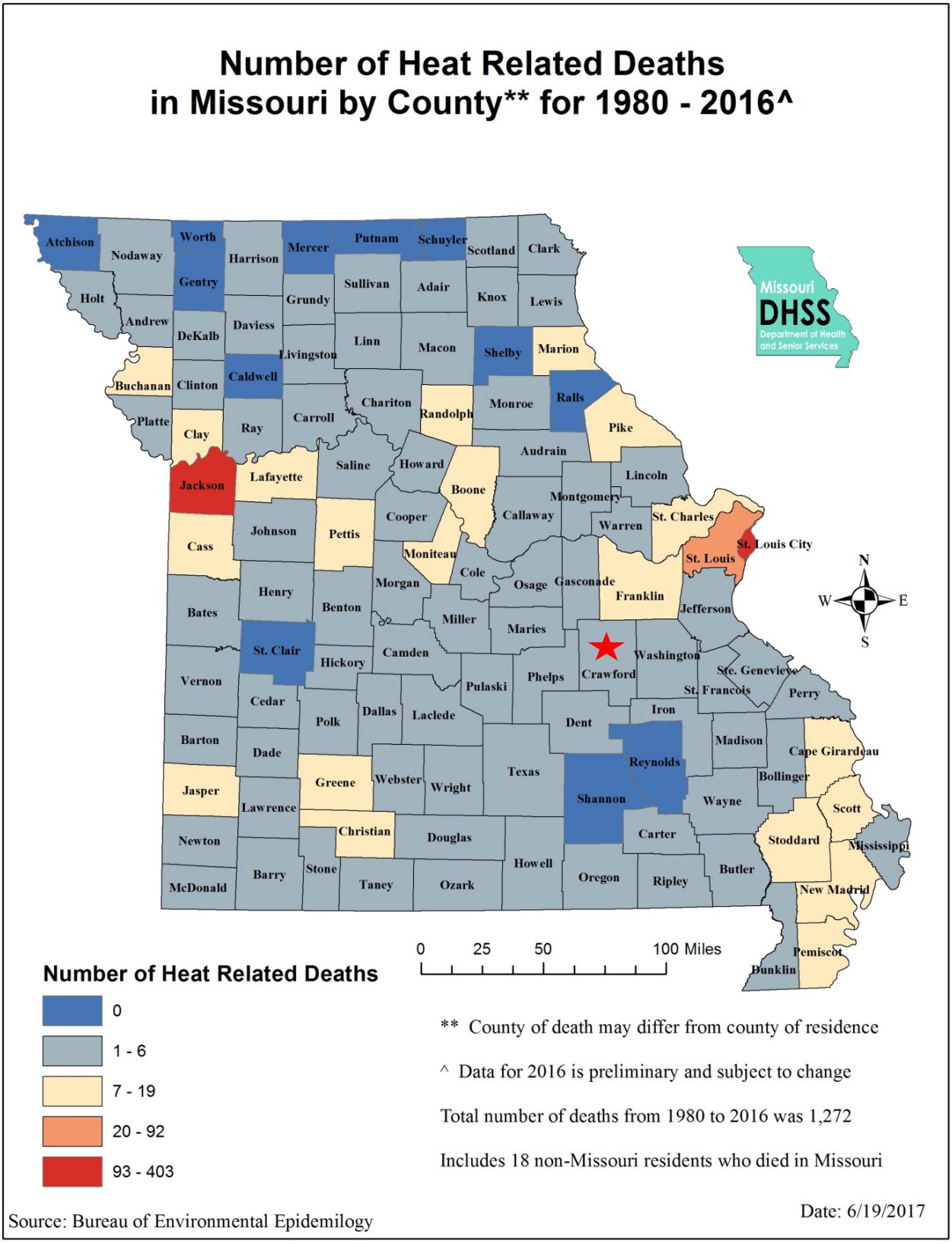
Table 3.32. Crawford County Recorded Heat Events 2001 – 2020

Month, Year	# of Event Days	Fatalities	Injuries	Temperature (F°)	Heat Index Values (F°)
7/7/2001	3	0	0	95-100	105-110
7/17/2001	1	0	0	95-100	110-115
7/21/2001	3	0	0	95-100	105-115
7/29/2001	2	0	0	90-95	105-110
8/1/2001	1	0	0	95-100	105
8/7/2001	2	0	0	95-100	102-110
8/21/2001	1	0	0	95-100	105-110
6/1/2002	3	0	4	85-95	-
7/8/2002	1	0	0	95-100	105-110
7/20/2002	2	0	0	95-100	105-115
7/26/2002	5	0	0	95-100	105-115
8/1/2002	5	0	0	95-100	-
8/15/2003	6	0	6	95-105	-
8/24/2003	4	0	0	95-100	105-110
7/20/2004	2	0	0	90-95	105-110
7/20/2005	6	0	0	100+	105-120
7/17/2006	3	0	0	95-100	105-110
7/30/2006	1	0	0	95-100	105-110
8/1/2006	1	0	0	100+	-
7/1/2011	2	0	0	95-100	105
7/10/2011	2	0	0	95-100	-
8/6/2011	1	0	0	95-100	105-110

Month, Year	# of Event Days	Fatalities	Injuries	Temperature (F°)	Heat Index Values (F°)
8/31/2011	1	0	0	100+	105-110
9/1/2011	2	0	0	100	105
8/31/2013	1	0	0	100	105-110
9/1/2013	1	0	0	100	105-110
6/15/2016	1	0	0	95-100	105
6/22/2016	1	0	0	95	105
Total	**64**	**0**	**10**	**-**	**-**

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

Figure 3.31. Heat Related Deaths in Missouri 2000 - 2016

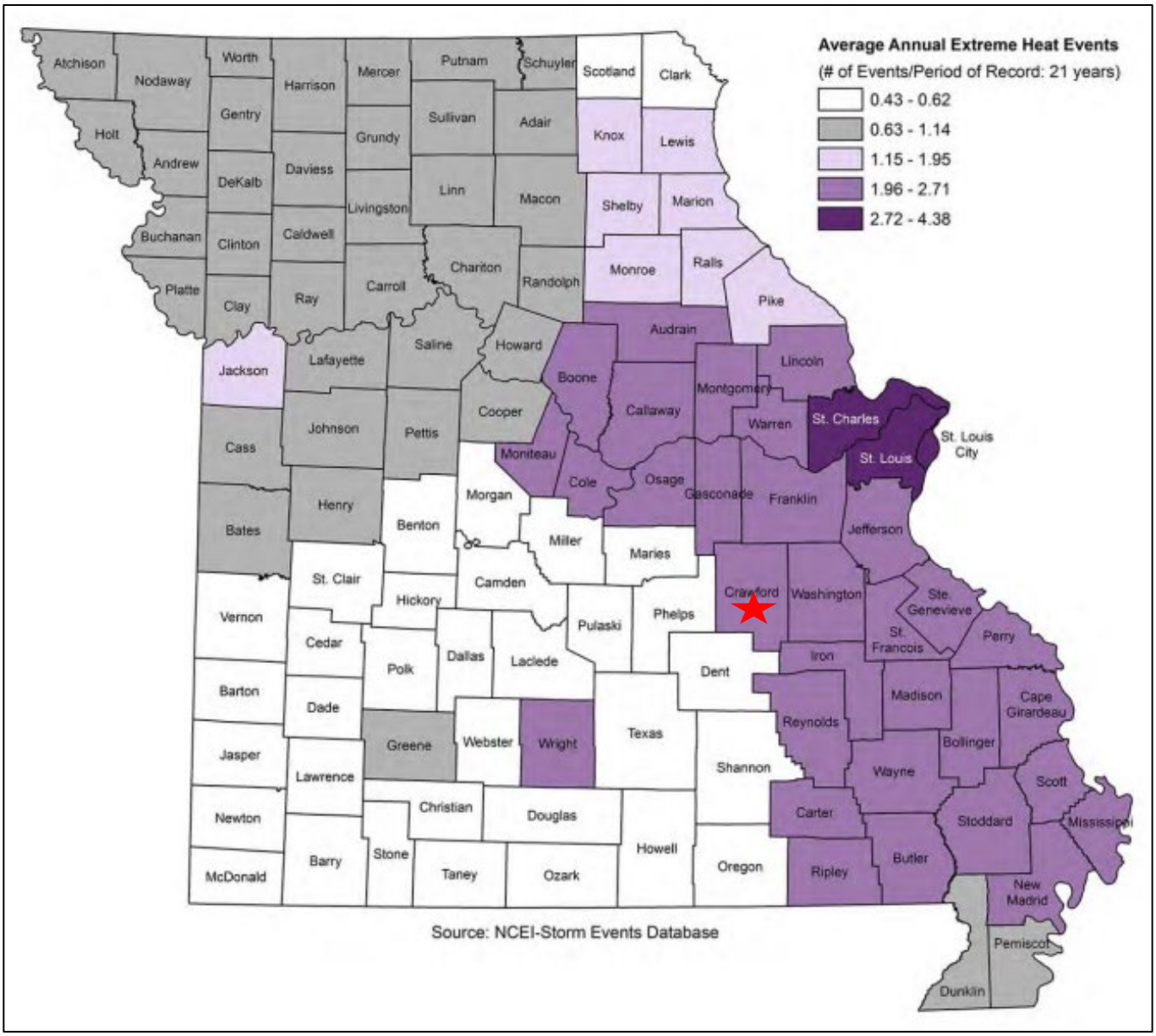


Source: https://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/stat-report.pdf
*Red star indicates Crawford County

Probability of Future Occurrence

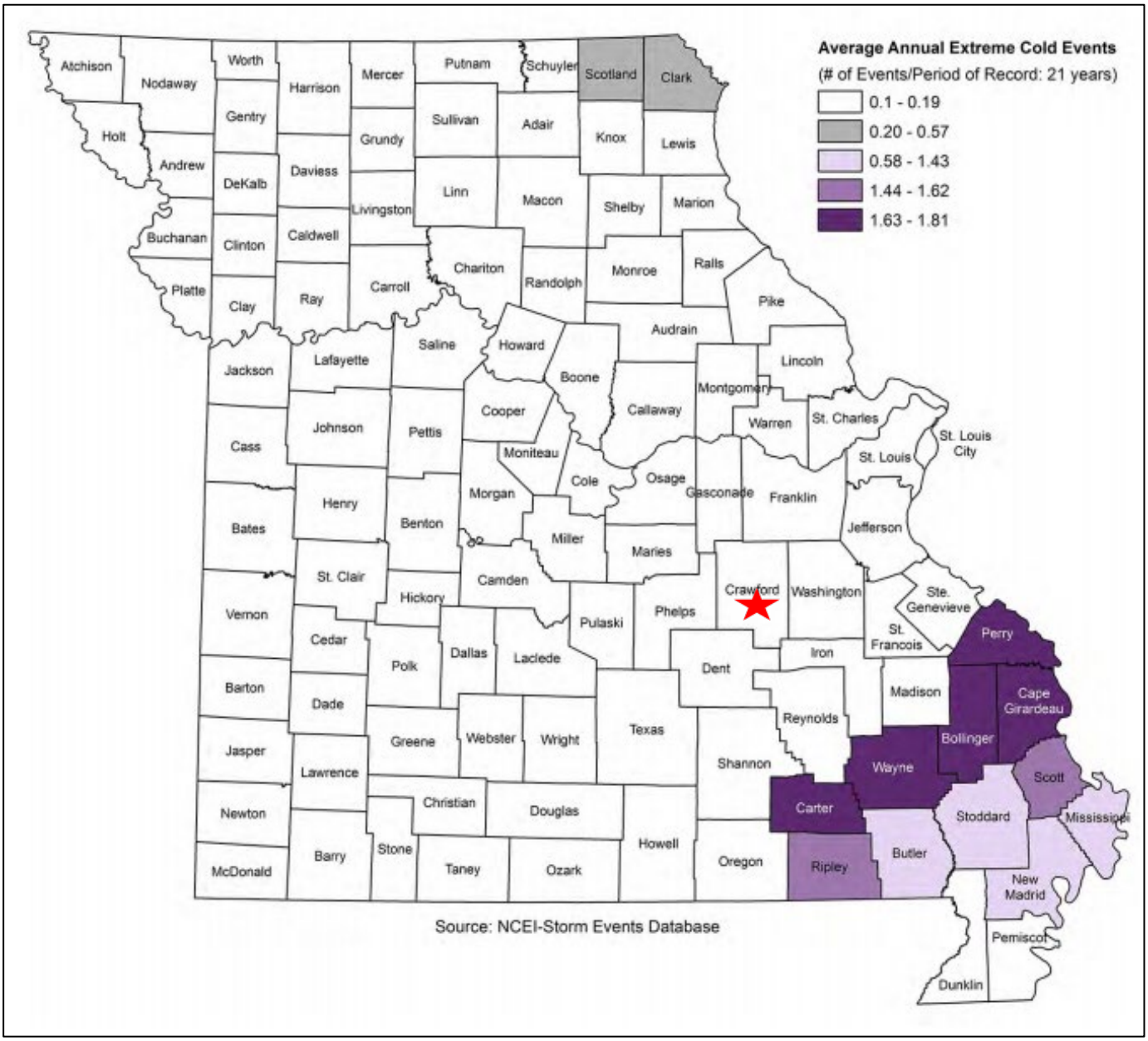
Figure 3.32 illustrates the average annual occurrence for extreme heat statewide. Based on information provided in the 2018 Missouri State Hazard Mitigation Plan, Crawford County has an average of 1.96 to 2.71 events per year based on data from 21 years. **Figure 3.33** illustrates the average annual occurrence for extreme cold statewide. Crawford County has an average of 0.1 to 0.19 events per year based on data from 21 years. It should be noted that there are data limitations due to underreporting of extreme heat and cold events.

Figure 3.32. Average Annual Occurrence for Extreme Heat



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

Figure 3.33. Average Annual Occurrence for Extreme Cold



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

Changing Future Conditions Considerations

According to the 2018 Missouri Hazard Mitigation Plan, under a higher emissions pathway, historically unprecedented warming is projected by the end of the century. Even under a pathway of lower greenhouse gas emissions, average annual temperatures are projected to most likely exceed historical record levels by the middle of the 21st century. For example, in southern Missouri, the annual maximum number of consecutive days with temperatures exceeding 95 degrees F is projected to increase by up to 20 days. Temperature increases will cause future heat waves to be more intense, a concern for this region which already experiences hot and humid conditions. If the warming trend continues, future heat waves are likely to be more intense and cold spells are

projected to decrease.

Furthermore, higher temperatures are experienced more acutely by vulnerable populations such as the elderly, the very young, the homeless, the ill and disabled, and those living in poverty. Higher demands and costs for electricity to run air conditioners can stress power systems. Higher temperatures can also cause harmful algal blooms in warmer water – resulting in poor water quality.

Mitigation against the impacts of future temperature increases may include increasing education on heat stress prevention, organizing cooling centers, allocating additional funding to repair and maintain roads damaged by buckling and potholes and reducing nutrient runoff that contributes to algal blooms. Local governments should also prepare for increased demand on utility systems. Improving energy efficiency in public buildings will also present an increasingly valuable savings potential.

Vulnerability

Vulnerability Overview

Crawford County, along with the rest of the state of Missouri is vulnerable to extreme heat and cold events. **Table 3.33** shows the typical health impacts of extreme heat. Jurisdictions with higher percentages of individuals below the age of 5, and above the age of 65 tend to be more at risk for extreme heat (**Table 3.36**). People who are overweight, ill or on certain medication can also be more vulnerable to high temperatures. Steelville has an estimated 19.9 percent of individuals are 65 or older. The city of Leasburg had the lowest number of older residents with 10.7 percent aged 65 and over. Unincorporated Crawford County had the highest rate overall with 21.4 percent of residents falling into the 65 and older category. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather. The exposure to extreme temperatures of farm workers and livestock is also a major concern.

Table 3.33. Typical Health Impacts of Extreme Heat

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

Source: National Weather Service Heat Index Program, https://www.weather.gov/safety/heat-index

The method used by state planners to determine vulnerability to extreme temperatures across Missouri was statistical analysis of data from several sources: National Centers for Environmental Information (NCEI) storm events data (1996- December 31, 2016), percentage of population over 65 data from the U.S. Census (2015 ACS) and the calculated Social Vulnerability Index for Missouri counties from the hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina. Four factors were considered in determining overall vulnerability to extreme temperatures – total population, percentage of population over 65, likelihood of occurrence and social vulnerability. Based on natural breaks in the data, a rating value of one through five was assigned with one being low, two being low-medium, three being medium, four being medium-high and five being high.

Table 3.34 shows the population, percent of population over 65 and social vulnerability index data for Crawford County overall.

Table 3.34. Population, Percent of Population Over 65 and SOVI Data for Crawford County

County	Total Population Rating	Percentage of Population Over 65	Percent of Population Over 65 Rating	SOVI Ranking	SOVI Rating
Crawford	1	17.4	2	Medium Low	2

Source: 2018 Missouri Hazard Mitigation Plan

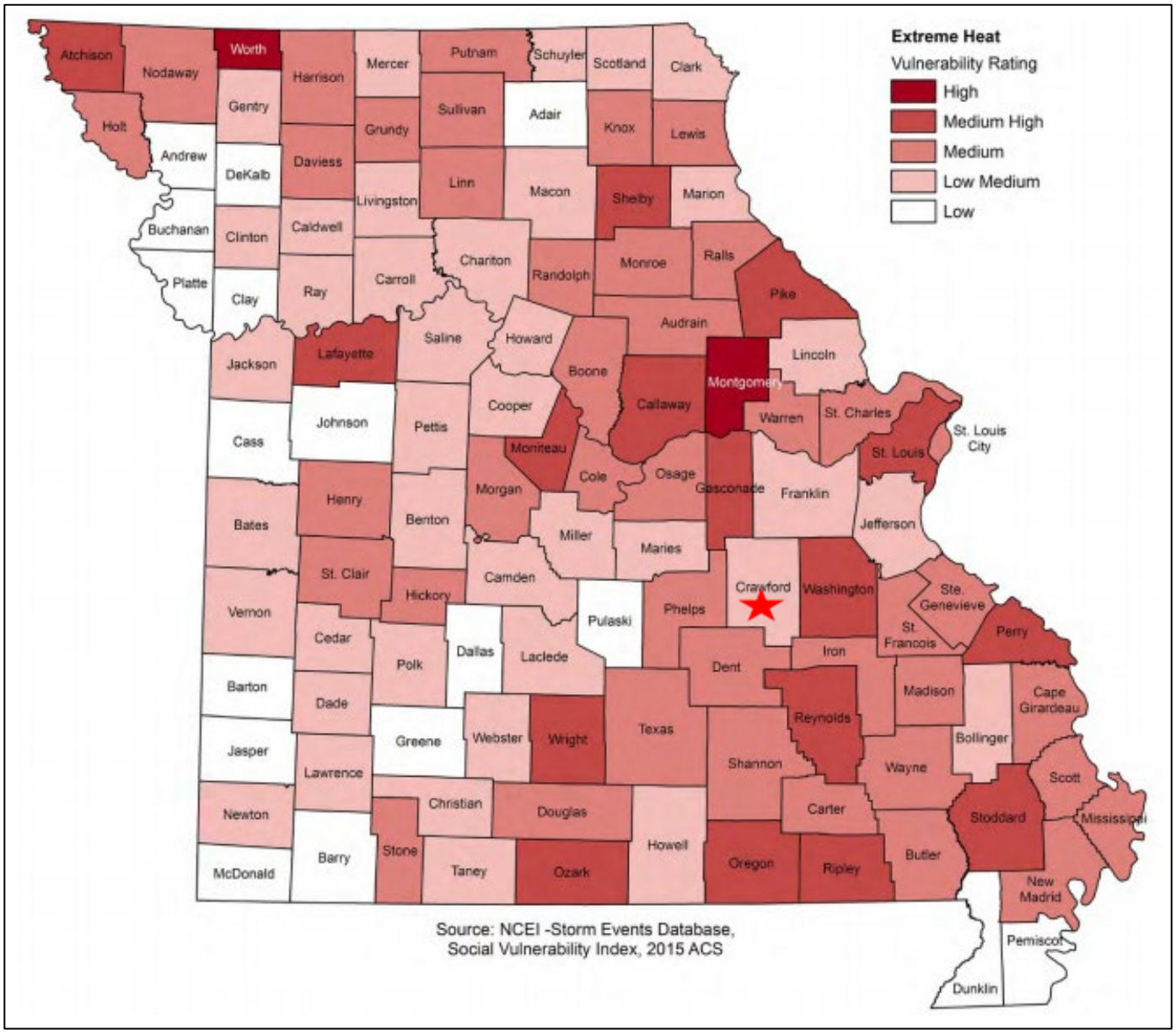
Table 3.35 illustrates the likelihood of occurrence and overall vulnerability rating for extreme temperatures for Crawford County. **Figure 3.34** and **Figure 3.35** provide a vulnerability summary for extreme heat and extreme cold, respectively. Crawford County has Low-Medium vulnerability for extreme heat and Low vulnerability for extreme cold.

Table 3.35. Crawford County Likelihood of Occurrence and Overall Vulnerability Rating for Extreme Temperatures

Heat					Cold				
Total Events	Likelihood of Occurrence	Likelihood Rating	Total Vulnerability	Total Vulnerability Description	Total Events	Likelihood of Occurrence	Likelihood Rating	Total Vulnerability	Total Vulnerability Description
53	2.52	4	9	Low Medium	2	0.10	1	6	Low

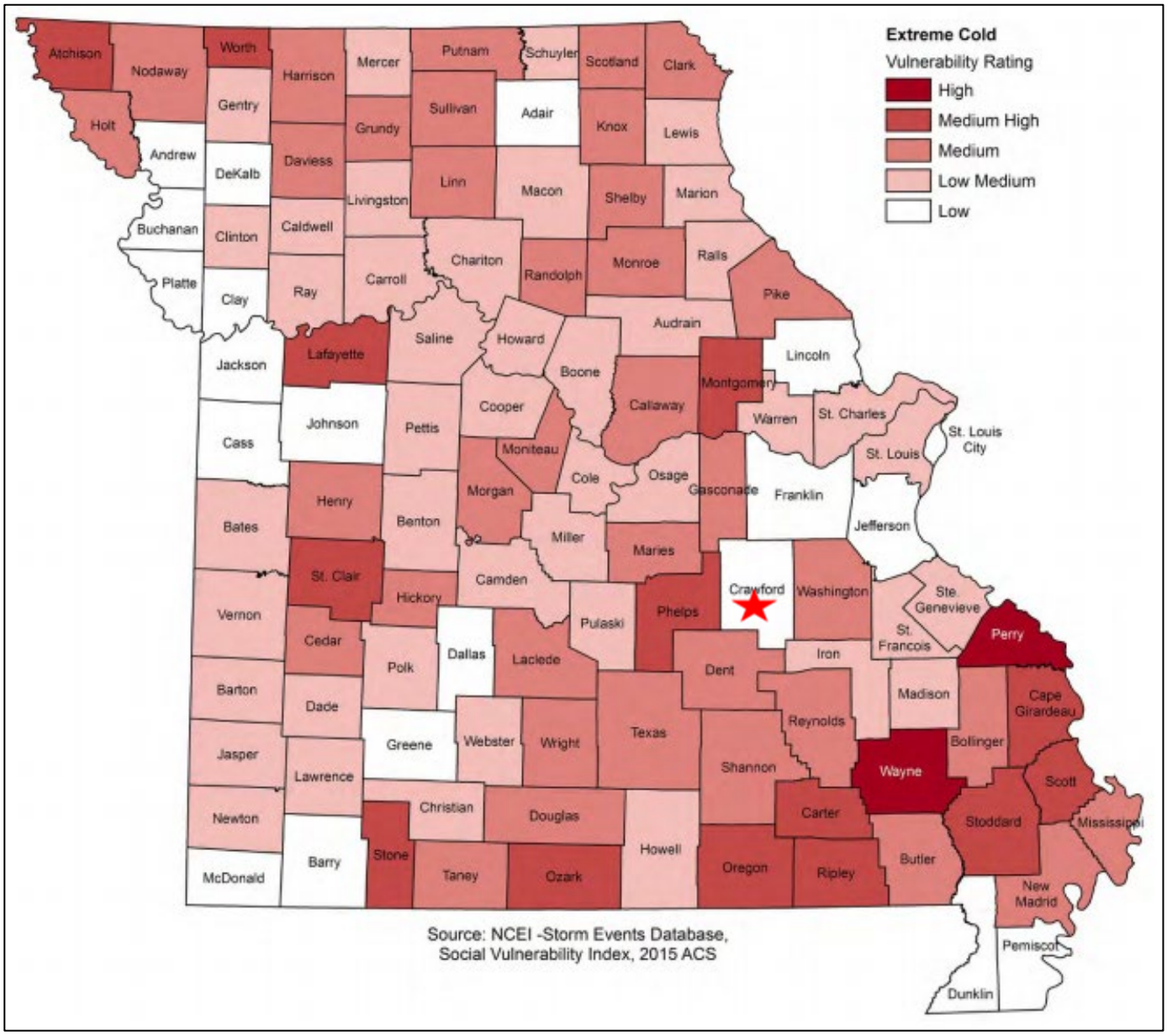
Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.34. Vulnerability Summary for Extreme Heat



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

Figure 3.35. Vulnerability Summary for Extreme Cold



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

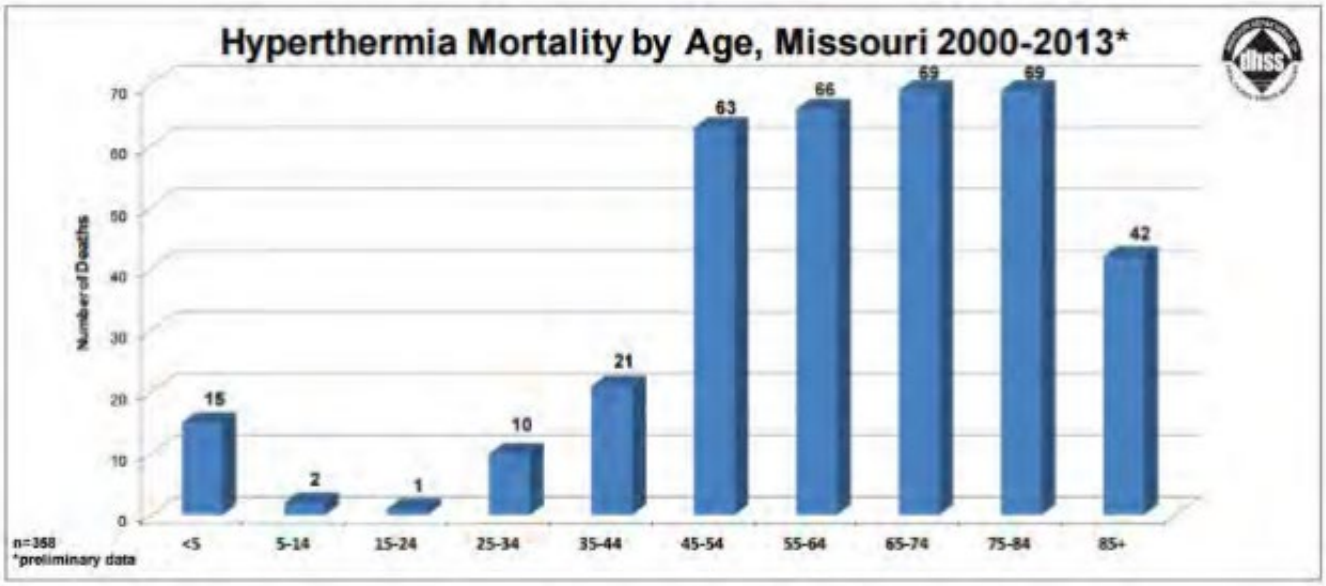
Potential Losses to Existing Development

Extreme Heat/Heat Wave

Of greatest concern during extreme heat events are hyperthermia injuries and deaths. The 2018 Missouri Hazard Mitigation plan states that there were 358 heat-related deaths reported in Missouri from 2000 through 2013. There were 217 (61%) deaths in the metropolitan areas of Kansas City and St. Louis and 141 (39%) deaths in rural parts of the state. Half of the deaths were age 65 or older. People in this demographic group are more vulnerable to this hazard for a number of reasons. Many live alone and have medical conditions that put them at higher risk. The lack of air conditioning or the refusal to use it for fear of higher utility bills further increases their risk. Deaths among children under

the age of five are often linked to being left in vehicles during hot weather. Between 2000 and 2013 there were 15 (4%) heat-related deaths of children less than five years old. In the age group between 5 years and 65 years deaths are generally due to over exertion at work or in sports activities, complicating medical conditions or substance abuse. **Figure 3.36** shows the hyperthermia mortality rate by age for the 2000-2013 timeframe.

Figure 3.36. Hyperthermia Mortality of Age, Missouri 2000-2013



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

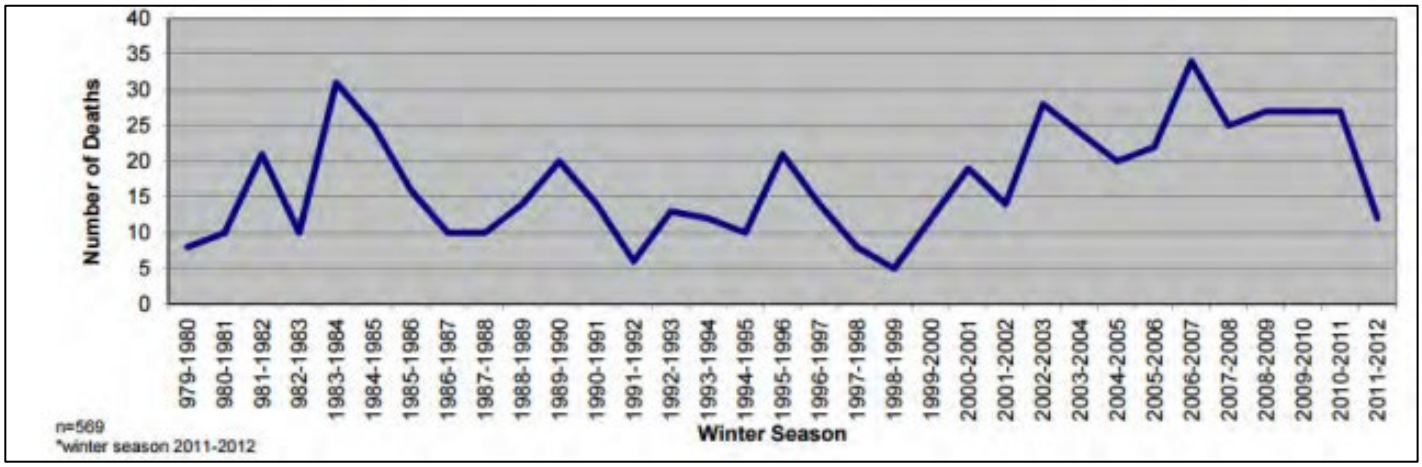
During extreme heat events structural, road, and electrical infrastructure are vulnerable to damages. Depending upon temperatures and duration of extreme heat, losses will vary.

Extreme Cold

According to the Missouri Department of Health and Senior Services, 569 people died in Missouri due to extreme cold conditions between 1979 and 2012, see **Figure 3.37**. As with extreme heat, the elderly are more vulnerable to cold-related deaths. Elderly or disabled individuals fall outside their homes and are not able to call for help or reach the safety of shelter during periods of extreme cold. According to the 2018 Missouri State Hazard Mitigation plan, during the winters of 1989-2012, a total of 414 hypothermia deaths occurred, with 186 (44.9%) being 65 years of age or older. As with extreme heat, substance abuse can be a contributing factor for people between the ages of 25 and 64. Between 1989 and 2012, substance abuse factored into the hypothermia deaths of 107 of the 208 (51.4%) deaths in this age group. Fortunately, hypothermia deaths in people under the age of 25 are rare in Missouri, accounting for only 19 (4.6%) of the total extreme cold related deaths during this timeframe. There were two (0.5%) deaths of children under the age of five. Over 72 percent of hypothermia deaths are among males – 299 of the total 414. The remaining 115 (27.8%) were female.

In regards urban versus rural, hypothermia deaths tend to be higher in rural areas than in urban communities. There were 183 (44.2%) cold related deaths in the Kansas City and St. Louis metropolitan areas, while 231 (55.8%) occurred in other parts of the state.

Figure 3.37. Hypothermia Deaths, Missouri: Winter Seasons 1979-2012



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

Impact of Future Development

Population trends from 2010 to 2020 for Crawford County indicate that the population in unincorporated areas has fallen by an estimated 12.01 percent. The city of Bourbon has fallen by 3.98 percent. Overall, the county's population has shrunk 6.6 percent. Population growth can result in increased age groups that are more susceptible to extreme heat and cold. Additionally, as populations increase, so does the strain on each jurisdiction's electricity and road infrastructure. Local government and local emergency management should take extreme heat and cold in consideration when upgrades occur to the local power grid.

Hazard Summary by Jurisdiction

Those at greatest risk for heat-related illness and deaths include children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications or have medical conditions that make them more vulnerable. To determine jurisdictions within the planning area with populations more vulnerable to extreme heat, demographic data was obtained from the 2016-2020 census on population percentages in each jurisdiction comprised of those under age 5 and over age 65. Data was not available for overweight individuals and those on medications vulnerable to extreme heat or with medical conditions that made them more vulnerable. **Table 3.36** below summarizes vulnerable populations in the participating jurisdictions. Note that school and special districts are not included in the table because students and those working for the special districts are not customarily in these age groups.

Table 3.36. County Population Under Age 5 and Over Age 65 (2016-2020)

Jurisdiction	Population Under 5 Years	Population 65 Years and over
Unincorporated Crawford County	4.3%	24.4%
Bourbon	7.9%	15.7%
Cuba	4.3%	16.5%
Leasburg	6.4%	11.7%
Steelville	7.5%	17.0%

Jurisdiction	Population Under 5 Years	Population 65 Years and over
Sullivan	7.2%	20.2%

Source: U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates

Due to lack of data, strategic buildings that lack air-conditioning could not be analyzed for this report. Additionally, school policy data in regard to extreme heat or cold were not available.

In summary, the risks of extreme heat or cold can impact the health/lives of citizens within the county, specifically the young and elderly. Unincorporated Crawford County has a high percentage of individuals 65 and over, with 24.4 percent.

Many people do not realize how deadly a heat wave can be. Extreme heat is a natural disaster that is not as dramatic as floods or tornadoes. Working with the Crawford County Health Department and EMD, local governments should encourage residents to:

- Stay indoors as much as possible and limit exposure to the sun;
- Stay on the lowest floor out of the sunshine if air conditioning is not available;
- Consider spending the warmest part of the day in public buildings such as libraries or other public or community buildings. Circulating air can cool the body by increasing the evaporation rate of perspiration;
- Eat light, well-balanced meals at regular intervals and avoid using salt tablets unless directed by a physician;
- Hydrate by drinking plenty of water. Individuals with epilepsy or heart, kidney or liver disease who are on fluid restricted diets or have problems with fluid retention should consult their physicians on liquid intake;
- Limit consumption of alcoholic beverages;
- Dress in loos-fitting, lightweight and light colored clothes that dover as much skin as possible;
- Protect your face and head by wearing a wide-brimmed hat. Wear sunscreen;
- Check on family, friends and neighbors who do not have air conditioning and are generally alone;
- Never leave children or pets in closed vehicles;
- Avoid strenuous work during the warmest part of the day and use the buddy system when working in extreme heat and take frequent breaks.

People who work outdoors should be educated about the dangers and warning signs of heat disorders. Buildings, ranging from homes (particularly those of the elderly) to factories, should be equipped with properly installed, working air conditioning units, or have fans that can be used to generate adequate ventilation. However, although fans are less expensive to operate than air conditioning, they may not be effective, and may even be harmful when temperatures are very high. As the air temperature rises, air flow is increasingly ineffective in cooling the body. At temperatures above 100° F, the fan may be delivering overheated air to the skin at a rate that exceeds the capacity of the body to get rid of this heat – even with perspiring – and the net effect is to add heat rather than to cool the body. An air conditioner is a much better option. Charitable organizations and the health department should work together to provide fans, when appropriate, to at-risk residents during times of critical heat. When temperatures are too high, however, these groups should work to get at-risk populations into cooling shelters.

Extreme Cold

Extreme cold can also be life-threatening and the following precautions should be taken when someone is suffering from hypothermia:

- Call 9-1-1 for immediate medical assistance;
- Move the victim to a warm place;
- Monitor the victim's blood pressure and breathing;
- If necessary, provide rescue breathing and CPR;
- Remove wet clothing;
- Dry off the victim;
- Take the victim's temperature;
- Warm the body core first, NOT the extremities. Warming the extremities first can cause the victim to go into shock and can also drive cold blood toward the heart and lead to heart failure;
- Do not warm the victim too fast – rapid warming may cause heart arrhythmias

Problem Statement

In summary, the risks of extreme heat and cold can impact the health/lives of citizens within the county, specifically the young and elderly. Based on the vulnerability analysis, unincorporated Crawford County and the city of Steelville have the highest risk because both have large populations of people aged 65 and over (**Table 3.36**).

All jurisdictions should make sure they have plans in place to provide both cooling and warming shelters during times of extreme temperatures. School districts should have policies in place to minimize strenuous exercise outdoors during heat waves and to consider policies for delaying or cancelling school during times of extreme cold to reduce risk to students waiting for buses.

3.4.5 Flooding (Riverine and Flash)

Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.1, Page 3.80 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- Watershed map, Environmental Protection Agency, http://cfpub.epa.gov/surf/county.cfm?fips_code=19169
- FEMA Map Service Center, Digital Flood Insurance Rate Maps (DFIRM) for all jurisdictions, if available, https://msc.fema.gov/portal/home
- NFIP Community Status Book, http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book
- NFIP claims status, BureauNet, http://bsa.nfipstat.fema.gov/reports/reports.html
- Flood Insurance Administration—Repetitive Loss List (this must be requested from the State Floodplain Management agency or FEMA)
- National Centers for Environmental Information, Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
- USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/en/Information-Tools/Summary-of-Business/Cause-of-Loss
- FEMA Data Visualization Tool, https://www.fema.gov/data-visualization-floods-data-visualization
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Risk MAP, DFIRM, and Hazus based depth grids used in Hazus Analysis
  - Flood losses by County 1978-2018
  - Number of flood insurance claims by County
  - Total building exposure to flooding (1% annual chance) by County
  - Buildings impacted by flooding (1% annual chance) by County
  - Flood insurance coverage by County
  - Number of flood insurance policies by County
  - NFIP participation status by County
  - Number of state facilities impacted by flooding (1% annual chance) by County
  - Critical facilities impacted by flooding (1% annual chance) by County

Hazard Profile

Hazard Description

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

Flooding caused by dam failure is discussed in **Section 3.4.1.** It will not be addressed in this section.

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

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

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

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

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

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

Geographic Location

Riverine flooding is most likely to occur in Special Flood Hazard Areas (SFHA). Below in **Figure 3.38** is a map of Crawford County showing the floodplain boundaries. Following the county-wide map are FIRMs for Bourbon, Cuba, Steelville, and Sullivan (**Figure 3.39 through Figure 3.42**). **Figure 3.43** shows a map of the school districts in Crawford County with an overlay of the SFHA. Steelville R-3 School District is the only district within the county that has school building located in the floodplain. **Figure 3.44** is a map showing the floodplain and the location of the Steelville R-3 school buildings in relation to the SFHA. **Table 3.37** and **Table 3.38** show Crawford County NCEI flood and flash flood events by location between 2001 and 2020.

Figure 3.38. Map of Crawford County with Special Flood Hazard Areas.

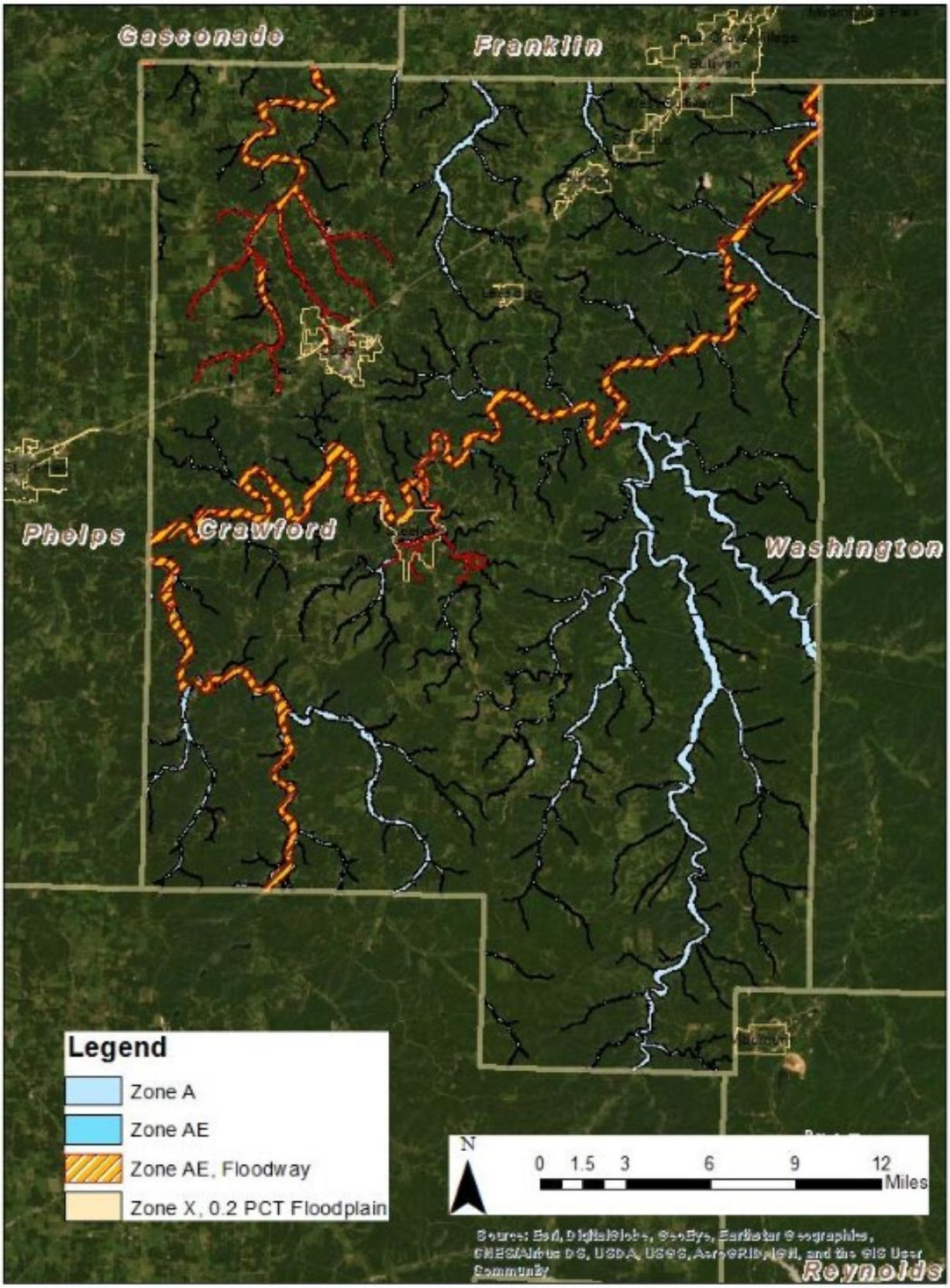


Figure 3.39. Bourbon, Missouri Special Flood Hazard Areas (SFHAs)

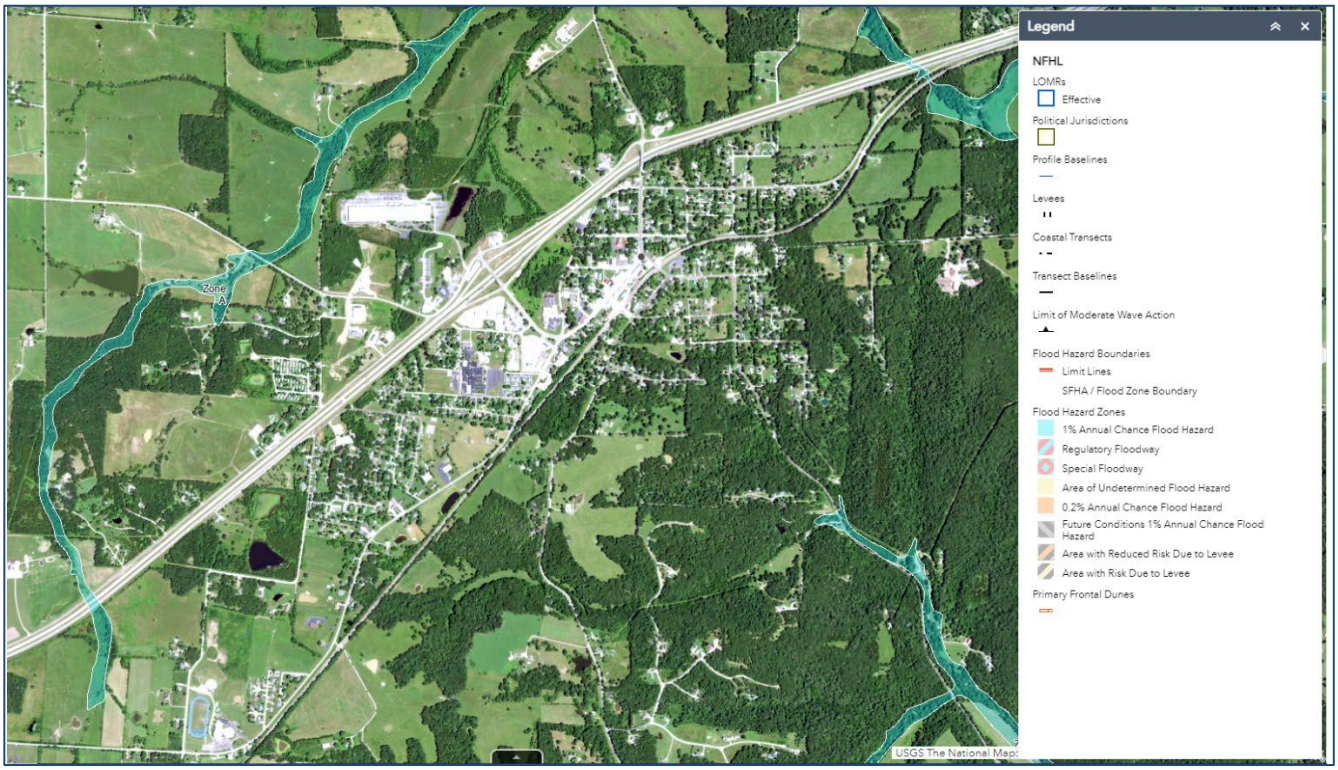


Figure 3.40. Cuba, Missouri Special Flood Hazard Areas (SFHAs)

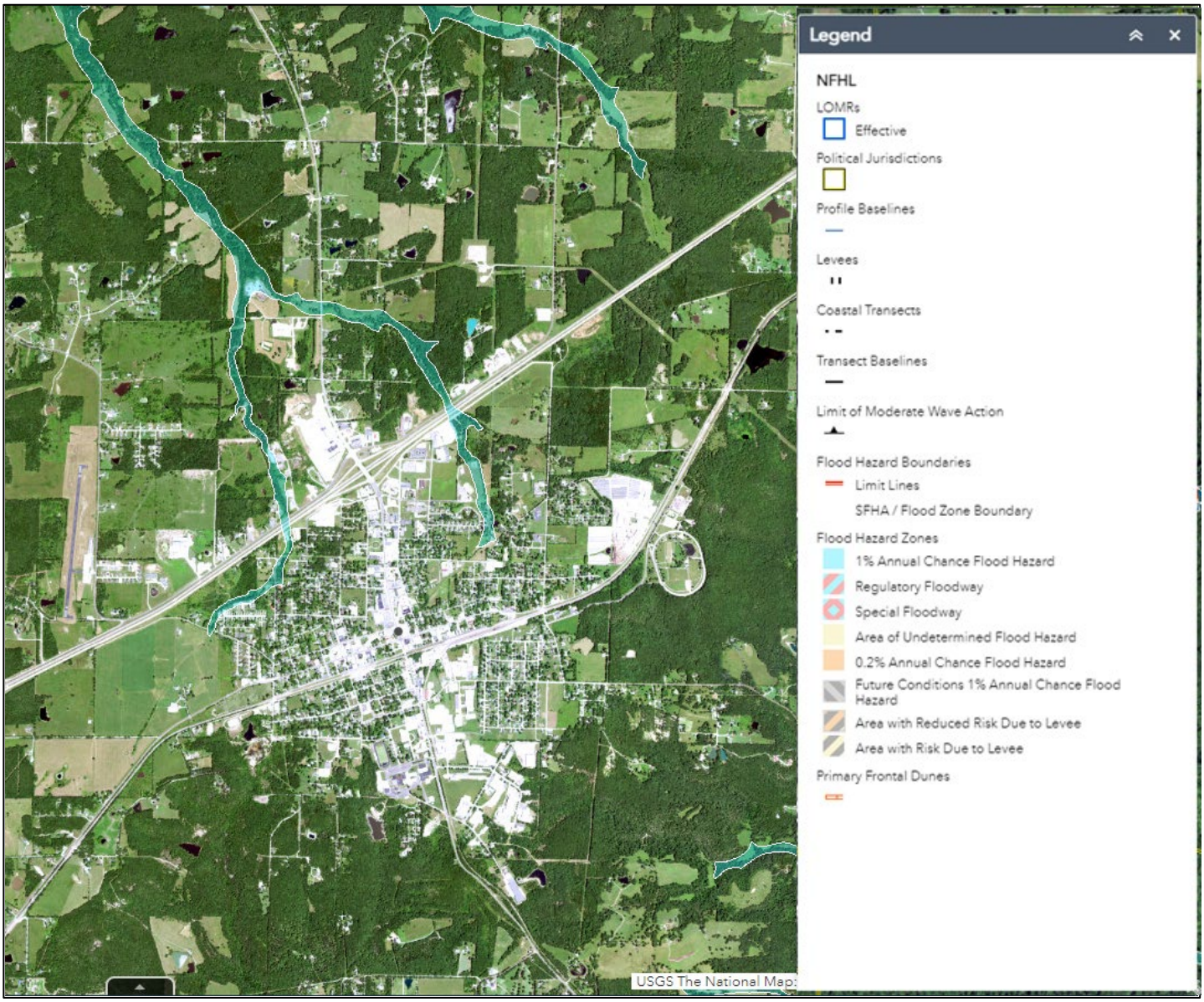


Figure 3.41. Steelville, Missouri Special Flood Hazard Areas (SFHAs)

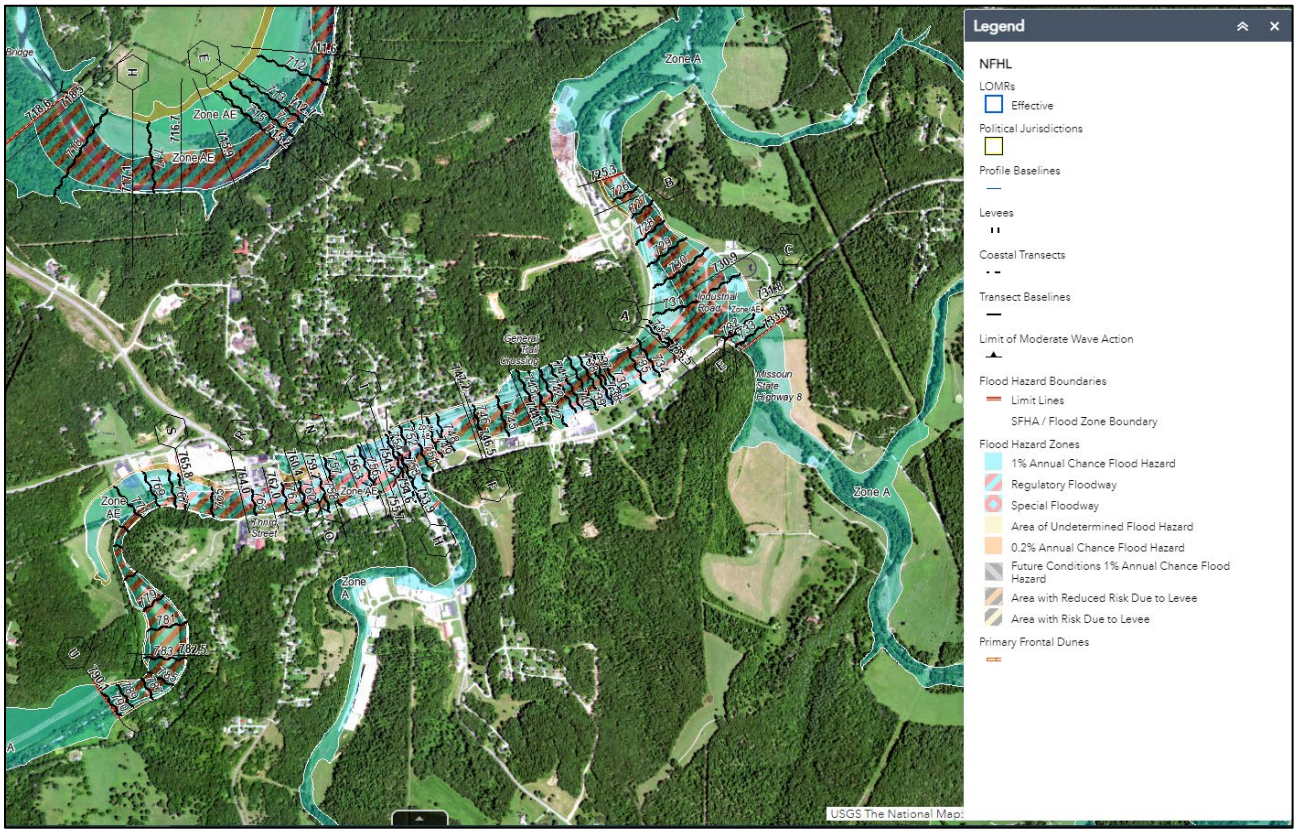


Figure 3.42. Sullivan Missouri Special Flood Hazard Areas (SFHAs)

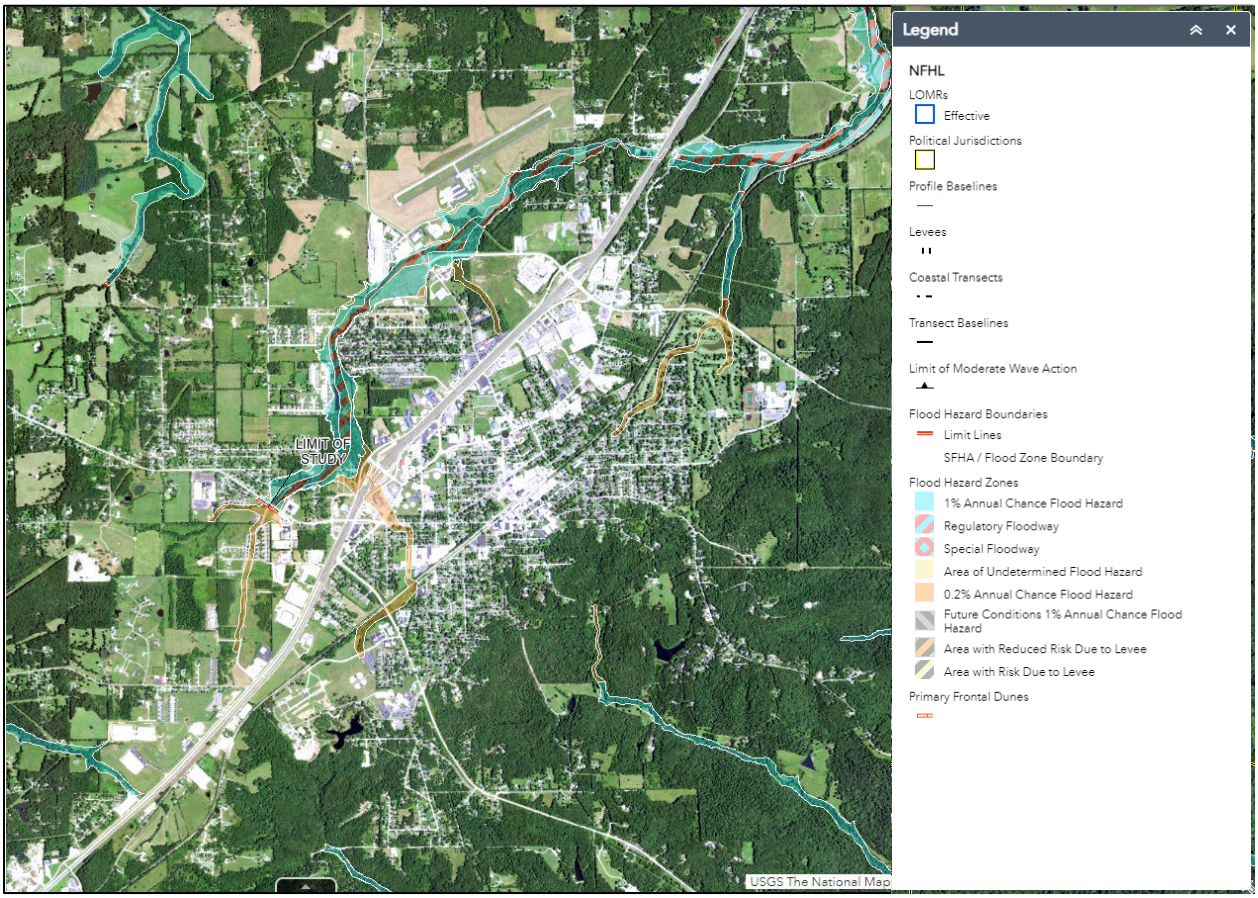


Figure 3.43. Crawford County School Districts and Special Flood Hazard Areas (SFHAs)

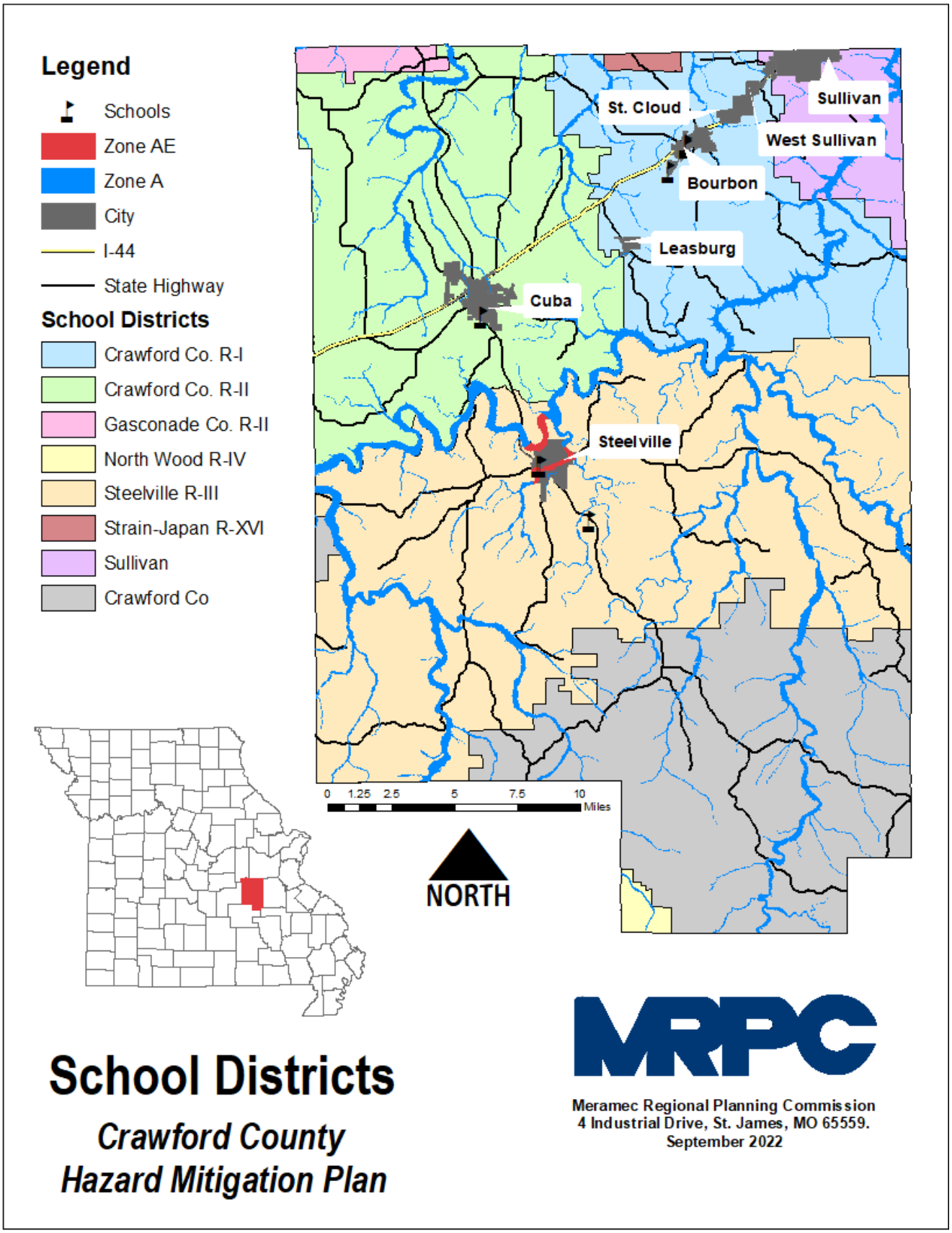


Figure 3.44. Steelville Elementary/Middle School Special Flood Hazard Areas (SFHAs)

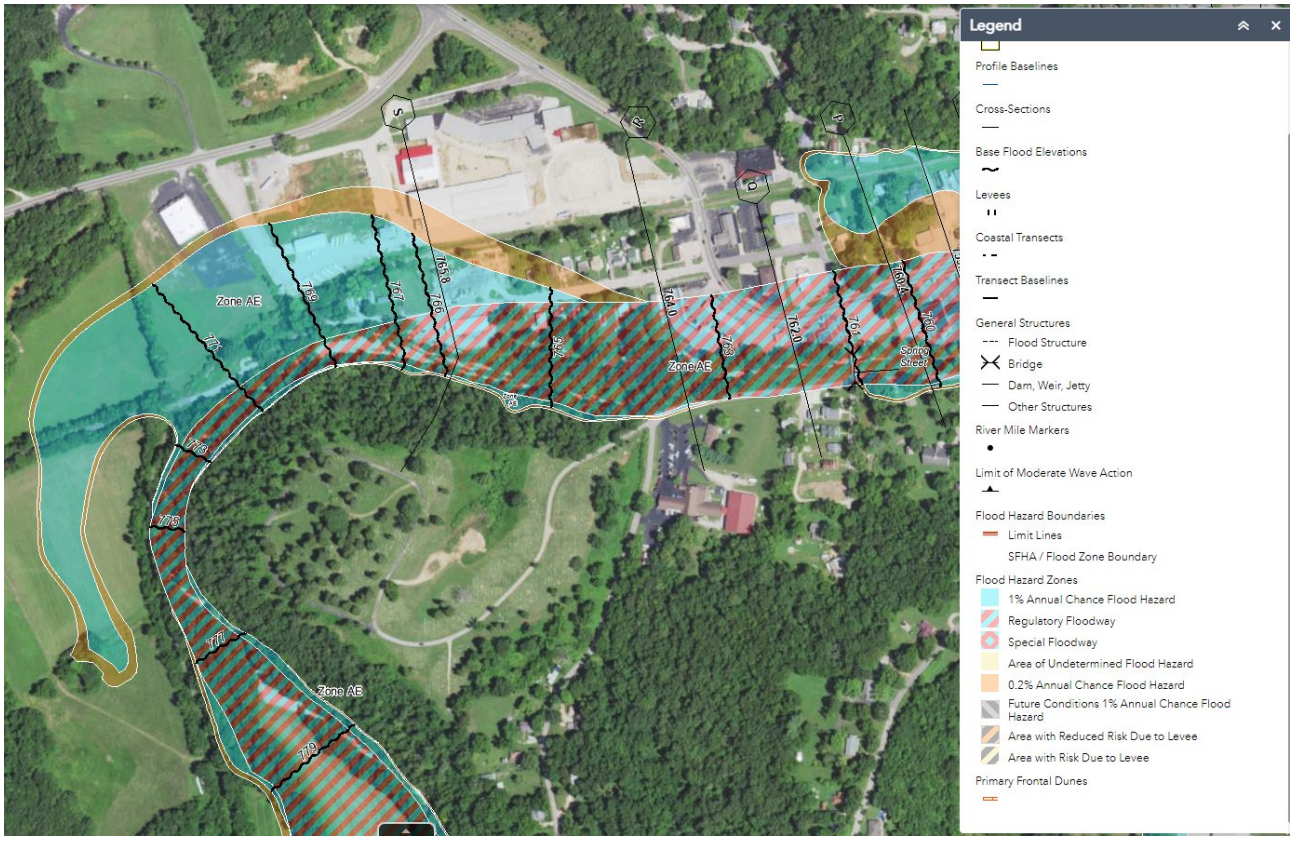


Table 3.37. Summary of Crawford County NCEI Flood Events by Location, 2001-2020

Location	# of Events
Crawford County	1
Steelville	3
Bourbon	1
Fox Springs	2

Source: National Centers for Environmental Information Storm Events Database

Flash flooding occurs in SFHAs and locations in the planning area that are low-lying. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. After review of NCEI data, Jake Prairie, an unincorporated area of the county, is the community most prone to flash flooding events. The city of Bourbon and Dillard, an unincorporated area of the county, also have a high rate of flash flood events (both 3). **Table 3.38** provides information in regards to flash flood events between 2001 and 2020.

Table 3.38. Crawford County NCEI Flash Flood Events by Location, 2001-2020

Location	# of Events
Crawford County	5
Steelville	1
Cuba	1
Leasburg	1
Fox SPGS	1
Jake Prairie	6
Indian Hills	1

Location	# of Events
Berryman	1
Cuba Airstrip ARPT	2
Bourbon	3
Highway	1
Dillard	3

Source: National Centers for Environmental Information

Strength/Magnitude/Extent

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

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

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

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

Between 2001 and 2020, there was only 1 recorded flood-related crop insurance claim. The claim was reported in 2002 and had a total loss of $2126.00 due to flooding within Crawford County[33].

