

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



Meramec Regional Planning Commission • March 2018



## CONTRIBUTORS

### Crawford County Hazard Mitigation Planning Committee

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

#### Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Organization
Leo Sanders	Presiding Commissioner	County	Crawford Co.
Rob Cummings	Associate Commissioner	County	Crawford Co.
Jared Boast	Associate Commissioner	County	Crawford Co.
John Martin	County Clerk	County	Crawford Co.
Darin Layman	Sherriff	Sherriff's Dept.	Crawford Co.
Lesa Mizell	EMD	Emergency Management	Crawford Co.
Crawford Co. Road District 1	-	Road Dept.	Crawford Co.
Crawford Co. Road District 2	-	Road Dept.	Crawford Co.
Crawford Co. PWSD #1	-	Water	Crawford Co.
Scott Cason	Director	911 Comm.	Crawford Co.
-	Administrator	Health Dept.	Crawford Co.
Danny Skaggs	Mayor	City Admin.	Bourbon
Cathy Bremer	Clerk	City Admin.	Bourbon
Rick Wise	Chief of Police	Police Dept.	Bourbon
Daniel Whatley	Fire Chief	Fire Dept.	Bourbon
-	EMD	Emergency Management	Bourbon
Ray Mortimeyer	Mayor	City Admin	Cuba
Christine Nash	Clerk	City Admin.	Cuba
Paul Crow	Chief of Police	Police Dept.	Cuba
Mike Plank	Fire Chief	Fire Dept.	Cuba
Rodney Neff	EMD	Emergency Management	Cuba
Dennis Chandler	Street Superintendent	Public Works	Cuba
Jared West	Chairman	City Admin.	Leasburg
Della Bishop	Clerk	City Admin.	Leasburg
-	Fire Chief	Fire Dept.	Leasburg
-	Chairperson	City Admin.	St. Cloud
Michael (Tiny) Keen	Mayor	City Admin.	Steelville
Sheila Anderson	Clerk	City Admin.	Steelville
Mike Sherman	City Marshall	Police Dept.	Steelville
-	Fire Chief	Fire Dept.	Steelville
-	Sewer, Water, Street Supervisor	Public Works	Steelville
Dennis Watz	Mayor	City Admin.	Sullivan
Jan Koch	Clerk	City Admin.	Sullivan

Name	Title	Department	Jurisdiction/Agency/Organization
Kevin Halbert	EMD	Emergency Management	Sullivan
-	Fire Chief	Fire Dept.	Sullivan
George Counts	Chief of Police	Police Dept.	Sullivan
Larry Cuneio	Street Commissioner	Public works	Sullivan
J.V. Thurmond	Light Commissioner	Public Works	Sullivan
Kent Koch	Water & Sewer Commission	Public Works	Sullivan
-	Mayor	City Admin.	West Sullivan
Patricia Thompson	Superintendent	School District	Crawford Co. R-I
Johnny Thompson	Superintendent	School District	Crawford Co. R-II
Michael Whittaker	Superintendent	School District	Steelville R-III
Dr. Thomas Allen	Superintendent	School District	Sullivan School District

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

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

### **Stakeholder Representatives**

Name	Title	Agency/Organization
-	-	Crawford Electric Co-Op Inc
-	Administrator	The Arbors at Victorian Place of Cuba
-	Administrator	Cuba Manor Inc
-	Administrator	Rock Springs Residential
-	Administrator	Stubble Field
-	Administrator	Sunshine Acres Residential
-	Administrator	Redwood Manor Care Center
-	Administrator	Life Care of Sullivan
-	Administrator	Meramec Nursing Center
-	Administrator	Victorian Place of Sullivan
-	Administrator	Happy Acres Residential Care
-	-	American Red Cross
-	-	MO SEMA
-	-	U.S. Army Corps of Engineers
-	-	FEMA Region VII
Josh Hundley	Biologist	U.S. Fish and Wildlife Service
-	-	Missouri Dept. of Conservation
-	-	USDA, NRCS
-	Administrator	Missouri Baptist Sullivan Hospital
-	-	MoDOT
James W. Remillard	Captain	MSHP, Troop I
-	-	Charter Communications
-	-	Intercounty Electric Co-Op
-	-	Ameren UE
-	-	Crawford Medical Clinic
-	-	Cuba Free Press
-	-	Sullivan Independent News
-	-	Steelville Star-Crawford Mirror

**TABLE OF CONTENTS**

---

- Executive Summary .....vi**
- Contributors .....i
- Table of Contents..... iii
- Prerequisites..... viii
- 1 Introduction and Planning Process .....1.1**
  - 1.1 Purpose.....1.1
  - 1.2 Background and Scope .....1.2
  - 1.3 Plan Organization .....1.2
  - 1.4 Planning Process.....1.4
    - 1.4.1 Multi-Jurisdictional Participation .....1.7
    - 1.4.2 The Planning Steps.....1.9
- 2 Planning Area Profile and Capabilities .....2.1**
  - 2.1 Crawford County Planning Area Profile .....2.2
    - 2.1.2 Geography, Geology, and Topography .....2.3
    - 2.1.3 Climate.....2.8
    - 2.1.4 Population/Demographics .....2.8
    - 2.1.5 History.....2.12
    - 2.1.6 Occupations.....2.13
    - 2.1.7 Agriculture.....2.13
    - 2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area.....2.14
  - 2.2 Jurisdictional Profiles and Mitigation Capabilities.....2.14
    - Unincorporated Crawford County .....2.14
    - City of Bourbon .....2.17
    - City of Cuba .....2.21
    - City of Steelville .....2.24
    - City of Sullivan .....2.37

City of West Sullivan .....	2.30
Public School District Profiles and Mitigation Capabilities .....	2.38
Critical Facilities .....	2.41
<b>3 Risk Assessment .....</b>	<b>3.1</b>
3.1 Hazard Identification .....	3.4
3.1.1 Review of Existing Mitigation Plans .....	3.4
3.1.2 Review Disaster Declaration History .....	3.7
3.1.3 Research Additional Sources .....	3.9
3.1.4 Hazards Identified .....	3.11
3.1.5 Multi-Jurisdictional Risk Assessment.....	3.13
3.2 Assets at Risk.....	3.13
3.2.1 Total Exposure of Population and Structures .....	3.13
3.2.2 Critical and Essential Facilities and Infrastructure .....	3.15
3.2.3 Other Assets .....	3.18
3.3 Future Land Use and Development .....	3.22
3.4 Hazard Profiles, Vulnerability, and Problem Statements.....	3.25
3.4.1 Dam Failure .....	3.28
3.4.2 Drought.....	3.49
3.4.3 Earthquakes.....	3.62
3.4.4 Extreme Heat.....	3.76
3.4.5 Fires (Urban/Structural and Wild).....	3.84
3.4.6 Flooding (Flash and River) .....	3.92
3.4.7 Land Subsidence/Sinkholes .....	3.117
3.4.8 Thunderstorm/High Winds/Lightning/Hail .....	3.124
3.4.9 Tornado .....	3.141
3.4.10 Winter Weather/Snow/Ice/Severe Cold .....	3.154
<b>4 Mitigation Strategy.....</b>	<b>4.1</b>

4.1 Goals.....	4.1
4.2 Identification and Analysis of Mitigation Actions.....	4.2
4.3 Implementation of Mitigation Actions .....	4.4
<b>5 Plan Maintenance Process .....</b>	<b>5.1</b>
5.1 Monitoring, Evaluating, and Updating the Plan .....	5.1
5.1.1 Responsibility for Plan Maintenance .....	5.1
5.1.2 Plan Maintenance Schedule.....	5.2
5.1.3 Plan Maintenance Process.....	5.2
5.2 Incorporation into Existing Planning Mechanisms .....	5.3
5.3 Continued Public Involvement .....	5.5
<b>6 Appendix .....</b>	<b>6.1</b>
A: References.....	6.2
B: Planning Process .....	6.6
D: Adoption Resolutions .....	6.31
E: Critical/Essential Facilities.....	6.32
F: MDC Wildfire Data Search .....	6.34

## EXECUTIVE SUMMARY

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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 March 22, 2013. The original plan was approved in April 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
- 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

Crawford County and the jurisdictions listed above developed a multi-jurisdictional Hazard Mitigation Plan that was originally approved by FEMA in April 2005 with an update approved by FEMA on March 22, 2013. This current planning effort serves as an update (hereafter referred to as the 2018 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, with emphasis on changes that have occurred since the previously approved plan was adopted. The MPC determined that the planning area is vulnerable to several hazards that are identified, profiled and analyzed in this plan. Riverine and flash flooding, winter storms, severe thunderstorms/hail/lightening/high winds and tornadoes are among the hazards that historically have had a significant impact.

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

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

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

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

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

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

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

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



## PREREQUISITES

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

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

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

- Crawford County
- City of Bourbon
- City of Cuba
- 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

# 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**, 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**, (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

# 1 Introduction and Planning Process

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

## 1.1 Purpose

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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. Those jurisdictions within Crawford County that do not adopt the 2018 plan will not be eligible for funding through these grant programs.

## 1.2 Background and Scope

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The 2018 Crawford County Hazard Mitigation Plan is an update of the original plan developed and approved in April 2005. The most recent update was approved by FEMA on March 22, 2013. The revised document will be valid for five years from approval by FEMA. It is a multi-jurisdictional plan that covers the participating jurisdictions within the county's borders, all of whom adopted both the 2013 and 2018 plan, excluding the Village of Leasburg and Village of St. Cloud:

- Crawford County
- City of Bourbon
- City of Cuba
- 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

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

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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

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.

**Table 1.1 Summary of 2017 Revisions to Plan**

Chapter	Summary of Revisions
Chapter 1 Introduction and Planning Process	Updated with 2017 information and reformatted to follow the 4-4-17 model outline. Provided information on how the planning process followed the <i>Local Mitigation Planning Guidance (March 2013)</i> , the <i>Local Mitigation Plan Review Guide (October 1, 2011)</i> , and <i>Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013)</i> . Added information on RiskMAP
Chapter 2 Planning Area Profile and Capabilities	Updated with 2017 data and reformatted to follow the 4-4-17 model outline.
Chapter 3 Risk Assessment	Updated with 2017 data and reformatted to follow the 4-4-17 model outline.
Chapter 4 Mitigation Strategy	Updated with 2017 data and reformatted to follow the 4-4-17 model outline, including substituting action item worksheets for the narrative used in the previous plan to provide required information for each action item.
Chapter 5 Plan Implementation and Maintenance	Updated with 2017 data and reformatted to follow the 4-4-17 model outline.
Appendices	Updated with 2017 data and reformatted to follow the 4-4-17 model outline.

\*2017 data encompasses the most recent available data.

## 1.4 Planning Process

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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 2005 when the Missouri State Emergency Management Agency (SEMA) provided grant funds and contracted with the Meramec Regional Planning Commission (MRPC) to develop a hazard mitigation plan for the county. MRPC is a council of local governments in south central Missouri serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties. The initial plan was completed and approved in April 2005. An update was completed and approved in March 2013.

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

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

The Crawford County Multi-Hazard Mitigation Plan was developed as the result of a collaborative effort among Crawford County, the cities/villages of Bourbon, Cuba, Steelville, Sullivan, West Sullivan, Crawford Co. R-I School District, Crawford Co. 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 provided information to update the document, reviewed the plan and provided input. Interviews were conducted with stakeholders from the community and several planning meetings were conducted during the plan review and update.

The 2018 planning process began with a meeting held on April 11, 2017. MRPC staff provided an overview of the planning process and review of the existing hazard mitigation plan. The

group reviewed and discussed hazard mitigation goals and what progress had been made on hazard mitigation action items over the past four years. The second meeting was held on June 6, 2017. The MPC reviewed and updated the list of action items, making note of those that had been accomplished, those that were no longer applicable and adding a number of projects to the list. The group then reviewed the action items, applying the STAPLEE method (Social; Technical; Administrative; Political; Legal; Economic; Environmental) and applying cost benefit analysis to best determine priorities. A full description of the prioritization process is included in Chapter 4.

County road and bridge staff attended meetings on April 11, 2017 and June 6, 2017. County Associate Commissioners and staff provided a comprehensive list of completed mitigation projects as well as proposed new projects to be included in the plan update. Staff incorporated these action items and completed projects into the planning materials reviewed and prioritized by the MPC in June.

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

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

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

The MPC contributed to the planning process by:

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

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

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

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

<b>Name</b>	<b>Title</b>	<b>Department</b>	<b>Jurisdiction/Agency/ Organization</b>	<b>Direct Participation</b>	<b>Indirect Participation</b>
Larry Flesher	Asst. Fire Chief	Fire Dept.	Sullivan	X	
Kim Robinson	Asst. Superintendent	School District	Crawford Co. R-II	X	
J.T. Hardy	City Administrator	City Admin.	Sullivan	X	
Scott Cason	E-911/Deputy EMD	Emergency Management	Crawford Co.	X	
Lesa Mizell	EMD	Emergency Management	Crawford Co.	X	
Danny Brown	Dist. 1 Forman	Road & Bridge	Crawford Co.	X	
Rob Cummings	Assoc. Commissioner	County	Crawford Co.	X	
Leo Sanders	Presiding Commissioner	County	Crawford Co.	X	
Jared Boast	Assoc. Commissioner	County	Crawford Co.	X	
Paul Satterfield	Chief of Police	Police Dept.	Bourbon	X	
Curits Finley	Principle	School District	Steelville R-III	X	
Darin Layman	Sheriff	Sheriff's Dept.	Crawford Co.	X	
Kenny McGrew	Dist. 2 Forman	Road & Bridge	Crawford Co.	X	
Michael (Tiny) Keen	Mayor	City Admin.	Steelville	X	
Michael Sherman	Chief of Police	Police Dept.	Steelville	X	
Patricia Thompson	Superintendent	School District	Crawford Co. R-I	X	
Doug Cuneio	Asst. Superintendent	School District	Sullivan Schools	X	
Jon Earnhart	Superintendent	School District	Crawford Co. R-II	X	
Rodney Neff	EMD	Emergency Management	Cuba	X	
Denise Franklin	Clerk	City Admin.	West Sullivan		X
Sherry Horn	Exec. Admin. Assistant	School District	Crawford Co. R-I		X
Mike Whittaker	Superintendent	School District	Steelville R-III		X
Genifer Cape	-	-	Crawford Co. Electric	X	
Scott Blue	-	-	Crawford Co. Electric	X	
Amy England	-	-	Three Rivers Publishing	X	



Name	Title	Department	Jurisdiction/Agency/Organization	Direct Participation	Indirect Participation
Matt Shively	Regulatory Branch	-	USACE	X	
Cathy Bremer	City Clerk	City Admin.	Bourbon		X

## 1.5 Multi-Jurisdictional Participation

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

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. 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 Co. R-I School District
- Crawford Co. R-II School District
- Steelville R-III School District
- Sullivan School District
- Crawford Electric Co-Op Inc.
- Intercounty Electric Co-Op Inc.
- Ameren UE
- The Arbors at Victorian Place of Cuba
- Cuba Manor Inc.
- Rock Springs Residential
- Stubble Field
- Sunshine Acres Residential
- Redwood Manor Care Center
- Life Care of Sullivan
- Meramec Nursing Center
- Victorian Place of Sullivan
- Happy Acres Residential Care
- American Red Cross
- Missouri SEMA
- FEMA Region VII
- USFWS
- Missouri Dept. of Conservation
- MoDOT
- MSHP, Troop I
- USACE
- USDA, NRCS
- Missouri Baptist Sullivan Hospital
- Charter Communications
- Crawford Medical Clinic
- 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;

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

Not all jurisdictions were able to attend the MPC meetings. Most communities and school districts in 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. The jurisdictions that participated in the process, as well as their level of participation in the process are shown in Table 1.3. Documentation of meetings, including sign-in sheets are included in Appendix B: Planning Process.

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

Jurisdiction	Meeting #1	Meeting #2	Interviews	Data Collection Survey/Call	Update/Develop/Prioritize Mitigation Actions	Review/Comment on Plan
Crawford Co.	X	X		X	X	
Bourbon	X			X	X	
Cuba		X		X	X	
Steelville		X	X	X	X	
Sullivan	X	X		X	X	
West Sullivan				X	X	
Crawford Co. R-I		X		X	X	
Crawford Co. R-II	X	X		X	X	
Steelville R-III	X	X		X	X	
Sullivan School District		X		X	X	

## 1.6 The Planning Steps

Crawford County and MRPC worked together to develop the plan and based the planning process in FEMA’s *Local Mitigation Planning Guidance (March 2013)*, the *Local Mitigation Plan Review Guide (October 1, 2011)*, and *Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013)*. The planning guides used for the initial plan development are no longer current and were not used in the update. The planning process has included organizing the county’s resources, assessing the risks to the county, developing the mitigation plan and implementing the plan and monitoring the progress of plan implementation.

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

**Table 1.4 Crawford County Plan Update Process**

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

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

The planning area was determined by the boundaries of 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 offered to host the meetings in conjunction with the regular commission meetings and two meeting dates were selected – April 11, 2017 and June 6, 2017.

At the first meeting on April 11, 2017, MRPC staff made introductions and provided an overview of hazard mitigation planning and 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 and adding new mitigation actions to the existing list. Staff wrapped up the meeting by explaining the process that would be used to prioritize the action items at the next meeting – using both the STAPLEE method and analyzing the cost benefit.

At the second meeting on June 6, 2017, the group reviewed the complete list of action items developed at the April 11, 2017 meeting. MRPC provided an explanation of the prioritization process using both STAPLEE and cost benefit scoring. The MCP then provided input on prioritizing all of the action items. Staff took those recommendations and developed a matrix of the action items with the STAPLEE and cost benefit scores. This matrix was mailed out to all of the individuals and organizations on the mailing list for the MPC with a request for feedback. All suggestions for changes were incorporated into the plan. The group also reviewed the list of critical facilities in the plan and provided feedback on any changes or additions to that list. It was decided at this meeting that staff would mail out data collection surveys to each of the jurisdictions and begin working on the plan. Plan chapters would be shared with the MPC via mail, email and website. If necessary the group would meet again but no date was set.

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

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

**Table 1.5 Schedule of MPC Meetings**

Meeting	Topics	Date
Planning Meeting #1	Overview of mitigation planning & Crawford County plan; Discussion of goals & objectives; Discussion of changes to goals and action items; Discussion of natural hazard events of the last five years, any new data and any changes in mitigation needs	April 11, 2017
Planning Meeting #2	Review of action items & prioritization process; discussion and identification of critical facilities	June 6, 2017
Meeting with Road & Bridge staff	Road & Bridge staff came prepared with a list of mitigation projects that they wanted included in the plan document as well as a list of mitigation projects completed by the road department over the past five years for inclusion in the plan.	April 11, 2017 and June 6, 2017

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

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

The MPC followed the same process for public involvement and input as was followed during the initial planning process. MPC meetings were held at the Steelville Community Center and Crawford Co. R-II School’s Central Office. Public notices were placed at the courthouse and press releases were done prior to the meeting to make the public aware. Meetings were also posted on the MRPC webpage. The public was notified each time the plan or sections of the plan was presented for review and discussion. MPC members and public officials within the county as well as in surrounding counties were contacted, directed to the MRPC website ([www.meramecregion.org](http://www.meramecregion.org)) where a copy of the draft plan could be viewed or downloaded. The document was made available on the website on March 22, 2018. Hard copies of the final draft were placed at the Crawford County Courthouse and city hall buildings for Bourbon, Cuba, Steelville, Sullivan, and West Sullivan. A hard copy of the draft could be obtained directly from MRPC by request. Members of the local media, both radio, newspaper and on-line were invited to attend planning meetings. Information was shared by these media outlets with the public on the planning process and where to find draft copies of the plan. Copies of public notices and press release are included in **Appendix A: Planning Process**.

No comments were received from the public.

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

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

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

Stakeholders involved in the hazard mitigation planning process included Crawford Co. Electric Co-Op, Inc., Three Rivers Publishing, and U.S. Army Corps of Engineers. All representatives provided input.

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

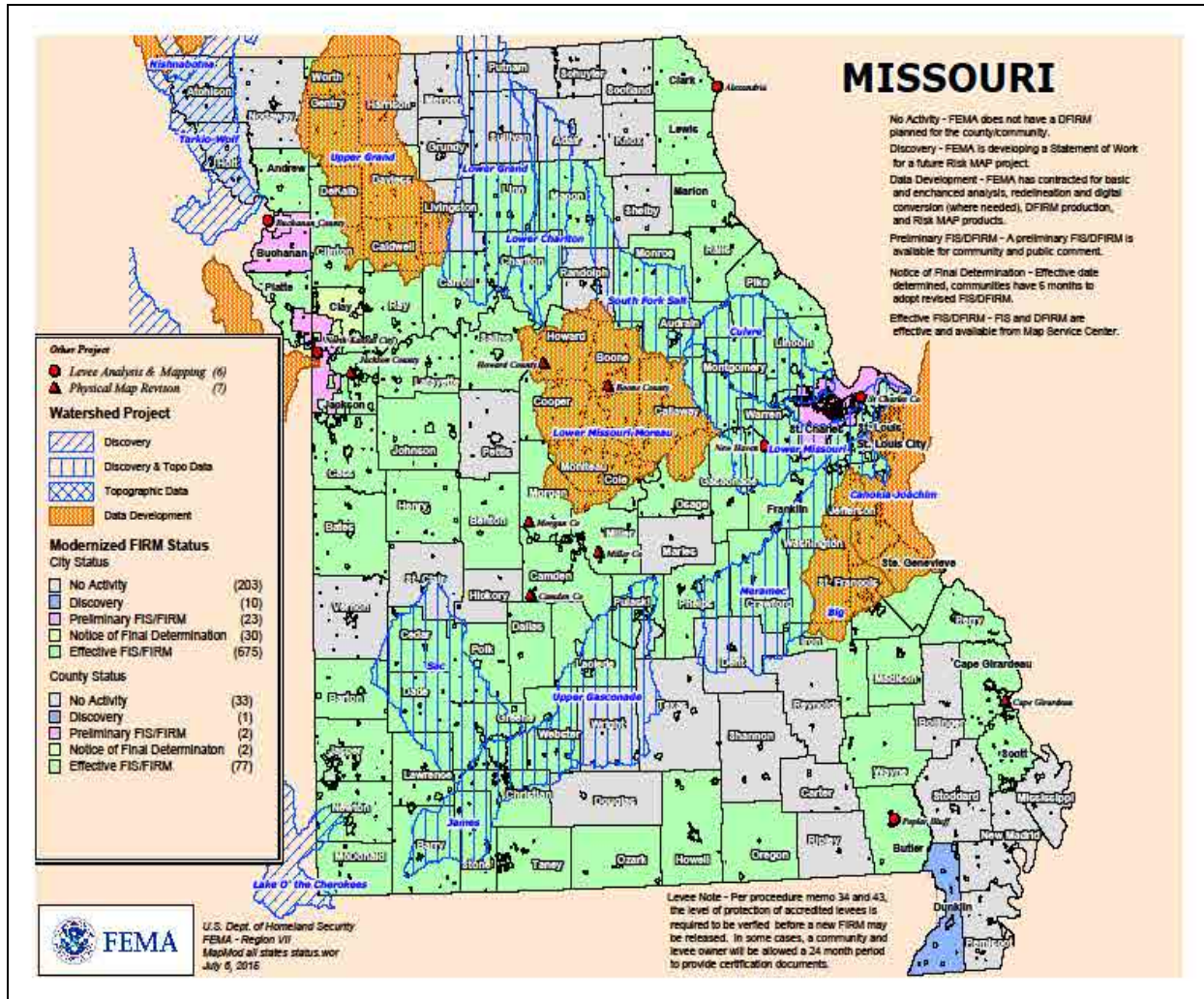
The survey provided to every jurisdiction asked how mitigation actions were being incorporated into other planning documents. The county road and bridge department did a good job of incorporating mitigation projects into their regular maintenance program. Those projects have been incorporated into the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

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

Crawford County is currently in the Discovery and Topo Data phase of the Watershed Project, and is in the Effective FIS/FIRM phase for Modernized FIRM Status. Risk MAP provides mitigation planning support in a variety of ways including helping in the assessment of risks and identifying action items to reduce vulnerability. In addition, this project will provide tools to improve the understanding of risk by local officials and the general public.

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

**Figure 1.1. Map of RiskMAP projects**



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

The MPC researched available plans, studies, reports and technical information during development of the Update. The intent was to identify existing data and information, shared objectives and past and ongoing activities that would add to the Update. The goal was to identify the existing capabilities and planning mechanisms to implement the mitigation strategy. 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 (2013) was reviewed and referenced throughout the document. Other data sources included dam information from the Missouri Department of Natural Resources and National Inventory of Dams (NID); fire reports from state agencies; Wildland/Urban Interface and Intermix data from the SILVIS Lab – Department of Forest Ecology and Management – University of Wisconsin; the Community Economic Development Strategy (CEDS); capital improvement plans from the participating jurisdictions; historic weather data and damage estimates from the National Oceanic and Atmospheric Administration; the critical facilities inventory conducted by MRPC; and road and bridge department plans/budgets.

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

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

The MPC reviewed the hazards that affected Crawford County at the first planning meeting on April 11, 2017 including discussions of any hazard events that occurred during the last five years and all of the hazards included in the Missouri Hazard Mitigation plan. A variety of sources were used to identify and profile hazards. These included U.S. Census data, GIS data, HAZUS, the Missouri Spatial Data Information Service (MSDIS), statewide datasets compiled by state and federal agencies, existing plans and reports, personal interviews with MPC members and the survey completed by each jurisdiction. Data was compiled and compared to the original plan document and updates made in the 2013 revision. Every effort was made to use the most current and best data available. Additional information on the risk assessment and the conclusions drawn from the available data can be found in Chapter 3.

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

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

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

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

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



The goals from the initial hazard mitigation plan were reviewed at the first planning meeting on April 11, 2017. Those goals are as follows:

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

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

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

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

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

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

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

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

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

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

Staff met separately with the Road and Bridge representatives on April 11, 2017 and June 6, 2017 to thoroughly review their list of mitigation projects that had been completed as well as the list of projects that remained to be addressed.

As RiskMAP is still in the Discovery and Topo Data Phase in Crawford County, no projects have been identified through that process at this time.

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

STAPLEE stands for the following:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The MPC reviewed the final list of action items at the June 6, 2017 meeting and completed the prioritization process. The final list was then mailed out to all jurisdictions and members of the MPC for review and approval as everyone was not able to attend the meeting. Staff were directed by the MPC to take the finalized list after allowing time for comments, remove all action items that scored a 13 or below, and draft an action plan.

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

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

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

At both planning meetings (April 11, 2017 and June 6, 2017) 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.

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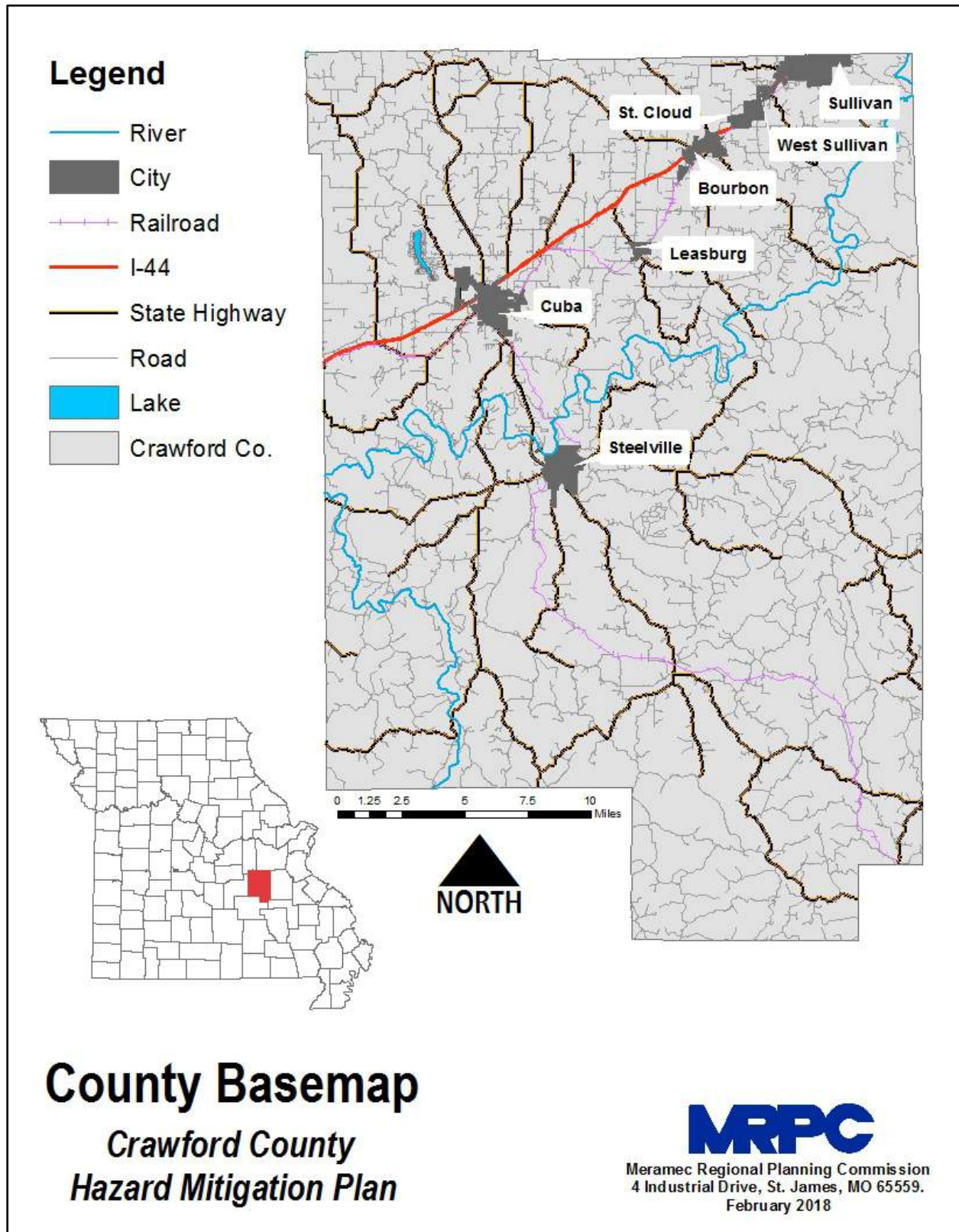
# 2 PLANNING AREA PROFILE AND CAPABILITIES

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- 2 PLANNING AREA PROFILE AND CAPABILITIES..... 2.1**
- 2.1 Crawford County Planning Area Profile..... 2.2**
- 2.1.2 Geography, Geology and Topography..... 2.3
- 2.1.3 Climate ..... 2.8
- 2.1.4 Population/Demographics ..... 2.8
- 2.1.5 History ..... 2.12
- 2.1.6 Occupations ..... 2.13
- 2.1.7 Agriculture..... 2.13
- 2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area ..... 2.14
- 2.2 Jurisdictional Profiles and Mitigation Capabilities..... 2.14**
- 2.2.1 Unincorporated Crawford County..... 2.14
- 2.2.2 City of Bourbon ..... 2.17
- 2.2.3 City of Cuba ..... 2.21
- 2.2.4 City of Steelville..... 2.24
- 2.2.5 City of Sullivan ..... 2.27
- 2.2.6 Village of West Sullivan ..... 2.30
- 2.2.7 Public School District Profiles and Mitigation Capabilities ..... 2.38
- 2.2.8 Critical Facilities..... 2.41

## 2.1 Crawford County Planning Area Profile

Figure 2.1. Map of Crawford County



Crawford County has a population of approximately 24,545 according to the most recent census data<sup>1</sup>. **Table 2.1** illustrates the percentage population growth since 2000 as compared to the statewide and national population growth. The median household income and percentage growth since 2000, as compared to statewide and national figures can be found in **Table 2.2**. Furthermore, median house value percentage growth for Crawford County, Missouri, and the United States is provided in **Table 2.3**

**Table 2.1. Percent Population Growth for County, State, and Nation 2000 - 2016**

Demographic Region	Total Population		Change Over Period	
	2000	2016	Change	Percent
<b>Crawford County</b>	15,374	24,545	9,171	59.7
<b>Missouri</b>	5,595,211	6,059,651	464,440	8.3
<b>United States</b>	282,162,411	318,558,162	36,395,751	12.9

Source: U.S. Census Bureau, Census 2000 Summary File 1; U.S. Census Bureau, 2012-2016 5-Year American Community Survey

**Table 2.2. Median Household Income and Percentage Growth for County, State, and Nation 2000 - 2016**

Demographic Region	Median Household Income (USD)		Change Over Period	
	2000	2016	Change	Percent
<b>United States</b>	\$41,994	\$55,322	\$13,328	31.7
<b>Missouri</b>	\$37,934	\$49,593	\$11,659	30.7
<b>Crawford County</b>	\$30,860	\$36,983	\$6,123	19.8

Source: U.S. Census Bureau, Census 2000 Summary File 3; U.S. Census Bureau, 2012-2016 5-Year American Community Survey

**Table 2.3. Median House Value Percentage Growth for County, State, and Nation 2000 - 2016**

Demographic Region	Median House Value (USD)		Change Over Period	
	2000	2016	Change	Percent
<b>United States</b>	\$119,600	\$184,700	\$65,100	54.4
<b>Missouri</b>	\$89,900	\$141,200	\$51,300	57.1
<b>Crawford County</b>	\$66,100	\$123,600	\$57,500	87.0

Source: U.S. Census Bureau, Census 2000 Summary File 3; U.S. Census Bureau, 2012-2016 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. Approximately 61 percent of the land cover in the county is deciduous forest intermixed with 27 percent of grassland. Six percent of the land cover within the county is deciduous woody/herbaceous. 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

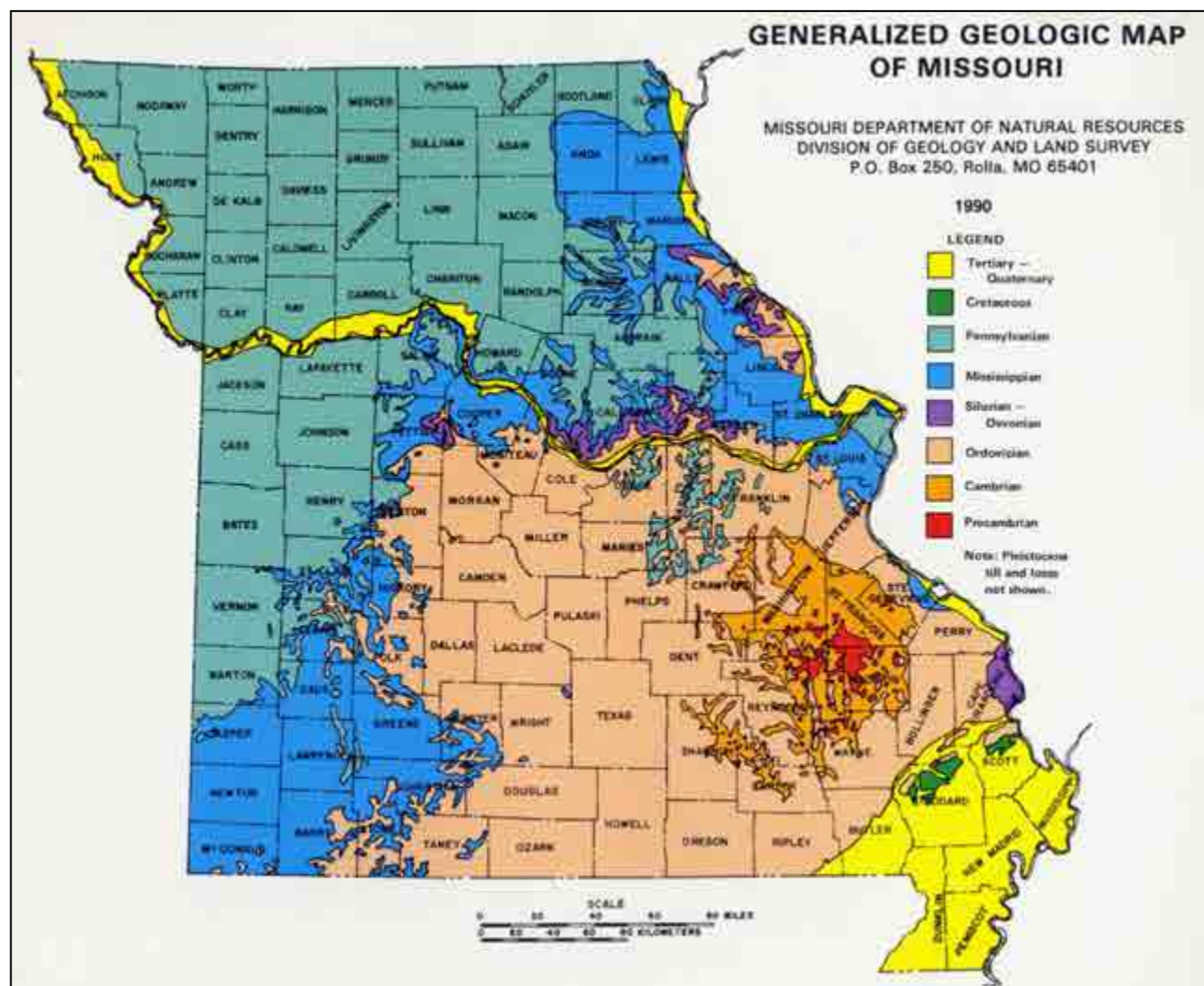
<sup>1</sup> U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates



of West Sullivan.

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

**Figure 2.2. Generalized Geologic Map of Missouri**



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

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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, Needleeye-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 **Figure 2.3**.

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



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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.

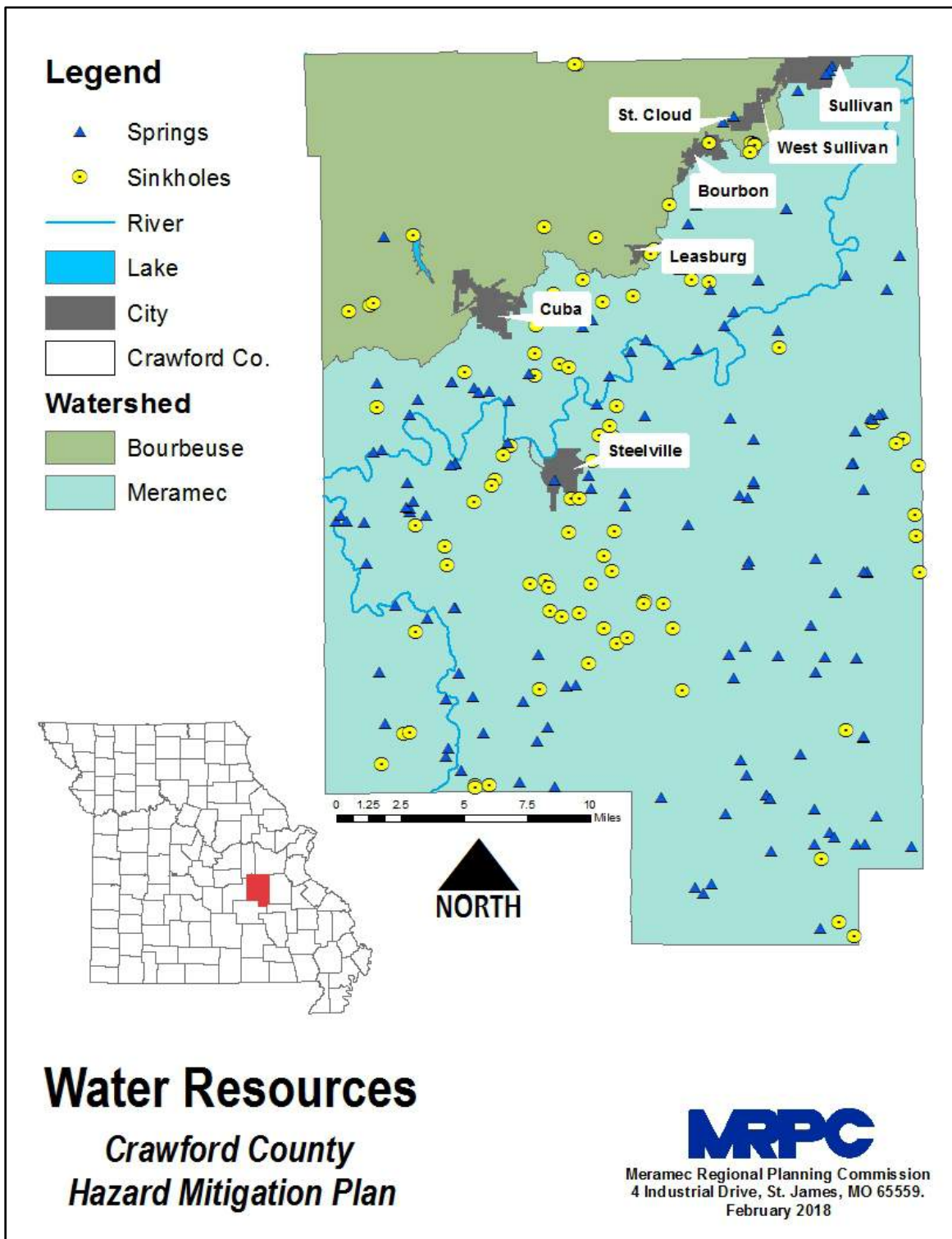
Maramec Spring is the first of the four major contributors. It pours an average volume of 100 million gallons of cold clear water into the Meramec River per day, swelling the river to twice its size. It is interesting to note that the Dry Fork creek, which is about the same size as the Meramec River 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 decent 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.

**Figure 2.3. Crawford County Watershed/Water Resources**



### 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 2016 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 2000-2016 by Jurisdiction**

Jurisdiction	2000 Population	2016 Population	2000-2016 # Change	2000-2016 % Change
<b>Unincorporated Crawford County</b>	9,978	10,163	185	1.9%
<b>Bourbon</b>	1,348	1,700	352	26.1
<b>Cuba</b>	3,230	3,348	118	3.7
<b>*Leasburg</b>	324	431	107	33.0
<b>*St. Cloud</b>	56	91	35	62.5
<b>Steeleville</b>	1,429	1,903	474	33.2
<b>Sullivan</b>	6,351	6,838	487	7.7
<b>West Sullivan</b>	88	71	-17	-19.3

Source: U.S. Census Bureau, Census 2000 Summary File 1; U.S. Bureau of the Census, 2012-2016 5-Year American Community Survey; \*Not included in the 2018 Crawford Co. HMP

**Table 2.5** provides information regarding 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 2016 there were an estimated 9,290 households within the county<sup>2</sup>.

**Table 2.5. Percent of Individuals Under the Age of 5, and Over 65 for County, State, and Nation (2016)**

Location	% Under Age of 5	% Over Age of 65
Crawford County	6.0	17.9
Missouri	6.2	15.3
United States	6.2	14.5

Source: U.S. Census Bureau, 2012-2016 5-Year American Community Survey

**Table 2.6. 2016 Average Household Size for County, State, and Nation**

Location	Average Household Size
Crawford County	2.60
Missouri	2.48
United States	2.64

Source: \*U.S. Census Bureau, 2012-2016 American Community 5-Year Estimates

### Social Vulnerability Index (SoVI ®)

The University of South Carolina developed the Social Vulnerability Index to evaluate and rank the ability to respond to, cope with, recover from, and adapt to natural disasters. The index 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 (06 - 10)	National Percentile (06 - 10)
Missouri	Crawford County	1.379999995	72.7%

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

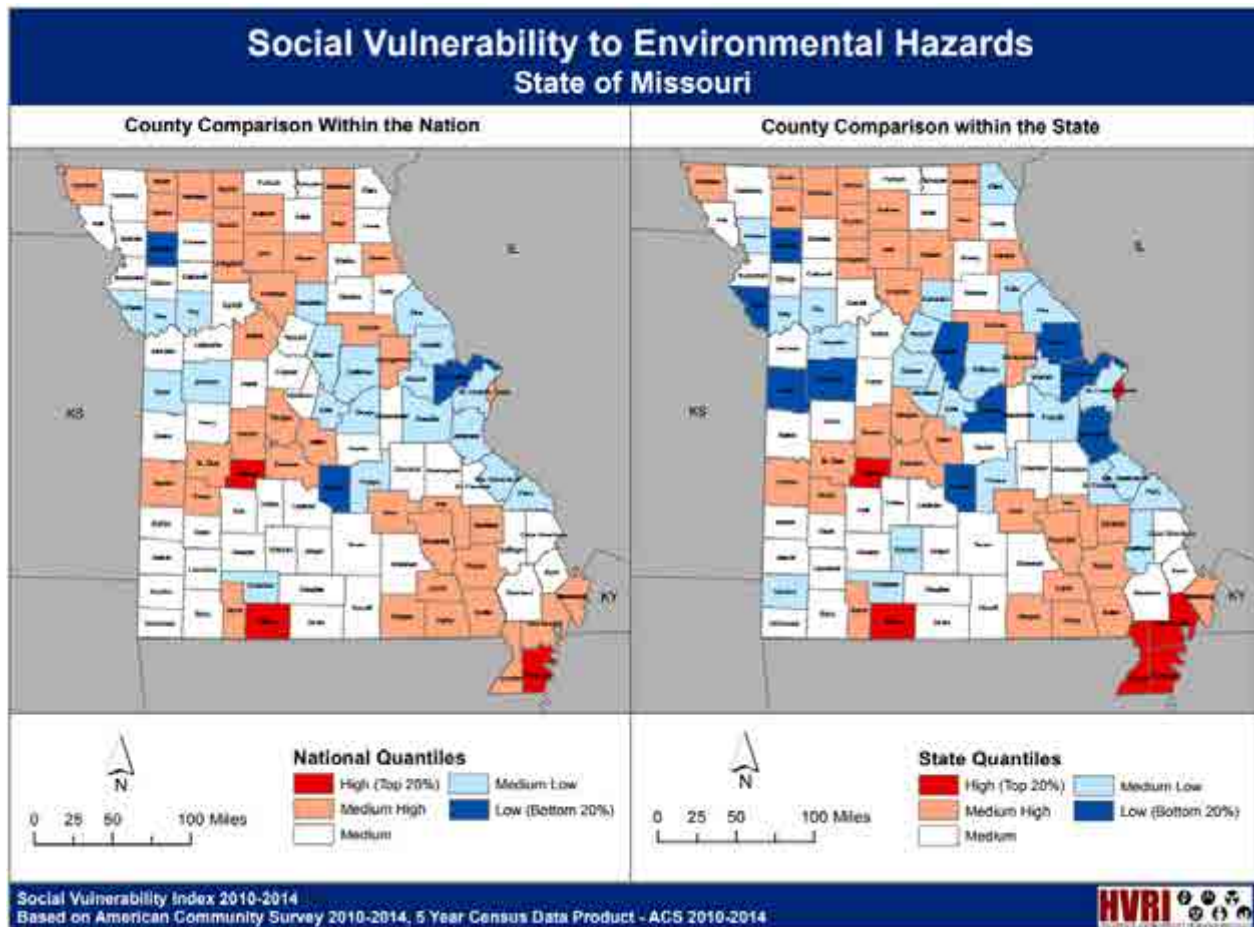
The analysis of 30 socioeconomic variables includes the standardization of data, and reduction of variables into a condensed set of statistically optimized components; positive component loadings (+) are linked with amplified vulnerability, and negative component loadings (-) are linked with diminished 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<sup>3</sup>. Crawford County's SoVI ® Score illustrates an decreased resiliency to cope with natural disasters. Additionally, Crawford County is included in the medium category in comparison

<sup>2</sup> U.S. Census Bureau, 2012-2016 5-Year American Community Survey

<sup>3</sup> <http://webra.cas.sc.edu/hvri/products/sovifaq.aspx>

within the nation. **Figure 2.4** depicts Missouri's SoVI ® to environmental hazards between 2010 and 2014. Furthermore, **Figure 2.5** depicts the Nation's SoVI ® to environmental hazards between 2010 and 2014.

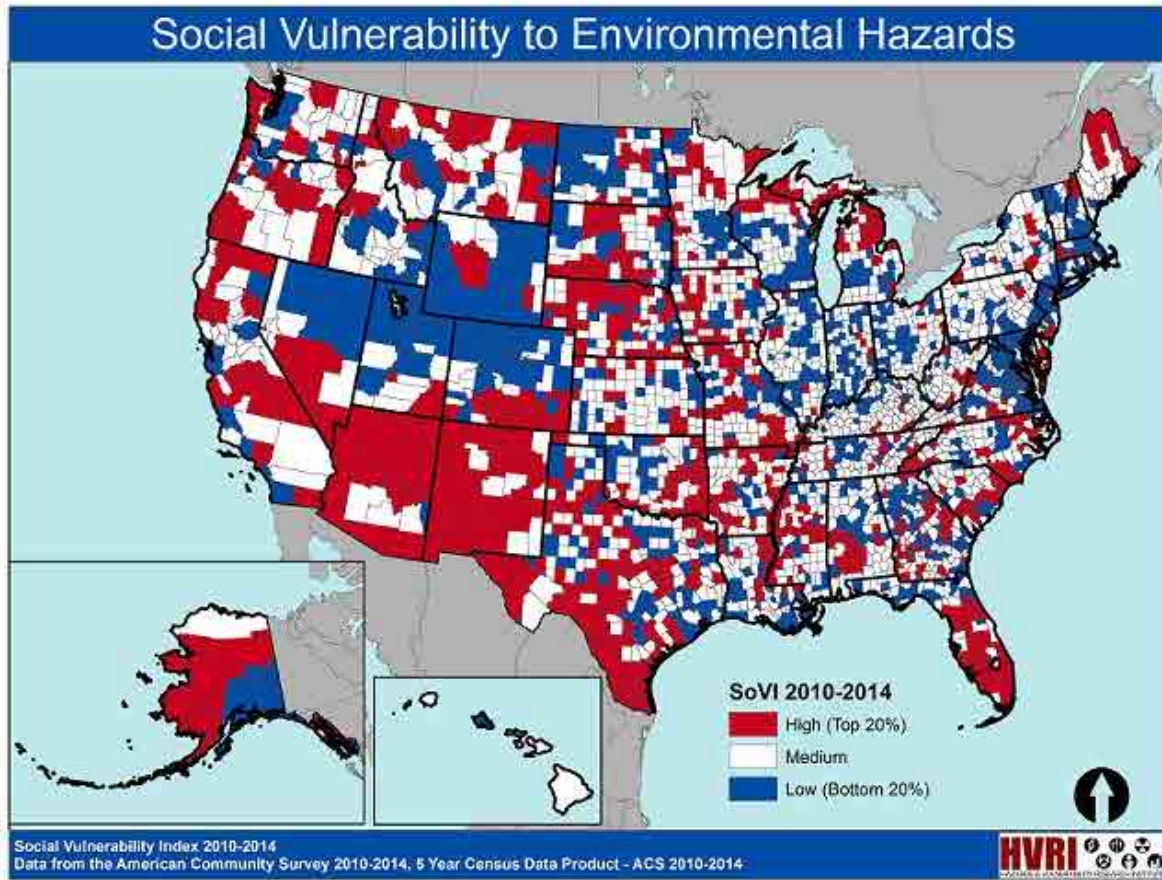
**Figure 2.4. 2010 – 2014 Missouri Social Vulnerability to Environmental Hazards (SoVI ®)**



Source: [http://artsandsciences.sc.edu/geog/hvri/sites/sc.edu.geog.hvri/files/attachments/MO\\_1014.pdf](http://artsandsciences.sc.edu/geog/hvri/sites/sc.edu.geog.hvri/files/attachments/MO_1014.pdf)



**Figure 2.5. 2014 – 2010 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. 2016 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	55.2	11.9	17.9	39.9	12.5	1.7
Bourbon	53.9	11.9	17.1	41.3	5.0	2.9
Cuba	53.2	14.9	31.3	26.5	11.4	3.4
*Leasburg	54.2	7.4	19.8	41.9	7.6	0.0
*St. Cloud	71.0	6.8	5.6	27.8	18.5	0.0
Steelville	56.3	11.2	23.6	42.7	10.6	1.7
Sullivan	58.7	11.6	17.8	36.9	12.1	1.3
West Sullivan	45.0	0.0	18.8	46.4	1.8	0.0

Source: U.S. Census Bureau, 2012-2016 American Community Survey, 5-Year American Community Survey

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## 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	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Natural Resources, Construction, and Maintenance Occupations	Production, Transportation, and Material Moving Occupations
Crawford County	2,429	2,015	1,843	1,226	1,912
Bourbon	29	158	163	63	169
Cuba	255	234	272	133	224
*Leasburg	33	32	18	21	46
*St. Cloud	9	19	5	6	2
Steelville	157	212	111	102	143
Sullivan	667	500	535	481	543
West Sullivan	0	7	11	0	9

Source: U.S. Census, 2012-2016 American Community Survey, 5-year Estimates.

## 2.1.7 Agriculture

Due to the rural nature of the area, agriculture and timber are significant factors in the local economy. According to the 2007 Census of Agriculture, the number of farms in the county was 679 encompassing 186,999 total acres. In addition, the average farm was 275 acres. According to the 2012 Census of Agriculture, Crawford County had maintained the number of farms while increasing farmed acreage by 4 percent, with an average farm size of 286 acres. Furthermore, there are only approximately 40 farms with 1,000 or more acres in the county. Land in farms by land use for the county includes woodland (33.2%), pastureland (37.6%), cropland (24.5%), and other uses (4.8%). In 2012, 33,152 acres of cropland were harvested, with forage (hay, haylage, grass silage, and greenchop) being the top crop in the county. Moreover, 29,420 cattle and calves were raised. The market value of products sold included crop sales (\$3.1 million) and livestock sales (\$12.1 million). The average market value of products sold per farm was \$22,392<sup>4</sup>.

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

<sup>4</sup> 2012 Census of Agriculture, Missouri Farm Commodity Sales, USDA, National Agriculture Statistics Service



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## 2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area

FEMA’s Hazard Mitigation Assistance (HMA) grant program provides funding for mitigation activities which have the potential to reduce disaster losses and protect life and property from future disaster damages<sup>5</sup>. No FEMA HMA Grants have been issued in the planning area (Table 2.10).

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

Project Type	Sub applicant	Declaration	Project Total (\$)
-	-	-	-
<b>Total</b>			\$0

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

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## 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

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<sup>5</sup> <https://www.fema.gov/media-library/assets/documents/103279>

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. Additionally, the county does not utilize a mass notification system. 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

Crawford County participates in the National Flood Insurance Program. The County Emergency Management Director serves as the Floodplain Manager. The county has a Local Emergency Operations Plan, Hazard Mitigation Plan, Regional Transportation Plan (MRPC), and a Regional Comprehensive Economic Development Strategy (MRPC).

### Other Mitigation Activities

The Office of Emergency Management, local fire departments, Sheriff's Department and the 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.

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

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	% of Residences Built Prior to 1939	# of Mobile Homes
Unincorporated Crawford County	2,401	0	1,710	233	2,043	6.8	1,300

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

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

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
<b>Comprehensive Plan</b>	No
Builder's Plan	N/A
Capital Improvement Plan	No
City Emergency Operations Plan	N/A
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	N/A

County Mitigation Plan	2013
Debris Management Plan	No
<b>Economic Development Plan</b>	CEDS
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
<b>Watershed Plan</b>	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	No
Building Code	N/A
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	Yes
Landscape Ordinance	N/A
<b>Program</b>	
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 Certification	Yes
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	-
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	No
Engineering Studies for Streams	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
<b>Staff/Department</b>	

Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	-
Engineer	-
Development Planner	-
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	-
Emergency Response Team	-
Hazardous Materials Expert	-
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	No
Sanitation Department	-
Transportation Department	Yes
Economic Development Department	No
Housing Department	Phelps Co. PHA
Regional Planning Agencies	MRPC
Historic Preservation	-
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	Yes
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes
<b>Financial Resources</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2017

## 2.2.2 City of Bourbon

### Overview

Bourbon is located just west of Sullivan on U.S. Interstate I-44. Bourbon is believed to be the only town in the United States named for Bourbon whiskey. The beginnings of the city coincide with the construction of the railroad (first called the Pacific and later the Frisco).

When a post office was established in September 1853, the name was given as "Bourbon in the village of St. Cloud ". The town was never located at the proposed village, but was built further west where steam engines could stop and start where there was no grade. The town of Bourbon sprang up along the railroad and Old Springfield Road, where it is located today.

According to the 2016 U.S. Census, the community has a population of 1,700. 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.

**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; activated by the police department. 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, and debt through private activities.

**Existing Plans and Policies**

The city has a Comprehensive Plan, City Emergency Operations Plan, Hazard Mitigation Plan, Regional Transportation Plan (MRPC), and Regional Comprehensive Economic Development Strategy (MRPC). The city has a Zoning Ordinance, Subdivision Ordinance, Nuisance Ordinance, Subdivision Ordinance, and Site Plan Review Requirements.

**Other Mitigation Activities**

The city educates citizens on responsible water use on a regular basis.

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

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Bourbon	448	47	381	52	254	92	123

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

**Table 2.14. City of Bourbon Mitigation Capabilities**

<b>Capabilities</b>	<b>Status Including Date of Document or Policy</b>
Planning Capabilities	
<b>Comprehensive Plan</b>	Yes, 1970's
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A
City Mitigation Plan	2013
County Mitigation Plan	N/A
Debris Management Plan	No
<b>Economic Development Plan</b>	CEDS
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
<b>Watershed Plan</b>	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	Yes
Building Code	No
Floodplain Ordinance	Yes
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
<b>Program</b>	
Zoning/Land Use Restrictions	Yes
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 Certification	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	-
Economic Development Program	No
Land Use Program	Yes
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No

Engineering Studies for Streams	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	N/A
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	Yes
<b>Staff/Department</b>	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	No
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	MREPC
County Emergency Management Commission	N/A
Sanitation Department	No
Transportation Department	Yes
Economic Development Department	No
Housing Department	Phelps Co. PHA
Regional Planning Agencies	MRPC
Historic Preservation	No
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes
<b>Financial Resources</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation bonds	No
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
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Source: Data Collection Questionnaire, 2017

### 2.2.3 City of Cuba

#### Overview

Cuba was founded in 1857 in anticipation of the construction of the southern branch of the Pacific Railroad. With the arrival of the southern branch of the Pacific Railroad in 1859-1860, the train brought a new way to get goods and send products to market. Cuba became a shipping center for agriculture and industry. From 1865-1912, Cuba was known as “The Land of the Big Red Apple.” By 1900, Cuba was the largest producer and distributor of apples in Missouri.

With the advent of the Model T, road improvements became necessary. Paving for Route 66, the “Mother Road,” through Cuba was completed in 1931. With more automobile traffic, new business opportunities were created. Restaurants, gasoline stations and motels opened their doors all along Route 66 to answer the needs of traveling motorists.

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. According to the 2016 U.S. Census, the community has a population of 3,348. 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.

#### Technical and Fiscal Resources

Cuba does not participate 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 two 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, fees for water, sewer, gas, and electric services, debt through general obligation bonds, debt through special tax bonds, and debt through private activities.

#### Existing Plans and Policies

The city has a Capital Improvement Plan, City Emergency Operations Plan, Hazard Mitigation Plan, Regional Transportation Plan (MRPC), Economic Development Plan, and Regional Comprehensive Economic Development Strategy (MRPC). The city has a Zoning Ordinance, Nuisance Ordinance, and Storm Water Ordinance.



## Other Mitigation Activities

The city currently provides education/awareness and emergency preparedness programs for severe weather.

**Table 2.15. Demographic and Structure Risk Parameters For Cuba**

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Cuba	900	106	1,094	273	569	117	105

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

**Table 2.16. City of Cuba Mitigation Capabilities**

Capabilities	Status Including Date of Document or Policy
<b>Planning Capabilities</b>	
<b>Comprehensive Plan</b>	No
Builder's Plan	No
Capital Improvement Plan	Yes
City Emergency Operations Plan	Yes, 5/2017
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A
City Mitigation Plan	2013
County Mitigation Plan	N/A
Debris Management Plan	No
<b>Economic Development Plan</b>	Yes
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
<b>Watershed Plan</b>	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	Yes
Building Code	-
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
<b>Program</b>	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	No

National Flood Insurance Program	No
NFIP Community Rating System (CRS) Participating Community	-
National Weather Service (NWS) Storm Ready Certification	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	5
Economic Development Program	Yes
Land Use Program	No
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	Yes
Tree Trimming Program	Yes
Engineering Studies for Streams	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	N/A
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	No
Land Use Map	No
<b>Staff/Department</b>	
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	No
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	N/A
Sanitation Department	Yes
Transportation Department	Yes
Economic Development Department	Yes
Housing Department	Phelps Co. PHA
Regional Planning Agencies	MRPC
Historic Preservation	Yes
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	Yes
Salvation Army	No
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	Yes

Community Organizations (Lions, Kiwanis, etc.)	Yes
<b>Financial Resources</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	No
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	Yes
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2017

## 2.2.4 City of Steelville

### Overview

The City of Steelville is located in the center of Crawford County approximately eight miles south of Interstate 44. The first settlers in Steelville were William Britton, who built a small grist mill along the Yadkin Creek, and James Steel, who operated a trading post and was appointed by the government as Commissioner to lay out the city in 1835—the year in which Steelville was founded. Britton remained in the area. Steel, according to census, moved northward to continue his interest in mining.

James Steel purchased 40 acres of land from the government which he later sold to the "County Court" on December 16, 1835 for \$50. By this time a little settlement had sprung up. Crawford County Court named the town Steelville as the County Seat. The deed was recorded on December 18, 1835, the town was platted, and the first deeds to lots were sold for \$12 each.

The town was incorporated as a city of the fourth class in 1885. At this time, there were 500 inhabitants. According to the 2016 census, the current population is 1,903. There is a four member city council and a mayor. The city employs a City Clerk, Collector, Attorney, Police Chief, City/Street Supt., Sewer Supt., and Water Supt.

### 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 owns and operates one portable generator. The city also employs 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, and debt through private activities.

### Existing Plans and Policies

The city has a Comprehensive Plan, Capital Improvement Plan, Hazard Mitigation Plan, Regional Transportation Plan (MRPC), Economic Development Plan, and Regional Comprehensive Economic Development Strategy (MRPC). The city has a Zoning Ordinance, Building Code Ordinance, Floodplain Ordinance, Subdivision Ordinance, Nuisance Ordinance, Storm Water Ordinance, and Site Plan Review Requirements.

### Other Mitigation Activities

The Steelville FPD currently provides fire education/awareness and emergency preparedness programs for the school district. The city also has a tree trimming program, upgrades water and sewer infrastructure when possible, and creek improvements to reduce flooding.

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

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Steelville	388	31	526	118	318	159	63

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

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

Capabilities	Status Including Date of Document or Policy
<b>Planning Capabilities</b>	
<b>Comprehensive Plan</b>	Yes
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	2013
County Mitigation Plan	N/A
Debris Management Plan	No
<b>Economic Development Plan</b>	CEDS
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
<b>Watershed Plan</b>	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	Yes
Building Code	Yes

Floodplain Ordinance	Yes
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
<b>Program</b>	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	Yes
Hazard Awareness Program	No
National Flood Insurance Program	Yes
NFIP Community Rating System (CRS) Participating Community	-
National Weather Service (NWS) Storm Ready Certification	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	Yes
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	N/A
Evacuation Route Map	No
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	No
Land Use Map	No
<b>Staff/Department</b>	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	Yes, Contracted
Development Planner	No
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	Yes
Hazardous Materials Expert	No
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	N/A

Sanitation Department	Contract
Transportation Department	Yes
Economic Development Department	No
Housing Department	Phelps Co. PHA
Regional Planning Agencies	MRPC
Historic Preservation	Yes
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	Yes
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
<b>Financial Resources</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Ability to incur debt through general obligation bonds	No
Ability to incur debt through special tax bonds	No
Ability to incur debt through private activities	Yes
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2017

## 2.2.5 City of Sullivan

### Overview

Sullivan is located on the Interstate 44 corridor. The City of Sullivan, long known as the "Gateway to the Ozarks," is located on Old Highway 66 and the St. Louis & San Francisco Railroad, 68 miles southwest of St. Louis, at the southern border of Franklin County. The area was founded in 1856, by Stephen Sullivan who with his wife Dorcas accompanied Daniel Boone on his return trip from Kentucky to secure settlers to populate the wild and unbroken territory around the Meramec River. When the railroad finally reached the small settlement in 1858, a town was laid out that the railroad company appropriately named "Sullivan."

According to the 2016 census, the current population is 6,838. 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.

## 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 North Crawford County 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.

## Existing Plans and Policies

The city has a Comprehensive Plan, Emergency Operations Plan, Hazard Mitigation Plan, Regional Transportation Plan (MRPC), Economic Development Plan, and Regional Comprehensive Economic Development Strategy (MRPC). The city has a Zoning Ordinance, Building Code Ordinance, Floodplain Ordinance, Subdivision Ordinance, Nuisance Ordinance, Storm Water Ordinance, and Site Plan Review Requirements.

## Other Mitigation Activities

The city currently provides education/awareness and emergency preparedness programs for the school district. The city also has a tree trimming program, upgrades water, sewer, and road infrastructure when possible to accommodate future natural hazards.

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

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
Sullivan	976	78	1,340	713	1,144	531	85

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

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

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
<b>Comprehensive Plan</b>	Yes, 3/2000
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A

City Mitigation Plan	2013
County Mitigation Plan	N/A
Debris Management Plan	No
<b>Economic Development Plan</b>	CEDS
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
<b>Watershed Plan</b>	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	Yes
Building Code	Yes, 2009 ICC
Floodplain Ordinance	Yes, 4/6/04
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
<b>Program</b>	
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	-
National Weather Service (NWS) Storm Ready Certification	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	3
ISO Fire Rating	4
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	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	N/A
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No



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

Source: Data Collection Questionnaire, 2017

## 2.2.6 Village of West Sullivan

### Overview

The Village of West Sullivan is located just west of the City of Sullivan off of Interstate 44 in the northeastern edge of Crawford County. West Sullivan resides on former U.S. Route 66. The village limits are adjacent to Sullivan on the east and St. Cloud on the west. The community

was incorporated in 2000. According to the 2016 census, the village has a population of 71. West Sullivan has a five member City Council and a Mayor. The city contracts for a part-time City Clerk.

### Technical and Fiscal Resources

West Sullivan does not participate in the National Flood Insurance Program. Law enforcement in the community is provided by the West Sullivan Police Department. The North Crawford County Ambulance District provides ambulance service for the village and surrounding area. The village is served by the Sullivan Fire Protection District, located in Franklin County. The village does not have warning sirens. The village owns and operates one generator. West Sullivan also employs a part-time Building Inspector and Public Works Director.

Fiscal tools or resources that the village could potentially use to help fund mitigation activities include Community Development Block Grants, Capital Improvements project funding, fees for water, sewer, gas, and electric services, and debt through private activities.

### Existing Plans and Policies

The village has a Hazard Mitigation Plan, Regional Transportation Plan (MRPC), and Regional Comprehensive Economic Development Strategy (MRPC).

### Other Mitigation Activities

West Sullivan does not currently provide education/awareness and emergency preparedness programs.

**Table 2.21. Demographic and Structure Risk Parameters For West Sullivan**

Jurisdiction	Population with a Disability	Non-English Speaking Populations	Population Below Poverty Level	Population Under 5 Yrs	Population 65 Yrs and Over	# of Residences Built Prior to 1939	# of Mobile Homes
West Sullivan	26	0	14	3	5	0	8

Source: Source: U.S. Census Bureau, 2012-2016 5-Years American Community Survey

**Table 2.22. Village of West Sullivan Mitigation Capabilities**

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
<b>Comprehensive Plan</b>	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	2013
County Mitigation Plan	N/A
Debris Management Plan	No

<b>Economic Development Plan</b>	No
Transportation Plan	Regional Transportation Plan (MRPC)
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
<b>Watershed Plan</b>	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan	No
<b>Policies/Ordinance</b>	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
<b>Program</b>	
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	-
National Weather Service (NWS) Storm Ready Certification	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	-
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
Hazard Analysis/Risk Assessment (City)	No
Hazard Analysis/Risk Assessment (County)	N/A
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
<b>Staff/Department</b>	
Building Code Official	Yes
Building Inspector	No

Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Director	No
NFIP Floodplain Administrator	No
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	MREPC
County Emergency Management Commission	N/A
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	Phelps Co. PHA
Regional Planning Agencies	MRPC
Historic Preservation	No
<b>Non-Governmental Organizations (NGOs)</b>	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	No
<b>Financial Resources</b>	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	No
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	Yes
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2017

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

**Table 2.23. Mitigation Capabilities Summary Table**

Capabilities	Unincorporated Crawford Co.	Bourbon	Cuba	Steelville	Sullivan	West Sullivan
Planning Capabilities						
<b>Comprehensive Plan</b>	No	Yes, 1970's	No	Yes	Yes, 3/2000	No
Builder's Plan	N/A	No	No	No	No	No
Capital Improvement Plan	No	No	Yes	Yes	No	No
City Emergency Operations Plan	N/A	Yes	Yes, 5/2017	No	Yes	No
County Emergency Operations Plan	Yes	N/A	N/A	N/A	N/A	N/A
Local Recovery Plan	No	No	No	No	No	No
County Recovery Plan	No	N/A	N/A	N/A	N/A	N/A
City Mitigation Plan	N/A	2013	2013	2013	2013	2013
County Mitigation Plan	2013	N/A	N/A	N/A	N/A	N/A
Debris Management Plan	No	No	No	No	No	No
<b>Economic Development Plan</b>	CEDS	CEDS	Yes	CEDS	CEDS	CEDS
Transportation Plan	Regional Transportation Plan (MRPC)	Regional Transportation Plan (MRPC)	Regional Transportation Plan (MRPC)	Regional Transportation Plan (MRPC)	Regional Transportation Plan (MRPC)	Regional Transportation Plan (MRPC)
Land-use Plan	No	No	No	No	No	No
Flood Mitigation	No	No	No	No	No	No
<b>Watershed Plan</b>	No	No	No	No	No	No
Firewise or other fire mitigation plan	No	No	No	No	No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No	No	No	No	No	No
<b>Policies/Ordinance</b>						
Zoning Ordinance	No	Yes	Yes	Yes	Yes	No
Building Code	N/A	No	-	Yes	Yes, 2009 ICC	No
Floodplain Ordinance	Yes	Yes	No	Yes	Yes, 4/6/04	No
Subdivision Ordinance	No	Yes	No	Yes	Yes	No
Tree Trimming Ordinance	No	No	No	No	No	No
Nuisance Ordinance	No	Yes	Yes	Yes	Yes	No

Storm Water Ordinance	No	Yes	Yes	Yes	Yes	No
Drainage Ordinance	No	No	No	No	No	No
Site Plan Review Requirements	No	Yes	No	Yes	Yes	No
Historic Preservation Ordinance	Yes	No	No	No	No	No
Landscape Ordinance	N/A	No	No	No	No	No
<b>Program</b>						
Zoning/Land Use	No	Yes	Yes	No	Yes	No
Codes Building Site/Design	No	No	Yes	Yes	Yes	No
Hazard Awareness Program	No	No	No	No	No	No
National Flood Insurance Program	Yes	Yes	No	Yes	Yes	No
NFIP Community Rating System (CRS) Participating Community	No	No	-	-	-	-
National Weather Service (NWS) Storm Ready	Yes	No	No	No	No	No
Firewise Community Certification	No	No	No	Yes	No	No
Building Code Effectiveness Grading	No	No	No	No	3	No
ISO Fire Rating	-	-	5	6	4	-
Economic Development Program	No	No	Yes	No	No	No
Land Use Program	No	Yes	No	No	No	No
Public Education/Awareness	Yes	Yes	Yes	Yes	Yes	No
Property Acquisition	No	No	No	No	No	No
Planning/Zoning Boards	Yes	Yes	Yes	Yes	Yes	No
Stream Maintenance	No	No	Yes	No	No	No
Tree Trimming Program	No	No	Yes	Yes	Yes	No
Engineering Studies for Streams (Local/County/Regional)	No	No	No	Yes	No	No
Mutual Aid Agreements	Yes	Yes	Yes	Yes	Yes	Yes
<b>Studies/Reports/Maps</b>						

Hazard Analysis/Risk Assessment (City)	No	No	No	No	No	No
Hazard Analysis/Risk Assessment (County)	No	N/A	N/A	N/A	N/A	N/A
Evacuation Route Map	No	No	Yes	No	No	No
Critical Facilities Inventory	No	No	Yes	Yes	No	No
Vulnerable Population Inventory	No	No	No	No	No	No
Land Use Map	No	Yes	No	No	No	No
<b>Staff/Department</b>						
Building Code Official	No	Yes	Yes	Yes	Yes	Yes
Building Inspector	No	Yes	Yes	Yes	Yes	No
Mapping Specialist (GIS)	-	No	No	No	Yes	No
Engineer	-	Yes	No	Yes, Contracted	Yes	No
Development Planner	-	No	No	No	No	No
Public Works Official	Yes	Yes	Yes	Yes	Yes	Yes
Emergency Management Director	Yes	Yes	Yes	Yes	Yes	No
NFIP Floodplain Administrator	Yes	Yes	No	Yes	Yes	No
Bomb and/or Arson Squad	-	No	No	No	No	No
Emergency Response Team	-	No	No	Yes	No	No
Hazardous Materials Expert	-	No	No	No	No	No
Local Emergency Planning Committee	MREPC	MREPC	MREPC	MREPC	MREPC	MREPC
County Emergency Management Commission	No	N/A	N/A	N/A	N/A	N/A
Sanitation Department	-	No	Yes	Contract	No	No
Transportation Department	Yes	Yes	Yes	Yes	Yes	No
Economic Development Department	No	No	Yes	No	Yes	No
Housing Department	Phelps Co. PHA	Phelps Co. PHA	Phelps Co. PHA	Phelps Co. PHA	Phelps Co. PHA	Phelps Co. PHA
Regional Planning Agencies	MRPC	MRPC	MRPC	MRPC	MRPC	MRPC
Historic Preservation	-	No	Yes	Yes	No	No
<b>Non-Governmental</b>						

American Red Cross	Yes	Yes	Yes	Yes	Yes	No
Salvation Army	Yes	Yes	No	No	Yes	No
Veterans Groups	Yes	Yes	Yes	Yes	No	No
Environmental Organization	No	No	No	Yes	No	No
Homeowner Associations	No	No	No	No	Yes	No
Neighborhood Associations	Yes	No	No	No	No	No
Chamber of Commerce	No	No	Yes	Yes	Yes	No
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes	Yes	Yes	Yes	No
<b>Financial Resources</b>						
Ability to apply for Community Development Block	Yes	Yes	Yes	Yes	Yes	Yes
Ability to fund projects through Capital Improvements funding	Yes	Yes	Yes	Yes	Yes	Yes
Authority to levy taxes for a specific purpose	Yes	Yes	No	Yes	Yes	No
Fees for water, sewer, gas, or electric services	No	Yes	Yes	Yes	Yes	Yes
Impact fees for new development	No	No	No	Yes	Yes	No
Ability to incur debt through general obligation bonds	Yes	No	Yes	No	Yes	No
Ability to incur debt through special tax bonds	Yes	Yes	Yes	No	Yes	No
Ability to incur debt through private activities	No	Yes	Yes	Yes	No	Yes
Ability to withhold spending in hazard	No	No	No	No	No	No

Source: Data Collection Questionnaires, 2017



## 2.2.7 Public School District Profiles and Mitigation Capabilities

The following school districts are participating jurisdictions in this plan: Crawford Co. R-I School District, Crawford Co. R-II School District, Steelville R-III School District, 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 schools within the four school districts have NOAA all hazard radios on site to provide early warning of hazard events. In addition, each school district has fire alarms and intercom systems capable of providing specific instructions in the event of an emergency. All districts reported using a mass notification system for public address/emergency alert; BrightArrow and School Messenger.

All school districts have an Emergency Manager and Public Information Officer. Crawford Co. R-II reported having a grant writer. All school districts can obtain financial resources from local funds. Four out of the three districts obtain financial resources through capital improvement project funding, private activities/donations, and state and federal/grants.

Since the last plan update, Crawford Co. R-II added a FEMA certified tornado shelter to their high school, and remodeled a building. Crawford Co. R-I reported the additions of classrooms at the elementary and middle school. 2014 Bond Funds were used to construct a double-gated entry at the high school for access control. Sullivan School District anticipates the addition of a gym and classrooms within the next five years.

### Existing Plans and Policies

All school districts have an emergency management plan and weapons policy. Crawford Co. R-II conducted a Hazard Assessment in 2014. Additionally, the school district consulted with certified engineers to conduct an Extreme Wind Evaluation on school buildings in 2013.

### Other Mitigation Activities

All school districts actively participate in fire, tornado, earthquake, and lock-down security training at least annually. Within the county, Cuba High School has the only Certified Tornado Shelter in accordance with FEMA standards. All school districts regularly utilize local fire departments to educate students on fire safety, as well as their families.

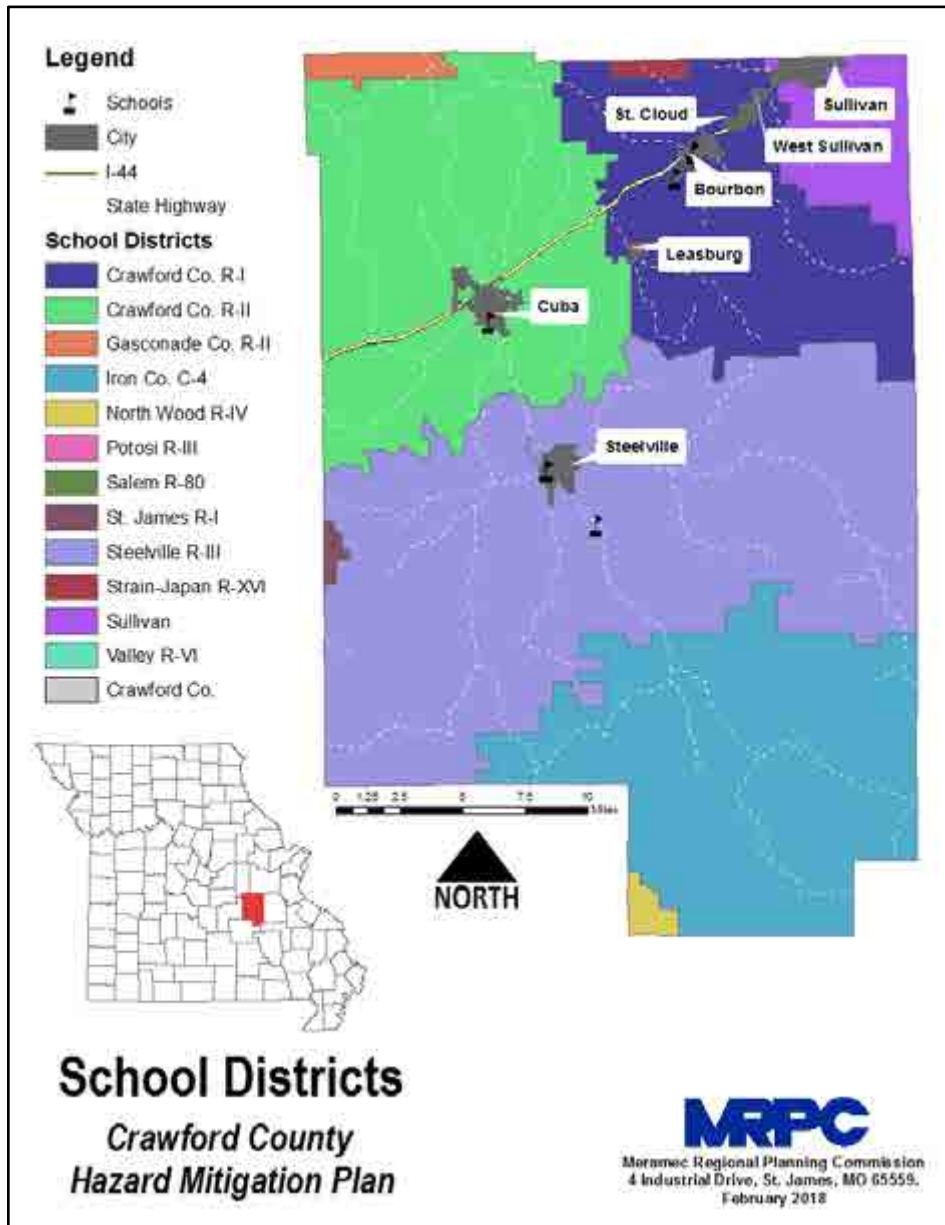
**Table 2.24. School District Buildings and Enrollment Data, 2017**

District Name	Building Name	Enrolment
Crawford Co. R-I School District		
	Bourbon Elem.	399
	Bourbon Middle	297
	Bourbon High	274
Crawford Co. R-II School District		

District Name	Building Name	Enrolment
	Cuba Elem.	554
	Cuba Middle	471
	Cuba High	400
Steelville R-III School District		
	Steelville Elem.	401
	Steelville Middle	316
	Steelville High	253
Sullivan School District		
	Sullivan Elem.	630
	Sullivan Primary	380
	Sullivan Middle	473
	Sullivan High	736

Source: <https://oji.oe.mo.gov/DESE/schoolSearch/index.html>

Figure 2.6. Crawford County School Districts



**Table 2.25. Summary of Mitigation Capabilities- Crawford Co. School Districts**

Capability	Crawford Co. R-I	Crawford Co. R-II	Steelville R-III	Sullivan
<b>Planning Elements</b>				
Master Plan/Date	No	N/A	Yes	Yes
Capital Improvement	No	N/A	No	No
School Emergency Plan/Date	7/08/2010	2016/17	Yes	Yes
Weapons Policy/Date	1/11/2001	March 2010	Yes	Yes
<b>Personnel Resources</b>				
Full-Time Building Official (Principle)	Yes	Yes	-	Yes
Emergency Manager	Yes	Yes	Yes	Yes
Grant Writer	No	Yes	No	No
Public Information Officer	Yes	Yes	Yes	Yes
<b>Financial Resources</b>				
Capital Improvements Project Funding	Yes	Yes	Yes	No
Local Funds	Yes	Yes	Yes	Yes
General Obligation	N/A	No	No	Yes
Special Tax Bonds	N/A	Yes	No	Yes
Private Activities/Donations	N/A	Yes	Yes	Yes
State and Federal Funds/Grants	Yes	No	Yes	Yes
<b>Other</b>				
Public Education Programs	Fire Awareness	Fire Awareness	Fire Awareness	Fire Awareness
Privately or Self-Insured?	MUSIC	-	Private	Private
Fire Evacuation Training	Annually	Quarterly	Annually	Monthly
Tornado Sheltering Exercises	Annually	Quarterly	Annually	Annually
Public Address/Emergency Alert System	BrightArrow	Yes	School Messenger	School Messenger
NOAA Weather Radios	Yes	Yes	Yes	Yes
Lock-Down Security Training	Annually	Annually	Annually	Annually
Mitigation Programs	Yes	Yes	Yes	No
Tornado Shelter/Safe-room	High School Basement	FEMA Certified High School, Jan. 2015	No	No
Campus Police	No	Yes	No	Yes

Source: Data Collection Questionnaires, 2017

## 2.2.8 Critical Facilities

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

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

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>Emergency Facilities</b>						
	Crawford Co.	Crawford Co. E-911	PO Box 1314	Steelville	MO	65565
	Crawford Co.	Emergency Management Director	904 W. Washington	Cuba	MO	65453
<b>Fire Department Facilities</b>						
MO000684	Bourbon	Bourbon Fire Prot. Dist.	555 Elm St.	Bourbon	MO	65441
MO000426	Cuba	Cuba Vol. Fire Dept. Station 1	600 S Franklin St.	Cuba	MO	65453
	Cuba	Cuba Vol. Fire Dept. Station 2	State Hwy DD	Cuba	MO	65453
MO000427	Leasburg	Leasburg Vol. Fire Dept.	East Cedar Ave.	Leasburg	MO	65535
MO000685	Steelville	Steelville Fire Prot. Dist., Station 1	77 East State Hwy 8	Steelville	MO	65565
	Steelville	Steelville Fire Prot. Dist., Station 2	State Hwy 19	Cherryville	MO	65446
	Steelville	Steelville Fire Prot. Dist., Station 3	1441 East State Hwy 8	Steelville	MO	65565
<b>Law Enforcement Facilities</b>						
MO000579	Crawford Co.	Crawford Co. Sheriff	212 Third Street	Steelville	MO	65565
MO000415	Bourbon	Bourbon Police Dept.	355 E Pine St.	Bourbon	MO	65441
MO000394	Cuba	Cuba Police Dept.	602 S. Franklin St.	Cuba	MO	65453
MO000026	Steelville	Steelville Police Dept.	103 S Second St.	Steelville	MO	65565
	Sullivan	Sullivan Police Dept.	106 Progress Dr.	Sullivan	MO	63080
<b>Medical Facilities</b>						
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
<b>School Facilities</b>						
	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

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
	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 Elmout Road	Sullivan	MO	63080
	Sullivan	Sullivan Middle	1156 Elmout Road	Sullivan	MO	63080
	Sullivan	Sullivan High	1073 E Vine St.	Sullivan	MO	63080

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

Although there are no post-secondary schools in Crawford County, there are numerous colleges located within the region. These campuses and their locations are shown in **Table 2.27**.