Table 3.39. Recorded USDA Crop Insurance Losses (Flood) for Crawford County 2001 – 2020

Year	Number of Payments	Total
2001	1	$2126.00
TOTAL	**1**	**$2126.00**

Source: USDA \ Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/en/Information-Tools/Summary-of-Business/Cause-of-Loss

National Flood Insurance Program (NFIP) Participation

Table 3.40 depicts jurisdictions within the planning area that participate in NFIP. In addition, **Table**

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

3.41 provides the number of policies in force, amount of insurance in force, number of closed losses, and total payments for Crawford County.

Table 3.40. NFIP Participation in Crawford County

Community ID #	Community Name	NFIP Participant (Y/N/S)	Current Effective Map Date	Regular-Emergency Program Entry Date
290795	Crawford County	Y	05/20/10	05/01/87
290113	Bourbon	Y	NSFHA	08/24/84
290856	Cuba	Y	05/20/10(M)	10/30/18
290561	Leasburg	Y	05/20/10(M)	08/24/84
290114	Steelville	Y	05/20/10	02/13/76
290136	Sullivan	Y	10/18/11	06/15/81

Source: NFIP Community Status Book, 09/02/2020; BureauNet, https://www.fema.gov/flood-insurance/work-with-nfip/community-status-book; M= No elevation determined – all Zone A, C, and X: NSFHA = No Special Flood Hazard Area; E=Emergency Program;

Table 3.41. NFIP Policy and Claim Statistics as of 06/23/2022

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Crawford County	36	$6,335,200	95	$4,856,915.11
Steelville	16	$1,534,500	17	$165,989.61

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

Crawford County has the highest number of policies, losses and total payments with $4,856,915.11 compared to Steelville's $165,989.61

RiskMAP

Risk mapping, assessment, and planning is a FEMA program which provides communities with flood information and tools to enhance their mitigation plan and take action to better protect their citizens. The project kick-off meeting for RiskMAP in Crawford County was held in December 2018 and flood study review meetings were held in November of 2019 and January of 2020.

Repetitive Loss/Severe Repetitive Loss Properties

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

According to SEMA, as of 09/24/2021, there are 14 repetitive loss properties in Crawford County that have had 48 losses with total payments of $4,120,737.57. Unincorporated Crawford County has eleven repetitive loss properties which have had 30 losses with total payments of $4,067,123.28. The city of Steelville has three repetitive loss properties which have had 9 losses with total payments of $53,614.29. According to SEMA, no repetitive loss properties have been mitigated with the planning area.

Table 3.42. Repetitive Loss Properties in Crawford County

Jurisdiction	# of Properties	# Mitigated	Building Payments	Content Payments	Total Payments	# of Losses
Crawford County	11	0	$3,275,643.90	$791,479.38	$4,067,123.28	39
Steelville	3	0	$48,032.10	$5,582.19	$53,614.29	9

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

There are three Severe Repetitive Loss property in Crawford County. These properties have not been mitigated, and the total amount of $2,356,787.10 has been paid over 12 NFIP claims.

Table 3.43. Severe Repetitive Loss Properties in Crawford County

Jurisdiction	# of Properties	# Mitigated	Building Payments	Content Payments	Total Payments	# of Losses
Crawford County	3	0	$1,910,305.24	$446,481.86	$2,356,787.10	12

Previous Occurrences

Table 3.44 provides information regarding Presidential Flooding Disaster Declarations between 2001 and 2020 for Crawford County.

Table 3.44. Crawford County Presidential Flooding Disaster Declarations 2001 to 2020

Declaration No.	Date	State	Incident Description
DR-1463	05/06/2003	Missouri	Severe Storms, Tornadoes, and Flooding
DR-1631	03/16/2006	Missouri	Severe Storms, Tornadoes, and Flooding
DR-1676	01/15/2007	Missouri	Severe Winter Storms, Flooding
DR-1749	03/19/2008	Missouri	Severe Storms, and Flooding
DR-1809	11/13/2008	Missouri	Severe Storms, Flooding, and Tornado
DR-1847	06/19/2009	Missouri	Severe Storms, Tornadoes, and Flooding
DR-4238	08/07/2015	Missouri	Severe Storms, Tornadoes, Straight-line Winds, and Flooding
EM-3374	01/02/2016	Missouri	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding
DR-4250	01/21/2016	Missouri	Heavy Rains, Widespread Flash Flooding, and Flooding
DR-4317	05/24/17	Missouri	Severe Storms, Tornadoes, Straight-line Winds and Flooding

Source: FEMA, Disaster Declarations for Missouri, Flooding

Data was obtained from the NCEI regarding flash and river flooding over the last 20 years. **Table 3.45** and **Table 3.46** provide this information. Additionally, narratives available for each event are included.

Table 3.45. NCEI Crawford County Riverine Flood Events Summary, 2001 to 2020

Year	# of Events	# of Deaths	# of Injuries	Property Damages ($)	Crop Damages ($)
2002	1	0	0	0	0
2007	1	0	0	0	0
2008	2	0	0	0	0
2015	1	1	0	500.00K	0
2017	2	0	0	0	0
Total	**7**	**1**	**0**	**500.00K**	**0**

Source: NCEI, data accessed [10/06/2021]

Narratives on flood events:

1. **05/08/2002:** Several heavy rain events during May caused the Meramec River to flood several times. At Steelville, Sullivan, Pacific, Eureka, and Valley Park, the flooding started on the 9th and continued off and on until the 22nd. At Arnold, backwater from the Mississippi helped create flooding from the 8th through the 29th. The river ranged from about 7 to almost 13 feet over flood stage at various points. Numerous roads along the river were closed during the flooding.

2. **01/13/2007:** Several inches of rain caused flooding of small creeks and streams and low-water crossings mainly across southern Crawford County.

3. **03/18/2008:** Heavy rain in March produced major flooding on the Gasconade and Meramec rivers in eastern Missouri. The trigger was a four to seven inch rainfall which produced the flooding from the 19th to the 22nd. The Gasconade River at Rich Fountain crested at 33.0 feet which was the second highest level ever recorded. The Meramec River at Steelville crested at 26.84 feet, the 2nd highest crest of record. At Valley Park, the crest of 37.83 represented the 3rd highest of record, while crests at Sullivan, Pacific, and Eureka all represented the 4th highest of record. Damage along the Gasconade River was mild, mainly to secondary homes or cabins along the river. Highway E was closed due to flooding and US Highway 50 was closed for about 24 hours near Mt. Sterling due to flooding when the river crested on the 21st. The Meramec River produced the most damaging flooding. Homes, businesses and roads in Pacific and Eureka were flooded. Highway 141 in Valley Park, a major north south commuting route through western St. Louis County had to be closed at the intersection of I-44 due to flooding. Initial damage estimates for individual and public assistance were from $20 to $25 million.

4. **09/14/2008:** Three to four inches of rain fell in a short amount of time on already saturated soils due to the remnants of Hurricane Ike. Several creeks in the Steelville area, including Yadkin Creek, were out of their banks for a time and several roads in the area were flooded.

5. **12/30/2015:** Between 5 and 8 inches of rain fell across Crawford County during a 2 day period. All of this rain caused the creeks and rivers to rise. The Meramec River rose above flood stage at Steelville on December 27th. On December 30th, an 81 year old man drove into the flood waters of the Meramec on Highway N at Campbell Bridge, about 5 miles southeast of Bourbon. He apparently got out of his vehicle and drown. The flooding caused major damage to one home and completely destroyed another one.

6. **04/30/2017:** The Meramec River rose well above major flood stage at Steelville due to very heavy rain that fell across the river basin. Numerous roads along the flow of the river were flooded as well as a number of camp grounds, as well as, a couple of hotels.

7. **05/01/2017:** The Meramec River rose well above major flood stage at Steelville due to very heavy rain that fell across the river basin. Numerous roads along the flow of the river were flooded as well as a number of camp grounds, as well as, a couple of hotels.

Table 3.46. NCEI Crawford County Flash Flood Events Summary, 2001 to 2020

Year	# of Events	# of Deaths	# of Injuries	Property Damages ($)	Crop Damages ($)
2001	1	0	0	0	0
2002	3	0	1	0	0
2003	1	0	0	0	0
2004	1	0	0	0	0
2006	1	0	0	0	0
2007	1	0	0	1.00K	0
2008	4	0	0	1.00K	0
2009	1	0	0	0	0
2010	3	0	0	0	0
2011	1	0	0	0	0
2012	2	0	0	0	0
2015	3	0	0	0	0
2016	1	0	0	0	0
2017	2	0	0	0	0
2020	1	0	0	0	0
Total	**26**	**0**	**0**	**2.00K**	**0**

Source: NCEI, data accessed [10/06/2021]

Narratives on flash flood events:

1. **09/08/2001:** Rainfall close to 6 inches caused widespread flooding across the county. Numerous roads were closed much of the day. Many roads and bridges were damaged from the runoff from the heavy rain. The Department of Natural Resources reported that Onondaga Cave State Park suffered significant damage from the rain as well.

2. **05/12/2002:** Some of the worse flash flooding in recent years hit on Sunday, Mother's Day, and continued into early Monday. Around 6 inches of rain fell on ground already saturated by previous rain. For several counties, it was the worst flooding in memory. Iron County was especially hard hit. Virtually every creek and small stream flooded closing roads throughout the county. There were numerous water rescues as people were trapped in their cars. Emergency shelters in the County were opened to help stranded motorists and people who were flooded out of homes. The story was similar in Reynolds County as Highways 49 and 21 had to be closed. In Fredericktown, in Madison County, many city streets flooded. Several people were stranded in flooded vehicles and could not be reached for an hour or so. Numerous roads were flooded across Crawford, St. Francois, Ste. Genevieve and Washington Counties as well. The only death that occurred happened in Iron County near Ironton. A 43 year old man was trying to cross Stouts Creek on foot to get to his home to rescue his dogs. He was knocked down, but managed to grab hold of a tree. He was swept away and drowned by the rising water before rescue workers could reach him.

3. **07/18/2002:** A reported 4 inches of rain in about an hour caused flash flooding in Cuba. The Sheriff Department reported the Highway 19 railroad underpass had at least 2 feet of water in it and had to be closed. Another area that flooded had 2 propane tanks break loose and float away. The heavy rain caused problems at the County Fair that had started the day before. The entire evenings planned events had to be cancelled. The roof of the main stage collapsed due to the rain. One man was injured with a broken arm when the roof collapsed.

4. **08/18/2002:** Rainfall of 3 to 4 inches flooded several roads primarily across western Crawford County. Highway M flooded as did several nearby secondary roads.

5. **06/10/2003:** Heavy rain caused flash flooding across the north portion of Crawford County. Highway N southeast of Bourbon was closed due to flooding.

6. **05/01/2004:** Rainfall up to 3 inches caused flash flooding across the county. Crooked Creek flooded way out of its banks as did several other small streams. Roberts Cemetery, Bales, and Old Mines roads were all reported flooded.

7. **03/12/2006:** Several rounds of thunderstorms moved through Crawford county. Between 3 and 5 inches of rain fell in a short amount of time causing numerous creeks to flood. County highways E, C and M were closed due to flooding. Also, County highway H had one foot of water over the road in Onondaga Cave State Park near the Meramec River and was still rising at the time of the report. Various other county roads were closed as well.

8. **09/08/2007:** Three to four inches of rain fell over a short amount of time on ground that was already saturated from previous rains. The sheriff's department reported that Highway E at Scotia had water over the bridge that crosses Huzzah Creek. The flooding lingered for several hours.

9. **02/05/2008:** Two to three inches of rain fell over portions of Crawford county during the evening of February 5th. Several roads around the Steelville area had over a foot of water flowing over them.

10. **03/18/2008**: Two to three inches of rain fell onto already saturated soils in Crawford county from the evening hours of March 17th through March 18th. Numerous roads were flooded including Highway 19 southeast of Steelville.

11. **03/31/2008:** Up to three inches of rain fell over a short amount of time on already saturated soils in Crawford county. Numerous roads were closed due to flooding including Highway 19 south of Cuba, Highway C west of Bourbon and Highway N southeast of Bourbon near Blue Springs Creek.

12. **06/06/2008**: Two to four inches of rain fell on already saturated soils in northern Crawford county. Numerous secondary roads became flooded including parts of Highway 19 south of Cuba, Highway PP east of Cuba, and Highway N southeast of Bourbon.

13. **05/08/2009:** Up to four inches of rain fell in a short amount of time causing flash flooding. Numerous roads were flooded including Highways C and N.

14. **04/30/2010:** Up to 2 inches of rain fell in a short amount of time on already saturated soils causing flash flooding. Numerous roads were flooded and a small creek in Steelville rose out of its banks blocking access to a bridge in town.

15. **05/20/2010**: Between 1 and 3 inches of rain fell in a short amount of time on already saturated soils causing flash flooding. Numerous roads were flooded including County Roads C and N near Bourbon, as well as low water crossings on County Road AA and TT.

16. **07/18/2010:** Up to 6 inches of rain fell in a short amount of time causing flash flooding. Numerous roads were flooded including Cherryville Road and Highway 19. Also, in Steelville several roads were flooded due to Yadkin Creek overflowing its banks.

17. **04/24/2011:** Between 4 and 6 inches of rain fell over several days causing flash flooding. Numerous roads were flooded countywide.

18. **03/15/2012:** Up to two inches of rain fell in a short amount of time causing flash flooding. Several roads were flooded including Highway N between Bourbon and Anthonies Mill.

19. **03/17/2012:** Up to three inches of rain fell in a short amount of time causing flash flooding. Numerous roads were flooded including streets and yards in Cuba. Also, Highway C just northwest of Bourbon and Highway ZZ just west of Cuba.

20. **06/19/2015:** Up to three inches of rain fell onto already saturated ground causing flash flooding. Several roads were flooded throughout the county. Also, in Steelville, several people had to be evacuated on the southwest side of town due to Yadkin Creek rising well above its banks.

21. **12/26/2015:** Between 3 and 6 inches of rain fell across Crawford County. There were numerous roads flooded including a two mile stretch of Route N southeast of Bourbon due to Blue Springs Creek, which was well out of its banks in several locations.

22. **12/28/2015:** Another round of heavy rain fell across Crawford County, with an additional 2 to 3 inches reported. Storm total rainfall was 5 to 8 inches from December 26th through December 28th. This second round caused numerous creeks to rise even more, including Huzzah Creek. It flooded a large camping/floating resort off of Highway 8 where Dry Creek empties into Huzzah Creek. Numerous roads were flooded as well.

23. **08/05/2016:** Up to three inches of rain fell onto already saturated soils causing flash flooding. About 3 miles west of Steelville, campers were stranded at the Indian Springs Camp Ground. The campers were on high ground, stuck between a flooded creek and the Meramec River. They were on high enough ground to be safe. In Cuba, a small creek on the west side of town inundated a mobile home park. Residents were evacuated by emergency services.

24. **04/05/2017:** Crawford County sheriff's office reported several low water crossings and bridges flooded due to heavy rain in the Steelville, Cuba and Leasburg areas.

25. **04/29/2017:** Four to seven inches of rain fell causing widespread flash flooding. Numerous roads were flooded including Route E about five miles east northeast of Steelville.

26. **07/03/2020:** A detached lobe of vorticity drifted slowly south/southwestward across the region. Weak forcing associated with it combined with ample low-level moisture allowed showers and storms to develop. Some of the storms produced heavy rain and flash flooding. Up to 4 inches of rain fell in a short amount of time causing flash flooding. Lakeshore Drive around Indian Lake was impassable which cutoff access to parts of the community. Numerous other roads in the area were flooded as well.

Probability of Future Occurrence

From the data obtained from the NCEI [34], there were 7 riverine flood events (**Table 3.45)** over a period of 20 years. This information was utilized to determine the annual average percent probability of riverine flooding (**Table 3.47**). The probability of riverine flooding in Crawford County per year is 35 percent (7 events/20 years x 100). Furthermore, data was obtained for flash flooding within the county. Crawford County endured 26 flash flooding events (**Table 3.46**) over a 20 year period. The probability of flash flooding in Crawford County per year is 100% (26 events/20 years x 100) with an average of 1.3 events per year (**Table 3.48**).

Table 3.47. Annual Average % Probability of Riverine Flooding in Crawford County

Location	Annual Avg. % P
Crawford County	35%

*P = probability; see page 3.24 for definition.

Table 3.48. Annual Average % Probability of Flash Flooding in Crawford County

Location	Annual Avg. % P	Avg. Number of Events
Crawford County	100%	1.3

*P = probability; see page 3.24 for definition.

Changing Future Conditions Considerations

As discussed in the 2018 Missouri Hazard Mitigation Plan, there is a high probability that total rainfall from heavy rainfalls will increase in the 21st century across the globe. As the number of heavy rain events increase, more flooding can be expected.[35] Increased development – more roofs and paved areas - can also increase run-off and exacerbate flooding and stormwater issues. These changes will likely result in an increased frequency and severity of floods in Crawford County. This change is already being seen in the last 20 years, with heavy rainfall events becoming more severe and occurring more often and severe flooding occurring more frequently. Flood levels on the Gasconade River broke records three times in the past six years. Homes that were elevated several feet above base flood elevation flooded in Jerome.

If rainfall frequency and intensity continue to increase as expected, this will put additional stress on natural hydrological systems and community stormwater systems. Higher groundwater levels can result in more intensive flooding if the ground is already saturated and flood waters typically recede more slowly when groundwater levels are high.[36] Other considerations include planning for more expansive stormwater capacity, better drainage and erosion control.[37]

[34] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI
[35] 2018 Missouri State Hazard Mitigation Plan
[36] 2018 Missouri State Hazard Mitigation Plan
[37] 2018 Missouri State Hazard Mitigation Plan

Vulnerability

Vulnerability Overview

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

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

When roads and bridges are inundated by water, damage can occur as the water scours materials around bridge abutments and gravel roads. Additional information on scour bridges can be found on page 3.16. Floodwaters can also cause erosion undermining road beds. In some instances, steep slopes that are saturated with water may cause mud or rock slides onto roadways. These damages can cause costly repairs for state, county and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners a well as present a health hazard.

For the vulnerability analysis of flooding for Crawford County, data was obtained from the 2018 Missouri State Hazard Mitigation Plan. The 2018 Plan used the most recent release of Hazus, version 4.0, to model flood vulnerability and estimate flood losses due to the depth of flooding. Additional hazard data inputs were utilized, as available, to perform Hazus Level 2 analyses. This included the extensive use of the FEMA special flood hazard area data and RiskMAP flood risk datasets.

For the Hazus analysis, the flood hazard area and depth of flooding was determined for each county using one of three methods – depending on the data available for that county. Crawford County does have digital FIRMS, the regulatory special flood hazard area was utilized. Next, depth grids were generated using cross sections from the FIRM database and/or hydraulic models in combination with the terrain elevation data from which the DFIRM was derived.

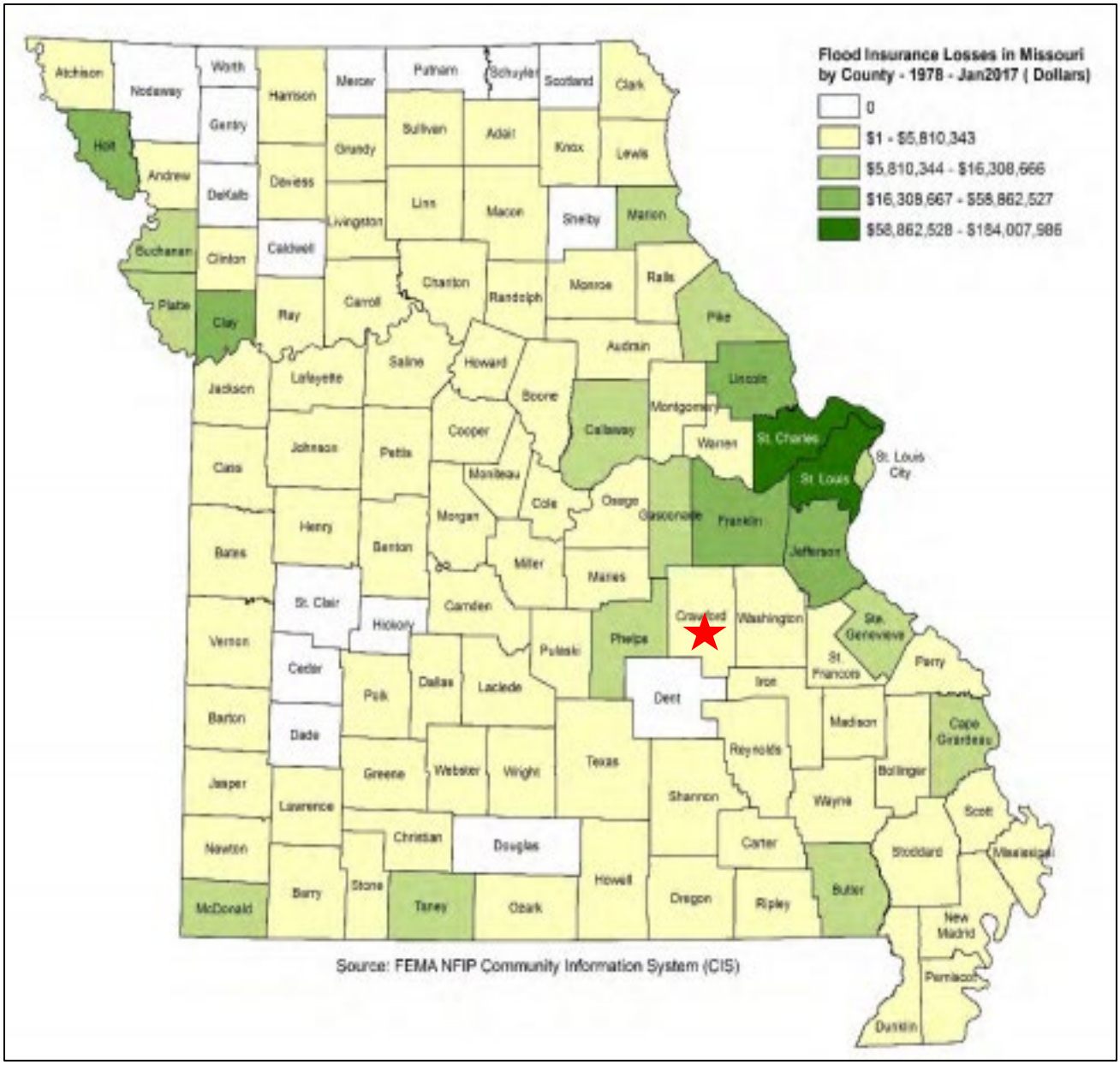
This method was preferred of the three methods, along with RiskMAP flood risk datasets.

In addition to the DFIRM, SEMA analyzed National Flood Insurance Program (NFIP) flood-loss data to determine areas of Missouri with the greatest flood risk. Missouri flood-loss information was obtained from BureauNet which documents losses from 1978 to the present (November 30, 2017 for the State Plan). With this flood-loss data there are limitations noted, including:

- Only losses to participating NFIP communities are represented
- Communities joined the NFIP at various times since 1978
- The number of flood insurance policies in effect may not include all structures at risk to flooding
- Some of the historic loss areas have been mitigated with property buyouts

Figure 3.45 depicts the amount of flood insurance losses in Missouri by county for the period 1978-January 2017. Crawford County falls in the $1- $5,810,343 range of payments.

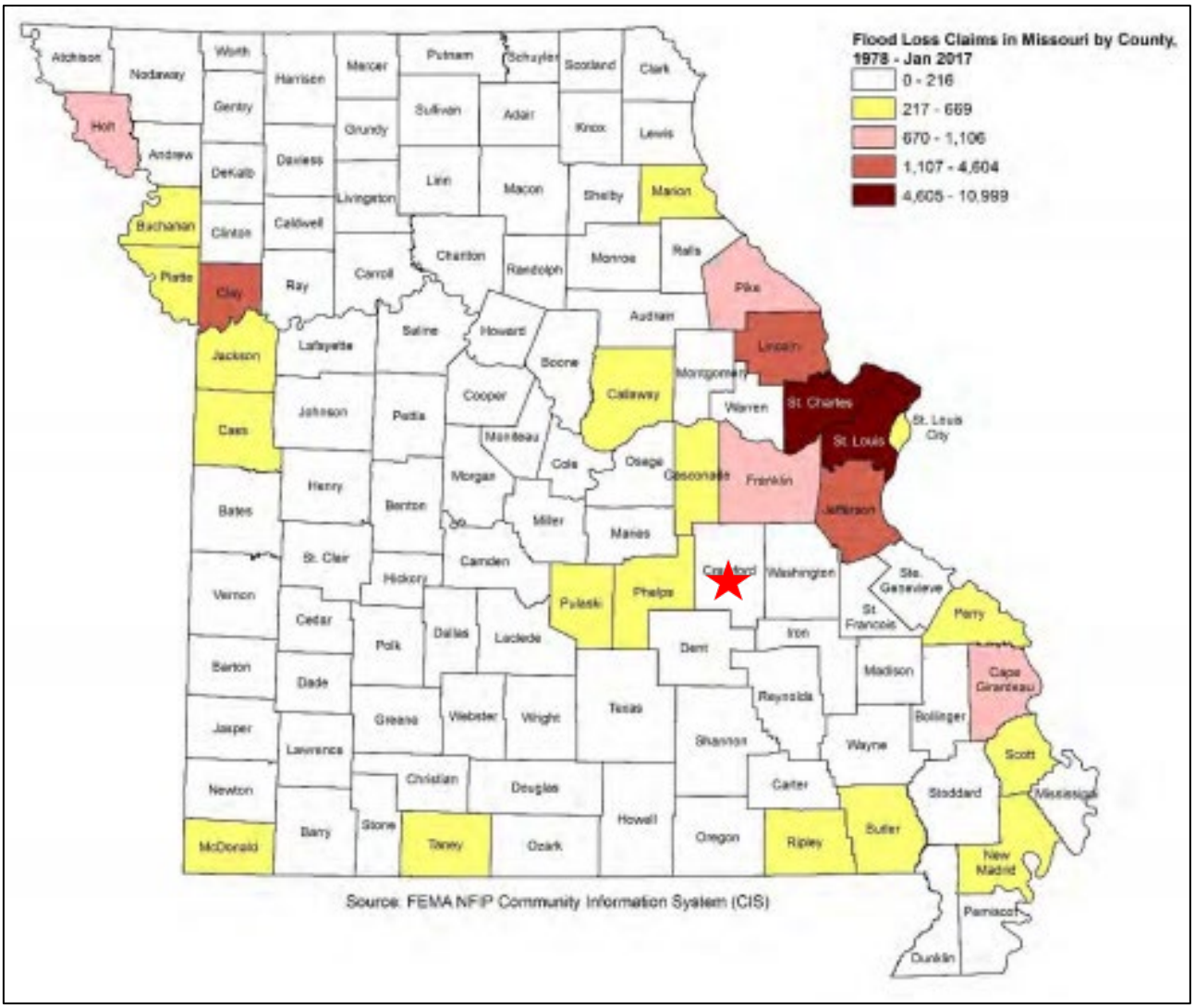
Figure 3.45. Map of Funds Paid Historically for Flood Insurance Losses in Missouri by County 1978 - January 2017



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

Figure 3.46 illustrates the number of flood loss claims made in Missouri during the same time period. Crawford County had 0 - 216 claims during that timeframe.

Figure 3.46. Flood Loss Claims in Missouri by County, 1978 – January 2017



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

Furthermore, the state analyzed potential loss estimates to flooding. The purpose of the analysis is to determine where flood losses can occur and the degree of severity using consistent methodology. These results were generated from DFIRM data and Hazus floodplain data. **Table 3.49** provides information regarding total direct building loss and income loss to Crawford County. **Table 3.50** provides information on exposure of buildings. According to the Missouri Spatial Data Information Service (MSDIS) there are 145 residential structures at risk of flood. Hazus shows the number of building exposed to flood damage at 123, with 27 potentially substantially damaged in a one percent annual chance of a flood.

Table 3.49. Total Direct Building Loss and Income Loss to Crawford County

County-wide Building Loss	Structural Damage	Contents Loss	Inventory Loss	Total Direct Loss	Total Income Loss	Total Direct and Income Loss	Calc. Loss Ratio
$2,389,455,000	$57,048,000	$46,649,000	$1,068,000	$104,765,000	$296,000	$105,061,000	2.39

Source: 2018 Missouri State Hazard Mitigation Plan

Table 3.50. Crawford County Structures Exposure

# MSDIS Residential Structures Exposed	# Hazus Buildings Exposed	# Substantially Damaged
145	123	27

Source: 2018 Missouri State Hazard Mitigation Plan

This same analysis indicates that 1,741 people would be displaced in Crawford County and 469 would need to be sheltered in the event of a major flood.

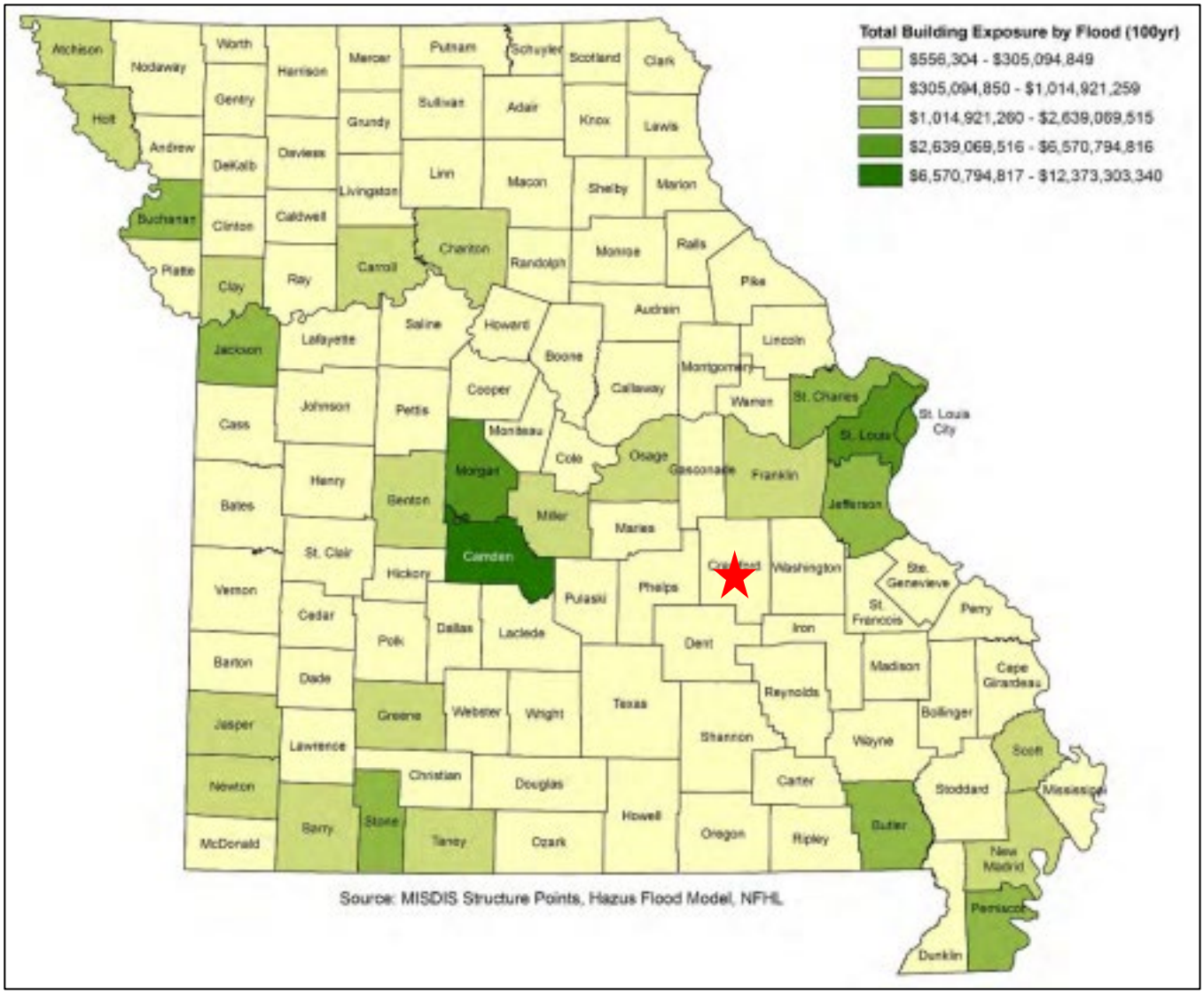
Table 3.51 presents the results of the primary indicators for Crawford County – residential, agricultural, commercial, education, government and industrial. This table illustrates the number of affected structures and estimated losses. **Figure 3.47** shows the building exposure for the Hazus Base-Flood Scenario. **Figure 3.48** illustrates the building impacted ratio for a 100-year flood.

Table 3.51. Crawford County Total Building Loss and Income Loss

# Residential Structures	Total $$ of Loss	# Agriculture Structures	Total $$ of Loss	# Commercial Structures	Total $$ of Loss	# of Education Structures	Total $$ of Loss	# of Government Structures	Total $$ of Loss	# of Industrial Structures	Total $$ of Loss	Total # Population Affected	Total Loss – Hazus Layer
145	$167,887	179	$206,700	108	$554,899	0	$0	9	$614,000	5	$755,175	378	$2,298,660

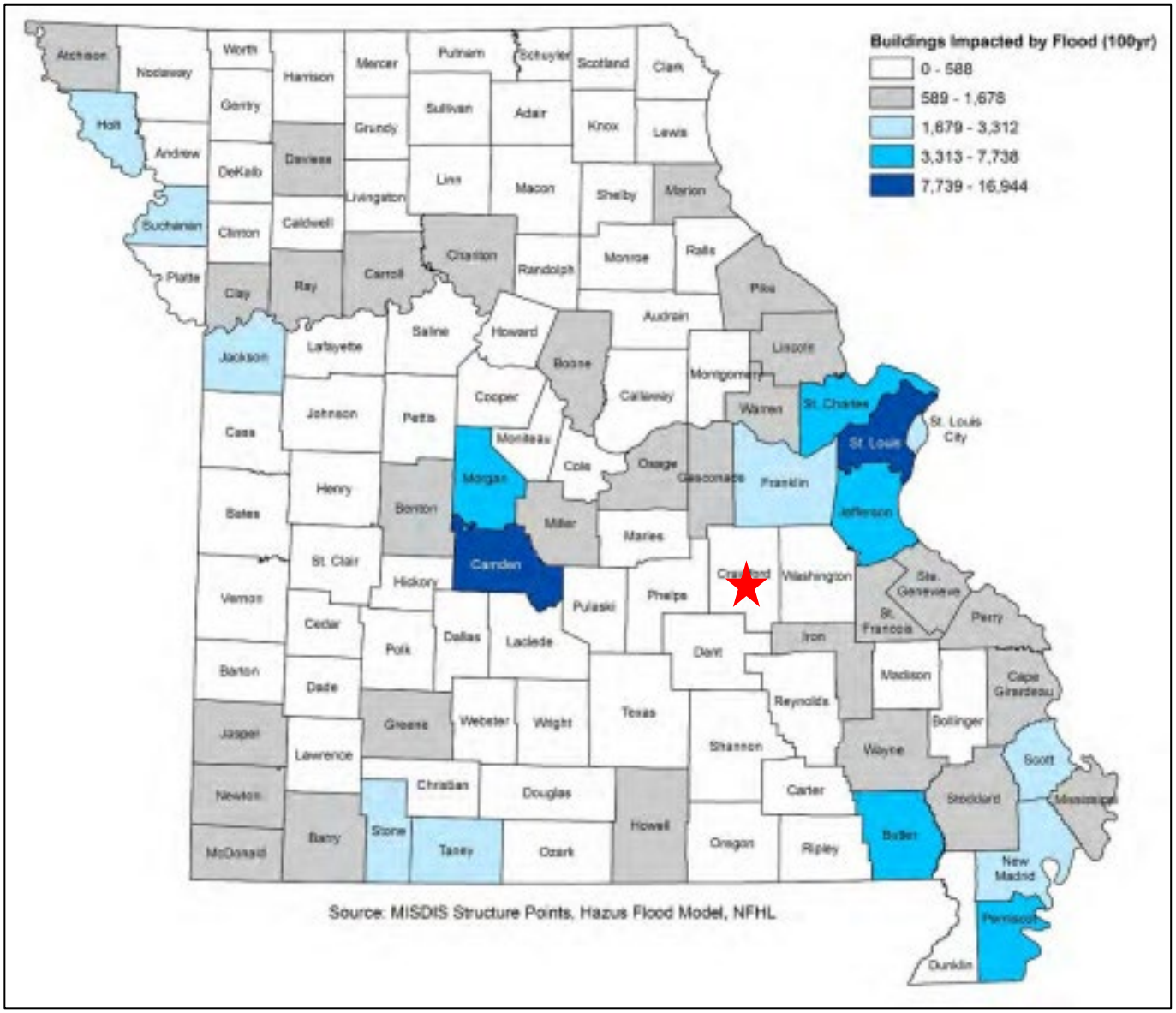
Source: 2018 Missouri State Hazard Mitigation Plan

Figure 3.47. Hazus Countywide Base-Flood Scenarios: Building Exposure



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

Figure 3.48. Hazus Countywide Base-Flood Scenarios: Building Impacted Ratio



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

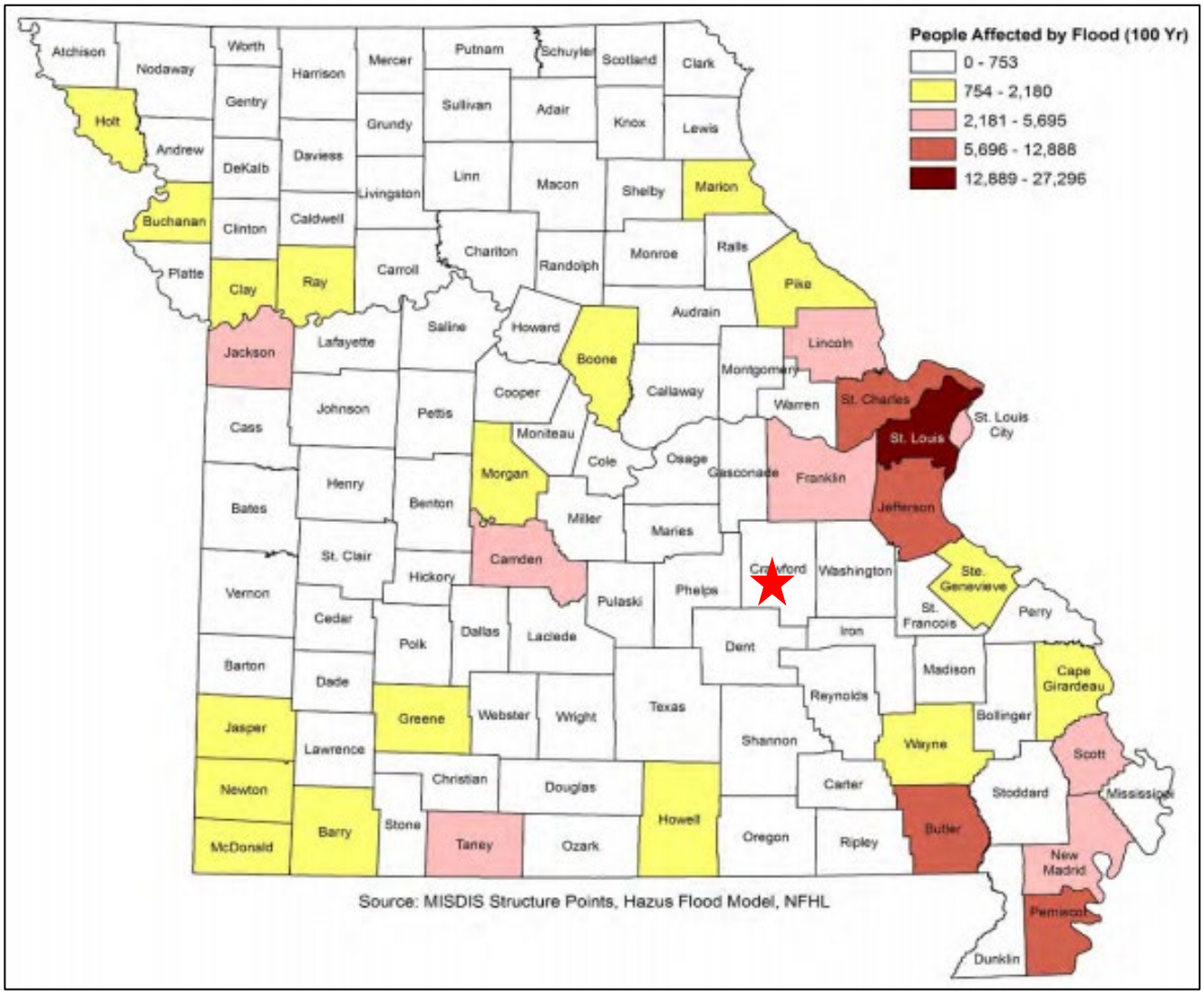
Lastly, the State determined the estimated number of displaced households and need for shelters within Crawford County in the event of a 100 year flood. **Table 3.52** and **Figure 3.49** illustrate this information.

Table 3.52. Estimated Displaced People and Shelter Needs for Crawford County

County	Displaced People	Displaced Population Requiring Shelter
Crawford	1,741	469

Source: 2018 Missouri State Hazard Mitigation Plan

Figure 3.49. HAZUS Countywide Base-Flood Scenarios: Displaced People



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

Potential Losses to Existing Development

Every jurisdiction in the county contains a portion of the 100 Year Floodplain. According to the HAZUS model, Crawford County has a building loss ratio of 2.39 percent for countywide base-flood scenarios. However, the unprecedented flooding in 2013 suggests that future flood events could cause significant disruption in the county. The August 2013 flash flood caused significant damages to property ($1,000,000). The statewide average building loss ratio is 1.40 which makes Crawford County's ratio in the high range. Additionally, the county has 11 repetitive loss properties, while Steelville has 3 repetitive loss properties. With the annual average probability for flooding at 35 percent and 100 percent for flash floods, Crawford County's existing development is vulnerable to flood. Especially development located in low-lying areas, near rivers or streams, or where drainage systems are not adequate are prone to flooding. Both the elementary and middle school buildings in the city of Steelville are in the SFHA.

Impact of Future Development

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

Hazard Summary by Jurisdiction

Vulnerability to flooding varies slightly across the planning area. The jurisdictions most vulnerable to flooding include unincorporated Crawford County and the city of Steelville. Since 2001 there have been 33 incidents of flooding or flash flooding in Crawford County; 4 incidents in and around Steelville; and 4 incidents in and around Bourbon (**Table 3.45** and **Table 3.46**). Out of the county's 14 repetitive loss properties, none have been mitigated (**Table 3.42**).

Crawford Co. has residential properties within the floodplain, as well as infrastructure such as roads, bridges, and low water crossings. SFHAs do not reside within Bourbon's city limits; however, the city has experienced multiple flash flood events. Cuba's water treatment plant resides in the floodplain along with a section of I-44, and residential properties near Star Creek Lane. Almost the entirety of Steelville's downtown, along Highway 8 resides in the floodplain and consists of commercial and residential properties, including Steelville R-III buildings; commercial and residential properties along Highway 19, properties along Industrial Drive, and the water treatment plant all reside in a SFHA. Sullivan has properties in the floodplain including at least one commercial property, a section of Highway 185, and numerous residential structures near the golf course.

Problem Statement

The county has adopted a Floodplain Management Ordinance that regulates construction in the floodplain. Local governments should make a strong effort to further improve emergency warning systems to ensure that future deaths and injuries do not occur. Local governments should consider making improvements to roads and low water crossings that consistently flood by placing them on a hazard mitigation projects list, and actively seek funding to successful complete the projects.

3.4.6 Land Subsidence/Sinkholes

Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.5, Page 3.218 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- http://www.dnr.mo.gov/geology/geosrv/envgeo/sinkholes.htm
- http://www.businessinsider.com/where-youll-be-swallowed-by-a-sinkhole-2013-3
- http://water.usgs.gov/edu/sinkholes.html
- http://pubs.usgs.gov/fs/2007/3060/
- Missouri hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  http://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9NOu-oPFWi9hkst/view - User Guide
    - Total number of sinkholes by County
    - Vulnerability to sinkholes by County
    - Total number of mines by County
    - Vulnerability to mines by County
    - Total value of structures impacted by sinkholes by County
    - Total population impacted by sinkholes by County

Hazard Profile

Hazard Description

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

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

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

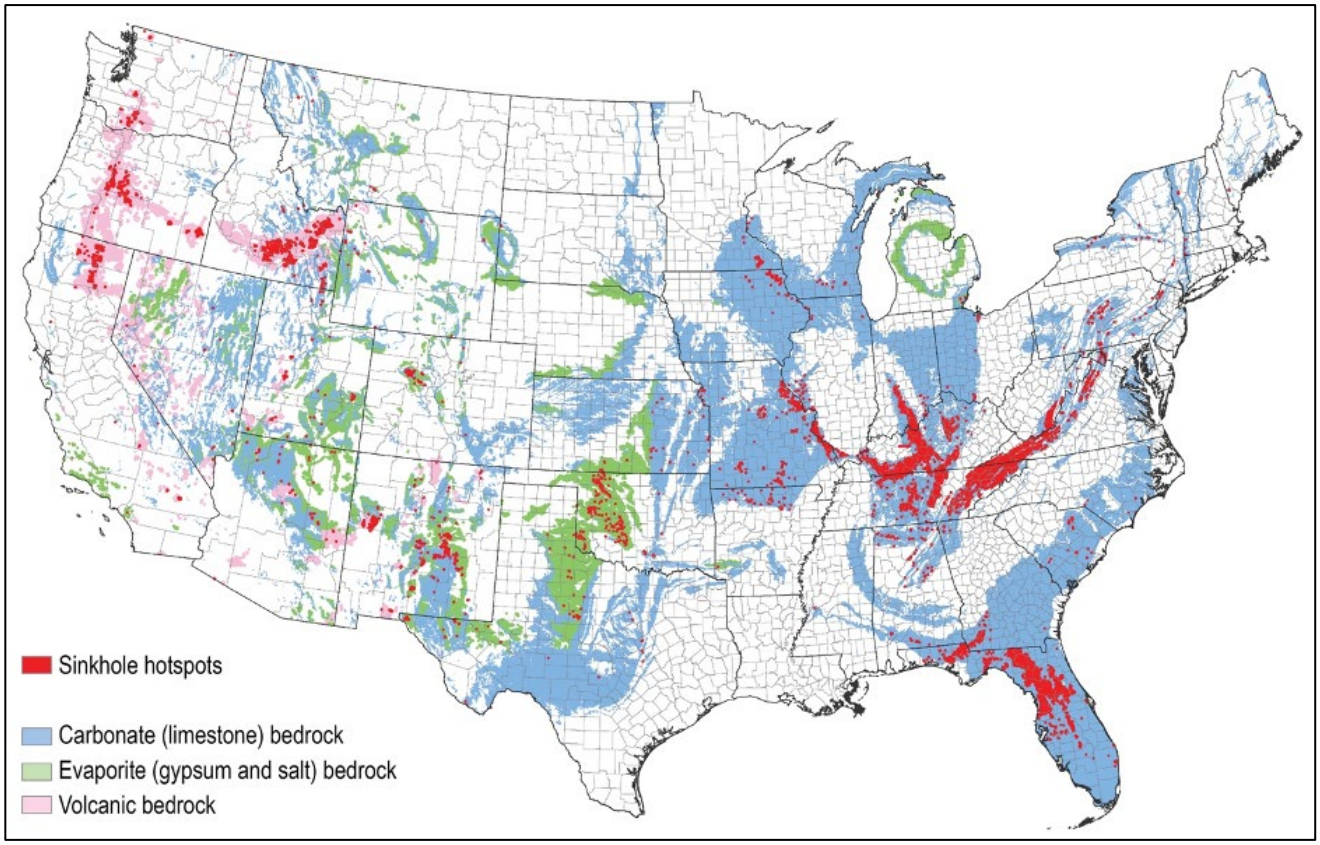
According to the U.S. Geological Survey (USGS), the most damage from sinkholes tends to occur in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. Fifty-nine percent of Missouri is underlain by thick, carbonate rock that makes Missouri vulnerable to sinkholes. Sinkholes occur in Missouri on a fairly frequent basis. Most of Missouri‘s sinkholes occur naturally in the State‘s karst regions (areas with soluble bedrock). They are a common geologic hazard in southern Missouri, but also occur in the central and northeastern parts of the State. Missouri sinkholes have varied from

a few feet to hundreds of acres and from less than one to more than 100 feet deep. The largest known sinkhole in Missouri encompasses about 700 acres in western Boone County southeast of where Interstate 70 crosses the Missouri River. Sinkholes can also vary in shape like shallow bowls or saucers whereas other have vertical walls. Some hold water and form natural ponds.

Geographic Location

Figure 3.50 depicts karst topography across the United States. Missouri's karst topography is comprised of carbonate rocks such as limestone, dolomite, and marble. Variability in areas prone to sinkholes does not differ greatly across the county. According to the 2018 Missouri State Hazard Mitigation Plan there are 57 sinkholes that have been recorded within Crawford County (**Figure 3.51**). In addition, the Plan states that there are 546 mines in Crawford County - as shown in **Figure 3.53**. According to the Missouri Department of Natural Resources, Crawford County primarily produces refractory clay but has deposits of barite with lead, sedimentary limonite and hematite. Activities such as mining or drilling are known to be responsible for the formation of sinkholes.

Figure 3.50. Karst Map of the Conterminous United States - 2020



Source: https://www.usgs.gov/media/images/karst-map-conterminous-united-states-2020

Figure 3.51. Crawford County Watershed/Water Resources

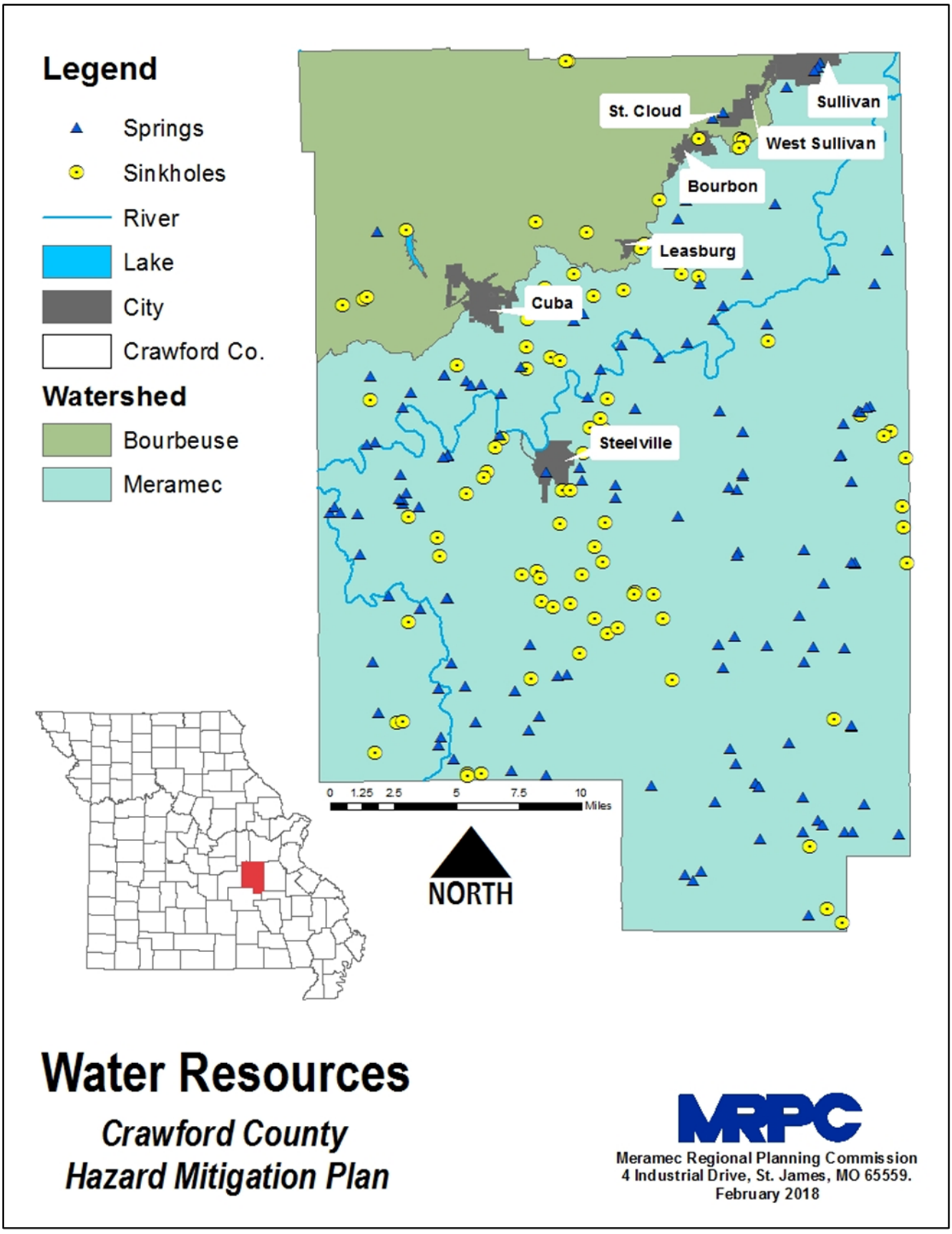
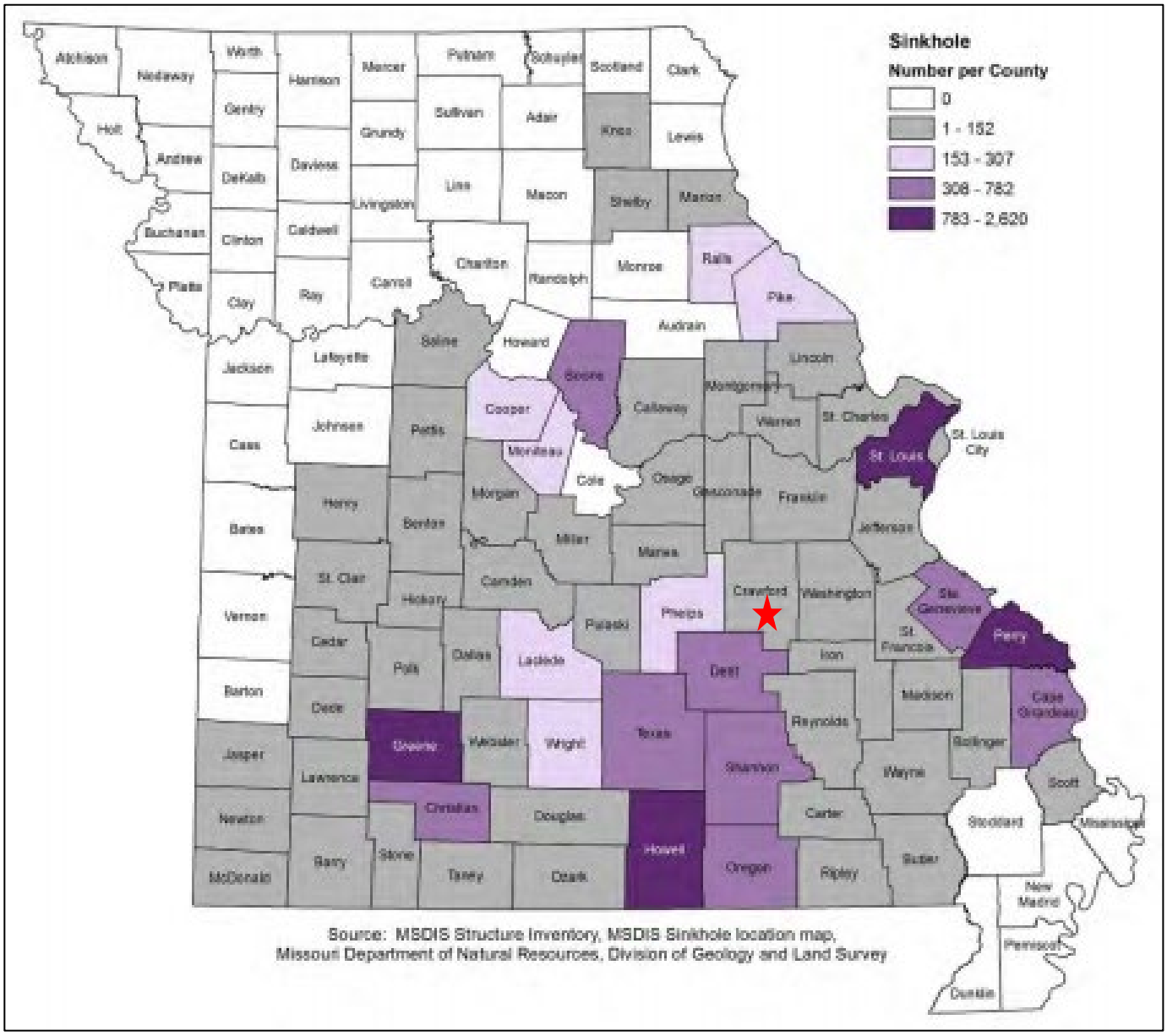
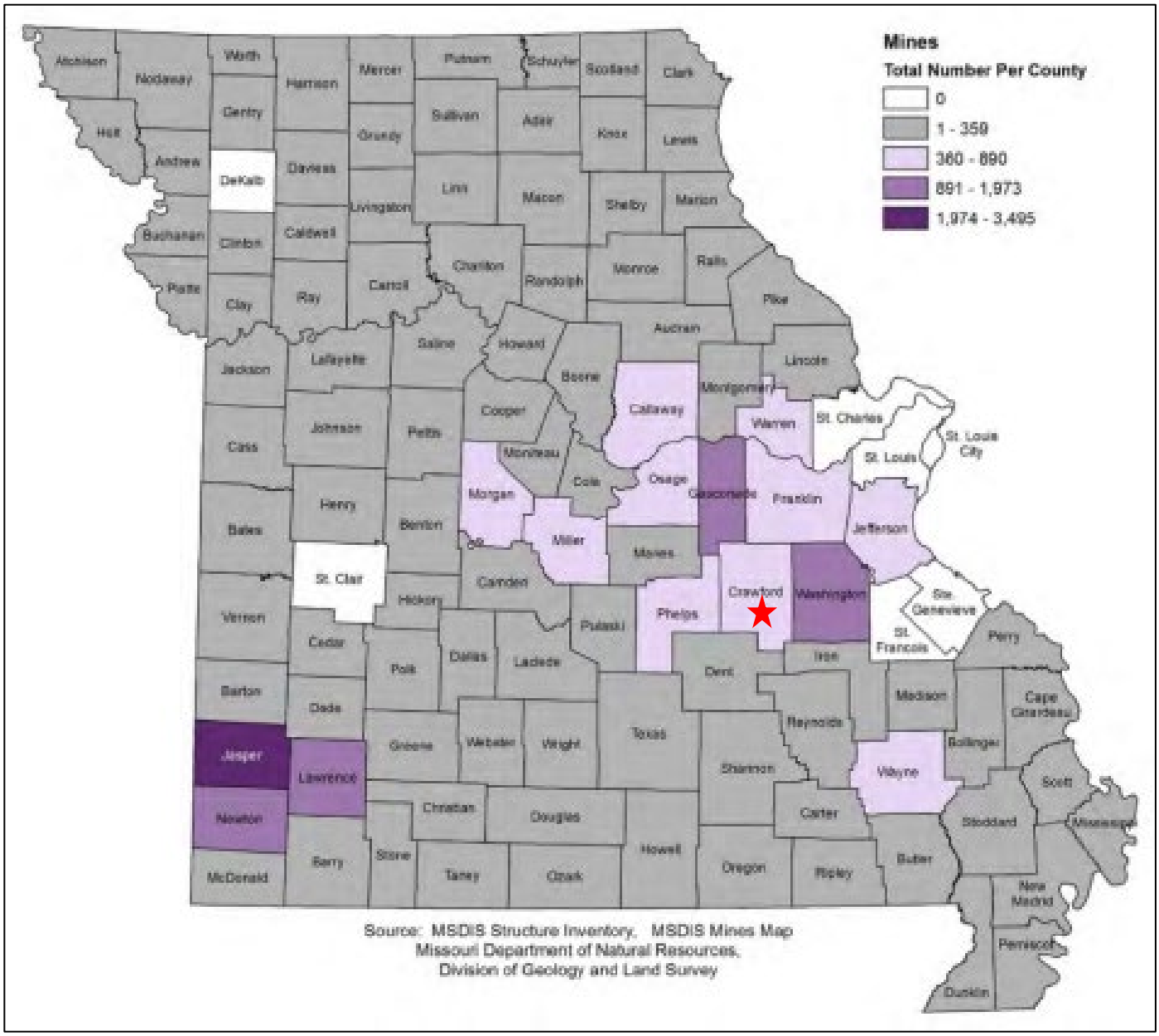


Figure 3.52. Sinkholes Counts per County



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

Figure 3.53. Mines Counts Per County



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

Strength/Magnitude/Extent

Unlike earthquakes or other geologic hazards, there currently is no scale for measuring or determining the severity of sinkholes. However, geological and mining parameters can affect the magnitude and extent of sinkhole subsidence. As previously noted, natural sinkholes develop in areas where the rock below the surface is limestone, carbonate rock, salt beds or any type of rock that can naturally be dissolved by groundwater circulating through it. Artificial sinkholes form due to groundwater pumping, water main and sewer collapses and mine collapses.[38]

[38] 2018 Missouri Hazard Mitigation Plan

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

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

Previous Occurrences

Although there are numerous sinkholes and sinkhole areas in Crawford County, incidents have occurred in other counties in southern Missouri, there is no recorded incident of death due to sinkholes in the County. Based on the map of sinkholes in Crawford County, some of the communities may be more vulnerable to this hazard than the unincorporated parts of the county due to population density and the likelihood of future development. Leasburg and Bourbon have sinkholes within their boundaries, and there are several known sinkholes near, but not within the borders of Steelville.

Probability of Future Occurrence

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

Changing Future Conditions Considerations

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

Vulnerability

Vulnerability Overview

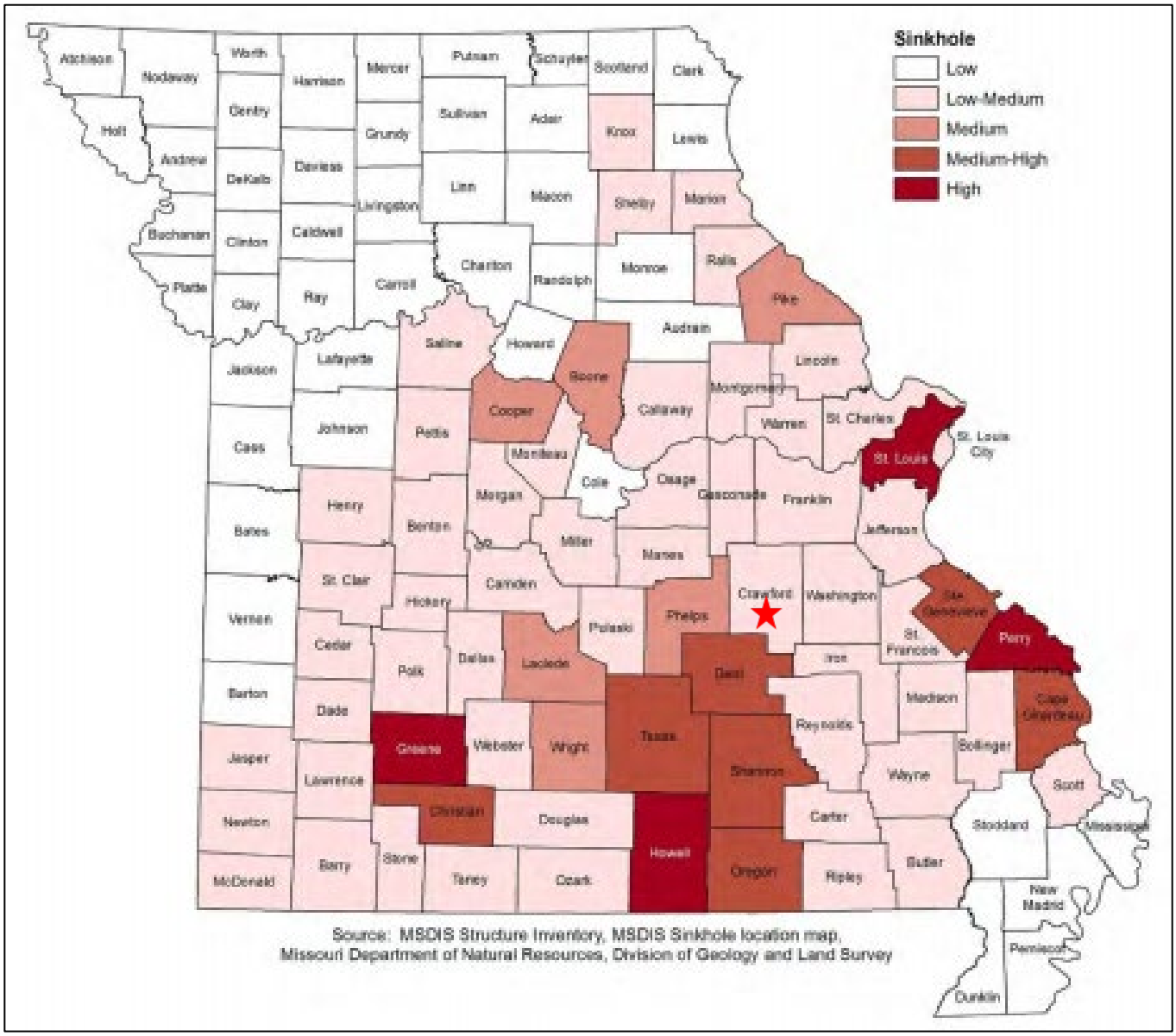
Unfortunately, no statistics are available for the number of subsurface locations that may potentially collapse in the future, forming a sinkhole. According to the state plan, if a county has 1-200 sinkholes, the risk is considered 2 – low-medium. For mines, the state plan calculates that Crawford County's risk is rated as 4 – medium-high. See **03**. **Figure 3.54** and **Figure 3.55** further illustrate the sinkhole and mining rating values respectively.