**Table 2.27. Local Colleges/Universities**

College/University	Location	Description
State Technical College of Missouri	One Technology Drive, Linn, MO 65051	Associates Degree and Certificates
East Central College	1964 Prairie Dell Road, Union, MO 63084	Associate Degree
Missouri University of Science and Technology	Parker Hall Rolla, MO 65401	Main campus in Rolla, MO Bachelor, Masters, and Doctoral degrees
Drury University	Forum Plaza Rolla, MO 65401	Main campus in Springfield, MO Bachelor degrees
Webster University	1103 Kingshighway Rolla, MO 65401	Main campus in St. Louis, MO Bachelor and Masters degrees
Metro Business College	Hwy 72 Rolla, MO 65401	Main campus in Jefferson City, Mo Associate degrees
Columbia College	Hwy 63 N. Rolla, MO 65401	Main campus in Columbia, MO Bachelor degrees

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## 3 RISK ASSESSMENT

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<b>3.1 Hazard Identification</b> .....	<b>3.4</b>
3.1.1 <i>Review of Existing Mitigation Plans</i> .....	3.4
3.1.2 <i>Review Disaster Declaration History</i> .....	3.7
3.1.3 <i>Research Additional Sources</i> .....	3.9
3.1.4 <i>Hazards Identified</i> .....	3.11
3.1.5 <i>Multi-Jurisdictional Risk Assessment</i> .....	3.13
<b>3.2 Assets at Risk</b> .....	<b>3.13</b>
3.2.1 <i>Total Exposure of Population and Structures</i> .....	3.13
Unincorporated County and Incorporated Cities .....	3.13
3.2.2 <i>Critical and Essential Facilities and Infrastructure</i> .....	3.15
3.2.3 <i>Other Assets</i> .....	3.18
<b>3.3 Future Land Use and Development</b> .....	<b>3.22</b>
<b>3.4 Hazard Profiles, Vulnerability, and Problem Statements</b> .....	<b>3.25</b>
Hazard Profiles .....	3.25
Vulnerability Assessments.....	3.26
Problem Statements .....	3.27
3.4.1 <i>Dam Failure</i> .....	3.28
Hazard Profile .....	3.28
Vulnerability.....	3.43
Problem Statement.....	3.48
3.4.2 <i>Drought</i> .....	3.49
Hazard Profile .....	3.49
Vulnerability.....	3.57
Problem Statement.....	3.61
3.4.3 <i>Earthquakes</i> .....	3.62
Hazard Profile .....	3.62
Vulnerability.....	3.69
Problem Statement.....	3.75
3.4.4 <i>Extreme Heat</i> .....	3.76
Hazard Profile .....	3.76
Vulnerability.....	3.82
Problem Statement.....	3.83
3.4.5 <i>Fires (Urban/Structural and Wild)</i> .....	3.84
Hazard Profile .....	3.84
Vulnerability.....	3.89
Problem Statement.....	3.91

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3.4.6	<i>Flooding (Flash and River)</i> .....	3.92
	Hazard Profile .....	3.92
	Vulnerability.....	3.108
	Problem Statement.....	3.116
3.4.7	<i>Land Subsidence/Sinkholes</i> .....	3.117
	Hazard Profile .....	3.117
	Vulnerability.....	3.123
	Problem Statement.....	3.123
3.4.8	<i>Thunderstorm/High Winds/Lightning/Hail</i> .....	3.124
	Hazard Profile .....	3.124
	Vulnerability.....	3.133
	Problem Statement.....	3.140
3.4.9	<i>Tornado</i> .....	3.141
	HazardProfile .....	3.141
	Vulnerability.....	3.147
	Problem Statement.....	3.153
3.4.10	<i>Winter Weather/Snow/Ice/Severe Cold</i> .....	3.154
	Hazard Profile .....	3.154
	Vulnerability.....	3.159
	Problem Statement.....	3.164

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

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

This chapter is divided into four main parts:

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



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## 3.1 Hazard Identification

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**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

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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 Heat
- Fires (Urban/Structural and Wild)
- Flooding
- Land Subsidence/Sinkholes
- Thunderstorm/High Winds/Lightning/Hail
- Tornado
- Severe Winter Weather

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

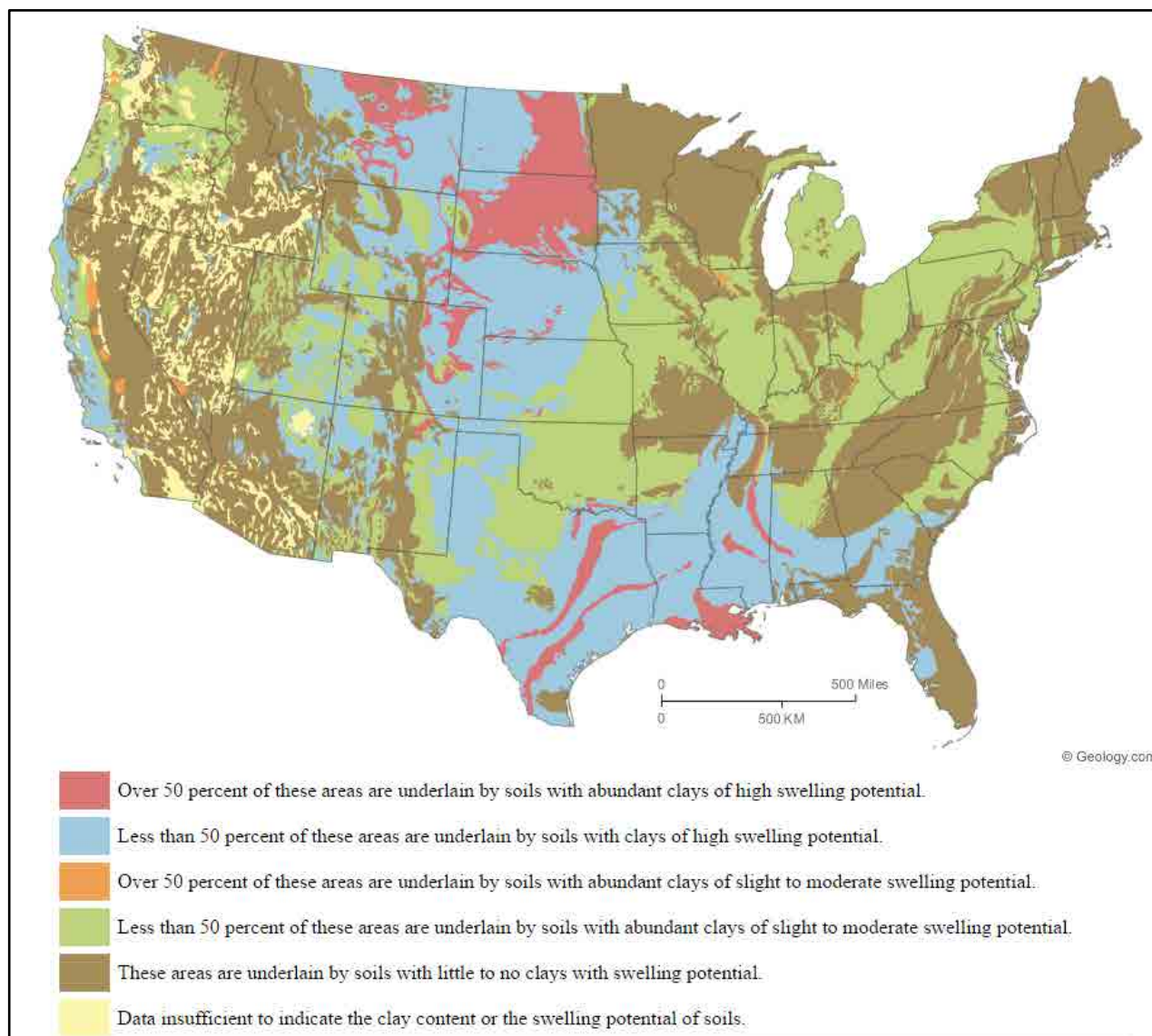
**Table 3.1. Table 3.1 Hazards Not Profiled in the Plan**

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

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

<sup>2</sup> <http://nld.usace.army.mil/egis/f?p=471:1:0::NO>

Figure 3.1. Swelling clays map of the conterminous United States



Source: [http://ngmdb.usgs.gov/Prodesc/prodesc\\_10014.htm](http://ngmdb.usgs.gov/Prodesc/prodesc_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 initiated when the local government's response and recovery capabilities have been exhausted. In this type of situation, the state may declare a disaster and provide resources from the state level. If the disaster is so great that state resources are also overwhelmed, a federal disaster may be declared in order to allow for federal assistance.

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

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

Missouri has been especially hard hit by natural disasters in the recent past. The state has had 68 federally declared disasters since 1953. Of those, 38 have occurred between 2000 and 2016. All of these disasters have been weather related – severe wind and rain storms, tornadoes, flooding, hail, ice storms and winter storms. **Table 3.2** lists the federal disaster declarations for Crawford County from 1990 through 2017.

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

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-995	Severe Storms & Flooding	Incident Period: June 10, 1993- October 25, 1993 Declaration Date: July 09, 1993	-
DR-1006	Missouri Flooding, Severe Storm, Tornadoes	Incident Period: November 13, 1993-November 19, 1993 Declaration Date: December 01, 1993	-
DR-1328	Missouri Severe Thunderstorms & Flash Flooding	Incident Period: May 06, 2000- May 07, 2000 Declaration Date: May 12, 2000	PA
DR-1412	Missouri Severe Storms & Tornadoes	Incident Period: April 24, 2002- June 10, 2002 Declaration Date: May 06, 2002	PA

<b>Disaster Number</b>	<b>Description</b>	<b>Declaration Date Incident Period</b>	<b>Individual Assistance (IA) Public Assistance (PA)</b>
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
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	-
DR-1676	Missouri Severe Winter Storms & Flooding	Incident Period: January 12, 2007-January 22, 2007 Declaration Date: January 15, 2007	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-1749	Missouri Severe Storms & Flooding	Incident Period: March 17, 2008-May 09, 2008 Declaration Date: March 19, 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	-
EM-3317	Missouri Severe Winter Storm	Incident Period: January 31, 2011-February 05, 2011 Declaration Date: February 03, 2011	-
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

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (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	-
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
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

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

### 3.1.3 Research Additional Sources

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

- Missouri Hazard Mitigation Plans (2010 and 2013)
- Previously approved planning area Hazard Mitigation Plan (12/1/2011)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources (MDNR)
- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- National Agricultural Statistics Service (Agriculture production/losses)
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Environmental Protection Agency
- Flood Insurance Administration
- Hazards US (HAZUS)
- Missouri Department of Transportation
- Missouri Division of Fire Marshal Safety
- Missouri Public Service Commission
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC);
- Pipeline and Hazardous Materials Safety Administration
- County and local Comprehensive Plans to the extent available
- County Emergency Management
- County Flood Insurance Rate Map, FEMA

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

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

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

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

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

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

### 3.1.4 Hazards Identified

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

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

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme Heat	Fires (Urban/Structural and wild)	Flooding (River and Flash)	Land Subsidence/Sinkholes	Thunderstorms/High Winds/ Lightning/Hail	Tornado	Severe Winter Weather
Crawford Co.	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
Steelville	X	X	X	X	X	X	X	X	X	X
Sullivan	X	X	X	X	X	X	X	X	X	X
West 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



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

		Crawford County	Bourbon	Cuba	Steelville	Sullivan	West Sullivan	Crawford Co. R-I	Crawford Co. R-II	Steelville R-III	Sullivan School District
Dam Failure	P	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Drought	P	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%
	V	L	L	L	L	L	L	L	L	L	L
Earthquake	P	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	V	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L
Extreme Heat	P	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	V	M	M	M	M	M	M	M	M	M	M
Fires (Urban/Structural and *Wild)	P	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	V	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
*Flood/Flash Flood	P	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%
	V	M	M	M	M	M	M	M	M	M	M
Land Subsidence/Sinkholes	P	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
	V	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Thunderstorm: *Heavy Rain/High Winds/Lightning/Hail	P	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	V	L	L	L	L	L	L	L	L	L	L
Tornado	P	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
	V	M	M	M	M	M	M	M	M	M	M
Severe Winter Weather/Snow/Ice/Severe Cold	P	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	V	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L
<p><b>Vulnerability Rating Key: L = Low, L-M = Low-Medium, M = Medium, M-H = Medium-High, H = High, NDA = No Data Avail.</b></p> <p><b>*indicates hazard utilized for probability.</b></p>											

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

## 3.2 Assets at Risk

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

### 3.2.1 Total Exposure of Population and Structures

#### Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2016 Census Bureau data. Building counts values are based on parcel data provided by the Missouri Spatial Data Information Service which can be found at the following website, <http://msdis.missouri.edu>. Contents exposure values were unable to be calculated due to incompatibility/technical issues with HAZUS MH 4.0. Total exposure for Unincorporated Crawford County was obtained from the 2013 Crawford Co. Hazard Mitigation Plan.

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

Jurisdiction	2016 Population	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Bourbon	1,700	1,090	-	-	-
Cuba	3,348	2,101	-	-	-
*Leasburg	431	255	-	-	-
*St. Cloud	91	116	-	-	-
Steelville	1,903	1,034	-	-	-
Sullivan	6,838	838	-	-	-
West Sullivan	71	139			
Unincorporated Crawford County	10,163	22,637	-	-	-
<b>Total</b>	<b>24,545</b>	<b>28,210</b>	<b>-</b>	<b>-</b>	<b>\$1,116,986,000</b>

Sources: U.S. Census Bureau, 2012-2016 5-Year American Community Survey; 2013 Crawford Co. Hazard Mitigation Plan; MO\_2014\_Missouri\_Structures\_Project\_gdb; \*Not included in 2018 Crawford Co. HMP

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

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Other	Total
Bourbon	-	-	-	-	-	-
Cuba	-	-	-	-	-	-
*Leasburg	-	-	-	-	-	-
*St. Cloud	-	-	-	-	-	-
Steelville	-	-	-	-	-	-
Sullivan	-	-	-	-	-	-
West Sullivan	-	-	-	-	-	-
Unincorporated Crawford County	\$939,565,000	\$117,431,000	\$22,662,000	\$4,759,000	\$32,569,000	\$1,116,986,000
<b>Total</b>	\$939,565,000	\$117,431,000	\$22,662,000	\$4,759,000	\$32,569,000	\$1,116,986,000

Source: 2013 Crawford County Hazard Mitigation Plan

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

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Other	Total
Bourbon	585	73	0	3	429	1,090
Cuba	1,182	213	53	9	644	2,101
*Leasburg	129	10	0	2	114	255
*St. Cloud	20	27	0	18	51	116
Steelville	554	87	14	4	375	1,034
Sullivan	526	33	0	1	278	838
West Sullivan	42	21	1	1	74	139
Unincorporated Crawford County	7,120	176	14	4,828	10,499	22,637
<b>Total</b>	10,158	640	82	4,866	12,464	28,210

Source: MO\_2014\_Missouri\_Structures\_Project\_gdb. \*Not included in 2018 Crawford Co. HMP

**Table 3.8** 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.

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

Public School District	Enrollment	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Crawford Co. R-I	970	10	28,431,765	4,105,499	32,537,264
Crawford Co. R-II	1,425	7	-	-	-
Steelville R-III	970	10	26,001,085	4,341,927	30,343,012
Sullivan School District	2,219	12	-	-	70,879,171

Source: <https://ogi.ia.mo.gov/DESE/schoolSearch/index.html>; 2017 Data Collection Questionnaire

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### 3.2.2 Critical and Essential Facilities and Infrastructure

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

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

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

- 2013 Crawford County Hazard Mitigation Plan

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

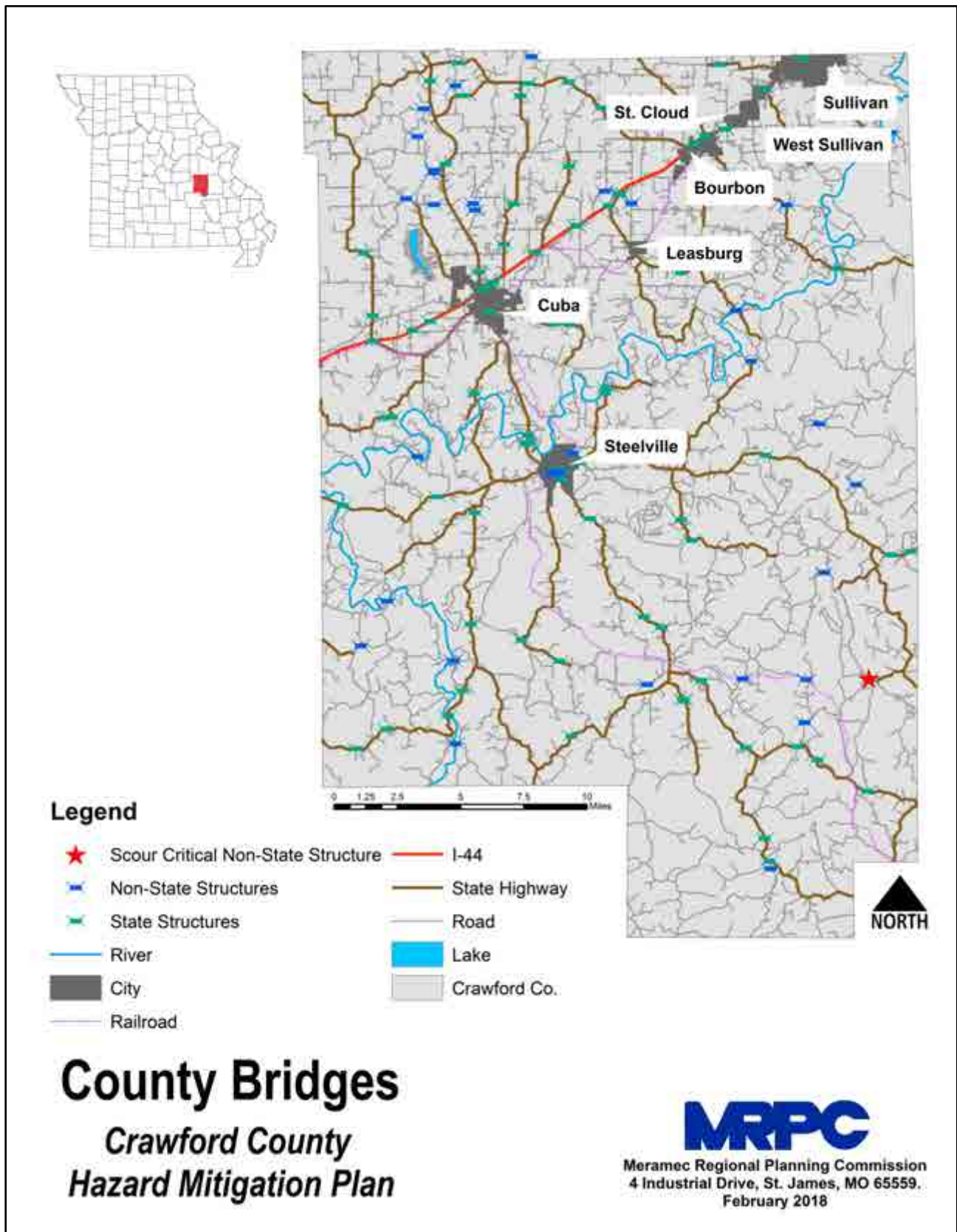
	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Highway Bridge	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	Total
Unincorporated Crawford County	0	0	5	-	-	1	1	1	1	1	70	0	0	-	3	1	-	1	-	0	-	4	-	89
Bourbon	0	0	2	-	-	0	1	1	1	0	2	0	0	-	1	1	-	1	-	0	-	10	-	20
Cuba	1	0	5	1	1	1	2	1	1	3	3	4	0	-	2	1	-	1	1	2	1	25	1	57
Steelville	0	0	3	-	1	1	3	1	1	4	3	3	0	-	1	1	-	1	-	3	-	14	1	41
Sullivan	0	0	4	-	-	1	0	1	1	0	1	1	0	-	6	1	-	1	-	4	-	6	-	27
West Sullivan	0	0	0	-	-	0	0	1	1	0	1	0	0	-	1	0	-	1	-	0	-	0	-	5
<b>Totals</b>	<b>1</b>	<b>0</b>	<b>19</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>7</b>	<b>6</b>	<b>6</b>	<b>8</b>	<b>80</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>14</b>	<b>5</b>	<b>0</b>	<b>6</b>	<b>1</b>	<b>9</b>	<b>1</b>	<b>59</b>	<b>2</b>	<b>239</b>

Source: Data Collection Questionnaires

According to the National Bridge Inventory there are a total of 121 bridges in Crawford County<sup>3</sup>. **Figure 3.2** shows the locations of State regulated bridges and non-State bridges in the planning area along with scour critical bridges. Scour critical refers to one of the database elements in the National Bridge Inventory. This element is quantified using a “scour index”, which is a number indicating the vulnerability of a bridge to scour during a flood. Bridges with a scour index between 1 and 3 are considered “scour critical”, or a bridge with a foundation determined to be unstable for the observed or evaluated scour condition. Nonetheless, there are 1 scour critical non-state structure within the county.

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

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

**Table 3.10. Threatened and Endangered Species in Crawford County**

Common Name	Scientific Name	Status
<b>Fish</b>		
Taillight Shiner	<i>Notropis maculatus</i>	Endangered (S)
<b>Insect</b>		
Hine's Emerald Dragonfly	<i>Somatochlora hineana</i>	Endangered (F)
<b>Mammal</b>		
Gray bat	<i>Myotis grisescens</i>	Endangered (F) (S)
Indiana bat	<i>Myotis sodalis</i>	Endangered (F) (S)
Northern long-eared bat	<i>Myotis septentrionalis</i>	Threatened (F) Endangered (S)
<b>Mollusk</b>		
Pink Mucket	<i>Lampsilis abrupta</i>	Endangered (F) (S)
Scaleshell	<i>Leptoea leptodon</i>	Endangered (F) (S)
Sheepnose	<i>Plethobasus cyphus</i>	Endangered (F) (S)
Snuffbox	<i>Epioblasma triquetra</i>	Endangered (F) (S)
Spectaclecase	<i>Cumberlandia monodonta</i>	Endangered (F)
Winged Mapleleaf	<i>Quadrula fragosa</i>	Endangered (F)
<b>Salamander</b>		
Eastern Hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>	Endangered (S)

Note: S = State, F = Federal

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

MDC Missouri Natural Heritage Program Search

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

**Table 3.11. 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

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



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

**Table 3.12. Community Owned Parks in Crawford County**

Park Name	Address	City
Hood Park	1 Hood Dr., 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	-	Steelville
City Lake Park	Mattox Dr, Sullivan, MO 63080	Sullivan
Sunny Jim Bottomley City Park	305 Fisher 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 3.13** provides information in regards to properties on the National Register of Historic Places in Crawford County.

**Table 3.13. 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 3.14** provides major non-government employers in the planning area. There are approximately 498 employer establishments within the county, employing on average 11 individuals each<sup>4</sup>.

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

Employer Name	Product or Service	Employees
Missouri Baptist Sullivan Hospital	Hospital	250+
Paramount Apparel Int. Inc.	Apparel	250+
Crawford Co. R-I	Education	100-249
Crawford Co. R-II	Education	100-249
Mar-Bal Inc.	Injection Molding	100-249
McGinnis Wood Products	Manufacturing	100-249
LMI Aerospace Inc.	Engineering, Manufacturing, Supplier	100-249
Steelville Manufacturing Co.	Manufacturing	100-249
Vera Tags Inc.	Printing	100-249

Source: <https://missourieconomy.org/Employers/default.aspx>

**Agriculture** plays an important role in Crawford County. However, the Agribusiness Employment Location Quotient for the County is lower than 1.0; meaning that there is a relatively low share of agribusiness employment to its share of total national employment<sup>5</sup>. In addition, there were 105 individuals working in the agriculture industry, comprising 6.5% of the total workforce in 2016<sup>6</sup>. In addition, the market value of products sold in 2012 was \$15.2 million; 80% from livestock sales, and 20% from crop sales.

<sup>4</sup> <https://www.census.gov/quickfacts/fact/table/washingtoncountymissouri.crawfordcountymissouri/HSG650216>

<sup>5</sup> [http://www.missourieconomy.org/pdfs/missouri\\_farms\\_and\\_agribusiness.pdf](http://www.missourieconomy.org/pdfs/missouri_farms_and_agribusiness.pdf);

<sup>6</sup> [https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS\\_16\\_5YR\\_DP03&prodType=table](https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_DP03&prodType=table)

### 3.3 Future Land Use and Development

Table 3.15 provides population growth statistics for Crawford County.

**Table 3.15. Crawford County Population Growth, 2000-2016**

Jurisdiction	Total Population 2000	Total population 2016	2000-2016 # Change	2000-2016 % Change
<b>Unincorporated Crawford County</b>	9,978	10,163	185	1.9
<b>Bourbon</b>	1,348	1,700	352	26.1
<b>Cuba</b>	3,230	3,348	118	3.7
<b>*Leasburg</b>	324	431	107	33.0
<b>*St. Cloud</b>	56	91	35	62.5
<b>Steelville</b>	1,429	1,903	474	33.2
<b>Sullivan</b>	6,351	6,838	487	7.7
<b>West Sullivan</b>	88	71	-17	-19.3

Source: U.S. Bureau of the Census, 2012-2016 5 Year American Community Survey; Census 2000 Summary File 1

\*Not included in the 2018 Crawford Co. HMP

Typically population growth or decline is generally accompanied by an increase or decrease in the number of housing units. Table 3.16 provides the change in numbers of housing units in the planning area from 2000-2016.

**Table 3.16. Change in Housing Units, 2000-2016**

Jurisdiction	Housing Units 2000	Housing Units 2016	2000-2016 # Change	2000-2016 % change
<b>Unincorporated Crawford County</b>	5,337	5,507	170	3.2
<b>Bourbon</b>	600	771	171	28.5
<b>Cuba</b>	1,414	1,471	57	4.0
<b>*Leasburg</b>	-	186	-	-
<b>*St. Cloud</b>	-	33	-	-
<b>Steelville</b>	724	786	62	8.6
<b>Sullivan</b>	2,775	3,150	375	13.5
<b>West Sullivan</b>	-	27	-	-

Source: U.S. Census Bureau, 2012-2016 5 Year American Community Survey; U.S. Bureau of the Census, Census 2000 Summary File 1

\*Not included in the 2018 Crawford Co. HMP

Since the last update of the Crawford County Hazard Mitigation Plan (2013), multiple jurisdictions reported commercial and industrial developments. The City of Bourbon built a new fire protection district building in the Industrial Park. Cuba reported the construction for the Meramec Instrument Transformer Company. The City of Steelville reported new developments for Steelville Manufacturing, residential, and a Dollar General. Crawford Co. R-I reported the addition of classrooms at the elementary and middle school. Also classrooms were added and remodeled at the high school. Lastly, Crawford Co. R-II added a tornado shelter to their high school in 2015 (meets FEMA standards), and

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remodeled the high school.

Jurisdictions also reported anticipated future developments within the next 5 years (2018-2023). The City of Bourbon anticipates the resurfacing of Pine Street and an update to water and sewer lines with funding from CDBG. The City of Steelville anticipates new development at Steelville Manufacturing and the Steelville Telephone Company. The Sullivan School District anticipates adding classrooms and a new gym to an existing building. Crawford Co., Cuba, Sullivan, Crawford Co. R-I, Crawford Co. R-II, and Steelville R-III did not report future developments within the next 5 years.

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

### **Socioeconomic Profile**

The University of Missouri Extension developed a Social and Economic Profile for Crawford County. Population trend data suggests that Crawford County will increase by 3,440 individuals within the next 2 to 12 years<sup>7</sup>. Furthermore, business incentives are available in the County including MissouriWorks, a program for qualified job creators which enables the retention of withholding tax or tax credits that can be transferrable, refundable and/or saleable; 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<sup>8</sup>. **Figure 3.3** displays socioeconomic data for Crawford County compared to the State of Missouri.

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<sup>7</sup> UM Extension Social and Economic Profile <http://mcdc.missouri.edu/cgi-bin/broker? PROGRAM=websas.cntypage.sas&county=29055>

<sup>8</sup> <https://www.ded.mo.gov/Programs.aspx>

**Figure 3.3. Crawford County Socioeconomic Profile**

<b>Sales Tax</b>		<b>Cost of Living</b>			
	<b>Rate</b>	<b>Community</b>	<b>Cost of living index</b>	<b>Year</b>	
Steelville	2.5%	Crawford County	89.3	2017	
Crawford County	1.88%	Missouri	89.2	2017	
Missouri	4.23%				
Total	9.1%				
<b>Property Tax</b>		<b>Total Retail Sales</b>		<b>Transportation</b>	
	<b>Rate</b>	<b>Year</b>	<b>Crawford County</b>	<b>Airport</b>	<b>KUBX</b>
Crawford County	0.704%	2012	\$205,031,000	<b>Highways</b>	I-44
				<b>State Highways</b>	8, 19, 49
				<b>Transportation Services</b>	SMTS
				<b>Railroad</b>	BNSF
				<b>Parcel Service</b>	UPS, Fed Ex, DHL, USPS
<b>Median Household Income</b>		<b>Per Capita Income</b>			
Crawford County	\$36,983	<b>Crawford County</b>	\$20,373	2016	
Missouri	\$49,593	<b>Missouri</b>	\$27,044	2016	
<b>Median Housing Value</b>		<b>Sources:</b>			
Crawford County	\$123,600	1. U.S. Census Bureau, 5-Year American Community Survey			
Missouri	\$151,400	2. <a href="https://www.taxrates.com/state-rates/missouri/cities/linn/">https://www.taxrates.com/state-rates/missouri/cities/linn/</a>			
		3. <a href="http://www.city-data.com">http://www.city-data.com</a>			
		4. <a href="https://smartasset.com/taxes/missouri-property-tax-calculator">https://smartasset.com/taxes/missouri-property-tax-calculator</a>			
		5. <a href="https://www.missourieconomy.org/indicators/cost_of_living/">https://www.missourieconomy.org/indicators/cost_of_living/</a>			
		6. Missouri Economic Research and Information Center			
		7. Missouri Spatial Data Information Service			

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## 3.4 Hazard Profiles, Vulnerability, and Problem Statements

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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.

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

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

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

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

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

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## **Vulnerability Assessments**

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

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

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

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

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

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

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

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

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

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

### **Problem Statements**

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



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### 3.4.1 Dam Failure

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Some specific sources for this hazard are:

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

#### **Hazard Profile**

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

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

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

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

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**Table 3.17. MDNR Dam Hazard Classification Definitions**

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

Source: Missouri Department of Natural Resources, [http://dnr.mo.gov/env/wrc/docs/rules\\_reg\\_94.pdf](http://dnr.mo.gov/env/wrc/docs/rules_reg_94.pdf)

**Table 3.18. NID Dam Hazard Classification Definitions**

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

Source: National Inventory of Dams

### **Geographic Location**

#### Dams in Planning Area

According to the Department of Natural Resources there are 76 dams within Crawford County; including Class 1 (8), Class 2 (18), Class 3 (50) (**Table 3.19**). In addition, the state regulates 10 of the 76 dams. The NID recognizes 75 dams in the planning area; including high (26), significant (3), and low (46) NID hazard class dams. None of the dams are owned or operated by the United States Army Corps of Engineers (USACE). County dams are privately or commercially owned. **Table 3.20** provides the names, locations, and other pertinent information for all NID High Hazard Dams in the planning area.

**Table 3.19. 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

<b>Name of Dam</b>	<b>DNR Hazard Class</b>	<b>NID Hazard Class</b>
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
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

<b>Name of Dam</b>	<b>DNR Hazard Class</b>	<b>NID Hazard Class</b>
MONONAME 410	3	Low
MONONAME 717	3	Low
MONONAME 718	3	-
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
THUNDER VALLEY FARM DAM	2	High
WEISEL LAKE DAM	3	Low

Source: Missouri Department of Natural Resources, Water Resources Program

**Table 3.20. 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
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	COOK STATION	3

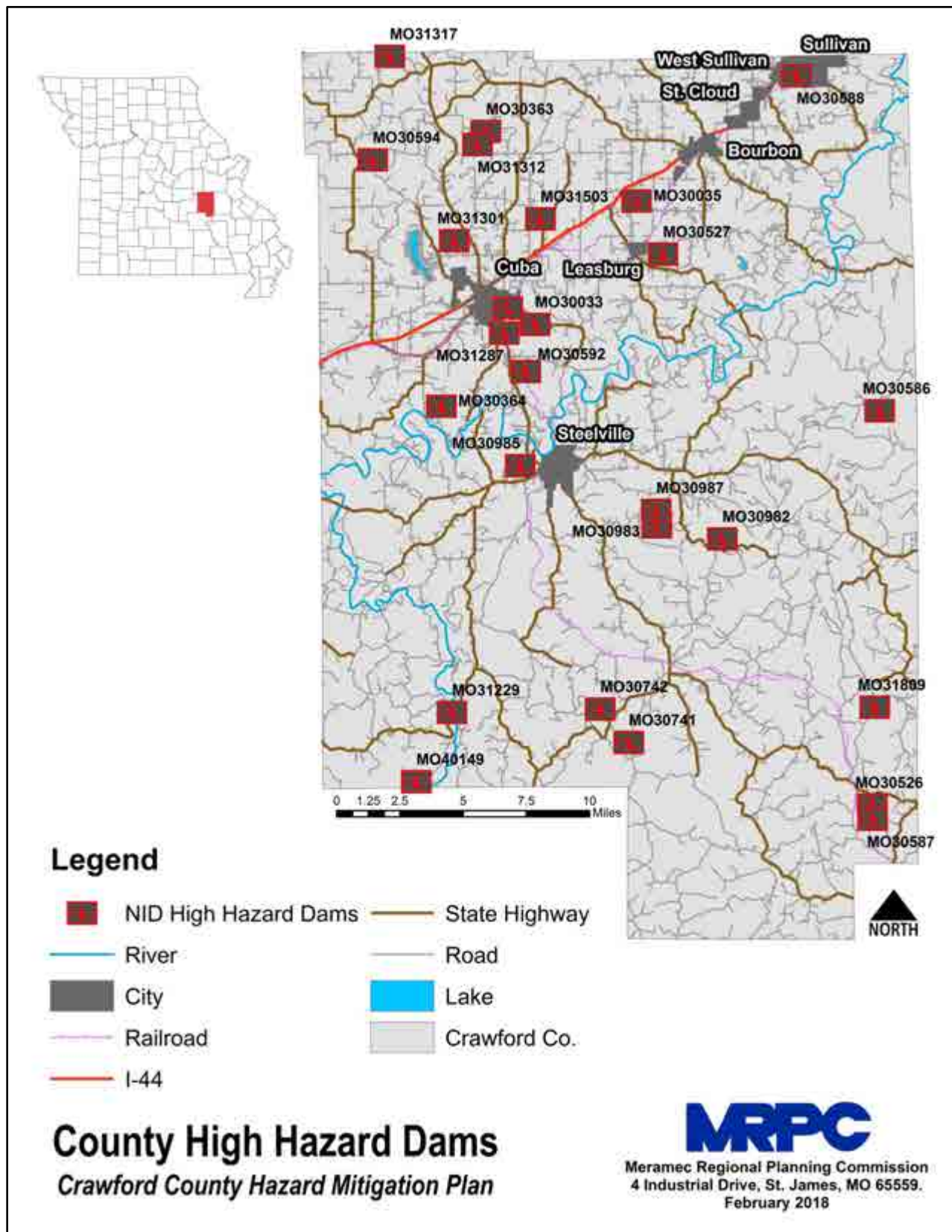
Dam Name	NIDID	Hazard Potential *	NID Height (Ft.)	NID Storage	River	Nearest City *	Distance To City (MI.) *
					CREEK		
KEMP LAKE DAM	MO30035	High	22	212	TRIBUTARY OF LITTLE BOURBEUSE	CHAMPION CITY	0
PAPIN LAKE DAM	MO30364	High	33	141	TR-MERAMEC RIVER	CUBA	6
PINE LAKE DAM	MO30527	High	38	375	TR MERAMEC 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](http://nid.usace.army.mil/cm_apex/f?p=838:12).

**Figure 3.3** depicts locations of NID high hazard dams located in the planning area. If a dam failure were to occur in 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 3.4** to **Figure 3.8**). No other dam inundation maps were available for the remaining NID High Hazard Dams in the county.