Table 3.53. Sinkhole/Mine Rating Values for Crawford County

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

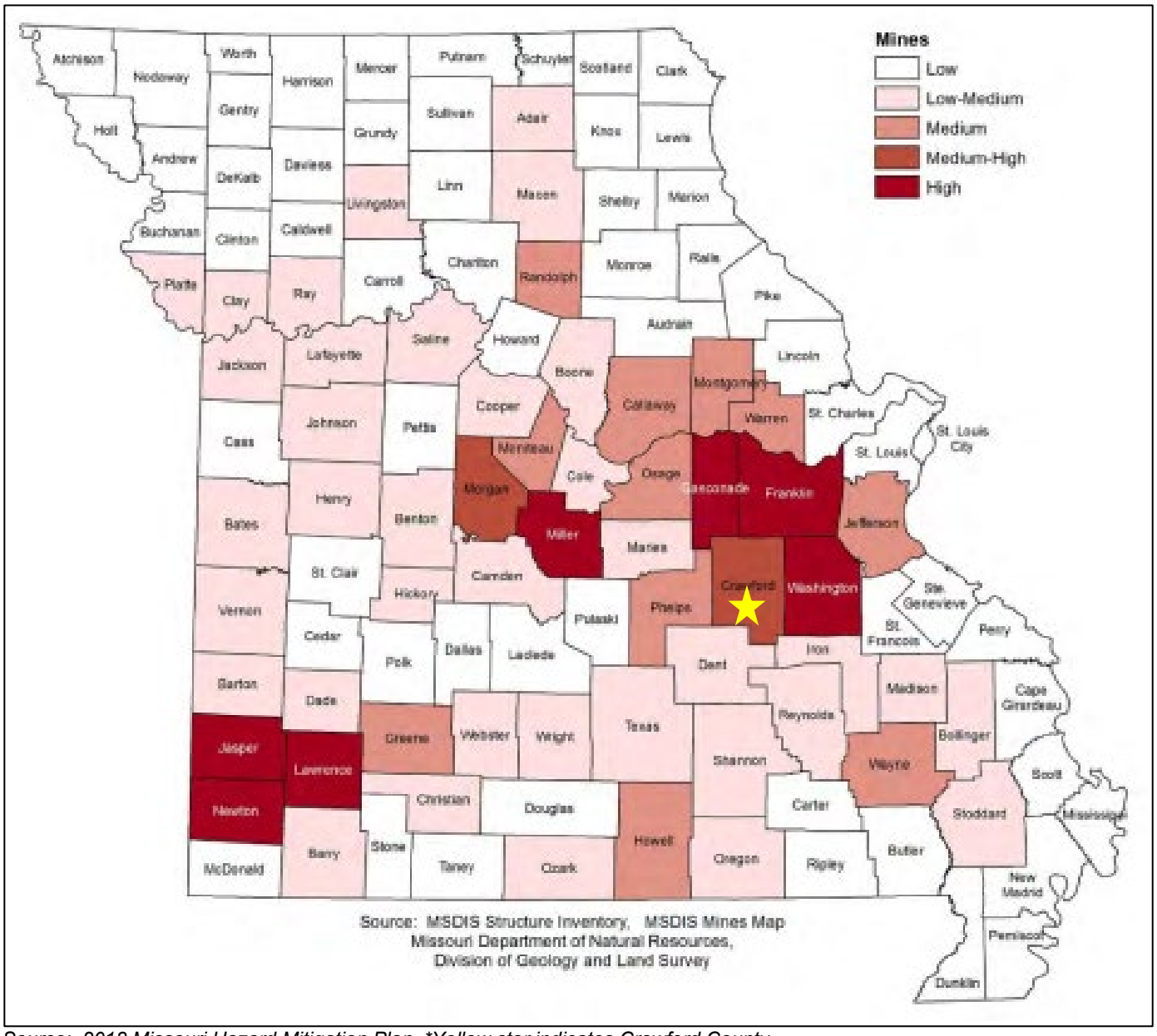
Source: 2018 Missouri Hazard Mitigation Plan, Yellow highlight shows values for Crawford County

Figure 3.54. Sinkhole Rating Value by County



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

Figure 3.55. Mine Rating Value By County



*Source: 2018 Missouri Hazard Mitigation Plan, *Yellow star indicates Crawford County*

Potential Losses to Existing Development

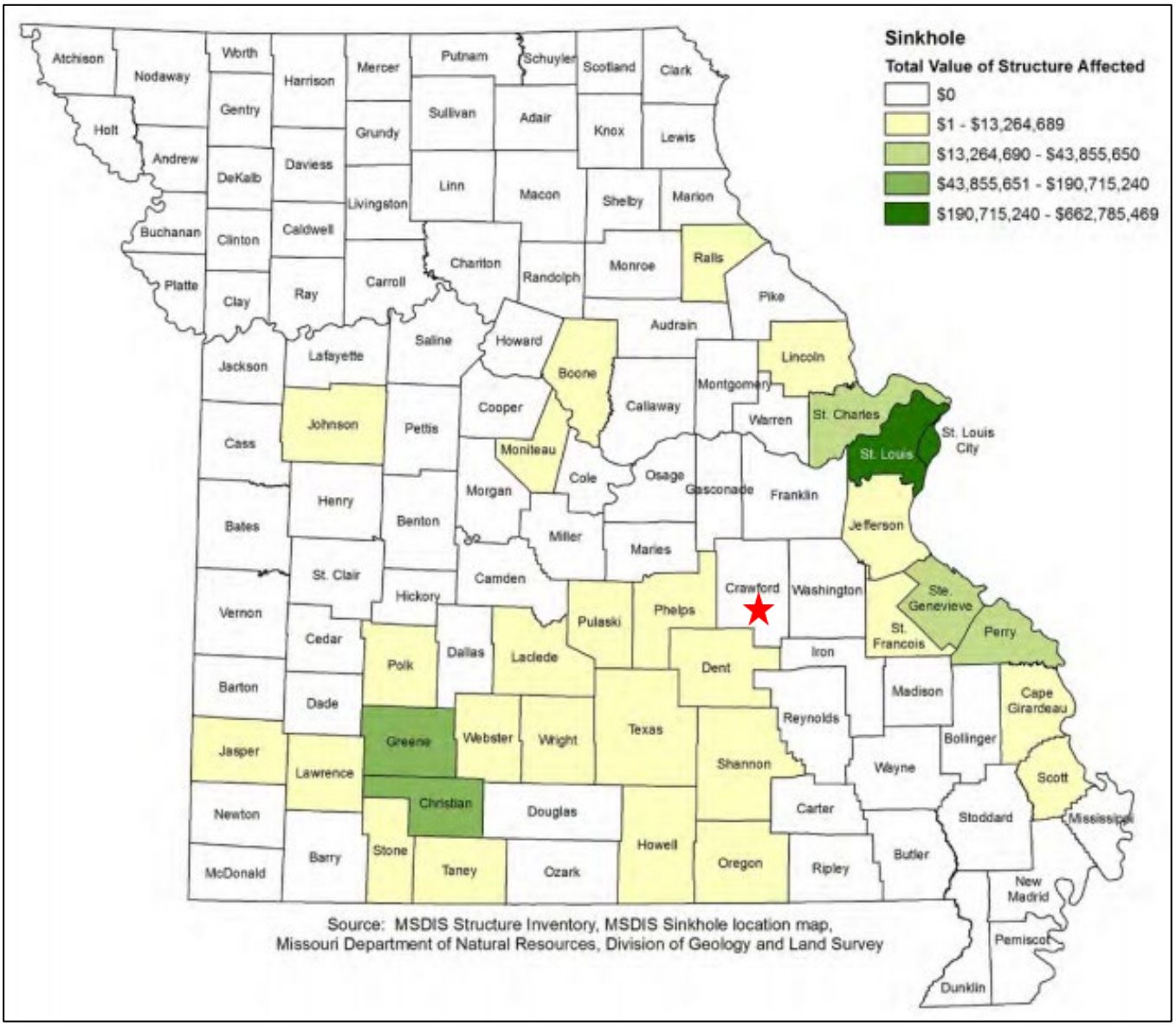
The most likely type of damage to occur in conjunction with a sinkhole collapse is property damage related to foundation disturbance. Signs include cracks in interior and exterior walls; doors and windows that no longer sit square or open and close properly; depressions forming in the yard; cracks in the street, sidewalk, foundation or driveway; and turbidity in local well water. All of these can be early indicators that a sinkhole is forming in the vicinity[39]. In the event of a sudden collapse, an open sinkhole can form in a matter of minutes and swallow lawns, automobiles, and homes. This has occurred in some parts of Missouri, particularly in the southwest part of the state, but there have been no dramatic

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

incidents like this in Crawford County.

The 2018 Missouri Hazard Mitigation Plan devised a method of estimating potential losses using GIS data. **Figure 3.56** shows the ranking of structures that could potentially be impacted by sinkholes by county. This map shows that Crawford County has $0 total value of structures affected.

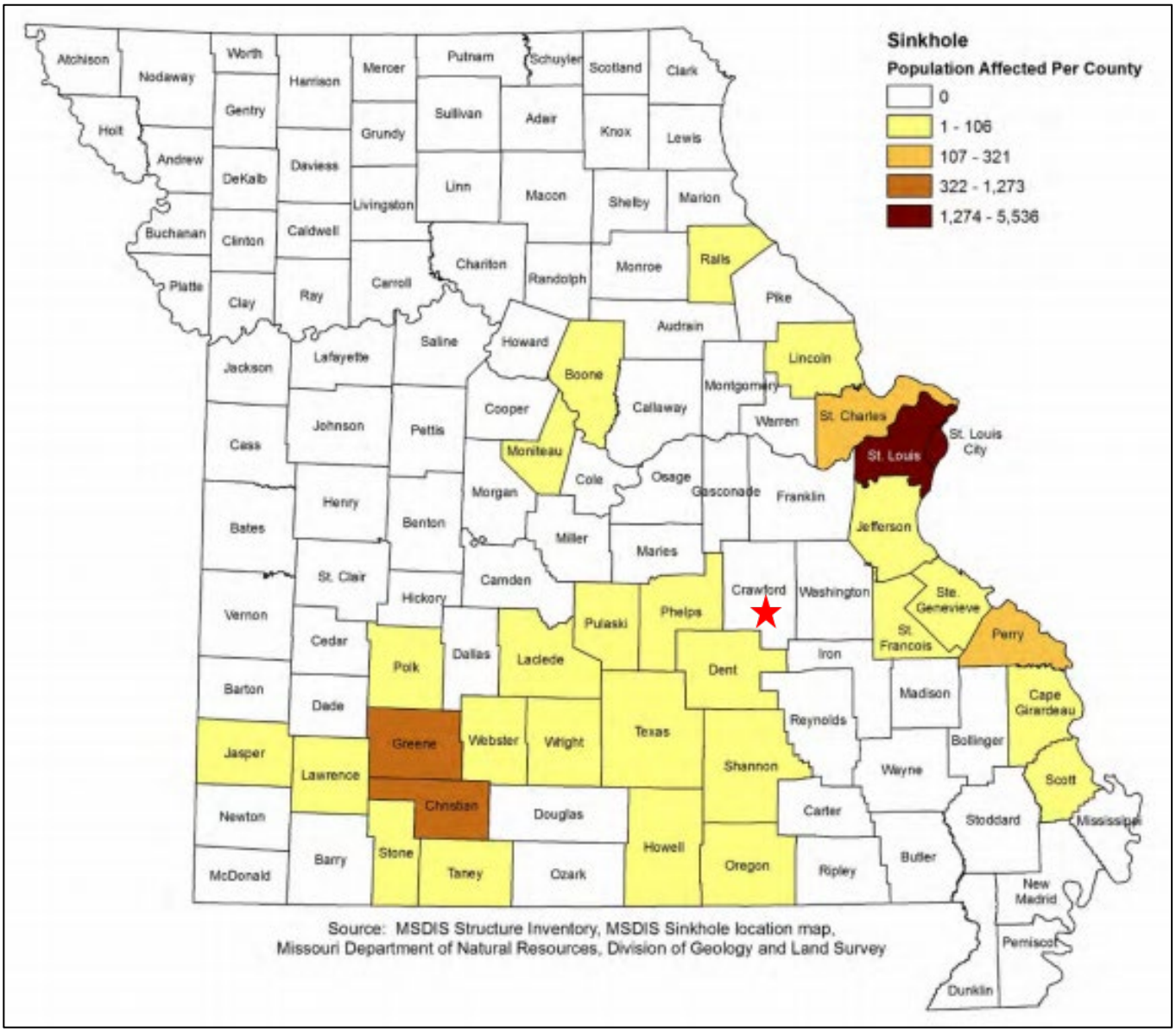
Figure 3.56. Ranking of Structures Potentially Impacted by Sinkholes by County



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

Figure 3.57 shows the population potentially impacted by sinkholes and again, Crawford County shows that no people with be affected by sinkholes.

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



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

Impact of Previous and Future Development

Future development over or near abandoned mines and in locations at risk of sinkhole formation will increase the hazard vulnerability. Information regarding regulations limiting construction near sinkholes is very limited. According to the state plan, Crawford County's sinkhole rating is low-medium however the county's mine rating is medium-high.

Hazard Summary by Jurisdiction

According to the state plan, Crawford County's risk is moderate. Based on the location of known sinkholes, the communities and school districts have less vulnerability than the unincorporated areas of the county. The jurisdictions most likely to be impacted by sinkholes are Bourbon, Leasburg, and Steelville. The other jurisdictions, both cities and school districts, are located in areas of the county

where the concentration of sinkholes is much lower.

Problem Statement

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

3.4.7 Severe Thunderstorms Including High Winds, Hail, and Lightning

Some Specific Sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.8, Page 3.280 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- FEMA 320, Taking Shelter from the Storm, 3rd edition, http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf
- Lightning Map, National Weather Service, https://www.vaisala.com/sites/default/files/documents/WEA-MET-Annual-Lightning-Report-2020-B212260EN-A.pdf
- 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), https://www.torro.org.uk/research/hail/hscale;
- NCEI data;
- USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/Information-Tools/Summary-of-Business/Cause-of-Loss;
- National Severe Storms Laboratory – hail map, http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  http://drive.google.com/file/d/1bPkc0jqF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Average annual high wind events by County
  - Average annual hail events by County
  - Average annual lightning events by County
  - Vulnerability to severe thunderstorm event by County
  - Annualized property loss for high wind events by County
  - Annualized property loss for lightning events by County
  - Annualized property loss ratio for high wind events by County
  - Annualized property loss ratio for hail events by County
  - Annualized property loss ratio for lightning events by County

Hazard Profile

Hazard Description

Thunderstorms

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

world, there are about 1,800 thunderstorms occurring. Severe thunderstorms most often occur in Missouri in the spring and summer, during the afternoon and evenings, but can occur at any time. Other hazards associated with thunderstorms are heavy rains resulting in flooding (**Section 3.4.5**) and tornadoes (**Section 3.4.9**)

High Winds

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

Lightning

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

Hail

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

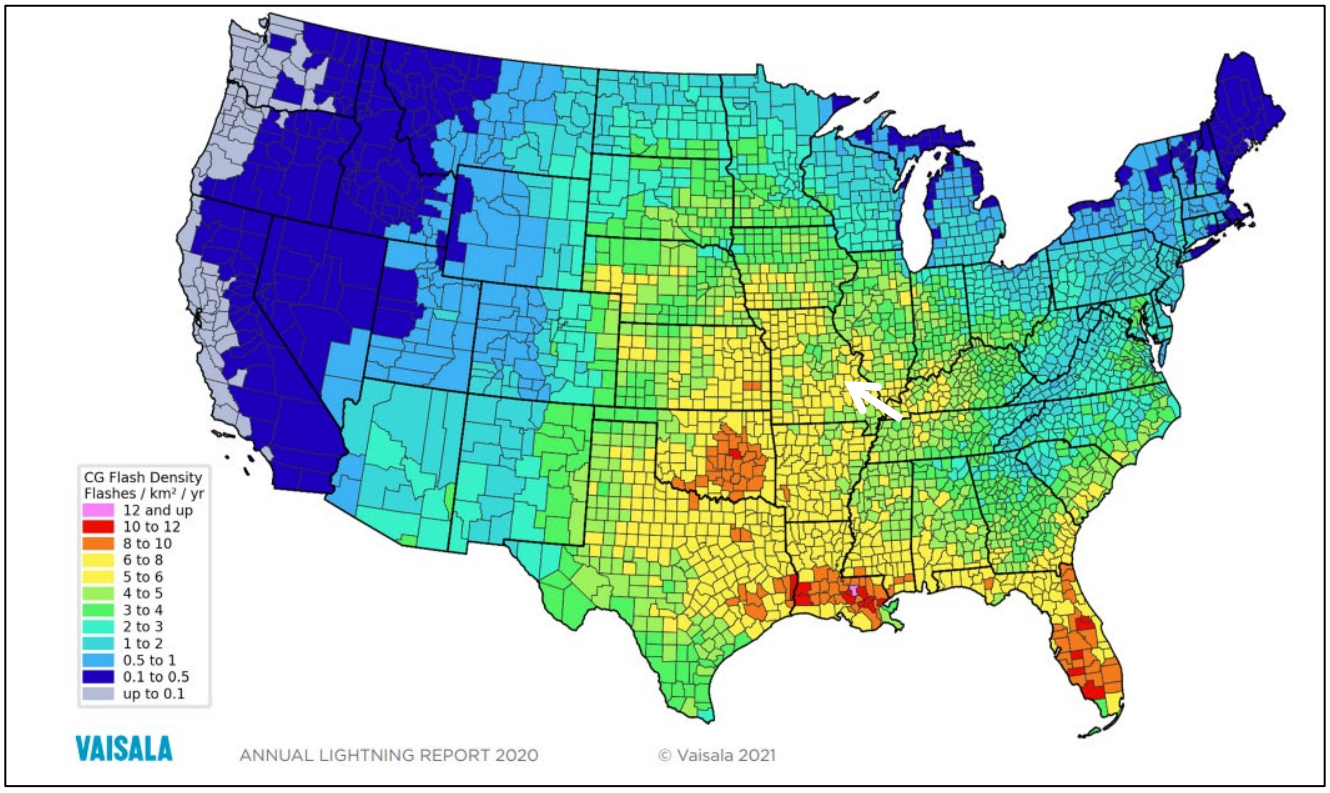
At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 miles per hour, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest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

Geographic Location

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

Figure 3.58 depicts the location and frequency of lightning in Missouri. Additionally, the map indicates that the flash density of Crawford County ranges between 12 and 20 flashes per square kilometer per year.

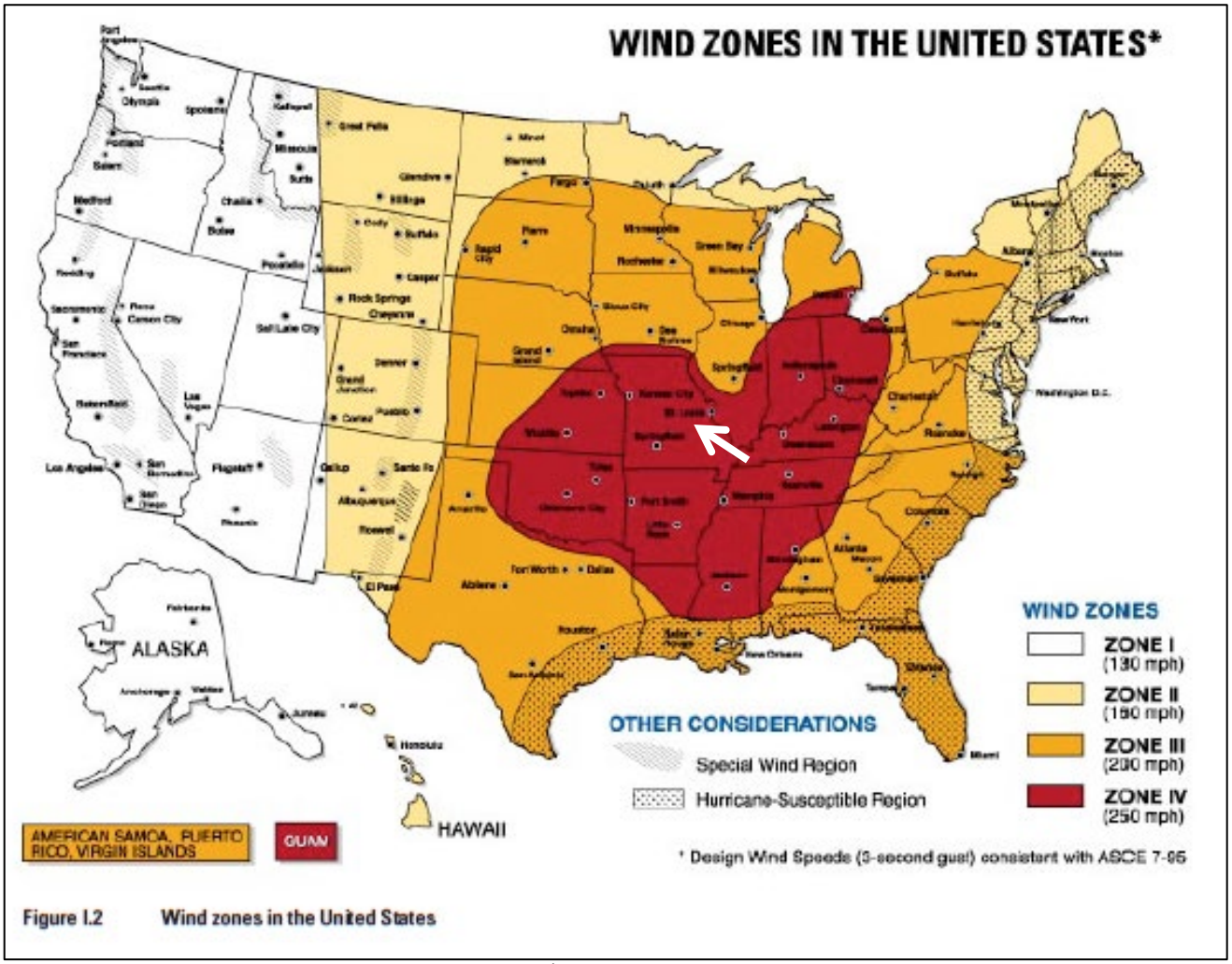
Figure 3.58. Location and Frequency of Lightning in Missouri



Source: National Weather Service, https://www.vaisala.com/sites/default/files/documents/WEA-MET-Annual-Lightning-Report-2020-B212260EN-A.pdf ** Crawford County is indicated by a white arrow.*

There are four wind zones that are characterized across the United States. These zones range from Zone I to Zone IV. All of Missouri as well as most of the Midwest fall within Zone IV. Within Zone IV, winds can reach up to 250 mph (**Figure 3.59**).

Figure 3.59. Wind Zones in the United States



Source: FEMA 320, Taking Shelter from the Storm, 3rd edition, https://www.fema.gov/pdf/library/ism2_s1.pdf
**Crawford County is indicated by a white arrow.*

Strength/Magnitude/Extent

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

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

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

Based on information provided by the Tornado and Storm Research Organization (TORRO), **Table 3.54** below describes typical damage impacts of the various sizes of hail.

Table 3.54. Tornado and Storm Research Organization Hailstorm Intensity Scale

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

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

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

Between 2001 and 2020, there were zero recorded crop insurance claims for Thunderstorms, lightning,

high wind, and hail in Crawford County.

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

Previous Occurrences

Due to the lack of available parameters, heavy rain is utilized in the place of thunderstorms in **Table 3.55**. Moreover, thunderstorm wind and strong wind was included with high winds. NCEI data was obtained for lightning, and hail events between 2001 and 2020 as well (**Table 3.56, Table 3.57**, and **Table 3.58).** However, limitations to the use of NCEI reported lightning events include the fact that only lightning events that result in fatality, injury and/or property and crop damage are in the NCEI.

Table 3.55. NCEI Crawford County Heavy Rain Events Summary, 2001 to 2020

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

Source: NCEI, data accessed [10/06/2021]

Table 3.56. NCEI Crawford County High Wind Events Summary, 2001 to 2020 (Thunderstorm)

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
2001	3	0	0	0	51
2002	3	0	0	100.00K	65
2003	3	0	0	0	65
2004	2	0	0	0	55
2005	3	0	0	0	55
2006	1	0	0	0	55
2007	1	0	0	0	52
2008	4	0	0	17.00K	61
2009	2	0	0	1.00K	52
2010	4	0	0	0	56
2011	2	0	0	0	65
2012	3	1	1	0	65
2013	1	0	0	0	87
2014	1	0	0	0	52

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
2015	1	0	0	0	56
2016	1	0	0	0	65
2017	1	0	0	0	56
2018	5	0	0	0	61
2019	6	0	0	0	56
2020	4	0	0	0	61
Total	**40**	**1**	**1**	**153.00K**	**-**

Source: NCEI, data accessed [10/06/2021]

Table 3.57. NCEI Crawford County Lightning Events Summary, 2001 to 2020

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

Source: NCEI, data accessed [10/06/2021]

Table 3.58. NCEI Crawford County Hail Events Summary, 2001 to 2020

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
2002	3	0	0	0	1.00
2003	5	0	0	0	1.00
2004	1	0	0	0	1.75
2005	7	0	0	0	.88
2006	23	0	0	0	2.75
2007	1	0	0	0	.75
2008	13	0	0	0	1.75
2009	2	0	0	0	1.00
2010	5	0	0	0	1.25
2011	8	0	0	0	2.75
2012	8	0	0	0	1.75
2014	3	0	0	0	1.00
2016	4	0	0	0	1.50
2017	5	0	0	0	1.75
2018	1	0	0	0	0.75
2019	3	0	0	0	1.00
Total	**92**	**0**	**0**	**0**	**-**

Source: NCEI, data accessed [10/06/2021]

Agriculture is an important piece of the economy for Crawford County. The tables below (**Table 3.59**)

summarize past crop damages as indicated by crop insurance claims. The tables illustrate the magnitude of the impact on the planning area's agricultural economy. It should be noted that the USDA Risk Management Agency data does not align directly with the breakdown of hazards listed here. The claims database only listed "Excessive Moisture/Precipitation/ Rain" and "Wind/Excessive Wind" as two causes of loss categories that align with this hazard. Between 2001 and 2020 a total of 19 insurance claims were paid out for damages due to excessive moisture, precipitation. The total claims paid for this cause were $95,814.50.

For the time period 2001-2020, there were no crop insurance claims made for wind and excessive wind damage.

Table 3.59. Crop Insurance Claims Paid In Crawford County from Excessive Moisture/ Precipitation/Rain 2001-2020

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2002	All Other Crops	Excessive Moisture/Precipitation/Rain	$435.00
2003	All Other Crops	Excessive Moisture/Precipitation/Rain	$729.00
2004	All Other Crops	Excessive Moisture/Precipitation/Rain	$699.00
2013	All Other Crops	Excessive Moisture/Precipitation/Rain	$4,918.00
2015	All Other Crops	Excessive Moisture/Precipitation/Rain	$42,292.00
2016	All Other Crops	Excessive Moisture/Precipitation/Rain	$6312.50
2017	All Other Crops	Excessive Moisture/Precipitation/Rain	$16,599.00
2019	All Other Crops	Excessive Moisture/Precipitation/Rain	$26,445
2020	All Other Crops	Excessive Moisture/Precipitation/Rain	$385.00
Total	**19**	-	**$95,814.50**

Source: USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/Information-Tools/Summary-of-Business/Cause-of-Loss

Probability of Future Occurrence

From the data obtained from the NCEI [40], annual average percent probabilities were calculated for heavy rainfall, high winds, lightning, and hail. Heavy rainfall has a 15 percent annual average percent probability of occurrence (3 events/20 years x 100) (**Table 3.60**). Heavy rainfall events can be found in **Table 3.55**.

The annual average percent probability for high winds within the county is 100 percent (40 event/2 years * 100) with an average 2.0 events per year (**Table 3.61**). High wind events can be found in **Table 3.56.**

Lightning events have a 0 percent annual average percent probability of occurrence (0 events/20 years x 100) **Table 3.62.** Lightning events can be found in **Table 3.57**.

Lastly, the annual average percent probability of hail occurrence is 100 percent (92 events/20 years x 100) with an average of 4.6 events per year (**Table 3.63**). Hail events can be found in **Table 3.58**.

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

Table 3.60. Annual Average % Probability of Heavy Rain in Crawford County

Location	Annual Avg. % P
Crawford County	15%

*P = probability; see page 3.24 for definition.

Table 3.61. Annual Average % Probability of High Winds in Crawford County

Location	Annual Avg. % P	Avg. # of Events
Crawford County	100%	2.0

*P = probability; see page 3.24 for definition.

Table 3.62. Annual Average % Probability of Lightning in Crawford County

Location	Annual Avg. % P
Crawford County	0%

*P = probability; see page 3.24 for definition.

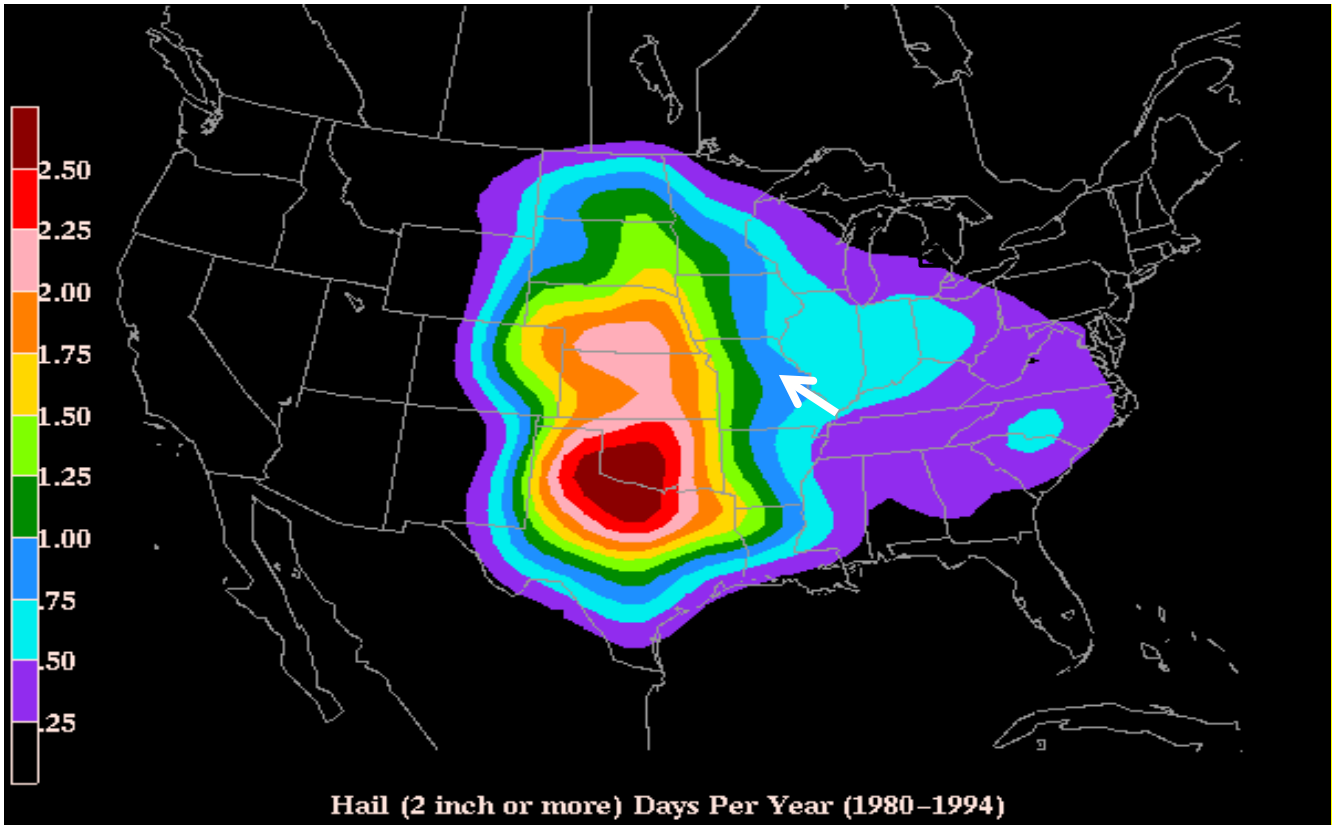
Table 3.63. Annual Average % Probability of Hail in Crawford County

Location	Annual Avg. % P	Avg. # of Events
Crawford County	100%	4.6

*P = probability; see page 3.24 for definition.

Figure 3.60 depicts a map based on hailstorm data from 1980-1994. It shows the probability of hailstorm occurrence (2" diameter or larger) based on number of days per year. The location of Crawford County is identified with a white arrow.

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



Source: NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif
** White arrow indicates Crawford County*

Changing Future Conditions Considerations

Analysis by NASA's Earth Observatory theorizes that the warming surface of the earth, particularly the oceans, puts more moisture into the air through evaporation and could increase potential storm energy. The presence of warm, moist air near the surface is the key component for summer storms called "convective available potential energy" or CAPE. With an increase in CAPE, there is greater potential for cumulus clouds to form and develop into storm systems. The same study provides a counter theory that the warming of the Arctic could result in less wind shear in the mid-latitudes, making powerful storms less likely.[41]

Temperatures are predicted to rise, and those rising temperatures could help create atmospheric conditions that are conducive to the development of thunderstorms and tornados in Crawford County. Jurisdictions should consider building certified tornado saferooms, improving warning systems, strengthening building codes, reinforcing utilities and other vulnerable infrastructure and increasing public information on storm safety and mitigation activities.[42]

[41] 2018 Missouri State Hazard Mitigation Plan
[42] 2018 Missouri State Hazard Mitigation Plan

Vulnerability

Vulnerability Overview

Severe thunderstorm losses are usually attributed to the associated hazards of hail, downburst winds, lightning and heavy rains. Losses due to hail and high wind are typically insured losses that are localized and do not result in presidential disaster declarations. However, in some cases, impacts are severe and widespread and assistance outside state capabilities is necessary. Hail and wind also can have devastating impacts on crops. Severe thunderstorms/heavy rains that lead to flooding are discussed in the flooding hazard profile.

Hailstorms cause damage to property, crops, and the environment, and can injure and even kill livestock. In the United States, hail causes more than $1 billion in damage to property and crops each year. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are also commonly damaged by hail. Hail has been known to cause injury to humans, occasionally fatal injury.

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

Most lightning damages occur to electronic equipment located inside buildings. But structural damage can also occur when a lightning strike causes a building fire. In addition, lightning strikes can cause damages to crops, if fields or forested lands are set on fire. Communications equipment and warning transmitters and receivers can also be knocked out by lightning strikes. [43]

Data was obtained from the 2018 Missouri State Hazard Mitigation Plan for vulnerability overview and analysis. Since severe thunderstorms occur frequently throughout Missouri, the method used to determine vulnerability to severe thunderstorms was statistical analysis of data from several sources including: National Centers for Environmental Information (NCEI) storm events data (1996 to December 31, 2016 – which will differ slightly from data collected for the Crawford County plan which is 2001-2020), HAZUS Building Exposure Value data, housing density and mobile home data from the U.S. Census (2015 ACS), and the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina.[44]

From the data collected, six factors were considered in determining vulnerability to lightning as follows: housing density, building exposure, percentage of mobile homes, social vulnerability, likelihood of occurrence and average annual property loss. A rating value of one through five was assigned to each factor. Rating values are as follows:

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

Table 3.64 illustrates the factors considered and ranges for the rating values assigned.

[43] http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx
[44] 2018 Missouri Hazard Mitigation Plan

Once the ranges were determined and applied to all factors considered in the analysis for wind, hail and lightning, they were rated individually and factored together to determine an overall vulnerability rating for thunderstorms. **Table 3.65** provides the calculated ranges applied to determine overall vulnerability of Missouri counties to severe thunderstorms.

Table 3.64. Ranges for Severe Thunderstorm Vulnerability Factor Ratings

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

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.65. Ranges for Severe Thunderstorm Combined Vulnerability Rating

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

Source: 2018 Missouri Hazard Mitigation Plan

According to the Hazus data included in the 2018 state plan, Crawford County has total building exposure to severe thunderstorms of $2,389,455,000. **Table 3.66** shows housing density, building

exposure, SOVI and mobile home data for Crawford County. The county's building exposure and housing density rating is medium, while the percent of mobile homes in the county is rated as medium at 14.8 percent of the housing stock. **Table 3.67**, also pulled from the state plan, provides data on the number of events and likelihood of occurrence and occurrence rating for high wind, hail and lightning.

Table 3.66. Crawford County Housing Density, Building Exposure, SOVI and Mobile Home Data

Total Building Exposure (Hazus)	Building Exposure Rating	Housing Density	Housing Density Rating	SOVI Ranking	SOVI Ranking Rating	Percent Mobile Homes	Percent Mobile Homes Rating
$2,389,455,000	1	16.06	1	Medium	3	14.8	4

Source: 2018 Missouri Hazard Mitigation Plan

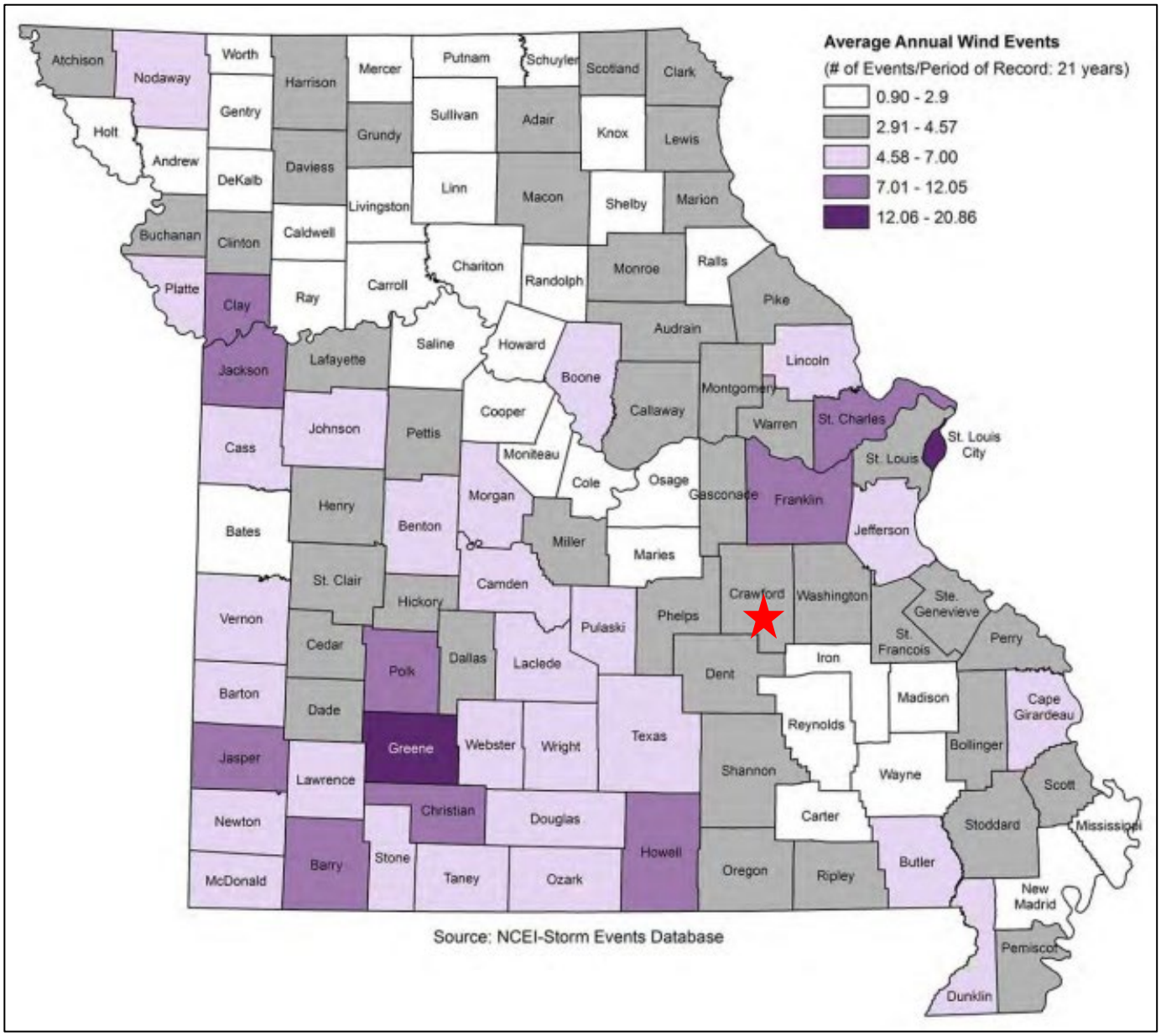
Table 3.67. Number of High Wind, Hail and Lightning Events, Likelihood of Occurrence and Associated Ratings for Crawford County

High Wind			Hail			Lightning		
Total Number of Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total Number of Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total Number of Events	Likelihood of Occurrence	Likelihood of Occurrence Rating
70	3.333	2	94	4.476	2	0	0.000	1

Source: 2018 Missouri Hazard Mitigation Plan

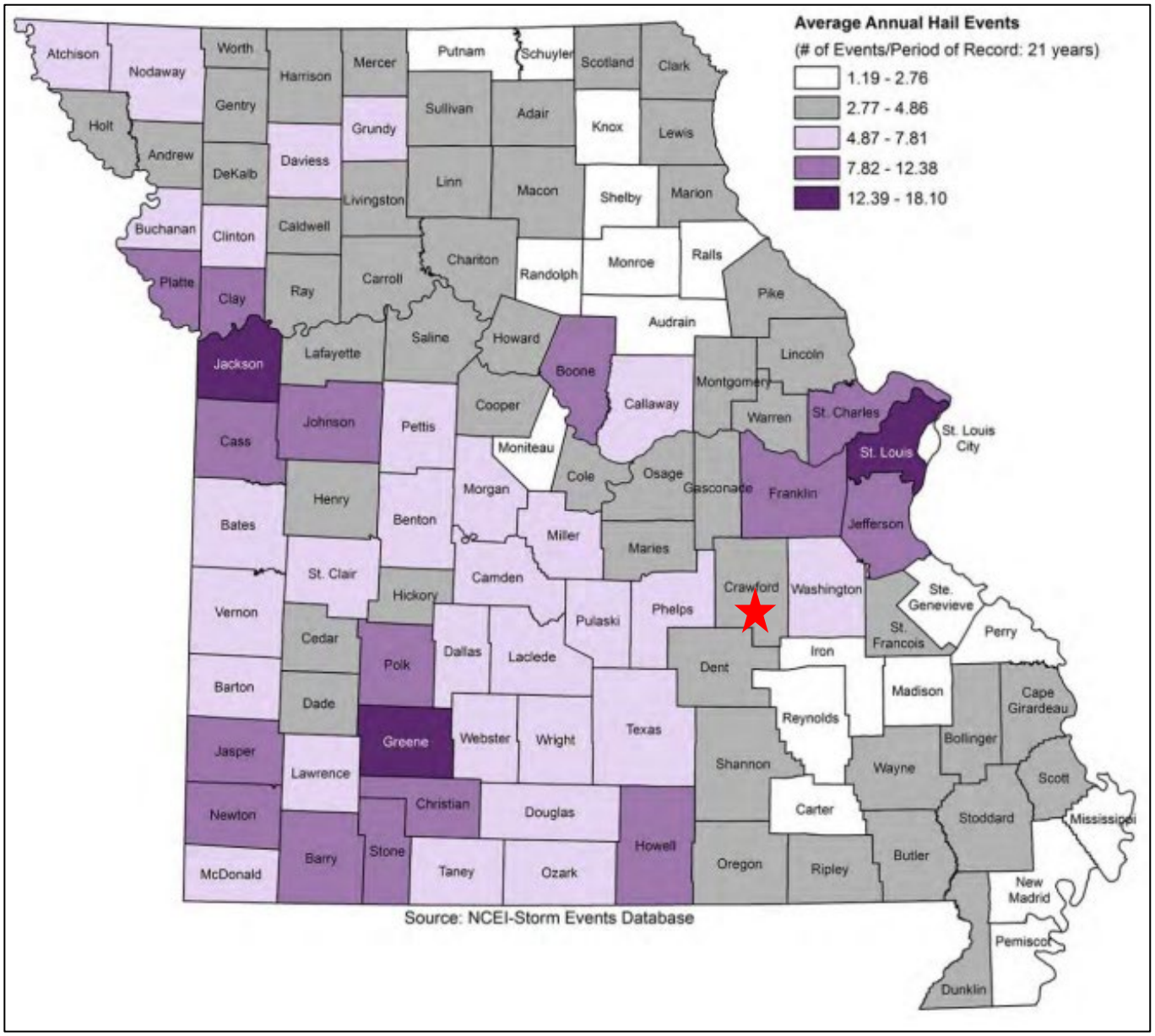
Figure 3.61 through **Figure 3.63** have been pulled from the 2018 Missouri Hazard Mitigation Plan and further depict the average annual likelihood of occurrence of high winds, hail, and lightning events in Missouri.

Figure 3.61. Average Annual High Wind Events (40 MPH and Higher)



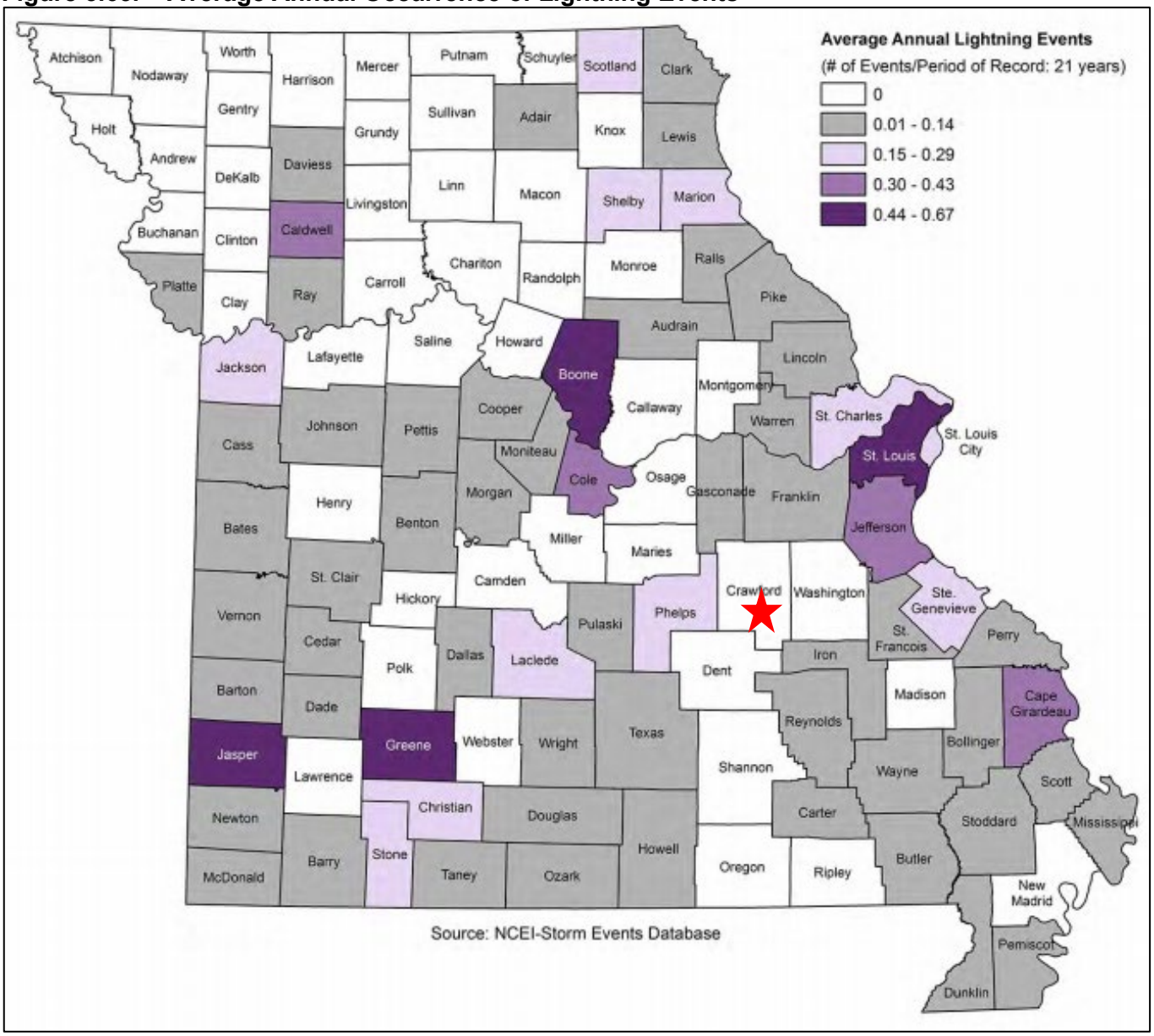
*Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Crawford County*

Figure 3.62. Average Annual Occurrence of Damaging Hail Events



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

Figure 3.63. Average Annual Occurrence of Lightning Events



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

Table 3.68 provides additional data obtained from the National Centers for Environmental Information for property loss to complete the overall vulnerability analysis.

Table 3.68. Annualized Property Loss and Associated Ratings for Crawford County

High Wind		Hail		Lightning	
Total Annualized Property Loss	Total Annualized Property Loss Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating
$7,000	1	$0	1	$0	1

Source: 2018 Missouri State Hazard Mitigation Plan

After ranges were applied to all factors in the analysis for wind, hail, and lightning, they were weighted equally and factored together to determine an overall vulnerability rating. Following, a combined vulnerability rating was calculated. The calculated ranges applied to determine overall vulnerability of Missouri counties to severe thunderstorms can be found in **Table 3.65**. **Table 3.69** provides the calculated vulnerability rating for the severe thunderstorm hazard. **Figure 3.64** that follows provides the mapped results of this analysis by county[45].

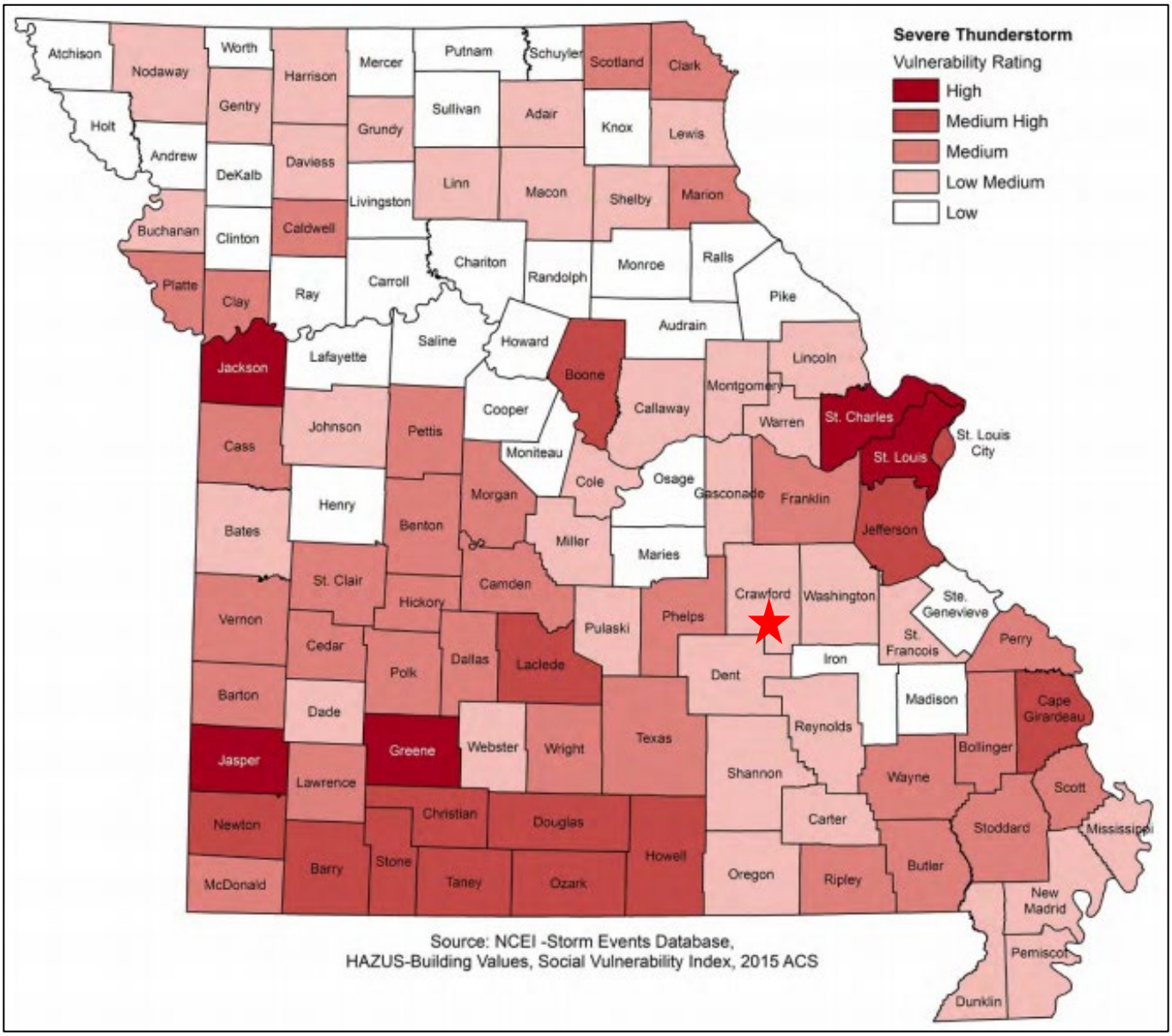
Table 3.69. Severe Thunderstorm Vulnerability Rating for Crawford County

Total Sum of All Factor Ratings	Overall Vulnerability Rating for Thunderstorms	Overall Vulnerability Rating for Thunderstorms Description
17	2	Low Medium

Source: 2018 Missouri State Hazard Mitigation Plan

[45] 2018 Missouri State Hazard Mitigation Plan

Figure 3.64. Vulnerability Summary for Severe Thunderstorms



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

Potential Losses to Existing Development

According to the NCEI Crawford County experienced approximately $153,000 in property damages from severe thunderstorms between 2001 and 2020. This is an average of $7,650 in losses due to this hazard per year. Most of the property damage caused by storms is covered by private insurance and data is not available. In addition, most damage from severe thunderstorms occurs to vehicles, roofs, siding, and windows. However, there is a variety of impacts from severe thunderstorms. Moreover, secondary effects from hazards, falling trees and debris, can cause destruction within the planning area.

Previous and Future Development

Population trends from 2010 to 2020 for Crawford County indicate that the population in unincorporated areas has fallen by an estimated 12.01 percent. The city of Bourbon has fallen by 3.98. Leasburg has decreased by 3.55 percent and Cuba has decreased by 3.14. The population of Steelville fell 1.87 percent while Sullivan remained flat losing only 0.03 percent. Overall, the county has decreased its population by 6.6 percent. It is difficult to determine future impacts, however, anticipated development in each jurisdiction will result in increased exposure. Likewise, increased development of residential structures will increase jurisdiction's vulnerability to damages from severe thunderstorms/ high winds/lightning/hail.

Hazard Summary by Jurisdiction

Although thunderstorms/high winds/lightning/hail events are area-wide, there are demographics indicating higher losses in one jurisdiction as compared to another. Jurisdictions with high percentages of housing built before 1939 are more prone to damages from severe thunderstorms. The jurisdictions with the highest percent of houses build before 1939 include the city of Steelville (23.3%) and Sullivan (17.9%).

Problem Statement

The NCEI Storm Events Database notes over 174 thunderstorm and wind events in Crawford County between 2001 and 2020, with over $153,000.00 in property and crop damages reported. Early warnings are possibly the best hope for residents when severe weather strikes. Cities that do not already possess warning systems – whether that is storm sirens or automated email/text/phone call systems - should plan to invest in such a system. Additional public awareness also includes coverage by local media sources. Storm shelters are another important means of mitigating the effects of severe thunderstorms. A community-wide shelter program should be adopted for residents who may not have adequate shelter in their homes. Residents should also be encouraged to build their own storm shelters to prepare for emergencies. Local governments should encourage residents to purchase weather radios to ensure that everyone has sufficient access to information in times of severe weather.

3.4.8 Severe Winter Weather

Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.9, Page 3.321 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- Wind chill chart, National Weather Service, http://www.nws.noaa.gov/om/winter/windchill.shtml;
- Average Number of House per year with Freezing Rain, American Meteorological Society. "Freezing Rain Events in the United States." http://ams.confex.com/ams/pdfpapers/71872.pdf;
- USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/Information-Tools/Summary-of-Business/Cause-of-Loss;
- Any local Road Department data on the cost of winter storm response efforts.
- National Centers for Environmental Information, Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  o Average annual severe winter weather events by County
  o Vulnerability to severe winter weather events by County
  o Annualized property loss for severe winter weather events by County
  o Annualized property loss for severe winter weather events by County

Hazard Profile

Hazard Description

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

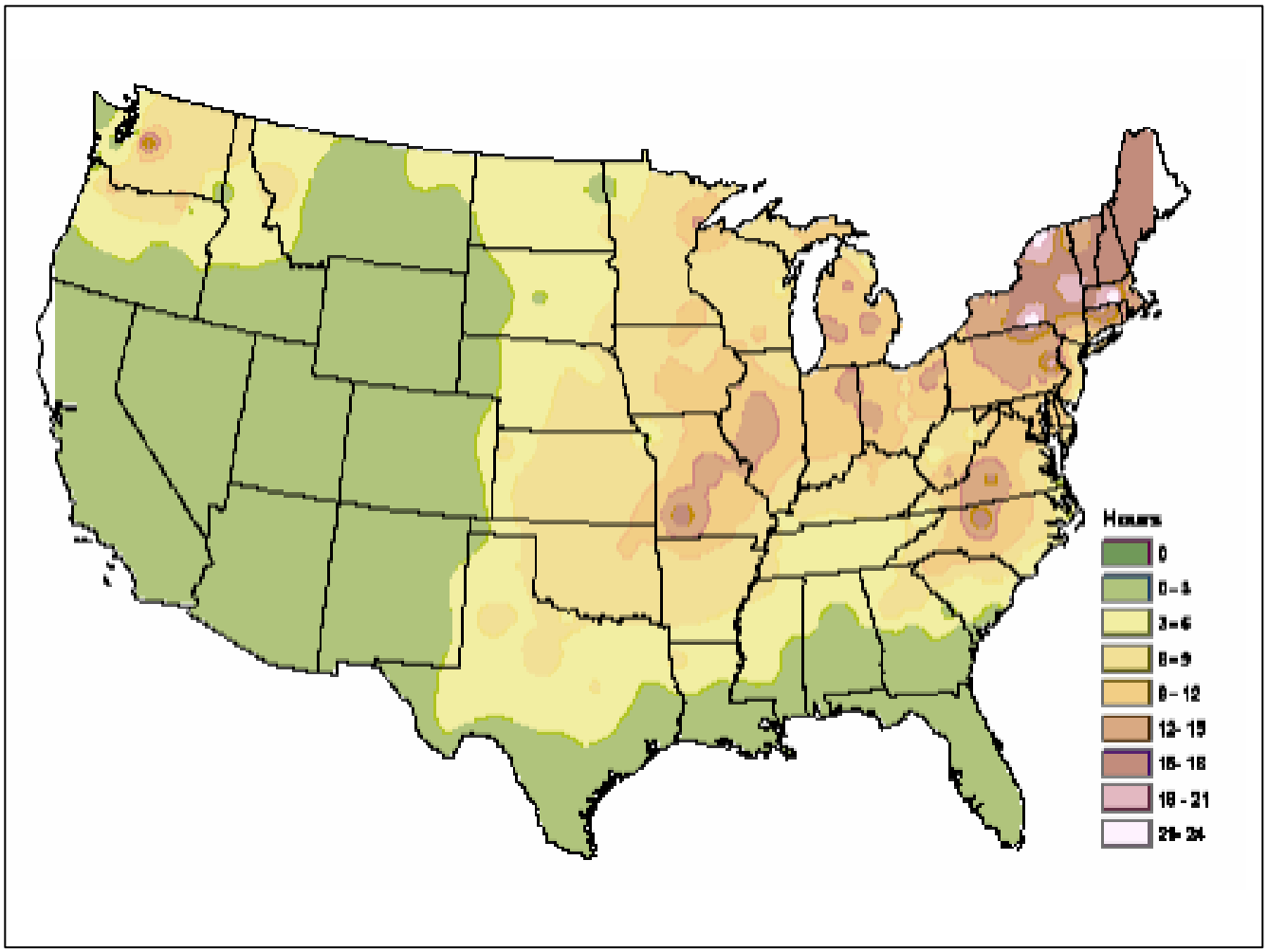
- **Blizzard**—Winds of 35 miles per hour or more with snow and blowing snow reducing visibility to less than ¼ mile for at least three hours.
- **Blowing Snow**—Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls**—Brief,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

Geographic Location

Severe winter weather typically strikes Missouri more than once every year. Crawford County receives winter weather events from heavy snows to freezing rain annually. Major snowstorms typically occur once each year, causing multiple school closings, as well as suspending business and government

activity. Crawford County is vulnerable to heavy snow, ice, extreme cold temperatures and freezing rain. **Figure 3.65** illustrates statewide average number of hours per year with freezing rain. Crawford County receives approximately 9 to 12 hours.

Figure 3.65. NWS Statewide Average Number of Hours per Year with Freezing Rain



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

Strength/Magnitude/Extent

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

Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and

supply lines, stopping electric generators. Cold temperatures can also overpower a building's heating system and cause water and sewer pipes to freeze and rupture. Extreme cold also increases the likelihood for ice jams on flat rivers or streams. When combined with high winds from winter storms, extreme cold becomes extreme wind chill, which is hazardous to health and safety.

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

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

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

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

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

Wind can greatly amplify the impact of cold ambient air temperatures. Provided by the National Weather Service, **Figure 3.66** below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

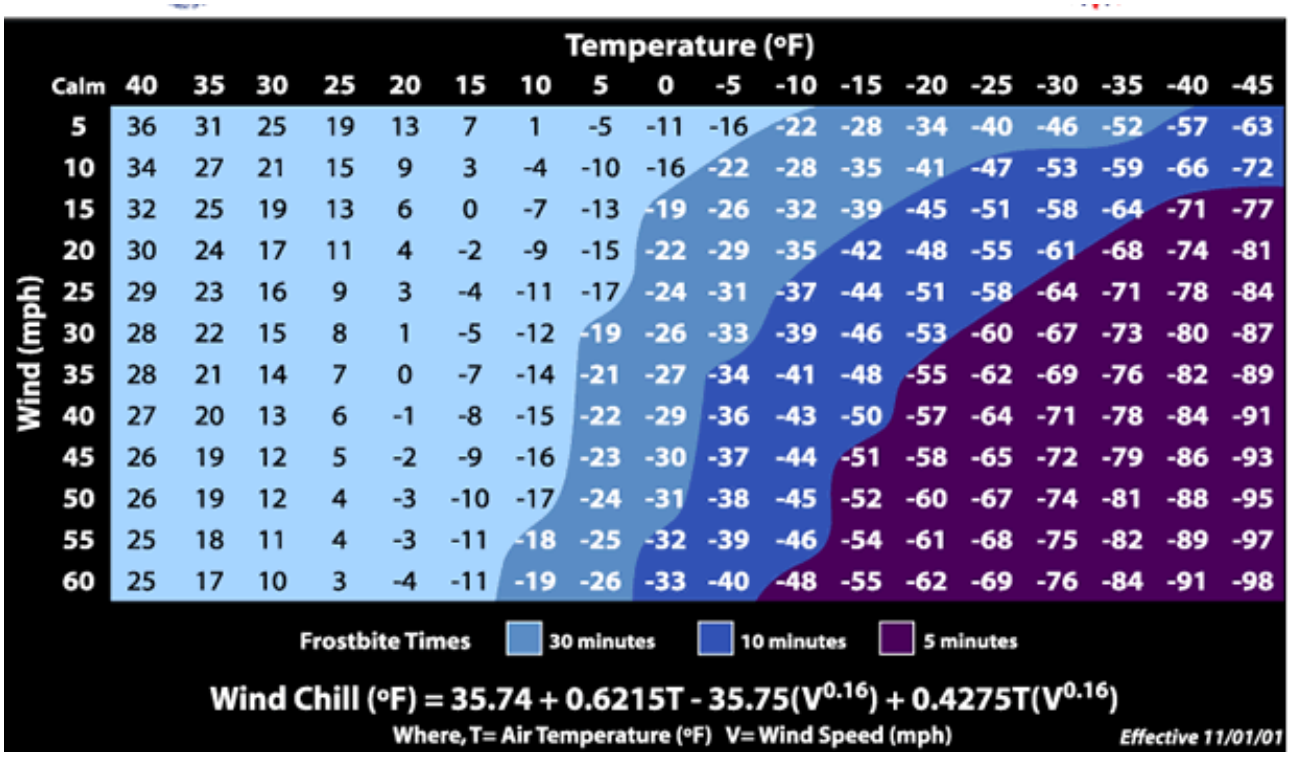
Winter storms, cold, frost, and freeze all can influence or negatively impact crop production. However, data obtained from the USDA's Risk Management Agency for insured crop losses indicates that there were two claims paid in Crawford County between 2001 and 2020 for severe winter weather.

Table 3.70. Crop Insurance Claims Paid in Crawford County from Winter Weather 2001-2020

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2014	All Other Crops	Cold Winter	$3,849.00
2018	All Other Crops	Cold Wet Weather	$196.00
Total	**2**		**$4,045.00**

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

Figure 3.66. Wind Chill Chart



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

Previous Occurrences

Data was obtained from the NCEI for winter weather reported events and damages between 1999 and 2019 **(Table 3.71**). This data includes variables such as blizzard, cold/wind chill, extreme cold/wind chill, heavy snow, ice storm, sleet, winter storm, and winter weather. Additionally, narratives for specific events are listed below.

Table 3.71. NCEI Crawford County Winter Weather Events Summary, 2001 - 2020

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Ice Storm	2/21/2001	0	0	0
Winter Storm	2/25/2002	0	0	0
Winter Storm	12/4/2002	0	0	0
Winter Storm	12/24/2002	0	0	0
Winter Storm	2/23/2003	0	0	0
Winter Storm	12/13/2003	0	0	0
Winter Storm	1/25/2004	0	0	0
Winter Storm	11/24/2004	0	0	0
Winter Storm	12/8/2005	0	0	0

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Winter Storm	11/30/2006	0	0	0
Winter Storm	12/1/2006	0	0	0
Ice Storm	1/12/2007	0	754K	0
Winter Weather	12/8/2007	0	0	0
Heavy Snow	12/15/2007	0	0	0
Sleet	2/11/2008	0	0	0
Sleet	2/21/2008	0	0	0
Winter Weather	2/23/2008	0	0	0
Winter Storm	3/3/2008	0	0	0
Winter Storm	1/26/2009	0	0	0
Cold/Wind Chill	1/1/2010	0	0	0
Winter Storm	1/31/2011	0	0	0
Winter Storm	2/1/2011	0	0	0
Winter Storm	2/21/2013	0	0	0
Winter Storm	12/5/2013	0	0	0
Winter Storm	1/5/2014	0	0	0
Cold/Wind Chill	1/6/2014	0	0	0
Winter Storm	3/1/2014	0	0	0
Ice Storm	1/13/2017	0	0	0
Heavy Snow	11/15/2018	0	0	0
Heavy Snow	1/11/2019	0	0	0
Winter Storm	12/15/2019	0	0	0
Total	**31**	**0**	**$754K**	**0**

Source: NCEI, data accessed [10/06/2021]

Notable Winter Narratives:

1. **02/21/2001:** A fast moving winter storm put a coating of ice on a portion of southeast Missouri. The freezing rain changed over to sleet and snow leaving 2 to 3 inches of snow on top of the ice. Trees and power lines were down throughout the area. Transportation was brought to a halt from the evening of the 21st through the 22nd.

2. **02/25/2002:** Snowfall of 1 to 4 inches hit portions of Central and Eastern Missouri from late night on February 25 to the early morning hours of February 26. In addition, strong winds developed during the morning hours of the 26th causing some drifting snow. The heaviest snow, 3 to 4 inches, primarily fell from just south and west of St. Louis to the St. Louis area. Many schools across the region were closed on the 26th. Numerous auto accidents occurred during the event.

3. **12/04/2002:** The first winter storm of the season dropped from 3 to 6 inches of snow across parts of South Central and Southeast Missouri. Virtually all area schools were closed through Thursday. as many rural roads remained very hazardous to travel.

4. **12/24/2002:** A Christmas Eve snowstorm hit parts of Southeast Missouri dropping from 7 to 12 inches of snow across the area

5. **02/23/2003:** Yet another winter storm struck Southeast Missouri on the 23rd - 24th. Snowfall amounts ranged from 6 - 8 inches across the area. Virtually all schools were closed on Monday the 24th. Due to all the school closings over the winter, many schools in the area were going to have to remain in session well into June.

6. **12/13/2003:** The first snow of the season hit much of East Central and parts of Southeast Missouri on the 13th. Snowfall was mostly in the 2 to 3 inch range.

7. **01/25/2004:** A combination of freezing rain, sleet and snow fell bringing the region to a standstill. The event started with a period of freezing rain early Sunday morning. Some places received 1/4 to 1/.2 inch of freezing rain. The freezing rain changed to sleet by mid-morning with some locations in Central and East Central Missouri receiving 1 to 2 inches of sleet. By afternoon, the sleet changed to snow and accumulated another 1 to 2 inches. Luckily it was a Sunday, as transportation was brought to a halt across the region. Some power outages were also reported in Central Missouri. Many schools across the region were closed into mid-week as another fast moving storm brought another inch or two of snow Monday night and early Tuesday.

8. **11/24/2004:** A Thanksgiving eve storm brought 2 - 4 inches of snow to parts of Central and East Central Missouri.

9. **12/08/2005:** The first significant winter storm of the season hit the area dropping from 2 to around 6 inches of snow. Most of Central Missouri picked up about 2 inches, East Central and Southeast Missouri saw 2 - 4 inches, and Northeast Missouri received from 2 to near 6 inches.

10. **11/30/2006**: A major winter storm caused a combination of freezing rain, sleet, and heavy snow to fall over sections of southwest and central Missouri. The frozen precipitation began on the 30th; the precipitation type was freezing rain and sleet, with ice accumulations up to four inches in some areas. The second wave of precipitation occurred overnight causing large amount of snow to accumulate over the ice. Storm total accumulations ranging from 13 to 17 inches occurred from the Lake of the Ozarks Region, over to Vernon and Cedar counties. Meanwhile other areas north of the Interstate 44 corridor experienced storm totals ranging from seven to 12 inches. The combination of the ice and snow weighted down all exposed objects. As a matter of fact, some areas experienced disaster as many roofs on businesses, barns, outbuildings, and schools collapsed due to the weight of the accumulated precipitation. On Lake of the Ozarks and Pomme De Terre Lake, numerous docks collapsed destroying a large number of boats and causing many of them to sink.

11. **01/12/2007**: An arctic boundary settled south of the area on the 12th and 13th of January bringing subfreezing temperatures to the northwestern half of the county warning area. Three rounds of precipitation occurred during this period, with the first being the most destructive of all. Significant tree and limb damage was reported as a result of this storm, together with widespread power outages. More than 100,000 homes and businesses lost power during this storm. About 1.5 inches of sleet fell and a 1/2 inch of ice accumulation hit parts of Central and Northeast Missouri. From 1/4 to 1/2 inch of ice accumulated from freezing rain across Eastern

Missouri and parts of Southwest Illinois. Flooding of low lying areas and low water crossings occurred across the eastern Ozarks late Friday night and Saturday morning.

12. **01/20/2007:** A fast moving storm system brought several forms of precipitation to extreme southeast Kansas and the Missouri Ozarks. The combination of rain, freezing rain, sleet, and snow were observed in numerous counties. For areas along and north of a line from McCune, Kansas to Eldon, Missouri, mainly snow fell with accumulations ranging from five to seven inches. Elsewhere, sleet and freezing rain accumulations ranged from one quarter of an inch to around an inch.

13. **12/08/2007:** Light freezing rain and sleet fell across southeast Missouri the weekend of December 8th into the early part of the next week. From 1/8 to 1/4 inch of ice accumulated along with light amounts of sleet. Travel was disrupted across the area, but overall the region fared well with little damage and few power outages reported.

14. **12/15/2007:** Snowfall up to 8 inches fell across east central Missouri. Travel was disrupted through the weekend.

15. **02/11/2008:** Up to five inches of sleet accumulated across parts of Southeast Missouri. Southern Reynolds and Madison County picked up about 5 inches of sleet with amounts in counties to the north ranging from 2 to 4 inches. There were numerous traffic accidents reported across the area. Many schools across the area were closed for the rest of the week.

16. **02/21/2008:** Another winter storm dropped freezing rain, sleet and some light snow across Central, Southeast, and East Central Missouri starting during the early morning hours on the 21st and finally ending shortly after midnight on the 22nd.

17. **02/23/2008:** From two to four inches of snow fell across Central and Southeast Missouri from the evening of the 23rd into the early morning of the 24th. The heaviest band which produced three to four inches of snow fell from Moniteau, Cole and Osage counties and then curved southeast into Gasconade, Crawford, Washington, Iron, and Reynolds counties.

18. **03/03/2008:** An early March winter storm dropped from 6 to 13 inches of snow across eastern and parts of southeast Missouri. Parts of southeast Missouri also received a quarter inch of ice from freezing rain and close to 1 inch of sleet. Transportation was brought to a halt in most areas and schools in rural areas of southeast Missouri were closed once again for several days. The event started overnight on March 3rd with freezing rain and sleet across southeast Missouri and light snow across east central counties. By midday on the 4th, a band of heavy snow developed from south central Missouri in Crawford County northeast across the St. Louis Metro area into southwest Illinois. This band of snow brought snowfall at the rate of two to three inches per hour at times. Steelville, MO and sections of western St. Louis County reported 12 to 13 inches of snow.

19. **01/26/2009:** A winter storm dropped from 6 to 8 inches of mainly snow across Eastern and Southeast Missouri. The precipitation started with a mix of freezing rain and sleet. An average of 7 inches of mainly snow fell across Crawford County. Steelville reported 7.0 inches.

20. **01/01/2010:** The first twelve days of January 2010 was one of the coldest outbreaks in many years. For some locations, it was the first time the temperature dropped below zero in about 10 years.

21. **01/31/2011:** The first true blizzard in many years hit from Central to Northeast Missouri. Up to

20 inches of snow fell along with winds gusting over 40 mph. For many counties it was a record snowfall event. I-70 was shut down from Warren County to just east of Kansas City. The National Guard was called out to help clear County roads and assist with emergency transportation. The region was brought to a standstill for several days. A Federal disaster declaration was obtained for many counties in order to assist with the cost of snow removal. Light freezing rain and sleet started on Monday 1/31 with an inch of sleet accumulating by the early morning hours of Tuesday (2/1). By midday Tuesday (2/1) the precipitation had changed to snow and the wind began increasing. By late Tuesday (2/1) afternoon travel became extremely dangerous. In the St. Louis Metro area from 2 - 3 inches of sleet fell followed by 2 to 3 inches of snow. Further south sleet accumulations ranged from 1 to 2 inches with from 1/2 to 3/4 inch of ice accumulation due to freezing rain.

22. **02/21/2013:** A combination of freezing rain, sleet, and snow hit Southeast Missouri causing very hazardous conditions. Up to 4 - 5 inches of snow, mixed with sleet, fell across the northern part of the area. The southern part received 1 - 3 inches along with an inch of sleet and some freezing rain.

23. **01/05/2014:** A very strong winter storm dropped 6 - 12 inches of snow across East Central Missouri. Strong northerly winds produced snow drifts of 2 to 5 feet. All schools and most businesses were closed on the 5th and 6th, with many schools remaining closed for several days due to very cold temperatures and wind chills. The winter storm that brought heavy snow to much of the area followed that up with the coldest temperatures in 20 years. Wind Chill values the morning of the 6th ranged from -25 to -33.

24. **03/01/2014:** An early March winter storm dropped from .5 to 2 inches of sleet across East Central and Southeast Missouri. Some locations also picked up a couple of inches of snow.

25. **01/13/2017:** An Ice Storm hit parts of Northeast, East Central and Southeast Missouri on Martin Luther King Weekend. There were transportation issues, however they were minimized due to almost all schools and businesses closing on Friday, the first day of the event.

26. **11/15/2018:** A strong system lifted northeast across the bootheel of Missouri into the Ohio Valley. North of the system, a strong deformation zone set up with a swath of heavier snowfall from east central Missouri into southwestern Illinois. By the time the snow came to an end during the afternoon hours of November 15th, up to 9 inches of snow fell. Very heavy snow fell across the northern portions of Crawford County. The heaviest snow fell across Cuba with 7 inches of snow reported and Steelville had 6.5 inches of snow.

27. **01/11/2019:** Several rounds of heavy snow fell across Crawford County beginning during the afternoon hours of January 11th through the early morning hours of January 13th. Even though the co-op observer 5.6 miles southwest of Steelville only reported a storm total of 5.0 inches with this event, several storm spotters reported around 6 inches in the far northern portions of the county.

28. **12/15/2019:** A winter storm moved into the region on Sunday, December 15th with snow moving into central Missouri by mid morning. The snow spread west to east through the day and into the evening hours before tapering off. Snowfall rates during this period were between 1 to 2 inches an hour in some locations, especially along the I-70 corridor. Then most of the area saw some light freezing drizzle through Monday morning, December 16th before a second round of snow developed by mid morning and persisted through Monday evening. The snow came to an end by midnight. Overall, a widespread 4 to 6 inches of snow fell during this event. Between 4 and 6 inches of snow fell across the county over a two day period, with the majority

of the snow falling in a two hour period on the 16th.

Crawford County has been included in four federal disaster declarations for winter weather since 2007.[46]

Probability of Future Occurrence

From the data obtained from the NCEI [47], annual average percent probabilities were calculated for winter weather within Crawford County (**Table 3.72)**. There were 31 recorded events (**Table 3.71**) over a 20 year period. There is 100 percent annual average probability of winter weather occurrence (31 events/20 years)**,** with an average of 1.55 events per year.

Changing Future Conditions Considerations

There are both positive and negative indirect impacts from warming temperatures. Shorter winter seasons and fewer days of extreme cold may result in changes in the distribution of native plant and wildlife. The stress of climate change may cause some native species to become endangered or extinct if that species cannot adapt to changing conditions. There may also be an increase in pests and undesirable non-native species. Warmer winter conditions will result in a deduction of ice lake cover and warmer water temperatures – which can lead to harmful blooms of algae and bacteria. Increased temperatures could also mean increased rainfall in winter months that could increase the risk and severity of spring floods.[48]

Table 3.72. Annual Average % Probability of Winter Weather in Crawford County

Location	Annual Avg. % P	Avg. # of Events
Crawford County	100%	1.55

*P = probability; see page 3.24 for definition.

Vulnerability

Vulnerability Overview

Heavy snow can bring a community to a standstill by inhibiting transportation (in whiteout conditions), weighing down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make transportation difficult and hazardous. Ice can also become a problem on roadways if the air temperature is high enough that precipitation falls as freezing rain rather than snow.

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

[46] https://www.fema.gov/data-visualization-summary-disaster-declarations-and-grants
[47] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI
[48] 2018 Missouri State Hazard Mitigation Plan

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

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

Data was obtained from the 2018 Missouri State Hazard Mitigation Plan for vulnerability information regarding Crawford County. Various data sources were utilized for statistical analysis including the following:

- National Centers for Environmental Information (NCEI) storm event data (1999 to December 31, 2019)
- HAZUS Building Exposure Value data
- Housing density data from the U.S. Census (2015 ACS)
- Calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina

From the statistical data collected, five factors were considered in determining overall vulnerability to severe winter weather as follows: housing density, building exposure, social vulnerability, likelihood of occurrence and average annual property loss. A rating value of one through five was assigned to each factor:

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

Table 3.73 provides the factors considered and the ranges for the rating values assigned. After the individual ratings were determined for the common factors, a combined vulnerability rating was computed for severe winter weather. Those can be seen in **Table 3.74**. The housing density, building exposure and SOVI data for Crawford County can be found in **Table 3.75**.

Table 3.73. Ranges for Severe Winter Weather Vulnerability Factor Ratings

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

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.74. Ranges for Severe Winter Weather Combined Vulnerability Rating

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

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.75. Housing Density, Building Exposure and SOVI Data for Crawford County

Total Building Exposure (Hazus)	Building Exposure Rating	Housing Density	Housing Density Rating	SOVI Ranking	SOVI Rating
$2,39,455,000	1	16.06	1	Medium	3

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.76 provides the last piece of the data gathered from NCEI to complete the overall vulnerability analysis and the total overall vulnerability rating for severe winter weather. The total number of winter weather events includes blizzard, heavy snow, ice storm winter storm and winter weather events. The likelihood of occurrence is 1.9 or 100 percent per year. The total annualized property loss is $35,905, which provides a total annualized property loss rating of two and an overall vulnerability rating of ten – which translates to an overall Low-Medium vulnerability rating for the county for severe winter weather.

Table 3.76. Additional Statistical Data Compiled for Vulnerability Analysis for Crawford County

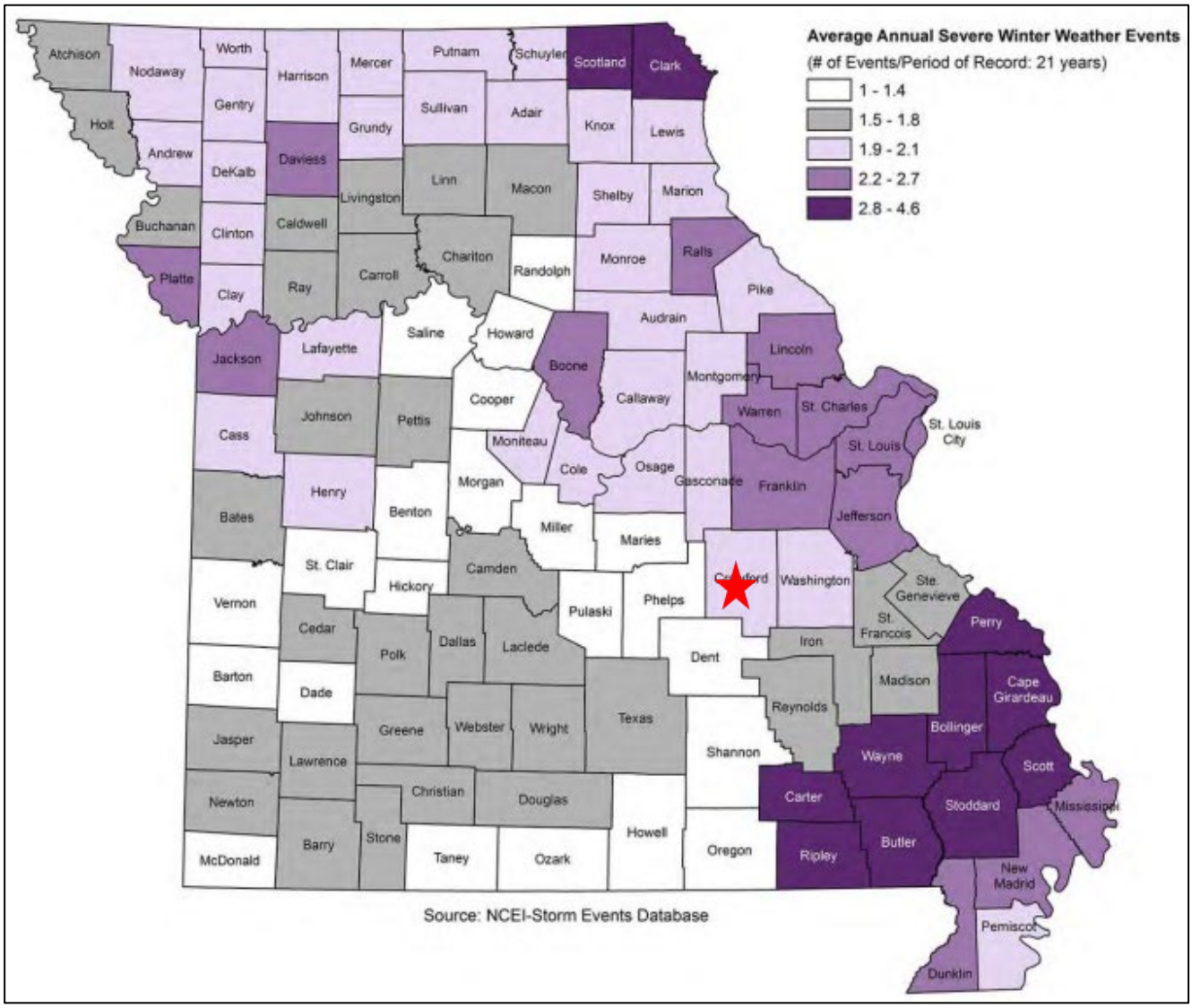
Total number of Winter Weather Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating	Overall Vulnerability Rating	Overall Vulnerability Rating Description
40	1.9048	3	$35,905	2	10	Low Medium

Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.67 illustrates the average annual occurrence of severe winter weather statewide. Crawford County falls into the Low category of 1.5 to 1.8 events per year.

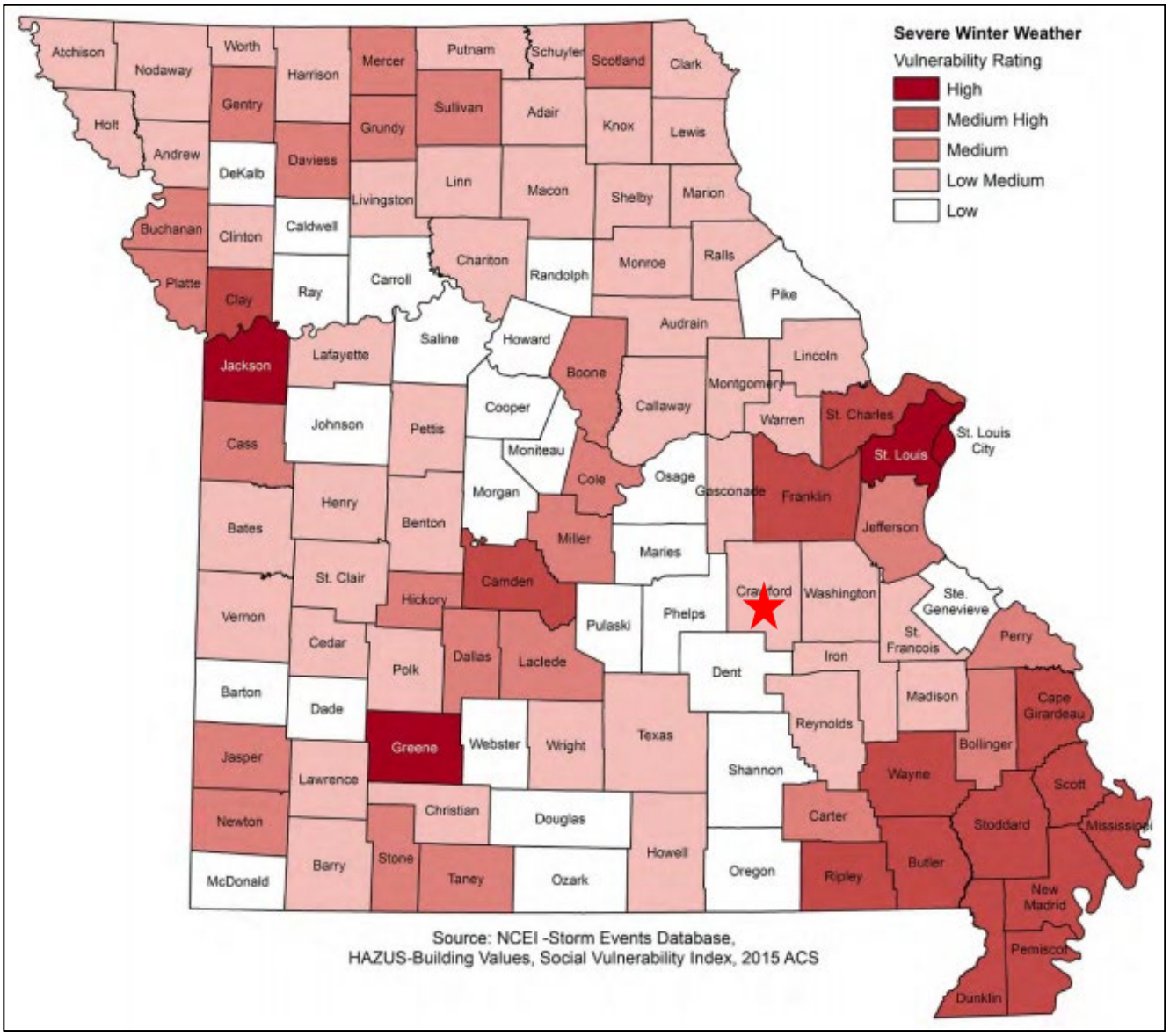
Figure 3.68 provides an illustration of the vulnerability summary of all Missouri counties for severe winter weather. Again, Crawford County falls into the Low-Medium rating for overall vulnerability.

Figure 3.67. Average Annual Occurrence of Severe Winter Weather Events



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

Figure 3.68. Vulnerability Summary for Severe Winter Weather



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

Potential Losses to Existing Development

The next severe winter storm will most likely close schools and businesses for multiple days and make roadways hazardous for travel. Heavy ice accumulation may damage electrical infrastructures, causing prolonged power outages for large portions of the region. In addition, freezing temperatures make water lines vulnerable to freeze/thaw. Fallen tree limbs also pose a threat to various structures/infrastructures across the county. According to the 2018 state plan, Crawford County can expect annual property losses of $35,905 due to severe winter storms.

Impact of Previous and Future Development

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

the county's population within the cities is anticipated to increase, which would increase the number of individuals at risk during a winter weather event.

Hazard Summary by Jurisdiction

Variations in impacts are not anticipated for severe winter weather across the planning area. Yet, areas with high number of mobile homes tend to experience increased damages. Sullivan has the highest abundance of mobile homes, making the area more prone to increased exposure to damage. In addition, rural areas of the county may be more susceptible to power outages due to more power infrastructure being exposed to the risk of damage from winter storms.

Problem Statement

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

3.4.9 Tornado

Some specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.10, Page 3.355 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- NWS Enhanced F Scale for Tornado Damage including damage indicators and degrees of damage www.spc.noaa.gov/faq/tornado/ef-scale.html;
- Tornado Activity in the U.S. map (1950-2006), FEMA 320, Taking Shelter from the Storm, 3rd edition;
- Tornado Alley in the U.S. map, http://tornadochaser.com/education/tornado-alley/
- National Centers for Environmental Information, https://www.ncdc.noaa.gov/stormevents/;
- Midwest Regional Climate Center, https://mrcc.purdue.edu/gismaps/cntytorn.htm;
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Number of Tornadoes by County
  - Percentage of Mobile Homes in 2015 by County
  - Average annual tornado events by County
  - Vulnerability to tornado events by County
  - Annualized property loss for tornado events by County
  - Annualized property loss for tornado events by County

Hazard Profile

Hazard Description

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

High winds not associated with tornadoes are profiled separately in this document in **Section 3.4.7,** Severe Thunderstorms Including High Winds, Hail, and Lightning.

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

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

A typical tornado can be described as a funnel-shaped cloud in contact with the earth‘s surface that is “anchored” to a cloud, usually a cumulonimbus. This contact on average lasts 30 minutes and covers

an average distance of 15 miles. The width of the tornado (and its path of destruction) is usually about 300 yards. However, tornadoes can stay on the ground for upward of 300 miles and can be up to a mile wide. The National Weather Service, in reviewing tornadoes occurring in Missouri between 1950 and 1996, calculated the mean path length at 2.27 miles and the mean path area at 0.14 square mile.

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

Geographic Location

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

Strength/Magnitude/Extent

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

Tornado magnitude is classified according to the EF- Scale (or the Enhanced Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (**Table 3.77**) 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 3.77. Enhanced F Scale for Tornado Damage

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

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

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.78.** The damage descriptions are summaries. For the actual EF scale, it is necessary to look up the damage indicator (type of structure damaged) and

refer to the degrees of damage associated with that indicator.

Table 3.78. Enhanced Fujita Scale with Potential Damage

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

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

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

Previous Occurrences

Table 3.79 illustrates NCEI data reported for tornado events and damages from 2001 to 2020 in the planning area.

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

lifts off the ground for greater than 5 minutes or 2.5 miles, it is considered a separate tornado. Tornadoes reported in Storm Data and the Storm Events Database are in segments.

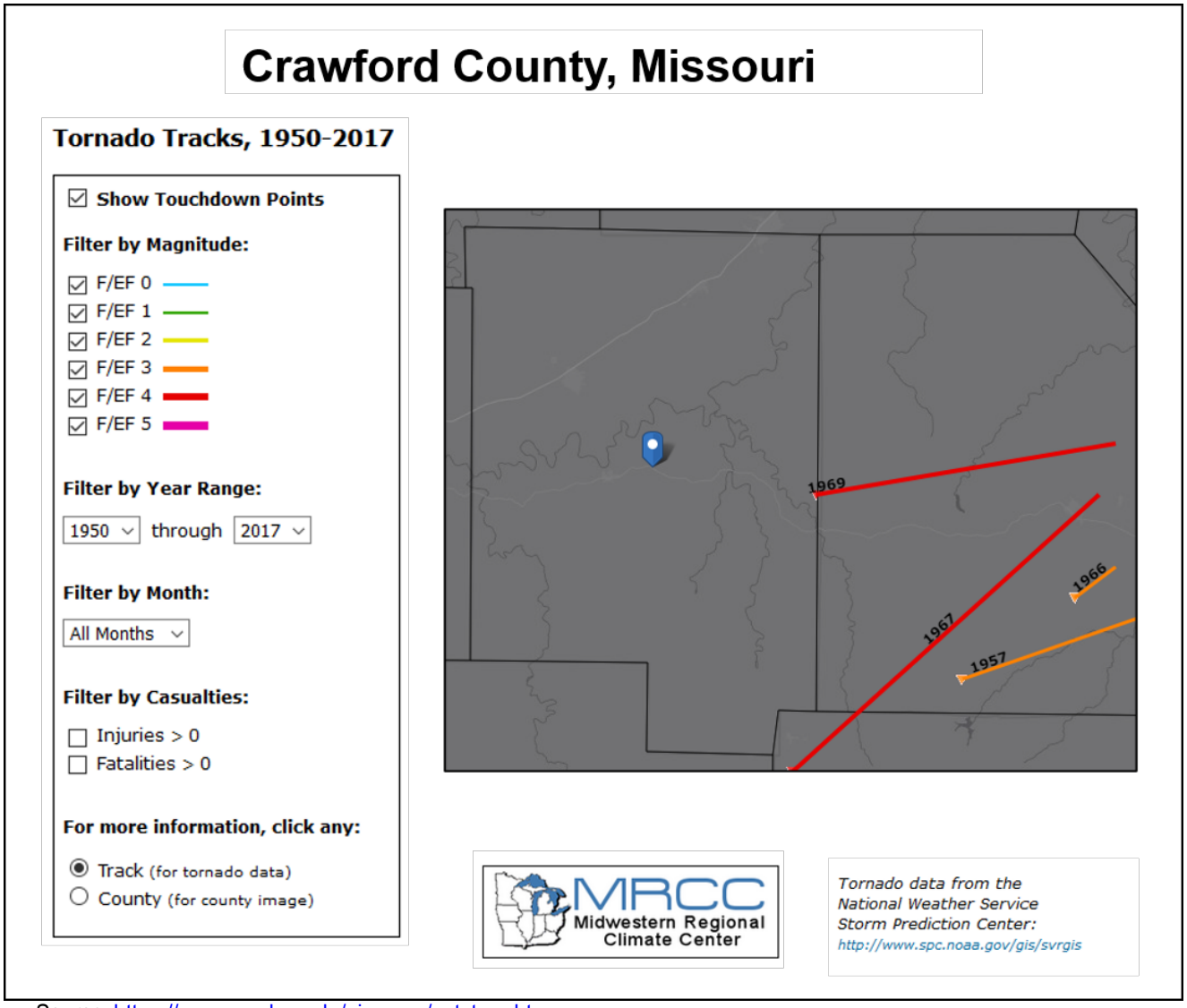
Table 3.79. Recorded Tornadoes in Crawford County, 2001 – 2020

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
9/22/2006	2W Leasburg	2E Leasburg	3	80	F0	0	0	0	0
9/22/2006	2S Leasburg	3NE Hinch	10.4	80	F1	0	0	0	0
4/30/2010	4W Cook Station	3W Cook Station	1.94	100	EF1	0	0	0	0
12/31/2010	2SE Jake Prairie	2SE Oak Hill	6.36	100	EF1	0	0	0	0
6/19/2011	0SW Keysville	1ESE Keysville	1.34	60	EF0	0	0	0	0
6/19/2011	2ESE Keysville	3NW Cherryville	2.77	80	EF2	0	3	150K	0
5/11/2016	2SE Bourbon	5ENE Bourbon	4.43	700	EF2	0	0	0	0
3/24/2019	4W Butts	2ENE Butts	5.75	100	EF0	0	0	0	0
6/27/2020	2WNW Cuba Airstrip ARPT	1WNW Cuba Airstrip ARPT	0.76	100	EF0	0	0	0	0
Total	**-**	**-**	**36.75**	**1,400**	**-**	**0**	**3**	**$150K**	**0**

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

Figure 3.69 depicts historic tornado paths across Crawford County.

Figure 3.69. Crawford County Map of Historic Tornado Paths (1950 – 2017)



Source: https://mrcc.purdue.edu/gismaps/cntytorn.htm

According to the USDA Risk Management Agency's record, there were no insurance payments in Crawford County for crop damages as a result of tornadoes between 2001 and 2020.

Probability of Future Occurrence

From the data obtained from the NCEI[49], an annual average percent probability was calculated for tornadoes within Crawford County (**Table 3.80**). There is a 45.0 percent annual average probability of a tornado occurrence (9 events/20 years x 100). Tornado events can be found in **Table 3.79**. In addition, **Figure 3.70,** obtained from the 2018 Missouri State Hazard Mitigation Plan, also illustrates tornado probabilities across the United States and further shows Crawford County's average probability of 20-30 percent.

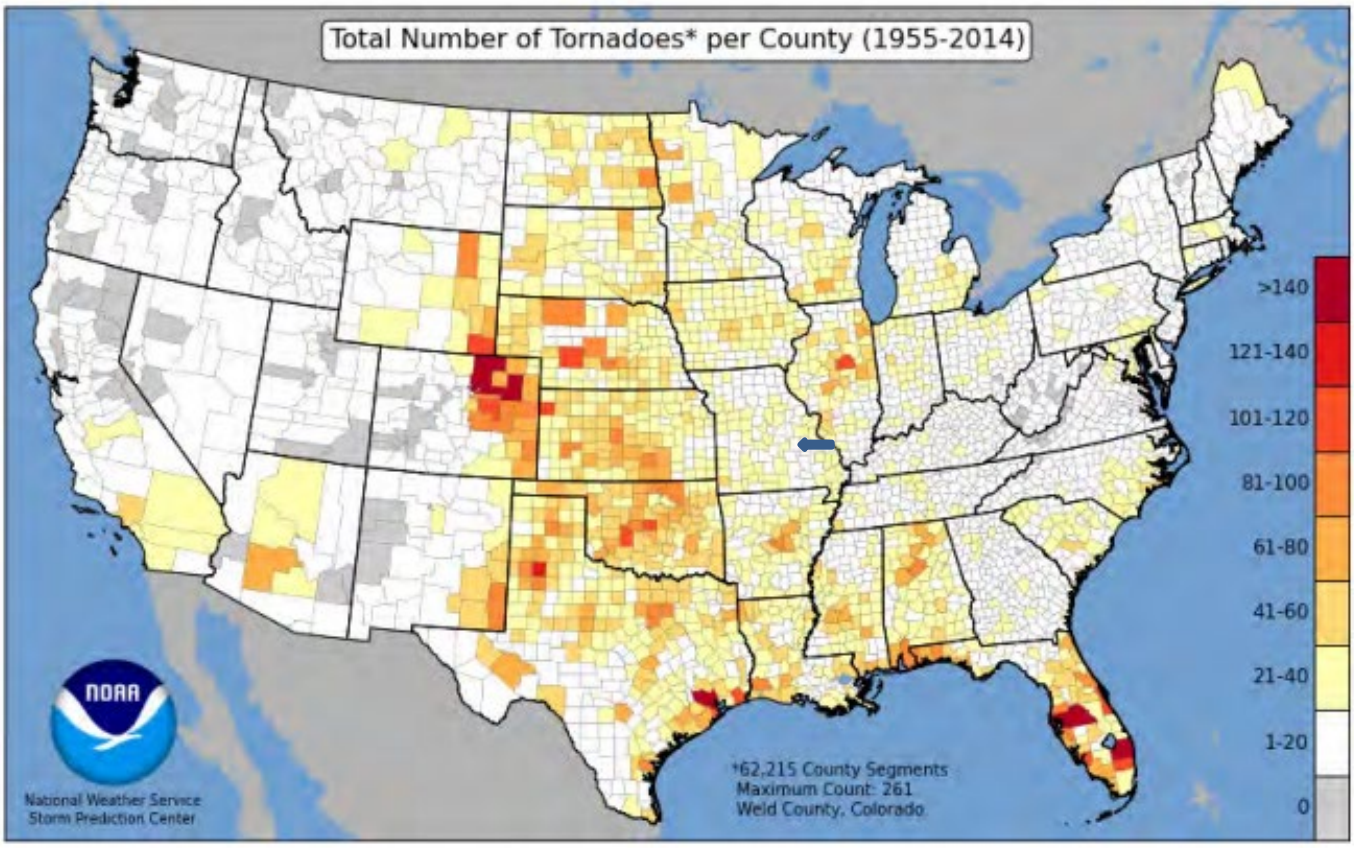
[49] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI

Table 3.80. Annual Average % Probability of Tornadoes in Crawford County

Location	Annual Avg. % P
Crawford County	45%

*P = probability; see page 3.24 for definition.

Figure 3.70. Tornado Activity in the United States



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

Changing Future Conditions Considerations

There is still not enough data to know how the frequency and severity of tornadoes will change in a warming world. Research suggests that changes in heat and moisture content in the atmosphere could play a role in making tornado outbreaks more frequent and more severe in the U.S. The research concluded that the number of days with large tornado outbreaks have been increasing for the past 70 years and that densely concentrated tornado outbreaks are increasing as well.[50]

[50] 2018 Missouri Hazard Mitigation Plan

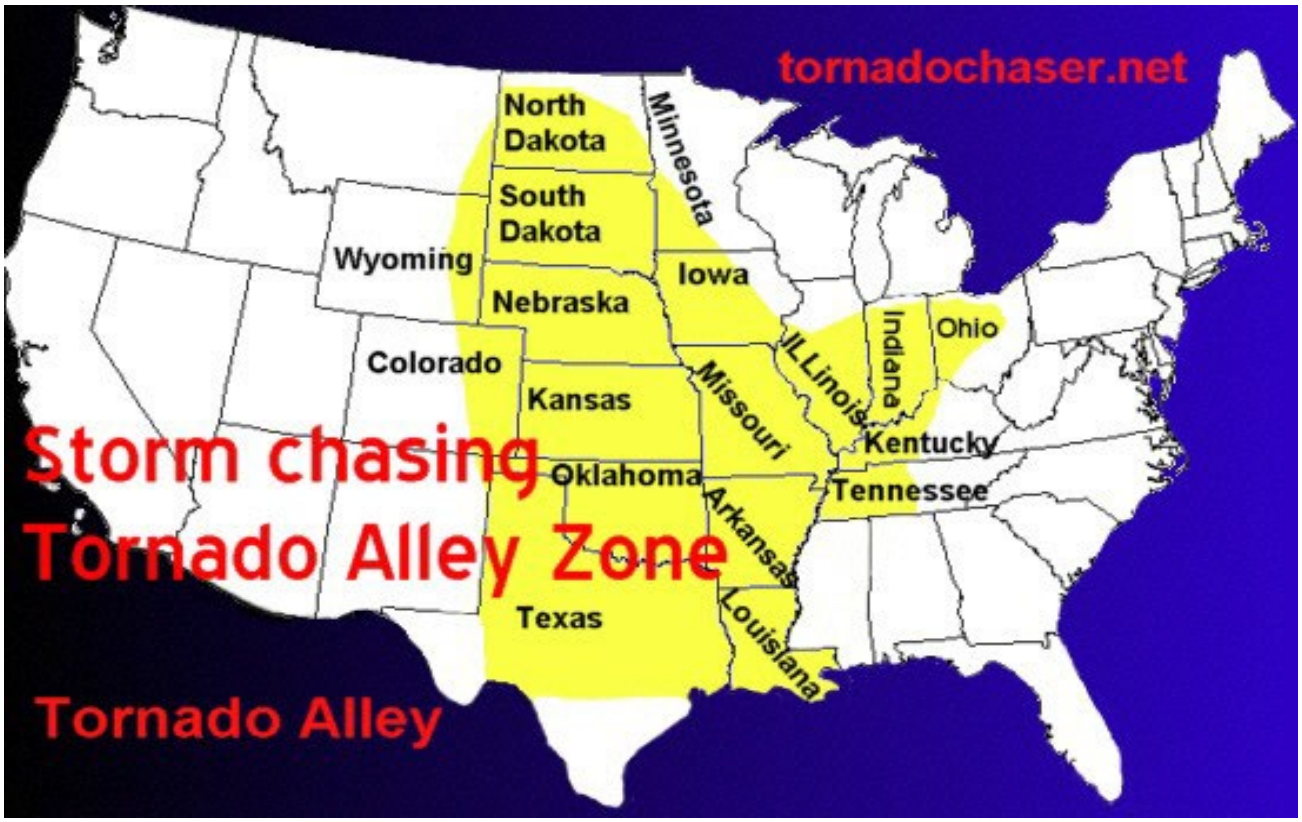
Vulnerability

Vulnerability Overview

Many tornadoes are capable of great destruction and every tornado is a potential killer. Tornadoes can topple buildings, destroy mobile homes, uproot trees, hurl people and animals through the air for hundreds of yards and fill the air with lethal, windblown debris. Sticks, glass, roofing material and lawn furniture all become deadly missiles when driven by tornado winds.[51] Crawford County resides in a region of the United States that has a high frequency of dangerous and destructive tornadoes. This region seen in **Figure 3.71** is referred to as "Tornado Alley".

The 2018 Missouri Hazard Mitigation Plan used statistical analysis of data from several sources to determine vulnerability to tornadoes across the state. HAZUS building exposure value data, population density and mobile home data from the U.S. Census (2015 ACS), the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina, and storm events data (1950 to December 31, 2016) from the National Centers for Environmental Information (NCEI). One limitation to the NCEI data is that many tornadoes that may have occurred in uninhabited areas and some in inhabited areas, may not have been reported. In addition, NOAA data cannot show a realistic frequency distribution of different Fujita scale tornado events, except for recent years. For these reasons a parametric model based on a combination of many physical aspects of the tornado to predict future expected losses was not used. The statistical model used for this analysis was probabilistic based purely on tornado frequency and historic losses.

Figure 3.71. Tornado Alley in the U.S.[iii]



Source: http://tornadochaser.net/

[51] 2018 Missouri Hazard Mitigation Plan

Six factors were considered in determining overall vulnerability to tornadoes as follows: building exposure, population density, social vulnerability, percentage of mobile homes, likelihood of occurrence and annual property loss. Based on natural breaks in the statistical data, a rating value of one through five was assigned to each factor. These rating values correspond to the following descriptive terms:

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

Table 3.81 provides the factors used and ranges for the rating values assigned. Once the ranges were established and applied to all factors, the ratings were combined to determine overall vulnerability. **Table 3.82** illustrates the ranges for tornado combined vulnerability rating.

Table 3.81. Ranges for Tornado Vulnerability Factor Ratings

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

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.82. Ranges for Tornado Combined vulnerability Rating

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

Source: 2018 Missouri Hazard Mitigation Plan

Table 3.83 provides data on building exposure, population density, SOVI and mobile home data for Crawford County that is used to determine overall vulnerability.

Table 3.83. Building Exposure, Population Density, SOVI and Mobile Home Data for Crawford County

Total Building Exposure (Hazus)	Exposure Rating	Population Density	Population Rating	SOVI Ranking	SOVI Rating	Percent Mobile Homes	Mobile Home Rating
$2,389,455,000	1	33.03	1	Medium	3	14.	4

Source: 2018 Missouri Hazard Mitigation Plan

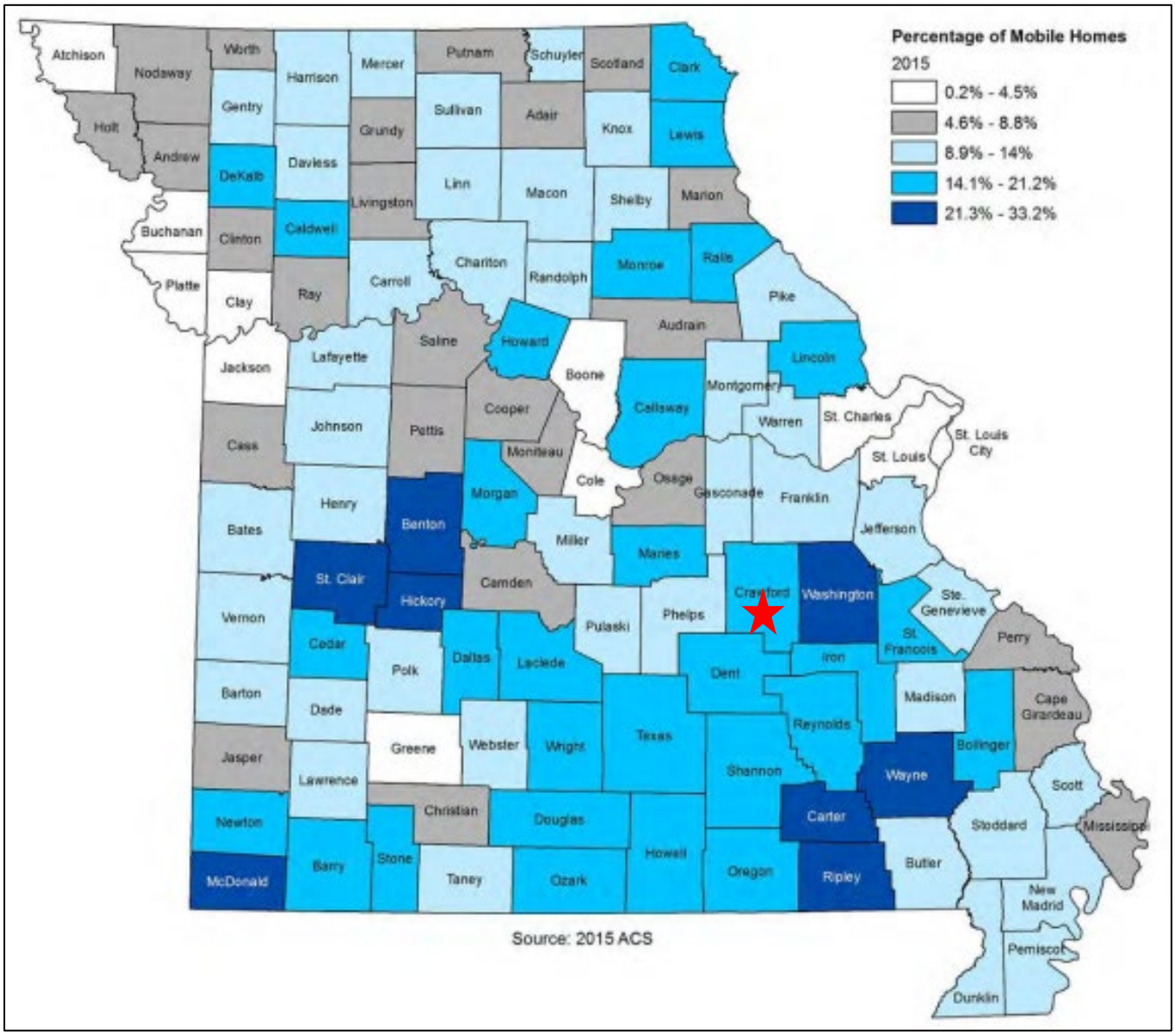
Table 3.84 provides additional data, obtained from the National Centers for Environmental Information to complete the overall vulnerability analysis and the total overall vulnerability rating for tornadoes. **Figure 3.72** shows the percent of mobile homes per county throughout the state with Crawford County determined to have medium mobile home density at 14.1 percent to 21.2 percent. **Figure 3.73** provides the average annual occurrence of tornadoes in Missouri and illustrates that Crawford County falls into the low-medium quadrant for historical events – 20 to 30 percentiles. Finally, **Figure 3.74** shows the county's overall vulnerability to tornadoes – Medium.

Table 3.84. Likelihood of Occurrence, Annual Property Loss and Overall Vulnerability Rating for Tornadoes for Crawford County

Total Number of Tornadoes	Likelihood of Occurrence	Likelihood of occurrence Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating	Overall Vulnerability Rating	Overall Vulnerability Rating Description
19	0.284	2	$394,272	2	13	Medium

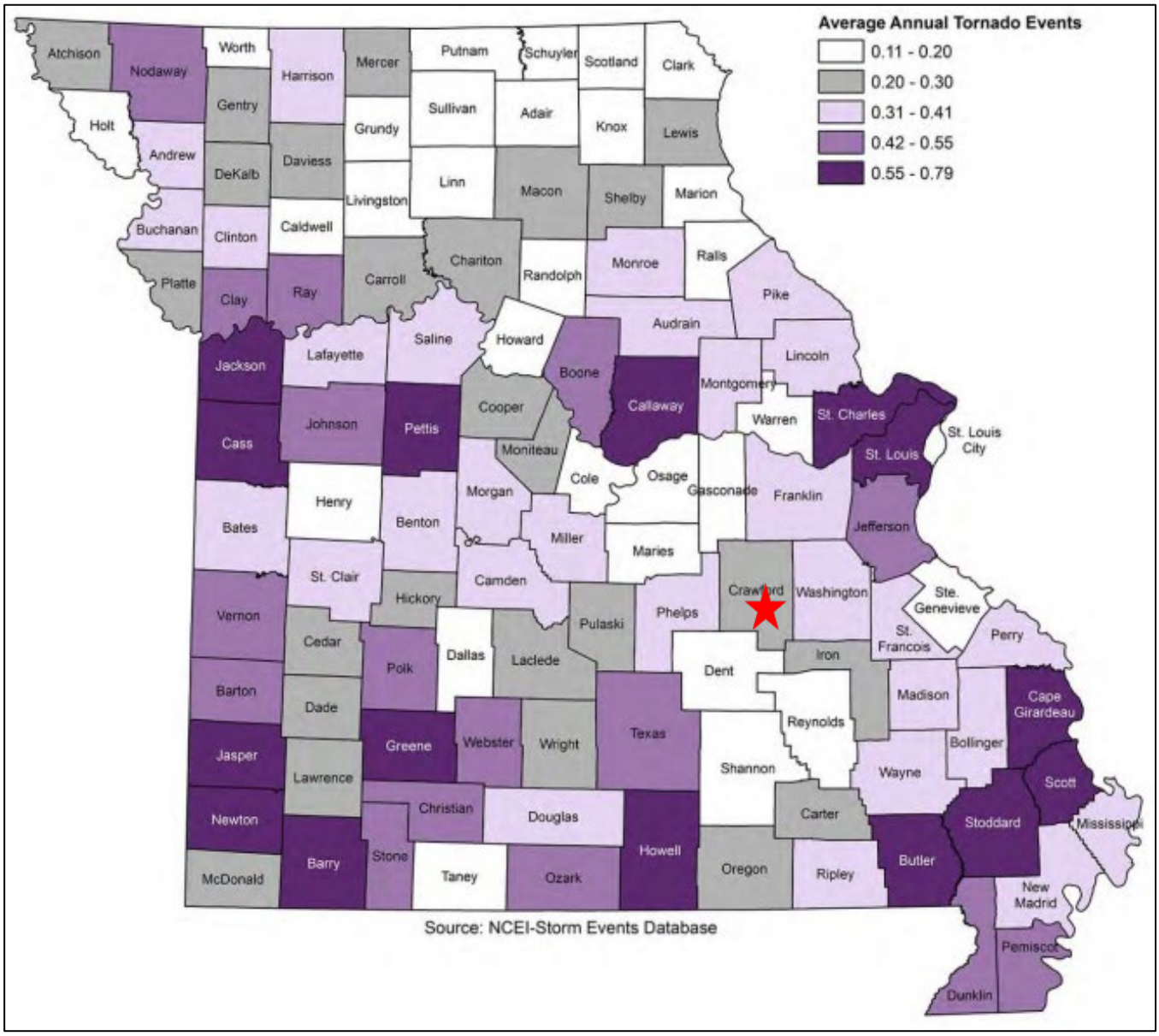
Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.72. Missouri – Percent of Mobile Homes Per County



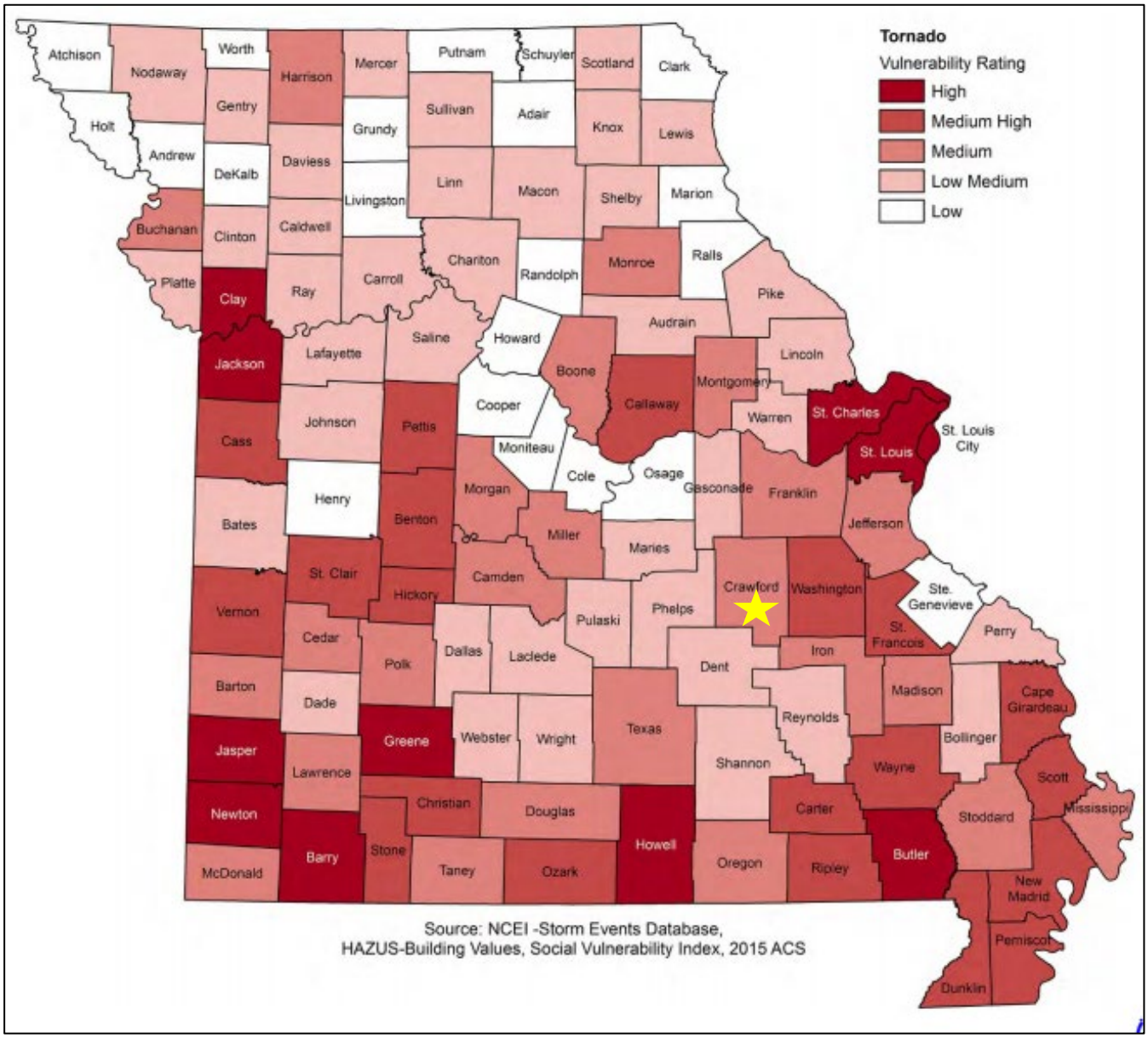
*Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Crawford County*

Figure 3.73. Average Annual Occurrence for Tornadoes



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

Figure 3.74. Overall Vulnerability to Tornadoes



*Source: 2018 Missouri State Hazard Mitigation Plan, *Yellow star indicates Crawford County*

Potential Losses to Existing Development

There has been a total of $150,000 in damage due to tornadoes within Crawford County in the previous 20 years. With this information we can estimate that each year there will be approximately $7,500.00 in loss to existing development. Additionally, the largest recorded tornado in the planning area has been an EF2. Utilizing this information we can infer that there is potential for another tornado of equivalence.

Impact of Previous and Future Development

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

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

Hazard Summary by Jurisdiction

As previously stated, a tornado event could occur anywhere in the planning area. However, some jurisdictions would suffer heavier damages because of the age of housing or high concentration of mobile homes. See **Table 3.30** for jurisdictions most vulnerable to damage due to the age of the structure. Based on structure age, the city of Steelville would have higher vulnerability due to 23.3 percent of its housing stock being built prior to 1939. Furthermore, data was obtained from the U.S. Census Bureau for the number of mobile homes in Crawford County and its jurisdictions. From the information provided in **Table 3.85,** Unincorporated Crawford County, with 1,383 mobile homes – 13.6 percent of housing in the count, is most vulnerable to losses due to the number of mobile homes residing within the jurisdiction.

Table 3.85. Percentage of Mobile Homes in Crawford County, 2019

Jurisdiction	Number of Mobile Homes	Percentage of Mobile Homes*
Unincorporated Crawford County	1,383	13.6
Bourbon	86	11.6
Cuba	25	1.7
Leasburg	17	13.2
Steelville	73	13.5
Sullivan	22	0.7

Source: U.S. Census Bureau, 2016-2020 5-Year American Community Survey
**Number of mobile homes per jurisdiction/total occupied housing units per jurisdiction*
***Total housing units for all jurisdictions = 9,798*

Problem Statement

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

3.4.10 Wildfires

The specific sources for this hazard are:

- 2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.11, Page 3.390 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- Missouri Department of Conservation Wildfire Data Search at http://mdc4.mdc.mo.gov/applications/FireReporting/Report.aspx
- Statistics, Missouri Division of Fire Safety at https://dfs.dps.mo.gov/;
- National Statistics, US Fire Administration at https://www.usfa.fema.gov/statistics/;
- Fire/Rescue Mutual Aid Regions in Missouri at https://dfs.dps.mo.gov/programs/resources/mutual-aid.php;
- Forestry Division of the Missouri Dept. of Conservation at https://mdc.mo.gov/your-property/fire-management;
- National Fire Incident Reporting System (NFIRS), http://www.dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.php
- Firewise, www.firewise.org
- University of Wisconsin Slivis Lab, http://silvis.forest.wisc.edu/maps/wui_main
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkcojgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
    - Likelihood of Occurrence of wildfire by County
    - Average annual land burned (acres) by County
    - Number of structures within the WUI Interface/Intermix Area
    - Potential loss, average annual land burned by County

Hazard Profile

Hazard Description

The fire incident types for wildfires include: 1) natural vegetation fire, 2) outside rubbish fire, 3) special outside fire, and 4) cultivated vegetation, crop fire.

The Missouri Division of Fire Safety (MDFS) indicates that approximately 80 percent of the fire departments in Missouri are staffed with volunteers. Whether paid or volunteer, these departments are often limited by lack of resources and financial assistance.

The Forestry Division of the Missouri Department of Conservation (MDC) is responsible for protecting privately owned and state-owned forests and grasslands from wildfires. To accomplish this task, eight forestry regions have been established in Missouri for fire suppression. The Forestry Division works closely with volunteer fire departments and federal partners to assist with fire suppression activities. Currently, approximately 700 rural fire departments in Missouri have mutual aid agreements with the Forestry Division to obtain assistance in wildfire protection if needed. Over 300 have mutual aid agreements with the State to obtain assistance in wildfire protection if needed. A cooperative agreement with the Mark Twain National Forest is renewed annually.

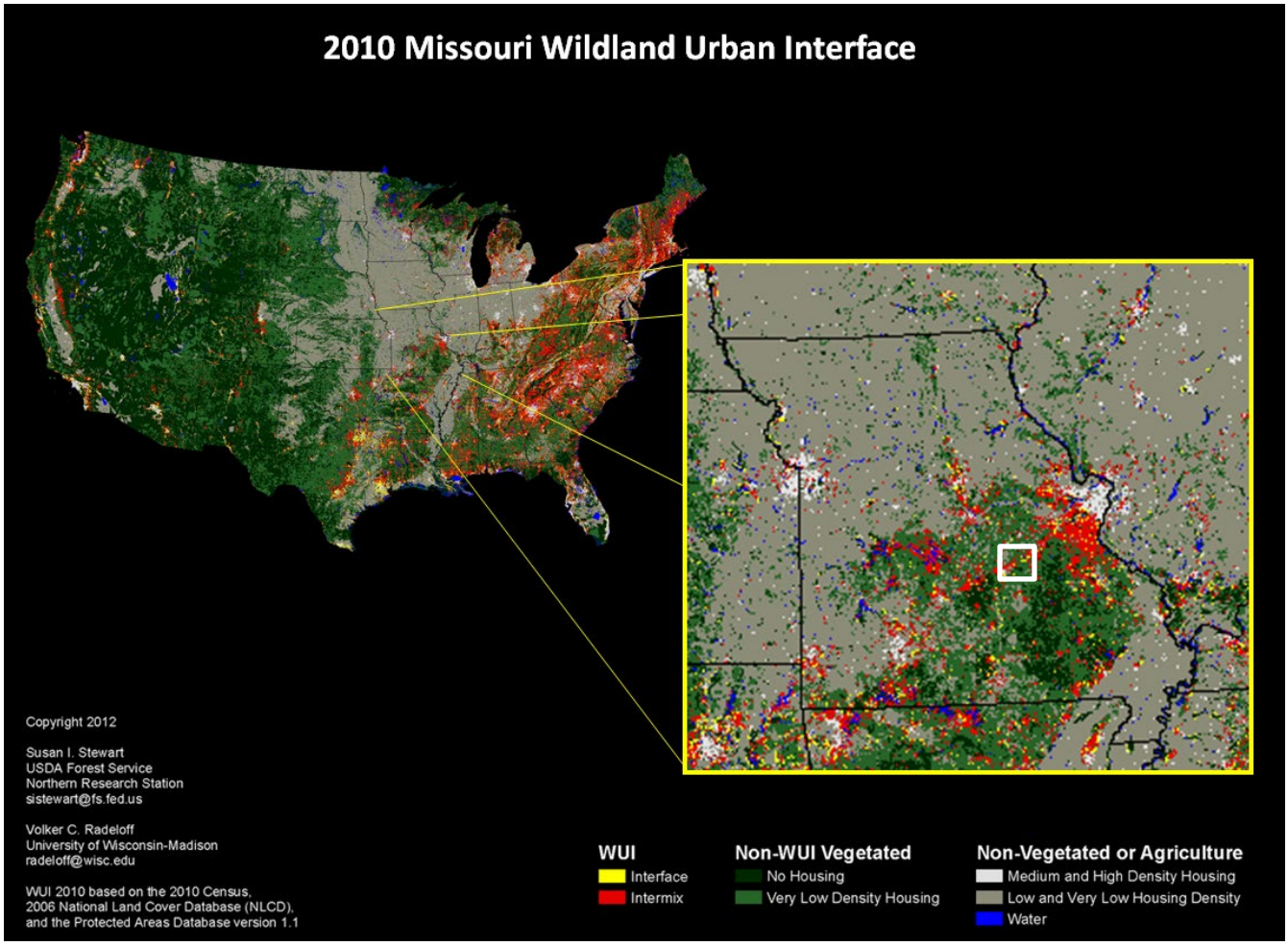
Most of Missouri fires occur during the spring season between February and May. The length and severity of both structural and wildland fires depend largely on weather conditions. Each year, an average of about 3,200 wildfires burn more than 52,000 acres of forest and grassland in Missouri. Spring in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

higher fire danger. Drought conditions can also hamper firefighting efforts, as decreasing water supplies may not prove adequate for firefighting. It is common for rural residents burn their garden spots, brush piles, and other areas in the spring. Some landowners also believe it is necessary to burn their forests in the spring to promote grass growth, kill ticks, and reduce brush. Therefore, spring months are the most dangerous for wildfires. The second most critical period of the year is fall. Depending on the weather conditions, a sizeable number of fires may occur between mid-October and late November.

Geographic Location

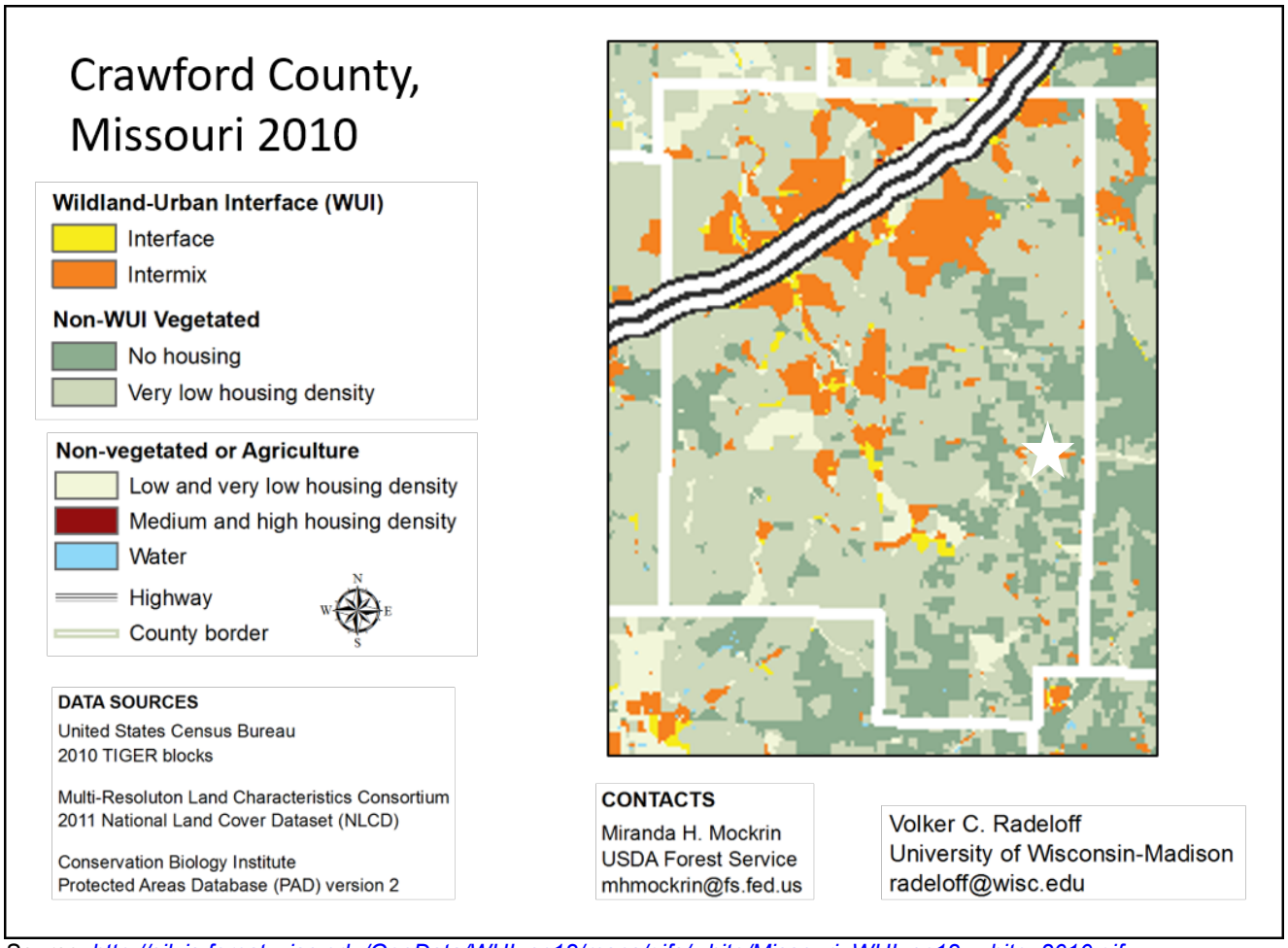
The risk of wildfire does not vary widely across the planning area. However, damages due to wildfires are expected to be higher in communities with more wildland–urban interface (WUI) areas. WUI refers to the zone of transition between unoccupied land and human development and needs to be defined in the plan. Within the WUI, there are two specific areas identified: 1) Interface and 2) Intermix. The interface areas are those areas that abut wildland vegetation and the Intermix areas are those areas that intermingle with wildland areas (**Figure 3.75**). To determine specific WUI areas and variations, data was obtain from ArcGIS, Streets and SILVIS (**Figure 3.76**). According to the WUI area map of Crawford County, all cities partially reside in a WUI area.