Figure 3.3. NID High Hazard Dam Locations in Crawford County



Source: MSDIS, MRPC



Figure 3.4. Brummet Lake Dam Inundation Zone

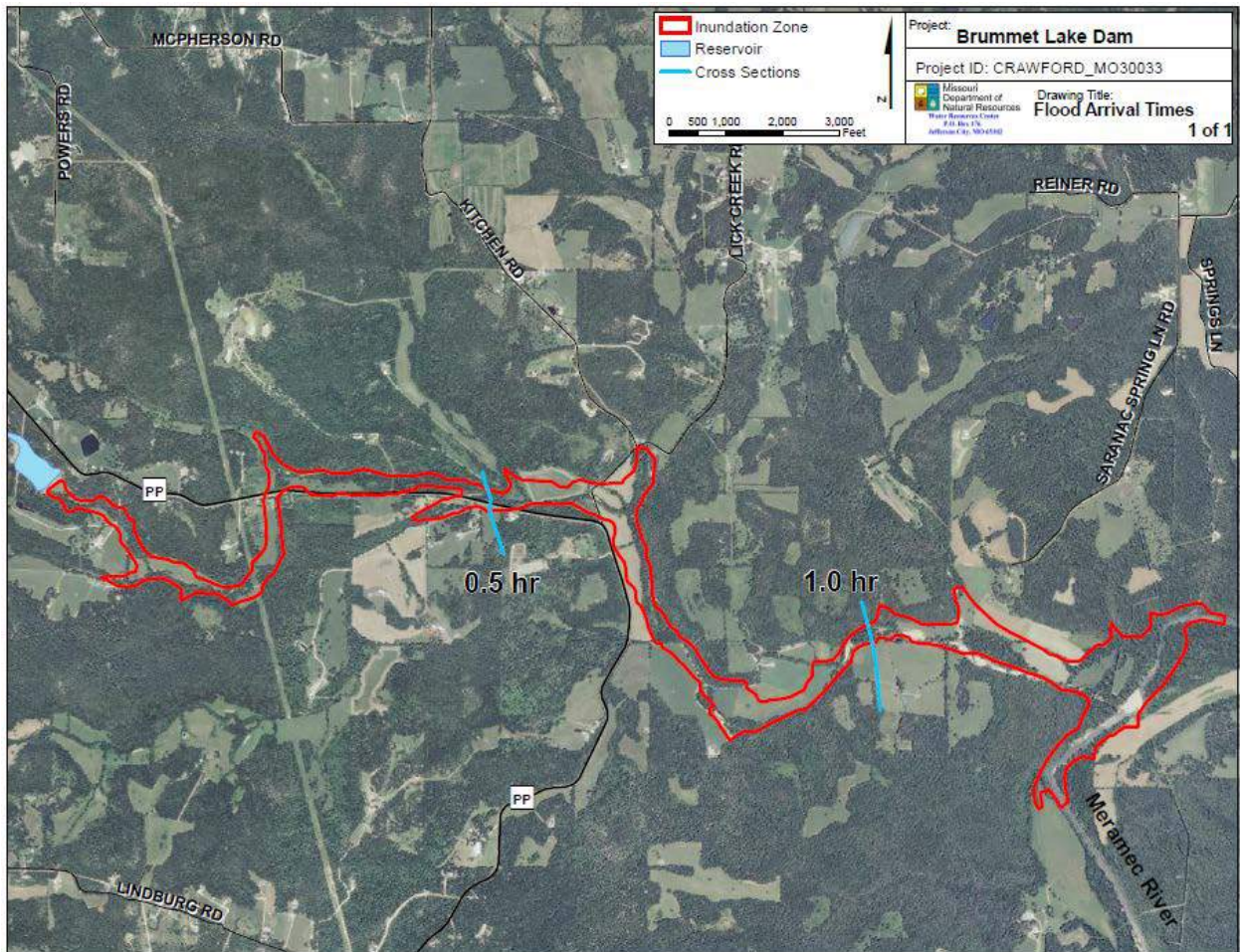




Figure 3.5. City Park Lake Dam Inundation Zone

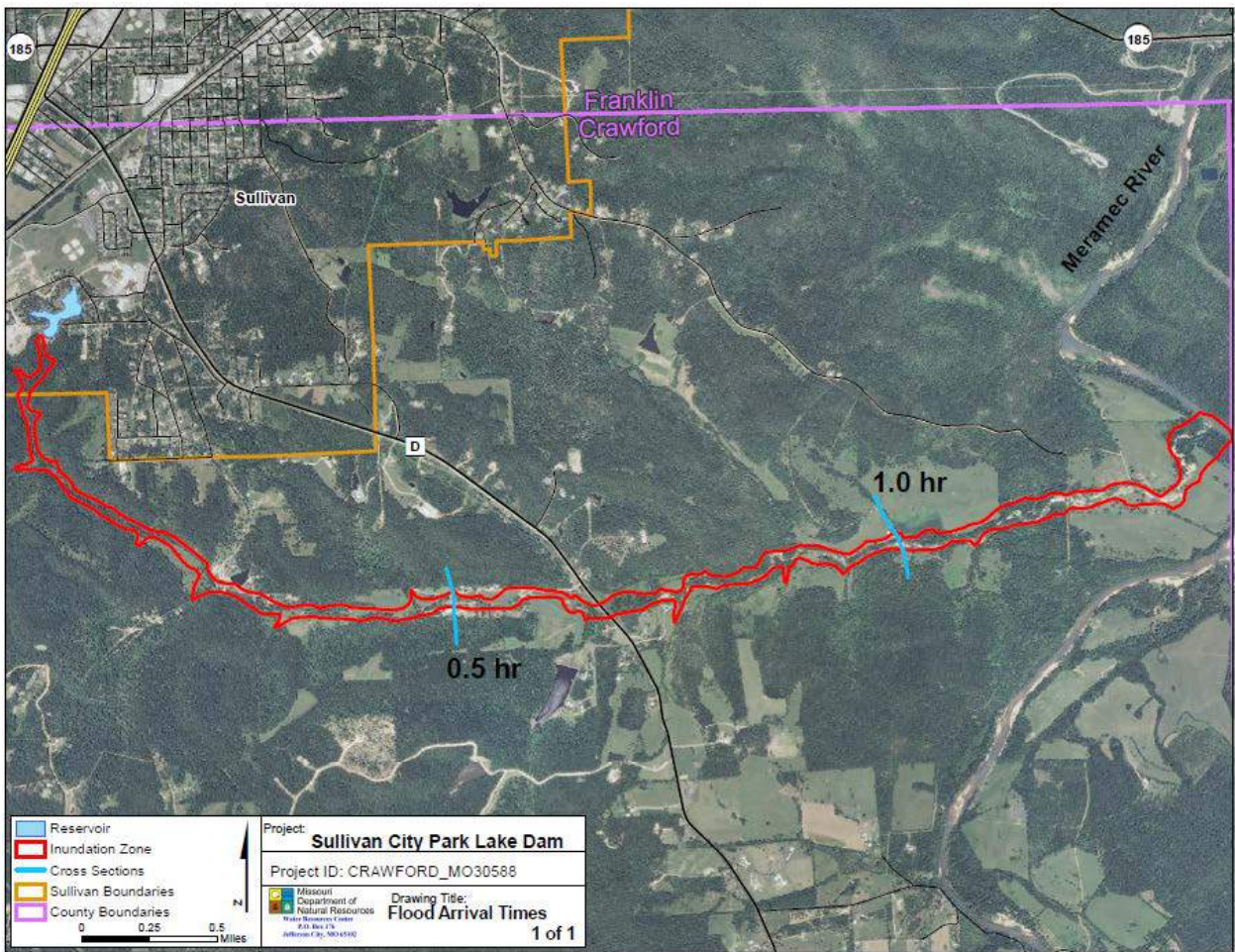




Figure 3.6. Green Dam Inundation Zone

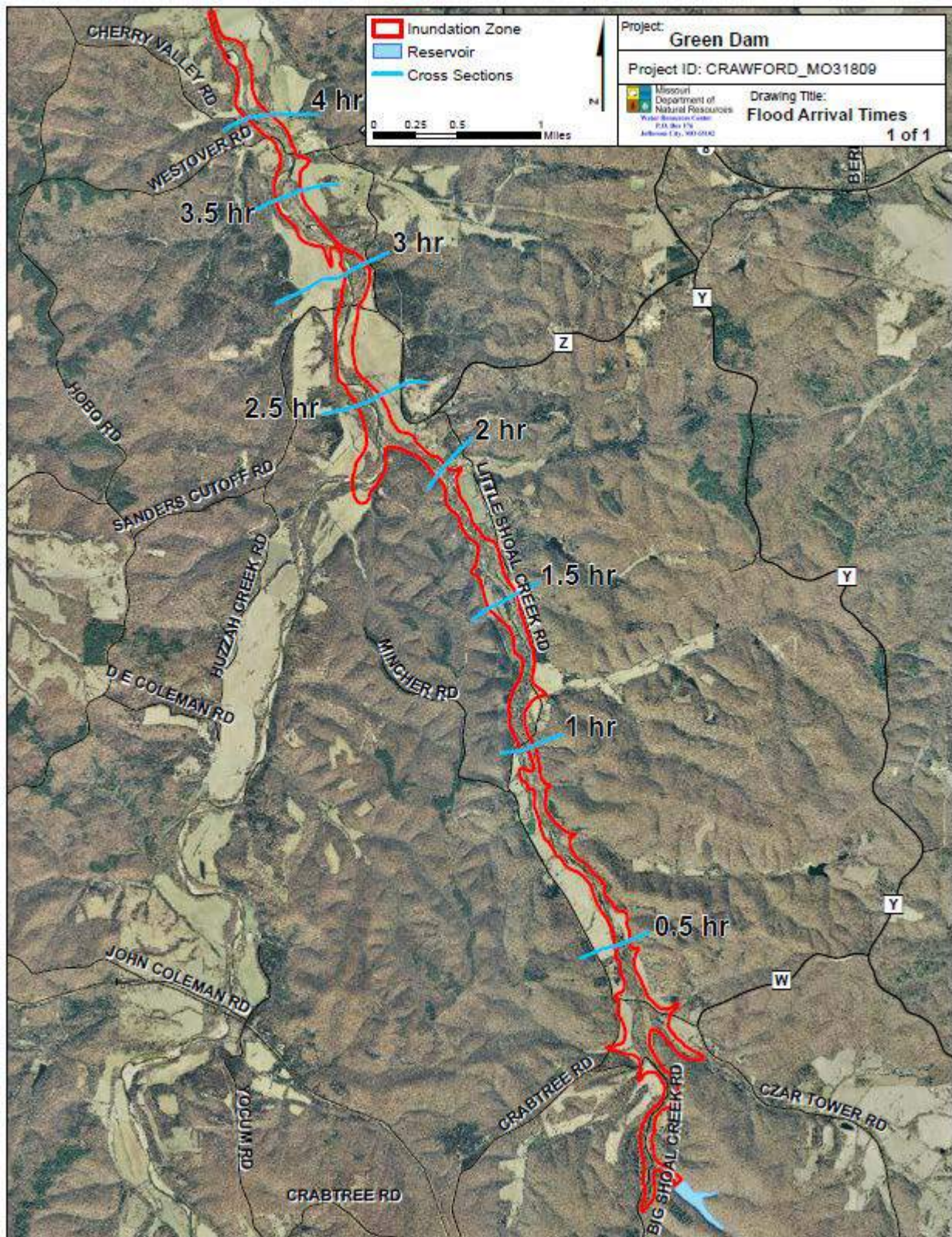




Figure 3.7. Haladale (Pine Lake) Dam Inundation Zone

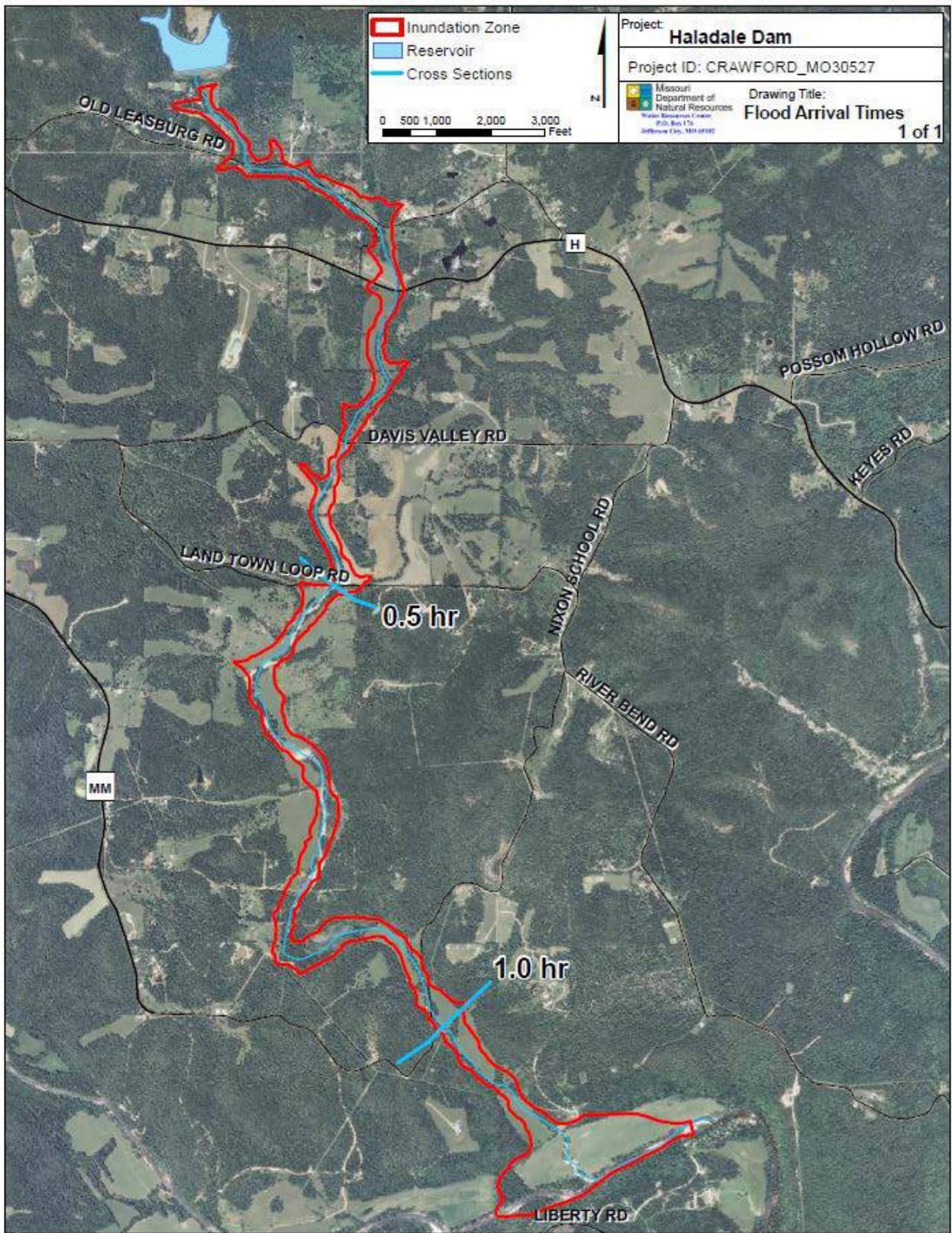
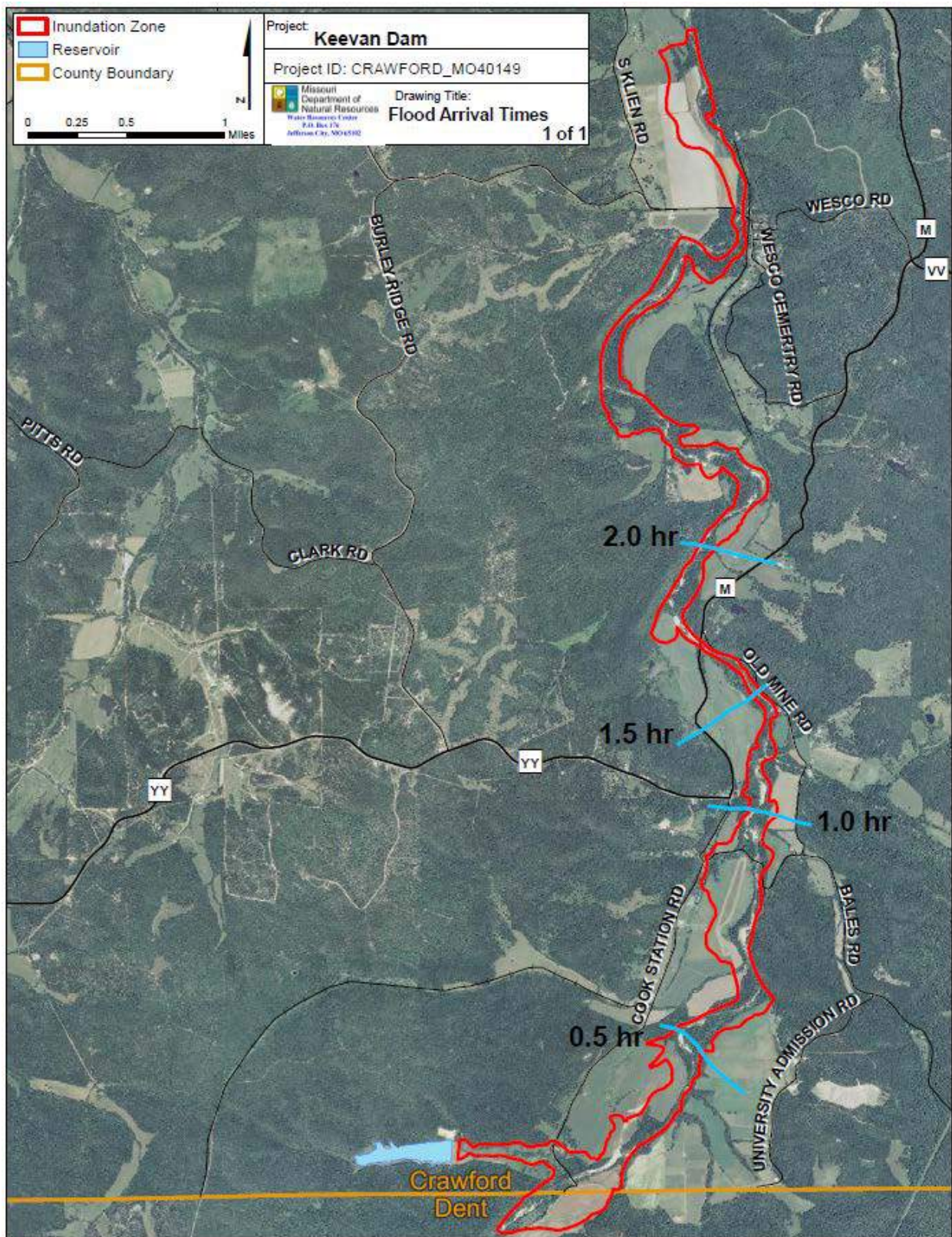




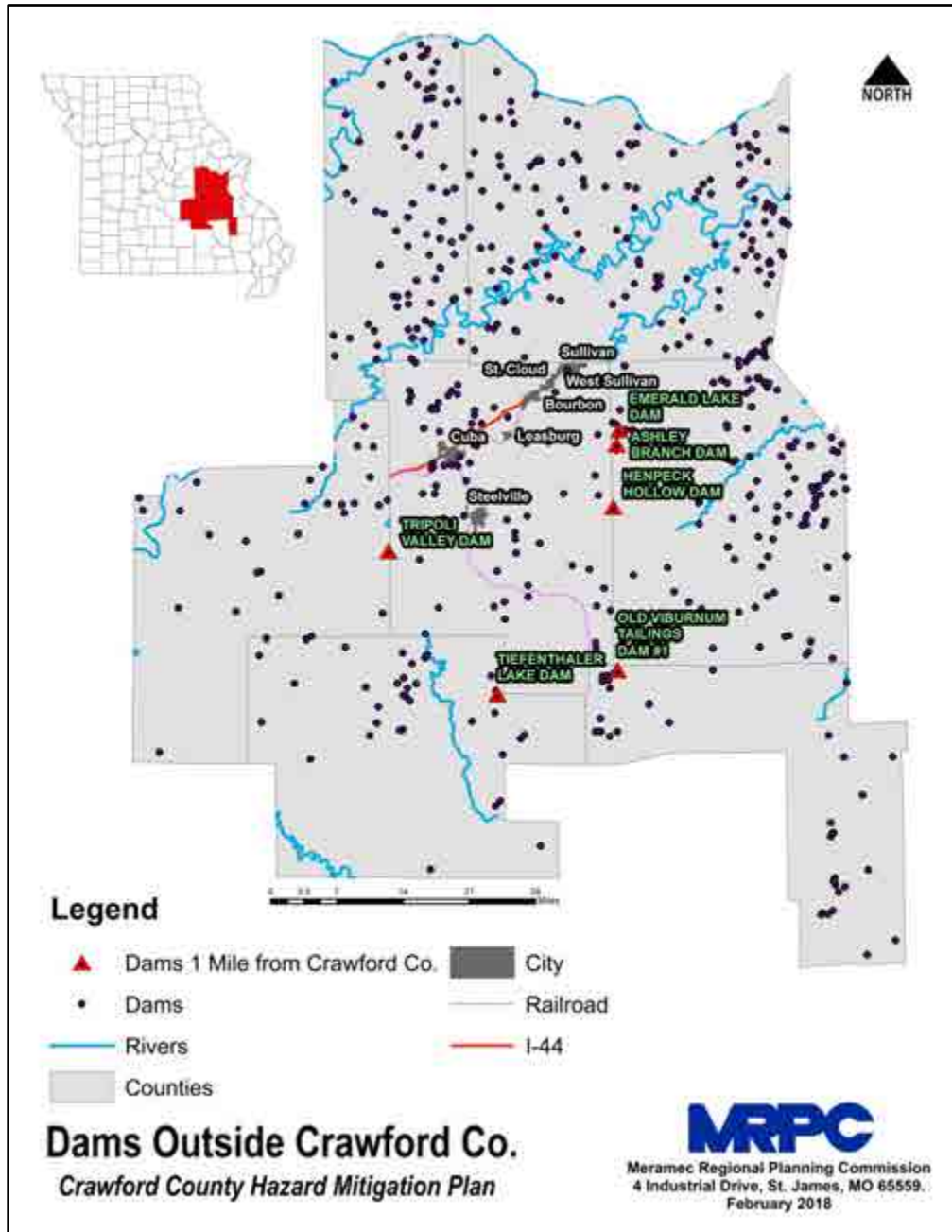
Figure 3.8. Keevan Dam Inundation Zone



Upstream Dams Outside the Planning Area

**Figure 3.9** 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 3.10**). Additionally, Henpeck Hollow Dam in Washington County (Unregulated, High Hazard, Class 1) resides approximately 151 yards from the county (**Figure 3.11**).

**Figure 3.9. Upstream Dams Outside Crawford County**

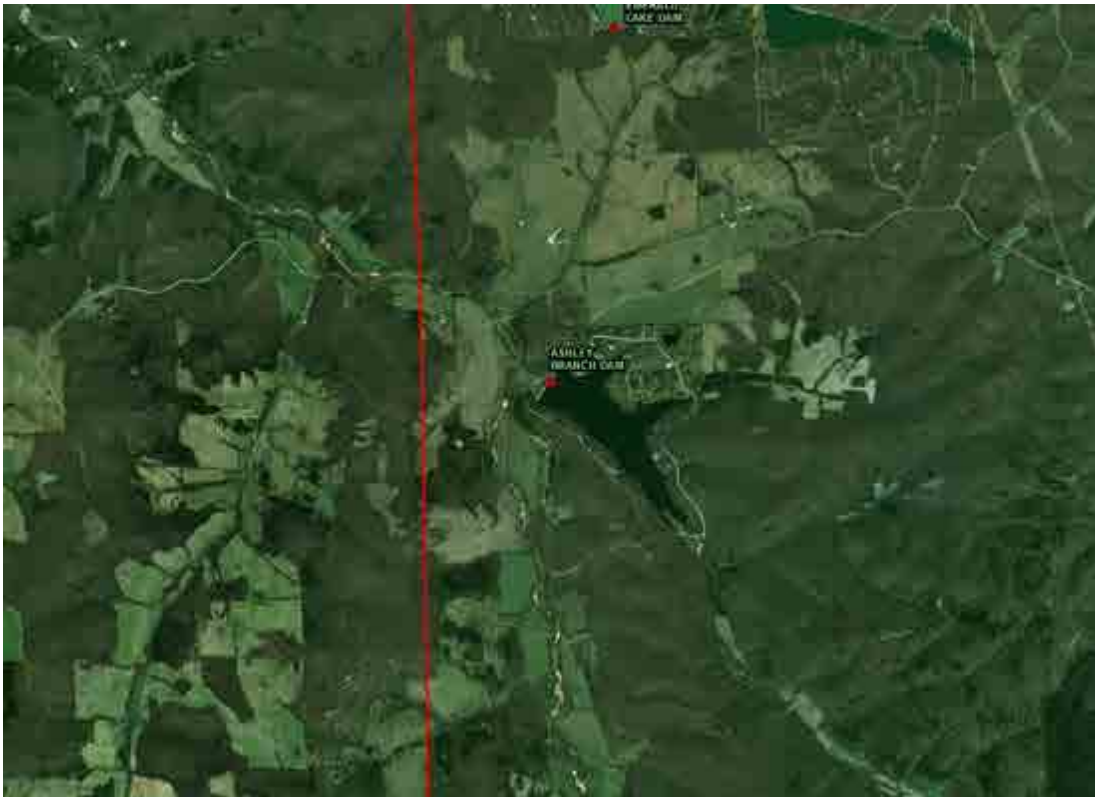


Source: MSDIS, MRPC



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**Figure 3.10. Ashely Branch Dam**



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**Figure 3.11. Henpeck Hollow Dam**



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

The severity/magnitude of dam failure would be similar in some cases to the impacts associated with flood events (see the flood hazard vulnerability analysis and discussion). Based on the hazard class definitions, failure of any of the High Hazard/Class I dams could result in a serious threat of loss of human life, serious damage to residential, industrial or commercial areas, public utilities, public buildings, or major transportation facilities. Catastrophic failure of any high hazard dams has the potential to result in greater destruction due to the potential speed of onset and greater depth, extent, and velocity of flooding. Worst case scenario would be a catastrophic failure at any of the high hazard class dams designated in **Table 3.20**.

## ***Previous Occurrences***

According to Stanford University's National Performance of Dams Program and the Missouri State Emergency Management Agency, there were 69 recorded dam incidents in Missouri between 1917 and 2008. Fourteen were considered failures<sup>9,10</sup>. 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<sup>11</sup>. The deluge destroyed Johnson's Shut-Ins State Park facilities, including the campground, and deposited sediment, boulders and debris into the park. The flood of debris diverted the East Fork of the Black River into an older channel and turned the river chocolate brown. Fortunately the breach occurred in mid-winter. Five people were injured when the park superintendent's home was swept away by the flood, but all were rescued and eventually recovered. Had it been summer, and the campground filled with park visitors, the death toll could have been very high<sup>12</sup>. This catastrophe has focused the public's attention on the dangers of dam failures and the need to adequately monitor dams to protect the vulnerable.

Despite the significance of the immediate damage done by the Taum Sauk Reservoir dam failure, the incident also highlights the long-term environmental and economic impacts of an event of this magnitude. Four years later, the toll of the flooding and sediment on aquatic life in the park and Black River is still being investigated. Even after the removal of thousands of dump truck loads of debris and mud, the river is still being affected by several feet of sediment left in the park. The local economy, heavily reliant upon the tourism from the park and Black River, has also been hit hard<sup>13</sup>.

Overall, many of Missouri's smaller dams are becoming a greater hazard as they continue to age and

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<sup>9</sup> [http://npdp.stanford.edu/dam\\_incidents](http://npdp.stanford.edu/dam_incidents)

<sup>10</sup> 2013 Missouri State Hazard Mitigation Plan

<sup>11</sup> United States Geological Survey. Damage Evaluation of the Taum Sauk Reservoir Failure using LiDAR. [http://mccgsc.usgs.gov/publications/t\\_sauk\\_failure.pdf](http://mccgsc.usgs.gov/publications/t_sauk_failure.pdf)

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

<sup>13</sup> The Alert. Spring 2006. After the Deluge...What's Ahead for Taum Sauk? By Dan Sherburne.

deteriorate. While hundreds of them need to be rehabilitated, lack of available funding and often questions of ownership loom as obstacles difficult to overcome<sup>14</sup>.

**Event Description**

According to Stanford University’s National Performance of Dams Program, no dam incidents have been recorded for Crawford County<sup>15</sup>.

**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<sup>16</sup>. In addition, dam failure within the county has not occurred according to available data. **Table 3.4** depicts dam failure probability as no data available (NDA).

**Vulnerability**

**Vulnerability Overview**

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for the vulnerability analysis of dam failure for 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 3.21** provides vulnerability analysis data for the failure of State-regulated dams in Missouri.

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

County	Class 1	Class 2	Class 3	Total	Estimated # of Buildings Vulnerable	Average Exposure Value per Structure (\$)	Estimated Total Potential Building Exposure (\$)	Estimated Total Population Exposure	Estimated Building Losses (\$)
Crawford	1	4	5	10	30	84,827	4,403,472	61	2,201,736

Source: 2013 Missouri State Hazard Mitigation Plan

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

- Class 1 dams, the number of structures in the inundation area was estimated to be 10 buildings since this is the minimum threshold for a dam being considered a class 1 dam.
- Class 2 dams, the number of structures in the inundation area was estimated to be 5

<sup>14</sup> United States Geological Survey Fact Sheet 131-02. October 2002

<sup>15</sup> [http://www.npdp.standord.edu/dam\\_incidents](http://www.npdp.standord.edu/dam_incidents)

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



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buildings. This is the mid-range of buildings in the inundation area for a dam to be considered a class 2 dam.

- Class 3 dams, the number of structures in the inundation area was estimated to be 0 buildings since class 3 dams do not have any structures within their inundation area.

According to the 2013 Missouri State Hazard Mitigation Plan, there is an estimated 30 buildings vulnerable to failure of State-regulated dams (**Figure 3.12**). Furthermore, the state quantified potential loss estimates in terms of property damages. To execute the analysis, the following assumptions were utilized.

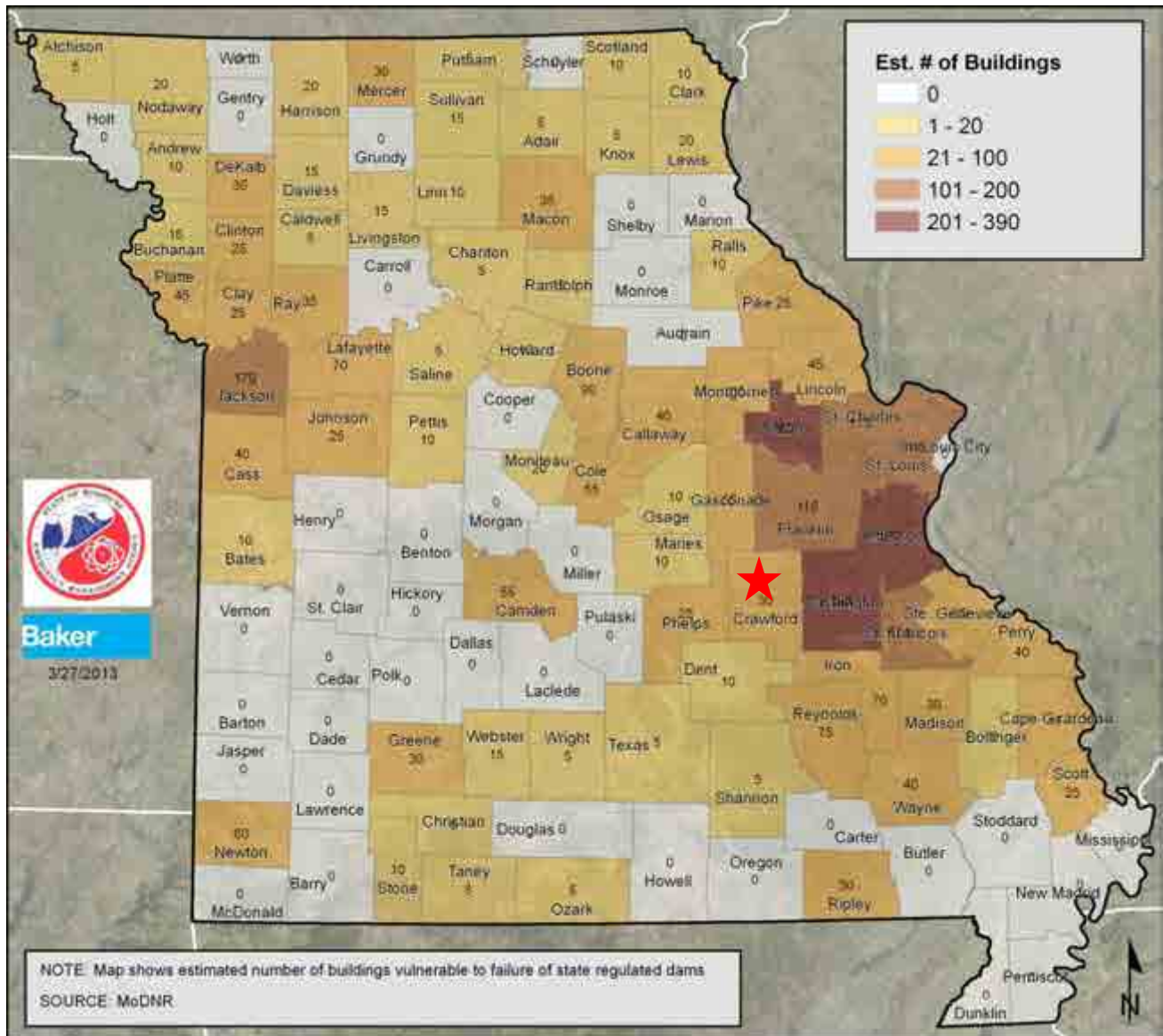
- Average values for residential structures were obtained for each county from HAZUS-MH MR4. Residential structures were chosen as the most prevalent structure-type downstream of dams. Although certainly other building types are present, the numbers and values are not known.
- The estimated structure loss was estimated to be at 50 percent of the value of the structure. Actual losses will vary based on the depth of inundation.
- For population exposure, United States Census blockgroups were intersected with available State regulated dam inundation areas to identify the vulnerable population for each county<sup>17</sup>.

**Figure 3.13** and **Figure 3.14** depict the total estimated building losses and population exposure by county, respectively. The estimated building losses from failure of State-regulated dams are \$2 – \$5 million. The estimated population exposure to failure of State-regulated dams ranges between 1 and 130.

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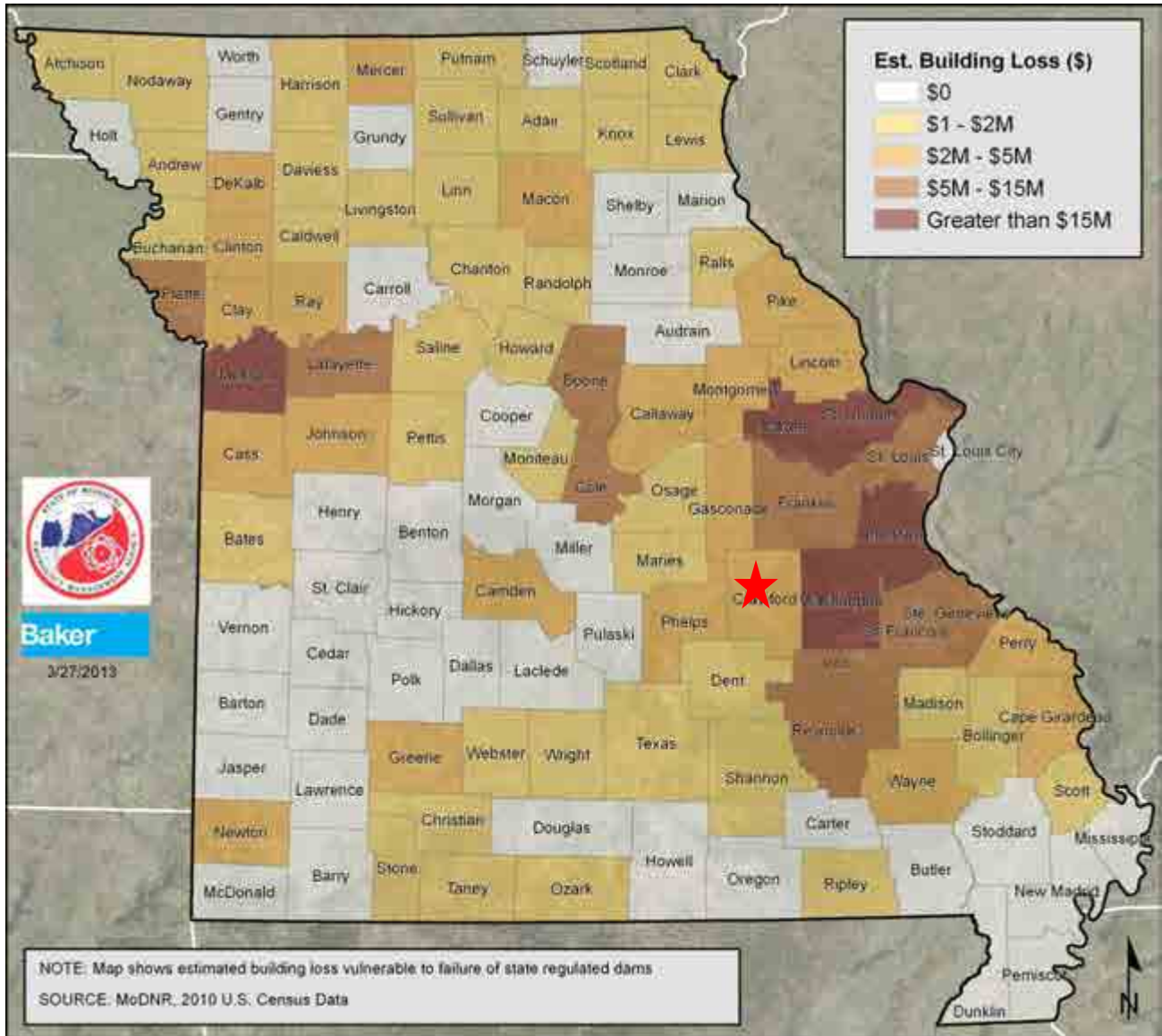
<sup>17</sup> 2013 Missouri State Hazard Mitigation Plan

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



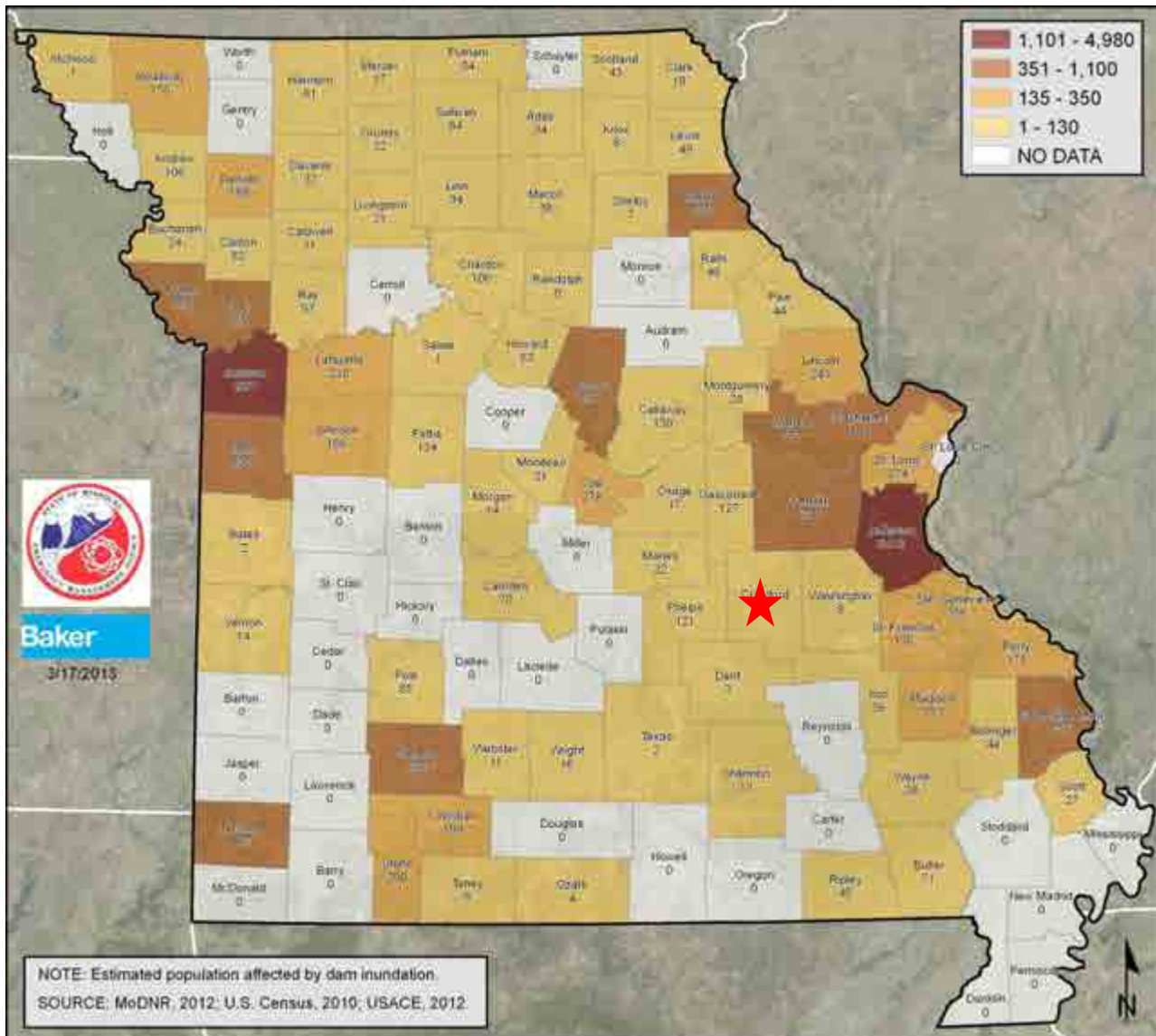
Source: 2013 Missouri State Hazard Mitigation Plan  
\*Red star indicates Crawford County

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



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

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



Source: 2013 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.

***Impact of Future Development***

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

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

Variations in vulnerability across the planning area depend upon multiple variables. 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 land owners how to properly inspect their dams, and develop emergency action plans would be advantageous.



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## 3.4.2 Drought

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Some specific sources for this hazard are:

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

### **Hazard Profile**

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

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

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

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

### **Geographic Location**

All areas and jurisdictions in 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 number of individuals within the county served by groundwater is 9,131<sup>19</sup>. However, rural residences with individual wells will likely be affected as well. Approximately 39.2% of the land in the county is utilized for agricultural purposes. Furthermore, livestock sales comprise 79% of the market of agricultural products sold in Crawford County. A drought would directly impact livestock production and the agriculture economy in Crawford County<sup>20</sup>.

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

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

**Figure 3.15** depicts a U.S. Drought Monitor map of Missouri on March 6, 2018. 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).

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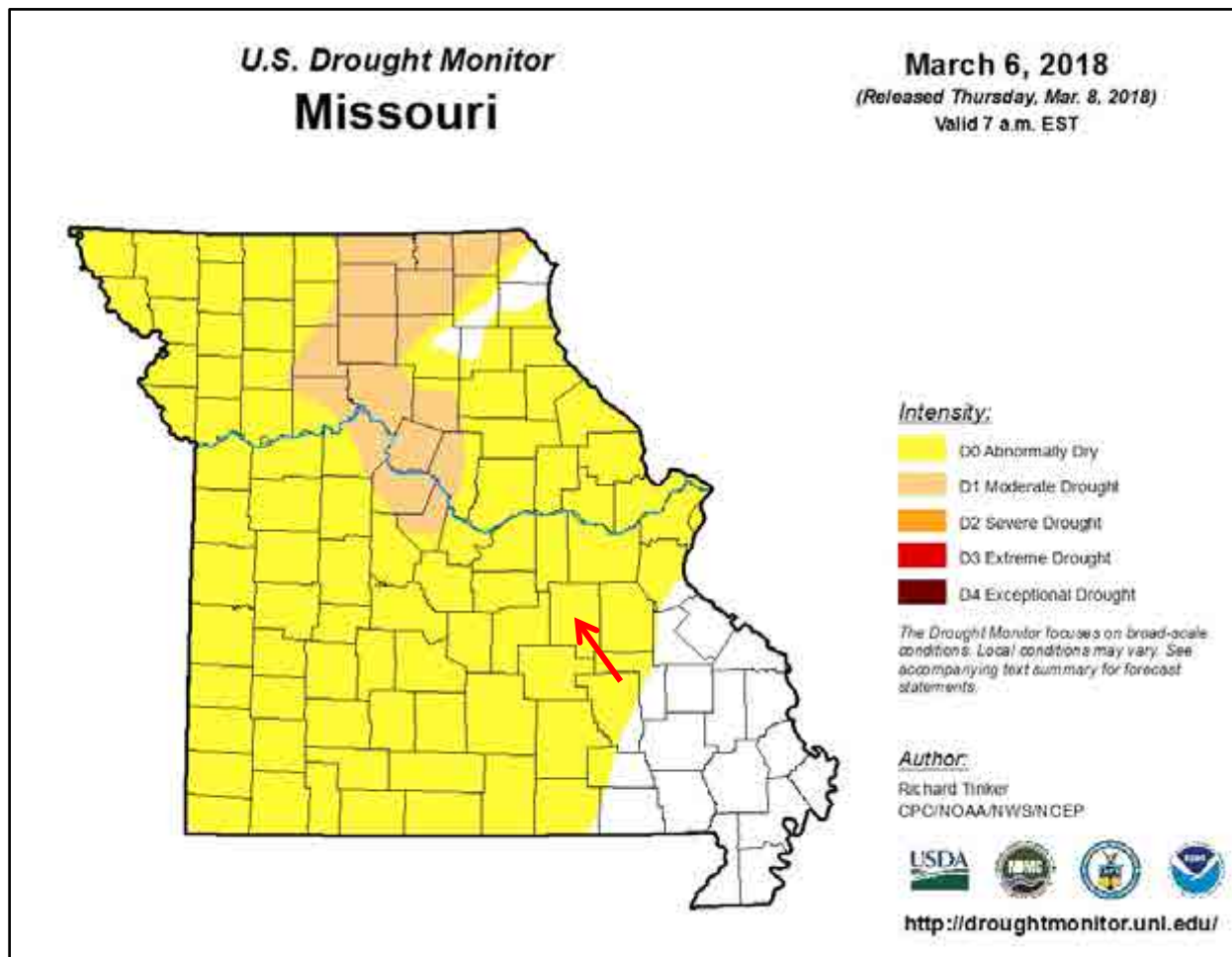
<sup>18</sup> <http://www.drought.unl.edu/> <http://droughtreporter.unl.edu/>

<sup>19</sup> [2013 Missouri State Hazard Mitigation Plan](#)

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

<sup>21</sup> Ibid

Figure 3.15. U.S. Drought Monitor Map of Missouri on March 6, 2018



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

Table 3.22 details crop losses between 1998 and 2012 for Crawford County. Additionally, Figure 3.16 illustrates RMA crop indemnities for 2017 across the United States. Crawford County fell in the range of \$0 for crop indemnities.

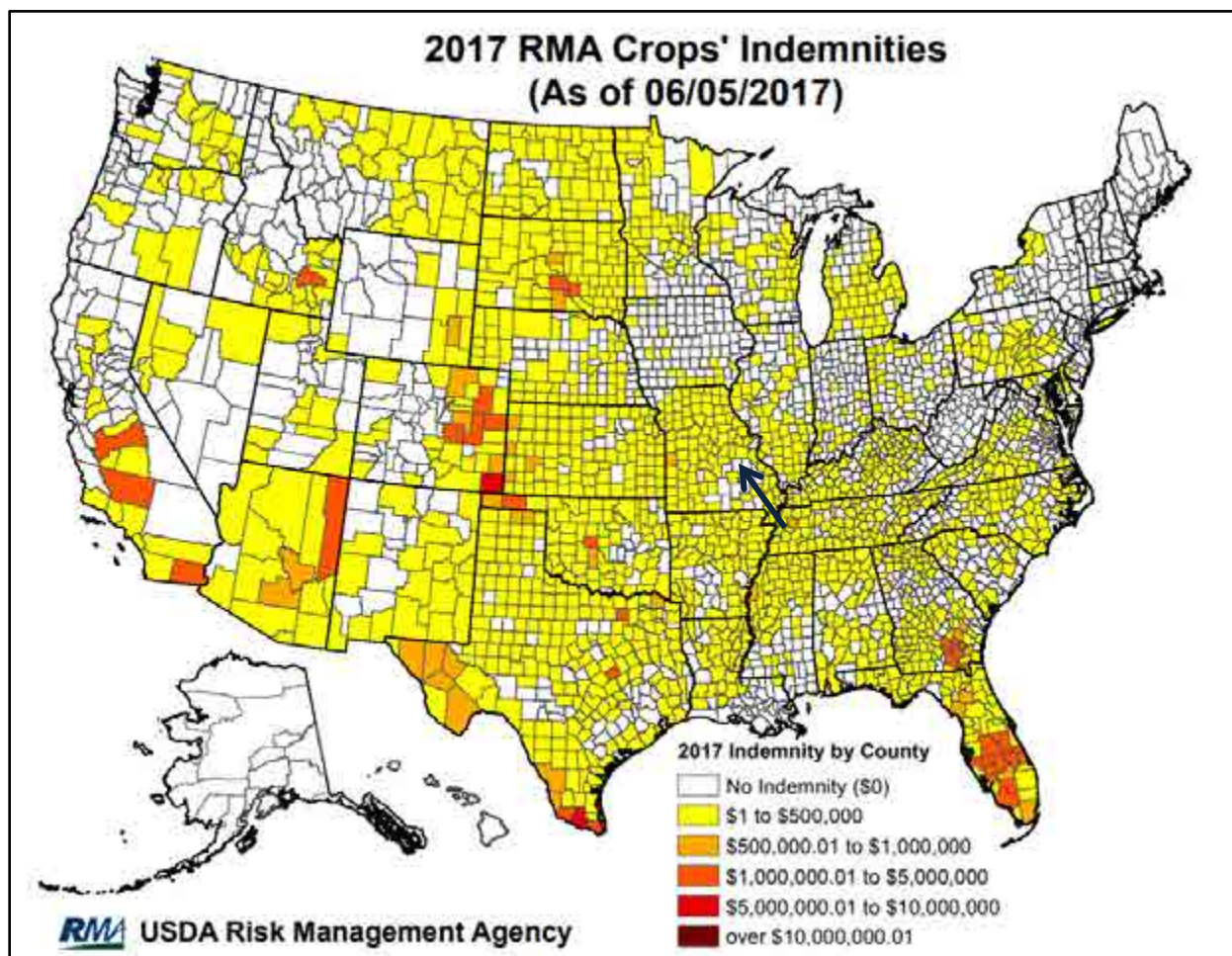
Table 3.22. Crawford County Crop Losses 1998 – 2012 (USDA Risk Management Agency)

Total Crop Insurance Paid for Drought Damage 1998-2012	Crop Claims Ratio Rating	Annualized Crop Insurance Claims/Drought Damage	Crop Exposure (2007 Census of Agriculture)	Annual Crop Claims Ration	Crop Loss Ratio Rating
\$241,833	1	\$16,122	\$1,777,000	0.91%	1

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



Figure 3.16. 2017 RMA Crop Indemnities for the United States



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

\*Black arrow indicates Crawford County

According to the USDA's Risk Management Agency, there have been 4 crop insurance payments due to drought between since 1998. **Table 3.23** illustrates the year, number of payments, and total amount of crop insurance payments.

**Table 3.23. Crawford County Crop Indemnity Payments (1998-2017)**

Year	Number of Payments	Total
2012	2	\$240,520
2014	1	\$4,773
2017	1	\$4,544

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

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

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

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

**Figure 3.17** illustrates the Palmer Drought Severity Index sub-regions of Missouri. Crawford County is categorized under the Southeast sub-region.

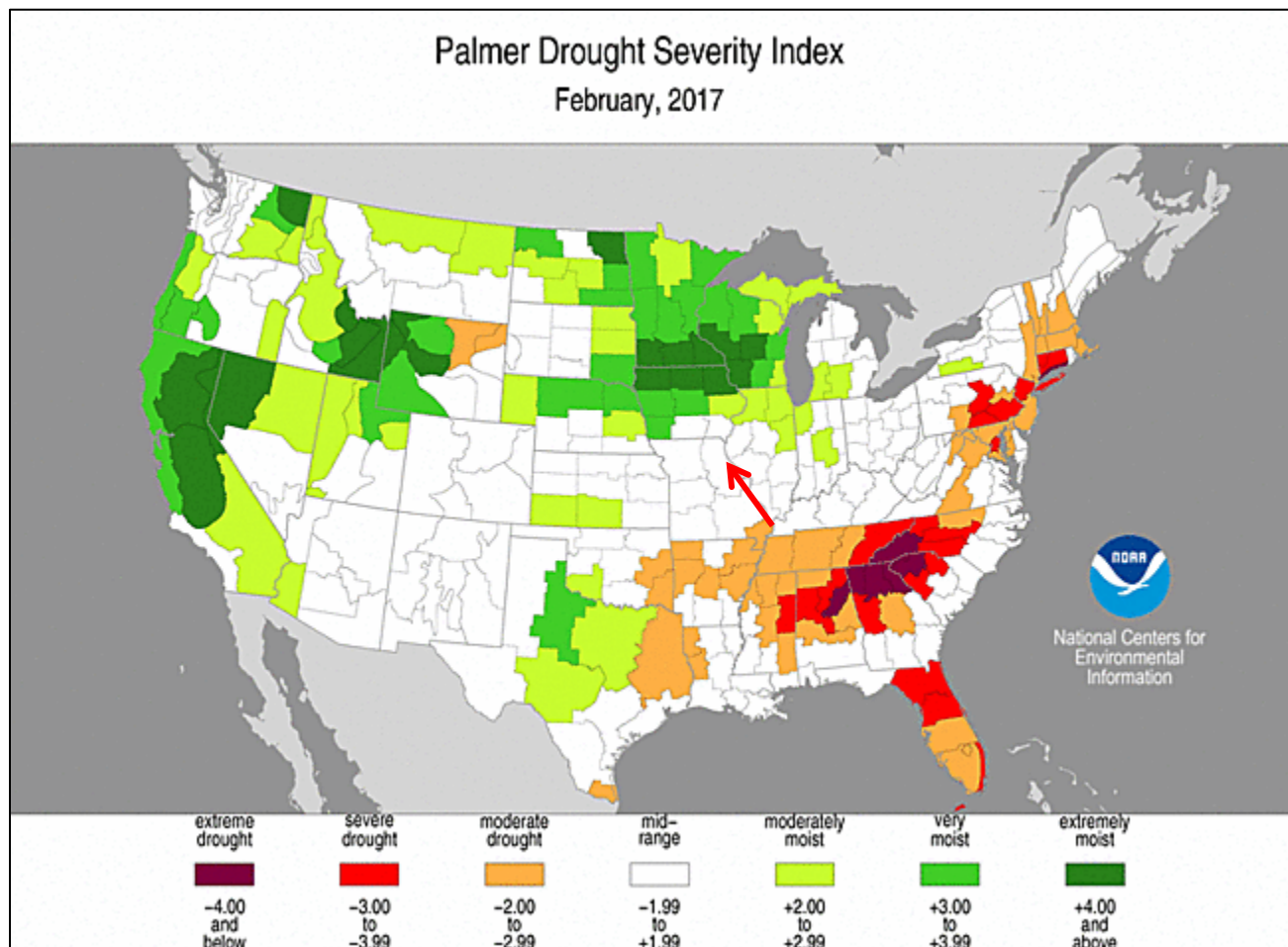
**Figure 3.17. Palmer Drought Severity Index: Missouri Sub-regions**



Source: 2013 Missouri State Hazard Mitigation Plan; \*Red star indicates Crawford County

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

**Figure 3.18. Palmer Modified Drought Index National Map February, 2017**



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 (2017 Census of Missouri Public Water Systems) to determine water source by jurisdiction. All Crawford County jurisdictions utilize well water as their sole source of water (**Table 3.24**). Communities that exclusively depend upon ground water could experience hardship in the event of a long term drought.

**Table 3.24. 2017 Water Source by Jurisdiction**

Jurisdiction	% of source that is groundwater
Bourbon	100
Cuba	100
Steelville	100
Sullivan	100
West Sullivan	100

Source: Missouri Dept. of Natural Resources, 2017 Census of Missouri Public Water Systems



**Previous Occurrences**

**Table 3.25** offers Palmer Drought Severity Index data for Crawford County between 2010 and 2017. This information exemplifies drought conditions on a monthly basis for Missouri’s Southeast sub-region within the United States.

**Table 3.25. Palmer Drought Severity Index for Crawford County, MO (2010 – 2017)**

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

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

**Probability of Future Occurrence**

To calculate the probability of future occurrence of drought in Crawford County, historical climate data was analyzed. There were 32 months of recorded drought (**Table 3.26**) over a 20 year span (January, 1998 to December, 2017). 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 3.27**). Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increase change of drought.

**Table 3.26. Palmer Drought Severity Index for Crawford County, MO (1998 – 2017)**

Month	Year											
	January	February	March	April	May	June	July	August	September	October	November	December
1998												
1999										x	x	x
2000	x	x	x	x	x	x	x	x	x	x	x	x
2001	x		x	x	x							
2002												
2003												
2004												
2005						x						
2006												
2007										x	x	
2008												
2009												
2010												
2011												
2012					x	x	x	x	x	x	x	x
2013												
2014												
2015												
2016												
2017											x	x

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

\*x indicates drought

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**Table 3.27. 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 3.24 for definition.

## **Vulnerability**

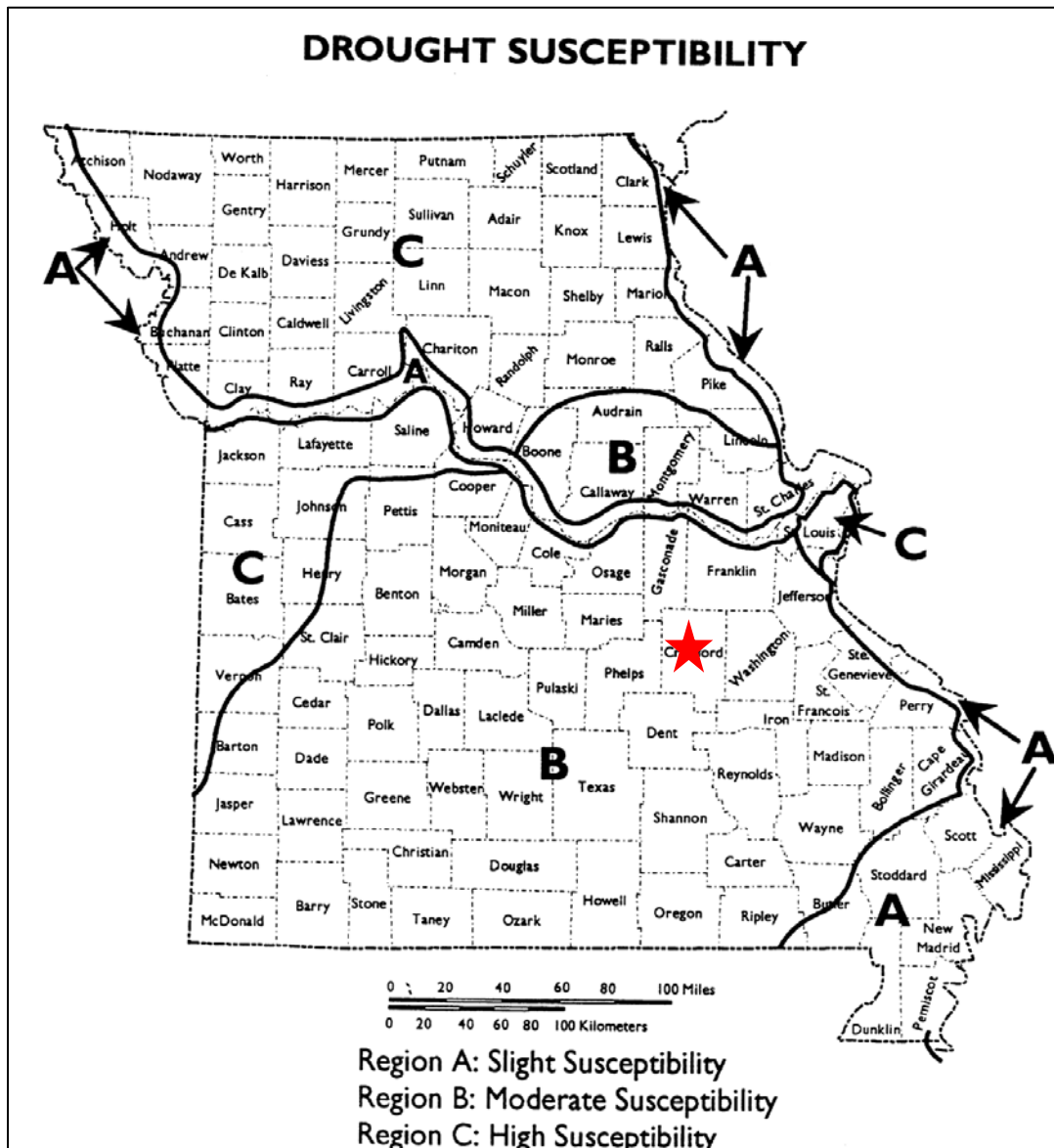
### ***Vulnerability Overview***

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

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

Figure 3.19. Drought Susceptibility in Missouri



Source: 2013 Missouri State Hazard Mitigation Plan; \*Red star indicates Crawford County

Table 3.28. Ranges for Drought Vulnerability Factor Ratings

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

Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.29. Vulnerability of Crawford County to Drought**

County	Total Crop Insurance Paid for Drought Damage 1998 - 2012	Crop Claims Ratio Rating	Annualized Crop Insurance Claims/Drought Damage	Crop Exposure (2007 Census of Agriculture)	Annual Crop Claims Ratio	Crop Loss Ratio Rating
Crawford	\$241,833	1	\$16,122	\$1,777,000	0.91%	1

Source: 2013 Missouri State Hazard Mitigation Plan

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

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

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

Impacts of drought on future development within Crawford County would be negligible. Population trend analysis from the University of Missouri Extension suggests that Crawford County will increase by approximately 3,440 individuals within the next 2 to 12 years<sup>24</sup>. Moreover, with an increasing population, water use and demand would be expected to increase as well; potentially straining the water supply systems. Bourbon anticipates new water infrastructure within the next 5 years. However, long term drought could expose vulnerabilities during construction/upgrades of water distribution and sewer infrastructures. Furthermore, any agriculture related development in terms of crop or livestock production would also be at risk.

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

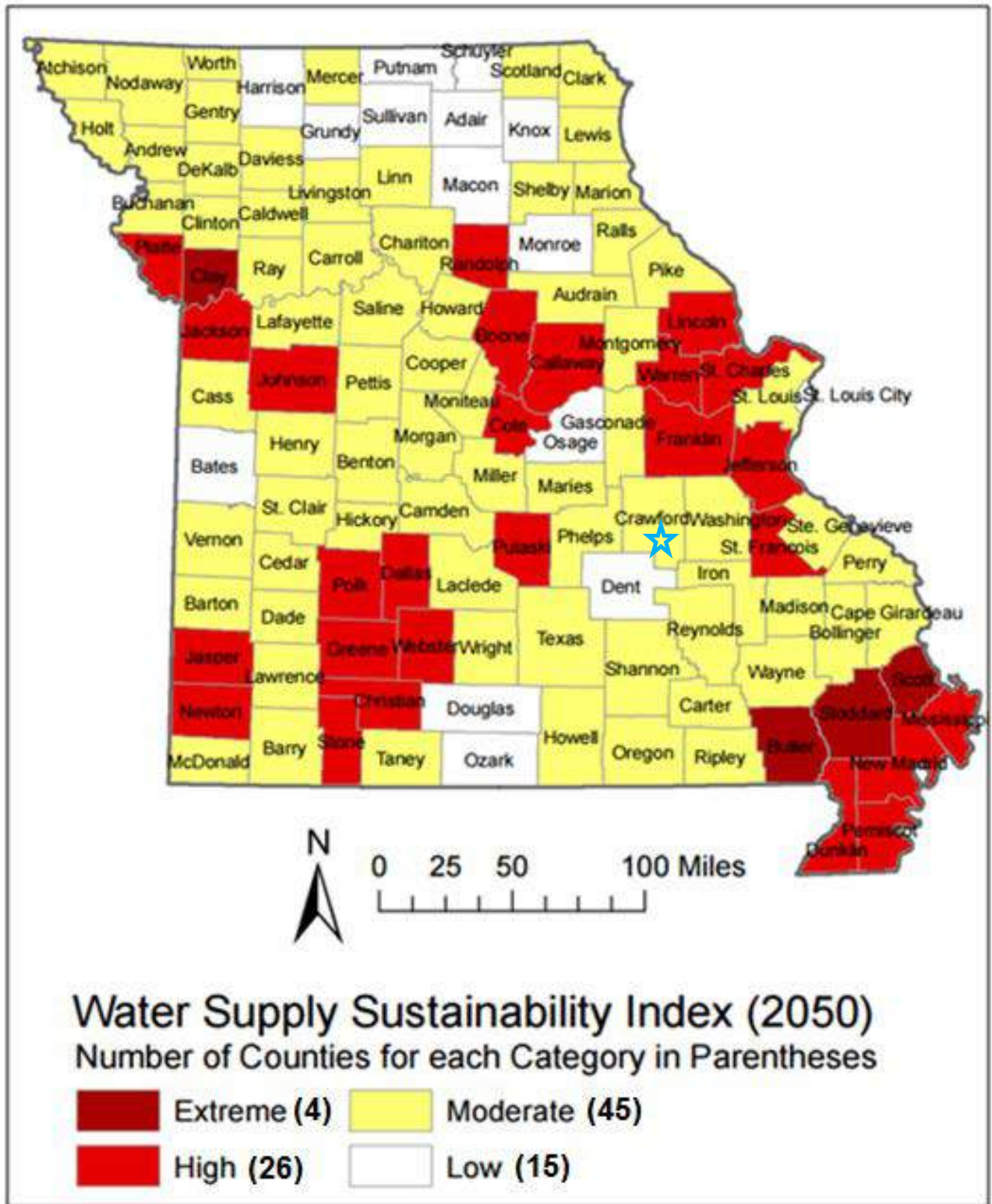
A new analysis, performed for the Natural Resources Defense Council, examined the effects of climate change on water supply and demand in the contiguous United States. The study found that more than 1,100 counties will face higher risks of water shortages by mid-century as a result of climate change.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

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

<sup>24</sup> UM Extension Social and Economic Profile <http://mcdc.missouri.edu/cgi-bin/broker? PROGRAM=websas.cntypage.sas&county=29055>



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



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

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

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

### **Problem Statement**

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

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

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### 3.4.3 Earthquakes

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Some specific sources for this hazard are:

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

#### **Hazard Profile**

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

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

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

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

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

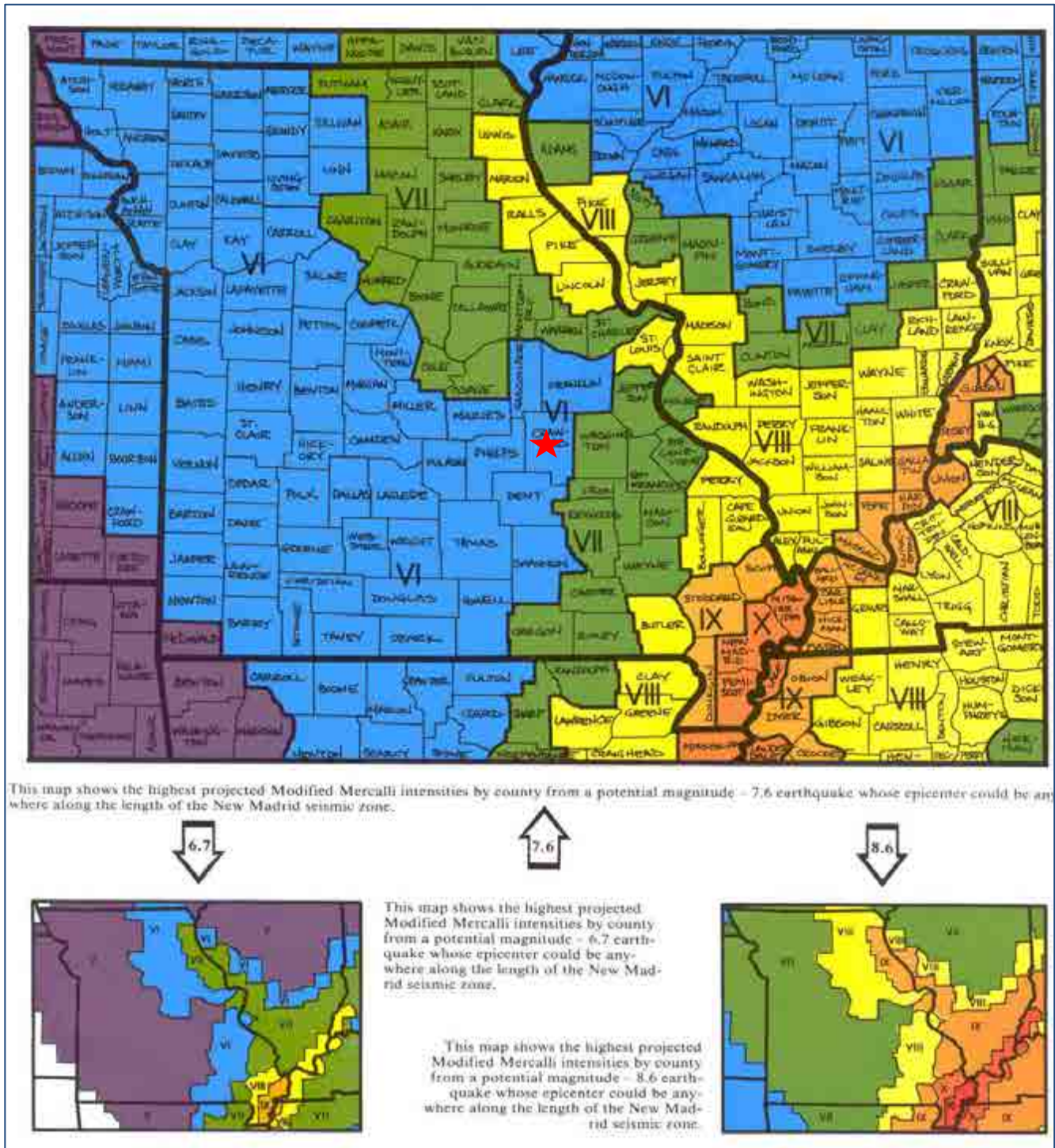
**Figure 3.21** depicts impact zones for a magnitude 7.6 earthquake along the New Madrid Fault along with associated Modified Mercalli Intensities. Crawford County is indicated by a red star. Furthermore, the Modified Mercalli Intensities for potential 6.7 and 8.6 magnitude earthquakes are illustrated. In the event of a 6.7 magnitude earthquake, Crawford County would experience a Modified Mercalli Intensity of V (**Figure 3.22**). This intensity is categorized as being almost felt by everyone. Most people are awakened. Doors swing open or closed. Dishes are broken. Pictures on the wall move. Windows crack in some cases. Small objects move or are turned over. Liquids might spill out of open containers. Additionally, in the occurrence of 7.6 and 8.6 magnitude earthquakes; the county would experience Modified Mercalli Intensities of VI and VII respectively. Earthquake intensities will not vary across the planning area, which is the case for most Missouri counties. **Figure 3.22** and **Table 3.30** further define Richter Scale intensities.

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

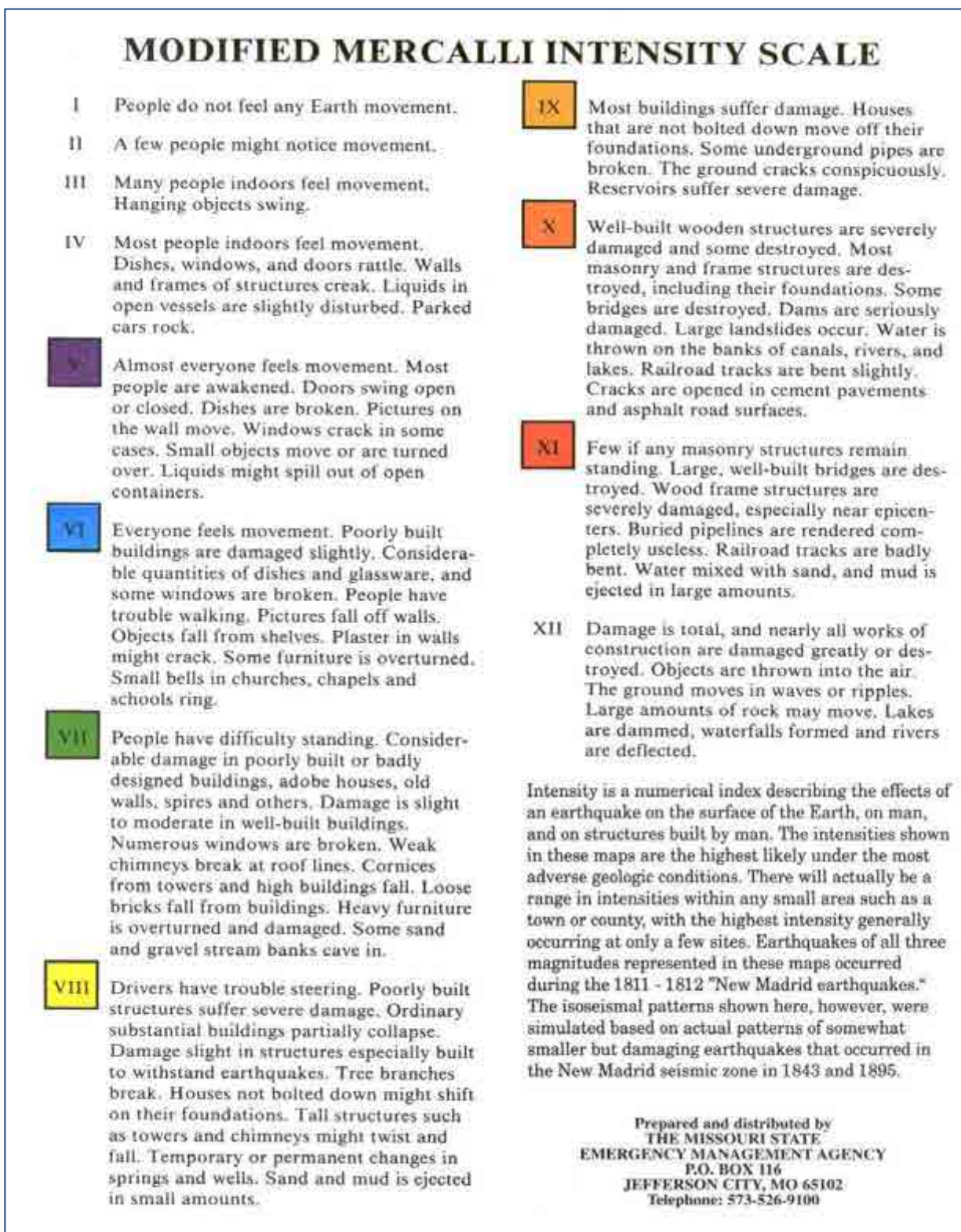


Figure 3.21. Impact Zones for Earthquake Along the New Madrid Fault



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

Figure 3.22. Projected Earthquake Intensities



Source: [sema.dps.mo.gov](http://sema.dps.mo.gov)

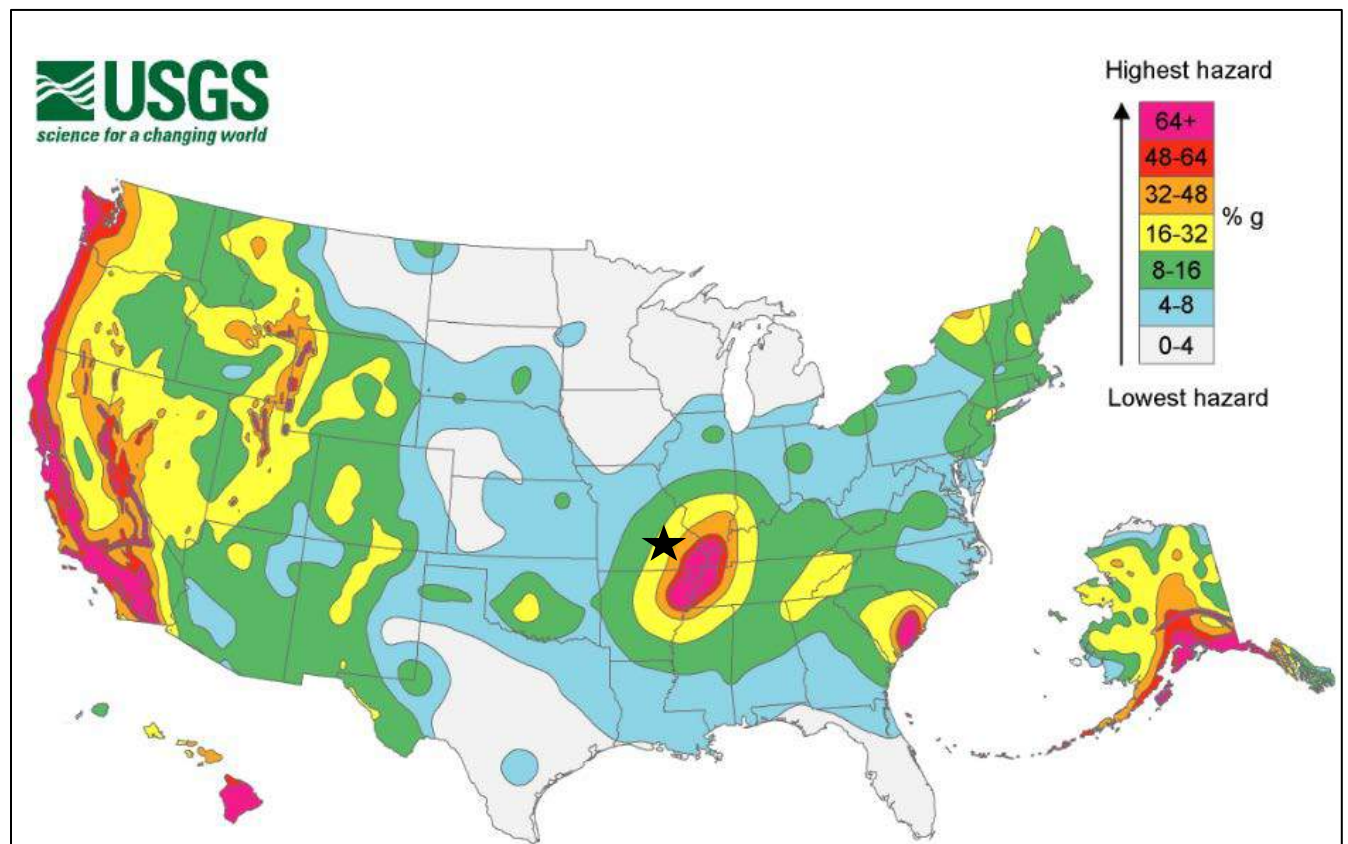


**Table 3.30. Richter Scale of Earthquake Magnitude**

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

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



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

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

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

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

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

### ***Modified Mercalli Intensity Scale***

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

## ***Previous Occurrences***

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

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

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

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<sup>26</sup> Measuring the Size of an Earthquake, <http://earthquake.usgs.gov/learn/topics/measure.php>

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

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

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

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

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

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

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

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

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

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



Hermann, St. Charles, St. Louis, and Sikeston, Missouri. The felt areas include all or portions of 23 states.<sup>i</sup>

**Table 3.31** describes earthquakes that have occurred within the planning area within the past 20 years (1998-2017). The nearest faults are the Leasburg Fault and the Cuba Fault.

**Table 3.31. Crawford County Earthquake Events 1998 - 2017**

Date	Magnitude	Location	Depth
July 8, 2003	2.9	20 miles northeast of Rolla	3.1 miles

Small earthquakes continue to occur frequently in Missouri. Averages of 200 earthquakes are detected every year in the New Madrid Seismic Zone alone. Most are detectable only with sensitive instruments, but on an average of every 18 months, southeast Missouri experiences an earthquake strong enough to crack plaster in buildings<sup>27</sup>.

**Probability of Future Occurrence**

Crawford County has reported one earthquake since 1998. The county, located in east central Missouri, a good distance from the southeast corner of the state that has the potential for moderate damage should a significant earthquake occur. Probability of future occurrence for some magnitude earthquake within the county is 5% (1 event/20 years x 100).

**Table 3.32. Annual Average Percentage Probability of Earthquake in Crawford County**

Location	Annual Avg. % P
Crawford County	5%

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

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

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

<sup>28</sup> SEMA

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## **Vulnerability**

### ***Vulnerability Overview***

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

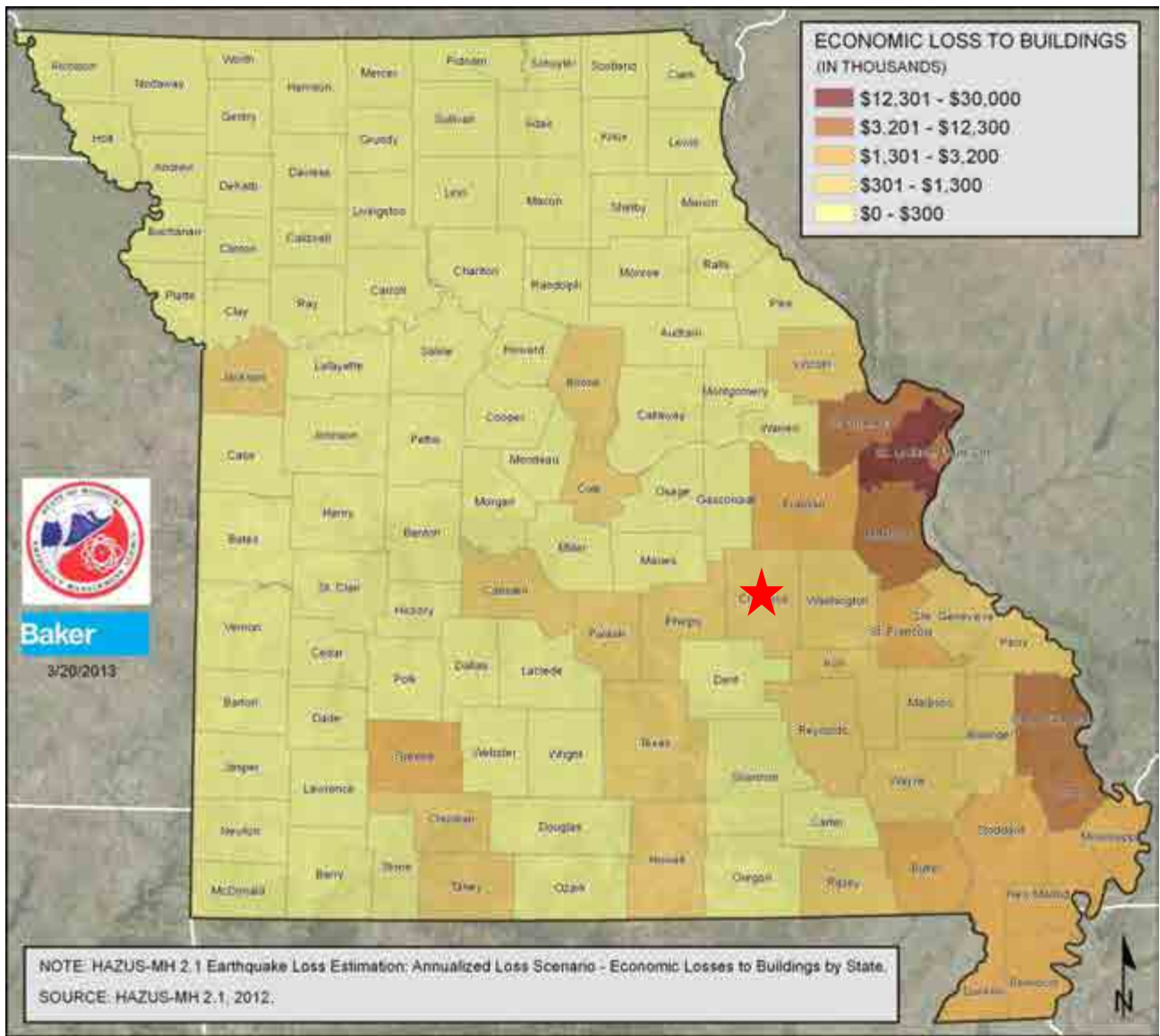
Annualized loss is the maximum potential annual dollar loss resulting from eight return periods (100, 200, 500, 750, 1,000, 1,500, 2,000, and 2,500 years) averaged on a 'per year' basis<sup>30</sup>. The Hazus earthquake loss estimation is depicted in **Figure 3.24** and **Table 3.33**. Crawford County's buildings are suggested to lose between \$301,000 and \$1,300,000 in any one year; thus ranking the county as having the 42<sup>nd</sup> highest expected loss in the state, or medium-low vulnerability. This loss ratio indicates impacts on local economies in the event of an earthquake, and the difficulty for jurisdictions to recover from said event.