Figure 3.75. 2010 Missouri Wildland Urban Interface (WUI)



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

Figure 3.76. Crawford County Wildlife Urban Interface



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

Strength/Magnitude/Extent

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

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

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

The severity of wildfires in Missouri is considered low to moderate, and wildfires in Missouri often go unnoticed by the general public because the sensational fire behavior that captures the attention of television viewers is rare in the state. Yet, from the standpoint of destroying homes and other property, Missouri wildfires can be quite destructive. Large fires have the potential to kill people, livestock, fish and wildlife as well as destroy crops and pastures. Wildfires can destroy not only natural areas, but homes, businesses and other facilities. Loss of life due to wildfires is not common in Missouri, but injuries to residents and firefighters can include falls, sprains, abrasions or heat-related injuries such as dehydration.

Previous Occurrences

Between 2001 and 2020 there were 1323 wildfires reported in Crawford County, according to wildfire reporting to the Missouri Department of Conservation[52]. This is an average of 66.15 wildfires per year. The size of the fires varied from as small as .01 acre to as large as 900 acres. **Table 3.86** shows the cause of wildfires, number of wildfires and acres burned for the period 2001-2020. Debris fires account for the largest number of fires however, the greatest number of acres burned were caused from unknown sources.

Table 3.86. 2001-2020 Crawford County Wildfires by Cause

Cause	Number	Acres	% Number	% Acres
Arson	54	1,249.1	4.08%	8.39%
Campfire	14	184	1.06%	1.24%
Children	6	16	0.45%	0.11%
Debris	621	4,141.36	46.94%	27.82%
Equipment	63	582	4.76%	3.91%
Fireworks	1	3.52	0.08%	0.02%
Lightning	6	3.45	0.45%	0.02%
Miscellaneous	114	1282	8.62%	8.61%
Not Reported	17	78	1.28%	0.52%
Powerline	2	7.32	0.15%	0.05%
Railroad	3	7.5	0.23%	0.05%
Smoking	12	13	0.91%	0.09%
Unknown	410	7,313.75	30.99%	49.14%
Totals	**1,323**	**14,883.86**	**100%**	**100%**

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

Probability of Future Occurrence

From the data obtained from the Missouri Department of Conservation[53] (Appendix: F), 1,302 wildfire events occurred in Crawford County between 2001 and 2020. This information was utilized to determine the annual average percent probabilities of wildfires. Since multiple occurrences are anticipated per year (1,302 events/20 years), the probability of wildfires per year is 100% with an average of 65.1 events per year **Table 3.87**.

[52] http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx
[53] http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx

Table 3.87. Annual Average Percentage Probability of Wildfires in Crawford County

Location	Annual Avg. % P	Avg. Number of Events
Crawford County	100%	65.1

*P = probability; see page 3.24 for definition.

Changing Future Conditions Considerations

Higher temperatures and changes in rainfall are unlikely to substantially reduce forest cover in Missouri, although the composition of trees in the forests may change. More droughts would reduce forest productivity and changing future conditions are also likely to increase the damage from insects and diseases. But longer growing seasons and increased carbon dioxide concentrations could offset the losses from those factors. Forests cover about one-third of the state, dominated by oak and hickory trees. As the climate changes, the abundance of pines in Missouri's forests are likely to increase, while the population of hickory trees is likely to decrease.[54]

Higher temperatures will also reduce the number of days prescribed burning can be performed. Reduction of prescribed burning will allow for growth of understory vegetation – providing fuel for destructive wildfires. Drought is also anticipated to increase in frequency and intensity during summer months under projected future scenarios. Drought can lead to dead or dying vegetation and landscaping material close to structures which creates fodder for wildfires.[55]

Vulnerability

Vulnerability Overview

According to the 2018 Missouri State Hazard Mitigation Plan, the Department of Conservation historical wildfire data was the best resource for data on wildfires. The Missouri State Hazard Mitigation Plan used data from 2004-2016 and determined that Crawford County should expect to have 87.15 wildfires per year, impacting 852 acres (**Table 3.88**).

The state plan also indicates that Crawford County is at Low-Medium possible likelihood for building damage from wildfires – likely from the low population numbers in the county. **Figure 3.77** illustrates the likelihood of wildfire events based on data from 2004-2016. **Figure 3.77** provides a map that illustrates the average annual acreage burned.

Table 3.88. Statistical Data for Wildfire Vulnerability in Crawford County

Number of Wildfires 2004-2016	Likelihood of Occurrence (#/year)	Total Acres Burned	Average Annual Acreage Burned
1,133	87.15	11,079.62	852

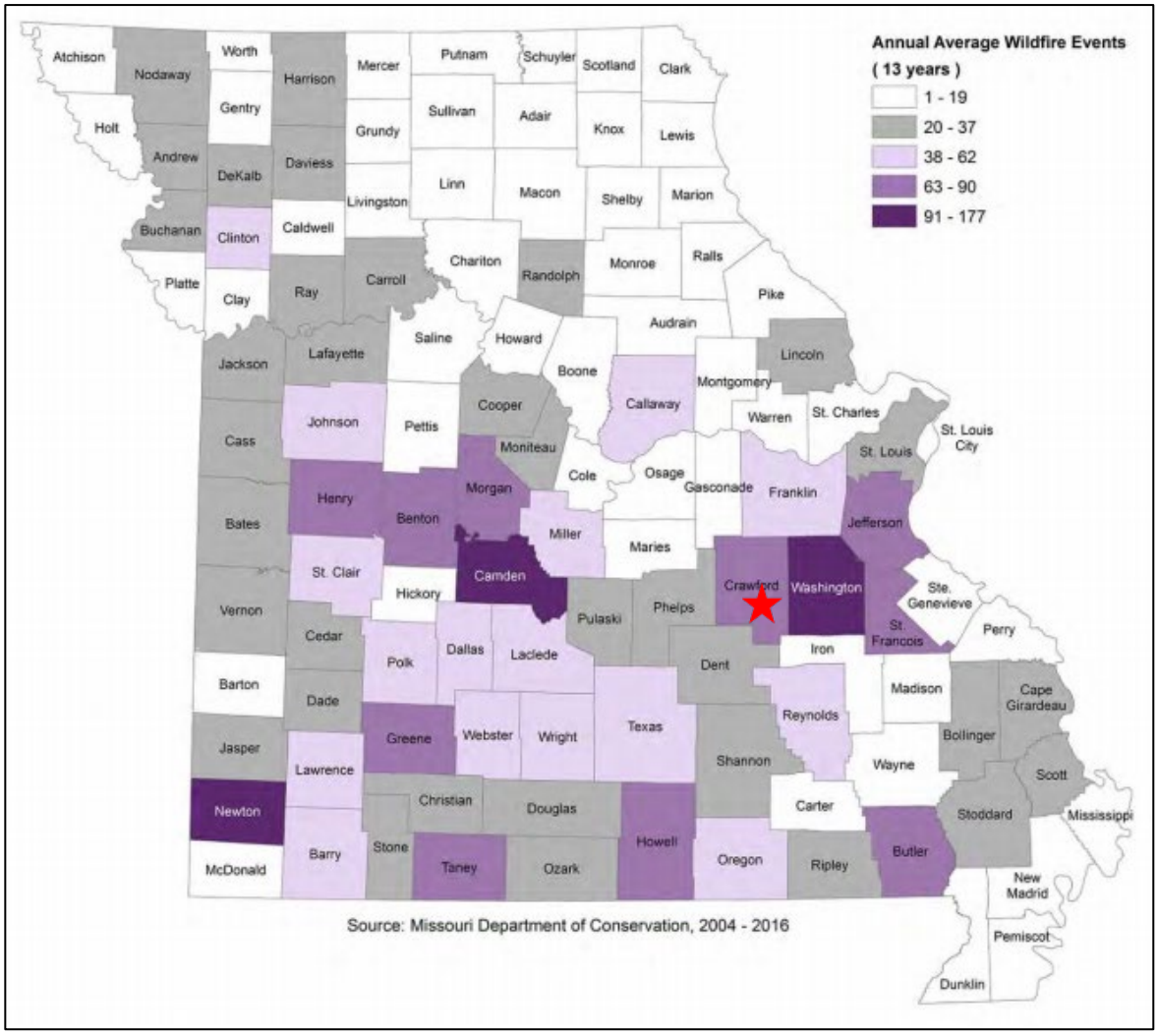
Source: 2018 Missouri State Hazard Mitigation Plan

[54] 2018 Missouri Hazard Mitigation Plan
[55] 2018 Missouri Hazard Mitigation Plan

The method used to determine vulnerability to wildfires in the 2018 Missouri Hazard Mitigation plan was a GIS comparative analysis of wildland urban interface and intermix (WUI) areas against building exposure data to determine the types, numbers and estimated values of buildings at risk to wildfire. This GIS-based analysis utilized data from several sources: the Missouri Spatial Data Inventory Service (MSDIS), HAZUS building exposure value data and wildland urban interface and intermix area data from the University of Wisconsin-Madison SILVIS Lab.

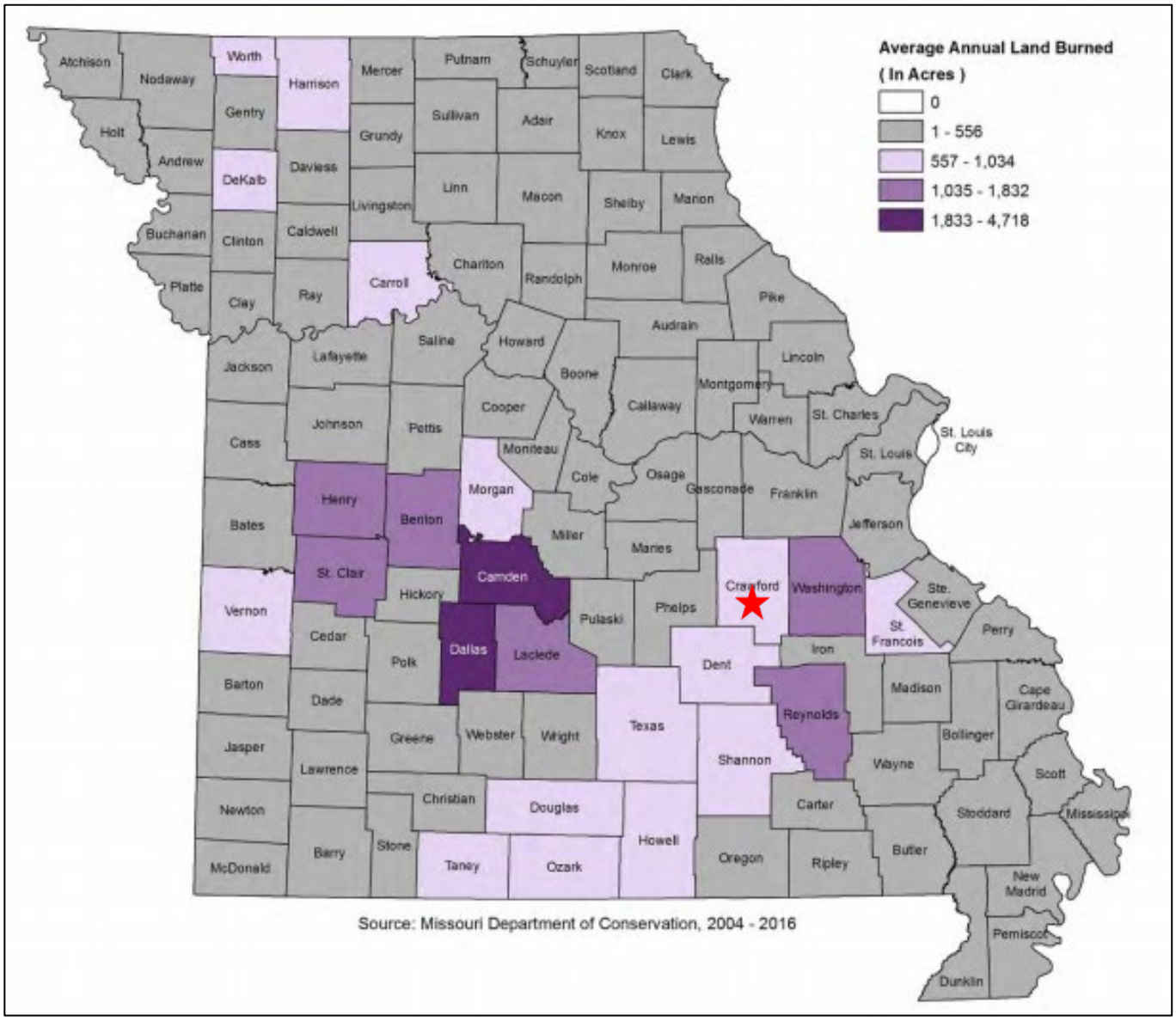
The results of that analysis, including estimated number of structures, value of structures and population are illustrated in **Table 3.89.** The total estimated number of structures vulnerable to wildfires is 8,833. The overall value of structures vulnerable to wildfire in Crawford County is estimated at $1,844,404,260. To further illustrate vulnerability in Crawford County, maps from the 2018 Missouri Hazard Mitigation plan illustrating these numbers and comparing them statewide are included. The number of structures in the WUI interface and intermix areas statewide are shown in **Figure 3.79**. **Figure 3.80** shows the estimated value of structures in the WUI interface and intermix areas. **Figure 3.81** illustrates the number of people at risk to wildfire in the WUI interface and intermix areas.

Figure 3.77. Likelihood of Wildfire Events, 2004-2016



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

Figure 3.78. Average Annual Acreage Burned



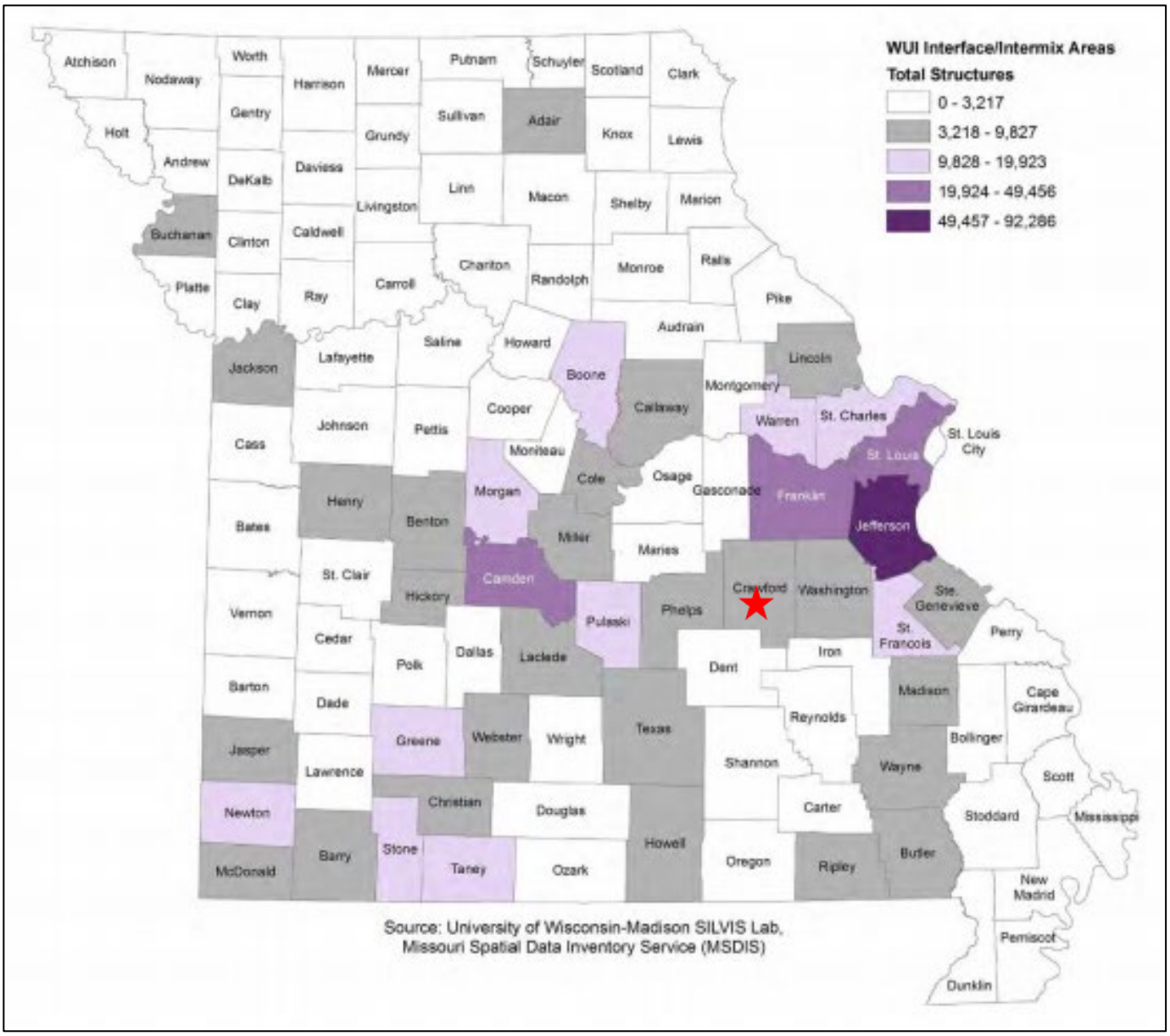
*Source: 2018 Missouri State Hazard Mitigation Plan, *Red star indicates Crawford County,*

Table 3.89. Estimated Numbers and Values of Structures and Population Vulnerable to Wildfire in Crawford County

Crawford County	Number of Structures	Value of Structures	Population
Agriculture	1,264	$261,268,800	
Commercial	589	$326,835,322	
Education	11	$20,667,900	
Government	26	$15,964,000	
Industrial	92	$69,476,063	
Residential	6,851	$1,150,192,175	
Totals	**8,833**	**$1,844,404,260**	**17,607**

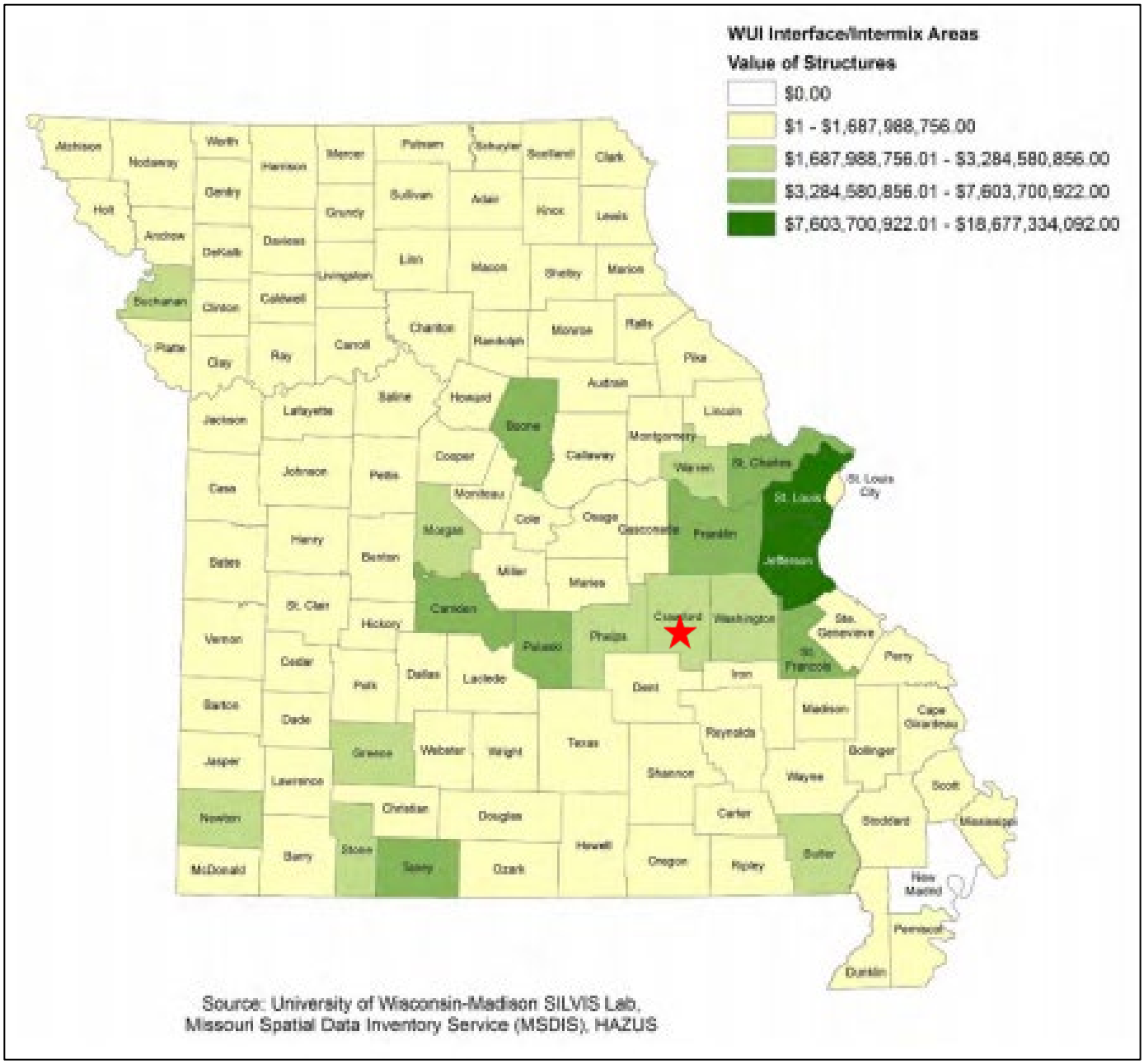
Source: 2018 Missouri State Hazard Mitigation Plan

Figure 3.79. Number of Structures in WUI Interface and Intermix Areas



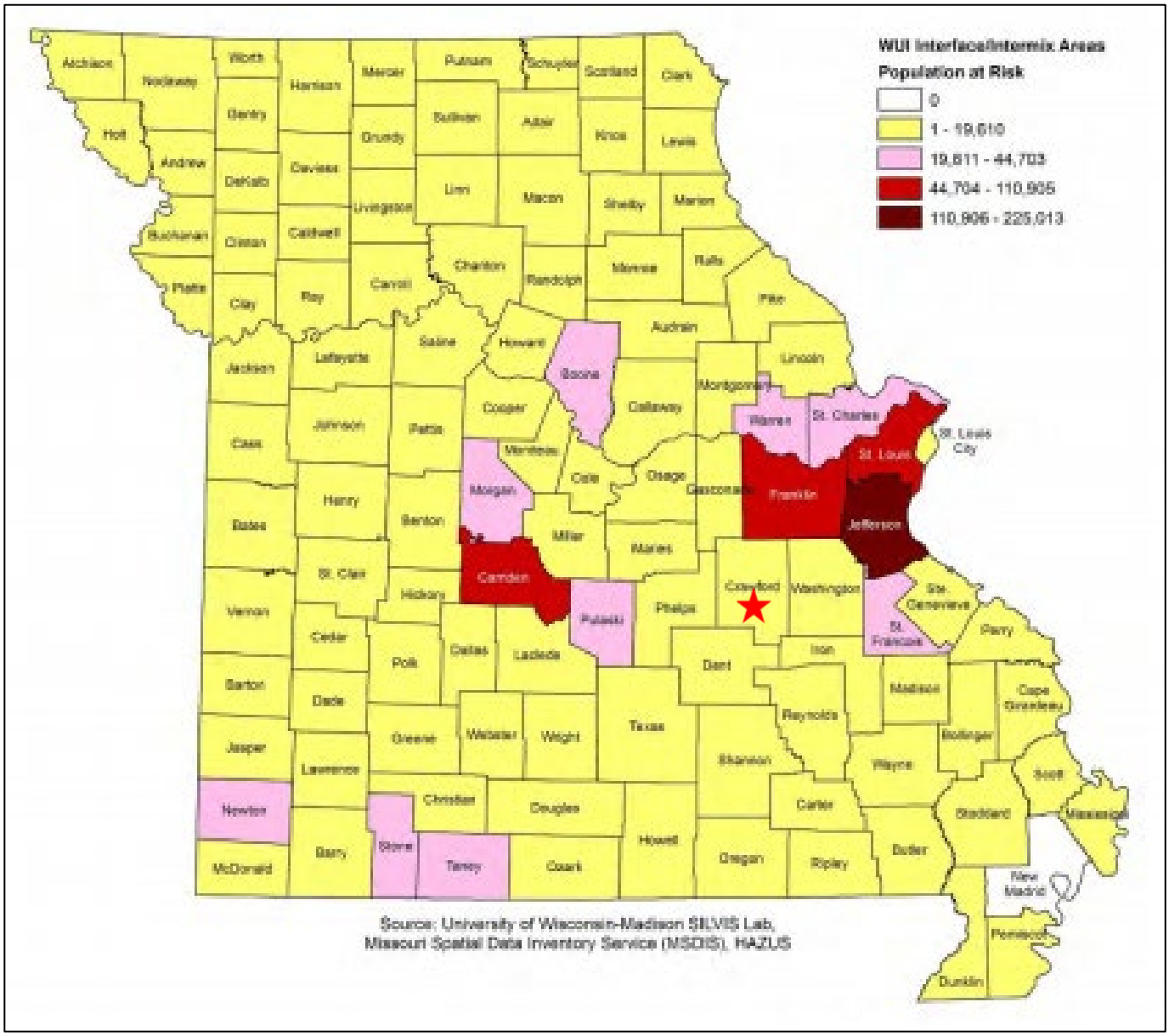
*Source: 2018 Missouri Hazard Mitigation Plan, *Red star indicates Crawford County,*

Figure 3.80. Value of Structures in the WUI Interface and Intermix Areas



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

Figure 3.81. Population at Risk to Wildfire in WUI Interface and Intermix Areas



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

Potential Losses to Existing Development

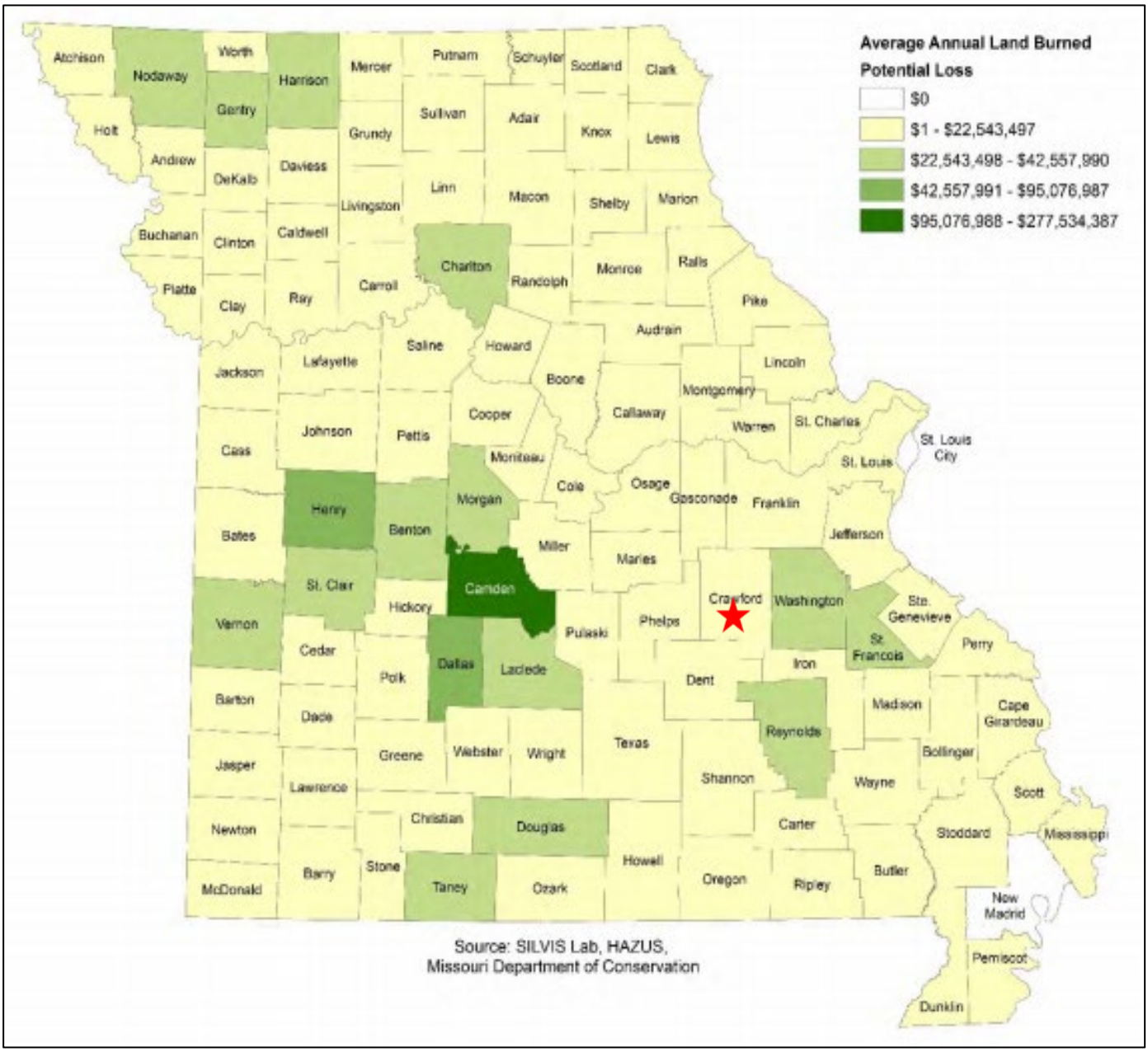
As there was not data available on Crawford County specific losses, data was used from the 2018 Missouri State Hazard Mitigation Plan. The factors considered for estimating potential losses due to wildfires were average acreage burned each year per county and the average value of structures per acre in the WU-Interface/Intermix areas. **Table 3.90** and **Figure 3.82** that follows provide the potential loss figures for Crawford County based on this methodology.

Table 3.90. Wildfire Potential Loss Estimates for Crawford County

Total WUI Acreage	Total Structure Value Within WUI	Average Value/Acre within WUI	Average Annual Acreage Burned	Potential Loss
83,803.60	$1,844,404,260	$22,009	852	$18,751,371

Source: 2018 Missouri Hazard Mitigation Plan

Figure 3.82. Annualized Wildfire Damages



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

Impact of Previous and Future Development

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

Hazard Summary by Jurisdiction

As long as drought conditions are not severe, future wildfires in Crawford County should have a low-medium adverse impact on the community, depending on the proximity to population centers. Nonetheless, homes, businesses, and schools located in unincorporated areas are at higher risk from wildfires due to proximity to woodland and more importantly, distance from fire services. All cities and school districts are in WUI areas but are closer to fire services.

Problem Statement

An estimated 8,833 structures and 17,607 people are vulnerable to wildfires in Crawford County. Wildfires are expected to occur on an annual basis. To mitigate adverse impacts a comprehensive community awareness and educational campaign on wildfire danger should be designed and implemented. This campaign should include the development of capabilities, systems, and procedures for pre-deploying fire-fighting resources during times of high wildfire hazards; training of local fire departments for wildfire scenarios; encouraging the development and dissemination of maps relating to the fire hazards (WUI areas) to help educate and assist builders and homeowners in being engaged in wildfire mitigation activities; and guidance of emergency services during response. Residents should be educated on the dangers of wildfires and what steps they can take to mitigate their vulnerability. This could include landscaping and water supply.

44 CFR Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section presents the mitigation strategy developed by the Mitigation Planning Committee (MPC). The mitigation strategy was developed through a collaborative group process. The process included review of general goal statements to guide the jurisdictions in lessening disaster impacts as well as specific mitigation actions to directly reduce vulnerability to hazards and losses. The following definitions are taken from FEMA's *Local Hazard Mitigation Review Guide (October 1, 2012)*.

- **Mitigation Goals** are general guidelines that explain what you want to achieve. Goals are long-term policy statements and global visions that support the mitigation strategy. The goals address the risk of hazards identified in the plan.

- **Mitigation Actions** are specific actions, projects, activities, or processes taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan's mission and goals.

4.1 Goals

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

This planning effort is an update to Crawford County's existing hazard mitigation plan originally approved by FEMA in April, 2005 and updated and approved by FEMA on March 22, 2013 and five years later in June, 2018. Therefore, the goals from the updated 2018 Crawford County Hazard Mitigation Plan were reviewed to see if they were still valid, feasible, practical, and applicable to the defined hazard impacts. The MPC conducted a discussion session during their first meeting to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the 2018 State Hazard Mitigation Plan goals were reviewed. The MPC reviewed the goals and decided to consolidate them from six goals to three. The following goals were established for the 2023 Crawford County plan update:

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

Goal 2: Reduce the potential impact of natural disasters to property, infrastructure and the local economy.

Goal 3: Reduce the potential impact of natural disaster on the continuity of government and essential services.

4.2 Identification and Analysis of Mitigation Actions

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

During the first MPC meeting, the committee discussed what needed to be updated in the risk assessment. Changes in risk since adoption of the previously approved plan were discussed. Since the last update, there have been no deaths due to natural hazard events. Action items were reviewed and suggestions made for changes to address the changes in risk. Discussions from the actions from the previous plan included completed actions, on-going actions, and actions upon which progress had not been made. The MPC discussed SEMA's identified funding priorities and the types of mitigation actions generally recognized by FEMA.

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

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

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

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

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

Additionally, the future inclusion of each mitigation action in the plan update was identified as either keep, delete, or modify Based on the status updates, there were six completed actions, two deleted actions, eight actions that were combined with other, similar actions, and 13 continuing actions.

Table 4.1 provides a summary of the action statuses for each jurisdiction.

Table 4.1. Action Status Summary

Jurisdiction	Completed Actions	Continuing Actions (ongoing or modify)	Deleted Actions
Crawford County	6	13	10
City of Bourbon	6	13	10
City of Cuba	6	13	10
Village of Leasburg	6	13	10
City of Steelville	6	13	10
City of Sullivan	6	13	10
Crawford Co. R-I School District	3	3	1
Crawford Co. R-II School District	3	3	1
Steelville R-III School District	3	3	1
Sullivan School District	3	3	1

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)
1.2 Promote development of emergency plans by businesses and public entities by providing information on business continuity and emergency planning through local chambers of commerce and emergency management offices.	Complete. Public entities in the county have emergency plans in place and the county EMD had done work with local businesses on continuity planning. The MPC stated that this was set in policy. In addition, the MPC did not feel that promoting the development of emergency plans to business entities met the SMART criteria and chose to remove that part of the action item from the plan.
1.6 Provide information on tree trimming and dead tree removal programs to utility companies and local governments.	Complete. Tree trimming protocols are set in policy. For the most part tree trimming is done by utility companies.

Completed Actions	Completion Details (date, amount, funding source)
1.9 Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence and wildfire upon Crawford County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	Complete. This action item is completed through the plan update process.
2.3 Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.	Completed. All cities in the planning area indicated they have established minimum building codes.
5.3 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operation plans and procedures.	Completed. This action item is set in policy.
6.7 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.	Completed through planning process.
Deleted Actions	**Reason for Deletion**
1.4 Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.	Combined with 1.1
2.1 Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.	Deleted. Facility inspection requires expertise that most jurisdictions did not believe they possessed. Did not believe this action item was achievable.
3.1 Distribute SEMA brochures at public facilities and events and distribute regular press releases concerning hazards, where they strike, frequency and preparedness.	Combined with 1.1
3.5 Re-evaluate the hazard mitigation plan and merge with other community planning.	Deleted. Not a high priority.
3.7 Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.	Combined with 1.1
5.2 Provide information to all communities on the benefits and costs of developing storm water management plans.	Combined with 5.4
6.2 Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	Combined with 1.7.

Deleted Actions	Reason for Deletion
6.3 Work with state/local/federal agencies to include mitigation in all economic and community development projects	Combined with 3.4
6.4 Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.	Combined with 3.4
6.5 Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole	Combine with 3.4.

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

4.3 Implementation of Mitigation Actions

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

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

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

Definitely yes = 3 points
Maybe yes = 2 points
Probably no = 1
Definitely no = 0

The following questions were asked for each proposed action.

S: Is the action socially acceptable?
T: Is the action technically feasible and potentially successful?
A: Does the jurisdiction have the administrative capability to successfully implement this action?

P: Is the action politically acceptable?
L: Does the jurisdiction have the legal authority to implement the action?
E: Is the action economically beneficial?
E: Will the project have an environmental impact that is either beneficial or neutral? (score "3" if positive and "2" if neutral)

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

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

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

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

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

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

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

In addition, the group considered the cost of mitigation versus the long-term savings in relation to potential lives saved and property damage avoided.

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

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

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

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

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

In addition to the STAPLEE and Benefit/Cost analysis, the committee was also asked to consider **SMART** – **S**pecific, **M**easurable, **A**chievable, **R**elevant, **T**ime-bound, per FEMA. All action items were reviewed with this criteria in mind. The results of the STAPLEE process and Benefit/Cost analysis were then mailed out to all MPC members for feedback and consensus.

The final scores are listed below in the analysis of each action. Correspondence regarding the STAPLEE process is included in Appendix B. A spreadsheet with the action items and final scores is illustrated in **Figure 4.4**.

Jurisdictional Floodplain Management Programs

Crawford County and the communities of Bourbon, Cuba, Leasburg, Steelville, and Sullivan are members of the NFIP and regulate development in the floodplain by reviewing permit applications for all development including new and existing structures. Elevation certificates are required for all new construction, and existing structures with 50% or more damage following a flood are required to elevate. Floodplain maps are available in hard copy at the city halls of each community and the county's flood maps can be obtained from the floodplain coordinator - MRPC. Furthermore, floodplain maps can be found online through FEMA's website https://msc.fema.gov/portal.

Table 4.1. Jurisdictional Floodplain Ordinance Adoption Date

Community Name	Ordinance Adoption Date
Crawford County	04/26/10
Bourbon	No flood hazard areas – not required to have ordinance
Cuba	09/01/2021
Leasburg	01/30/75
Steelville	2010
Sullivan	04/2004

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

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

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES 2 = Maybe YES			1 = Prob NO 0 = Def NO										
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
1.1	Local emergency management directors will coordinate education programs in schools and distribute brochures on natural disasters and emergency preparedness at all public offices.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.3	Obtain and upgrade early warning systems and improved communication systems as funding allows.	3	2	2	3	3	2	2	17	IC, PD, LF, EMCC	8	-3	5	22	H
1.7	Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.8	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows.	3	2	2	3	3	3	3	19	IC, LF, EMCC	6	-1	5	24	H
1.10	Continued compliance with NFIP requirements.	2	3	2	2	3	2	3	17	IC, PD, LF, EMCC	8	-1	7	24	H
2.2	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.	3	2	2	3	3	3	2	18	IC, PD, LF, EMCC	8	-2	6	24	H
2.4	Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.	2	3	2	2	3	3	3	18	IC, PD, LF, EMCC	8	-2	6	24	H
3.4	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-2	6	24	H
3.6	Distribute information about hazard mitigation projects to the public through press releases and social media.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
4.3	Adopt formal Memorandum of Understand between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
5.4	Require contractor stormwater management plans in all new development.	3	2	3	2	3	3	3	19	PD, EMCC	4	-1	3	22	H
5.5	Purchase properties in the floodplain to convert land into public space/recreation areas as funds allow.	2	2	2	2	3	2	3	16	IC, PD, LF, EMCC	8	-3	5	21	H
6.8	Purchase generators for all critical infrastructure facilities as funding allows.	3	2	2	2	3	3	3	18	IC, LF, EMCC	8	-2	6	24	H

Crawford County

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

Action 1.1: Local emergency management directors will coordinate education programs in schools and distribute brochures on natural disasters and emergency preparedness at all public offices.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks and hazards associated with residents unprepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Education/Awareness Program on Natural Hazards and Personal Preparedness
Action or Project Description:	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and schools and through the county health department and local government offices.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$500 -$3,500 estimated cost
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD and county health department
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods or services
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Activity has occurred in this area as most emergency response agencies, the health department and EMDs promote individual preparedness and provide *Ready in 3* brochures. SEMA distributes press releases periodically on personal preparedness. The county health department and EMD post information on their websites, and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for all the jurisdictions.

Action 1.3: Obtain and upgrade early warning systems and improved communication systems as funding allows.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Need to improve warning and communications systems throughout the county.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.3
Name of Action or Project:	Obtain and upgrade early warning systems and improved communication systems.
Action or Project Description:	Obtain and upgrade early warning systems and improved communication systems as funding allows, including tornado sirens and text and phone systems.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, County Commission
Action/Project Priority:	22 – High Priority
Timeline for Completion:	On-going – five years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Currently there are storm sirens in Indian Hills – a rural subdivision north of Cuba, as well as in Cuba, Steelville, Bourbon and Sullivan. The county has Smart 911 system and app that is free and available to anyone in the county. Residents also have access to the Rave system which provides alerts via phone, text and email. In addition, Crawford Electric Cooperative has a messaging system for customers. The Sullivan School District and Cuba School District have messaging systems used for students and their families. The county would benefit from a program to raise awareness of the Smart 911 and Rave systems and increase participation

Action 1.7: Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquakes events.
Hazard(s) Addressed:	Floods and Earthquake
Action or Project	
Action/Project Number:	1.7
Name of Action or Project:	Upgrade road and bridge upgrades for potential mitigation actions
Action or Project Description:	Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Crawford County Commission, road and bridge department
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The county works to upgrade road and bridge projects by increasing the size of culverts and using square rather than round culverts when doing replacements. The county is currently seeking funds to replace the bridge on Bass Road. In the past five years there have been four bridge replacements of slab low water crossings: Thurman Lake Rd., Brickie Bridge on Eaglehurst Rd., Blunt Rd. bridge, New Bridge on Four-Mile Rd. The County's goal is for bridges to be able to handle 85% of flood waters. Currently they are at 20%. Other bridge improvements that were funded through the Transportation Advisory Committee/MoDOT on state highways in Crawford County include two over Crooked Creek – one on M Highway and one on Highway 19; one on Highway 49 over Dry Creek; Highway C Bridge over the Little Bourbeouse and Highway CC bridge over Brush Creek. Have three additional slab crossings that they would like to either replace with bridges or increase culvert size. Highway HH bridge over Dry Creek will be improved in 2023.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, County Commission
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, capital improvement plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

Action 1.10: Continued compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of compliance with NFIP requirements.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.10
Name of Action or Project:	NFIP compliance
Action or Project Description:	Continued compliance with NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$4,000 - $8,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission, Floodplain Manager
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance
Progress Report	
Action Status	New - Continuing
Report of Progress	Crawford County continues to comply with NFIP requirements in order to remain a member in good standing.

Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.

Action 2.2: Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
Hazard(s) Addressed:	Floods
Action or Project	
Action/Project Number:	2.2
Name of Action or Project:	Floodplain education/awareness program.
Action or Project Description:	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$500 - $1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD and Floodplain Manager
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain management ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The county floodplain manager distributes brochures to the county courthouse and area banks and realtors on an annual basis. They also distribute press releases and information on floodplain management and development requirements.

Action 2.4: Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
Hazard(s) Addressed:	Floods, Severe Storms, and Tornados
Action or Project	
Action/Project Number:	2.4
Name of Action or Project:	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
Action or Project Description:	Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Crawford County Commission, Floodplain Manager
Action/Project Priority:	24 –High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Complete
Report of Progress	The county floodplain ordinance requires that hazardous materials tanks and manufactured homes in floodplains be secured.

Action 5.5 [2.6]: Purchase properties in the floodplain to convert land into public space/recreation areas as funds allow.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with properties located in the floodplain.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.5 [2.6]
Name of Action or Project:	Floodplain buyout
Action or Project Description:	Purchase properties in the floodplain and convert land into public space/recreation area as funds allow.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission, EMD, floodplain manager
Action/Project Priority:	22 –High Priority
Timeline for Completion:	On-going - Unknown
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Not started.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County Commission, EMD
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on hazard mitigation at its meetings that included representatives from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 3.6: Distribute information about hazard mitigation projects to the public through press releases and social media.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the public's lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.6
Name of Action or Project:	Awareness program on local mitigation activities.
Action or Project Description:	Distribute information about hazard mitigation projects to the public through press releases and social media.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$200-$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going – 1 – 5 years
Potential Fund Sources:	Local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The county regularly does press releases on road and bridge activities that mitigate problems with drainage and flooding.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, Crawford County Commission
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Some MOUs are in place for local volunteer fire departments.

Action 3.8: Purchase generators for all critical infrastructure facilities as funding allows.

Action Worksheet	
Name of Jurisdiction:	Crawford County
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with loss of power to critical infrastructure and facilities.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.8
Name of Action or Project:	Purchase generators for all critical infrastructure and facilities.
Action or Project Description:	Purchase generators for all critical infrastructure facilities as funding allows.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$8,000 - $75,000 per unit
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission, Local Planners,
Action/Project Priority:	24 – High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	New
Report of Progress	The county does not currently own any generators. Generators were purchased for the Steelville Ambulance District and Recklein Auditorium building through the Region I HSOC, with the equipment being maintained by local agencies

Bourbon

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Action 1.1: Local emergency management directors will coordinate education programs in schools and distribute brochures on natural disasters and emergency preparedness at all public offices.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks and hazards associated with residents unprepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Education/Awareness Program on Natural Hazards and Personal Preparedness
Action or Project Description:	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and schools and through the county health department and local government offices.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$500 -$3,500 estimated cost
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD and county health department
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods or services
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Activity has occurred in this area as most emergency response agencies, the health department and EMDs promote individual preparedness and provide *Ready in 3* brochures. SEMA distributes press releases periodically on personal preparedness. The county health department posts information on their website, and FaceBook pages. A more focused and coordinated effort

	would help to achieve comprehensive coverage for all the jurisdictions.

Action 1.3: Obtain and upgrade early warning systems and improved communication systems as funding allows.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Need to improve warning and communications systems throughout the county.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.3
Name of Action or Project:	Obtain and upgrade early warning systems and improved communication systems.
Action or Project Description:	Obtain and upgrade early warning systems and improved communication systems as funding allows, including tornado sirens and text and phone systems.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen
Action/Project Priority:	22 – High Priority
Timeline for Completion:	On-going – five years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Currently there are two storm sirens in Bourbon. The city does not have a phone/text-based warning system. The city needs to continue to work to improve communications systems within the city to improve city-wide as well as state-wide communications during disasters and joint response efforts.

Action 1.7: Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquakes events.
Hazard(s) Addressed:	Floods and Earthquake
Action or Project	
Action/Project Number:	1.7
Name of Action or Project:	Upgrade road and bridge upgrades for potential mitigation actions
Action or Project Description:	Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Public Works Department
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city works to upgrade road and bridge projects as funding allows.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, capital improvement plan
Progress Report	
Action Status	Revised – No progress
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress. There are no FEMA certified tornado shelters in Bourbon.

Action 1.10: Continued compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of compliance with NFIP requirements.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.10
Name of Action or Project:	NFIP compliance
Action or Project Description:	Continued compliance with NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$4,000 - $8,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance
Progress Report	
Action Status	New - Continuing
Report of Progress	Bourbon continues to comply with NFIP requirements in order to remain a member in good standing.

Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.

Action 2.2: Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.2
Name of Action or Project:	Floodplain education/awareness program.
Action or Project Description:	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$500 - $1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain management ordinance
Progress Report	
Action Status	Revised – Continuing
Report of Progress	No progress.

Action 2.4: Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
Hazard(s) Addressed:	Floods, Severe Storms, Tornados
Action or Project	
Action/Project Number:	2.4
Name of Action or Project:	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
Action or Project Description:	Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	24 –High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	No progress

Action 2.5: Require contractor stormwater management plans in all new development.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of stormwater management and infrastructure.
Hazard(s) Addressed:	Floods, Severe Storms
Action or Project	
Action/Project Number:	2.5
Name of Action or Project:	Contractor stormwater management plan requirements.
Action or Project Description:	Require contractor stormwater management plans in all new development.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $10,000
Benefits:	Losses avoided by implementing this action include property damages, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Local Planners, Public Works
Action/Project Priority:	22 –High Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Bourbon has a stormwater ordinance but does not specifically require stormwater management plans for new development.

Action 5.5 [2.6]: Purchase properties in the floodplain to convert land into public space/recreation areas as funds allow.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with properties located in the floodplain.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.5 [2.6]
Name of Action or Project:	Floodplain buyout
Action or Project Description:	Purchase properties in the floodplain and convert land into public space/recreation area as funds allow.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Floodplain Manager
Action/Project Priority:	22 –High Priority
Timeline for Completion:	On-going - Unknown
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Not started.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, EMD
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on hazard mitigation at its meetings that included representatives

	from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 3.6: Distribute information about hazard mitigation projects to the public through press releases and social media.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the public's lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.6
Name of Action or Project:	Awareness program on local mitigation activities.
Action or Project Description:	Distribute information about hazard mitigation projects to the public through press releases and social media.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$200-$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Public Works
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going – 1 – 5 years
Potential Fund Sources:	Local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city regularly does press releases on road and bridge improvements that mitigate problems with drainage and flooding.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Some MOUs are in place for local volunteer fire departments. This program would benefit from MOUs for: public works assistance, transportation for evacuations; emergency supplies such as water and food; and formal agreements with local churches, schools or other facilities that could serve as emergency shelters. Bourbon does have two designated tornado shelters for the public but they are not FEMA certified.

Action 3.8: Purchase generators for all critical infrastructure facilities as funding allows.

Action Worksheet	
Name of Jurisdiction:	Bourbon
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with loss of power to critical infrastructure and facilities.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.8
Name of Action or Project:	Purchase generators for all critical infrastructure and facilities.
Action or Project Description:	Purchase generators for all critical infrastructure facilities as funding allows.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$8,000 - $75,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen, Public Works
Action/Project Priority:	24 – High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	New
Report of Progress	The city does not currently own any generators.

Cuba

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Action 1.1: Local emergency management directors will coordinate education programs in schools and distribute brochures on natural disasters and emergency preparedness at all public offices.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks and hazards associated with residents unprepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Education/Awareness Program on Natural Hazards and Personal Preparedness
Action or Project Description:	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and schools and through the county health department and local government offices.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$500 -$3,500 estimated cost
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD and county health department
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods or services
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Activity has occurred in this area as most emergency response agencies, the health department and EMDs promote individual preparedness and provide *Ready in 3* brochures. SEMA distributes press releases periodically on personal preparedness. The county health department posts information on their website, and FaceBook pages. A more focused and coordinated effort

	would help to achieve comprehensive coverage for all the jurisdictions.

Action 1.3: Obtain and upgrade early warning systems and improved communication systems as funding allows.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Need to improve warning and communications systems throughout the county.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.3
Name of Action or Project:	Obtain and upgrade early warning systems and improved communication systems.
Action or Project Description:	Obtain and upgrade early warning systems and improved communication systems as funding allows, including tornado sirens and text and phone systems.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen
Action/Project Priority:	22 – High Priority
Timeline for Completion:	On-going – five years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Currently there are five storm sirens in Cuba. The city also has Rave and Smart 911. The city needs to continue to work to improve communications systems within the city to improve city-wide as well as state-wide communications during disasters and joint response efforts.

Action 1.7: Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquakes events.
Hazard(s) Addressed:	Floods and Earthquake
Action or Project	
Action/Project Number:	1.7
Name of Action or Project:	Upgrade road and bridge upgrades for potential mitigation actions
Action or Project Description:	Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Public Works Department
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city works to upgrade road and bridge projects as funding allows.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, capital improvement plan
Progress Report	
Action Status	Revised – No progress
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress. There are no FEMA certified tornado shelters in Bourbon.

Action 1.10: Continued compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of compliance with NFIP requirements.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.10
Name of Action or Project:	NFIP compliance
Action or Project Description:	Continued compliance with NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$4,000 - $8,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance
Progress Report	
Action Status	New - Continuing
Report of Progress	Cuba continues to comply with NFIP requirements in order to remain a member in good standing.

Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.

Action 2.2: Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.2
Name of Action or Project:	Floodplain education/awareness program.
Action or Project Description:	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$500 - $1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain management ordinance
Progress Report	
Action Status	Revised – Continuing
Report of Progress	No progress.

Action 2.4: Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
Hazard(s) Addressed:	Floods, Severe Storms, Tornados
Action or Project	
Action/Project Number:	2.4
Name of Action or Project:	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
Action or Project Description:	Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	24 –High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	No progress

Action 2.5: Require contractor stormwater management plans in all new development.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of stormwater management and infrastructure.
Hazard(s) Addressed:	Floods, Severe Storms
Action or Project	
Action/Project Number:	2.5
Name of Action or Project:	Contractor stormwater management plan requirements.
Action or Project Description:	Require contractor stormwater management plans in all new development.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $10,000
Benefits:	Losses avoided by implementing this action include property damages, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Local Planners, Public Works
Action/Project Priority:	22 –High Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Cuba does not have a stormwater ordinance and does not specifically require stormwater management plans for new development.

Action 5.5 [2.6]: Purchase properties in the floodplain to convert land into public space/recreation areas as funds allow.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with properties located in the floodplain.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.5 [2.6]
Name of Action or Project:	Floodplain buyout
Action or Project Description:	Purchase properties in the floodplain and convert land into public space/recreation area as funds allow.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Floodplain Manager
Action/Project Priority:	22 –High Priority
Timeline for Completion:	On-going - Unknown
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Not started.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, EMD
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on hazard mitigation at its meetings that included representatives

	from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 3.6: Distribute information about hazard mitigation projects to the public through press releases and social media.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the public's lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.6
Name of Action or Project:	Awareness program on local mitigation activities.
Action or Project Description:	Distribute information about hazard mitigation projects to the public through press releases and social media.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$200-$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Public Works
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going – 1 – 5 years
Potential Fund Sources:	Local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city regularly does press releases on road and bridge improvements that mitigate problems with drainage and flooding.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Some MOUs are in place for local volunteer fire departments. This program would benefit from MOUs for: public works assistance, transportation for evacuations; emergency supplies such as water and food; and formal agreements with local churches, schools or other facilities that could serve as emergency shelters.

Action 3.8: Purchase generators for all critical infrastructure facilities as funding allows.

Action Worksheet	
Name of Jurisdiction:	Cuba
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with loss of power to critical infrastructure and facilities.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.8
Name of Action or Project:	Purchase generators for all critical infrastructure and facilities.
Action or Project Description:	Purchase generators for all critical infrastructure facilities as funding allows.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$8,000 - $75,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen, Public Works
Action/Project Priority:	24 – High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	New
Report of Progress	The city has three fixed generators.

Leasburg

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Action 1.1: Local emergency management directors will coordinate education programs in schools and distribute brochures on natural disasters and emergency preparedness at all public offices.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks and hazards associated with residents unprepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Education/Awareness Program on Natural Hazards and Personal Preparedness
Action or Project Description:	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and schools and through the county health department and local government offices.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$500 -$3,500 estimated cost
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD and county health department
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods or services
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Activity has occurred in this area as most emergency response agencies, the health department and EMDs promote individual preparedness and provide *Ready in 3* brochures. SEMA distributes press releases periodically on personal preparedness. The county health department posts information on their website,

	and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for all the jurisdictions.

Action 1.3: Obtain and upgrade early warning systems and improved communication systems as funding allows.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Need to improve warning and communications systems throughout the county.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.3
Name of Action or Project:	Obtain and upgrade early warning systems and improved communication systems.
Action or Project Description:	Obtain and upgrade early warning systems and improved communication systems as funding allows, including tornado sirens and text and phone systems.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Chairman, Board of Trustees
Action/Project Priority:	22 – High Priority
Timeline for Completion:	On-going – five years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Currently there is one storm siren in Leasburg. The city does not have a phone/text-based warning system. The city needs to continue to work to improve communications systems within the city to improve city-wide as well as state-wide communications during disasters and joint response efforts.

Action 1.7: Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquakes events.
Hazard(s) Addressed:	Floods and Earthquake
Action or Project	
Action/Project Number:	1.7
Name of Action or Project:	Upgrade road and bridge upgrades for potential mitigation actions
Action or Project Description:	Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Chair, Board of Trustees, Public Works Department
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city works to upgrade road and bridge projects as funding allows.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Chair, Board of Trustees
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, capital improvement plan
Progress Report	
Action Status	Revised – No progress
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress. There are no FEMA certified tornado shelters in Leasburg.

Action 1.10: Continued compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of compliance with NFIP requirements.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.10
Name of Action or Project:	NFIP compliance
Action or Project Description:	Continued compliance with NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$4,000 - $8,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Chair, Board of Trustees
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance
Progress Report	
Action Status	New - Continuing
Report of Progress	Leasburg continues to comply with NFIP requirements in order to remain a member in good standing.

Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.

Action 2.2: Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.2
Name of Action or Project:	Floodplain education/awareness program.
Action or Project Description:	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$500 - $1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain management ordinance
Progress Report	
Action Status	Revised – Continuing
Report of Progress	No progress.

Action 2.4: Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
Hazard(s) Addressed:	Floods, Severe Storms, Tornados
Action or Project	
Action/Project Number:	2.4
Name of Action or Project:	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
Action or Project Description:	Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Chair, Board of Trustees
Action/Project Priority:	24 –High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	No progress

Action 2.5: Require contractor stormwater management plans in all new development.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of stormwater management and infrastructure.
Hazard(s) Addressed:	Floods, Severe Storms
Action or Project	
Action/Project Number:	2.5
Name of Action or Project:	Contractor stormwater management plan requirements.
Action or Project Description:	Require contractor stormwater management plans in all new development.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $10,000
Benefits:	Losses avoided by implementing this action include property damages, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Chair, Board of Aldermen, Local Planners, Public Works
Action/Project Priority:	22 –High Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised – Continuing
Report of Progress	Leasburg does not have a stormwater ordinance and does not require stormwater management plans for new development.

Action 5.5 [2.6]: Purchase properties in the floodplain to convert land into public space/recreation areas as funds allow.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with properties located in the floodplain.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.5 [2.6]
Name of Action or Project:	Floodplain buyout
Action or Project Description:	Purchase properties in the floodplain and convert land into public space/recreation area as funds allow.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Chair, Board of Trustees, Floodplain Manager
Action/Project Priority:	22 –High Priority
Timeline for Completion:	On-going - Unknown
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Not started.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Chair, EMD
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on hazard mitigation at its meetings that included representatives

	from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 3.6: Distribute information about hazard mitigation projects to the public through press releases and social media.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the public's lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.6
Name of Action or Project:	Awareness program on local mitigation activities.
Action or Project Description:	Distribute information about hazard mitigation projects to the public through press releases and social media.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$200-$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Chair
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going – 1 – 5 years
Potential Fund Sources:	Local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city could make a greater effort to inform the public of any projects that mitigate problems with drainage and flooding.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Chair, Board of Trustees
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Some MOUs are in place for local volunteer fire departments. This program would benefit from MOUs for: public works assistance, transportation for evacuations; emergency supplies such as water and food; and formal agreements with local churches, schools or other facilities that could serve as emergency shelters.

Action 3.8: Purchase generators for all critical infrastructure facilities as funding allows.

Action Worksheet	
Name of Jurisdiction:	Leasburg
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with loss of power to critical infrastructure and facilities.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.8
Name of Action or Project:	Purchase generators for all critical infrastructure and facilities.
Action or Project Description:	Purchase generators for all critical infrastructure facilities as funding allows.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$8,000 - $75,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Chair, Board of Trustees, Public Works
Action/Project Priority:	24 – High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	New
Report of Progress	The city does not currently own any generators.

Steelville

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Action 1.1: Local emergency management directors will coordinate education programs in schools and distribute brochures on natural disasters and emergency preparedness at all public offices.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks and hazards associated with residents unprepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Education/Awareness Program on Natural Hazards and Personal Preparedness
Action or Project Description:	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and schools and through the county health department and local government offices.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$500 -$3,500 estimated cost
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD and health department
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods or services
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Activity has occurred in this area as most emergency response agencies, the health department and EMDs promote individual preparedness and provide *Ready in 3* brochures. SEMA distributes press releases periodically on personal preparedness. The county health department posta information on their website,

	and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for all the jurisdictions.

Action 1.3: Obtain and upgrade early warning systems and improved communication systems as funding allows.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Need to improve warning and communications systems throughout the county.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.3
Name of Action or Project:	Obtain and upgrade early warning systems and improved communication systems.
Action or Project Description:	Obtain and upgrade early warning systems and improved communication systems as funding allows, including tornado sirens and text and phone systems.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen
Action/Project Priority:	22 – High Priority
Timeline for Completion:	On-going – five years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Currently there are six storm sirens in Steelville. The city does not have a phone/text-based warning system. The city needs to continue to work to improve communications systems within the city to improve city-wide as well as state-wide communications during disasters and joint response efforts.

Action 1.7: Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquakes events.
Hazard(s) Addressed:	Floods and Earthquake
Action or Project	
Action/Project Number:	1.7
Name of Action or Project:	Upgrade road and bridge upgrades for potential mitigation actions
Action or Project Description:	Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Public Works Department
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city works to upgrade road and bridge projects as funding allows. The city has done streambank stabilization projects and streambank reinforcement projects around bridges in the past five years.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, capital improvement plan
Progress Report	
Action Status	Revised – No progress
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress. There are no FEMA certified tornado shelters in Steelville.

Action 1.10: Continued compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of compliance with NFIP requirements.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.10
Name of Action or Project:	NFIP compliance
Action or Project Description:	Continued compliance with NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$4,000 - $8,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance
Progress Report	
Action Status	New - Continuing
Report of Progress	Steelville continues to comply with NFIP requirements in order to remain a member in good standing.

Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.

Action 2.2: Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.2
Name of Action or Project:	Floodplain education/awareness program.
Action or Project Description:	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$500 - $1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain management ordinance
Progress Report	
Action Status	Revised – Continuing
Report of Progress	No progress.

Action 2.4: Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
Hazard(s) Addressed:	Floods, Severe Storms, Tornados
Action or Project	
Action/Project Number:	2.4
Name of Action or Project:	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
Action or Project Description:	Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Mayor, Board of Aldermen
Action/Project Priority:	24 –High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	No progress

Action 2.5: Require contractor stormwater management plans in all new development.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of stormwater management and infrastructure.
Hazard(s) Addressed:	Floods, Severe Storms
Action or Project	
Action/Project Number:	2.5
Name of Action or Project:	Contractor stormwater management plan requirements.
Action or Project Description:	Require contractor stormwater management plans in all new development.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $10,000
Benefits:	Losses avoided by implementing this action include property damages, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Local Planners, Public Works
Action/Project Priority:	22 –High Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Steelville has a stormwater ordinance but does not specifically require stormwater management plans for new development.

Action 5.5 [2.6]: Purchase properties in the floodplain to convert land into public space/recreation areas as funds allow.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with properties located in the floodplain.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.5 [2.6]
Name of Action or Project:	Floodplain buyout
Action or Project Description:	Purchase properties in the floodplain and convert land into public space/recreation area as funds allow.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, Board of Aldermen, Floodplain Manager
Action/Project Priority:	22 –High Priority
Timeline for Completion:	On-going - Unknown
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Not started.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, EMD
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on

	hazard mitigation at its meetings that included representatives from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 3.6: Distribute information about hazard mitigation projects to the public through press releases and social media.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the public's lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.6
Name of Action or Project:	Awareness program on local mitigation activities.
Action or Project Description:	Distribute information about hazard mitigation projects to the public through press releases and social media.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$200-$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	County EMD, County Commission
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going – 1 – 5 years
Potential Fund Sources:	Local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city regularly does press releases on road and bridge and public works improvements that mitigate problems with drainage and flooding.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Some MOUs are in place for local volunteer fire departments. This program would benefit from MOUs for: public works assistance, transportation for evacuations; emergency supplies such as water and food; and formal agreements with local churches, schools or other facilities that could serve as emergency shelters.

Action 3.8: Purchase generators for all critical infrastructure facilities as funding allows.

Action Worksheet	
Name of Jurisdiction:	Steelville
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with loss of power to critical infrastructure and facilities.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.8
Name of Action or Project:	Purchase generators for all critical infrastructure and facilities.
Action or Project Description:	Purchase generators for all critical infrastructure facilities as funding allows.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$8,000 - $75,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, Board of Aldermen, Public Works
Action/Project Priority:	24 – High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	New
Report of Progress	The city does not currently own any generators.

Sullivan

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Action 1.1: Local emergency management directors will coordinate education programs in schools and distribute brochures on natural disasters and emergency preparedness at all public offices.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks and hazards associated with residents unprepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Education/Awareness Program on Natural Hazards and Personal Preparedness
Action or Project Description:	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and schools and through the county health department and local government offices.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$500 -$3,500 estimated cost
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD and health department
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods or services
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Activity has occurred in this area as most emergency response agencies, the health department and EMDs promote individual preparedness and provide *Ready in 3* brochures. SEMA distributes press releases periodically on personal preparedness. The county health department posta information on their website,

	and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for all the jurisdictions.

Action 1.3: Obtain and upgrade early warning systems and improved communication systems as funding allows.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Need to improve warning and communications systems throughout the county.
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	1.3
Name of Action or Project:	Obtain and upgrade early warning systems and improved communication systems.
Action or Project Description:	Obtain and upgrade early warning systems and improved communication systems as funding allows, including tornado sirens and text and phone systems.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, City Council
Action/Project Priority:	22 – High Priority
Timeline for Completion:	On-going – five years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, Hazard Mitigation Plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Currently there are four storm sirens in Sullivan. The city also has a phone/text-based warning system - Nixle. The city needs to continue to work to improve communications systems within the city to improve city-wide as well as state-wide communications during disasters and joint response efforts.

Action 1.7: Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with poor road infrastructure, including bridges and low water crossings, during flood and earthquakes events.
Hazard(s) Addressed:	Floods and Earthquake
Action or Project	
Action/Project Number:	1.7
Name of Action or Project:	Upgrade road and bridge upgrades for potential mitigation actions
Action or Project Description:	Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, City Council, Public Works Department
Action/Project Priority:	28 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, capital improvement plan
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city works to upgrade road and bridge projects as funding allows.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, City Council
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, capital improvement plan
Progress Report	
Action Status	Revised – No progress
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress. There are no FEMA certified tornado shelters in Sullivan.

Action 1.10: Continued compliance with NFIP requirements.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of compliance with NFIP requirements.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.10
Name of Action or Project:	NFIP compliance
Action or Project Description:	Continued compliance with NFIP requirements.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	$4,000 - $8,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Mayor, City Council
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance
Progress Report	
Action Status	New - Continuing
Report of Progress	Sullivan continues to comply with NFIP requirements in order to remain a member in good standing.

Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.

Action 2.2: Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.2
Name of Action or Project:	Floodplain education/awareness program.
Action or Project Description:	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
Estimated Cost:	$500 - $1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain management ordinance
Progress Report	
Action Status	Revised – Continuing
Report of Progress	No progress.

Action 2.4: Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
Hazard(s) Addressed:	Floods, Severe Storms, Tornados
Action or Project	
Action/Project Number:	2.4
Name of Action or Project:	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
Action or Project Description:	Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $5,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Floodplain Manager, Mayor, City Council
Action/Project Priority:	24 –High Priority
Timeline for Completion:	1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	No progress

Action 2.5: Require contractor stormwater management plans in all new development.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of stormwater management and infrastructure.
Hazard(s) Addressed:	Floods, Severe Storms
Action or Project	
Action/Project Number:	2.5
Name of Action or Project:	Contractor stormwater management plan requirements.
Action or Project Description:	Require contractor stormwater management plans in all new development.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	$1,500 - $10,000
Benefits:	Losses avoided by implementing this action include property damages, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, City Council, Local Planners, Public Works
Action/Project Priority:	22 –High Priority
Timeline for Completion:	5 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Sullivan has a stormwater ordinance in place.

Action 5.5 [2.6]: Purchase properties in the floodplain to convert land into public space/recreation areas as funds allow.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with properties located in the floodplain.
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	5.5 [2.6]
Name of Action or Project:	Floodplain buyout
Action or Project Description:	Purchase properties in the floodplain and convert land into public space/recreation area as funds allow.
Applicable Goal Statement:	Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, City Council, Floodplain Manager
Action/Project Priority:	22 –High Priority
Timeline for Completion:	On-going - Unknown
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Not started.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Mayor, EMD
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on hazard mitigation at its meetings that included representatives

	from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 3.6: Distribute information about hazard mitigation projects to the public through press releases and social media.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with the public's lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.6
Name of Action or Project:	Awareness program on local mitigation activities.
Action or Project Description:	Distribute information about hazard mitigation projects to the public through press releases and social media.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$200-$1,500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor
Action/Project Priority:	28 –High Priority
Timeline for Completion:	On-going – 1 – 5 years
Potential Fund Sources:	Local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	LEOP, hazard mitigation plan, floodplain ordinance
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The city regularly does press releases on road and bridge and infrastructure improvements that mitigate problems with drainage and flooding.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, City Council
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Some MOUs are in place for local volunteer fire departments. This program would benefit from MOUs for: public works assistance, transportation for evacuations; emergency supplies such as water and food; and formal agreements with local churches, schools or other facilities that could serve as emergency shelters.

Action 3.8: Purchase generators for all critical infrastructure facilities as funding allows.

Action Worksheet	
Name of Jurisdiction:	Sullivan
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with loss of power to critical infrastructure and facilities.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.8
Name of Action or Project:	Purchase generators for all critical infrastructure and facilities.
Action or Project Description:	Purchase generators for all critical infrastructure facilities as funding allows.
Applicable Goal Statement:	Secure resources for investment in hazard mitigation.
Estimated Cost:	$8,000 - $75,000
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	EMD, Mayor, City Council, Public Works
Action/Project Priority:	24 – High Priority
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard Mitigation Plan, LEOP
Progress Report	
Action Status	New
Report of Progress	The city currently has four fixed generators and one portable generator.

Crawford County R-I School District

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Crawford County R-I School District
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, school budget
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Crawford County R-I School District
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on hazard mitigation at its meetings that included representatives

	from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Crawford County R-I School District
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	No progress.

Crawford County R-II School District

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Crawford County R-II School District
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, school budget
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Crawford County R-II School District
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on hazard mitigation at its meetings that included representatives

	from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Crawford County R-II School District
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	No progress.

Steelville R-III School District

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Steelville R-III School District
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, school budget
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Steelville R-III School District
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on hazard mitigation at its meetings that included representatives

	from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Steelville R-III School District
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	No progress.

Sullivan School District

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

Action 1.8: Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows

Action Worksheet	
Name of Jurisdiction:	Sullivan School District
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with schools and large employer facilities that do not have certified tornado safe rooms and use alternative facilities to shelter students, staff and employees in the event of high winds/tornados.
Hazard(s) Addressed:	Severe Storms and Tornados
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
Action or Project Description:	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.
Estimated Cost:	Unknown
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	1 – 10 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, school budget
Progress Report	
Action Status	Revised - Continuing
Report of Progress	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

Goal 3: Reduce the potential impact of natural disasters on the continuity of government and essential services.

Action 3.4: Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.

Action Worksheet	
Name of Jurisdiction:	Sullivan School District
Risk / Vulnerability	
Problem being Mitigated:	Risks/vulnerabilities associated with lack of synergy for planning, implementing and budgeting for hazard mitigation projects and for including mitigation in all economic and community development projects.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Planning activities for hazard mitigation for local elected officials and planning organizations
Action or Project Description:	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$50 - $250
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	24 – High Priority
Timeline for Completion:	On-going – 1 – 2 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP, floodplain ordinance, CEDS
Progress Report	
Action Status	Revised - Continuing
Report of Progress	The Region I SEMA area coordinator conducts quarterly meetings in the region and has included hazard mitigation in those meetings. In addition, MRPC has had presentations on hazard mitigation at its meetings that included representatives

	from Crawford County. This program would benefit from a more focused effort to hold meetings centered on hazard mitigation.

Action 4.3 [3.7]: Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.

Action Worksheet	
Name of Jurisdiction:	Sullivan School District
Risk / Vulnerability	
Problem being Mitigated:	Risks and vulnerabilities associated with lack of MOUs between jurisdictions and agencies to provide support during disasters.
Hazard(s) Addressed:	All hazards
Action or Project	
Action/Project Number:	4.3 [3.7]
Name of Action or Project:	Adoption of Memorandums of Understanding
Action or Project Description:	Adopt formal Memorandums of Understanding between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
Applicable Goal Statement:	Reduce the potential impact of natural disasters on the continuity of government and essential services.
Estimated Cost:	$250 - $500
Benefits:	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
Plan for Implementation	
Responsible Organization/Department:	Superintendent, School Board
Action/Project Priority:	27 – High Priority
Timeline for Completion:	On-going 1 – 5 years
Potential Fund Sources:	Grants, local general revenue funds, and private donations of cash, goods, or services.
Local Planning Mechanisms to be Used in Implementation, if any:	Hazard mitigation plan, LEOP
Progress Report	
Action Status	Revised - Continuing
Report of Progress	No progress.

5 PLAN MAINTENANCE PROCESS

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

5.1 Monitoring, Evaluating, and Updating the Plan

44 CFR Requirement 201.6(c)(4): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

5.1.1 Responsibility for Plan Maintenance

Periodic revisions and updates of the Plan are required by Missouri SEMA to ensure that the goals and objectives for Crawford County are kept current. More importantly, revisions may be necessary to ensure the plan is in full compliance with Federal regulations and state statutes. This portion of the plan outlines the procedures for completing such revisions and updates.

A key component of the ongoing plan monitoring, evaluating and updating will be the Crawford County Hazard Mitigation Planning Committee (MPC). In order to carry out the activities necessary for maintaining the plan, the MPC will need to remain in place and meet periodically. The coordination of this group, as indicated in the mitigation strategy, should be a responsibility of the county EMD. On-going activities of the MPC are:

- Meet annually, and after a disaster event, to monitor and evaluate the implementation of the plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low or no-cost recommended actions;
- Maintain vigilant monitoring of multi-objective, cost-share, and other funding opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;

- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Report on plan progress and recommended changes to the County Board of Supervisors and governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

The MPC (or other designated responsible entity) is an advisory body and can only make recommendations to county, city, town, or district elected officials. Its primary duty is to see the plan successfully carried out and to report to the community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information in areas accessible to the public.

5.1.2 Plan Maintenance Schedule

The MPC (or other designated responsible entity) agrees to meet annually and after a state or federally declared hazard event, as appropriate, to monitor progress and update the mitigation strategy. The Crawford County Emergency Management Director will be responsible for initiating the plan reviews and will invite members of the MPC (or other designated responsible entity) to the meeting.

In coordination with all participating jurisdictions, a five-year written update of the plan will be submitted to the Missouri State Emergency Management Agency (SEMA) and FEMA Region VII per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule.

5.1.3 Plan Maintenance Process

Progress on the proposed actions can be monitored by evaluating changes in vulnerabilities identified in the plan. The MPC (or other designated responsible entity) during the annual meeting should review changes in vulnerability identified as follows:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions;
- Increased vulnerability due to hazard events; and/or
- Increased vulnerability as a result of new development (and/or annexation).

Future 5-year updates to this plan will include the following activities:

- Consideration of changes in vulnerability due to action implementation;
- Documentation of success stories where mitigation efforts have proven effective;
- Documentation of unsuccessful mitigation actions and why the actions were not effective;
- Documentation of previously overlooked hazard events that may have occurred since the previous plan approval;
- Incorporation of new data or studies with information on hazard risks;
- Incorporation of new capabilities or changes in capabilities;

- Incorporation of growth data and changes to inventories; and
- Incorporation of ideas for new actions and changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the participating jurisdictions will adopt the following process:

- Each proposed action in the plan identified an individual, office, or agency responsible for action implementation. This entity will track and report on an annual basis to the jurisdictional MPC (or designated responsible entity) member on action status. The entity will provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing risk.
- If the action does not meet identified objectives, the jurisdictional MPC (or designated responsible entity) member will determine necessary remedial action, making any required modifications to the plan.

Changes will be made to the plan to remedy actions that have failed or are not considered feasible. Feasibility will be determined after a review of action consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring of this plan. Updating of the plan will be accomplished by written changes and submissions, as the MPC (or designated responsible entity) deems appropriate and necessary. Changes will be approved by the Crawford County Hazard Mitigation Planning Committee and the governing boards of the other participating jurisdictions.

5.2 Incorporation into Existing Planning Mechanisms

44 CFR Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Where possible, plan participants, including school and special districts, will use existing plans and/or programs to implement hazard mitigation actions. Additionally, as jurisdictions review and update existing planning mechanisms, relevant action items and data from the HMP will be integrated. Those existing plans and programs were described in **Section 2.2** of this plan. Based on the capability assessments of the participating jurisdictions, communities in Crawford County will continue to plan and implement programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through the following plans:

- Regional Comprehensive Economic Development Strategy (CEDS) document
- General or master plans of participating jurisdictions;
- Ordinances of participating jurisdictions;
- Crawford County Local Emergency Operations Plan (LEOP);
- Capital improvement plans and budgets;
- Other community plans within the County, such as water conservation plans, storm water management plans, and parks and recreation plans;
- School and Special District Plans and budgets; and
- Other plans and policies outlined in the capability assessment sections for each jurisdiction in Chapter 2 of this plan.

The MPC (or designated responsible entity) members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The MPC (or designated responsible entity) is also responsible for monitoring this integration and incorporation of the appropriate information into the five-year update of the multi-jurisdictional hazard mitigation plan.

Additionally, after the annual review of the Hazard Mitigation Plan, the Crawford County Emergency Management Director (EMD) will provide the updated Mitigation Strategy with current status of each mitigation action to the County (Boards of Supervisors or Commissions) as well as all Mayors, City Clerks, and School District Superintendents. The EMD will request that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms.

Table 5.1 below lists the planning mechanisms by jurisdiction into which the Hazard Mitigation Plan will be integrated.

Table 5.1 Planning Mechanisms Identified for Integration of Hazard Mitigation Plan

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
Unincorporated Crawford County	County Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Comprehensive Economic Development Strategy Construction/Road & Bridge Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	County Commission and road and bridge supervisors will incorporate hazard mitigation projects into budgets and future road and bridge improvements. EMD will review LEOP and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Bourbon	Comprehensive Plan Emergency Operations Plan (part of county) County Mitigation Plan Regional Transportation Plan Comprehensive Economic Development Strategy Land -use Plan Public Works Construction Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	Mayor, and Aldermen will work toward incorporating hazard mitigation projects into Comprehensive Plan, Land-use Plan, city budget where possible, and future public works improvements. EMD will review LEOP again and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
Cuba	County Emergency Operations Plan City Emergency Operations Plan County Mitigation Plan Regional Transportation Plan Comprehensive Economic Development Strategy Public Works Construction Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. City EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	Mayor, City Council, and public works department will work toward incorporating hazard mitigation projects into city budget where possible and future public works improvements. EMD will review LEOP and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Leasburg	Emergency Operations Plan (part of county) County Mitigation Plan Regional Transportation Plan Comprehensive Plan Comprehensive Economic Development Strategy Public Works Construction Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	Mayor, city council and public works department will work toward incorporating hazard mitigation projects into city budget where possible and future public works improvements. EMD will review LEOP and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Steelville	Emergency Operations Plan (part of county) County Mitigation Plan Capital Improvement Plan Regional Transportation Plan Comprehensive Economic Development Strategy Public Works Construction Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	Mayor, Aldermen, and public works department will work toward incorporating hazard mitigation projects into capital improvement plan, city budget, where possible and future public works improvements. EMD will review LEOP and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
			update with revised action items.
Sullivan	City Emergency Operations Plan County Emergency Operations Plan County Mitigation Plan Local Mitigation Plan Comprehensive Plan Capital Improvement Plan Regional Transportation Plan Land-Use Plan Comprehensive Economic Development Strategy Public Works Construction Budget	Hazard Mitigation action items were incorporated into the regional CEDS and Regional Transportation Plan by MRPC. EMD was encouraged to incorporate hazard mitigation into LEOP where applicable.	Mayor, city council and public works department will work toward incorporating hazard mitigation projects into city budget where possible and future public works improvements. The comprehensive plan, capital improvement plan, storm water ordinance, drainage ordinance and land-use plan will also be reviewed, and any applicable hazard mitigation activities added to those documents. EMD will review LEOP again and incorporate hazard mitigation updates where applicable. CEDS and Regional Transportation Plan will be reviewed to update with revised action items.
Crawford County R-I	Capital Improvement Plan School Emergency Plan District Budget	School board and superintendent reviewed district emergency plan and district budget to see where hazard mitigation actions could be incorporated.	School board and superintendent will review School Emergency Plan, Capital Improvement Plan, and district budget to update applicable areas with revised action items list. Superintendent will work toward including the certified tornado safe room(s) into the district budget.
Crawford County R-II	Master Plan Capital Improvement Plan School Emergency Plan Weapons Policy District Budget	School board and superintendent reviewed district emergency plan and district budget to see where hazard mitigation actions could be incorporated.	School board and superintendent will review Master Plan, Capital Improvement Plan, School Emergency Plan and district budget to update applicable areas with revised action items list.

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
			Superintendent will work toward including the certified tornado safe room(s) into the district budget.
Steelville R-III	School Emergency Plan Weapons Policy District Budget	School board and superintendent reviewed district emergency plan and district budget to see where hazard mitigation actions could be incorporated.	School board and superintendent will review School Emergency Plan and district budget to update applicable areas with revised action items list. Superintendent will work toward including the certified tornado safe room(s) into the district budget.
Sullivan School District	Master Plan Capital Improvement Plan School Emergency Plan District Budget	School board and superintendent reviewed district emergency plan and district budget to see where hazard mitigation actions could be incorporated.	School board and superintendent will review Master Plan, Capital Improvement Plan, School Emergency Plan, and district budget to update applicable areas with revised action items list. Superintendent will work toward including the certified tornado safe room(s) into the district budget.

Source: Jurisdiction surveys 2022

Including hazard mitigation is now routine for any planning projects or plan updates carried out by the Meramec Regional Planning Commission (MRPC). Applicable goals and action items from hazard mitigation plans have been incorporated into the regional transportation plan as well as the Community Economic Development Strategy for the region. Both of these documents are resources for cities and counties within the eight-county area and are updated on a regular basis with input from city and county representatives. This review and update process has helped city and county representatives better understand and appreciate the importance of including hazard mitigation in all applicable plans. In addition, MRPC and the hazard mitigation planning committee are also working to encourage the incorporation of hazard mitigation into the planning activities of all local governments, school districts and local entities through presentations and participation in planning activities.

5.3 Continued Public Involvement

44 CFR Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

The hazard mitigation plan update process provides an opportunity to publicize success stories resulting from the plan's implementation and seek additional public comment. Information about the annual reviews will be posted in the local newspaper as well as on the Meramec Regional Planning Commission's website following each annual review of the mitigation plan. When the MPC reconvenes for the five-year update, it will coordinate with all stakeholders participating in the planning process. Included in this group will be those who joined the MPC after the initial effort to update and revise the plan. Public notice will be posted and public participation will be actively solicited, at a minimum, through available website postings and press releases to local media outlets, primarily newspapers.

6 Appendix

A: References

1. 2018 Missouri State Hazard Mitigation Plan, https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
2. Missouri Hazard Mitigation Viewer, http://bit.ly/MoHazardMitigationPlanViewer2018
3. U.S. Dept. of Commerce, United States Census Bureau, https://data.census.gov/cedsci/
4. USGS, National Geologic Map Database, https://ngmdb.usgs.gov/Prodesc/proddesc_10014.htm
5. USACE, National Levee Database, https://levees.sec.usace.army.mil/#/
6. FEMA, Disaster Information, https://www.fema.gov/disasters
7. MDNR, Generalized Geology Map of Missouri - https://dnr.mo.gov/document-search/generalized-geologic-map-missouri-pub2514/pub2514
8. South Carolina College of Arts and Sciences, Hazards Vulnerability & Resiliency Institute, https://www.sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/index.php
9. FEMA Hazard Mitigation Grants, https://www.fema.gov/openfema-data-page/hazard-mitigation-grants-v1
10. Missouri Department of Elementary & Secondary Education, https://apps.dese.mo.gov/MCDS/home.aspx?categoryid=1&view=2
11. USDOT, Bridges & Structures, https://www.fhwa.dot.gov/bridge/nbi/no10/county.cfm
12. USFWS, Midwest Region Endangered Species, https://ecos.fws.gov/ecp/
13. MDC, Field Guide, Endangered, https://nature.mdc.mo.gov/status/endangered
14. MDC, Find Places to Go in MO, https://mdc.mo.gov/discover-nature/places
15. MDC, Missouri National Register Listings, https://mostateparks.com/page/84436/missouri-national-register-listings
16. Missouri Economic Research and Information Center, https://meric.mo.gov/industry/business-locator (Business Locator Tool) & https://meric.mo.gov/media/pdf/rural-missouri-asset-mapping (Rural Missouri Asset Mapping)
17. USDA, National Agricultural Statistics Service, https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/2/table/1/state/MO/county/169/year/2017
18. Missouri Department of Economic Development, https://ded.mo.gov/programs/business/missouri-works
19. The Climate Explorer, https://crt-climate-explorer.nemac.org/

20. Missouri Department of Natural Resources, Dam and Reservoir Safety, https://dnr.mo.gov/land-geology/dam-reservoir-safety
21. Stanford University's National Performance of Dams Program, http://npdp.stanford.edu/
22. National Inventory of Dams, https://nid.usace.army.mil/#/
23. National Resources Conservation Service, http://www.nrcs.usda.gov
24. Missouri Spatial Data Information Service, http://msdis.missouri.edu
25. Maps of effects of drought, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln, http://www.drought.unl.edu/
26. Historical drought impacts, National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln, http://droughtreporter.unl.edu/
27. Recorded low precipitation, NOAA Regional Climate Center, http://www.hprcc.unl.edu
28. Water shortages, Missouri's Drought Response Plan, Missouri Department of Natural Resources, https://dnr.mo.gov/water/hows-water/state-water/drought
29. Populations served by groundwater by county, USGS-NWIS, http://maps.waterdata.usgs.gov/mapper/index.html
30. Missouri Department of Natural Resources, Census of Missouri Public Water Systems 2020, https://dnr.mo.gov/document-search/2020-census-missouri-public-water-supplies
31. Census of Agriculture, https://agcensus.library.cornell.edu/census_parts/2012-missouri/
32. USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/Information-Tools/Summary-of-Business/Cause-of-Loss, https://www.rma.usda.gov/-/media/RMA/Maps/Total-Crop-Indemnity-Maps/Crop-Year-2021/041122map.ashx
33. Natural Resources Defense Council, http://www.nrdc.org/globalWarming/watersustainability/
34. NOAA, Historical Palmer Drought Indices, https://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/
35. MO Office of Administration, Division of Budget & Planning, https://oa.mo.gov/budget-planning/demographic-information/population-projections/2000-2030-projections
36. U.S. Seismic Hazard Map, United States Geological Survey, https://www.usgs.gov/natural-hazards/earthquake-hazards/earthquakes
37. Impact of Earthquakes on the Central USA, http://www.cusec.org/documents/aar/NMSZ_CAT_PLANNING_SCENARIO.pdf

38. 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone map, https://iowageologicalsurvey.org/
39. Probability of magnitude 5.0 or greater within 100 Years, United States Geological Survey, https://www.usgs.gov/natural-hazards/earthquake-hazards
40. USGS, Measuring the Size of an Earthquake, https://www.usgs.gov/faqs/how-are-earthquakes-recorded-how-are-earthquakes-measured-how-magnitude-earthquake-determined?qt-news_science_products=0#qt-news_science_products
41. USGS, Earthquake Hazard in the Heart of the Homeland, https://pubs.usgs.gov/fs/2006/3125/
42. Missouri Department of Insurance, https://insurance.mo.gov/earthquake/
43. Heat Index Chart & typical health impacts from heat, National Weather Service; National Weather Service Heat Index Program, https://www.weather.gov/safety/heat-index
44. Daily temperatures averages and extremes, High Plains Regional Climate Summary, https://hprcc.unl.edu/climate_extremes.php
45. Hyperthermia mortality, Missouri; Missouri Department of Health and Senior Service, http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper1.pdf
46. Hyperthermia mortality by Geographic area, Missouri Department of Health and Senior Services, http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2.pdf
47. Missouri Department of Conversation Wildfire Data Search, https://mdc12.mdc.mo.gov/Applications/MDCFireReporting/Home/FireReportSearch
48. Statistics, Missouri Division of Fire Safety, https://dfs.dps.mo.gov/
49. National Statistics, US Fire Administration, https://www.usfa.fema.gov/statistics/
50. Fire/Rescue Mutual Aid Regions in Missouri, https://dfs.dps.mo.gov/programs/resources/mutual-aid.php
51. Forestry Division of the Missouri Department of Conservation, https://mdc.mo.gov/your-property/fire-management
52. National Fire Incident Reporting System (NFIRS), https://dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.php
53. University of Wisconsin Silvis Lab, http://silvis.forest.wisc.edu/data/wui-change/
54. FEMA Map Service Center, Digital Flood Insurance Rate Maps (DFIRM), http://msc.fema.gov/portal
55. EPA, How's My Waterway, https://mywaterway.epa.gov/
56. SEMA, Flood Insurance Administration—Repetitive Loss List
57. National Centers for Environmental Information, http://www.ncdc.noaa.gov/stormevents/

58. FEMA Data Visualization Tool, https://www.fema.gov/data-visualization-floods-data-visualization
59. Missouri Department of Natural Resources, http://www.dnr.mo.gov/geology/geosrv/envgeo/sinkholes.htm
60. Insider, http://www.businessinsider.com/where-youll-be-swallowed-by-a-sinkhole-2013-3
61. USGS, Sinkholes, http://water.usgs.gov/edu/sinkholes.html
62. USGS, Catastrophic Sinkhole Collapse in Missouri, http://pubs.usgs.gov/fs/2007/3060/
63. USGS, https://www.usgs.gov/media/images/karst-map-conterminous-united-states-2020
64. University of Florida, How to Spot a Sinkhole, https://ufonline.ufl.edu/infographics/how-to-spot-a-sinkhole/
65. FEMA 320, Taking Shelter from the Storm, 3rd edition, http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf
66. Lightning Map, National Weather Service, https://www.vaisala.com/sites/default/files/documents/WEA-MET-Annual-Lightning-Report-2020-B212260EN-A.pdf
67. Death and injury statistics from lightning strikes, National Weather Service, https://www.weather.gov/hazstat/
68. Wind Zones in the U.S. map, FEMA, https://www.fema.gov/pdf/library/ism2_s1.pdf
69. Annual Windstorm Probability (65+knots) map U.S. 1980-1994, NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif
70. Hailstorm intensity scale, The Tornado and Storm Research Organization (TORRO), https://www.torro.org.uk/research/hail/hscale
71. National Severe Storms Laboratory – hail map, http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif
72. Enhanced F Scale for Tornado Damage, NWS, www.spc.noaa.gov/faq/tornado/ef-scale.html
73. Enhanced Fujita Scale's damage indicators and degrees of damage table, NOAA Storm Prediction Center, www.spc.noaa.gov/efscale/ef-scale.html
74. Tornado Activity in the U.S. map (1950-2006), FEMA 320, Taking Shelter from the Storm, 3rd edition
75. Tornado Alley in the U.S. map, http://tornadochaser.net/
76. Midwest Regional Climate Center, https://mrcc.purdue.edu/gismaps/cntytorn.htm
77. Wind chill chart, National Weather Service, http://www.nws.noaa.gov/om/winter/windchill.shtml
78. 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

B: Planning Process

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MEMORANDUM

TO: Crawford County Hazard Mitigation Planning Committee

FROM: Tammy Snodgrass, MRPC Environmental Programs Manager/Assistant Director
Patrick Stites, MRPC Environmental Programs Specialist

DATE: October 15, 2021

SUBJECT: Hazard mitigation planning meeting November 4, 2021

The Meramec Regional Planning Commission (MRPC) has been contracted by Crawford County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Crawford County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Crawford County. We need your help to successfully complete this project.

The county must submit an approved, updated hazard mitigation plan to SEMA and FEMA by December, 2022 in order to continue to be eligible for hazard mitigation grant funds and certain recovery funds after a natural disaster occurs. It is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

A **meeting** of the **Crawford County Hazard Mitigation Planning Committee** is **scheduled** for **Thursday, November 4 at 10:30 a.m.** at the **Crawford County Courthouse Courtroom located at 111 3rd Street, Steelville, MO**. The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. This can include activities such as improvements to roads and bridges that were prone to flooding, new programs that have reduced risk to residents and/or businesses and new tornado shelters that have been constructed in the past five years. Additionally, we request that **each jurisdiction and school district bring a filled-out Hazard Mitigation Plan Questionnaire** (included). After the meeting we will answer questions and assist with completing the questionnaire.

As the county, each city and school district are required to participate in the planning process and will be asked to formally approve and adopt the Phelps County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from emergency management offices, law enforcement, city/county officials, fire protection, road and bridge departments, utilities and public works, local health services, disaster relief volunteer services and other appropriate groups. If you are not able to attend, please send a representative from your organization. It is very important that we have good participation from all stakeholders in Crawford County.

Thank you for your assistance in addressing hazard mitigation for Crawford County. If you have any questions, contact me at (573) 265-2993, or via e-mail: tsnodgrass@meramecregion.org. I look forward to seeing you at the meeting.

PS

Enclosures

Crawford County
Multi-Jurisdictional Hazard Mitigation Plan Update
Planning Meeting

Thursday, November 4, 2021 ~ 10:30 a.m.
Crawford County Courthouse Courtroom

AGENDA

I. Welcome/Introductions – Tammy Snodgrass, Assistant Director, Meramec Regional Planning Commission

II. Hazard Mitigation Planning Purpose

III. Grant Programs Linked to Approved Plan

IV. Planning Tasks / Multi-jurisdictional Approach

V. Participation Requirements

VI. Public Involvement

VII. Data Collection Questionnaires

VIII. Discussion of Hazards

IX. Critical Facilities

X. Next Steps in the Planning Process

XI. Set Next Meeting Date(s)

NOTICE OF PUBLIC MEETING

Date and time of posting: **11/02/2022 9:00 a.m.**
Notice is hereby given that the **Crawford County Hazard Mitigation Planning Committee** will meet at **10:30 a.m.** on **Thursday, November 4th, 2021** at the **Crawford County Courthouse, Courtroom, located at 111 3rd Street, Steelville, MO 65565**

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Integration of Other Data, Reports, Studies, Plans
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Review and Prioritize Action Items
- Jurisdiction and School District Questionnaire Assistance
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

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tsnodgrass@meramecregion.org

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

Crawford County Hazard Mitigation Plan Review Meeting
November 4, 2021 ~ 10:30 a.m.

Name	Representing	Email Address	Phone #	Address
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MIKE PLANK	CUBA FIRE	CUBAFD@gmail.com	573-259-8380	P.O. Box 511 Cuba MO
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Rob Cummings	Crawford	Rdcumming1773@gmail	573-272-9670	PO BOX 45 Steelville MO.
DARIN LAYMAN	CRAWFORD COUNTY SHERIFFS OFFICE	sheriffdayman@outlook.com	573-259-3024	PO BOX BE STEELVILLE, MO 65565
J.T. HARDY	CITY of SULLIVAN	jthardy@sullivan.mo.us	573-468-5462 4612	210 W. WASHINGTON SULLIVAN, MO. 63080
Jared Boast	Crawford County	jaredboast@yahoo.com	573-259-6813	P.O. Box 45 Steelville MO
STEVE KINKER	Bourbon Fire	bourbonfirechief@gmail.com	573-205-5304	PO Box 849 Bourbon 65441

Name	Representing	Email Address	Phone #	Address
Kathryn Hawes	MRPC			
Patrick Stites	MRPC			

For immediate release
Jan. 4, 2022

For more information, contact
Tammy Snodgrass at (573) 265-2993

MRPC begins holding meetings to update Crawford County hazard mitigation plan

CRAWFORD COUNTY—Meramec Regional Planning Commission (MRPC) is working on updating the hazard mitigation plan for Crawford County. The next meeting, which is open to the public, is scheduled for Feb. 3 at 10:30 a.m. at the Crawford County Courthouse, 111 3rd St., Steelville.

The first Crawford County hazard mitigation planning meeting was held on Nov. 4, 2021 at the courthouse. MRPC staff did a presentation on hazard mitigation and the process that the group would be going through to update the Crawford County plan. Discussions included explanation that hazard mitigation planning is focused on reducing risk before disasters strike (burying electric lines, elevating homes in the floodplain) and sharing the county must have a current, updated plan to be eligible for some hazard mitigation grants.

The first draft of the revised plan must be submitted to SEMA by Dec. 7, 2022. Jurisdictions within the county, such as cities, the county itself, schools, fire departments and others, are asked to participate in the planning process, complete the questionnaire, review the revised plan and adopt the new plan. It was also discussed that a survey on hazard mitigation would be promoted throughout the county to get public input into the plan. That survey can be found and completed at https://www.meramecregion.org/surveys/.

If you have questions, please contact Tammy Snodgrass at MRPC at 573-265-2993 or by email at tsnodgrass@meramecregion.org.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. Steve Vogt, representing the city of Belle, serves as MRPC chairman. A professional staff of 34, led by Executive Director Bonnie Prigge, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at *www.meramecregion.org* or on Facebook at *www.facebook.com/meramecregion/*.

-30-

MEMORANDUM

TO: Crawford County Hazard Mitigation Planning Committee

FROM: Tammy Snodgrass, MRPC Environmental Programs Manager/Assistant Director
Patrick Stites, MRPC Environmental Programs Specialist

DATE: March 21, 2022

SUBJECT: Second Hazard Mitigation Planning Meeting March 22, 2022

MRPC has been contracted by Crawford County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Crawford County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Crawford County. We need your help to successfully complete this project.

The county must submit an approved, updated hazard mitigation plan to SEMA and FEMA by the end of this year in order to continue to be eligible for some hazard mitigation grants, so it is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

A **meeting** of the **Crawford County Hazard Mitigation Planning Committee** is **scheduled** for **Tuesday, March 22 at 1:00 p.m.** at the **Crawford County Courthouse Courtroom located at 111 3rd Street, Steelville, MO**. The primary focus of this meeting will be to review existing goals and action items and determine if any changes or additions need to be made. The group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. This can include activities such as improvements to roads and bridges that were prone to flooding, new programs that have reduced risk to residents and/or businesses and new tornado shelters that have been constructed in the past five years. In addition, the group will be asked to look forward to identify any mitigations projects that they would to get funded in the next five years.

As the county, each city and school district will be asked to formally approve and adopt the Crawford County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from emergency management offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups. If you are not able to attend, please send a representative from your organization. It is very important that we have good participation from all stakeholders in Crawford County.

Reminder: Hazard Mitigation Questionnaires are due. If a jurisdiction **does not submit** a filled-out **questionnaire,** it will be **ineligible** to **receive hazard mitigation funds**.

Thank you for your assistance in addressing hazard mitigation for Crawford County. If you have any questions, contact me at (573) 265-2993, or via e-mail: pstites@meramecregion.org. I look forward to seeing you at the meeting.

PS

Crawford County
Multi-Jurisdictional Hazard Mitigation Plan Update
Planning Meeting

Tuesday, March 22, 2022 ~ 1:00 p.m.
Crawford County Courthouse Courtroom

AGENDA

I. Welcome/Introductions – Patrick Stites & Kathryn Hawes, Environmental Program Specialists, Meramec Regional Planning Commission

II. Brief Review

III. Public Survey Update

IV. Participation Requirements/Status

V. Plan Update Format

VI. Discuss Mitigation Action Updates – *(Which have been accomplished or had progress made; which are no longer high priority; which can be combined or eliminated)*

VII. Next Steps

VIII. Set Next Meeting Date(s)

NOTICE OF PUBLIC MEETING

Date and time of posting: **03/18/2022 9:00 a.m**.
Notice is hereby given that the **Crawford County Hazard Mitigation Planning Committee** will meet at **1:00 p.m.** on **Tuesday, March 22, 2022** at the **Crawford County Courthouse, Courtroom, located at 111 3rd Street, Steelville, MO 65565**

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Review and Prioritize Action Items
- Jurisdiction and School District Questionnaire Assistance
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

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tsnodgrass@meramecregion.org

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

From last update

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

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

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

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

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

Goal 6: Secure resources for investment in hazard mitigation.

Revised

Goal 1: Reduce the potential impact of natural disasters on the lives and livelihoods of the citizens of the county.

Goal 2: Reduce the potential impact of natural disaster to property, infrastructure, and the local economy.

Goal 3: Reduce the potential impact of natural disaster on the continuity of government and essential services.

From last plan update.		Revision Suggestion
1.1	Implement an education program on personal emergency preparedness.	Local emergency management directors will coordinate education programs in schools and distribute brochures on natural disasters and emergency preparedness at all public offices.
1.2	Promote development of emergency plans by businesses and public entities by providing information on business continuity and emergency planning through local chambers of commerce and emergency management offices.	Remove. Complete. Set in policy.
1.3	Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.	Obtain and upgrade early warning systems and improved communication systems as funding allows.
1.4	Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.	Combined with 1.1
1.6	Provide information on tree trimming and dead tree removal programs to utility companies and local government.	Complete. Set in policy.
1.7	Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.	Upgrade roads and bridges that would reduce danger to residents during occurrences of natural disasters as funding allows.
1.8	Disseminate information on the importance of and funding sources for storm shelters and tornado safe rooms near areas of high population densities (schools and large employers).	Construct storm shelters and tornado safe rooms near areas of high population densities (schools and large employers) as funding allows.
1.9	Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence and wildfire upon Crawford County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.	Remove. Completed through the plan update process.
	New add	Continued compliance with NFIP requirements.
2.1	Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.	Remove. Facility inspection requires expertise. Not deemed achievable.
2.2	Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.	Distribute FEMA brochures and factsheets about the National Flood Insurance Program (NFIP) at public offices and community events.
2.3	Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.	Remove. Completed. All cities in the planning area have established building codes.
2.4	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and	Revise floodplain ordinances to require securing hazardous material tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

	mobile homes in floodplain areas to reduce hazards during storms and flooding.	
3.1	Distribute SEMA brochures at public facilities and events and distribute regular press releases concerning hazards, where they strike, frequency and preparedness.	Combine with 1.1
3.4	Encourage meetings between SEMA mitigation specialists, EMD, city/county officials and local planning organizations to familiarize local officials with mitigation planning and implementation and budgeting for mitigation projects.	Schedule an annual meeting with city/county officials and local planning organizations to discuss planning, implementing, and budgeting for hazard mitigation projects as well as including mitigation in all economic and community development projects.
3.5	Re-evaluate the hazard mitigation plan and merge with other community planning.	Already included in the planning process.
3.6	Implement a public awareness program about the benefits of hazard mitigation projects – both public and private – and distribute press releases from local governments regarding adopted mitigation measures.	Distribute information about hazard mitigation projects to the public through press releases and social media.
3.7	Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.	Combine with 1.1
4.3	Pool different agency resources to achieve widespread mitigation results.	Adopt formal Memorandum of Understand between all jurisdictions in the planning area to provide aid and facilitate collaboration during disasters.
5.2	Provide information to all communities on the benefits and costs of developing storm water management plans.	Combine with 5.4
5.3	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operation plans and procedures.	Complete. Set in policy.
5.4	Encourage cities to require contractor stormwater management plans in all new development.	Require contractor stormwater management plans in all new development.
5.5	Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.	Purchase properties in the floodplain to convert land into public space/recreation areas as funds allow.
6.2	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	Combine with 1.7.
6.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects	Combine with 3.4
6.4	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.	Combine with 3.4
6.5	Provide information on the benefits of local governments implementing cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole	Combine with 3.4.
6.7	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.	Completed through planning process
	New Add.	Purchase generators for all critical infrastructure facilities as funding allows.

Some infrastructure and policy improvements common to mitigation plans

- Shelters and safe rooms
- Bridges and roads
- Generators
- Early Warning systems
- Code development (building/fire/stormwater/debris removal)
- property upgrades (earthquake proofing, landscaping for flooding, etc.)

Crawford County Hazard Mitigation Plan Review Meeting
March 22, 2022 ~ 1:00 p.m.

Name	Representing	Email Address	Phone #	Address
Gary Neff ×	City of Cuba		573-205-1102	
Danny Brown ×	Crawford Co		573-259-3520	
Tamra Cape ×	City of Steelville	tamracape@gmail.com	573-202-0506	
Tracey Stover ×	Health Dept		573-701-1193	
Mike Plank ×	Cuba Fire		573-259-8380	
Kyle Gibbs ×	CCR-1 Superintendent		573-732-4426	
J.T. Hardy ×	City of Sullivan ×			
Leo Sanders ×	Crawford Co		573-205-5756	
Craig Bouse ×	Cuba P/W		573 259 1391	

Name	Representing	Email Address	Phone #	Address
Jason Evans	City of Steelville	jhevans.consult@gmail.com	573-205-0646	28 Cherryvalley Rd. Steelville MO. 65565
CURTIS CROUCH	"	64dnnr@YAHOO.COM	" 205 9047	111 N 1ST STVL
Patrick Stiles	MRPC			
Kathryn Hawes	MRPC			

For immediate release
Jan. 27, 2022

For more information, contact
Tammy Snodgrass at (573) 265-2993

MRPC to hold public meeting for Crawford County hazard mitigation plan

CRAWFORD COUNTY—Meramec Regional Planning Commission (MRPC) will be meeting with the Crawford County hazard mitigation planning committee at 10:30 a.m. on Feb. 3, 2022, at the Crawford County Courthouse, 111 3rd St., Steelville, to update the county's hazard mitigation plan. The meeting is open to the public.

Hazard mitigation planning is focused on reducing risk before disasters strike. Activities such as burying electric lines, reduces damage during tornadoes and elevating homes in the floodplain help reduce damage and loss of life during natural disasters. Public input is necessary to truly understand the risks that could be facing the county. Additionally, the county must have a current, updated plan to be eligible for some hazard mitigation grants.

The first draft of the revised plan must be submitted to SEMA by Dec. 7, 2022. Jurisdictions within the county, such as cities, the county itself, schools, fire departments and others, are asked to participate in the planning process. Jurisdictions such as local governments and the school districts are required to complete questionnaires, review the revised plan and adopt the new plan. For those members of the public interested in providing input, a public survey can be found and completed at https://www.meramecregion.org/surveys/.

County-level hazard mitigation plans cover a five-year timeframe. Crawford County's last plan was approved in June 2018 and can be found at https://www.meramecregion.org/publications/.

If you have questions, please contact Tammy Snodgrass at MRPC at 573-265-2993 or by email at tsnodgrass@meramecregion.org.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. Steve Vogt, representing the city of Belle, serves as MRPC chairman. A professional staff of 34, led by Executive Director Bonnie Prigge, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at *www.meramecregion.org* or on Facebook at *www.facebook.com/meramecregion/*.

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MEMORANDUM

TO: Crawford County Hazard Mitigation Planning Committee

FROM: Tammy Snodgrass, MRPC Environmental Programs Manager/Assistant Director
Patrick Stites, MRPC Environmental Programs Specialist

DATE: September 1, 2022

SUBJECT: Third Hazard Mitigation Planning Meeting September 20, 2022

The next meeting of the Crawford County Hazard Mitigation Planning Committee is scheduled for Tuesday, September 20, 2022 at 1:30 p.m. at the **Crawford County Commission Chambers located at 111 3rd Street, Steelville, MO**. The focus of this meeting will be to review and discuss all completed draft chapters of the hazard mitigation plan and discuss the formal adoption process for each jurisdiction. The draft of chapter 3 of the plan has already been sent out via email. As additional chapter drafts are completed, we will continue to send those out. As you spend time reviewing these drafts it is very important that you document those hours spent and submit in-kind match forms so that we can get those hours counted. If you have comments or corrections, please feel free to send those over to me via email and I will get those addressed.

The Meramec Regional Planning Commission (MRPC) has been contracted by Crawford County and the State Emergency Management Agency (SEMA) to review and update the multi-jurisdictional hazard mitigation plan for Crawford County, its cities and school districts. The project is being funded by state and federal dollars with matching funds from Crawford County. We need your help to successfully complete this project.

All jurisdictions must formally adopt the plan document prior to submittal to be included in the plan. The first draft of the updated hazard mitigation plan must be submitted to SEMA and FEMA by December 7, 2022, in order to continue to be eligible for some hazard mitigation grants, so it is in every jurisdiction's best interest to participate in the review and update of this plan. Hazard mitigation funds are used for such projects as floodplain buyouts, burying electrical lines, tornado shelters for schools, etc.

As the county, each city and school district are required to participate in the planning process and will be asked to formally approve and adopt the Crawford County Hazard Mitigation Plan, we strongly encourage you to participate in this committee or to send a representative who will convey your jurisdiction or department's needs for hazard mitigation as well as report on your hazard mitigation accomplishments. It is important to include representatives from road and bridge, local planners, emergency management offices, law enforcement, city/county officials, fire protection, local health services, disaster relief volunteer services and other appropriate groups.

Thank you for your assistance in addressing hazard mitigation for Crawford County. If you have any questions, contact me at (573) 265-2993, extension 135 or via e-mail: pstites@merameregion.org. I look forward to seeing you at the meeting.

PS

Crawford County
Multi-Jurisdictional Hazard Mitigation Plan Update
Planning Meeting

Tuesday, September 20, 2022 ~ 1:30 p.m.
Crawford County Commission Chambers

AGENDA

I. Welcome/Introductions – Tammy Snodgrass, Assistant Director, Meramec Regional Planning Commission

II. Brief Review

III. Participation Requirements/Status

IV. Review and Discussion on Draft Chapters

V. Plan Maintenance

VI. Adoption Process

VII. Next Steps

VIII. Adjourn

NOTICE OF PUBLIC MEETING

Date and time of posting: **09/16/2022 10:00 a.m.**
Notice is hereby given that the **Crawford County Hazard Mitigation Planning Committee** will meet at **1:30 p.m.** on **Tuesday, September 20, 2022** at the **Crawford County Courthouse, Commission Chambers, located at 111 3rd Street, Steelville, MO 65565**

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Review and Prioritize Action Items
- Jurisdiction and School District Questionnaire Assistance
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Tamara Snodgrass
#4 Industrial Drive
St. James, MO 65559
(573) 265-2993
tsnodgrass@meramecregion.org

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

Crawford County Hazard Mitigation Plan Review Meeting
September 20, 2022 ~ 1:30 p.m.

Name	Representing	Email Address	Phone #	Address
	Crawford Co	Sanders ccc@gmail.com	573-205-5756	302 W main St Po Box 145 Steelville mo, 65565
	Crawford Co		573-259-6813	" "
	Cuba City		573-885-1102	202 North Smith St
Tracy Stover	Crawford Co Health Dept	tracy.stover@health.mo.gov	573-701-1193	202 W. Main PO Box 367 Steelville
	citizen		573-245-6675	782 Hwy H Leasburg MO
	Crawford Rd.	crawfordroad1@outlook.com	573-259-3520	101 West Euclid St. Steelville

For immediate release
October 6, 2022

For more information, contact
Tammy Snodgrass at (573) 265-2993

Public comment being accepted on Crawford County Hazard Mitigation Plan until Oct. 31

CRAWFORD COUNTY—Public comment is being accepted until Oct. 31, 2022, on the Crawford County Hazard Mitigation Plan. The plan update is available for review on Meramec Regional Planning Commission's website, http://www.meramecregion.org/publications/. The 2022 plan update is located under the Hazard Mitigation Plans by county along with the county's approved 2018 plan. A hard copy of the plan is also available at the Crawford County Courthouse in the county clerk's office.

The purpose of the plan is to reduce or eliminate long-term risk to people and property from natural hazards. It is required that the county have this plan in place in order to be eligible for several Federal Emergency Management Agency grant programs.

Several entities participated in the planning process to update the plan, including Crawford County, the cities of Bourbon, Cuba, Leasburg, Steelville and Sullivan, as well as Crawford County R-I School District, Crawford County R-II School District, Steelville R-III School District, Sullivan School District and Bourbon Fire District.

The Meramec Regional Planning Commission (MRPC) facilitated focus group meetings and assisted these entities in developing the plan. Following a public comment period, a final draft will be created and sent to FEMA and SEMA for review and approval.

If you need assistance locating the plan or have questions, please contact Tammy Snodgrass at MRPC at 573-265-2993 or by email at tsnodgrass@meramecregion.org.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. Steve Vogt, representing the city of Belle, serves as MRPC chairman. A professional staff of 34, led by Executive Director Bonnie Prigge, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at *www.meramecregion.org* or on Facebook at *www.facebook.com/meramecregion/*.

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Mailing list for surrounding jurisdictions:

Shelley Smythe, City Clerk
Gerald City Hall
106 East Fitzgerald Ave.
Gerald, MO 63037

Don Stolberg, City Administrator
St. Clair City Hall
#1 Paul Parks Drive
St. Clair, MO 63077

Berger City Hall
404 Rosalie Avenue
Berger, MO 63014

Superintendent Kathy Oetterer
Franklin Co R-II School District
3128 Highway Y
New Haven, MO 63068

Superintendent Josh Hoener
New Haven School District
100 Park Drive
New Haven, MO 63068

Superintendent Kathy Vandegriffe
Strain-Japan School District
4640 Highway H
Sullivan, MO 63080

Presiding Commissioner David Sansegraw
Washington County
102 N. Missouri
Potosi, MO 63664

Chairperson Tom Degonia
City of Mineral Point
701 State St. Box 127
Mineral Point, MO 63660

Kathleen Trentmann, City Administrator
New Haven City Hall
101 Front Street
New Haven, MO 63068

Jonathan Zimmerman, City Administrator
Union City Hall
10 E. Locust Street
Union, MO 63084

Oak Grove Village City Hall
260 James Street
Sullivan, MO 63080

Superintendent Jenny Ulrich
Londedell R-XIV School District
7466 Hwy FF
Lonedell, MO 63060

Superintendent Jeannie Jenkins
Spring Bluff R-XV School District
9374 Highway 185
Sullivan, MO 63080

Superintendent Scott Hayes
Union R-XI School District
P.O. BOX 440
Union, MO 63084

Chairperson John Robinson III
City of Caledonia
PO BOX 100
Caledonia, MO 63631

Mayor Joseph Blount
City of Potosi
121 East High St.
Potosi, MO 63664

Steve Roth, City Administrator
Pacific City Hall
300 Hoven Drive
Pacific, MO 63069

Darren Lamb, City Administrator
Washington City Hall
405 Jefferson Street
Washington, MO 63090

Village of Parkway
1361 Parkway Drive
St. Clair, MO 63077

Dr. Carrie Schwierjohn
Meramec Valley R-III School District
126 N Payne Street
Pacific, MO 63069

Superintendent Kyle Kruse
St. Clair R-XIII School District
905 Bardot Street
St. Clair, MO 63077

Superintendent Jennifer Kephart
School District of Washington
220 Locust Street
Washington, MO 63090

Mayor Jay Horton
City of Irondale
PO BOX 53
Irondale, MO 63648

Superintendent Lee Ann Wallace
Kingston K-14
10047 Diamond Rd.
Cadet, MO 63630

Superintendent Alex McCaul
Potosi R-III
400 N. Mine
Potosi, MO 63664

Jim Scaggs, Presiding Commissioner
Iron County Courthouse
PO Box 42
Ironton, MO 63650

Village of Des Arc
PO Box 207
Des Arc, MO 63636

Johnny Setzer, Mayor
City of Viburnum
PO Box 596
Viburnum, MO 65566

Superintendent Ray Forshee
Belleview R-3 School District
27431 Highway 32
Belleview, MO 63623

Mayor Kim Steelman
City of Salem
400 N. Iron St.
Salem, MO 65560

Superintendent Conrad Prugh
Green Forest R-II
6111 Hwy F
Salem, MO 65560

Randy Verkamp, Presiding Commissioner
Phelps County Courthouse
200 N. Main
Rolla, MO 65401

Superintendent Lindell Conway
Richwoods R-VII
10788 State Hwy A
Richwoods, MO 63071

Annapolis City Hall
204 School Street
Annapolis, MO 63620

Robert Lourwood, Mayor
City of Ironton
123 N. Main Street
Ironton, MO 63650

Superintendent Brian Beard
Arcadia Valley R-II School District
750 Park Drive
Ironton, MO 63650

Superintendent Adam Portell
Iron County C-4 School District
35 Highway 49
Viburnum, MO 65566

Superintendent Lynn Reed
Salem R-80
1409 W. Rolla Rd.
Salem, MO 65560

Superintendent Victoria Brooker
Dent-Phelps R-III
27870 Hwy C
Salem, MO 65560

Louis J. Magdits, IV, Mayor
City of Rolla
PO Box 979
Rolla, MO 65401

Superintendent Michael Silvy
Valley R-VI
1 Viking Dr.
Caledonia, MO 63631

Roy Carr, Mayor
City of Arcadia
PO Box 86
Arcadia, MO 63621

City of Pilot Knob
PO Box 188
Pilot Knob, MO 63663

Superintendent Don Wakefield
South Iron R-I School District
210 School Street
Annapolis, MO 63620

Presiding Commissioner Darrell Skiles
Dent County
400 N. Main
Salem, MO 65560

Superintendent Aibeen Holland
Oak Hill R-I
6200 Hwy 19 South
Salem, MO 65560

Superintendent Dr. Jeff Dodson
North Wood R-IV
3734 N Hwy 19
Salem, MO 65560

Paul Smith, Mayor
City of Doolittle
380 Eisenhower
Doolittle, MO 65401

Rick Krawiecki, Mayor
City of St. James
100 S. Jefferson
St. James, MO 65559

Superintendent Dr. Tim Webster
St. James R-I School District
122 E. Scioto Street
St. James, MO 65559

Superintendent John Fluhrer
Phelps County R-III School District
17790 State Route M
Edgar Springs, MO 65462

Debbie Green, Mayor
City of Gasconade
493 Oak St.
Gasconade, MO 65036

John Kamler, Mayor
City of Owensville
107 W. Sears
Owensville, MO 65066

Superintendent Jeri Hardy
Gasconade R-II School District
PO BOX 536
Owensville, MO 65066

City of Edgar Springs
PO Box 13
Edgar Springs, MO 65462

Superintendent Dr. Craig Hounsom
500 A Forum Drive
Rolla, MO 65401

Larry Miskel, Commissioner
Gasconade Co. Courthouse
119 E. First St.
Hermann, MO 65041

Bruce Cox, Mayor
City of Hermann
1902 Jefferson St.
Hermann, MO 65041

Shannon Grus, Mayor
City of Rosebud
P.O. Box 199
Rosebud, MO 63091

Tim Brinker, Presiding Commissioner
Franklin County Courthouse
400 E Locust
Union, MO 63084

James Poucher, Mayor
City of Newburg
PO Drawer K
Newburg, MO 65550

Superintendent Randy Caffey
Newburg R-II School District
701 Wolf Pride Drive
Newburg, MO 65550

Lee Medlock, Mayor
City of Bland
P.O. Box 40
Bland, MO 65014

Melissa Strope, Mayor
City of Morrison
PO BOX 8
Morrison, MO 65061

Superintendent Geoff Neill
Gasconade Co. R-I School District
170 Blue Pride Drive
Hermann, MO 65041

Meramec Regional Planning Commission
#4 Industrial Drive
St. James, MO 65559

10/05/22

Attention Members of the Crawford County Hazard Mitigation Planning Committee and neighboring jurisdictions:

The first draft of the Crawford County Hazard Mitigation Plan is now available for review on the MRPC website – http://www.meramecregion.org/publications/. A hard copy of the draft document is being made available at the Crawford County Clerk's Office for public viewing as well. Please take some time to review the planning document, especially sections that have specifics regarding your jurisdiction. The public comment period will be open until October 31, 2022. Please notify us no later than **October 31, 2022** with any recommended changes or corrections. Contact Tammy Snodgrass at (573) 265-2993 or via email at tsnodgrass@meramecregion.org.

Public Survey: Crawford County
Multi-jurisdictional Hazard Mitigation Plan

The federal government requires all states and local governments to have hazard mitigation plans approved by FEMA that are consistent with the Disaster Mitigation Act of 2000. Approved mitigation plans are required to maintain eligibility for certain types of federal Hazard Mitigation Assistance Grants.

A planning committee comprised of representatives from Crawford County, the incorporated cities, and the public-school districts is currently developing an update to the comprehensive Crawford County Multi-jurisdictional Hazard Mitigation Plan with a strategy to reduce the vulnerability of people and property in the planning area to the impacts of hazards and to remain eligible for mitigation funding programs from FEMA. One of the key components of a hazard mitigation plan is public input during the planning process. The planning committee will be evaluating information on the hazards that impact each jurisdiction within Crawford County. The committee is seeking your input on the hazards that will be evaluated as well as your opinions on the types of activities that should be considered to reduce future impacts. Your comments will be considered by your community's representatives on the planning committee as the plan is developed. Please take a few moments to answer the following questions. Thank you for your participation.

1. Please select your jurisdiction from the list. You may only select one jurisdiction for each survey completed. If you belong to more than one jurisdiction in this list, please complete multiple surveys.

- ❑ Unincorporated Crawford County
- ❑ City of Bourbon
- ❑ City of Cuba
- ❑ Village of Leasburg
- ❑ Village of St. Cloud
- ❑ City of Steelville
- ❑ City of Sullivan
- ❑ Village of West Sullivan
- ❑ Crawford Co. R-I School District
- ❑ Crawford Co. R-II School District
- ❑ Steelville R-III School District
- ❑ Sullivan School District

2. The hazards addressed in the Multi-jurisdictional Hazard Mitigation Plan Update are listed below. Please indicate your opinion on the likelihood for each hazard to impact YOUR JURISDICTION (identified above). **Please rate <u>EACH</u> hazard 1 through 4 as follows:**

1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

____ Flooding (Flash and River)	____ Earthquake	____ Severe Thunderstorms
____ Tornadoes	____ Land Subsidence / Sinkholes	____ Severe Winter Weather
____ Dam Failure	____ Drought	
____ Wildfire	____ Extreme Temperatures	

3. Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). **Please rate <u>EACH</u> hazard 1 through 4 as follows:**

1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

____ Flooding (Flash and River)	____ Earthquake	____ Severe Thunderstorms
____ Tornadoes	____ Land Subsidence / Sinkholes	____ Severe Winter Weather
____ Dam Failure	____ Drought	
____ Wildfire	____ Extreme Temperatures	

4. FEMA Hazard Mitigation Assistance Grants are administered by the State Emergency Management Agency. Listed below are some types of projects considered.

Please check all those that could benefit your jurisdiction, in your opinion:

- ❑ Flood-prone Property Acquisition & Structure Demolition /Relocation
- ❑ Flood-Prone Structure Elevation
- ❑ Dry Floodproofing of Historical Residential Structures and/or Non-residential Structures
- ❑ Minor Localized Flood Reduction Projects (storm water management or localized flood control projects)
- ❑ Structural Retrofitting of Existing Buildings to Add a Tornado Safe Room
- ❑ Storm Sirens
- ❑ Early Warning Systems such as phone/text alerts
- ❑ Retrofitting of Existing Buildings, and Facilities from Wind Damage.
- ❑ New Tornado Safe Room Construction
- ❑ Electrical Utilities Infrastructure Retrofit
- ❑ Soil Erosion Stabilization
- ❑ Wildfire Mitigation
- ❑ Other (please specify)

_____

5. Please comment on any other issues that the Crawford County Hazard Mitigation Planning Committee should consider in developing a strategy to reduce future losses caused by hazard events.

_____

_____

_____

Please return your completed survey to:

Tamara Snodgrass
Meramec Regional Planning Commission
4 Industrial Drive ~ St. James, MO 65559
Phone: 573-265-2993, ext. 104 ~ FAX: 573-265-3550
tsnodgrass@meramecregion.org

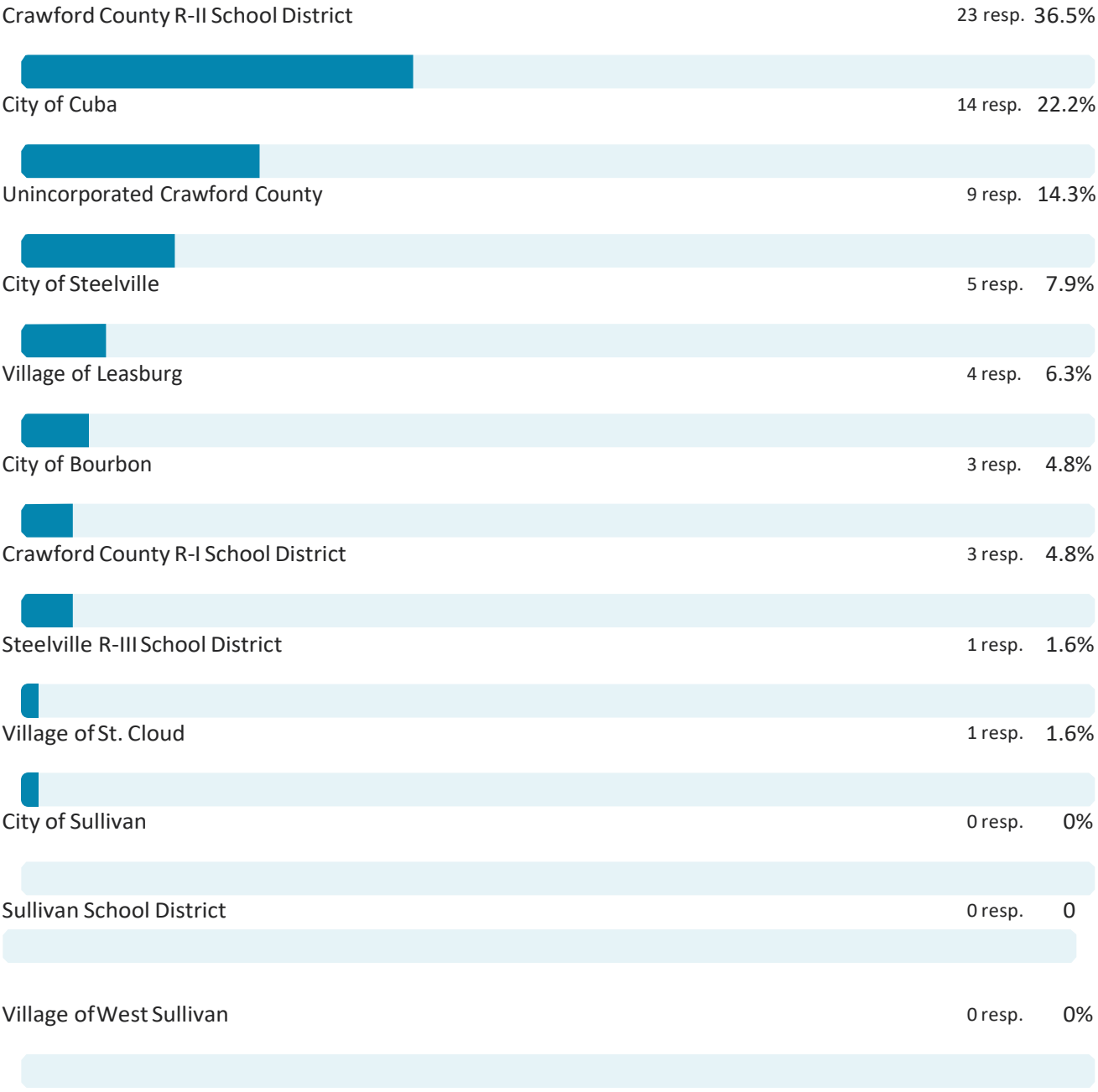
On-line surveys will be automatically sent.

Public Survey: Crawford County Multi-jurisdictional Hazard Mitigation Plan

63 responses

Please select your jurisdiction from the list. You may only select one jurisdiction for each survey completed. If you belong to more than one jurisdiction in this list, please complete multiple surveys.

63 out of 63 answered



Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

Dam Failure

63 out of 63 answered

1.3 Average rating

1	2	3	4
81%	7.9%	6.3%	4.8%
51 resp.	5 resp.	4 resp.	3 resp.

Drought

63 out of 63 answered

2.4 Average rating

1	2	3	4
17.5%	38.1%	31.7%	12.7%
11 resp.	24 resp.	20 resp.	8 resp.

Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely
Earthquake

63 out of 63 answered

2.2 Average rating

19%	46%	28.6%	6.3%
12 resp.	29 resp.	18 resp.	4 resp.

1 2 3 4

Extreme Temperatures

63 out of 63 answered

3.0 Average rating

4.8%	22.2%	42.9%	30.2%
3 resp.	14 resp.	27 resp.	19 resp.

1 2 3 4

Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

Flooding (Flash and River) 63

out of 63 answered

3.0 Average rating

6.3%	27%	28.6%	38.1%
4 resp.	17 resp.	18 resp.	24 resp.

1 2 3 4

Land Subsidence/Sinkholes

63 out of 63 answered

2.0 Average rating

38.1%	33.3%	22.2%	6.3%
24 resp.	21 resp.	14 resp.	4 resp.

1 2 3 4

Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

Severe Thunderstorms - Including high winds, hail, & lightning

63 out of 63 answered

3.8 Average rating

1	2	3	4
0%	0%	22.2%	77.8%
0 resp.	0 resp.	14 resp.	49 resp.

Severe Winter Weather 63

out of 63 answered

3.5 Average rating

1	2	3	4
0%	7.9%	36.5%	55.6%
0 resp.	5 resp.	23 resp.	35 resp.

Please indicate your opinion on the likelihood for each hazard addressed in the Multi-jurisdictional Hazard Mitigation Plan Update to impact YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Unlikely, 2 = Occasional, 3 = Likely, 4 = Highly Likely

Tornadoes

63 out of 63 answered

3.2 Average rating

1	2	3	4
1.6%	15.9%	42.9%	39.7%
1 resp.	10 resp.	27 resp.	25 resp.

Wildfire

63 out of 63 answered

2.3 Average rating

1	2	3	4
25.4%	31.7%	28.6%	14.3%
16 resp.	20 resp.	18 resp.	9 resp.

Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

Dam Failure

63 out of 63 answered

1.4 Average rating

65.1%	28.6%	4.8%	1.6%
41 resp.	18 resp.	3 resp.	1 resp.

1 2 3 4

Drought

63 out of 63 answered

2.3 Average rating

22.2%	33.3%	39.7%	4.8%
14 resp.	21 resp.	25 resp.	3 resp.

1 2 3 4

Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

Earthquake

63 out of 63 answered

2.4 Average rating

17.5%	33.3%	38.1%	11.1%
11 resp.	21 resp.	24 resp.	7 resp.

1 2 3 4

Extreme Temperatures

63 out of 63 answered

2.7 Average rating

6.3%	34.9%	44.4%	14.3%
4 resp.	22 resp.	28 resp.	9 resp.

1 2 3 4

Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

Flooding (Flash and River) 63

out of 63 answered

2.8 Average rating

4.8%	28.6%	44.4%	22.2%
3 resp.	18 resp.	28 resp.	14 resp.

1 2 3 4

Land Subsidence/Sinkholes

63 out of 63 answered

2.0 Average rating

31.7%	36.5%	27%	4.8%
20 resp.	23 resp.	17 resp.	3 resp.

1 2 3 4

Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

Severe Thunderstorms - Including high winds, hail, & lightning

63 out of 63 answered

3.2 Average rating

0%	12.7%	50.8%	36.5%
0 resp.	8 resp.	32 resp.	23 resp.

1 2 3 4

Severe Winter Weather 63

out of 63 answered

3.0 Average rating

1.6%	27%	36.5%	34.9%
1 resp.	17 resp.	23 resp.	22 resp.

1 2 3 4

Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). Please rate EACH hazard 1 through 4 as follows:
1 = Negligible, 2 = Limited, 3 = Critical, 4 = Catastrophic

Tornadoes

63 out of 63 answered

3.2 Average rating

1	2	3	4
1.6%	22.2%	34.9%	41.3%
1 resp.	14 resp.	22 resp.	26 resp.