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

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

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



Source: 2013 Missouri State Hazard Mitigation Plan; \*Red star indicates Crawford County

**Table 3.33. Hazus Earthquake Loss Estimation: Annualized Loss Scenario**

Location	Building Loss Total (\$)*	Loss Ratio %**	Income Loss Total (\$)*	Total Economic Loss to Buildings (\$)*	Loss Ratio Rank
Crawford	325	0.01	84	409	42

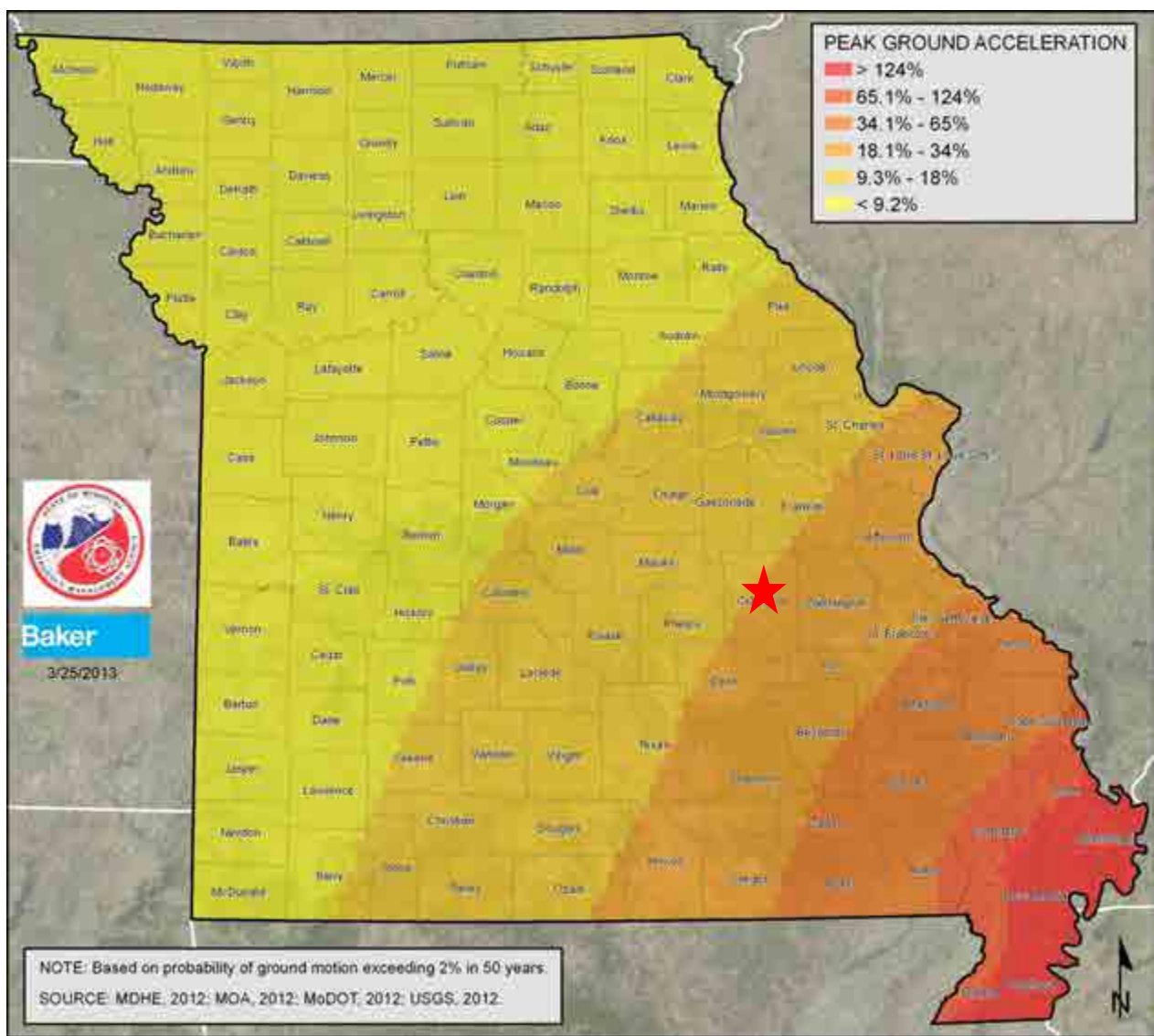
Source: Hazus 2.1

\*All \$values are in thousands

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

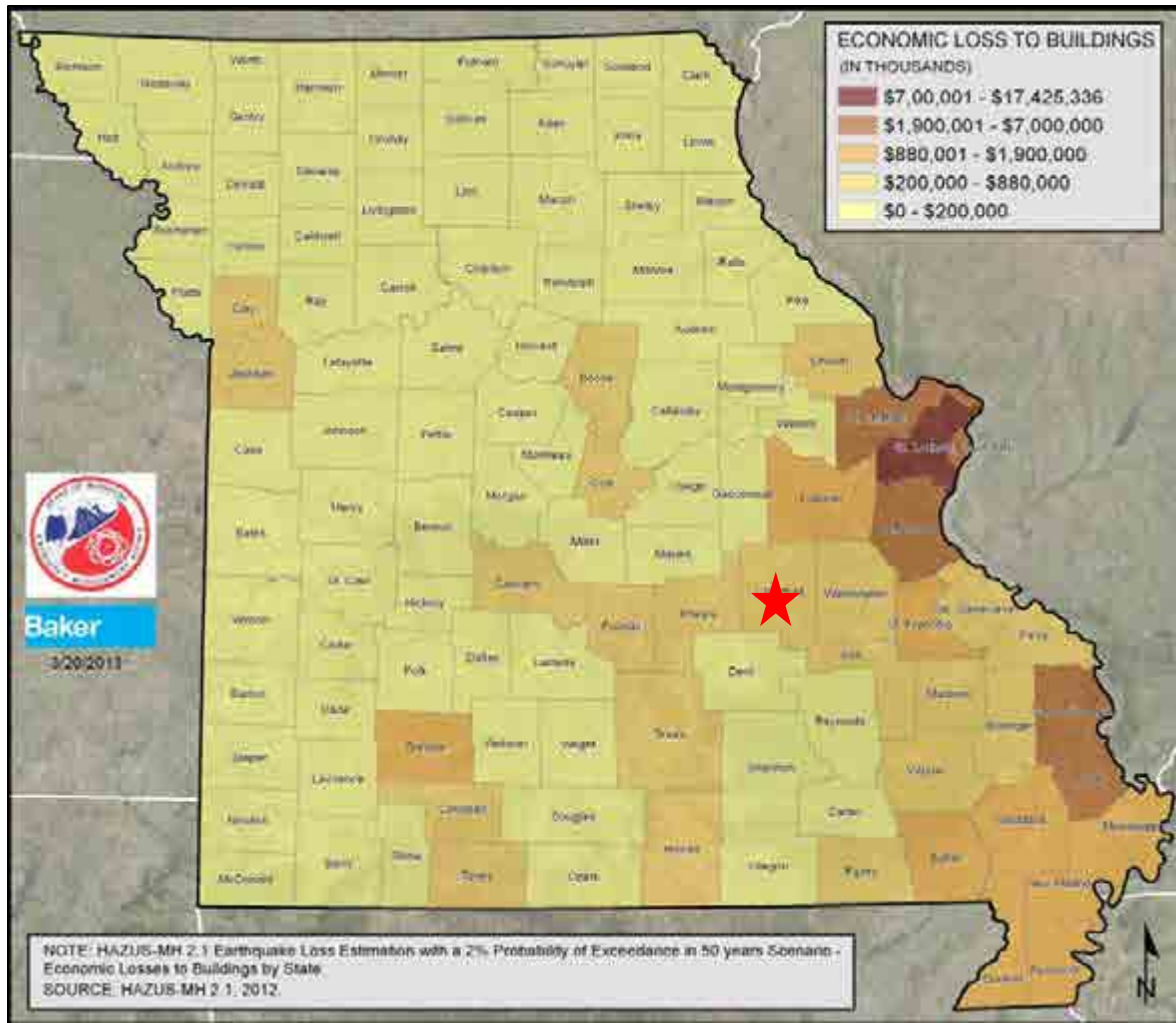
Likewise, SEMA developed a second scenario which incorporated a 2% probability of exceedance in 50 years. This model was to demonstrate a worst case scenario. **Figure 3.25** provides estimates of peak ground acceleration and spectral acceleration (ground shaking potential) at intervals of 0.3 and 1.0 seconds, respectively. These acceleration events have a 2% probability of exceedance in the next 50 years. A 7.7 magnitude earthquake was utilized in this scenario, which is typically utilized for New Madrid fault planning scenarios in Missouri. Crawford County is estimated to have peak ground acceleration between 9.3 and 34%. Furthermore, **Figure 3.26** illustrates total economic loss to buildings including content and inventory loss, and wage/income loss in the event of the modeled earthquake. Crawford County is anticipated to lose between \$200,000 and \$880,000 in a 50 year scenario. Moreover, in the same event the county is estimated to experience between 3.1% and 7% loss (damage) of the total building inventory (**Figure 3.27**). **Table 3.34** further exemplifies the County's loss ratio.

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



Source: 2013 Missouri State Hazard Mitigation Plan; \*Red star indicates Crawford County

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



Source: 2013 Missouri State Hazard Mitigation Plan; \*Red star indicates Crawford County

**Table 3.34. Hazus-MH Earthquake Loss Estimation: 2% Probability of Exceedance in 50 Years Scenario Results Building Impacts by County, Ranked by Highest Building Losses**

County	Structural Damage (\$)*	Non-Structural Damage (\$)*	Contents Damage and Inventory Loss (\$) *	Loss Ratio (%) **	Income Loss (\$)*	Total Economic Loss to Buildings (\$)***	Loss Ratio Rank
<b>Crawford</b>	40,328	121,360	41,936	7.46	53,115	256,739	27

Source: 2013 Missouri State Hazard Mitigation Plan, Hazus 2.1

\*All \$ values are in thousands

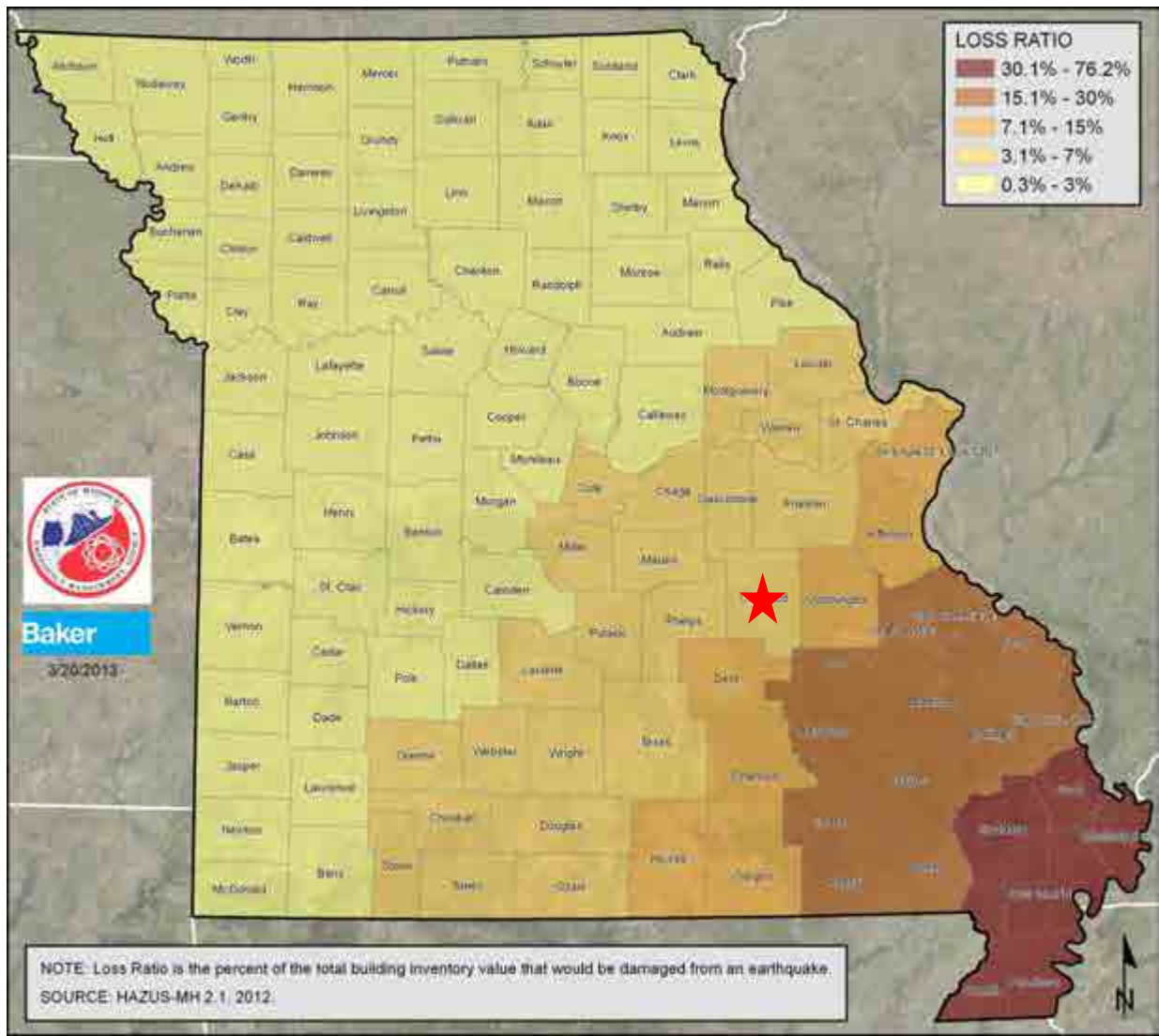
\*\*Loss ratio is the sum of structural and nonstructural damage divided by the entire building inventory value within a county

\*\*\*Total economic loss to buildings includes inventory loss, relocation loss, capital-related loss, wages loss, and rental income loss

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



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



Source: 2013 Missouri State Hazard Mitigation Plan; \*Red star indicates Crawford County

In terms of social impacts for the same earthquake event, **Table 3.35** defines casualty severity, displaced households, and short-term shelter needs that are utilized in **Table 3.36**. During this scenario, Crawford County is estimated to have 77 injuries requiring medical attention without hospitalization, 16 injuries requiring hospitalization, 2 life threatening injuries, and 4 deaths. Moreover, 154 individuals are expected to become displaced from their homes, along with 99 individuals requiring short-term shelter needs.

**Table 3.35. Casualty Severity, Displaced Households, and Short-Term Shelter Needs**

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

Source: Hazus 2.1

**Table 3.36. Social Impact Estimates by County from the 2% Probability of Exceedance in 50 Years Scenario 2 a.m. Time of Occurrence**

County	MMI Zone	Level 1	Level 2	Level 3	Level 4	Total	Displaced Households	Short-Term Shelter Needs
Crawford	VII	77	16	2	4	99	154	99

Source: 2013 Missouri State Hazard Mitigation Plan

***Potential Losses to Existing Development***

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

***Impact of Future Development***

Future development at risk includes new water infrastructure development in Bourbon, new industrial development in Steelville, and classroom additions at Sullivan School District. Future development will not increase the risk of an earthquake, rather contributing to the overall exposure of damaged property. As new development arises, minimum standards of building codes should be established in all jurisdictions to decrease the potential damage/loss should an earthquake occur.

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

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

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### **Hazard Summary by Jurisdiction**

Since earthquake intensity is not likely to vary greatly throughout the planning area, the risk will be the same throughout. Crawford County is not near the New Madrid Shock Zone, but it will most likely endure mild secondary effects from the earthquake, such as fire, structure damage, utility disruption, environmental impacts, and economic disruptions/losses. However, damages could differ if there are structural variations in the planning area's built environment. For example, if one community has a higher percentage of residences built prior to 1939 than the other participants, that community is likely to experience higher damages. **Table 3.37** depicts the percent of residences built prior to 1939 in Crawford County. Steelville (16.7%), Sullivan (15.8%), and Bourbon (10.3%) have the most residences susceptible to damage in the event of an earthquake. If a major earthquake should occur, Crawford County would likely be deeply impacted by the number of refugees traveling through the area seeking safety and assistance.

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**Table 3.37. Percent of Crawford County Residences Built Prior to 1939**

<b>Jurisdiction</b>	<b>% of Residences built prior to 1939</b>
<b>Unincorporated Crawford County</b>	6.8
<b>Bourbon</b>	10.3
<b>Cuba</b>	7.9
<b>Steelville</b>	16.7
<b>Sullivan</b>	15.8
<b>West Sullivan</b>	0.0

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5 – Year Estimates

### **Problem Statement**

In the event of a 7.7 magnitude earthquake (worst case scenario), Crawford County is estimated to have 77 injuries requiring medical attention without hospitalization, 16 injuries requiring hospitalization, 2 life threatening injuries, and 4 deaths. Moreover, 154 individuals are expected to become displaced from their homes, along with 99 individuals requiring short-term shelter needs. Additionally, the county is expected to encounter \$200,000 to \$880,000 in total economic losses to buildings. Moreover, Steelville, Sullivan, and Bourbon are particularly at risk due to the percent of residences built prior to 1939.

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



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## 3.4.4 Extreme Heat

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### **Hazard Profile**

Some specific sources for this hazard are:

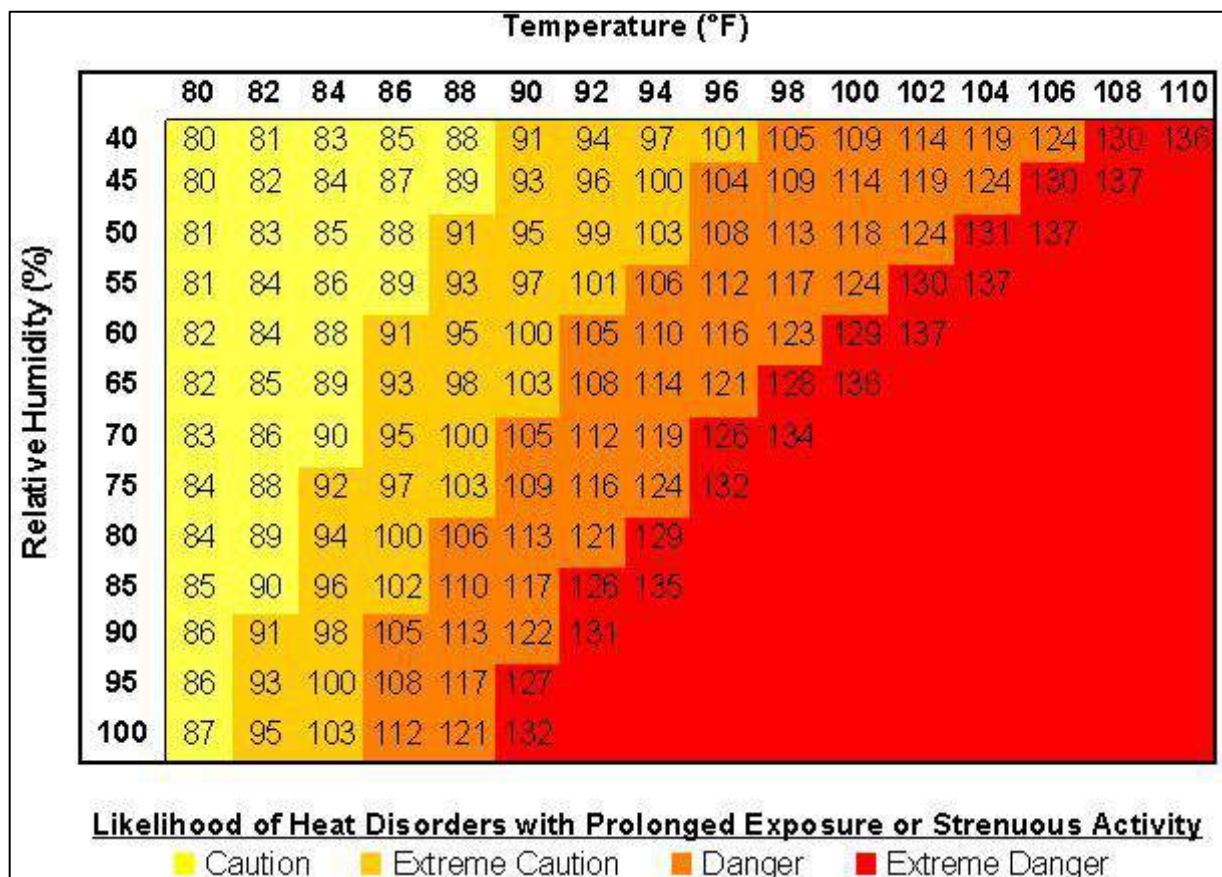
- National Climatic Data Center, Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>
- Heat Index Chart & typical health impacts from heat, National Weather Service; National Weather Service Heat Index Program, [www.weather.gov/os/heat/index.shtml](http://www.weather.gov/os/heat/index.shtml)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

### ***Hazard Description***

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. The remainder of this section profiles extreme heat. Extreme cold events are profiled in combination with Winter Storm in **Section 3.4.10**. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. These high temperatures generally occur from June through September, but are most prevalent in the months of July and August. Regional reports indicate all of Missouri is subject to heat wave during the summer months. Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index chart shown in **Figure 3.28** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

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

**Figure 3.28. Heat Index (HI) Chart**



Source: National Weather Service (NWS)

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

### Geographic Location

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

### Severity/Magnitude/Extent

Extreme heat can cause stress to crops and animals. According to USDA Risk Management Agency, Crawford County did not report losses to insurable crops during a 20-year time period from 1998 to 2017 due to extreme heat. Extreme heat can also strain electricity delivery infrastructure overloaded during peak use of air conditioning during extreme heat events. Another type of infrastructure damage from extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

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

<sup>32</sup> [https://www3.epa.gov/climatechange/pdfs/print\\_heat-deaths-2015.pdf](https://www3.epa.gov/climatechange/pdfs/print_heat-deaths-2015.pdf)

<sup>33</sup> <http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2b.pdf>

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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 3.38** lists typical symptoms and health impacts due to exposure to extreme heat.

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**Table 3.38. Typical Health Impacts of Extreme Heat**

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

Source: National Weather Service Heat Index Program, [www.weather.gov/os/heat/index.shtml](http://www.weather.gov/os/heat/index.shtml)

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

### ***Previous Occurrences***

**Table 3.39** provides data in relation to record heat events between 1998 and 2017 in Crawford County. Maximum heat index values and temperatures are shown for each extreme temperature event. Fortunately, there were zero recorded injuries and fatalities during this time. In addition, **Figure 3.29** illustrates heat related deaths by county in Missouri between 2000 and 2013.

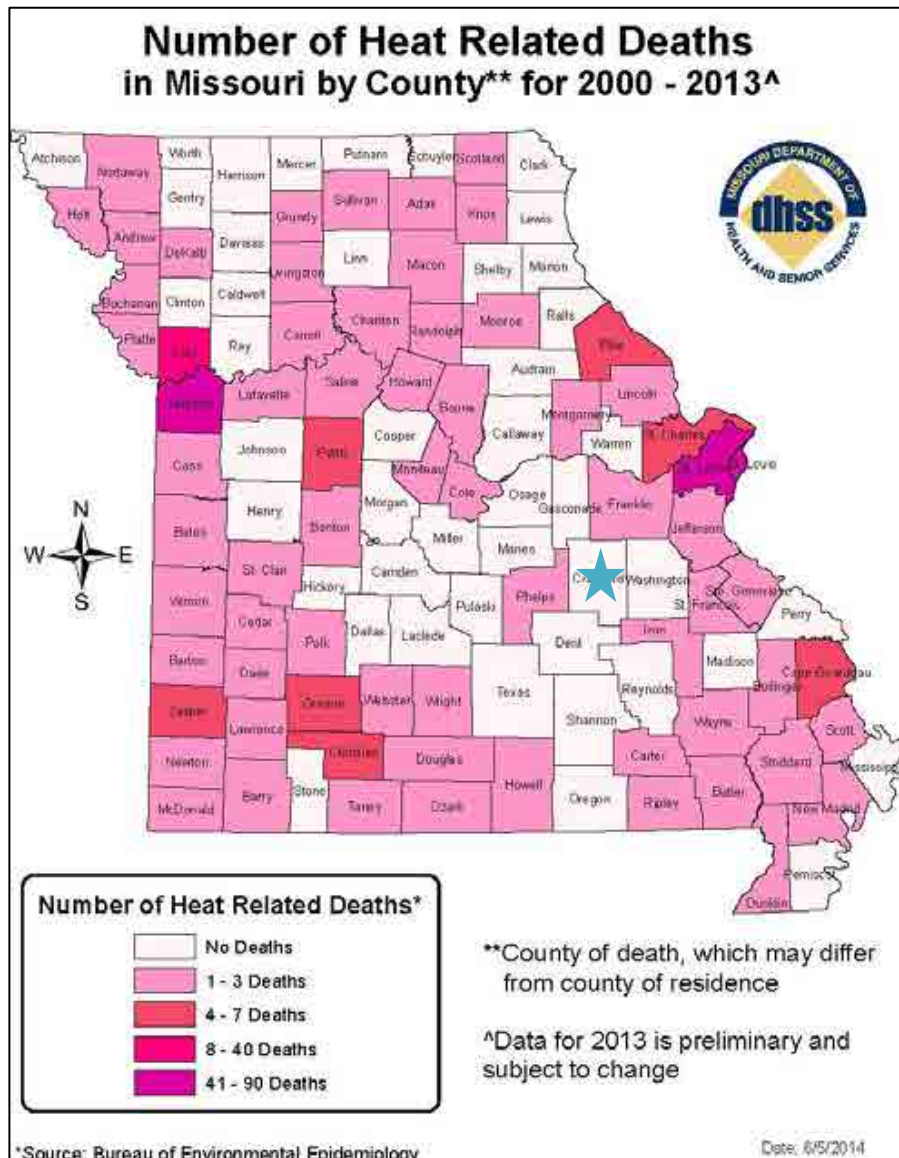
**Table 3.39. Crawford County Recorded Heat Events 1998 – 2017**

<b>Month, Year</b>	<b># of Event Days</b>	<b>Fatalities</b>	<b>Injuries</b>	<b>Temperature (F°)</b>	<b>Heat Index Values (F°)</b>
7/18/1999	14	0	13	95+	105-115
8/28/2000	4	0	4	95-99	105-110
7/7/2001	4	0	0	95-99	105-110
7/17/2001	1	0	0	95-99	110-115
7/21/2001	4	0	0	95-99	105-115
7/29/2001	3	0	0	90-95	105-110
8/1/2001	2	0	0	95-99	105
8/7/2001	3	0	0	95-99	102-110
8/21/2001	2	0	0	95-100	105-110
6/1/2002	4	0	4	85-95	-
7/8/2002	2	0	0	95-99	105-110
7/20/2002	3	0	0	95-99	105-115
7/26/2002	6	0	0	95-99	105-115
8/1/2002	6	0	0	99-101	-
8/15/2003	7	0	6	95-105	-
8/24/2003	5	0	0	95-100	105-110
7/20/2004	3	0	0	90-95	105-110
7/20/2005	7	0	0	105	105-120
7/17/2006	4	0	0	95-100+	105-110
7/30/2006	2	0	0	95-100	105-110
8/1/2006	2	0	0	100+	-
8/5/2007	12	0	0	100-105	-
6/21/2009	7	0	0	90-99	100-107
6/18/2010	6	0	0	95+	100-105
7/14/2010	1	0	0	90-95	105-110
7/17/2010	1	0	0	95+	105
7/22/2010	3	0	0	95-99	105-110
8/2/2010	3	0	0	100+	110

8/8/2010	7	0	0	100	110-115
7/1/2011	3	0	0	90-99	105
7/10/2011	3	0	0	95-102	-
7/17/2011	15	0	0	90-100	105-110
8/1/2011	3	0	0	100+	105-115
8/6/2011	2	0	0	95-99	105-110
8/31/2011	1	0	0	103	105-110
9/1/2011	3	0	0	104	105
6/27/2012	4	0	0	105+	-
7/1/2012	8	0	0	100+	-
7/22/2012	6	0	0	108	-
7/31/2012	1	0	0	105	105-110
8/1/2012	1	0	0	105	105-110
8/31/2013	1	0	0	100	105-110
9/1/2013	1	0	0	100	105-110
8/20/2014	8	0	0	95-99	105-110
7/12/2015	3	0	0	95-99	110
7/18/2015	2	0	0	90-95	105-110
7/25/2015	1	0	0	90-95	105
7/27/2015	3	0	0	95+	110
6/15/2016	2	0	0	95-99	105
6/22/2016	1	0	0	95+	105
7/18/2016	7	0	0	95-99	110
7/21/2017	3	0	0	95-100	105-110
<b>Total</b>	<b>210</b>	<b>0</b>	<b>27</b>	<b>-</b>	<b>-</b>

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

Figure 3.29. Heat Related Deaths in Missouri 2000 - 2013



\*Blue star indicates Crawford County

**Probability of Future Occurrence**

Table 3.40 illustrates the annual average percent probability of extreme heat in Crawford County. The county’s likelihood of enduring an extreme heat event per year is 100% (52 events/20 years x 100 = 2.6). The average number of events per year is 2.6. Extreme heat events can be found in Table 3.39.

Table 3.40. Annual Average % Probability of Extreme Heat in Crawford County

Location	Annual Avg. % P	Avg. Number of Events
Crawford County	100%	2.6

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

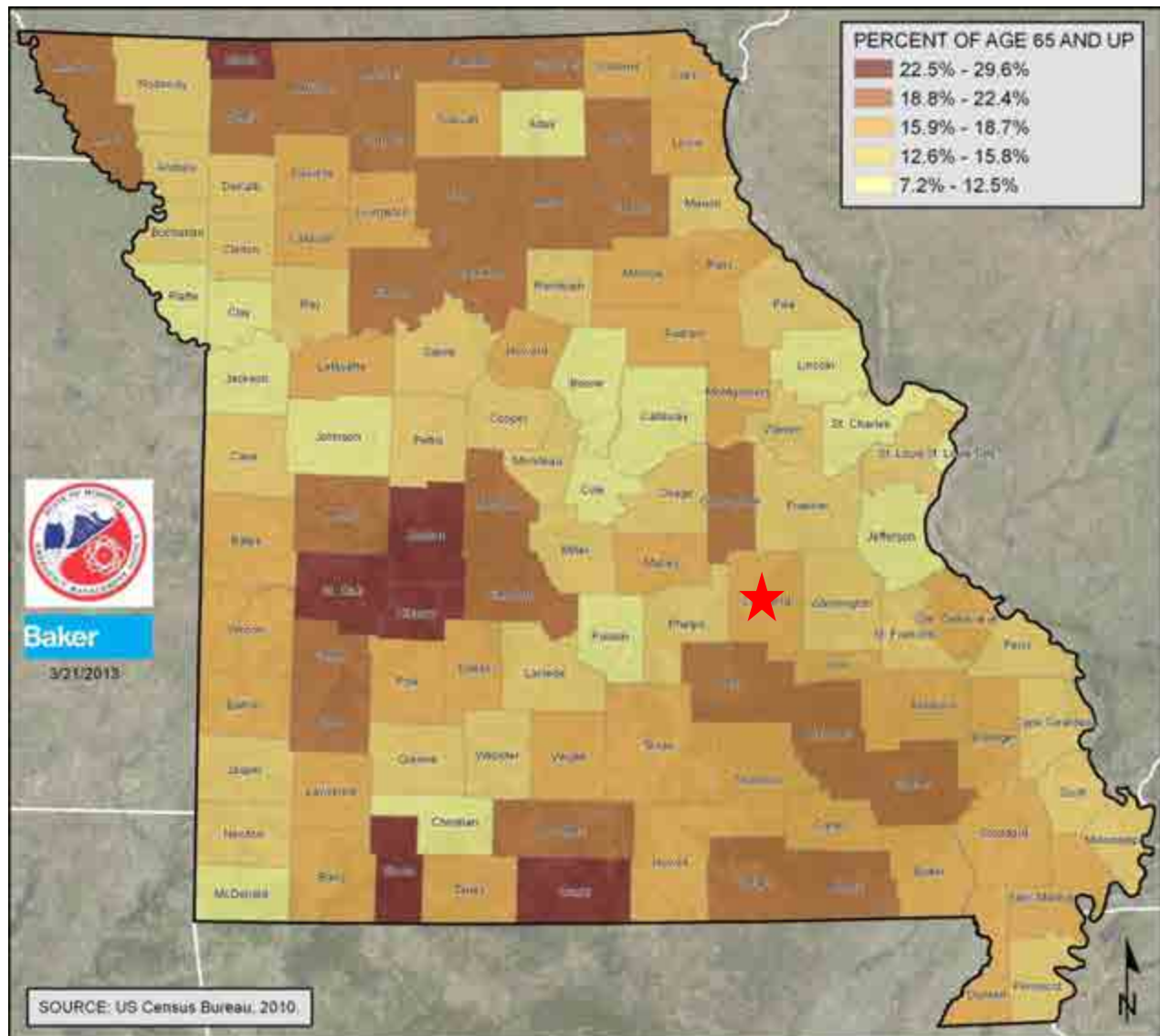


## **Vulnerability**

### ***Vulnerability Overview***

Crawford County, along with the rest of the state of Missouri is vulnerable to extreme heat. However, those jurisdictions with higher percentages of individuals below the age of 5, and above the age of 65 tend to be more at risk (**Table 3.41**). **Figure 3.30** depicts the distribution of the elderly population across Missouri. In 2010, 15.9 to 18.7% of the county was comprised of individuals ages 65 and up.

**Figure 3.30. Distribution of Elderly Population**



Source: 2013 Missouri State Hazard Mitigation Plan; \*Red star indicates Crawford County

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

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



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

Population trends from 2000 to 2016 for Crawford County and various jurisdictions indicate that 5 out of 6 jurisdictions were growing. Population growth can result in increased age groups that are more susceptible to extreme heat. Additionally, as populations increase, so does the strain on each jurisdiction's electricity and road infrastructure. Bourbon anticipates the resurfacing of Pine Street and would be susceptible to extreme heat. Local government and the City Emergency Management Director should take extreme heat in consideration while electrical upgrades are underway.

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

Those at greatest risk for heat-related illness and deaths include children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. To determine jurisdictions within the planning area with populations more vulnerable to extreme heat, demographic data was obtained from the 2012-2016 census on population percentages in each jurisdiction comprised of those under age 5 and over age 65. Data was not available for overweight individuals and those on medications vulnerable to extreme heat. **Table 3.41** 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.

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**Table 3.41. County Population Under Age 5 and Over Age 65 (2012-2016)**

<b>Jurisdiction</b>	<b>% Population Under 5 Years</b>	<b>% Population 65 Years and over</b>
Incorporated Crawford County	6.0	17.9
Bourbon	3.1	14.9
Cuba	8.2	17.0
Steelville	6.2	16.7
Sullivan	10.4	16.7
West Sullivan	4.2	7.0

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

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

## **Problem Statement**

In summary, the risks of extreme heat can impact the health/lives of citizens within the county, specifically the young and elderly. Sullivan and Crawford County have the highest percent of individuals under 5 and over 65, respectively. These two jurisdictions are most vulnerable to extreme heat.

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

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

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The specific sources for this hazard are:

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

#### **Hazard Profile**

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

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

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

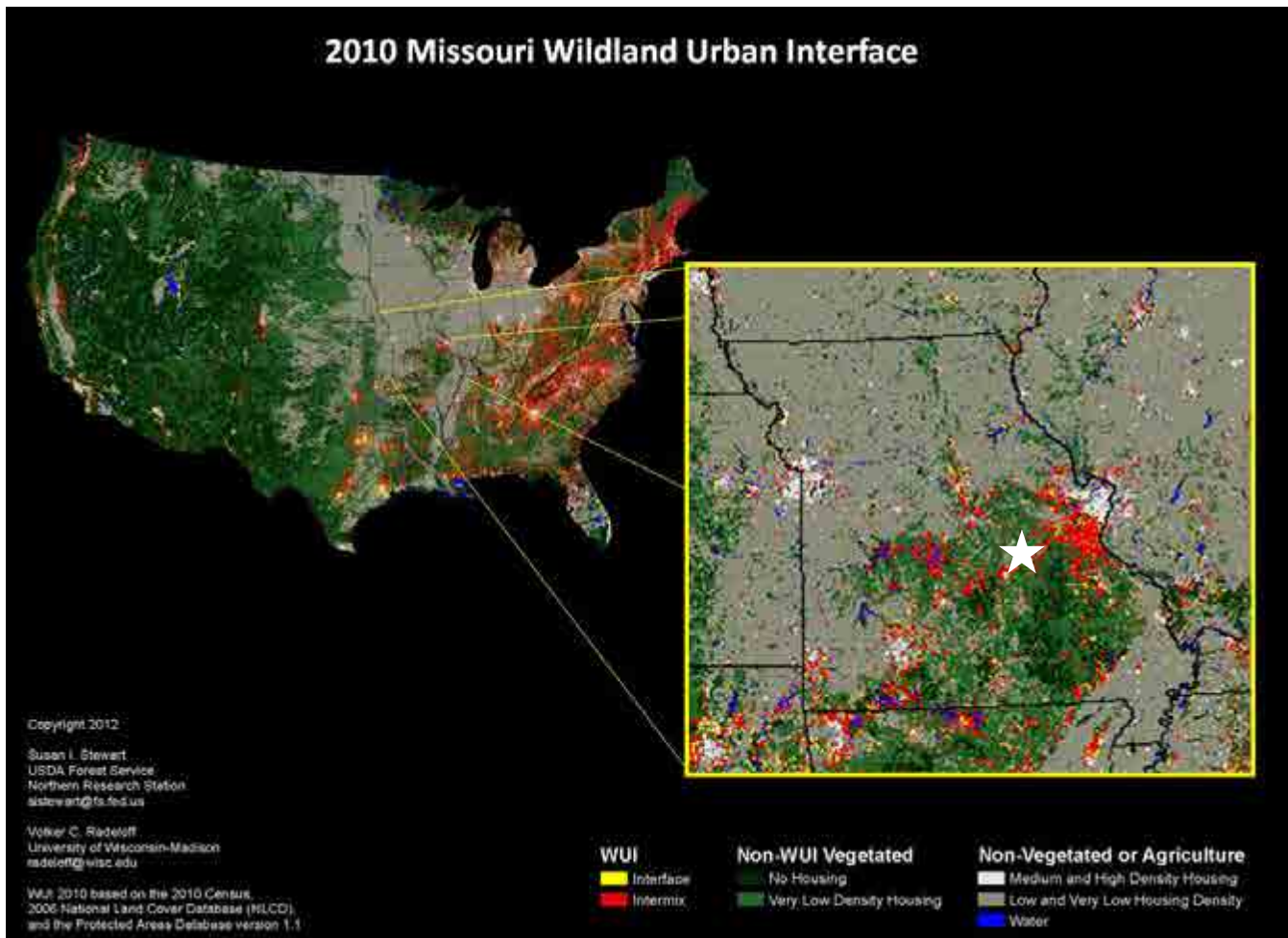
The Forestry Division of the Missouri Department of Conservation (MDC) is responsible for protecting privately owned and state-owned forests and grasslands from wildfires. To accomplish this task, eight forestry regions have been established in Missouri for fire suppression. The Forestry Division works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

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

## Geographic Location

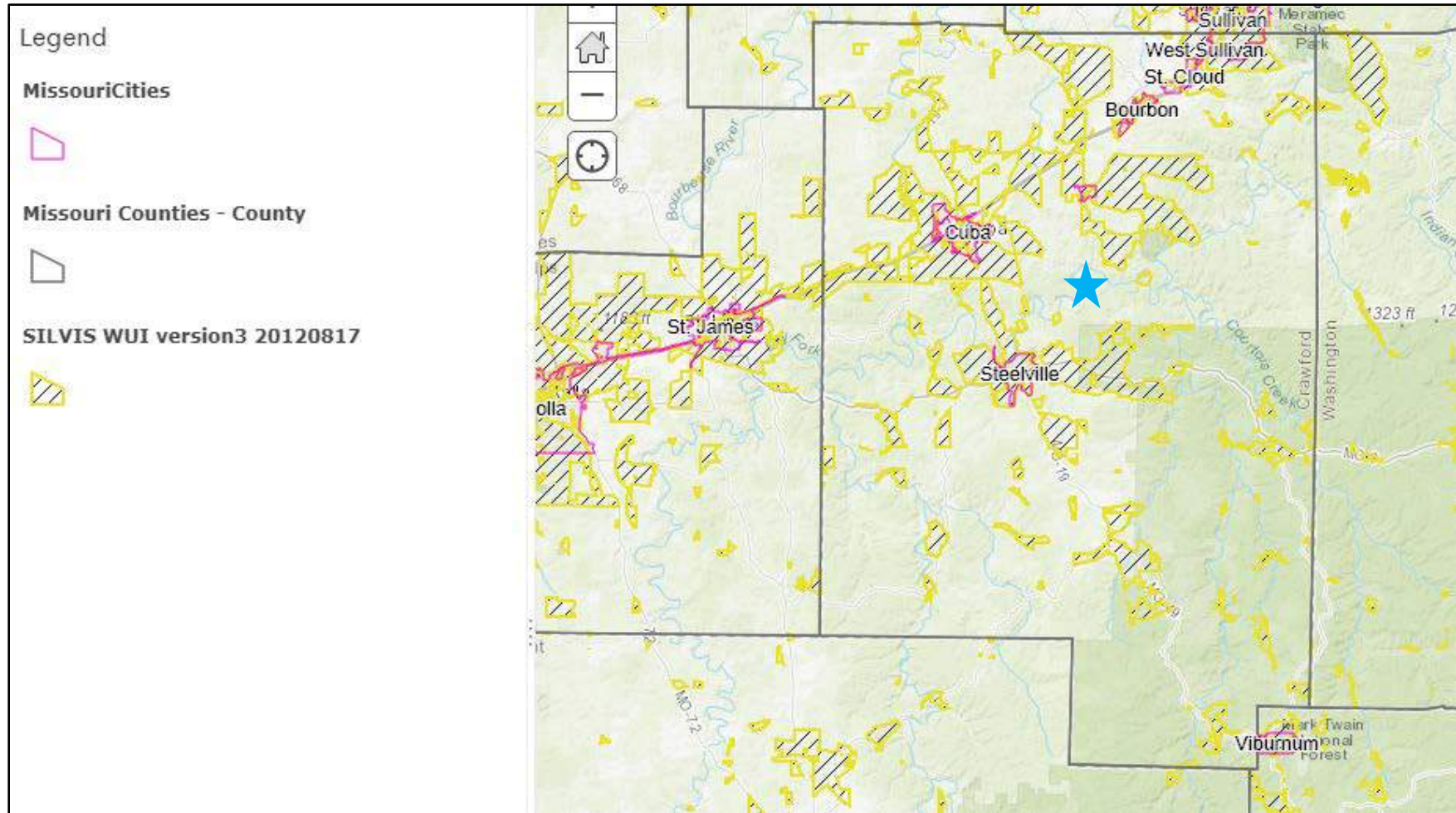
The risk of structural fire does not vary widely across the planning area. However, damages due to wildfires are expected to be higher in communities with more wildland–urban interface (WUI) areas. WUI refers to the zone of transition between unoccupied land and human development and needs to be defined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

**Figure 3.31. 2010 Missouri Wildland Urban Interface (WUI)**



Source: <http://silvis.forest.wisc.edu/maps/wui>; White star roughly estimates Crawford County's location

Figure 3.32. Crawford County Wildlife Urban Interface



Source: ArcGIS, Streets; \*Blue star indicates Crawford County

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

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

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

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

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

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

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

## ***Previous Occurrences***

Between 2009 and 2012 there was an estimated 195 annual average of urban/structural fires in Crawford County. Additionally, the average annual property loss was \$500,454,576. Total deaths and injuries reported totaled 13 and 98, respectively<sup>34</sup>.