Wildfire

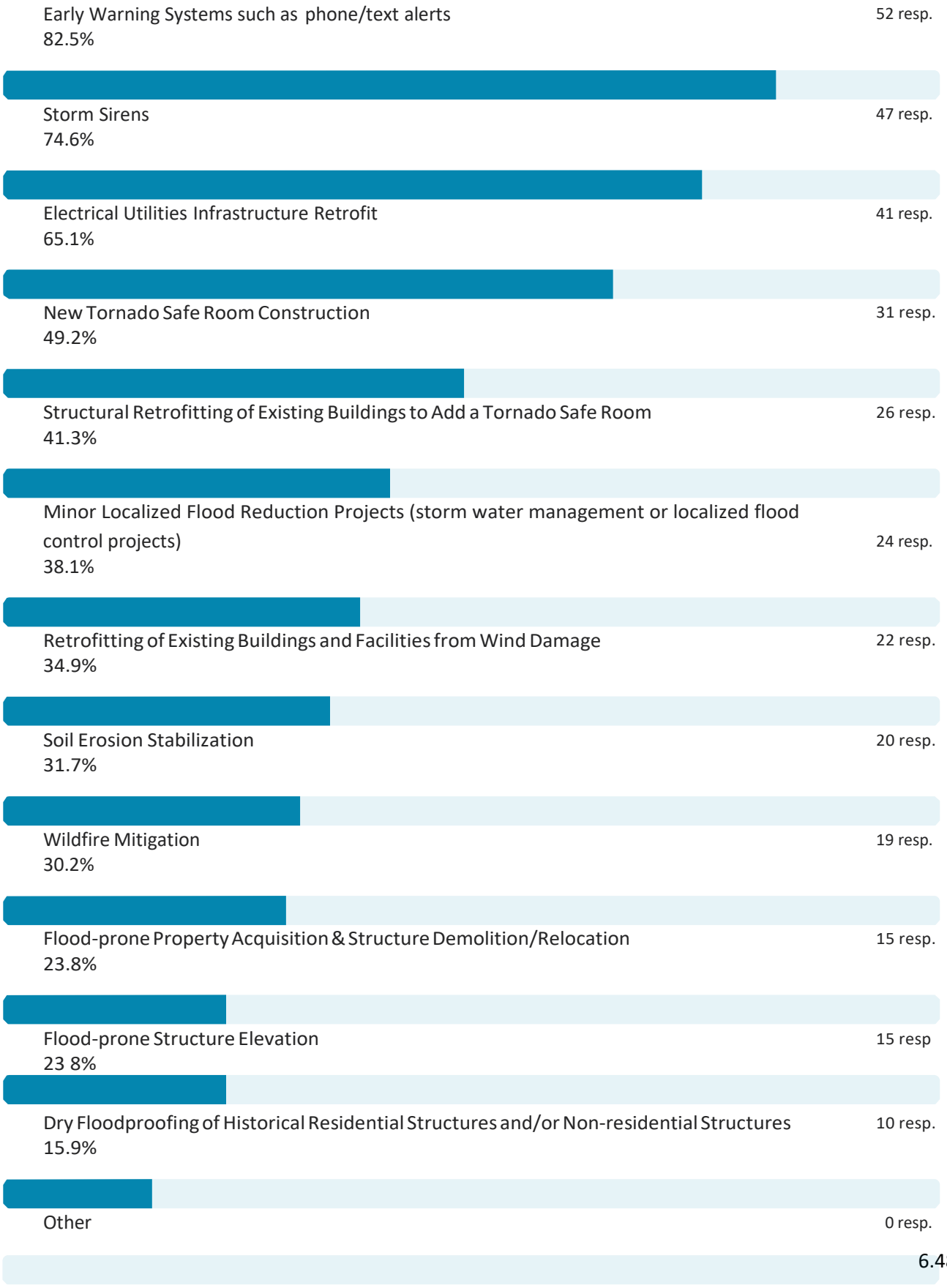
63 out of 63 answered

2.2 Average rating

1	2	3	4
30.2%	31.7%	22.2%	15.9%
19 resp.	20 resp.	14 resp.	10 resp.

FEMA Hazard Mitigation Assistance Grants are administered by the State Emergency Management Agency. Listed below are some types of projects considered.

63 out of 63 answered



0%

Please comment on any other issues that the Crawford County Hazard Mitigation Planning Committee should consider in developing a strategy to reduce future losses caused by hazard events.

- Grants to top/trim trees within the Village and to dig ditch lines and water ways.
- Our one time the flooding was catastrophic it was due to someone placing logs that lossened and damed up the creek.
- Build bridges instead of low water crossings
- Traffic and street infrastructure
- Spotter
- County roads are in critical condition
- Update emergency systems
- Flooding in the Trainer/Timothy Subdivision
- The electrical infrastructure in the city of Cuba needs a lot of work. Trees have been allowed to grow to the point that the overhead lines now run through the branches. Nearly every time a storm comes a power outage occurs some where within the city. In the event of a large storm that could damage trees there would be widespread power outages.
- Burying utilities or better storm proofing them.
- Our roads need desperately to be repaired, and proper drainage and maintenance. Phone and power lines need updates as well.
- Resident participation training exercises.
- So we can keep our pets and kids safe as well as our friends and family and eachother
- Updating the electric grid and the sewers. The systems are so old all it takes is some flooding or a strong wind to mess with them.
- We love our small steam in our city and see it as an asset to our beautiful setting. Therefore, we are interested in reducing the hazard it could cause. We are well equipped to handle tornado warnings. We work with other cities to handle fires and other disasters. But with the stream we are more on our own and we hope we can work with the Planning Committee to reduce its impact if it were to rise to a hazardous level.
- GIS MAPPING SYSTEMS FOR ALL COMMUNITIES
- MORE STABLE POWER LINES
- Prepare for tornadoes better
- More sirens
- Move tornado sirens out in the rural

D: Adoption Resolutions

RESOLUTION NO. 2022-09-27

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, Crawford County recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, Crawford County fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, Crawford County desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of Crawford County demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that Crawford County Commission adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

Presiding Commissioner — Date: 9/27/22

Associate Commissioner — Date: 9-27-22

Associate Commissioner — Date: 9/27/22

RESOLUTION NO. 1022

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the City of Bourbon recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, the City of Bourbon fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, the City of Bourbon desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the City of Bourbon demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that the City of Bourbon Board of Aldermen adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

Mayor — Date: 10-18-22

Witness — Date: 10-18-22

BILL NO. 2072 **RESOLUTION NO.** 10-18

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the City of Cuba recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, the City of Cuba fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

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

WHEREAS, the City of Cuba desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural
Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the City of Cuba demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that the City of Cuba Board of Aldermen adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

READ AND PASSED BY THE BOARD OF ALDERMEN OF THE CITY OF CUBA, MISSOURI, THIS 18 **DAY OF OCTOBER, 2022**

CODY LEATHERS, MAYOR

Attest:

LAINIE GARBO, CITY CLERK
(City Seal)

RESOLUTION NO. 22-01

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the Village of Leasburg recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, the Village of Leasburg fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, the Village of Leasburg desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the Village of Leasburg demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that the Village of Leasburg Board of Trustees adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

Mayor — Date: 10-24-22

Witness: Della Bishop-Baggett — Date: 10-24-22

RESOLUTION NO. 989 2022-14

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the City of Steelville recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, the City of Steelville fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, the City of Steelville desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the City of Steelville demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that the City of Steelville Board of Aldermen adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

Mayor — Date: 10-17-2022

Witness: Sandra C Richter — Date: 10/17/2022

Resolution

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the City of Sullivan recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, the City of Sullivan fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, the City of Sullivan desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the City of Sullivan demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

WHEREAS, adoption of this legitimizes the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

NOW, THEREFORE BE IT RESOLVED, that the City of Sullivan Board of Aldermen adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

Dennis Watz

Dennis Watz, Mayor

10-4-22

Date

Janice K. Koch

Witness: Janice K. Koch, City Clerk

CORPORATE SEAL OF SULLIVAN CITY MISSOURI

10/4/22

Date

RESOLUTION NO. 50

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the Crawford County R-I School District recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, the Crawford County R-I School District fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, the Crawford County R-I School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the Crawford County R-I School District demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that the Crawford County R-I School District Board of Education adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

School Board President — Date: 10/20/22

Witness — Date: 10/20/22

RESOLUTION NO. _____

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the Crawford County R-II School District recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, the Crawford County R-II School District fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, the Crawford County R-II School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the Crawford County R-II School District demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that the Crawford County R-II School District Board of Education adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

_____ 10-19-22

School Board President — Date

_____ 10-19-22

Witness — Date

RESOLUTION NO. _____

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the Steelville R-III School District recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, the Steelville R-II School District fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, the Steelville R-II School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the Steelville R-II School District demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that the Steelville R-II School District Board of Education adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

Jana Booher
School Board President

10-19-2022
Date

April Mathews
Witness

10-19-2022
Date

RESOLUTION NO. ________________

A RESOLUTION TO ADOPT THE CRAWFORD COUNTY MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the Sullivan School District recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 emphasizing the need for pre-disaster mitigation of potential hazards and made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Jurisdiction Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

WHEREAS, the Sullivan School District fully participated in the FEMA prescribed mitigation planning process to prepare this Mitigation Plan; and

WHEREAS, the Sullivan School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Crawford County Multi-Jurisdiction Natural Hazards Mitigation Plan; and

WHEREAS, adoption by the governing body of the Sullivan School District demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Mitigation Plan; and

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

NOW, THEREFORE BE IT RESOLVED, that the Sullivan School District Board of Education adopts the Crawford County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan and will submit this Adoption Resolution to the Missouri Emergency Management Agency and the Federal Emergency Management Agency officials to enable the plan's final approval.

[signature] ______________________ 9.26.22 ______________
School Board President Date

Donna Davis ______________________ 9.26.22 ______________
Witness Date

E: Critical/Essential Facilities

The table below (**Table 6.1**) provides information for critical facilities in the planning area. Specific information includes a Hazus ID if applicable, jurisdiction, building name/owner, and address.

Table 6.1 Crawford County Critical Facilities by Type and Jurisdiction

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Emergency Facilities						
	Crawford Co.	Crawford Co. E-911	PO Box 1314	Steelville	MO	65565
	Crawford Co.	Emergency Management Director	904 W. Washington	Cuba	MO	65453
Fire Department Facilities						
MO000684	Bourbon	Bourbon Fire Prot. Dist.	6 Industrial Park Dr.	Bourbon	MO	65441
MO000426	Cuba	Cuba Fire Dept.	600 South Franklin Street	Cuba	MO	65453
MO000427	Leasburg	Leasburg Comm. Vol. Fire Dept.	205 E Cedar Ave.	Leasburg	MO	65535
	Sullivan	Sullivan Fire Prot. Dist. Station 1	PO Box 475, 6 S Church St	Sullivan	MO	63080
	Sullivan	Sullivan Fire Prot. Dist. Station 4	11890 Mine Road	Sullivan	MO	63080
	Sullivan	Sullivan Fire Prot. Dist. Station 5	1230 N Church Street	Sullivan	MO	63080
MO000685	Steelville	Steelville Fire Prot. Dist. Station 1	PO Box 403, 421 Pine St.	Steelville	MO	65565
	Cherryville	Steelville Fire Prot. Dist. Station 2	Cherryville	Cherryville	MO	65565
	Berryman	Steelville Fire Prot. Dist. Station 3	Berryman	Berryman	MO	65665

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
Law Enforcement Facilities						
MO000579	Crawford County	Crawford County Sheriff's Dept.	212 3rd St. PO Box BE	Steelville	MO	65565
MO000415	Bourbon	Bourbon Police Dept.	355 East Pine St., PO Box 984	Bourbon	MO	65441
MO000394	Cuba	Cuba Police Dept.	602 S Franklin St.	Cuba	MO	65453
MO000026	Steelville	Steelville Police Dept.	895 Frisco St. PO Box M	Steelville	MO	65565
	Sullivan	Sullivan Police Dept.	106 Progress Dr.	Sullivan	MO	63080
HazusID	**Jurisdiction**	**Building Name**	**Address**	**City**	**State**	**Zip**
Medical Facilities						
MO000132	Sullivan	Missouri Bapt. Hospital of Sullivan	751 Sappington Bridge Rd.	Sullivan	MO	63080
	Crawford	Crawford Co. Health Dept.	202 W. Main St.	Steelville	MO	65565
School Facilities						
	Bourbon	Bourbon Elem.	357 Jost Street	Bourbon	MO	65441
	Bourbon	Bourbon Middle	363 Jost Street	Bourbon	MO	65441
	Bourbon	Bourbon High	1500 S Old Hwy 66	Bourbon	MO	65441
	Cuba	Cuba Elem.	1 Wildcat Pride Drive	Cuba	MO	65453
	Cuba	Cuba Middle	1 Wildcat Pride Drive	Cuba	MO	65453
	Cuba	Cuba High	1 Wildcat Pride Drive	Cuba	MO	65453

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
	Steelville	Steelville Elem.	868 W Main St.	Steelville	MO	65565
	Steelville	Steelville Middle	810 W Main St.	Steelville	MO	65565
	Steelville	Steelville High	17154 Hwy 19	Steelville	MO	65565
	Sullivan	Sullivan Elem.	104 W Washington	Sullivan	MO	63080
	Sullivan	Sullivan Primary	1132 Elmont Road	Sullivan	MO	63080
	Sullivan	Sullivan Middle	1156 Elmont Road	Sullivan	MO	63080
	Sullivan	Sullivan High	1073 E Vine St.	Sullivan	MO	63080
Childcare Facilities						
	Cuba	All Aboard Learning Center	201 Rutz Subdivision Rd.	Cuba	MO	65453
	Steelville	Cardinal Care Daycare of Steelville	317 Pine St.	Steelville	MO	65565
	Steelville	Cardinal Clubhouse Daycare of Steelville LLC	319 Pine St.	Steelville	MO	65565
	Steelville	Community Child Care Center Inc.	209 N First St	Steelville	MO	65565
	Sullivan	Hines, Kristi	1151 Lilac Dr.	Sullivan	MO	63080
	Cuba	Killeen, Carleen Ann	10 Northwood Dr	Cuba	MO	65453
	Cuba	Missouri Ozark Community Action, Inc.	100 Hood Drive	Cuba	MO	65453
	Bourbon	Missouri Ozarks Community Action, Inc.	357 Jost St.	Bourbon	MO	65441

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
	Bourbon	Pasch, Brenda Lea	754 Marlette Dr.	Bourbon	MO	65441
	Cuba	St. Pauls Lutheran Early Childhood Center	760 Fleenor Rd.	Cuba	MO	65453
	Cuba	Wise Little Owls Preschool & Child Care Center LLC	401 W Washington	Cuba	MO	65453
HazusID	**Jurisdiction**	**Building Name**	**Address**	**City**	**State**	**Zip**
Nursing Homes						
	Cuba	Arbors Victorian Place	903 Highway DD	Cuba	MO	65453
	Bourbon	Barnabas Redwood Manor	1194 Landon Road	Bourbon	MO	65441
	Cuba	Cuba Manor, Inc.	210 Eldon Dr	Cuba	MO	65453
	Sullivan	Arbors at Dunsford Court-Assisted Living	775 Dunsford Road	Sullivan	MO	63080
	Sullivan	Life Care Center of Sullivan	875 Dunsford Drive	Sullivan	MO	63080
	Sullivan	Meramec Nursing Center	940 Mattox Drive	Sullivan	MO	63080
	Sullivan	Ridgeway Residential Care	431 Russell, PO Box 267	Sullivan	MO	63080
	Cuba	Rock Springs Residential, LLC	81 Pilkenton Lane	Cuba	MO	65453
	Steelville	Steelville Senior Living	311 N. Springfield St.	Steelville	MO	65565
	Steelville	Steelville Senior Living	311 N. Spring Street	Steelville	MO	65565

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
	Cuba	Stubblefield Retirement Home	5349 Highway P	Cuba	MO	65453
	Bourbon	Sunshine Acres	541 Rock Road	Bourbon	MO	65441
	Cuba	Victorian Place of Cuba	901 Highway DD	Cuba	MO	65453
	Sullivan	Victorian Place of Sullivan	1250 East Springfield Rd.	Sullivan	MO	63080

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

F: MDC Wildfire Data Search

View	Discovered Date	County	Station	Cause	Acres Burned
2002-00008-001324	11/08/2002	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	0.5
2002-00008-001334	11/08/2002	Crawford	MDC REPORTING REGION - ST. LOUIS	Equipment	225
2002-00008-001347	11/18/2002	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	1
2002-00008-001349	11/20/2002	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	0.25
2002-02811-001555	07/21/2002	Crawford	Cuba Fire Department	Miscellaneous	1
2002-02811-001556	08/10/2002	Crawford	Cuba Fire Department	Debris	1
2002-02811-001558	08/17/2002	Crawford	Cuba Fire Department	Unknown	1
2002-02811-001560	09/05/2002	Crawford	Cuba Fire Department	Debris	4
2002-02811-001562	10/02/2002	Crawford	Cuba Fire Department	Unknown	1
2002-02811-001563	10/05/2002	Crawford	Cuba Fire Department	Unknown	2
2002-02811-001564	10/12/2002	Crawford	Cuba Fire Department	Railroad	2
2003-00008-001354	03/07/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	55
2003-00008-001358	03/15/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	20
2003-00008-001366	03/24/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	50
2003-00008-001508	03/31/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	5
2003-00008-001533	04/02/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	0.5
2003-00008-001537	04/02/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	10
2003-00008-001543	04/04/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	20
2003-00008-003195	11/03/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	2
2003-02810-003175	08/25/2003	Crawford	Bourbon Fire Protection District	Debris	0.5
2003-02810-003179	10/03/2003	Crawford	Bourbon Fire Protection District	Debris	2
2003-02810-003192	07/31/2003	Crawford	Bourbon Fire Protection District	Not Reported	0.25
2003-02810-003193	08/19/2003	Crawford	Bourbon Fire Protection District	Not Reported	0.25
2003-02810-003194	08/20/2003	Crawford	Bourbon Fire Protection District	Debris	0.25

2003-02810-003196	11/12/2003	Crawford	Bourbon Fire Protection District	Debris	11
2003-02810-003197	11/30/2003	Crawford	Bourbon Fire Protection District	Debris	0.25
2003-02811-003168	08/09/2003	Crawford	Cuba Fire Department	Campfire	1
2003-02811-003169	08/22/2003	Crawford	Cuba Fire Department	Debris	10
2003-02811-003170	08/21/2003	Crawford	Cuba Fire Department	Debris	1
2003-02811-003171	08/14/2003	Crawford	Cuba Fire Department	Equipment	2
2003-02811-003181	12/01/2003	Crawford	Cuba Fire Department	Arson	3
2003-02811-003182	11/29/2003	Crawford	Cuba Fire Department	Debris	2
2003-02813-000047	04/14/2003	Crawford	Steelville Fire Protection District	Debris	2
2003-02813-000093	04/14/2003	Crawford	Steelville Fire Protection District	Debris	2
2003-02813-000682	12/02/2003	Crawford	Steelville Fire Protection District	Debris	2
2003-02813-003159	04/03/2003	Crawford	Steelville Fire Protection District	Not Reported	10
2003-02813-003160	10/30/2003	Crawford	Steelville Fire Protection District	Debris	2
2003-02813-003161	11/04/2003	Crawford	Steelville Fire Protection District	Railroad	4
2003-02813-003162	11/12/2003	Crawford	Steelville Fire Protection District	Debris	2
2003-02813-003163	11/13/2003	Crawford	Steelville Fire Protection District	Debris	2
2003-02813-003164	11/29/2003	Crawford	Steelville Fire Protection District	Debris	2
2003-02813-003165	11/29/2003	Crawford	Steelville Fire Protection District	Debris	2
2003-02813-003166	12/01/2003	Crawford	Steelville Fire Protection District	Debris	0.5
2003-02813-003167	12/03/2003	Crawford	Steelville Fire Protection District	Arson	7
2003-02813-003178	11/04/2003	Crawford	Steelville Fire Protection District	Debris	30
2003-03627-003137	03/08/2003	Crawford	Sullivan Fire Protection District	Unknown	
2003-03627-003143	03/26/2003	Crawford	Sullivan Fire Protection District	Debris	4
2004-00008-004196	04/08/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	1
2004-00008-004197	04/08/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	1
2004-00008-004203	04/08/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	50
2004-00008-004206	04/08/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	0.25
2004-00008-004207	04/09/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	3
2004-00008-004312	04/18/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	5

2004-00008-004594	04/18/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	0.25
2004-00008-004595	04/18/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	0.75
2004-02810-004191	02/24/2004	Crawford	Bourbon Fire Protection District	Debris	15
2004-02810-005748	03/02/2004	Crawford	Bourbon Fire Protection District	Debris	0.7
2004-02810-005749	03/12/2004	Crawford	Bourbon Fire Protection District	Debris	3
2004-02810-005750	03/19/2004	Crawford	Bourbon Fire Protection District	Debris	13
2004-02810-005751	04/06/2004	Crawford	Bourbon Fire Protection District	Debris	4
2004-02810-005752	04/08/2004	Crawford	Bourbon Fire Protection District	Debris	1
2004-02810-005753	04/17/2004	Crawford	Bourbon Fire Protection District	Debris	15
2004-02810-005754	04/18/2004	Crawford	Bourbon Fire Protection District	Debris	70
2004-02810-005755	04/21/2004	Crawford	Bourbon Fire Protection District	Debris	1
2004-02810-005756	05/24/2004	Crawford	Bourbon Fire Protection District	Debris	1
2004-02810-005757	05/21/2004	Crawford	Bourbon Fire Protection District	Equipment	1
2004-02810-005962	08/01/2004	Crawford	Bourbon Fire Protection District	Unknown	0.1
2004-02810-005963	07/10/2004	Crawford	Bourbon Fire Protection District	Unknown	0.1
2004-02810-005964	08/01/2004	Crawford	Bourbon Fire Protection District	Unknown	0.1
2004-02810-005986	10/23/2004	Crawford	Bourbon Fire Protection District	Unknown	0.25
2004-02810-006520	11/06/2004	Crawford	Bourbon Fire Protection District	Debris	1
2004-02810-006521	11/07/2004	Crawford	Bourbon Fire Protection District	Debris	1.5
2004-02810-006522	12/30/2004	Crawford	Bourbon Fire Protection District	Debris	1
2004-02811-003607	01/10/2004	Crawford	Cuba Fire Department	Debris	1
2004-02811-003608	01/02/2004	Crawford	Cuba Fire Department	Unknown	3
2004-02811-003854	03/02/2004	Crawford	Cuba Fire Department	Debris	1
2004-02811-003855	02/28/2004	Crawford	Cuba Fire Department	Debris	0.25
2004-02811-003856	02/28/2004	Crawford	Cuba Fire Department	Debris	1
2004-02811-003857	02/23/2004	Crawford	Cuba Fire Department	Debris	1
2004-02811-004186	03/22/2004	Crawford	Cuba Fire Department	Debris	14
2004-02811-004307	04/18/2004	Crawford	Cuba Fire Department	Debris	2
2004-02811-006517	12/04/2004	Crawford	Cuba Fire Department	Debris	2

2004-02811-006518	11/15/2004	Crawford	Cuba Fire Department	Unknown	1
2004-02811-006519	11/10/2004	Crawford	Cuba Fire Department	Unknown	1
2004-02811-006657	11/08/2004	Crawford	Cuba Fire Department	Debris	1
2004-02811-006658	09/25/2004	Crawford	Cuba Fire Department	Unknown	1
2004-02812-005109	06/03/2004	Crawford	Leasburg Community Volunteer Fire Departmetn	Arson	16
2004-02813-003639	01/11/2004	Crawford	Steelville Fire Protection District	Debris	5
2004-02813-003640	01/11/2004	Crawford	Steelville Fire Protection District	Debris	10
2004-02813-003641	02/18/2004	Crawford	Steelville Fire Protection District	Debris	35
2004-02813-003642	02/23/2004	Crawford	Steelville Fire Protection District	Debris	2
2004-02813-003643	02/23/2004	Crawford	Steelville Fire Protection District	Debris	2
2004-02813-003644	02/23/2004	Crawford	Steelville Fire Protection District	Debris	1
2004-02813-003806	02/22/2004	Crawford	Steelville Fire Protection District	Debris	12
2004-02813-003843	02/22/2004	Crawford	Steelville Fire Protection District	Arson	3
2004-02813-003844	02/27/2004	Crawford	Steelville Fire Protection District	Debris	2
2004-02813-003845	02/28/2004	Crawford	Steelville Fire Protection District	Debris	5
2004-02813-003850	03/01/2004	Crawford	Steelville Fire Protection District	Equipment	1
2004-02813-003851	03/02/2004	Crawford	Steelville Fire Protection District	Debris	5
2004-02813-003852	03/08/2004	Crawford	Steelville Fire Protection District	Debris	4.5
2004-02813-003859	03/10/2004	Crawford	Steelville Fire Protection District	Arson	4
2004-02813-003860	03/12/2004	Crawford	Steelville Fire Protection District	Debris	2
2004-02813-005987	10/25/2004	Crawford	Steelville Fire Protection District	Debris	2
2004-02813-005988	10/25/2004	Crawford	Steelville Fire Protection District	Arson	2
2004-02813-005989	10/07/2004	Crawford	Steelville Fire Protection District	Unknown	2
2004-02813-006008	04/15/2004	Crawford	Steelville Fire Protection District	Debris	0.5
2004-02813-006009	03/22/2004	Crawford	Steelville Fire Protection District	Debris	2
2004-02813-006010	03/21/2004	Crawford	Steelville Fire Protection District	Debris	2
2004-02813-006023	10/03/2004	Crawford	Steelville Fire Protection District	Unknown	2
2004-02813-006024	09/27/2004	Crawford	Steelville Fire Protection District	Unknown	2

2004-02813-006025	10/07/2004	Crawford	Steelville Fire Protection District	Unknown	2
2004-02813-006515	12/30/2004	Crawford	Steelville Fire Protection District	Not Reported	2
2004-02813-006516	12/25/2004	Crawford	Steelville Fire Protection District	Debris	2
2004-03600-005828	03/12/2004	Crawford	SULLIVAN FORESTRY	Miscellaneous	5
2004-03600-005829	03/19/2004	Crawford	SULLIVAN FORESTRY	Arson	80
2004-03627-003136	04/10/2004	Crawford	Sullivan Fire Protection District	Debris	1
2004-03627-003689	02/25/2004	Crawford	Sullivan Fire Protection District	Debris	7
2004-03627-004047	02/29/2004	Crawford	Sullivan Fire Protection District	Debris	4
2004-03627-004048	02/28/2004	Crawford	Sullivan Fire Protection District	Unknown	1
2004-03627-004109	03/12/2004	Crawford	Sullivan Fire Protection District	Miscellaneous	10
2004-03627-004120	03/21/2004	Crawford	Sullivan Fire Protection District	Debris	1
2004-03627-004123	03/29/2004	Crawford	Sullivan Fire Protection District	Debris	1
2004-03627-005099	06/01/2004	Crawford	Sullivan Fire Protection District	Debris	1
2005-00008-007019	03/18/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	16
2005-00008-007020	03/12/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	110
2005-00008-007021	03/18/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	4
2005-00008-007022	03/30/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	98
2005-00008-007023	03/06/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Campfire	16
2005-00008-007025	03/14/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	325
2005-00008-007379	03/31/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	2
2005-00008-007409	04/19/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	44
2005-00008-007410	03/19/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	5
2005-00008-007411	04/18/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	25
2005-00008-008654	03/17/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Equipment	1
2005-00008-009938	11/23/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	2
2005-02810-009025	04/03/2005	Crawford	Bourbon Fire Protection District	Debris	1
2005-02810-009026	04/04/2005	Crawford	Bourbon Fire Protection District	Debris	0.5
2005-02810-009027	04/09/2005	Crawford	Bourbon Fire Protection District	Debris	0.25
2005-02810-009030	04/14/2005	Crawford	Bourbon Fire Protection District	Unknown	0.5

2005-02810-009032	04/17/2005	Crawford	Bourbon Fire Protection District	Debris	1
2005-02810-009033	05/25/2005	Crawford	Bourbon Fire Protection District	Debris	0.25
2005-02810-009034	05/07/2005	Crawford	Bourbon Fire Protection District	Debris	0.25
2005-02810-009035	03/13/2005	Crawford	Bourbon Fire Protection District	Equipment	1
2005-02810-009036	03/20/2005	Crawford	Bourbon Fire Protection District	Debris	10
2005-02810-009037	03/20/2005	Crawford	Bourbon Fire Protection District	Debris	3
2005-02810-009038	03/12/2005	Crawford	Bourbon Fire Protection District	Debris	0.25
2005-02810-009039	03/30/2005	Crawford	Bourbon Fire Protection District	Debris	2
2005-02810-009040	03/06/2005	Crawford	Bourbon Fire Protection District	Debris	1
2005-02810-009041	03/31/2005	Crawford	Bourbon Fire Protection District	Equipment	1
2005-02810-009868	08/29/2005	Crawford	Bourbon Fire Protection District	Unknown	1
2005-02810-009870	07/06/2005	Crawford	Bourbon Fire Protection District	Debris	0.1
2005-02810-009871	07/03/2005	Crawford	Bourbon Fire Protection District	Equipment	15
2005-02810-009872	06/27/2005	Crawford	Bourbon Fire Protection District	Debris	0.8
2005-02811-007024	02/26/2005	Crawford	Cuba Fire Department	Debris	5
2005-02811-007026	02/26/2005	Crawford	Cuba Fire Department	Debris	5
2005-02811-007433	03/05/2005	Crawford	Cuba Fire Department	Debris	2
2005-02811-007434	03/21/2005	Crawford	Cuba Fire Department	Debris	4
2005-02811-007436	03/20/2005	Crawford	Cuba Fire Department	Equipment	1
2005-02811-007438	03/18/2005	Crawford	Cuba Fire Department	Equipment	0.5
2005-02811-007440	03/17/2005	Crawford	Cuba Fire Department	Unknown	0.5
2005-02811-007442	03/16/2005	Crawford	Cuba Fire Department	Debris	3
2005-02811-007445	03/14/2005	Crawford	Cuba Fire Department	Unknown	0.5
2005-02811-007446	03/14/2005	Crawford	Cuba Fire Department	Debris	3
2005-02811-007447	03/12/2005	Crawford	Cuba Fire Department	Debris	1
2005-02811-009022	03/31/2005	Crawford	Cuba Fire Department	Debris	2
2005-02811-009023	03/30/2005	Crawford	Cuba Fire Department	Unknown	2
2005-02811-009024	04/10/2005	Crawford	Cuba Fire Department	Debris	0.5
2005-02811-009770	05/02/2005	Crawford	Cuba Fire Department	Miscellaneous	1

2005-02811-009772	05/04/2005	Crawford	Cuba Fire Department	Unknown	0.25
2005-02811-009773	06/25/2005	Crawford	Cuba Fire Department	Equipment	0.5
2005-02811-009775	07/02/2005	Crawford	Cuba Fire Department	Arson	2
2005-02811-009776	08/03/2005	Crawford	Cuba Fire Department	Debris	0.25
2005-02811-009778	08/12/2005	Crawford	Cuba Fire Department	Debris	0.25
2005-02811-009937	09/12/2005	Crawford	Cuba Fire Department	Unknown	2
2005-02811-010869	11/26/2005	Crawford	Cuba Fire Department	Debris	2
2005-02811-010870	11/24/2005	Crawford	Cuba Fire Department	Debris	1.5
2005-02811-010871	11/23/2005	Crawford	Cuba Fire Department	Unknown	2
2005-02811-010872	11/12/2005	Crawford	Cuba Fire Department	Unknown	0.1
2005-02811-010873	11/26/2005	Crawford	Cuba Fire Department	Debris	1
2005-02812-010030	04/05/2005	Crawford	Leasburg Community Volunteer Fire Departmetn	Unknown	26
2005-02812-010031	07/02/2005	Crawford	Leasburg Community Volunteer Fire Departmetn	Smoking	1
2005-02812-010032	07/03/2005	Crawford	Leasburg Community Volunteer Fire Departmetn	Unknown	1
2005-02812-010033	07/04/2005	Crawford	Leasburg Community Volunteer Fire Departmetn	Not Reported	1
2005-02812-010034	07/10/2005	Crawford	Leasburg Community Volunteer Fire Departmetn	Miscellaneous	1
2005-02813-000681	12/02/2005	Crawford	Steelville Fire Protection District	Debris	5
2005-02813-007380	02/20/2005	Crawford	Steelville Fire Protection District	Arson	2
2005-02813-007381	02/20/2005	Crawford	Steelville Fire Protection District	Debris	2
2005-02813-007382	03/18/2005	Crawford	Steelville Fire Protection District	Debris	2
2005-02813-007383	03/06/2005	Crawford	Steelville Fire Protection District	Smoking	3
2005-02813-007384	03/12/2005	Crawford	Steelville Fire Protection District	Not Reported	2
2005-02813-007386	04/18/2005	Crawford	Steelville Fire Protection District	Arson	5
2005-02813-007388	04/18/2005	Crawford	Steelville Fire Protection District	Arson	10
2005-02813-007397	03/30/2005	Crawford	Steelville Fire Protection District	Equipment	150

2005-02813-007399	04/03/2005	Crawford	Steelville Fire Protection District	Debris	7
2005-02813-007400	04/09/2005	Crawford	Steelville Fire Protection District	Unknown	4
2005-02813-007401	03/29/2005	Crawford	Steelville Fire Protection District	Debris	2
2005-02813-007402	03/30/2005	Crawford	Steelville Fire Protection District	Equipment	25
2005-02813-007403	03/30/2005	Crawford	Steelville Fire Protection District	Unknown	900
2005-02813-007404	03/31/2005	Crawford	Steelville Fire Protection District	Debris	1.5
2005-02813-007405	03/31/2005	Crawford	Steelville Fire Protection District	Debris	0.5
2005-02813-007406	03/31/2005	Crawford	Steelville Fire Protection District	Debris	0.5
2005-02813-007407	03/31/2005	Crawford	Steelville Fire Protection District	Debris	0.5
2005-02813-007408	03/31/2005	Crawford	Steelville Fire Protection District	Unknown	30
2005-02813-008908	04/19/2005	Crawford	Steelville Fire Protection District	Arson	50
2005-02813-008909	04/19/2005	Crawford	Steelville Fire Protection District	Arson	6
2005-02813-009042	04/03/2005	Crawford	Steelville Fire Protection District	Debris	1
2005-02813-009866	07/02/2005	Crawford	Steelville Fire Protection District	Unknown	30
2005-02813-009867	07/06/2005	Crawford	Steelville Fire Protection District	Equipment	2
2005-03626-008863	03/12/2005	Crawford	St Clair Fire Protection District	Unknown	1
2005-03627-007779	03/06/2005	Crawford	Sullivan Fire Protection District	Debris	3
2005-03627-007783	03/05/2005	Crawford	Sullivan Fire Protection District	Miscellaneous	1
2005-03627-009028	06/24/2005	Crawford	Sullivan Fire Protection District	Miscellaneous	1
2005-03627-009542	07/07/2005	Crawford	Sullivan Fire Protection District	Debris	1
2005-03627-009543	07/07/2005	Crawford	Sullivan Fire Protection District	Miscellaneous	1
2005-04718-009099	04/06/2005	Crawford	Quad County Fire Protection District	Arson	100
2005-04718-009101	04/04/2005	Crawford	Quad County Fire Protection District	Arson	8
2005-04718-009105	03/04/2005	Crawford	Quad County Fire Protection District	Debris	3
2005-04718-010147	11/09/2005	Crawford	Quad County Fire Protection District	Arson	4
2005-04718-010148	11/23/2005	Crawford	Quad County Fire Protection District	Debris	35
2005-04718-010155	11/26/2005	Crawford	Quad County Fire Protection District	Arson	50
2005-08100-008171	03/30/2005	Crawford	ROLLA FORESTRY	Debris	46
2005-08110-008129	03/30/2005	Crawford	St. James Fire Protection District	Miscellaneous	80

2005-11043-007803	03/30/2005	Crawford	Potosi Fire Protection District	Debris	200
2005-11043-007806	03/30/2005	Crawford	Potosi Fire Protection District	Debris	60
2006-00005-012334	03/17/2006	Crawford	MDC REPORTING REGION - OZARK	Arson	47
2006-00008-011255	02/27/2006	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	1
2006-02810-012421	02/26/2006	Crawford	Bourbon Fire Protection District	Debris	10
2006-02810-012422	02/24/2006	Crawford	Bourbon Fire Protection District	Debris	2
2006-02810-012423	02/23/2006	Crawford	Bourbon Fire Protection District	Debris	1
2006-02810-012424	02/14/2006	Crawford	Bourbon Fire Protection District	Equipment	1.5
2006-02810-023651	03/16/2006	Crawford	Bourbon Fire Protection District	Debris	10
2006-02810-023652	03/26/2006	Crawford	Bourbon Fire Protection District	Debris	5
2006-02810-023653	03/26/2006	Crawford	Bourbon Fire Protection District	Debris	5
2006-02810-023654	03/15/2006	Crawford	Bourbon Fire Protection District	Debris	0.5
2006-02810-023655	03/01/2006	Crawford	Bourbon Fire Protection District	Debris	0.5
2006-02810-023656	04/26/2006	Crawford	Bourbon Fire Protection District	Debris	0.25
2006-02810-023657	04/09/2006	Crawford	Bourbon Fire Protection District	Debris	1
2006-02810-027145	11/25/2006	Crawford	Bourbon Fire Protection District	Miscellaneous	6
2006-02810-027205	07/01/2006	Crawford	Bourbon Fire Protection District	Debris	0.1
2006-02810-027206	07/03/2006	Crawford	Bourbon Fire Protection District	Equipment	0.1
2006-02810-027208	07/25/2006	Crawford	Bourbon Fire Protection District	Unknown	8
2006-02810-027209	08/10/2006	Crawford	Bourbon Fire Protection District	Equipment	0.2
2006-02810-027210	08/16/2006	Crawford	Bourbon Fire Protection District	Debris	2
2006-02810-027211	09/16/2006	Crawford	Bourbon Fire Protection District	Debris	0.25
2006-02810-027212	10/13/2006	Crawford	Bourbon Fire Protection District	Debris	15
2006-02810-027213	11/26/2006	Crawford	Bourbon Fire Protection District	Debris	10
2006-02811-010874	01/18/2006	Crawford	Cuba Fire Department	Debris	3
2006-02811-023507	02/23/2006	Crawford	Cuba Fire Department	Debris	30
2006-02811-023508	04/16/2006	Crawford	Cuba Fire Department	Debris	1
2006-02811-023509	04/14/2006	Crawford	Cuba Fire Department	Debris	3
2006-02811-023521	04/01/2006	Crawford	Cuba Fire Department	Debris	7

2006-02811-023522	02/24/2006	Crawford	Cuba Fire Department	Debris	60
2006-02811-023545	03/14/2006	Crawford	Cuba Fire Department	Unknown	0.1
2006-02811-023546	03/11/2006	Crawford	Cuba Fire Department	Debris	30
2006-02811-023547	02/26/2006	Crawford	Cuba Fire Department	Unknown	20
2006-02811-023548	02/28/2006	Crawford	Cuba Fire Department	Debris	1
2006-02811-025738	06/13/2006	Crawford	Cuba Fire Department	Unknown	0.2
2006-02811-025739	05/21/2006	Crawford	Cuba Fire Department	Unknown	0.1
2006-02811-025741	07/02/2006	Crawford	Cuba Fire Department	Unknown	0.1
2006-02811-025743	07/01/2006	Crawford	Cuba Fire Department	Unknown	0.1
2006-02811-025745	07/03/2006	Crawford	Cuba Fire Department	Arson	1
2006-02811-025747	07/07/2006	Crawford	Cuba Fire Department	Equipment	0.2
2006-02811-025749	07/25/2006	Crawford	Cuba Fire Department	Debris	5
2006-02811-025750	07/31/2006	Crawford	Cuba Fire Department	Unknown	0.1
2006-02811-025757	08/06/2006	Crawford	Cuba Fire Department	Unknown	5
2006-02811-025758	08/09/2006	Crawford	Cuba Fire Department	Debris	6
2006-02811-025760	08/15/2006	Crawford	Cuba Fire Department	Unknown	0.1
2006-02811-027311	11/23/2006	Crawford	Cuba Fire Department	Arson	1
2006-02811-027312	12/27/2006	Crawford	Cuba Fire Department	Unknown	3
2006-02811-027313	11/18/2006	Crawford	Cuba Fire Department	Debris	0.25
2006-02812-026382	11/30/2006	Crawford	Leasburg Community Volunteer Fire Departmetn	Unknown	16
2006-02812-026463	12/07/2006	Crawford	Leasburg Community Volunteer Fire Departmetn	Equipment	1
2006-02812-026523	04/01/2006	Crawford	Leasburg Community Volunteer Fire Departmetn	Unknown	0.25
2006-02812-026532	08/14/2006	Crawford	Leasburg Community Volunteer Fire Departmetn	Debris	10
2006-02813-023641	01/08/2006	Crawford	Steelville Fire Protection District	Debris	2
2006-02813-023642	02/28/2006	Crawford	Steelville Fire Protection District	Debris	0.25
2006-02813-023643	03/01/2006	Crawford	Steelville Fire Protection District	Debris	3

2006-02813-023644	04/11/2006	Crawford	Steelville Fire Protection District	Debris	4
2006-02813-023646	01/27/2006	Crawford	Steelville Fire Protection District	Debris	50
2006-03627-011828	02/24/2006	Crawford	Sullivan Fire Protection District	Unknown	10
2006-03627-011829	02/27/2006	Crawford	Sullivan Fire Protection District	Debris	5
2006-03627-011830	02/27/2006	Crawford	Sullivan Fire Protection District	Equipment	1
2006-03627-011832	02/28/2006	Crawford	Sullivan Fire Protection District	Debris	5
2006-03627-013010	03/02/2006	Crawford	Sullivan Fire Protection District	Debris	1
2006-03627-013014	01/14/2006	Crawford	Sullivan Fire Protection District	Debris	1
2006-03627-013016	03/30/2006	Crawford	Sullivan Fire Protection District	Equipment	1
2006-03627-023768	04/10/2006	Crawford	Sullivan Fire Protection District	Debris	5
2006-03627-024728	06/09/2006	Crawford	Sullivan Fire Protection District	Equipment	0.9
2006-03627-024743	07/06/2006	Crawford	Sullivan Fire Protection District	Unknown	0.2
2006-03627-024744	07/04/2006	Crawford	Sullivan Fire Protection District	Unknown	0.1
2006-03627-025342	08/06/2006	Crawford	Sullivan Fire Protection District	Unknown	1
2006-03627-025344	08/07/2006	Crawford	Sullivan Fire Protection District	Miscellaneous	0.1
2006-03627-026371	11/28/2006	Crawford	Sullivan Fire Protection District	Equipment	0.7
2006-04718-023715	04/07/2006	Crawford	Quad County Fire Protection District	Arson	10
2006-04718-027039	11/26/2006	Crawford	Quad County Fire Protection District	Debris	1
2006-04718-027040	11/04/2006	Crawford	Quad County Fire Protection District	Debris	3
2006-09140-025744	07/02/2006	Crawford	Current River Volunteer Fire Department	Lightning	0.1
2006-10399-013156	04/08/2006	Crawford	Puxico Fire Department	Arson	2
2007-00008-031615	11/01/2007	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	1
2007-00008-031855	11/16/2007	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	5
2007-02810-031049	09/02/2007	Crawford	Bourbon Fire Protection District	Miscellaneous	5
2007-02811-028587	02/10/2007	Crawford	Cuba Fire Department	Unknown	0.5
2007-02811-028588	02/10/2007	Crawford	Cuba Fire Department	Debris	1
2007-02811-028589	02/11/2007	Crawford	Cuba Fire Department	Debris	1
2007-02811-028590	03/05/2007	Crawford	Cuba Fire Department	Debris	4
2007-02811-028591	03/06/2007	Crawford	Cuba Fire Department	Debris	1

2007-02811-028592	03/03/2007	Crawford	Cuba Fire Department	Unknown	2
2007-02811-028593	03/07/2007	Crawford	Cuba Fire Department	Unknown	2
2007-02811-028594	03/11/2007	Crawford	Cuba Fire Department	Debris	2
2007-02811-028595	03/11/2007	Crawford	Cuba Fire Department	Debris	2
2007-02811-028596	03/11/2007	Crawford	Cuba Fire Department	Children	10
2007-02811-028597	03/11/2007	Crawford	Cuba Fire Department	Debris	1
2007-02811-030279	03/23/2007	Crawford	Cuba Fire Department	Lightning	0.25
2007-02811-030280	04/16/2007	Crawford	Cuba Fire Department	Debris	0.25
2007-02811-030281	04/19/2007	Crawford	Cuba Fire Department	Unknown	1
2007-02811-030282	04/30/2007	Crawford	Cuba Fire Department	Unknown	0.25
2007-02811-030284	05/19/2007	Crawford	Cuba Fire Department	Unknown	0.25
2007-02811-030285	05/23/2007	Crawford	Cuba Fire Department	Unknown	0.25
2007-02811-031715	07/08/2007	Crawford	Cuba Fire Department	Debris	0.25
2007-02811-031716	08/02/2007	Crawford	Cuba Fire Department	Debris	0.75
2007-02811-031717	08/09/2007	Crawford	Cuba Fire Department	Equipment	1
2007-02811-031718	11/02/2007	Crawford	Cuba Fire Department	Debris	0.25
2007-02811-031719	11/04/2007	Crawford	Cuba Fire Department	Debris	0.25
2007-02811-031720	11/06/2007	Crawford	Cuba Fire Department	Debris	0.5
2007-02811-031901	09/29/2007	Crawford	Cuba Fire Department	Unknown	5
2007-02811-031902	08/29/2007	Crawford	Cuba Fire Department	Unknown	0.25
2007-02811-031904	11/08/2007	Crawford	Cuba Fire Department	Debris	0.5
2007-02811-031905	11/10/2007	Crawford	Cuba Fire Department	Debris	0.75
2007-02811-031906	11/10/2007	Crawford	Cuba Fire Department	Debris	0.25
2007-02811-031907	11/16/2007	Crawford	Cuba Fire Department	Debris	5
2007-02811-031908	11/17/2007	Crawford	Cuba Fire Department	Debris	0.5
2007-02811-033072	12/31/2007	Crawford	Cuba Fire Department	Miscellaneous	0.25
2007-02812-028585	02/11/2007	Crawford	Leasburg Community Volunteer Fire Departmetn	Unknown	1

2007-02812-028586	02/11/2007	Crawford	Leasburg Community Volunteer Fire Departmetn	Unknown	2
2007-02813-028534	01/09/2007	Crawford	Steelville Fire Protection District	Debris	3
2007-02813-028535	01/10/2007	Crawford	Steelville Fire Protection District	Debris	1
2007-02813-028536	01/10/2007	Crawford	Steelville Fire Protection District	Debris	1
2007-02813-028537	01/11/2007	Crawford	Steelville Fire Protection District	Unknown	3
2007-02813-028538	01/30/2007	Crawford	Steelville Fire Protection District	Unknown	1
2007-02813-028540	02/23/2007	Crawford	Steelville Fire Protection District	Debris	1
2007-02813-028541	02/23/2007	Crawford	Steelville Fire Protection District	Unknown	1
2007-02813-028543	03/07/2007	Crawford	Steelville Fire Protection District	Unknown	15
2007-02813-028544	03/07/2007	Crawford	Steelville Fire Protection District	Debris	15
2007-02813-028551	03/07/2007	Crawford	Steelville Fire Protection District	Miscellaneous	40
2007-02813-028552	03/10/2007	Crawford	Steelville Fire Protection District	Debris	2
2007-02813-028554	03/11/2007	Crawford	Steelville Fire Protection District	Arson	3
2007-02813-028556	03/11/2007	Crawford	Steelville Fire Protection District	Debris	2
2007-02813-028558	03/11/2007	Crawford	Steelville Fire Protection District	Debris	2
2007-02813-028559	03/11/2007	Crawford	Steelville Fire Protection District	Arson	40
2007-02813-028560	03/14/2007	Crawford	Steelville Fire Protection District	Unknown	2
2007-02813-032041	04/02/2007	Crawford	Steelville Fire Protection District	Not Reported	5
2007-02813-032042	04/09/2007	Crawford	Steelville Fire Protection District	Debris	3
2007-02813-032043	04/19/2007	Crawford	Steelville Fire Protection District	Unknown	1
2007-02813-032044	04/23/2007	Crawford	Steelville Fire Protection District	Debris	1
2007-02813-032045	04/28/2007	Crawford	Steelville Fire Protection District	Debris	2
2007-02813-032046	05/01/2007	Crawford	Steelville Fire Protection District	Debris	1
2007-02813-032047	05/19/2007	Crawford	Steelville Fire Protection District	Unknown	2
2007-02813-032048	05/24/2007	Crawford	Steelville Fire Protection District	Unknown	2
2007-02813-032049	08/09/2007	Crawford	Steelville Fire Protection District	Debris	1
2007-02813-032050	08/12/2007	Crawford	Steelville Fire Protection District	Miscellaneous	2
2007-02813-032051	08/12/2007	Crawford	Steelville Fire Protection District	Unknown	1

2007-02813-032052	08/14/2007	Crawford	Steelville Fire Protection District	Miscellaneous	1
2007-02813-032053	09/03/2007	Crawford	Steelville Fire Protection District	Unknown	1
2007-02813-032054	09/28/2007	Crawford	Steelville Fire Protection District	Unknown	1
2007-02813-032055	10/07/2007	Crawford	Steelville Fire Protection District	Unknown	1
2007-02813-032057	11/09/2007	Crawford	Steelville Fire Protection District	Debris	1
2007-02813-032058	11/09/2007	Crawford	Steelville Fire Protection District	Debris	1
2007-02813-032059	11/09/2007	Crawford	Steelville Fire Protection District	Unknown	4
2007-02813-032060	11/10/2007	Crawford	Steelville Fire Protection District	Unknown	1
2007-02813-032063	11/18/2007	Crawford	Steelville Fire Protection District	Smoking	2
2007-02813-032064	11/28/2007	Crawford	Steelville Fire Protection District	Debris	1
2007-03627-027983	03/07/2007	Crawford	Sullivan Fire Protection District	Unknown	0.1
2007-03627-028754	03/09/2007	Crawford	Sullivan Fire Protection District	Debris	1
2007-03627-029772	04/30/2007	Crawford	Sullivan Fire Protection District	Debris	0.5
2007-03627-030662	08/05/2007	Crawford	Sullivan Fire Protection District	Unknown	2
2007-04718-028882	03/02/2007	Crawford	Quad County Fire Protection District	Unknown	1
2007-04718-028884	03/04/2007	Crawford	Quad County Fire Protection District	Unknown	30
2007-04718-028886	03/07/2007	Crawford	Quad County Fire Protection District	Unknown	5
2007-09421-032958	12/01/2007	Crawford	Leadwood Fire Protection District	Not Reported	5
2008-00008-032676	01/04/2008	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	5
2008-00008-034275	04/16/2008	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	20
2008-02810-036273	01/03/2008	Crawford	Bourbon Fire Protection District	Debris	1
2008-02810-036274	01/06/2008	Crawford	Bourbon Fire Protection District	Arson	1
2008-02810-036275	01/06/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-036276	03/01/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-036277	03/09/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-036278	03/11/2008	Crawford	Bourbon Fire Protection District	Unknown	5
2008-02810-036279	03/25/2008	Crawford	Bourbon Fire Protection District	Equipment	1
2008-02810-036280	03/27/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-036281	04/05/2008	Crawford	Bourbon Fire Protection District	Unknown	1

2008-02810-036282	04/15/2008	Crawford	Bourbon Fire Protection District	Campfire	1
2008-02810-036283	04/17/2008	Crawford	Bourbon Fire Protection District	Campfire	1
2008-02810-036284	04/30/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-036285	06/16/2008	Crawford	Bourbon Fire Protection District	Lightning	1
2008-02810-036286	11/26/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-036287	11/28/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-036288	12/07/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-036289	12/07/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-036290	12/07/2008	Crawford	Bourbon Fire Protection District	Unknown	1
2008-02810-038419	03/08/2008	Crawford	Bourbon Fire Protection District	Miscellaneous	30
2008-02811-033074	01/04/2008	Crawford	Cuba Fire Department	Arson	0.1
2008-02811-033076	01/04/2008	Crawford	Cuba Fire Department	Arson	0.1
2008-02811-033078	01/04/2008	Crawford	Cuba Fire Department	Arson	0.1
2008-02811-033079	01/04/2008	Crawford	Cuba Fire Department	Arson	0.25
2008-02811-033080	01/15/2008	Crawford	Cuba Fire Department	Debris	0.1
2008-02811-033082	01/19/2008	Crawford	Cuba Fire Department	Miscellaneous	0.01
2008-02811-033083	01/21/2008	Crawford	Cuba Fire Department	Equipment	0.1
2008-02811-033527	01/26/2008	Crawford	Cuba Fire Department	Debris	2
2008-02811-033528	01/27/2008	Crawford	Cuba Fire Department	Debris	1
2008-02811-033529	01/27/2008	Crawford	Cuba Fire Department	Debris	5
2008-02811-033530	01/27/2008	Crawford	Cuba Fire Department	Debris	1
2008-02811-033531	02/09/2008	Crawford	Cuba Fire Department	Debris	3
2008-02811-033532	02/09/2008	Crawford	Cuba Fire Department	Debris	1
2008-02811-034177	03/01/2008	Crawford	Cuba Fire Department	Not Reported	0.25
2008-02811-034178	03/01/2008	Crawford	Cuba Fire Department	Not Reported	5
2008-02811-034180	03/02/2008	Crawford	Cuba Fire Department	Debris	0.25
2008-02811-034181	03/09/2008	Crawford	Cuba Fire Department	Unknown	2
2008-02811-034182	03/11/2008	Crawford	Cuba Fire Department	Debris	1.5
2008-02811-034183	03/11/2008	Crawford	Cuba Fire Department	Debris	1.2

2008-02811-034184	03/11/2008	Crawford	Cuba Fire Department	Debris	1
2008-02811-034186	03/12/2008	Crawford	Cuba Fire Department	Debris	0.5
2008-02811-034187	03/02/2008	Crawford	Cuba Fire Department	Debris	0.5
2008-02811-034188	03/12/2008	Crawford	Cuba Fire Department	Debris	25
2008-02811-034189	03/14/2008	Crawford	Cuba Fire Department	Debris	1
2008-02811-034190	03/24/2008	Crawford	Cuba Fire Department	Debris	50
2008-02811-034192	04/07/2008	Crawford	Cuba Fire Department	Debris	2
2008-02811-034194	04/06/2008	Crawford	Cuba Fire Department	Debris	5
2008-02811-034278	04/16/2008	Crawford	Cuba Fire Department	Debris	20
2008-02811-036001	04/26/2008	Crawford	Cuba Fire Department	Unknown	0.5
2008-02811-036002	10/03/2008	Crawford	Cuba Fire Department	Arson	1
2008-02811-036003	11/01/2008	Crawford	Cuba Fire Department	Unknown	1
2008-02811-036255	10/03/2008	Crawford	Cuba Fire Department	Unknown	0.1
2008-02811-036260	11/01/2008	Crawford	Cuba Fire Department	Unknown	1
2008-02811-036261	11/10/2008	Crawford	Cuba Fire Department	Unknown	0.5
2008-02811-036262	11/28/2008	Crawford	Cuba Fire Department	Debris	2
2008-02811-036263	11/28/2008	Crawford	Cuba Fire Department	Debris	2
2008-02811-036264	11/22/2008	Crawford	Cuba Fire Department	Debris	2
2008-02813-034387	01/03/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-034388	01/14/2008	Crawford	Steelville Fire Protection District	Miscellaneous	2
2008-02813-034389	01/27/2008	Crawford	Steelville Fire Protection District	Debris	5
2008-02813-034390	01/27/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-034391	01/27/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-034392	01/28/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-034393	03/01/2008	Crawford	Steelville Fire Protection District	Unknown	2
2008-02813-034394	03/01/2008	Crawford	Steelville Fire Protection District	Unknown	2
2008-02813-034396	03/12/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-034397	03/12/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-034399	03/14/2008	Crawford	Steelville Fire Protection District	Debris	33

2008-02813-034401	03/22/2008	Crawford	Steelville Fire Protection District	Debris	6
2008-02813-034402	03/22/2008	Crawford	Steelville Fire Protection District	Debris	10
2008-02813-034403	03/24/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-034447	04/01/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-034449	04/01/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-034450	04/06/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-034453	04/06/2008	Crawford	Steelville Fire Protection District	Debris	10
2008-02813-034455	04/11/2008	Crawford	Steelville Fire Protection District	Miscellaneous	2
2008-02813-034457	04/16/2008	Crawford	Steelville Fire Protection District	Miscellaneous	40
2008-02813-034458	04/21/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-034459	04/22/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-034460	04/29/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-036765	12/30/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-036766	12/30/2008	Crawford	Steelville Fire Protection District	Debris	4
2008-02813-036767	12/29/2008	Crawford	Steelville Fire Protection District	Debris	6
2008-02813-036769	11/29/2008	Crawford	Steelville Fire Protection District	Arson	1
2008-02813-036770	10/30/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-036771	08/04/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-036772	07/02/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-036773	07/20/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-02813-036774	06/08/2008	Crawford	Steelville Fire Protection District	Miscellaneous	1
2008-02813-036775	05/04/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-036776	04/29/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-036777	03/16/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-036778	09/12/2008	Crawford	Steelville Fire Protection District	Debris	1
2008-02813-036779	01/01/2008	Crawford	Steelville Fire Protection District	Unknown	1
2008-03627-033768	01/28/2008	Crawford	Sullivan Fire Protection District	Unknown	0.1
2008-03627-033771	03/02/2008	Crawford	Sullivan Fire Protection District	Debris	2
2008-03627-036498	10/26/2008	Crawford	Sullivan Fire Protection District	Unknown	1

2008-03627-036501	12/06/2008	Crawford	Sullivan Fire Protection District	Debris	1
2008-04718-036192	11/23/2008	Crawford	Quad County Fire Protection District	Arson	220
2009-00008-036534	01/06/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	0.5
2009-00008-038461	03/08/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Smoking	1.5
2009-00008-038462	03/09/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	1.5
2009-00008-038702	03/18/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	2
2009-00008-038703	03/18/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	2
2009-00008-039050	03/23/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	70
2009-02810-037625	02/19/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-038402	01/01/2009	Crawford	Bourbon Fire Protection District	Unknown	1
2009-02810-038403	01/02/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	10
2009-02810-038404	01/09/2009	Crawford	Bourbon Fire Protection District	Arson	1
2009-02810-038405	01/14/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-038406	01/17/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-038407	01/18/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-038408	01/18/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-038409	01/19/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-038410	01/23/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-038411	01/24/2009	Crawford	Bourbon Fire Protection District	Arson	1
2009-02810-038413	02/25/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	10
2009-02810-038415	02/25/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-038416	03/04/2009	Crawford	Bourbon Fire Protection District	Campfire	1
2009-02810-038417	03/07/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	20
2009-02810-038418	03/08/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	40
2009-02810-038513	03/14/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	15
2009-02810-041583	08/25/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-043153	03/08/2009	Crawford	Bourbon Fire Protection District	Unknown	1
2009-02810-043154	03/14/2009	Crawford	Bourbon Fire Protection District	Unknown	2
2009-02810-043155	03/16/2009	Crawford	Bourbon Fire Protection District	Unknown	10

2009-02810-043156	03/17/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-043159	03/22/2009	Crawford	Bourbon Fire Protection District	Unknown	1
2009-02810-043164	03/20/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-043165	03/23/2009	Crawford	Bourbon Fire Protection District	Unknown	10
2009-02810-043166	03/30/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-043167	03/31/2009	Crawford	Bourbon Fire Protection District	Unknown	1
2009-02810-043168	04/04/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-043169	04/04/2009	Crawford	Bourbon Fire Protection District	Unknown	2
2009-02810-043170	11/29/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-043181	04/07/2009	Crawford	Bourbon Fire Protection District	Unknown	1
2009-02810-043182	04/07/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2009-02810-043183	04/26/2009	Crawford	Bourbon Fire Protection District	Unknown	7
2009-02810-043184	08/30/2009	Crawford	Bourbon Fire Protection District	Unknown	1
2009-02811-038455	01/09/2009	Crawford	Cuba Fire Department	Debris	0.25
2009-02811-038456	01/22/2009	Crawford	Cuba Fire Department	Unknown	2
2009-02811-038457	02/15/2009	Crawford	Cuba Fire Department	Unknown	2
2009-02811-038458	02/20/2009	Crawford	Cuba Fire Department	Unknown	0.25
2009-02811-038459	02/22/2009	Crawford	Cuba Fire Department	Debris	0.25
2009-02811-038460	02/22/2009	Crawford	Cuba Fire Department	Debris	0.5
2009-02811-038463	03/09/2009	Crawford	Cuba Fire Department	Debris	1.5
2009-02811-038464	03/08/2009	Crawford	Cuba Fire Department	Smoking	1.5
2009-02811-038489	02/24/2009	Crawford	Cuba Fire Department	Unknown	2
2009-02811-040289	03/09/2009	Crawford	Cuba Fire Department	Debris	1
2009-02811-040290	03/09/2009	Crawford	Cuba Fire Department	Debris	5
2009-02811-040291	03/14/2009	Crawford	Cuba Fire Department	Unknown	1
2009-02811-040292	03/14/2009	Crawford	Cuba Fire Department	Unknown	1
2009-02811-040293	03/15/2009	Crawford	Cuba Fire Department	Unknown	0.25
2009-02811-040294	03/16/2009	Crawford	Cuba Fire Department	Debris	0.5
2009-02811-040295	03/16/2009	Crawford	Cuba Fire Department	Unknown	0.5

2009-02811-040296	03/17/2009	Crawford	Cuba Fire Department	Campfire	0.5
2009-02811-040298	03/18/2009	Crawford	Cuba Fire Department	Unknown	25
2009-02811-040299	03/23/2009	Crawford	Cuba Fire Department	Unknown	10
2009-02811-040301	04/01/2009	Crawford	Cuba Fire Department	Unknown	25
2009-02811-040302	04/08/2009	Crawford	Cuba Fire Department	Debris	0.5
2009-02811-040303	04/27/2009	Crawford	Cuba Fire Department	Unknown	0.25
2009-02811-043204	09/30/2009	Crawford	Cuba Fire Department	Debris	0.25
2009-02811-043205	10/20/2009	Crawford	Cuba Fire Department	Equipment	0.5
2009-02811-043223	09/01/2009	Crawford	Cuba Fire Department	Debris	1
2009-02811-043224	10/20/2009	Crawford	Cuba Fire Department	Debris	3
2009-02811-043225	11/03/2009	Crawford	Cuba Fire Department	Debris	0.5
2009-02811-043226	11/06/2009	Crawford	Cuba Fire Department	Miscellaneous	3
2009-02811-043227	11/28/2009	Crawford	Cuba Fire Department	Debris	1
2009-02812-038465	03/08/2009	Crawford	Leasburg Community Volunteer Fire Departmetn	Railroad	1.5
2009-02813-039313	03/18/2009	Crawford	Steelville Fire Protection District	Unknown	10
2009-02813-039314	03/19/2009	Crawford	Steelville Fire Protection District	Unknown	5
2009-02813-039315	03/23/2009	Crawford	Steelville Fire Protection District	Debris	73
2009-02813-039316	04/01/2009	Crawford	Steelville Fire Protection District	Smoking	1
2009-02813-039375	01/24/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-039376	01/20/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-039378	01/22/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-039379	01/22/2009	Crawford	Steelville Fire Protection District	Debris	2
2009-02813-039380	01/23/2009	Crawford	Steelville Fire Protection District	Miscellaneous	1
2009-02813-039381	01/26/2009	Crawford	Steelville Fire Protection District	Unknown	6
2009-02813-039382	01/21/2009	Crawford	Steelville Fire Protection District	Miscellaneous	1
2009-02813-039383	01/25/2009	Crawford	Steelville Fire Protection District	Debris	15
2009-02813-039384	01/22/2009	Crawford	Steelville Fire Protection District	Unknown	30
2009-02813-039385	02/23/2009	Crawford	Steelville Fire Protection District	Unknown	6

2009-02813-039387	02/06/2009	Crawford	Steelville Fire Protection District	Debris	5
2009-02813-039388	02/24/2009	Crawford	Steelville Fire Protection District	Unknown	8
2009-02813-039389	02/22/2009	Crawford	Steelville Fire Protection District	Debris	5
2009-02813-039390	02/22/2009	Crawford	Steelville Fire Protection District	Debris	1
2009-02813-039391	03/04/2009	Crawford	Steelville Fire Protection District	Debris	300
2009-02813-039392	03/05/2009	Crawford	Steelville Fire Protection District	Unknown	5
2009-02813-039393	03/05/2009	Crawford	Steelville Fire Protection District	Debris	20
2009-02813-039394	03/04/2009	Crawford	Steelville Fire Protection District	Unknown	50
2009-02813-039395	03/04/2009	Crawford	Steelville Fire Protection District	Unknown	20
2009-02813-039396	03/09/2009	Crawford	Steelville Fire Protection District	Debris	1
2009-02813-039397	03/09/2009	Crawford	Steelville Fire Protection District	Debris	2
2009-02813-039398	03/06/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-039399	03/15/2009	Crawford	Steelville Fire Protection District	Debris	1
2009-02813-039400	03/19/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-039401	03/18/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-039402	03/22/2009	Crawford	Steelville Fire Protection District	Debris	3
2009-02813-039403	03/19/2009	Crawford	Steelville Fire Protection District	Miscellaneous	15
2009-02813-039405	03/20/2009	Crawford	Steelville Fire Protection District	Unknown	3
2009-02813-039408	03/16/2009	Crawford	Steelville Fire Protection District	Debris	3
2009-02813-039409	03/15/2009	Crawford	Steelville Fire Protection District	Debris	1
2009-02813-039412	03/20/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-039414	03/18/2009	Crawford	Steelville Fire Protection District	Debris	1
2009-02813-039419	03/23/2009	Crawford	Steelville Fire Protection District	Arson	1
2009-02813-039420	03/23/2009	Crawford	Steelville Fire Protection District	Unknown	3
2009-02813-039421	03/30/2009	Crawford	Steelville Fire Protection District	Unknown	5
2009-02813-039558	03/14/2009	Crawford	Steelville Fire Protection District	Unknown	2
2009-02813-039559	04/02/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-043564	04/17/2009	Crawford	Steelville Fire Protection District	Unknown	5
2009-02813-043565	04/01/2009	Crawford	Steelville Fire Protection District	Unknown	2

2009-02813-043566	04/26/2009	Crawford	Steelville Fire Protection District	Debris	15
2009-02813-043567	07/31/2009	Crawford	Steelville Fire Protection District	Debris	2
2009-02813-043568	11/06/2009	Crawford	Steelville Fire Protection District	Debris	1
2009-02813-043583	06/13/2009	Crawford	Steelville Fire Protection District	Miscellaneous	1
2009-02813-043584	04/04/2009	Crawford	Steelville Fire Protection District	Lightning	1
2009-02813-043585	04/26/2009	Crawford	Steelville Fire Protection District	Unknown	2
2009-02813-043586	04/26/2009	Crawford	Steelville Fire Protection District	Debris	2
2009-02813-043587	04/27/2009	Crawford	Steelville Fire Protection District	Miscellaneous	3
2009-02813-043588	07/19/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-043589	08/09/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-043590	08/09/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-043591	11/04/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-043592	11/05/2009	Crawford	Steelville Fire Protection District	Debris	1
2009-02813-043593	11/06/2009	Crawford	Steelville Fire Protection District	Debris	2
2009-02813-043594	11/09/2009	Crawford	Steelville Fire Protection District	Unknown	1
2009-02813-043595	11/11/2009	Crawford	Steelville Fire Protection District	Unknown	3
2009-03627-036496	01/02/2009	Crawford	Sullivan Fire Protection District	Miscellaneous	1
2009-03627-038608	03/16/2009	Crawford	Sullivan Fire Protection District	Unknown	20
2009-03627-038863	03/21/2009	Crawford	Sullivan Fire Protection District	Debris	0.5
2009-03627-038994	03/24/2009	Crawford	Sullivan Fire Protection District	Debris	6
2009-03627-042389	11/05/2009	Crawford	Sullivan Fire Protection District	Debris	0.01
2009-03627-042391	11/05/2009	Crawford	Sullivan Fire Protection District	Debris	0.01
2009-03734-039956	02/07/2009	Crawford	Owensville Volunteer Fire Department	Debris	1
2009-04718-040248	04/22/2009	Crawford	Quad County Fire Protection District	Unknown	34
2009-05004-038925	03/24/2009	Crawford	Mapaville Fire Prot. Dist.	Unknown	1
2010-00008-044740	03/03/2010	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	40
2010-00008-045661	04/06/2010	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	26
2010-00008-049221	10/22/2010	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	89
2010-00008-049241	10/23/2010	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	18

2010-02810-051841	02/28/2010	Crawford	Bourbon Fire Protection District	Unknown	4
2010-02810-051843	03/30/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	2
2010-02810-051844	04/09/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2010-02810-051846	04/10/2010	Crawford	Bourbon Fire Protection District	Unknown	1
2010-02810-051850	10/07/2010	Crawford	Bourbon Fire Protection District	Unknown	2
2010-02810-051851	10/14/2010	Crawford	Bourbon Fire Protection District	Unknown	1
2010-02810-051852	11/01/2010	Crawford	Bourbon Fire Protection District	Unknown	25
2010-02810-051853	11/19/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	3
2010-02810-051854	12/07/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2010-02810-051861	03/06/2010	Crawford	Bourbon Fire Protection District	Not Reported	25
2010-02810-051862	03/07/2010	Crawford	Bourbon Fire Protection District	Unknown	2
2010-02810-051865	03/23/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	3
2010-02810-051866	03/23/2010	Crawford	Bourbon Fire Protection District	Unknown	38
2010-02810-051867	03/24/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	2
2010-02810-051870	04/11/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	14
2010-02810-051871	04/11/2010	Crawford	Bourbon Fire Protection District	Arson	2
2010-02810-051872	04/12/2010	Crawford	Bourbon Fire Protection District	Unknown	1
2010-02810-051873	05/14/2010	Crawford	Bourbon Fire Protection District	Unknown	1
2010-02810-051877	08/18/2010	Crawford	Bourbon Fire Protection District	Unknown	1
2010-02810-051883	10/23/2010	Crawford	Bourbon Fire Protection District	Unknown	22
2010-02810-051885	11/28/2010	Crawford	Bourbon Fire Protection District	Unknown	1
2010-02811-047545	01/19/2010	Crawford	Cuba Fire Department	Debris	0.25
2010-02811-047546	03/20/2010	Crawford	Cuba Fire Department	Debris	2
2010-02811-047547	03/06/2010	Crawford	Cuba Fire Department	Not Reported	0.5
2010-02811-047548	03/07/2010	Crawford	Cuba Fire Department	Not Reported	10
2010-02811-047549	03/10/2010	Crawford	Cuba Fire Department	Debris	0.5
2010-02811-047550	04/01/2010	Crawford	Cuba Fire Department	Debris	2
2010-02811-047551	04/06/2010	Crawford	Cuba Fire Department	Debris	40
2010-02811-047552	04/09/2010	Crawford	Cuba Fire Department	Debris	1

2010-02811-047553	04/11/2010	Crawford	Cuba Fire Department	Debris	1
2010-02811-047554	04/13/2010	Crawford	Cuba Fire Department	Debris	5
2010-02811-047561	02/28/2010	Crawford	Cuba Fire Department	Debris	2
2010-02811-047562	03/03/2010	Crawford	Cuba Fire Department	Debris	20
2010-02811-047563	03/06/2010	Crawford	Cuba Fire Department	Debris	4
2010-02811-047564	03/23/2010	Crawford	Cuba Fire Department	Arson	10
2010-02811-047565	03/30/2010	Crawford	Cuba Fire Department	Debris	1
2010-02811-047566	04/11/2010	Crawford	Cuba Fire Department	Debris	10
2010-02811-047567	04/11/2010	Crawford	Cuba Fire Department	Debris	1
2010-02811-047568	04/19/2010	Crawford	Cuba Fire Department	Debris	1
2010-02811-051842	10/14/2010	Crawford	Cuba Fire Department	Debris	2
2010-02811-051845	10/22/2010	Crawford	Cuba Fire Department	Unknown	120
2010-02811-051847	10/24/2010	Crawford	Cuba Fire Department	Debris	0.5
2010-02811-051848	11/07/2010	Crawford	Cuba Fire Department	Debris	0.25
2010-02811-051849	11/09/2010	Crawford	Cuba Fire Department	Debris	0.5
2010-02811-051863	07/03/2010	Crawford	Cuba Fire Department	Miscellaneous	0.25
2010-02811-051864	07/07/2010	Crawford	Cuba Fire Department	Unknown	0.25
2010-02811-051868	10/18/2010	Crawford	Cuba Fire Department	Miscellaneous	183
2010-02811-051869	10/23/2010	Crawford	Cuba Fire Department	Debris	18
2010-02811-051874	11/09/2010	Crawford	Cuba Fire Department	Debris	0.25
2010-02811-051875	11/09/2010	Crawford	Cuba Fire Department	Debris	0.5
2010-02811-051880	11/20/2010	Crawford	Cuba Fire Department	Debris	1
2010-02811-051881	11/23/2010	Crawford	Cuba Fire Department	Debris	1
2010-02811-051882	11/28/2010	Crawford	Cuba Fire Department	Equipment	1
2010-02812-056068	04/03/2010	Crawford	Leasburg Community Volunteer Fire Departmetn	Miscellaneous	22
2010-02813-045454	04/04/2010	Crawford	Steelville Fire Protection District	Debris	1.5
2010-02813-045455	03/06/2010	Crawford	Steelville Fire Protection District	Unknown	20
2010-02813-045456	03/06/2010	Crawford	Steelville Fire Protection District	Debris	2

2010-02813-045457	03/03/2010	Crawford	Steelville Fire Protection District	Unknown	25
2010-02813-045458	02/28/2010	Crawford	Steelville Fire Protection District	Debris	1
2010-02813-045459	02/27/2010	Crawford	Steelville Fire Protection District	Debris	4
2010-02813-045474	04/09/2010	Crawford	Steelville Fire Protection District	Debris	1
2010-02813-045475	03/07/2010	Crawford	Steelville Fire Protection District	Debris	9
2010-02813-045476	03/07/2010	Crawford	Steelville Fire Protection District	Debris	1
2010-02813-045477	03/07/2010	Crawford	Steelville Fire Protection District	Debris	2
2010-02813-045478	02/27/2010	Crawford	Steelville Fire Protection District	Debris	3
2010-02813-045479	02/26/2010	Crawford	Steelville Fire Protection District	Debris	2
2010-02813-045538	04/11/2010	Crawford	Steelville Fire Protection District	Debris	2
2010-02813-049593	04/01/2010	Crawford	Steelville Fire Protection District	Debris	2
2010-02813-049594	04/12/2010	Crawford	Steelville Fire Protection District	Unknown	6
2010-02813-049595	04/13/2010	Crawford	Steelville Fire Protection District	Unknown	30
2010-02813-049596	04/21/2010	Crawford	Steelville Fire Protection District	Unknown	12
2010-02813-049607	04/01/2010	Crawford	Steelville Fire Protection District	Debris	4
2010-02813-049608	04/13/2010	Crawford	Steelville Fire Protection District	Debris	1
2010-02813-049609	04/18/2010	Crawford	Steelville Fire Protection District	Unknown	1
2010-02813-049611	04/20/2010	Crawford	Steelville Fire Protection District	Unknown	1
2010-02813-049627	10/31/2010	Crawford	Steelville Fire Protection District	Debris	2
2010-02813-049628	10/29/2010	Crawford	Steelville Fire Protection District	Unknown	8
2010-02813-049629	10/25/2010	Crawford	Steelville Fire Protection District	Unknown	2
2010-02813-049630	11/04/2010	Crawford	Steelville Fire Protection District	Miscellaneous	2
2010-02813-049647	11/08/2010	Crawford	Steelville Fire Protection District	Equipment	4
2010-02813-049648	11/06/2010	Crawford	Steelville Fire Protection District	Debris	4
2010-02813-050241	11/08/2010	Crawford	Steelville Fire Protection District	Unknown	2
2010-02813-050602	04/18/2010	Crawford	Steelville Fire Protection District	Debris	2
2010-02813-050608	07/07/2010	Crawford	Steelville Fire Protection District	Unknown	1
2010-02813-050611	09/22/2010	Crawford	Steelville Fire Protection District	Debris	1
2010-02813-050613	11/08/2010	Crawford	Steelville Fire Protection District	Unknown	5

2010-02813-050626	06/26/2010	Crawford	Steelville Fire Protection District	Unknown	0.5
2010-02813-050628	07/01/2010	Crawford	Steelville Fire Protection District	Miscellaneous	0.5
2010-03627-044577	03/04/2010	Crawford	Sullivan Fire Protection District	Unknown	0.25
2010-03627-045492	04/11/2010	Crawford	Sullivan Fire Protection District	Equipment	1
2010-03627-051623	12/10/2010	Crawford	Sullivan Fire Protection District	Debris	0.25
2010-04718-045493	03/10/2010	Crawford	Quad County Fire Protection District	Unknown	3
2010-04718-045509	03/04/2010	Crawford	Quad County Fire Protection District	Miscellaneous	1
2010-04718-046061	04/19/2010	Crawford	Quad County Fire Protection District	Unknown	3
2010-04718-051806	11/07/2010	Crawford	Quad County Fire Protection District	Unknown	1.5
2010-08101-045411	04/06/2010	Crawford	Doolittle Rural Fire Protection District	Unknown	30
2010-08101-049166	10/22/2010	Crawford	Doolittle Rural Fire Protection District	Unknown	100
2010-76409-049001	10/18/2010	Crawford	SALEM FORESTRY	Unknown	154
2011-02810-077784	03/04/2011	Crawford	Bourbon Fire Protection District	Unknown	1
2011-02810-077785	03/11/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	4
2011-02810-077786	03/24/2011	Crawford	Bourbon Fire Protection District	Debris	1
2011-02810-077787	04/02/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2011-02810-077788	04/02/2011	Crawford	Bourbon Fire Protection District	Debris	1
2011-02810-077789	04/03/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2011-02810-077790	07/02/2011	Crawford	Bourbon Fire Protection District	Debris	4
2011-02810-077791	07/03/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2011-02810-077792	08/30/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2011-02810-077793	09/30/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2011-02810-077794	11/01/2011	Crawford	Bourbon Fire Protection District	Debris	5
2011-02810-078144	11/19/2011	Crawford	Bourbon Fire Protection District	Debris	1
2011-02810-078145	12/10/2011	Crawford	Bourbon Fire Protection District	Unknown	1
2011-02811-056567	02/18/2011	Crawford	Cuba Fire Department	Debris	15
2011-02811-056568	02/18/2011	Crawford	Cuba Fire Department	Unknown	12
2011-02811-056569	03/04/2011	Crawford	Cuba Fire Department	Unknown	20
2011-02811-056570	03/02/2011	Crawford	Cuba Fire Department	Debris	4

2011-02811-056571	03/12/2011	Crawford	Cuba Fire Department	Equipment	4
2011-02811-056584	03/11/2011	Crawford	Cuba Fire Department	Debris	1
2011-02811-056585	03/12/2011	Crawford	Cuba Fire Department	Debris	1
2011-02811-056586	03/13/2011	Crawford	Cuba Fire Department	Debris	3
2011-02811-056587	03/12/2011	Crawford	Cuba Fire Department	Unknown	3
2011-02811-056588	03/23/2011	Crawford	Cuba Fire Department	Debris	40
2011-02811-056589	04/03/2011	Crawford	Cuba Fire Department	Debris	2
2011-02811-056590	04/03/2011	Crawford	Cuba Fire Department	Debris	4
2011-02811-056591	04/03/2011	Crawford	Cuba Fire Department	Debris	0.5
2011-02811-062919	04/21/2011	Crawford	Cuba Fire Department	Unknown	1.2
2011-02811-062920	04/29/2011	Crawford	Cuba Fire Department	Equipment	2
2011-02811-063061	07/20/2011	Crawford	Cuba Fire Department	Unknown	0.25
2011-02811-063062	08/27/2011	Crawford	Cuba Fire Department	Debris	0.5
2011-02811-063063	09/03/2011	Crawford	Cuba Fire Department	Equipment	1.5
2011-02811-063064	09/13/2011	Crawford	Cuba Fire Department	Equipment	0.25
2011-02811-063065	10/29/2011	Crawford	Cuba Fire Department	Unknown	0.25
2011-02811-063067	10/31/2011	Crawford	Cuba Fire Department	Unknown	20
2011-02811-063961	11/01/2011	Crawford	Cuba Fire Department	Unknown	0.5
2011-02811-063962	11/02/2011	Crawford	Cuba Fire Department	Debris	0.25
2011-02811-063963	11/18/2011	Crawford	Cuba Fire Department	Unknown	1.5
2011-02811-063965	11/30/2011	Crawford	Cuba Fire Department	Debris	1
2011-02811-063982	11/02/2011	Crawford	Cuba Fire Department	Debris	10
2011-02811-063983	11/14/2011	Crawford	Cuba Fire Department	Equipment	0.5
2011-02811-063984	11/18/2011	Crawford	Cuba Fire Department	Unknown	0.25
2011-02811-065111	12/31/2011	Crawford	Cuba Fire Department	Debris	0.25
2011-02812-056331	02/16/2011	Crawford	Leasburg Community Volunteer Fire Departmetn	Unknown	5
2011-02813-062768	02/18/2011	Crawford	Steelville Fire Protection District	Unknown	1
2011-02813-062769	03/12/2011	Crawford	Steelville Fire Protection District	Unknown	10

2011-02813-062770	03/13/2011	Crawford	Steelville Fire Protection District	Debris	20
2011-02813-062771	03/23/2011	Crawford	Steelville Fire Protection District	Unknown	5
2011-02813-062772	03/04/2011	Crawford	Steelville Fire Protection District	Unknown	1
2011-02813-062773	03/12/2011	Crawford	Steelville Fire Protection District	Debris	2
2011-02813-062774	03/04/2011	Crawford	Steelville Fire Protection District	Unknown	5
2011-02813-062775	03/03/2011	Crawford	Steelville Fire Protection District	Unknown	20
2011-02813-062776	03/02/2011	Crawford	Steelville Fire Protection District	Unknown	10
2011-02813-062777	03/23/2011	Crawford	Steelville Fire Protection District	Debris	3
2011-02813-062778	06/26/2011	Crawford	Steelville Fire Protection District	Debris	1
2011-02813-062779	11/17/2011	Crawford	Steelville Fire Protection District	Unknown	2
2011-02813-062780	11/14/2011	Crawford	Steelville Fire Protection District	Miscellaneous	60
2011-02813-062790	03/20/2011	Crawford	Steelville Fire Protection District	Debris	4
2011-02813-062791	03/03/2011	Crawford	Steelville Fire Protection District	Debris	2
2011-02813-062792	03/03/2011	Crawford	Steelville Fire Protection District	Unknown	20
2011-02813-062793	03/02/2011	Crawford	Steelville Fire Protection District	Unknown	3
2011-02813-062794	04/03/2011	Crawford	Steelville Fire Protection District	Debris	3
2011-02813-062795	04/03/2011	Crawford	Steelville Fire Protection District	Unknown	60
2011-02813-062796	04/03/2011	Crawford	Steelville Fire Protection District	Unknown	1
2011-02813-062797	08/31/2011	Crawford	Steelville Fire Protection District	Unknown	3
2011-02813-062801	11/14/2011	Crawford	Steelville Fire Protection District	Miscellaneous	1
2011-02813-064940	12/08/2011	Crawford	Steelville Fire Protection District	Unknown	1
2011-02813-064945	12/11/2011	Crawford	Steelville Fire Protection District	Unknown	1
2011-02813-064946	12/31/2011	Crawford	Steelville Fire Protection District	Debris	4
2011-02813-064947	12/31/2011	Crawford	Steelville Fire Protection District	Debris	8
2011-02813-064953	12/31/2011	Crawford	Steelville Fire Protection District	Debris	4
2011-02813-064961	12/19/2011	Crawford	Steelville Fire Protection District	Unknown	4
2011-02813-064962	12/31/2011	Crawford	Steelville Fire Protection District	Debris	1
2011-03627-055243	03/19/2011	Crawford	Sullivan Fire Protection District	Not Reported	1
2011-03627-055329	03/23/2011	Crawford	Sullivan Fire Protection District	Debris	3

2011-03627-055332	03/23/2011	Crawford	Sullivan Fire Protection District	Debris	0.01
2011-03627-061321	10/15/2011	Crawford	Sullivan Fire Protection District	Debris	0.01
2011-03627-062284	11/12/2011	Crawford	Sullivan Fire Protection District	Miscellaneous	1.5
2011-04718-056442	03/12/2011	Crawford	Quad County Fire Protection District	Unknown	400
2011-04718-056443	03/23/2011	Crawford	Quad County Fire Protection District	Unknown	15
2011-04718-057269	04/09/2011	Crawford	Quad County Fire Protection District	Unknown	5
2011-04718-057305	04/06/2011	Crawford	Quad County Fire Protection District	Unknown	50
2011-04718-063748	11/17/2011	Crawford	Quad County Fire Protection District	Debris	125
2011-04718-063749	11/18/2011	Crawford	Quad County Fire Protection District	Miscellaneous	4
2011-04718-063772	11/13/2011	Crawford	Quad County Fire Protection District	Miscellaneous	65
2012-00008-065350	01/06/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	25
2012-00008-068413	03/10/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Miscellaneous	3
2012-00008-074282	07/17/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Miscellaneous	7
2012-00008-074691	07/25/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Equipment	40
2012-00008-074692	06/29/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	5
2012-00008-074693	06/28/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Campfire	30
2012-02810-078146	01/05/2012	Crawford	Bourbon Fire Protection District	Debris	4
2012-02810-078147	01/29/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2012-02810-078148	02/29/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	7
2012-02810-078149	03/01/2012	Crawford	Bourbon Fire Protection District	Unknown	5
2012-02810-078150	03/04/2012	Crawford	Bourbon Fire Protection District	Arson	1
2012-02810-078334	03/05/2012	Crawford	Bourbon Fire Protection District	Unknown	4
2012-02810-078336	03/06/2012	Crawford	Bourbon Fire Protection District	Unknown	1
2012-02810-078338	03/06/2012	Crawford	Bourbon Fire Protection District	Unknown	2
2012-02810-078339	04/03/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	0.5
2012-02810-078340	05/16/2012	Crawford	Bourbon Fire Protection District	Equipment	2
2012-02810-078341	05/21/2012	Crawford	Bourbon Fire Protection District	Children	0.5
2012-02810-078342	06/14/2012	Crawford	Bourbon Fire Protection District	Unknown	1
2012-02810-078343	06/17/2012	Crawford	Bourbon Fire Protection District	Debris	0.5

2012-02810-078347	06/18/2012	Crawford	Bourbon Fire Protection District	Unknown	15
2012-02810-078351	06/20/2012	Crawford	Bourbon Fire Protection District	Equipment	10
2012-02810-080262	06/28/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	20
2012-02810-080263	06/28/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	2
2012-02810-080264	06/28/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	2
2012-02810-080265	06/30/2012	Crawford	Bourbon Fire Protection District	Debris	1
2012-02810-080266	07/05/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2012-02810-080267	07/06/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2012-02810-080269	07/06/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	10
2012-02810-080272	07/15/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	2
2012-02810-080273	08/04/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2012-02810-080274	08/30/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2012-02810-080275	11/17/2012	Crawford	Bourbon Fire Protection District	Debris	1
2012-02811-073831	01/07/2012	Crawford	Cuba Fire Department	Debris	0.5
2012-02811-073832	01/30/2012	Crawford	Cuba Fire Department	Debris	2
2012-02811-073833	02/02/2012	Crawford	Cuba Fire Department	Debris	0.5
2012-02811-073836	03/15/2012	Crawford	Cuba Fire Department	Smoking	0.5
2012-02811-073837	03/29/2012	Crawford	Cuba Fire Department	Debris	5
2012-02811-073838	03/31/2012	Crawford	Cuba Fire Department	Equipment	1
2012-02811-073839	04/11/2012	Crawford	Cuba Fire Department	Miscellaneous	0.5
2012-02811-073840	05/15/2012	Crawford	Cuba Fire Department	Miscellaneous	0.25
2012-02811-073861	01/07/2012	Crawford	Cuba Fire Department	Debris	138.55
2012-02811-073862	02/01/2012	Crawford	Cuba Fire Department	Debris	0.5
2012-02811-073863	02/02/2012	Crawford	Cuba Fire Department	Debris	0.5
2012-02811-073864	02/02/2012	Crawford	Cuba Fire Department	Debris	3
2012-02811-073870	02/12/2012	Crawford	Cuba Fire Department	Debris	0.5
2012-02811-073871	02/23/2012	Crawford	Cuba Fire Department	Unknown	0.5
2012-02811-073872	03/16/2012	Crawford	Cuba Fire Department	Unknown	7
2012-02811-073873	05/10/2012	Crawford	Cuba Fire Department	Unknown	0.5

2012-02811-073874	05/11/2012	Crawford	Cuba Fire Department	Miscellaneous	1
2012-02811-073875	06/08/2012	Crawford	Cuba Fire Department	Equipment	5
2012-02811-073876	06/24/2012	Crawford	Cuba Fire Department	Children	1
2012-02811-073881	06/13/2012	Crawford	Cuba Fire Department	Children	0.25
2012-02811-073882	06/18/2012	Crawford	Cuba Fire Department	Unknown	1.5
2012-02811-073883	06/26/2012	Crawford	Cuba Fire Department	Unknown	1
2012-02811-073884	06/28/2012	Crawford	Cuba Fire Department	Campfire	30
2012-02811-073886	06/28/2012	Crawford	Cuba Fire Department	Unknown	0.25
2012-02811-073887	06/29/2012	Crawford	Cuba Fire Department	Debris	5
2012-02811-079264	07/08/2012	Crawford	Cuba Fire Department	Lightning	1
2012-02811-079265	07/25/2012	Crawford	Cuba Fire Department	Debris	40
2012-02811-079266	07/31/2012	Crawford	Cuba Fire Department	Debris	1
2012-02811-079270	08/20/2012	Crawford	Cuba Fire Department	Equipment	0.5
2012-02811-079272	08/24/2012	Crawford	Cuba Fire Department	Smoking	0.25
2012-02811-079273	10/22/2012	Crawford	Cuba Fire Department	Equipment	4
2012-02811-079274	10/31/2012	Crawford	Cuba Fire Department	Debris	1.5
2012-02811-081943	11/10/2012	Crawford	Cuba Fire Department	Debris	0.5
2012-02811-081944	11/10/2012	Crawford	Cuba Fire Department	Debris	2
2012-02811-081945	11/10/2012	Crawford	Cuba Fire Department	Equipment	3
2012-02811-081946	11/10/2012	Crawford	Cuba Fire Department	Debris	2
2012-02811-081947	11/11/2012	Crawford	Cuba Fire Department	Not Reported	0.5
2012-02811-081948	11/18/2012	Crawford	Cuba Fire Department	Debris	0.5
2012-02811-081949	12/01/2012	Crawford	Cuba Fire Department	Not Reported	0.5
2012-02811-081950	12/01/2012	Crawford	Cuba Fire Department	Debris	0.25
2012-02812-068376	03/10/2012	Crawford	Leasburg Community Volunteer Fire Departmetn	Miscellaneous	3
2012-02813-070123	01/03/2012	Crawford	Steelville Fire Protection District	Debris	3
2012-02813-070124	01/05/2012	Crawford	Steelville Fire Protection District	Debris	35
2012-02813-070125	01/03/2012	Crawford	Steelville Fire Protection District	Debris	15

2012-02813-070126	01/03/2012	Crawford	Steelville Fire Protection District	Debris	1
2012-02813-070127	02/29/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-070128	02/26/2012	Crawford	Steelville Fire Protection District	Debris	10
2012-02813-070129	02/25/2012	Crawford	Steelville Fire Protection District	Unknown	2
2012-02813-070130	02/23/2012	Crawford	Steelville Fire Protection District	Debris	3
2012-02813-070131	03/05/2012	Crawford	Steelville Fire Protection District	Debris	2
2012-02813-070132	03/06/2012	Crawford	Steelville Fire Protection District	Unknown	20
2012-02813-070133	03/10/2012	Crawford	Steelville Fire Protection District	Debris	2
2012-02813-070134	03/28/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-070141	01/04/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-070142	01/05/2012	Crawford	Steelville Fire Protection District	Debris	1
2012-02813-070143	01/07/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-070144	01/23/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-070145	02/27/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-070146	02/22/2012	Crawford	Steelville Fire Protection District	Unknown	7
2012-02813-070147	02/23/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-070148	02/23/2012	Crawford	Steelville Fire Protection District	Unknown	20
2012-02813-070149	02/12/2012	Crawford	Steelville Fire Protection District	Debris	2
2012-02813-070150	02/02/2012	Crawford	Steelville Fire Protection District	Debris	1
2012-02813-070151	03/02/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-070152	03/05/2012	Crawford	Steelville Fire Protection District	Unknown	30
2012-02813-070153	03/05/2012	Crawford	Steelville Fire Protection District	Debris	5
2012-02813-070155	03/10/2012	Crawford	Steelville Fire Protection District	Debris	1
2012-02813-070156	03/24/2012	Crawford	Steelville Fire Protection District	Unknown	10
2012-02813-077361	04/02/2012	Crawford	Steelville Fire Protection District	Unknown	5
2012-02813-077362	05/27/2012	Crawford	Steelville Fire Protection District	Unknown	2
2012-02813-077363	05/27/2012	Crawford	Steelville Fire Protection District	Arson	5
2012-02813-077364	05/24/2012	Crawford	Steelville Fire Protection District	Miscellaneous	5
2012-02813-077365	05/24/2012	Crawford	Steelville Fire Protection District	Miscellaneous	6

2012-02813-077366	05/11/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-077367	06/27/2012	Crawford	Steelville Fire Protection District	Debris	2
2012-02813-077368	06/27/2012	Crawford	Steelville Fire Protection District	Debris	3
2012-02813-077369	06/29/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-077370	06/28/2012	Crawford	Steelville Fire Protection District	Unknown	30
2012-02813-077371	06/26/2012	Crawford	Steelville Fire Protection District	Unknown	2
2012-02813-077372	06/23/2012	Crawford	Steelville Fire Protection District	Unknown	3
2012-02813-077373	06/23/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-077374	06/05/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-077375	06/07/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-077376	06/08/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-077377	06/10/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-077378	06/21/2012	Crawford	Steelville Fire Protection District	Debris	10
2012-02813-077379	07/25/2012	Crawford	Steelville Fire Protection District	Miscellaneous	50
2012-02813-077380	07/25/2012	Crawford	Steelville Fire Protection District	Miscellaneous	50
2012-02813-077381	07/26/2012	Crawford	Steelville Fire Protection District	Miscellaneous	1
2012-02813-077382	07/25/2012	Crawford	Steelville Fire Protection District	Miscellaneous	50
2012-02813-077383	07/03/2012	Crawford	Steelville Fire Protection District	Debris	1
2012-02813-077384	08/09/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-077385	08/05/2012	Crawford	Steelville Fire Protection District	Debris	1
2012-02813-077386	09/12/2012	Crawford	Steelville Fire Protection District	Unknown	1
2012-02813-077387	09/19/2012	Crawford	Steelville Fire Protection District	Debris	2
2012-02813-077388	09/19/2012	Crawford	Steelville Fire Protection District	Debris	1
2012-02813-079464	11/18/2012	Crawford	Steelville Fire Protection District	Unknown	5
2012-02813-079465	11/10/2012	Crawford	Steelville Fire Protection District	Debris	2
2012-02813-080062	11/25/2012	Crawford	Steelville Fire Protection District	Unknown	4
2012-03627-065234	01/05/2012	Crawford	Sullivan Fire Protection District	Debris	0.5
2012-03627-065355	01/07/2012	Crawford	Sullivan Fire Protection District	Debris	3
2012-03627-066932	02/20/2012	Crawford	Sullivan Fire Protection District	Debris	5

2012-03627-068538	03/12/2012	Crawford	Sullivan Fire Protection District	Debris	1
2012-03627-069370	03/31/2012	Crawford	Sullivan Fire Protection District	Debris	1
2012-03627-072401	06/15/2012	Crawford	Sullivan Fire Protection District	Equipment	1.7
2012-03627-072804	06/25/2012	Crawford	Sullivan Fire Protection District	Debris	0.01
2012-04718-066628	01/04/2012	Crawford	Quad County Fire Protection District	Unknown	5
2012-04718-070042	03/10/2012	Crawford	Quad County Fire Protection District	Unknown	5
2013-00008-091357	11/18/2013	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	60
2013-00008-091542	04/20/2013	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	50
2013-02810-091755	04/01/2013	Crawford	Bourbon Fire Protection District	Unknown	3
2013-02810-091756	04/05/2013	Crawford	Bourbon Fire Protection District	Debris	3
2013-02810-091757	04/07/2013	Crawford	Bourbon Fire Protection District	Unknown	2
2013-02810-091758	04/14/2013	Crawford	Bourbon Fire Protection District	Debris	5
2013-02810-091759	04/14/2013	Crawford	Bourbon Fire Protection District	Debris	5
2013-02810-091761	08/22/2013	Crawford	Bourbon Fire Protection District	Smoking	1
2013-02810-091762	09/13/2013	Crawford	Bourbon Fire Protection District	Unknown	1
2013-02810-091763	09/29/2013	Crawford	Bourbon Fire Protection District	Unknown	1
2013-02810-091764	11/09/2013	Crawford	Bourbon Fire Protection District	Unknown	1
2013-02810-091765	11/15/2013	Crawford	Bourbon Fire Protection District	Unknown	1
2013-02810-091931	11/30/2013	Crawford	Bourbon Fire Protection District	Unknown	1
2013-02811-090208	01/24/2013	Crawford	Cuba Fire Department	Unknown	1
2013-02811-090209	01/25/2013	Crawford	Cuba Fire Department	Debris	0.25
2013-02811-090210	03/15/2013	Crawford	Cuba Fire Department	Debris	1
2013-02811-090212	04/06/2013	Crawford	Cuba Fire Department	Debris	0.25
2013-02811-090213	04/07/2013	Crawford	Cuba Fire Department	Equipment	1
2013-02811-090214	04/07/2013	Crawford	Cuba Fire Department	Debris	15
2013-02811-090215	04/14/2013	Crawford	Cuba Fire Department	Debris	7
2013-02811-090216	04/20/2013	Crawford	Cuba Fire Department	Unknown	50
2013-02811-090217	05/02/2013	Crawford	Cuba Fire Department	Unknown	0.25
2013-02811-090218	05/14/2013	Crawford	Cuba Fire Department	Debris	0.25

2013-02811-091543	07/12/2013	Crawford	Cuba Fire Department	Debris	1
2013-02811-091544	09/12/2013	Crawford	Cuba Fire Department	Unknown	0.25
2013-02811-091545	09/13/2013	Crawford	Cuba Fire Department	Debris	0.5
2013-02811-091546	10/03/2013	Crawford	Cuba Fire Department	Unknown	0.5
2013-02813-083862	01/19/2013	Crawford	Steelville Fire Protection District	Arson	1
2013-02813-085202	02/06/2013	Crawford	Steelville Fire Protection District	Debris	75
2013-02813-085439	03/08/2013	Crawford	Steelville Fire Protection District	Debris	2
2013-02813-085440	03/09/2013	Crawford	Steelville Fire Protection District	Unknown	3
2013-02813-085884	04/01/2013	Crawford	Steelville Fire Protection District	Debris	12
2013-02813-086110	04/06/2013	Crawford	Steelville Fire Protection District	Debris	2
2013-02813-086111	04/04/2013	Crawford	Steelville Fire Protection District	Unknown	3
2013-02813-086112	04/02/2013	Crawford	Steelville Fire Protection District	Unknown	6
2013-02813-086113	04/10/2013	Crawford	Steelville Fire Protection District	Debris	2
2013-02813-086142	04/04/2013	Crawford	Steelville Fire Protection District	Debris	3
2013-02813-086143	04/07/2013	Crawford	Steelville Fire Protection District	Debris	1
2013-02813-086487	04/20/2013	Crawford	Steelville Fire Protection District	Unknown	30
2013-02813-089507	08/31/2013	Crawford	Steelville Fire Protection District	Equipment	4
2013-02813-089530	09/03/2013	Crawford	Steelville Fire Protection District	Equipment	2
2013-02813-090922	10/23/2013	Crawford	Steelville Fire Protection District	Unknown	1
2013-02813-091223	11/13/2013	Crawford	Steelville Fire Protection District	Unknown	1
2013-02813-091237	11/11/2013	Crawford	Steelville Fire Protection District	Debris	4
2013-02813-091554	11/18/2013	Crawford	Steelville Fire Protection District	Unknown	59
2013-02813-091899	11/26/2013	Crawford	Steelville Fire Protection District	Debris	2
2013-02813-091903	11/30/2013	Crawford	Steelville Fire Protection District	Debris	0.5
2013-02813-092665	12/30/2013	Crawford	Steelville Fire Protection District	Debris	1
2013-02813-092666	12/30/2013	Crawford	Steelville Fire Protection District	Debris	1
2013-03627-084267	01/27/2013	Crawford	Sullivan Fire Protection District	Debris	2
2013-03627-086010	03/23/2013	Crawford	Sullivan Fire Protection District	Campfire	4
2013-03627-086402	04/22/2013	Crawford	Sullivan Fire Protection District	Debris	6

2013-03627-088422	07/04/2013	Crawford	Sullivan Fire Protection District	Unknown	0.1
2013-03627-091354	11/15/2013	Crawford	Sullivan Fire Protection District	Debris	1
2013-03627-092462	12/18/2013	Crawford	Sullivan Fire Protection District	Miscellaneous	5
2013-03627-092742	12/28/2013	Crawford	Sullivan Fire Protection District	Debris	0.9
2013-04718-085425	03/06/2013	Crawford	Quad County Fire Protection District	Miscellaneous	100
2014-00008-094770	03/01/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	35
2014-00008-095164	03/10/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	15
2014-00008-095423	03/14/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	50
2014-00008-095560	03/15/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	4
2014-00008-095682	03/15/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	20
2014-00008-097622	03/30/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Miscellaneous	35
2014-00008-103962	04/24/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Miscellaneous	30
2014-00008-112613	11/10/2014	Crawford	MDC REPORTING REGION - ST. LOUIS		200
2014-00008-112710	11/13/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	87
2014-02811-098002	01/19/2014	Crawford	Cuba Fire Department	Debris	3
2014-02811-098003	01/24/2014	Crawford	Cuba Fire Department	Equipment	30
2014-02811-098022	01/25/2014	Crawford	Cuba Fire Department	Debris	40
2014-02811-098023	01/25/2014	Crawford	Cuba Fire Department	Debris	40
2014-02811-098024	01/26/2014	Crawford	Cuba Fire Department	Campfire	2
2014-02811-098025	01/26/2014	Crawford	Cuba Fire Department	Campfire	6
2014-02811-098044	01/26/2014	Crawford	Cuba Fire Department	Debris	1
2014-02811-098045	01/26/2014	Crawford	Cuba Fire Department	Debris	1
2014-02811-098046	01/26/2014	Crawford	Cuba Fire Department	Debris	1
2014-02811-098082	02/22/2014	Crawford	Cuba Fire Department	Debris	0.5
2014-02811-098084	02/27/2014	Crawford	Cuba Fire Department	Debris	5
2014-02811-098103	02/28/2014	Crawford	Cuba Fire Department	Debris	1.5
2014-02811-106543	03/01/2014	Crawford	Cuba Fire Department	Unknown	35
2014-02811-106544	03/09/2014	Crawford	Cuba Fire Department	Miscellaneous	3
2014-02811-106545	03/09/2014	Crawford	Cuba Fire Department	Debris	0.5

2014-02811-106546	03/08/2014	Crawford	Cuba Fire Department	Debris	5
2014-02811-106547	03/10/2014	Crawford	Cuba Fire Department	Debris	0.5
2014-02811-106548	03/10/2014	Crawford	Cuba Fire Department	Debris	1
2014-02811-106550	03/14/2014	Crawford	Cuba Fire Department	Debris	1
2014-02811-106552	03/13/2014	Crawford	Cuba Fire Department	Unknown	0.25
2014-02811-106553	03/15/2014	Crawford	Cuba Fire Department	Debris	0.5
2014-02811-106554	03/15/2014	Crawford	Cuba Fire Department	Debris	20
2014-02811-106556	03/15/2014	Crawford	Cuba Fire Department	Debris	0.25
2014-02811-106558	03/24/2014	Crawford	Cuba Fire Department	Debris	1
2014-02811-106559	03/26/2014	Crawford	Cuba Fire Department	Debris	10
2014-02811-106560	03/26/2014	Crawford	Cuba Fire Department	Debris	30
2014-02811-106561	03/30/2014	Crawford	Cuba Fire Department	Debris	35
2014-02811-106562	04/10/2014	Crawford	Cuba Fire Department	Equipment	1
2014-02811-106563	04/11/2014	Crawford	Cuba Fire Department	Debris	1
2014-02811-106564	04/14/2014	Crawford	Cuba Fire Department	Debris	0.1
2014-02811-118108	04/19/2014	Crawford	Cuba Fire Department	Debris	6
2014-02811-118109	04/24/2014	Crawford	Cuba Fire Department	Unknown	20
2014-02811-118110	07/03/2014	Crawford	Cuba Fire Department	Unknown	6
2014-02811-118111	05/04/2014	Crawford	Cuba Fire Department	Smoking	0.25
2014-02811-118112	05/04/2014	Crawford	Cuba Fire Department	Smoking	0.25
2014-02811-118113	09/06/2014	Crawford	Cuba Fire Department	Unknown	0.25
2014-02811-118114	09/12/2014	Crawford	Cuba Fire Department	Debris	0.25
2014-02811-118115	10/28/2014	Crawford	Cuba Fire Department	Debris	5
2014-02811-118116	12/26/2014	Crawford	Cuba Fire Department	Debris	1
2014-02811-118117	12/26/2014	Crawford	Cuba Fire Department	Miscellaneous	1
2014-02813-093122	01/14/2014	Crawford	Steelville Fire Protection District	Debris	2
2014-02813-093503	01/20/2014	Crawford	Steelville Fire Protection District	Unknown	2
2014-02813-093504	01/24/2014	Crawford	Steelville Fire Protection District	Miscellaneous	0.5
2014-02813-093505	01/24/2014	Crawford	Steelville Fire Protection District	Debris	0.25

2014-02813-093559	01/25/2014	Crawford	Steelville Fire Protection District	Equipment	0.25
2014-02813-093560	01/26/2014	Crawford	Steelville Fire Protection District	Debris	1
2014-02813-093663	01/24/2014	Crawford	Steelville Fire Protection District	Unknown	8
2014-02813-093664	01/27/2014	Crawford	Steelville Fire Protection District	Debris	6
2014-02813-094476	02/19/2014	Crawford	Steelville Fire Protection District	Debris	1.5
2014-02813-094477	02/19/2014	Crawford	Steelville Fire Protection District	Debris	1
2014-02813-094601	02/25/2014	Crawford	Steelville Fire Protection District	Debris	3
2014-02813-094623	02/23/2014	Crawford	Steelville Fire Protection District	Debris	1
2014-02813-094673	02/23/2014	Crawford	Steelville Fire Protection District	Unknown	2
2014-02813-094817	03/01/2014	Crawford	Steelville Fire Protection District	Debris	20
2014-02813-094818	03/01/2014	Crawford	Steelville Fire Protection District	Debris	1
2014-02813-094947	03/01/2014	Crawford	Steelville Fire Protection District	Unknown	40
2014-02813-095117	03/07/2014	Crawford	Steelville Fire Protection District	Debris	1
2014-02813-095118	03/01/2014	Crawford	Steelville Fire Protection District	Unknown	20
2014-02813-095219	03/08/2014	Crawford	Steelville Fire Protection District	Debris	3
2014-02813-095220	03/08/2014	Crawford	Steelville Fire Protection District	Unknown	1
2014-02813-095221	03/10/2014	Crawford	Steelville Fire Protection District	Debris	10
2014-02813-095310	03/09/2014	Crawford	Steelville Fire Protection District	Debris	2
2014-02813-095311	03/09/2014	Crawford	Steelville Fire Protection District	Debris	1
2014-02813-095318	03/10/2014	Crawford	Steelville Fire Protection District	Unknown	1.5
2014-02813-095425	03/14/2014	Crawford	Steelville Fire Protection District	Unknown	27
2014-02813-095427	03/14/2014	Crawford	Steelville Fire Protection District	Debris	25
2014-02813-095455	03/14/2014	Crawford	Steelville Fire Protection District	Unknown	1
2014-02813-095601	03/15/2014	Crawford	Steelville Fire Protection District	Debris	0.5
2014-02813-095603	03/15/2014	Crawford	Steelville Fire Protection District	Debris	25
2014-02813-095604	03/15/2014	Crawford	Steelville Fire Protection District	Debris	1
2014-02813-095607	03/15/2014	Crawford	Steelville Fire Protection District	Debris	45
2014-02813-095609	03/15/2014	Crawford	Steelville Fire Protection District	Debris	6
2014-02813-095611	03/15/2014	Crawford	Steelville Fire Protection District	Unknown	30

2014-02813-095962	03/20/2014	Crawford	Steelville Fire Protection District	Debris	0.25
2014-02813-095983	03/19/2014	Crawford	Steelville Fire Protection District	Unknown	1
2014-02813-096459	03/24/2014	Crawford	Steelville Fire Protection District	Debris	2
2014-02813-096460	03/23/2014	Crawford	Steelville Fire Protection District	Debris	7
2014-02813-096461	03/22/2014	Crawford	Steelville Fire Protection District	Debris	2
2014-02813-096621	03/26/2014	Crawford	Steelville Fire Protection District	Unknown	10
2014-02813-096682	03/24/2014	Crawford	Steelville Fire Protection District	Debris	4
2014-02813-096683	03/25/2014	Crawford	Steelville Fire Protection District	Debris	6
2014-02813-096684	03/28/2014	Crawford	Steelville Fire Protection District	Debris	15
2014-02813-098382	03/30/2014	Crawford	Steelville Fire Protection District	Debris	109
2014-02813-098383	03/20/2014	Crawford	Steelville Fire Protection District	Debris	4
2014-02813-100262	04/05/2014	Crawford	Steelville Fire Protection District	Debris	30
2014-02813-100263	04/10/2014	Crawford	Steelville Fire Protection District	Miscellaneous	70
2014-02813-100442	04/12/2014	Crawford	Steelville Fire Protection District	Debris	2
2014-02813-101902	04/19/2014	Crawford	Steelville Fire Protection District	Debris	5
2014-02813-102702	04/18/2014	Crawford	Steelville Fire Protection District	Debris	0.5
2014-02813-103242	04/24/2014	Crawford	Steelville Fire Protection District	Unknown	22
2014-02813-106502	05/28/2014	Crawford	Steelville Fire Protection District	Debris	6
2014-02813-108182	07/28/2014	Crawford	Steelville Fire Protection District	Debris	0.5
2014-02813-108322	07/31/2014	Crawford	Steelville Fire Protection District	Unknown	1
2014-02813-109045	08/01/2014	Crawford	Steelville Fire Protection District	Debris	1
2014-02813-110242	09/26/2014	Crawford	Steelville Fire Protection District	Debris	2
2014-02813-110833	10/05/2014	Crawford	Steelville Fire Protection District	Debris	2
2014-02813-111721	10/29/2014	Crawford	Steelville Fire Protection District	Unknown	2
2014-02813-112990	11/10/2014	Crawford	Steelville Fire Protection District	Unknown	25
2014-02813-112991	11/10/2014	Crawford	Steelville Fire Protection District	Unknown	223
2014-02813-115239	12/26/2014	Crawford	Steelville Fire Protection District	Unknown	1
2014-02813-120073	03/11/2014	Crawford	Steelville Fire Protection District	Debris	0.2
2014-03620-094807	02/27/2014	Crawford	Beaufort-Leslie Fire Protection District	Unknown	30

2014-03627-094403	02/20/2014	Crawford	Sullivan Fire Protection District	Unknown	1
2014-03627-094523	02/21/2014	Crawford	Sullivan Fire Protection District	Debris	4
2014-03627-094656	02/27/2014	Crawford	Sullivan Fire Protection District	Debris	10
2014-03627-096362	03/22/2014	Crawford	Sullivan Fire Protection District	Debris	0.25
2014-03627-102403	04/20/2014	Crawford	Sullivan Fire Protection District	Debris	2
2014-04718-093971	01/26/2014	Crawford	Quad County Fire Protection District	Unknown	2
2014-04718-095307	02/19/2014	Crawford	Quad County Fire Protection District	Unknown	5
2014-04718-099984	03/15/2014	Crawford	Quad County Fire Protection District	Unknown	100
2014-05038-106557	03/15/2014	Crawford	Crystal City Fire Department	Equipment	0.25
2015-02810-129489	01/07/2015	Crawford	Bourbon Fire Protection District	Debris	0.25
2015-02810-129490	01/07/2015	Crawford	Bourbon Fire Protection District	Debris	0.25
2015-02810-129491	01/08/2015	Crawford	Bourbon Fire Protection District	Unknown	0.25
2015-02810-129492	02/15/2015	Crawford	Bourbon Fire Protection District	Unknown	1
2015-02810-129493	03/08/2015	Crawford	Bourbon Fire Protection District	Not Reported	10
2015-02810-129494	03/12/2015	Crawford	Bourbon Fire Protection District	Debris	1
2015-02810-129495	03/15/2015	Crawford	Bourbon Fire Protection District	Miscellaneous	56
2015-02810-129496	03/15/2015	Crawford	Bourbon Fire Protection District	Debris	1
2015-02810-129700	03/21/2015	Crawford	Bourbon Fire Protection District	Debris	62
2015-02810-129705	03/22/2015	Crawford	Bourbon Fire Protection District	Miscellaneous	5
2015-02810-129890	04/01/2015	Crawford	Bourbon Fire Protection District	Miscellaneous	0.75
2015-02810-129891	04/04/2015	Crawford	Bourbon Fire Protection District	Debris	1
2015-02810-129892	09/27/2015	Crawford	Bourbon Fire Protection District	Debris	0.25
2015-02810-129893	10/11/2015	Crawford	Bourbon Fire Protection District	Children	2
2015-02810-129894	10/13/2015	Crawford	Bourbon Fire Protection District	Debris	1.25
2015-02810-129895	10/25/2015	Crawford	Bourbon Fire Protection District	Debris	1
2015-02811-120358	01/19/2015	Crawford	Cuba Fire Department	Equipment	10
2015-02811-120359	02/07/2015	Crawford	Cuba Fire Department	Debris	5
2015-02811-121629	03/07/2015	Crawford	Cuba Fire Department	Debris	5
2015-02811-121630	03/22/2015	Crawford	Cuba Fire Department	Debris	1

2015-02811-121631	03/22/2015	Crawford	Cuba Fire Department	Debris	2
2015-02811-121632	03/09/2015	Crawford	Cuba Fire Department	Debris	10
2015-02811-121633	03/21/2015	Crawford	Cuba Fire Department	Debris	25
2015-02811-121634	03/23/2015	Crawford	Cuba Fire Department	Unknown	1
2015-02811-121635	03/31/2015	Crawford	Cuba Fire Department	Unknown	10
2015-02811-121636	03/31/2015	Crawford	Cuba Fire Department	Unknown	1
2015-02811-121637	04/01/2015	Crawford	Cuba Fire Department	Debris	1
2015-02811-129938	05/25/2015	Crawford	Cuba Fire Department	Debris	1
2015-02811-129939	06/25/2015	Crawford	Cuba Fire Department	Debris	1
2015-02811-129940	10/01/2015	Crawford	Cuba Fire Department	Equipment	1
2015-02811-129941	10/15/2015	Crawford	Cuba Fire Department	Unknown	1
2015-02811-129942	10/15/2015	Crawford	Cuba Fire Department	Debris	1
2015-02811-129943	10/16/2015	Crawford	Cuba Fire Department	Unknown	1
2015-02811-129944	10/18/2015	Crawford	Cuba Fire Department	Debris	1
2015-02811-129945	10/20/2015	Crawford	Cuba Fire Department	Debris	1
2015-02811-129946	10/20/2015	Crawford	Cuba Fire Department	Debris	1
2015-02813-116891	01/19/2015	Crawford	Steelville Fire Protection District	Unknown	3
2015-02813-117978	02/04/2015	Crawford	Steelville Fire Protection District	Unknown	2
2015-02813-117979	02/07/2015	Crawford	Steelville Fire Protection District	Debris	5
2015-02813-118209	02/10/2015	Crawford	Steelville Fire Protection District	Unknown	1
2015-02813-118610	02/13/2015	Crawford	Steelville Fire Protection District	Debris	2
2015-02813-120072	03/12/2015	Crawford	Steelville Fire Protection District	Debris	1
2015-02813-120075	03/09/2015	Crawford	Steelville Fire Protection District	Unknown	75
2015-02813-121031	03/15/2015	Crawford	Steelville Fire Protection District	Unknown	3
2015-02813-121441	03/31/2015	Crawford	Steelville Fire Protection District	Unknown	2
2015-02813-121442	03/31/2015	Crawford	Steelville Fire Protection District	Debris	5
2015-02813-121443	03/31/2015	Crawford	Steelville Fire Protection District	Debris	20
2015-02813-121444	03/31/2015	Crawford	Steelville Fire Protection District	Unknown	60
2015-02813-121732	03/21/2015	Crawford	Steelville Fire Protection District	Debris	3

2015-02813-122016	04/12/2015	Crawford	Steelville Fire Protection District	Equipment	0.25
2015-02813-122017	04/12/2015	Crawford	Steelville Fire Protection District	Unknown	2
2015-02813-123430	04/18/2015	Crawford	Steelville Fire Protection District	Debris	3
2015-02813-123431	04/28/2015	Crawford	Steelville Fire Protection District	Unknown	0.5
2015-02813-123432	04/30/2015	Crawford	Steelville Fire Protection District	Debris	0.25
2015-02813-124770	05/02/2015	Crawford	Steelville Fire Protection District	Debris	2
2015-02813-124771	05/03/2015	Crawford	Steelville Fire Protection District	Unknown	2
2015-02813-125310	05/29/2015	Crawford	Steelville Fire Protection District	Unknown	0.25
2015-02813-128142	09/05/2015	Crawford	Steelville Fire Protection District	Debris	0.5
2015-02813-129413	10/11/2015	Crawford	Steelville Fire Protection District	Debris	2
2015-02813-129415	10/16/2015	Crawford	Steelville Fire Protection District	Equipment	1
2015-02813-129418	10/18/2015	Crawford	Steelville Fire Protection District	Debris	10
2015-02813-129877	10/20/2015	Crawford	Steelville Fire Protection District	Unknown	3
2015-02813-129878	10/19/2015	Crawford	Steelville Fire Protection District	Unknown	3
2015-02813-129879	10/19/2015	Crawford	Steelville Fire Protection District	Debris	10
2015-02813-130377	11/04/2015	Crawford	Steelville Fire Protection District	Unknown	0.75
2015-02813-130739	11/13/2015	Crawford	Steelville Fire Protection District	Debris	4
2015-02813-130740	11/26/2015	Crawford	Steelville Fire Protection District	Unknown	0.25
2015-02813-130741	11/09/2015	Crawford	Steelville Fire Protection District	Debris	6
2015-02813-130742	11/15/2015	Crawford	Steelville Fire Protection District	Unknown	2
2015-02813-131096	12/08/2015	Crawford	Steelville Fire Protection District	Unknown	5
2015-03627-116792	01/18/2015	Crawford	Sullivan Fire Protection District	Miscellaneous	1
2015-03627-116793	01/18/2015	Crawford	Sullivan Fire Protection District	Miscellaneous	2
2015-03627-118354	02/15/2015	Crawford	Sullivan Fire Protection District	Debris	0.1
2015-03627-128571	09/23/2015	Crawford	Sullivan Fire Protection District	Debris	0.75
2015-03627-130191	11/04/2015	Crawford	Sullivan Fire Protection District	Debris	4
2016-00008-134732	03/06/2016	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	130
2016-02810-141432	01/31/2016	Crawford	Bourbon Fire Protection District	Debris	15
2016-02810-141433	02/26/2016	Crawford	Bourbon Fire Protection District	Debris	5

2016-02810-141434	02/28/2016	Crawford	Bourbon Fire Protection District	Debris	4.5
2016-02810-141435	04/04/2016	Crawford	Bourbon Fire Protection District	Unknown	658
2016-02810-141436	04/09/2016	Crawford	Bourbon Fire Protection District	Debris	2
2016-02810-141437	04/13/2016	Crawford	Bourbon Fire Protection District	Debris	0.5
2016-02810-141438	05/26/2016	Crawford	Bourbon Fire Protection District	Lightning	0.1
2016-02810-141439	09/06/2016	Crawford	Bourbon Fire Protection District	Unknown	0.1
2016-02810-141440	10/28/2016	Crawford	Bourbon Fire Protection District	Equipment	0.1
2016-02810-141441	11/06/2015	Crawford	Bourbon Fire Protection District	Debris	0.1
2016-02810-141442	11/07/2015	Crawford	Bourbon Fire Protection District	Debris	0.5
2016-02810-141443	11/14/2015	Crawford	Bourbon Fire Protection District	Debris	0.1
2016-02810-141444	11/19/2015	Crawford	Bourbon Fire Protection District	Debris	0.5
2016-02813-133131	02/07/2016	Crawford	Steelville Fire Protection District	Debris	5
2016-02813-133267	02/19/2016	Crawford	Steelville Fire Protection District	Debris	1
2016-02813-133332	02/18/2016	Crawford	Steelville Fire Protection District	Debris	2
2016-02813-133333	02/18/2016	Crawford	Steelville Fire Protection District	Debris	3
2016-02813-133838	02/20/2016	Crawford	Steelville Fire Protection District	Unknown	1
2016-02813-133839	02/29/2016	Crawford	Steelville Fire Protection District	Unknown	5
2016-02813-134513	03/06/2016	Crawford	Steelville Fire Protection District	Unknown	130
2016-02813-134514	03/05/2016	Crawford	Steelville Fire Protection District	Debris	0.25
2016-02813-134515	03/02/2016	Crawford	Steelville Fire Protection District	Debris	15
2016-02813-134516	03/05/2016	Crawford	Steelville Fire Protection District	Unknown	2
2016-02813-134517	03/05/2016	Crawford	Steelville Fire Protection District	Unknown	0.2
2016-02813-134817	03/15/2016	Crawford	Steelville Fire Protection District	Unknown	6
2016-02813-134818	03/17/2016	Crawford	Steelville Fire Protection District	Unknown	3
2016-02813-134819	03/17/2016	Crawford	Steelville Fire Protection District	Unknown	1
2016-02813-134820	03/22/2016	Crawford	Steelville Fire Protection District	Equipment	5
2016-02813-135117	03/29/2016	Crawford	Steelville Fire Protection District	Debris	5
2016-02813-135931	04/04/2016	Crawford	Steelville Fire Protection District	Equipment	5
2016-02813-135932	04/03/2016	Crawford	Steelville Fire Protection District	Unknown	10

2016-02813-135936	04/04/2016	Crawford	Steelville Fire Protection District	Unknown	650
2016-02813-135938	04/16/2016	Crawford	Steelville Fire Protection District	Debris	15
2016-03627-142412	08/10/2016	Crawford	Sullivan Fire Protection District	Unknown	0.01
2017-00008-143731	01/11/2017	Crawford	MDC REPORTING REGION - ST. LOUIS	Campfire	47
2017-02810-163420	11/17/2016	Crawford	Bourbon Fire Protection District	Debris	1
2017-02810-163421	11/23/2016	Crawford	Bourbon Fire Protection District	Unknown	0.1
2017-02810-163422	11/30/2016	Crawford	Bourbon Fire Protection District	Debris	0.1
2017-02810-163423	12/29/2016	Crawford	Bourbon Fire Protection District	Unknown	1.5
2017-02810-163424	01/24/2017	Crawford	Bourbon Fire Protection District	Unknown	1
2017-02810-163425	02/05/2017	Crawford	Bourbon Fire Protection District	Unknown	0.5
2017-02810-163426	02/07/2017	Crawford	Bourbon Fire Protection District	Unknown	1
2017-02810-163427	02/22/2017	Crawford	Bourbon Fire Protection District	Debris	0.5
2017-02810-163428	02/26/2017	Crawford	Bourbon Fire Protection District	Unknown	4
2017-02810-163429	02/26/2017	Crawford	Bourbon Fire Protection District	Debris	1
2017-02810-163430	03/18/2017	Crawford	Bourbon Fire Protection District	Unknown	0.5
2017-02810-163431	03/20/2017	Crawford	Bourbon Fire Protection District	Children	2
2017-02810-163432	04/07/2017	Crawford	Bourbon Fire Protection District	Unknown	1
2017-02811-144318	02/20/2016	Crawford	Cuba Fire Department	Debris	1.5
2017-02811-144711	06/22/2016	Crawford	Cuba Fire Department	Debris	1
2017-02811-144712	06/23/2016	Crawford	Cuba Fire Department	Unknown	1
2017-02811-144732	07/29/2016	Crawford	Cuba Fire Department	Debris	1
2017-02811-144733	09/12/2016	Crawford	Cuba Fire Department	Equipment	1
2017-02811-144751	10/07/2016	Crawford	Cuba Fire Department	Unknown	0.25
2017-02811-144752	11/02/2016	Crawford	Cuba Fire Department	Unknown	0.5
2017-02811-144753	11/11/2016	Crawford	Cuba Fire Department	Unknown	0.1
2017-02811-144771	11/13/2016	Crawford	Cuba Fire Department	Campfire	0.25
2017-02811-144772	11/17/2016	Crawford	Cuba Fire Department	Unknown	3
2017-02811-144773	11/22/2016	Crawford	Cuba Fire Department	Equipment	0.5
2017-02811-144774	12/30/2016	Crawford	Cuba Fire Department	Miscellaneous	3

2017-02811-144775	12/30/2016	Crawford	Cuba Fire Department	Miscellaneous	1
2017-02811-144776	12/30/2016	Crawford	Cuba Fire Department	Miscellaneous	2
2017-02811-144777	01/01/2017	Crawford	Cuba Fire Department	Unknown	0.2
2017-02811-144791	02/06/2016	Crawford	Cuba Fire Department	Unknown	5
2017-02811-144792	02/28/2016	Crawford	Cuba Fire Department	Debris	1
2017-02811-144793	02/29/2016	Crawford	Cuba Fire Department	Unknown	0.5
2017-02811-144794	03/06/2016	Crawford	Cuba Fire Department	Unknown	1
2017-02811-144795	03/26/2016	Crawford	Cuba Fire Department	Debris	1.5
2017-02811-144796	03/28/2016	Crawford	Cuba Fire Department	Debris	0.5
2017-02811-144797	04/05/2016	Crawford	Cuba Fire Department	Unknown	0.25
2017-02811-144798	04/08/2016	Crawford	Cuba Fire Department	Unknown	0.1
2017-02811-144799	04/17/2016	Crawford	Cuba Fire Department	Unknown	1
2017-02811-144800	06/20/2016	Crawford	Cuba Fire Department	Equipment	1
2017-02811-144801	06/21/2016	Crawford	Cuba Fire Department	Unknown	0.1
2017-02811-145153	02/11/2017	Crawford	Cuba Fire Department	Debris	3
2017-02811-145754	02/10/2017	Crawford	Cuba Fire Department	Unknown	20
2017-02811-145755	02/16/2017	Crawford	Cuba Fire Department	Debris	1
2017-02811-145756	02/01/2017	Crawford	Cuba Fire Department	Debris	1
2017-02811-145757	01/10/2017	Crawford	Cuba Fire Department	Debris	2
2017-02811-145758	02/03/2017	Crawford	Cuba Fire Department	Debris	15
2017-02811-145759	02/03/2017	Crawford	Cuba Fire Department	Smoking	1
2017-02811-145760	01/11/2017	Crawford	Cuba Fire Department	Miscellaneous	1
2017-02811-145761	01/11/2017	Crawford	Cuba Fire Department	Unknown	50
2017-02811-146053	02/19/2017	Crawford	Cuba Fire Department	Equipment	0.75
2017-02811-146054	02/23/2017	Crawford	Cuba Fire Department	Equipment	1
2017-02811-146055	02/19/2017	Crawford	Cuba Fire Department	Unknown	1
2017-02811-146771	03/04/2017	Crawford	Cuba Fire Department	Debris	0.2
2017-02811-147606	03/04/2017	Crawford	Cuba Fire Department	Debris	1
2017-02813-143732	01/11/2017	Crawford	Steelville Fire Protection District	Campfire	47

2017-03623-145454	02/16/2017	Crawford	Gerald-Rosebud Fire Prot. Dist.	Unknown	30
2017-03627-145726	02/01/2017	Crawford	Sullivan Fire Protection District	Debris	0.5
2017-03627-149951	03/16/2017	Crawford	Sullivan Fire Protection District	Debris	0.1
2017-03627-157092	08/13/2017	Crawford	Sullivan Fire Protection District	Debris	0.5
2017-03627-160092	09/24/2017	Crawford	Sullivan Fire Protection District	Debris	0.25
2017-03627-160093	09/24/2017	Crawford	Sullivan Fire Protection District	Debris	0.25
2017-03627-165085	12/03/2017	Crawford	Sullivan Fire Protection District	Debris	2
2017-03627-165093	12/19/2017	Crawford	Sullivan Fire Protection District	Debris	0.25
2017-03627-165096	12/21/2017	Crawford	Sullivan Fire Protection District	Debris	0.25
2017-05008-154971	04/04/2016	Crawford	Hillsboro Fire Protection District	Unknown	900
2018-03627-165903	02/08/2018	Crawford	Sullivan Fire Protection District	Debris	0.31
2018-03627-177951	04/06/2018	Crawford	Sullivan Fire Protection District	Unknown	10.34
2018-03627-177954	04/20/2018	Crawford	Sullivan Fire Protection District	Debris	0.54
2018-03627-177962	05/14/2018	Crawford	Sullivan Fire Protection District	Unknown	0.27
2018-03627-177963	05/14/2018	Crawford	Sullivan Fire Protection District	Unknown	0.27
2019-02811-178532	01/21/2018	Crawford	Cuba Fire Department	Debris	0.01
2019-02811-178537	02/01/2018	Crawford	Cuba Fire Department	Debris	6.43
2019-02811-178538	02/15/2018	Crawford	Cuba Fire Department	Debris	0.55
2019-02811-178539	03/03/2018	Crawford	Cuba Fire Department	Fireworks	3.52
2019-02811-178540	03/15/2018	Crawford	Cuba Fire Department	Debris	0.83
2019-02811-178541	04/28/2018	Crawford	Cuba Fire Department	Debris	0.41
2019-02811-178542	04/28/2018	Crawford	Cuba Fire Department	Debris	0.53
2019-02811-178544	05/26/2018	Crawford	Cuba Fire Department	Unknown	0.51
2019-02811-178545	10/20/2018	Crawford	Cuba Fire Department	Unknown	0.44
2019-02811-178546	10/21/2018	Crawford	Cuba Fire Department	Debris	0.47
2019-02811-178547	10/23/2018	Crawford	Cuba Fire Department	Unknown	0.7
2019-02811-178548	11/29/2018	Crawford	Cuba Fire Department	Debris	0.05
2019-02811-178549	03/23/2019	Crawford	Cuba Fire Department	Unknown	0.54
2019-02811-178550	03/23/2019	Crawford	Cuba Fire Department	Debris	0.05

2019-02811-178551	03/23/2019	Crawford	Cuba Fire Department	Debris	0.02
2019-02811-178552	03/22/2019	Crawford	Cuba Fire Department	Unknown	0.59
2019-02811-178553	03/14/2019	Crawford	Cuba Fire Department	Power line	4.12
2019-02811-178554	04/15/2019	Crawford	Cuba Fire Department	Power line	3.2
2019-02811-178576	04/17/2019	Crawford	Cuba Fire Department	Debris	7.67
2019-02811-178599	04/21/2019	Crawford	Cuba Fire Department	Debris	2.4
2019-02811-178609	04/22/2019	Crawford	Cuba Fire Department	Debris	0.76
2019-02811-178610	04/22/2019	Crawford	Cuba Fire Department	Debris	2.08
2019-08110-178382	03/23/2019	Crawford	St. James Fire Protection District	Unknown	2.08
2020-00000-190259	03/03/2020	Crawford	MDC Forestry	Arson	5.8

Source: Missouri Department of Conservation, Fire Report Search, https://mdc12.mdc.mo.gov/Applications/MDCFireReporting/Home/FireReportSearch