Between 1998 and 2017, wildfires consumed 14,828.37 acres in Crawford County<sup>35</sup>. Between 2004 and 2012 there were 824 wildfires in the county, which consumed 7,543.71 acres and damaged 18 buildings<sup>36</sup>.

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

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<sup>34</sup> 2013 Missouri State Hazard Mitigation Plan

<sup>35</sup> <http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx>

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



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### **Probability of Future Occurrence**

From the data obtained from the Missouri Department of Conservation<sup>37</sup> (**Appendix: E**), 1,295 wildfire events occurred in Crawford County between 1998 and 2017. This information was utilized to determine the annual average percent probabilities of wildfires. Since multiple occurrences are anticipated per year (1,295 events/20 years), the probability of wildfires per year is 100% with an average of 64.75 events per year (**Table 3.42**). In addition, 18 buildings were considered damaged due to wildfires between 2004 and 2012. The average percent probability of structural damage due to wildfires is 100% (18 events/9 years \*100) with an average of 2 events per year (**Table 3.43**). Lastly, according to the 2013 Missouri State Hazard Mitigation Plan, the probability of structural/urban fires in Crawford County per year is 100% with an average of 48.75 structural fires annually<sup>38</sup> (**Table 3.44**).

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**Table 3.42. Annual Average Percentage Probability of Wildfires in Crawford County**

Location	Annual Avg. % P	Avg. Number of Events
Crawford County	100%	64.75

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

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**Table 3.43. Annual Average Percentage Probability of Structural Damage due to Wildfires in Crawford County**

Location	Annual Avg. % P	Avg. Number of Events
Crawford County	100%	2

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

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**Table 3.44. Annual Average Percentage Probability of Structural/Urban Fires in Crawford County**

Location	Annual Avg. % P	Avg. Number of Events
Crawford County	100%	48.75

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

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<sup>37</sup> <http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx>

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

## **Vulnerability**

### ***Vulnerability Overview***

Data was collected from the National Fire Incident Reporting System (NFIRS) between 2009 and 2012. The data was analyzed to delineate overall statewide vulnerability for urban/structural fires in Crawford County. Unfortunately, only 61 percent of fire departments in the State of Missouri reported occurrences to NFIRS. **Table 3.45** depicts the ranges for urban/structure fire vulnerability ratings. Furthermore, **Table 3.46** illustrates vulnerability analysis utilizing statistical data for urban/structural fires for Crawford County between 2009 and 2012<sup>39</sup>. The overall vulnerability rating of urban/structural fires in Crawford County is high (5).

**Table 3.45. Ranges for Urban/Structure Fire Vulnerability Factor Ratings**

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

Source: 2013 Missouri State Hazard Mitigation Plan

<sup>39</sup> 2013 Missouri State Hazard Mitigation Plan



**Table 3.46. Statistical Data and Factor Ratings for Urban/Structure Fire Vulnerability (2004 to 2008)**

County	Housing Units /sq. mi.	Housing Density Rating	Annual # Average	Likelihood Rating	Total Building Exposure (\$)	Building Exposure Rating	Average Annual Property Loss (\$)	Annual Property Loss Ratio	Property Loss Ratio Rating	Total Deaths/Injuries	Death/Injury Factor	Death/Injury Factor Rating	Death/Injury/# of Fires Factor	Death/Injury/# of Fires Factor Rating	Average of Factors	Overall Vulnerability Rating	
<b>Crawford</b>	16.1	1	195	3	2,166,540,000	4	500,454,576	0.230993	5	13	98	124	5	0.64	5	4	5

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

For wildfires, data was obtained from the Missouri Department of Conservation (MDC). **Table 3.47** depicts the ranges for wildfire vulnerability factor ratings, including the two factors considered; likelihood and annualized acres burned. **Table 3.48** illustrates the statistical data and factor ratings for wildfire vulnerability. The data collected from MDC included wildfire reported between 2004 and 2012. The overall vulnerability of wildfires in Crawford County is medium-high (4).

**Table 3.47. Ranges for Wildfire Vulnerability Factor Ratings**

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

Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.48. Statistical Data and Factor Ratings for Wildfire Vulnerability**

County	Wildfires 2004 -2012	Average Annual # of Wildfires	Likelihood Rating 1-5	Acres Burned	Average Annual Acres Burned	Average Acres Burned Rating	Total Buildings Damaged	Overall Vulnerability
Crawford	824	91.6	4	7543.71	838	4	18	4

Source: 2013 Missouri State Hazard Mitigation Plan

***Potential Losses to Existing Development***

According to the 2013 Missouri State Hazard Mitigation Plan, the average annual property loss due to urban/structure fires was \$500,454,576 (2009 to 2012). Unfortunately, due to lack of data, a monetary value could not be associated with wildfire loss. However the annual average percent probability for structural loss due to wildfires is 100%.

***Impact of Future Development***

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

***Hazard Summary by Jurisdiction***

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

**Problem Statement**

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

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### 3.4.6 Flooding (Flash and River)

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Some specific sources for this hazard are:

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

#### **Hazard Profile**

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

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

Flooding caused by dam failure is discussed in **Section 3.1**. 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

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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.

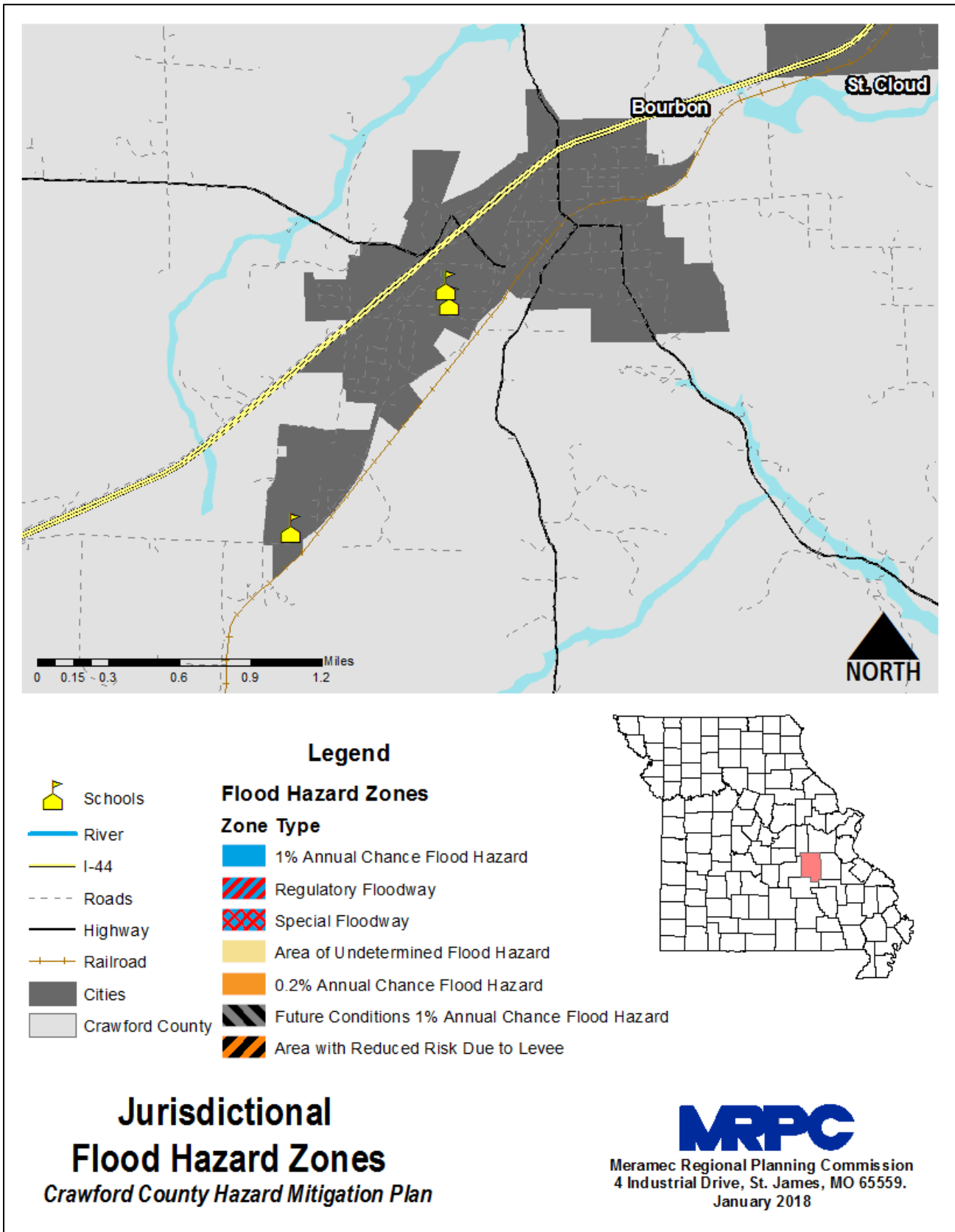
In certain areas, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. This combined with 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***

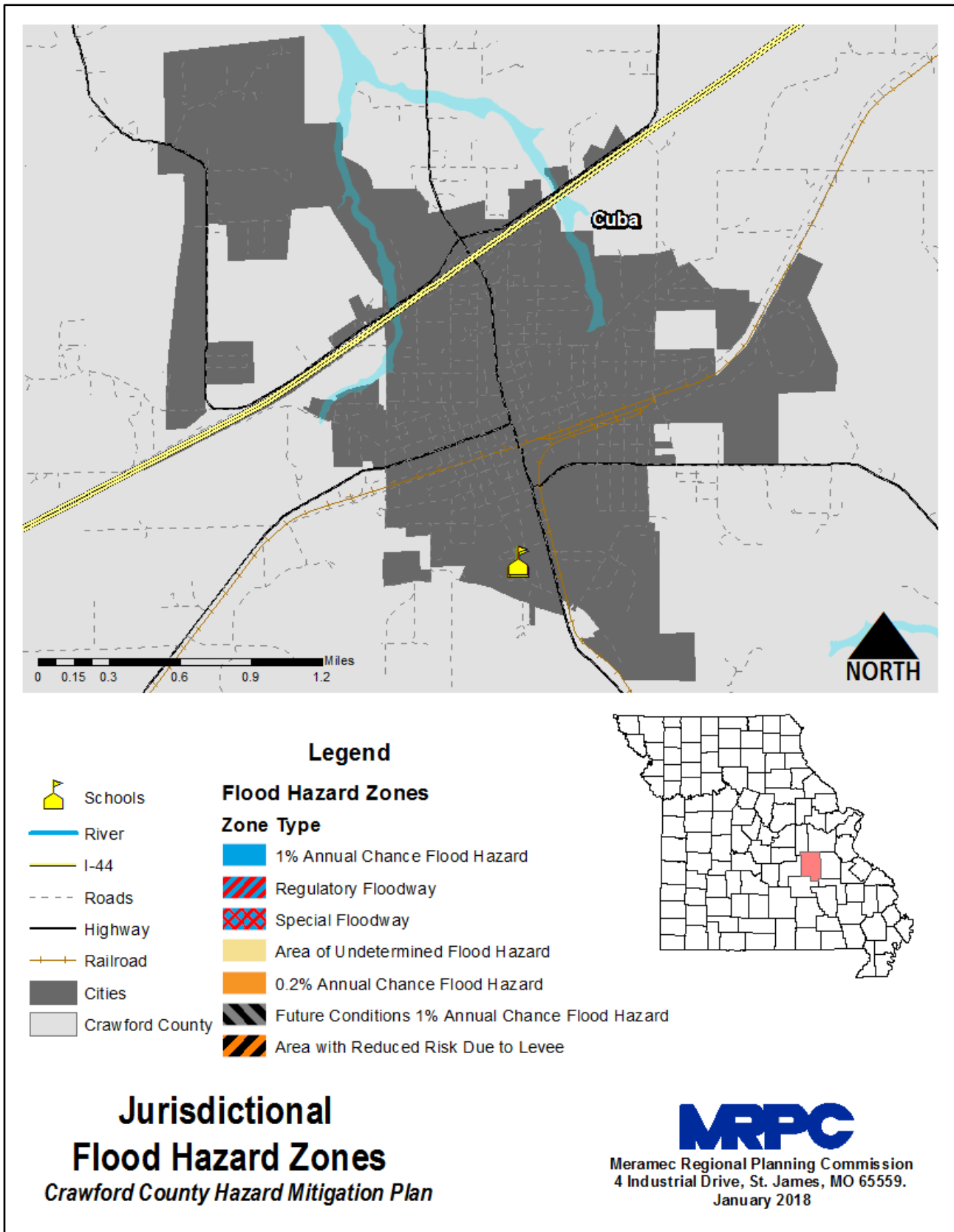
Riverine flooding is most likely to occur in SFHAs. Below are SFHAs for all jurisdictions except Unincorporated Crawford County (**Figure 3.33** to **Figure 3.36**). Included in the maps are public schools within each jurisdiction. **Table 3.49** shows Crawford County NCDC flood events by location between 1998 and 2017.

**Figure 3.33. Bourbon, Missouri Special Flood Hazard Areas (SFHAs)**



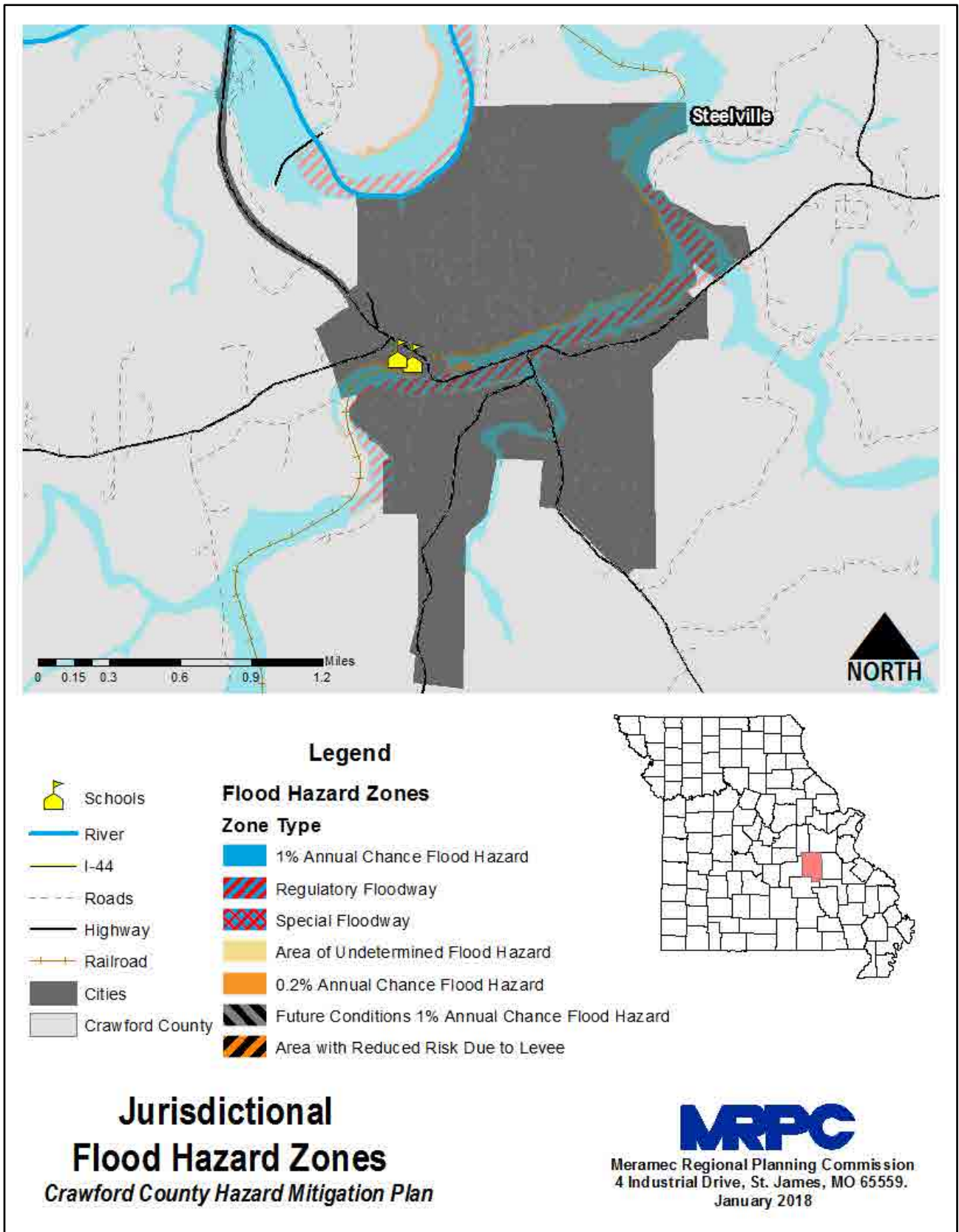
Source: FEMA NFHL, MSDIS

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



Source: FEMA NFHL, MSDIS

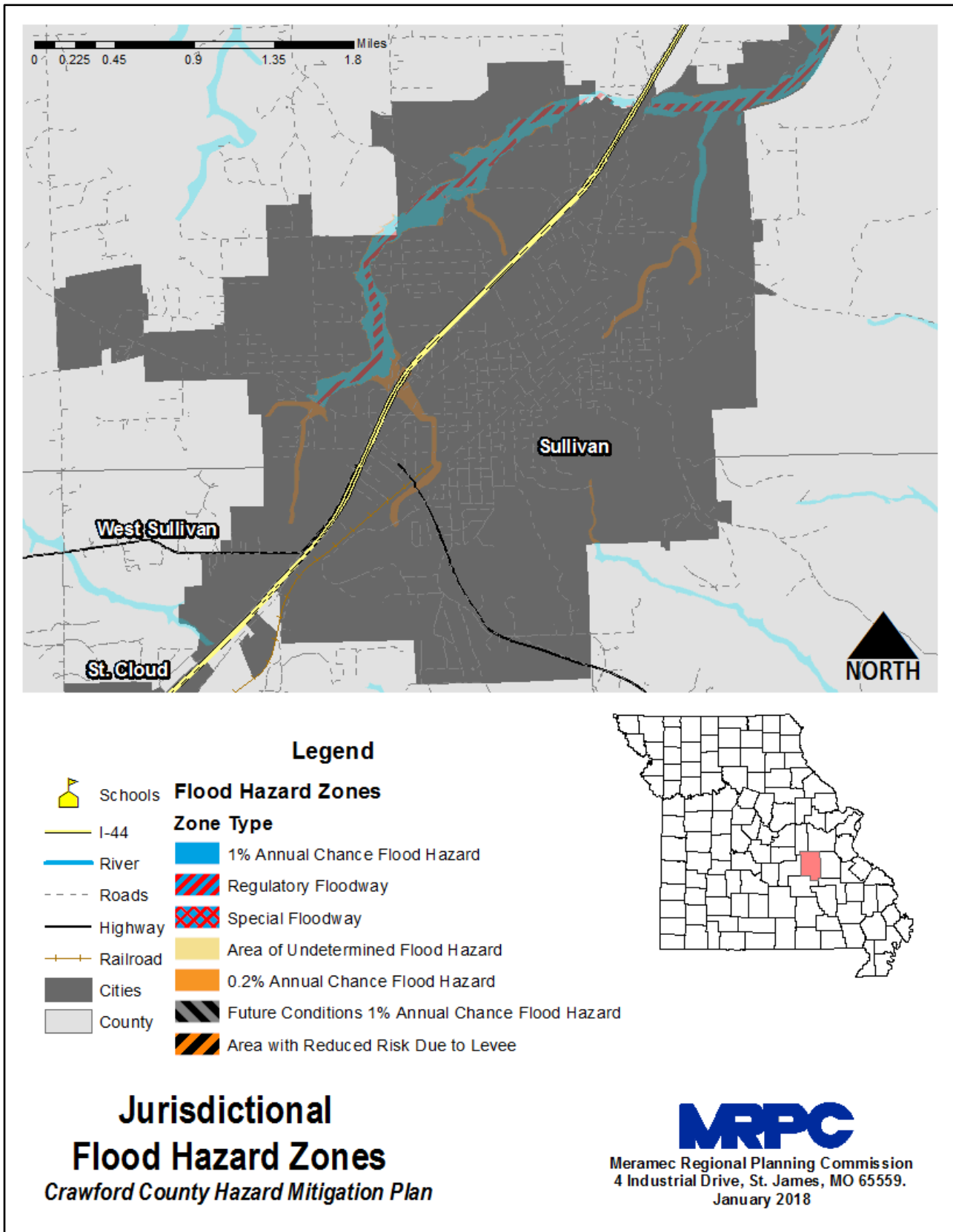
**Figure 3.35. Steelville, Missouri Special Flood Hazard Areas (SFHAs)**



Source: FEMA NFHL, MSDIS



**Figure 3.36. Sullivan & West Sullivan, Missouri Special Flood Hazard Areas (SFHAs)**



Source: FEMA NFHL, MSDIS

**Table 3.49. Crawford County NCDL Flood Events by Location, 1998-2017**

Location	# of Events
Crawford (Zone)	1
Bourbon	1
Fox Springs	2
Steelville	3

Source: National Climatic Data Center

Flash flooding occurs in SFHAs and locations in the planning area that are low-lying. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. After review of NCDL data, Steelville is the most prone jurisdiction to flash flooding events. **Table 3.50** provides information in regards to flash flood events between 1998 and 2017.

**Table 3.50. Crawford County NCDL Flash Flood Events by Location, 1998-2017**

Location	# of Events
Berryman	1
Bourbon	3
Countywide	4
Cuba	1
Cuba Airstrip Airport	2
Dillard	3
Fox Springs	1
Highway	1
Indian Hills	1
Jake Prairie	5
Leasburg	1
North Portion	1
Steelville	1
West Portion	1

Source: National Climatic Data Center

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

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

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

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

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

Between 1998 and 2017, there were zero recorded crop insurance claims in loss due to flooding within Crawford County<sup>40</sup>.

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

**Table 3.51** lists jurisdictions within the planning area that participate in NFIP. In addition, **Table 3.52** provides the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction.

**Table 3.51. NFIP Participation in Crawford County**

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	E Prc Date
290795	Crawford County	Y	05/20/10	05/01/87
290113	Bourbon	Y	NSFHA	08/24/84
	Cuba	N	-	-
290561	Leasburg	Y	05/20/10	08/24/84
	St. Cloud	N	-	-
290114	Steelville	Y	05/20/10	02/13/76
290136	Sullivan	Y	10/18/11	06/15/81
	West Sullivan	N	-	-

Source: NFIP Community Status Book, 2/16/18; BureauNet, <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book>; M= No elevation determined – all Zone A, C, and X; NSFHA = No Special Flood Hazard Area; E=Emergency Program

**Table 3.52. NFIP Policy and Claim Statistics as of [01/31/2018]**

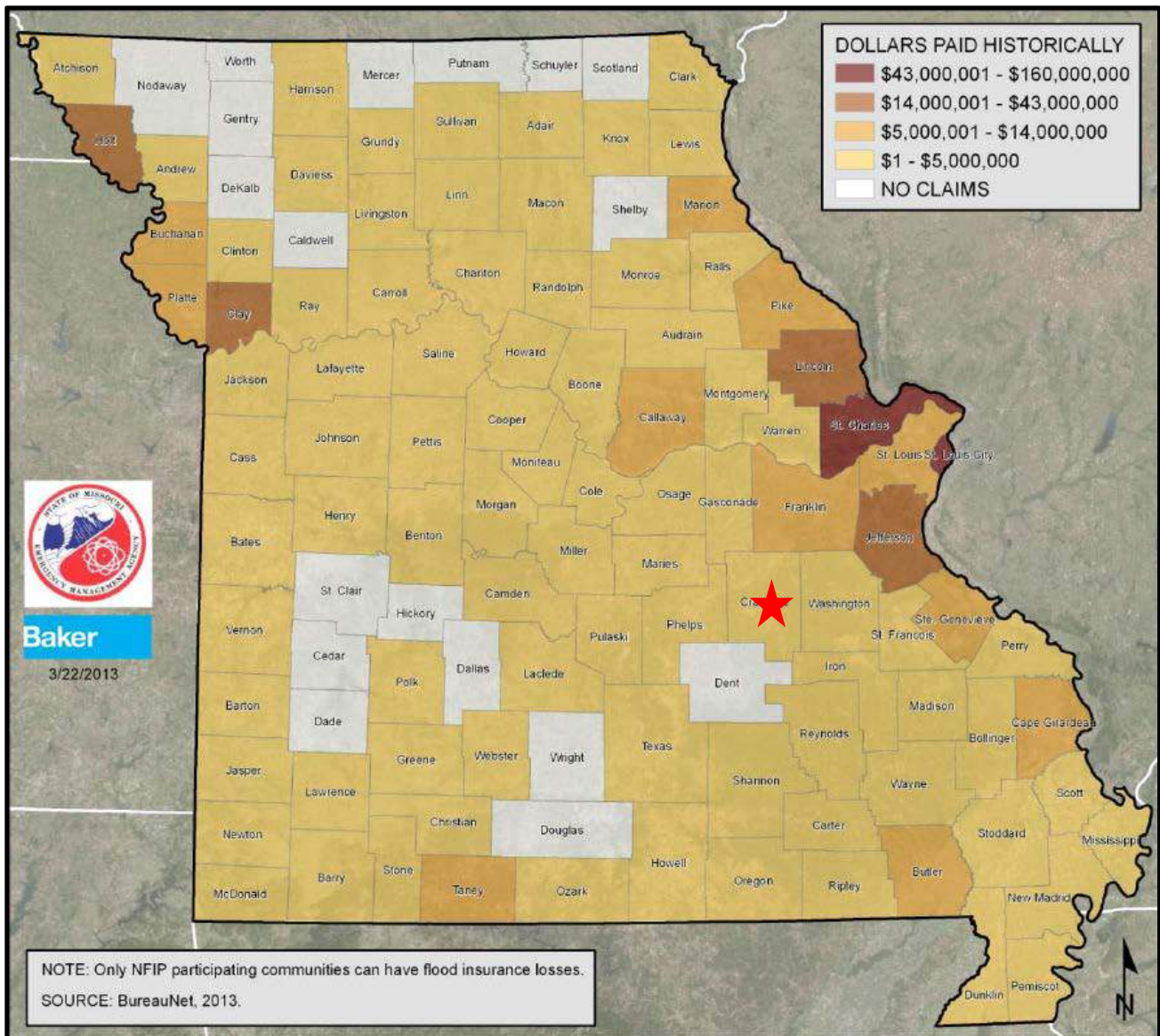
Community Name	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Crawford County	95	84	0	11	4,622,081.70
Steelville	14	12	2	0	138,745.85

Source: NFIP Community Status Book, [01/31/2018]; BureauNet, <http://bsa.nfipstat.femxa.gov/reports/reports.html>; \*Closed Losses are those flood insurance claims that resulted in payment.

The following figures depict the dollars paid historically for flood insurance losses in Missouri by county from 1978 to Jan. 2013 (**Figure 3.37**), and historical flood loss claims in Missouri by county, 1979 to Jan. 2013 (**Figure 3.38**).

<sup>40</sup> <http://www.rma.usda.gov/data/cause.html>

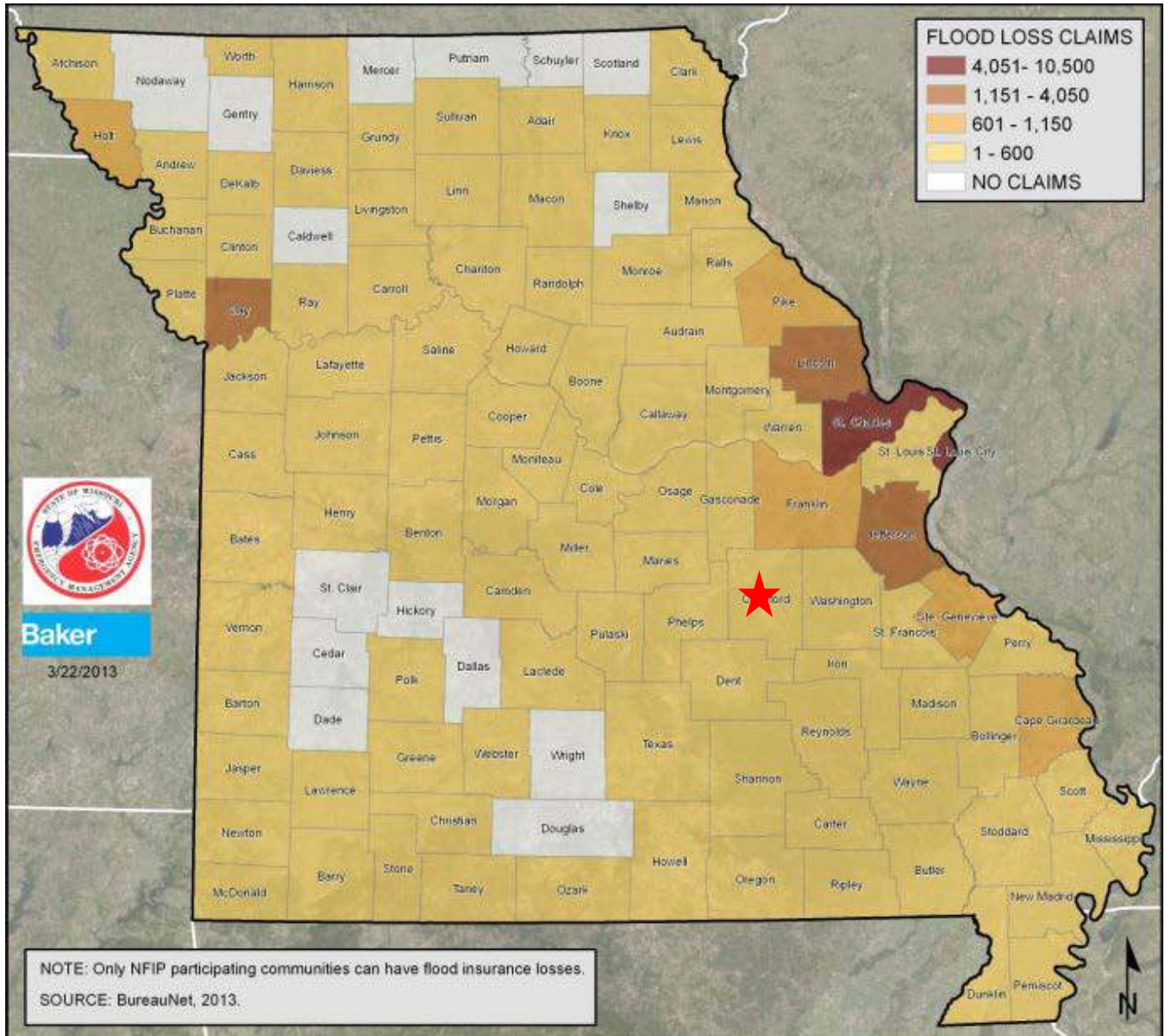
**Figure 3.37. Dollars Paid Historically for Flood Insurance Losses in Missouri by County, 1978 to Jan. 2013**



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



**Figure 3.38. Historical Flood Loss Claims in Missouri by County, 1978 to Jan. 2013**



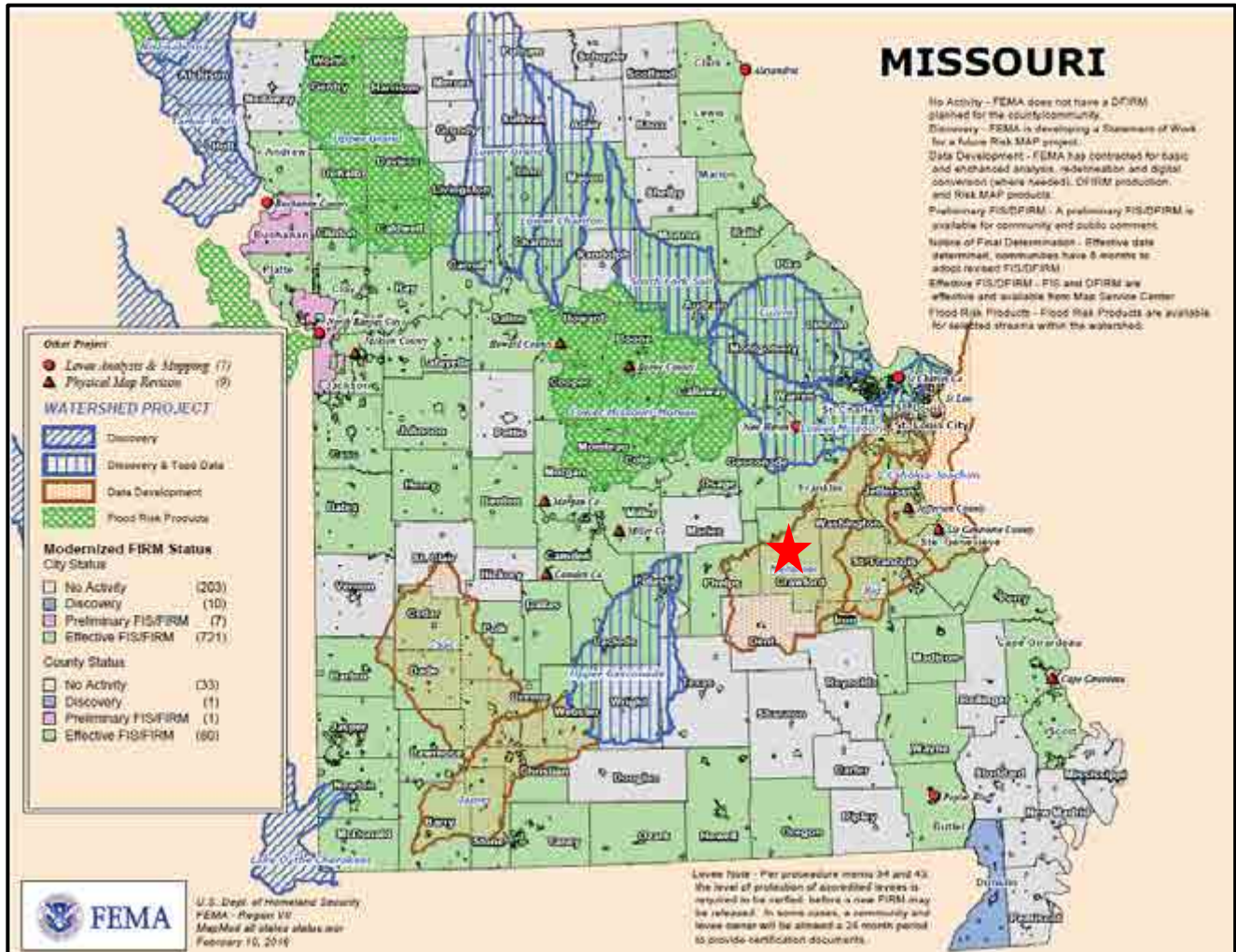
Source: 2013 Missouri State Hazard Mitigation Plan

\*Red star indicates Crawford County

## RiskMAP

Risk mapping, assessment, and planning is a FEMA program which provides communities with flood information and tools to enhance their mitigation plan and take action to better protect their citizens. The majority of Crawford County is in the data development phase with an effective FIS/FIRM. **Figure 3.39** below depicts various watershed projects and FIRM statuses for Missouri.

**Figure 3.39. RiskMAP 2015**



Source: SEMA, 2016

\*Red star indicates Crawford County

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

Repetitive Loss Properties are those properties with at least two flood insurance payments of \$5,000 or more in a 10-year period. According to the Flood Insurance Administration, jurisdictions included in the planning area have a combined total of 18 repetitive loss properties (16 in Crawford County and 2 in Steelville) with 57 losses as of 11/30/2017. Of those properties, there are 7 residential and 11 commercial properties (non-mitigated).

Total payments (building and contents) were \$4,032,716.6. The average payment was \$41,690.89. The properties have not been mitigated.

Severe Repetitive Loss (SRL): A SRL property is defined it as a single family property (consisting of one-to-four residences) that is covered under flood insurance by the NFIP; and has (1) incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding \$5,000 and with cumulative amounts of such claims payments exceeding \$20,000; or (2) for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. According to FEMA there are no SRL properties in Crawford County.

**Previous Occurrences**

**Table 3.53** provides information regarding Presidential Flooding Disaster Declarations between 1998 and 2017 for Crawford County.

**Table 3.53. Crawford County Presidential Flooding Disaster Declarations 1998 to 2017**

Declaration No.	Date	State	Incident Description
DR-1328	5/06/200	Missouri	Missouri Severe Thunderstorms & Flash Flooding
DR-1463	05/04/2003	Missouri	Missouri Severe Storms, Tornadoes, and Flooding
DR-1631	3/08/2006	Missouri	Missouri Severe Storms, Tornadoes, and Flooding
DR-1676	1/12/2007	Missouri	Missouri Severe Winter Storms and Flooding
DR-1749	3/17/2008	Missouri	Missouri Severe Storms and Flooding
DR-1809	9/11/2008	Missouri	Missouri Severe Storms, Flooding, and a Tornado
DR-1847	5/08/2009	Missouri	Missouri Severe Storms, Tornadoes, and Flooding
DR-4238	5/15/2015	Missouri	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding
EM-3374	12/22/15	Missouri	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding
DR-4250	12/23/2015	Missouri	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding
DR-4317	4/28/17	Missouri	Missouri Severe Storms, Tornadoes, Straight-line Winds, and Flooding

FEMA, Disaster Declarations for Missouri, Flooding

Data was obtained from the NCDC regarding flash and river flooding over the last 20 years. **Table 3.54** and **Table 3.55** provide this information. Additionally, narratives available for each event are included.

**Table 3.54. NCDC Crawford County Riverine Flood Events Summary, 1998 to 2017**

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
<b>Total</b>	<b>7</b>	<b>1</b>	<b>0</b>	<b>500.00K</b>	<b>0</b>

Source: NCDC, data accessed [3/16/2018]



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## 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 3.55. NCDC Crawford County Flash Flood Events Summary, 1998 to 2017**

Year	# of Events	# of Deaths	# of Injuries	Property Damages (\$)	Crop Damages (\$)
1998	1	0	0	100.00K	0
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	0	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
<b>Total</b>	<b>26</b>	<b>0</b>	<b>0</b>	<b>101.00K</b>	<b>0</b>

Source: NCDC, data accessed [3/16/2018]

#### **Narratives on flood events:**

- 07/26/1998:** 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.
- 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.
- 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.
- 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.

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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.

5. **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.
6. **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.
7. **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.
8. **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.
9. **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.
10. **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.
11. **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.
12. **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.
13. **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.
14. **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.
15. **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.
16. **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.

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17. **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.
  18. **04/24/2011:** Between 4 and 6 inches of rain fell over several days causing flash flooding. Numerous roads were flooded countywide.
  19. **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.
  20. **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.
  21. **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.
  22. **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.
  23. **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.
  24. **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.
  25. **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.
  26. **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.

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

From the data obtained from the NCDC<sup>41</sup>, there were 7 riverine flood events (**Table 3.55**) over a period of 20 years. This information was utilized to determine the annual average percent probability of riverine flooding (**Table 3.56**). The probability of riverine flooding in Crawford County per year is 35% (7 events/20 years x 100 = 35%). Furthermore, data was obtained for flash flooding within the county. Crawford County endured 26 flash flooding events (**Table 3.54**) 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 3.57**).

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<sup>41</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

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**Table 3.56. Annual Average % Probability of Riverine Flooding in Crawford County**

Location	Annual Avg. % P
Crawford County	35%

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

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**Table 3.57. 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.

## **Vulnerability**

### ***Vulnerability Overview***

For the vulnerability analysis of riverine and flash flooding for Crawford County, data was obtained from the 2013 Missouri State Hazard Mitigation Plan. The 2013 Plan was updated by enhancing the flood vulnerability assessment and loss estimation capabilities of Hazus by leveraging a number of improved local data inputs. This was achieved by integrating DFIRM depth grids for 51 additional counties. Furthermore, the State re-analyzed the previous 29 depth grids used in 2010, to utilize the latest enhancements available in Hazus 2.1; bringing the total number of regions analyzed using DFIRM depth grids to 80 jurisdictions. The subsequent set of improved data inputs included an enhanced building inventory database, which is an improvement over the standard Hazus 2.1 stock data. That data, coupled with the DFIRM depth grids, enabled Level 2 Hazus flood analysis for all 114 counties<sup>42</sup>.

**Figure 3.40** depicts the 100-year floodplain boundaries for all counties within Missouri. These DFIRM floodplains are comprised of streams based on a <1 sq. mile drainage area.

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<sup>42</sup> 2013 Missouri State Hazard Mitigation Plan

**Figure 3.40. DFIRM and Hazus Countywide Base-Flood Scenarios: Modeled Floodplain Boundaries**

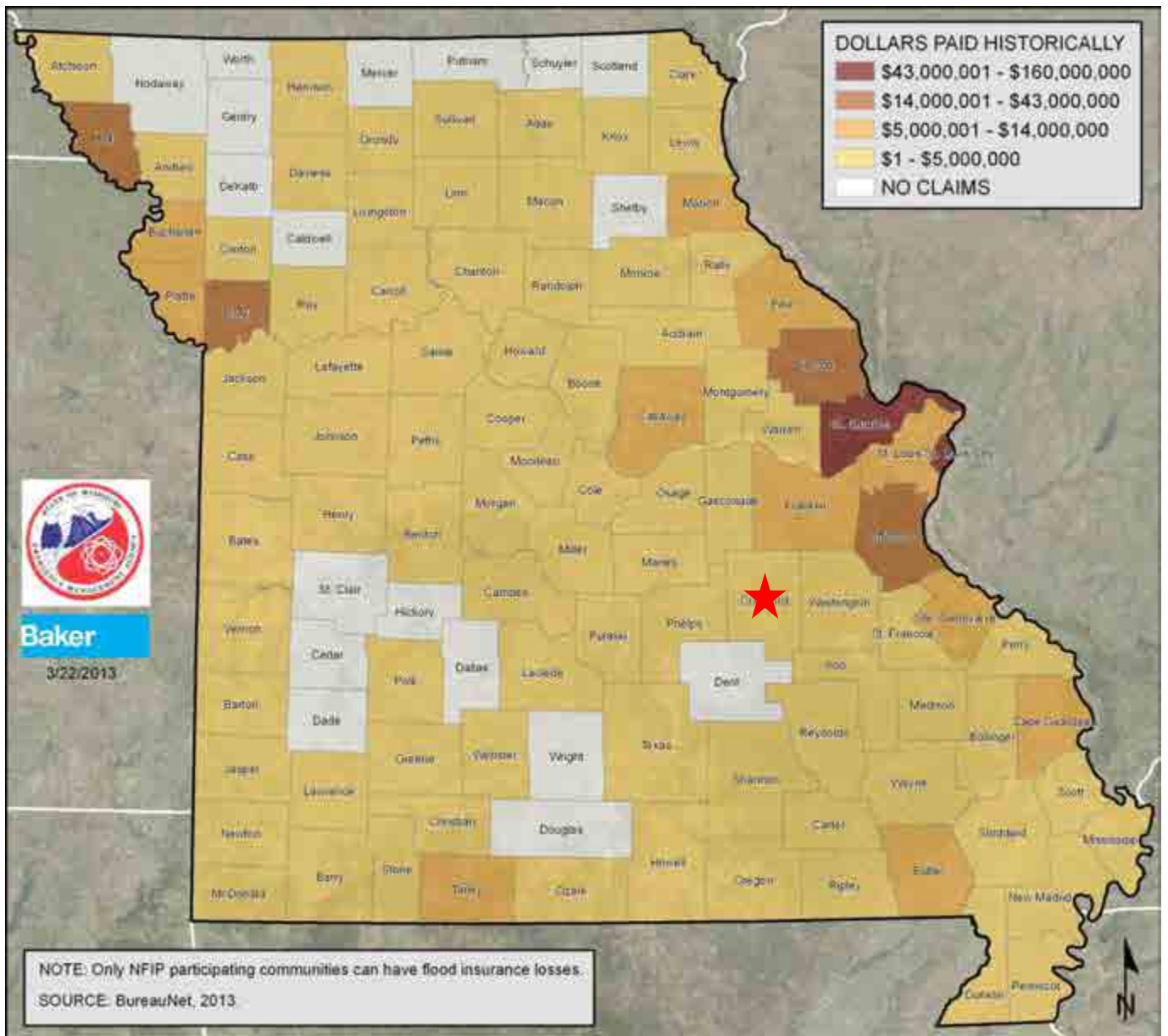


Source: 2013 Missouri State Hazard Mitigation Plan  
\*Red star indicates Crawford County

In addition, the state analyzed NFIP flood-loss data to establish areas in Missouri that are most at risk to flooding. **Figure 3.41** illustrates the dollars paid historically for flood insurance losses in Missouri by county from 1978 to 2013. Moreover, **Figure 3.42** depicts flood loss claims in Missouri during the same timeline.



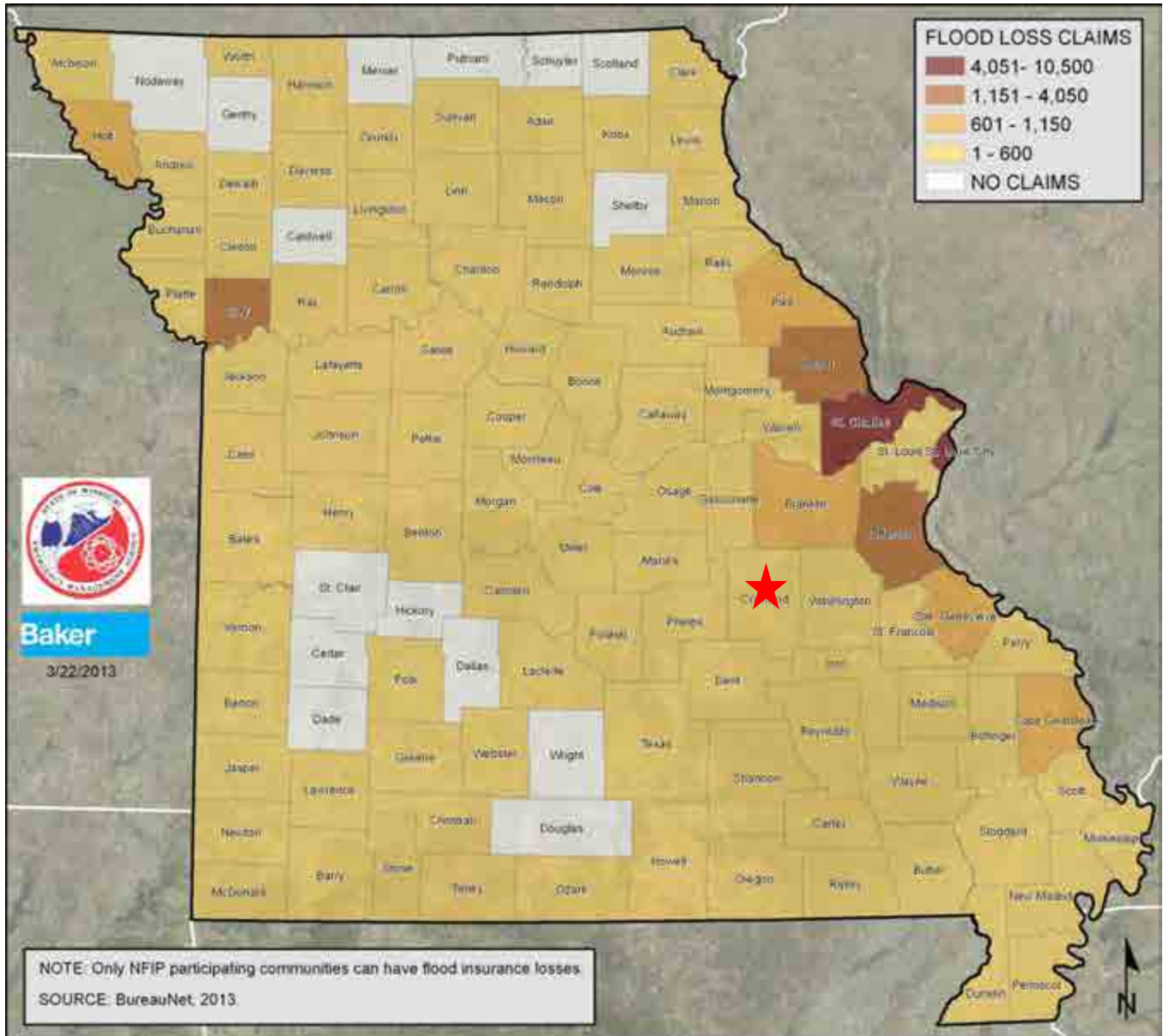
**Figure 3.41. Dollars Paid Historically for Flood Insurance Losses in Missouri by County, 1978 –Jan 2013**



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



**Figure 3.42. Flood Loss Claims in Missouri by County, 1978 – Jan 2013**



Source: 2013 Missouri State Hazard Mitigation Plan

\*Red star indicates Crawford County

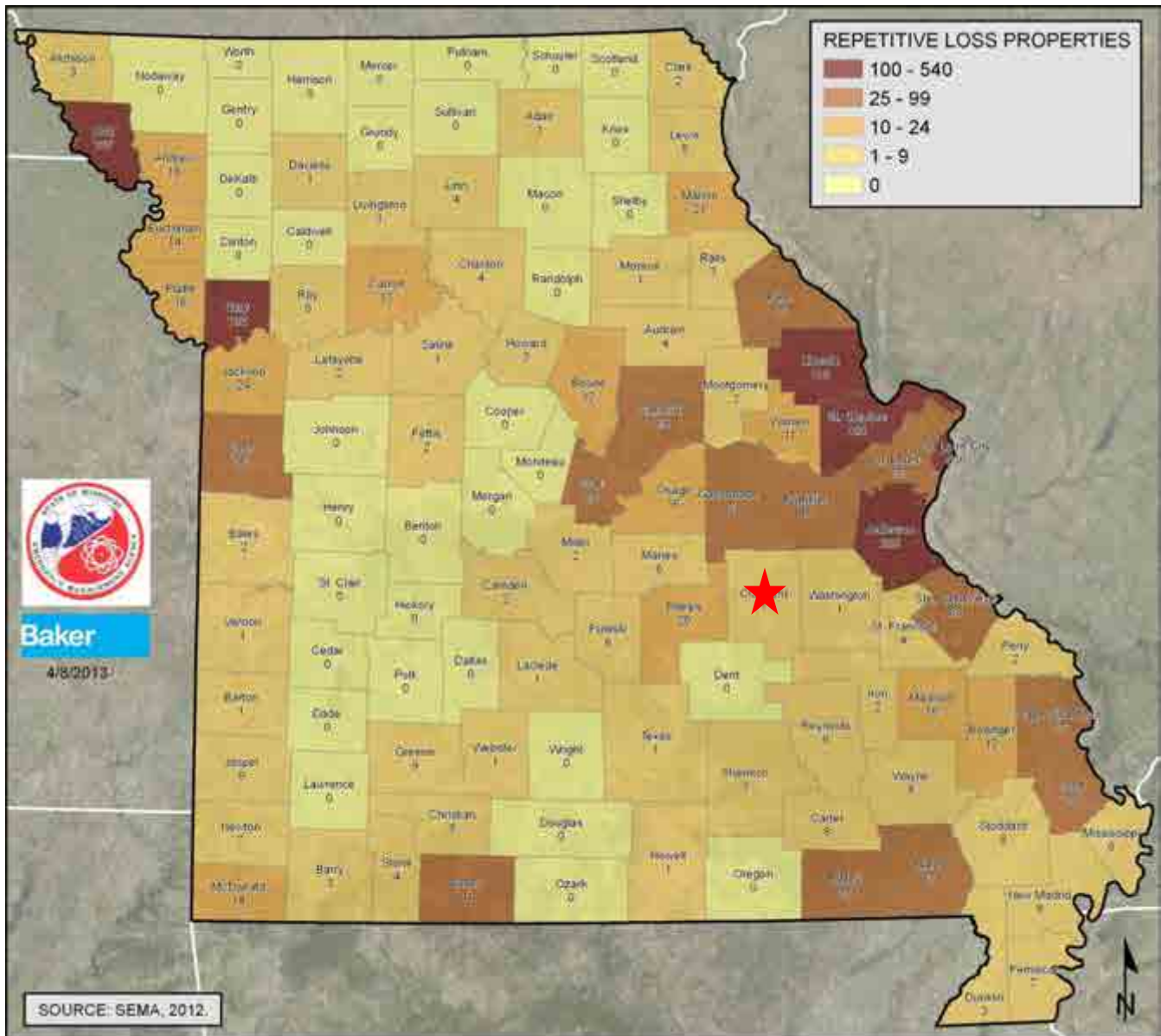
**Table 3.58** and **Figure 3.43** illustrate the number of repetitive loss properties in Crawford County.

**Table 3.58. Crawford County’s Repetitive Loss Property Summary**

County	Number of Repetitive Loss Properties	Number of Losses	Total Paid (\$)	Loss Ratio	Average Payment
Crawford	7	23	\$738,008	3.3	\$32,087

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.43. Repetitive Flood Loss Properties by County, 1978 - 2009**



Source: 2013 Missouri State Hazard Mitigation Plan

\*Red star indicates Crawford County

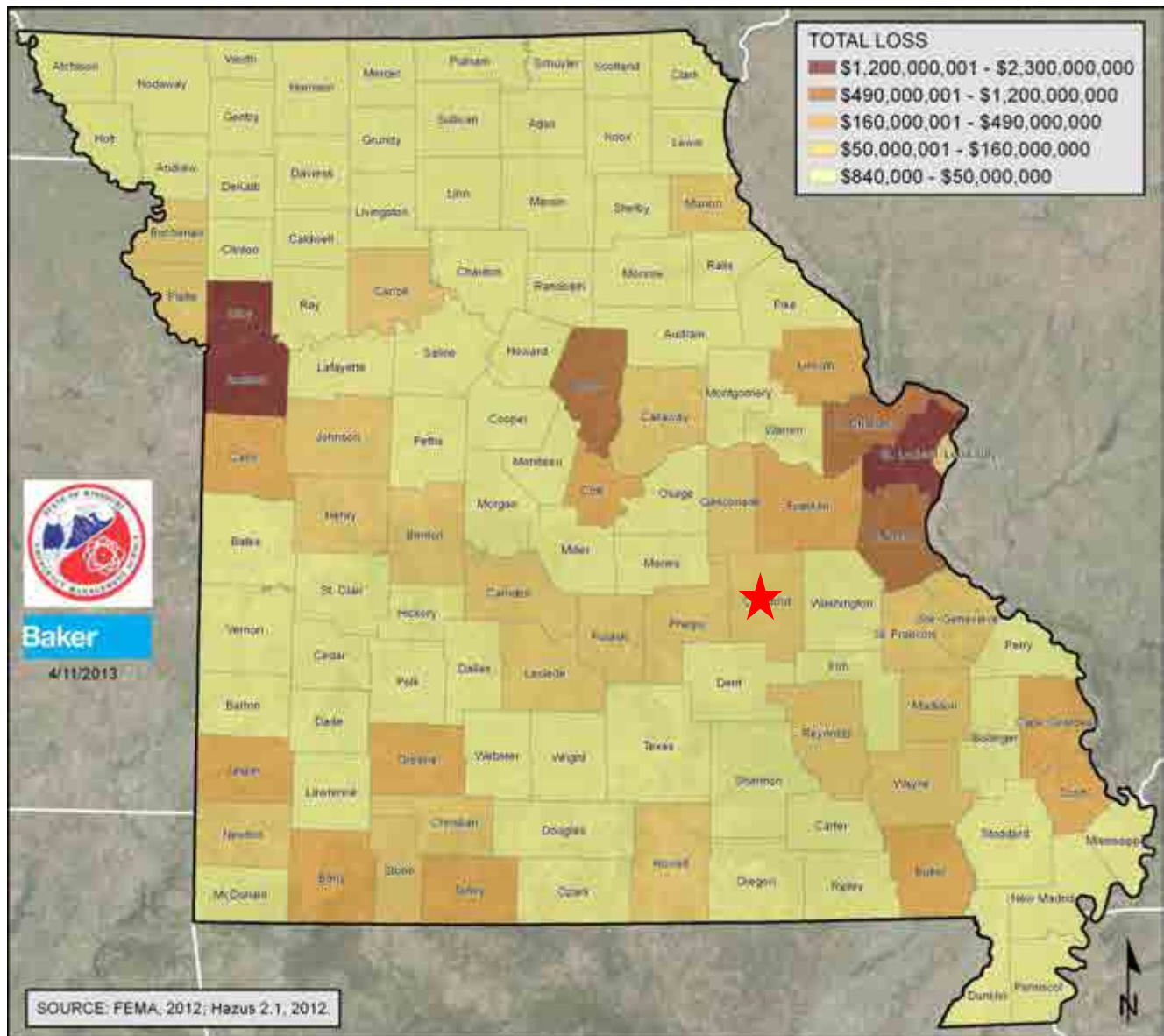
Furthermore, the state analyzed potential loss estimates to flooding. The purpose of the analysis is to determine where flood losses can occur and the degree of severity. These results were generated from DFIRM data and Hazus floodplain data. **Table 3.59** provides information regarding total direct building loss and income loss to Crawford County. In addition, **Figure 3.44** and **Figure 3.45** depict Hazus countywide base-flood (100 year) scenarios including building and income loss for total loss and loss ratio respectively.

**Table 3.59. Total Direct Building Loss and Income Loss to Crawford County**

County	Structural Damage	Contents Damage	Inventory Loss	Total Direct Loss	Total Income Loss	Total Direct and Income Loss	Calc. Loss Ratio
Crawford	\$25,282,968.60	\$33,544,930.71	\$967,090.34	\$59,794,989.65	\$834,968.25	\$60,629,957.90	3.00

Source: 2013 Missouri State Hazard Mitigation Plan

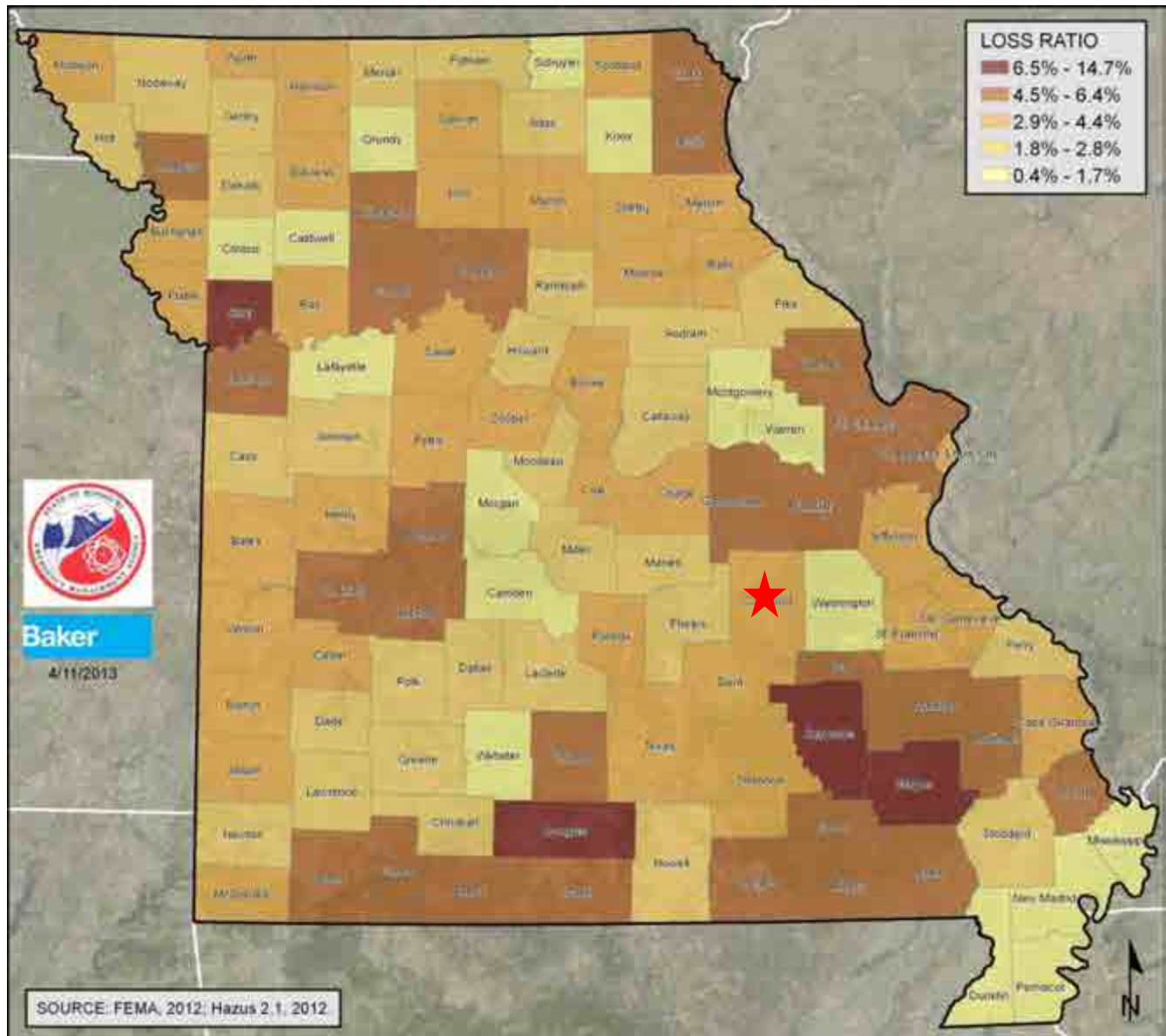
**Figure 3.44. Hazus Countywide Base-Flood Scenarios: Building and Income Loss**



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



**Figure 3.45. Hazus Countywide Base-Flood Scenarios: Building Loss Ratio**



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

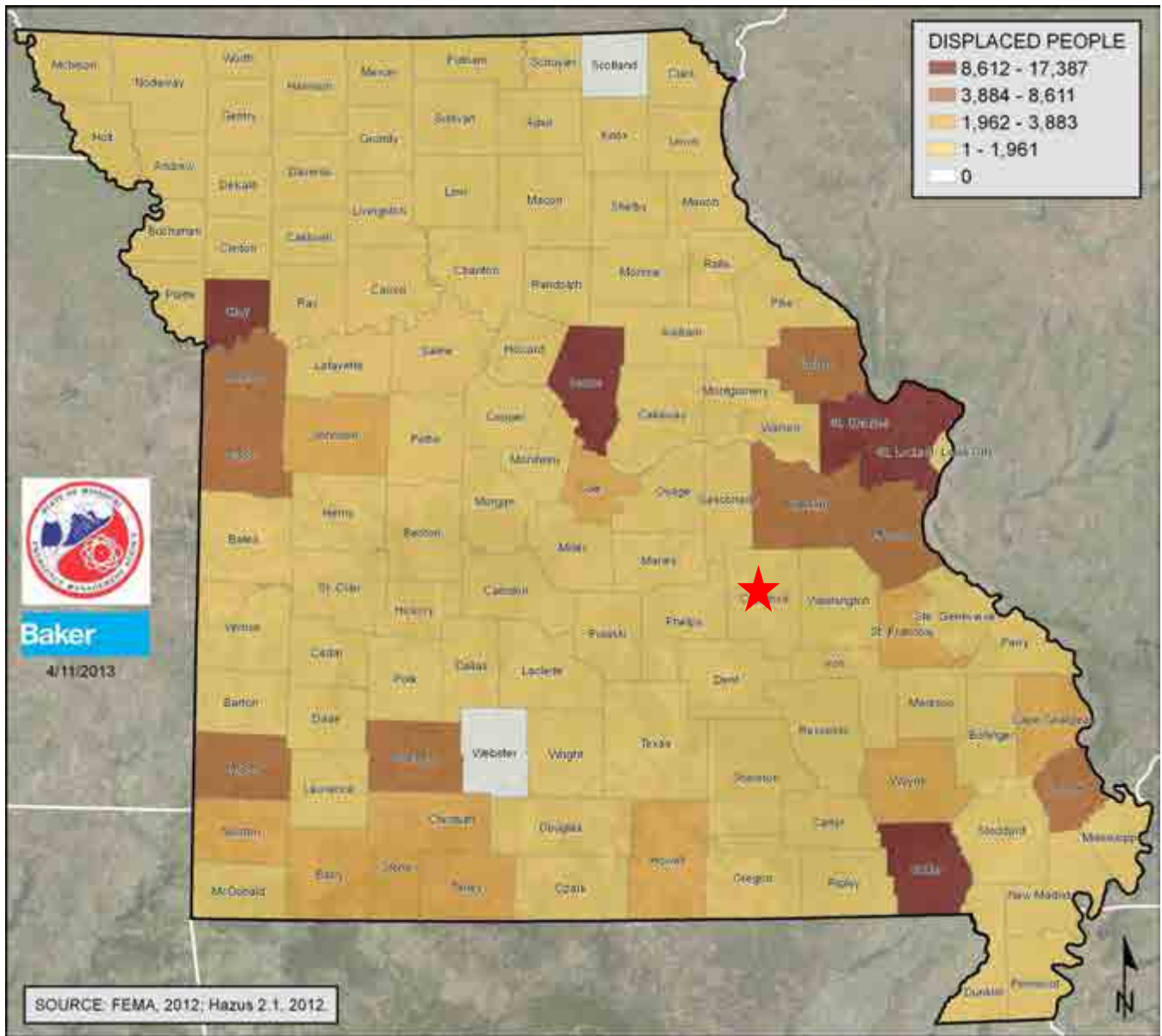
Lastly, the State determined the estimated number of displaced households and need for shelters within Crawford County in the event of a 100 year flood. **Table 3.60** and **Figure 3.46** illustrate this information.

**Table 3.60. Estimated Displaced households and Shelter Needs for Crawford County**

County	Displaced Households	Displaced Population Requiring Shelter
Crawford	1,058	148

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.46. Hazus Countywide Base-Flood Scenarios: Displaced People**



Source: 2013 Missouri State Hazard Mitigation Plan

\*Red star indicates Crawford County

**Potential Losses to Existing Development**

Every jurisdiction in Crawford County contains a portion of the 100 Year Floodplain except for Bourbon. According to the HAZUS model, Crawford County has a building loss ratio of 2.9% to 4.4% for countywide base-flood scenarios, which is medium in relation with other counties in the state. Additionally, the county has a total of 18 repetitive loss properties. With the annual average probability for flooding at 35% and 100% for flash floods, Crawford County’s existing development is vulnerable. Especially development located in low-lying areas, near rivers or streams, or where drainage systems are not adequate are all prone to flooding.

According to the 2017 Questionnaire, Steelville R-III School District has buildings located within the

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floodplain.

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

Impact of future development is correlated to floodplain management and regulations set forth by the county and jurisdictions<sup>43</sup>. Future development within low-lying areas near rivers and streams, or where interior drainage systems are not adequate to provide drainage during heavy rainfall events should be avoided. Additionally, future development would also increase impervious surface causing additional water run-off and drainage problems during heavy rainfall events.

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

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

### **Problem Statement**

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

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<sup>43</sup> 2015 Boone County Hazard Mitigation Plan

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### 3.4.7 Land Subsidence/Sinkholes

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Some specific sources for this hazard are:

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

#### **Hazard Profile**

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

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

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

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

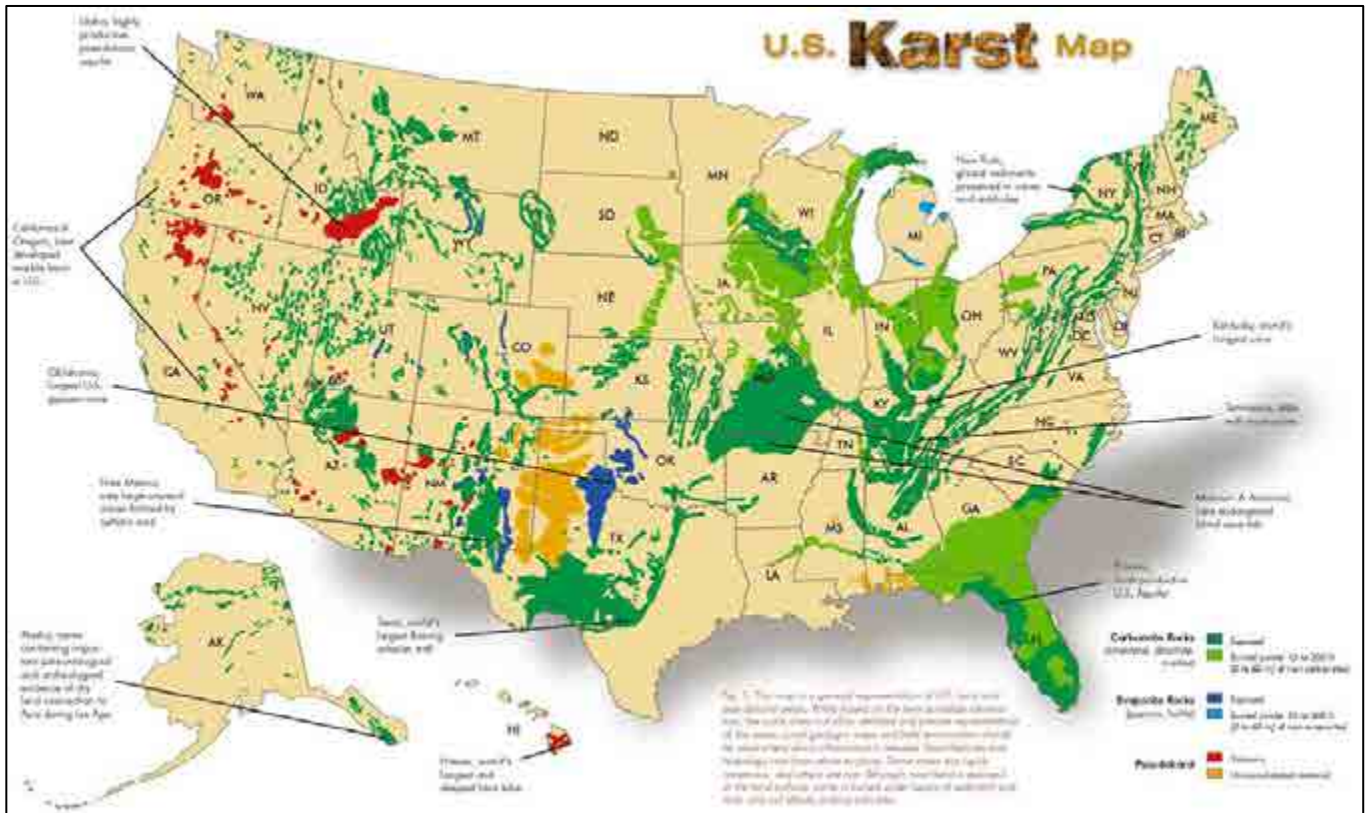
According to the U.S. Geological Survey (USGS), the most damage from sinkholes tends to occur in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. Fifty-nine percent of Missouri is underlain by thick, carbonate rock that makes Missouri vulnerable to sinkholes. Sinkholes occur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

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



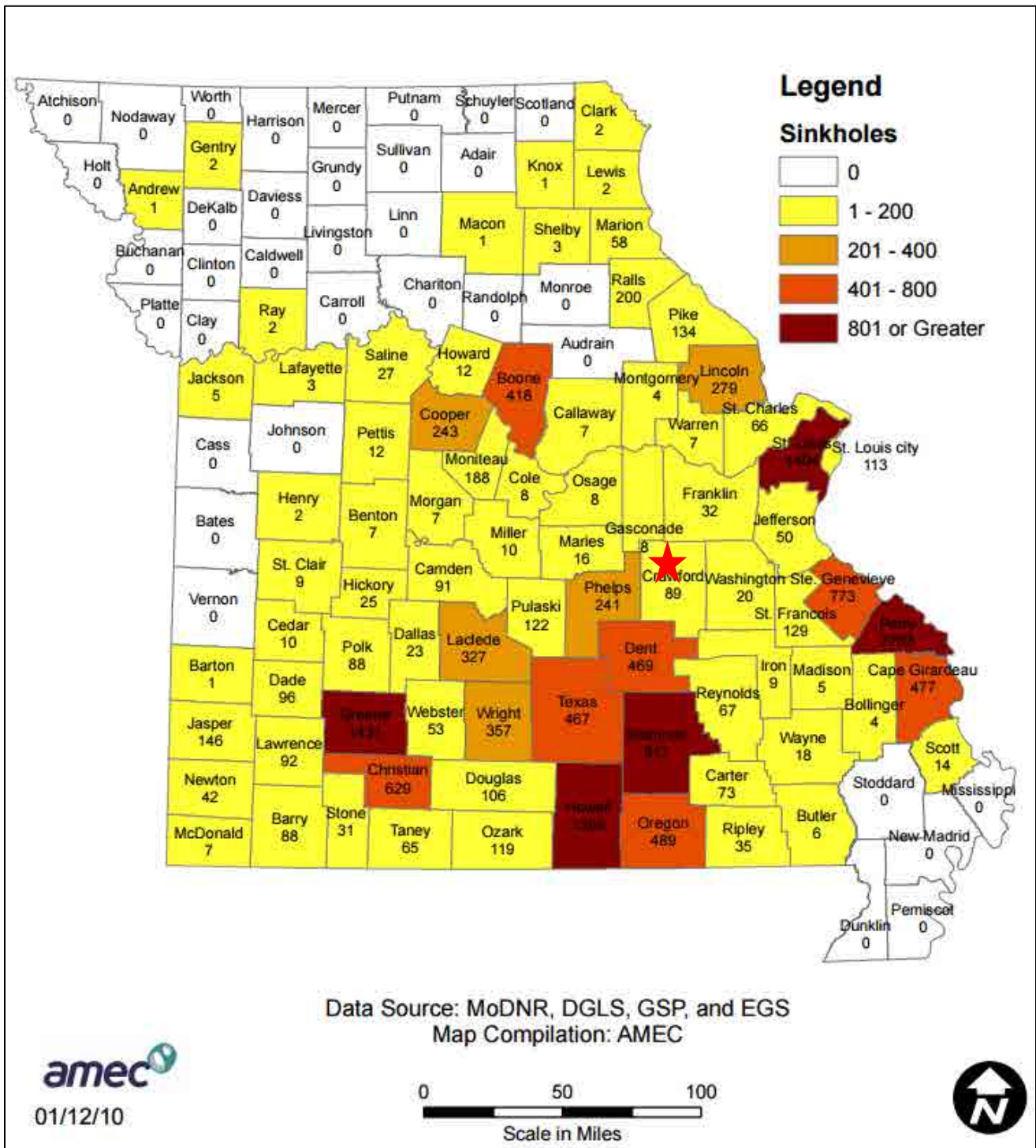
**Figure 3.47** depicts karst topography across the United States. Missouri's karst topography is comprised of carbonate rocks such as limestone, dolomite, and marble. Variability in areas prone to sinkholes does not differ greatly across the county. There are approximately 89 sinkholes that have been recorded within Crawford County (**Figure 3.48**). According to **Figure 3.49** there are approximately 407 mines in Crawford County. According to the Missouri Department of Natural Resources, Crawford County primarily produces iron, iron-sulfide, lead, zinc, copper, and barium. Activities such as mining or drilling are known to be responsible for the formation of sinkholes.

**Figure 3.47. U.S. Karst Map**



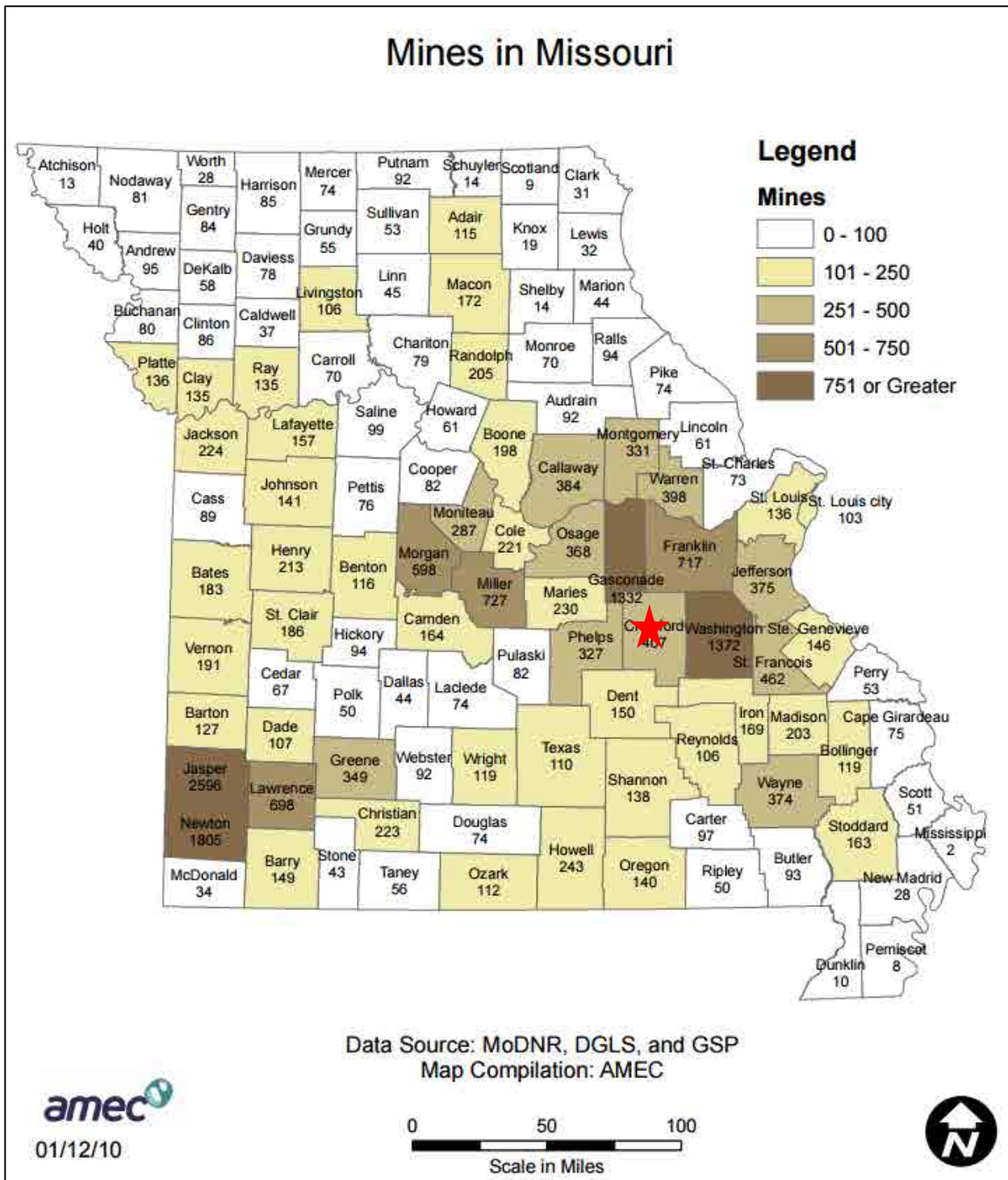
Source: [http://www.northeastern.edu/protect/wp-content/uploads/US\\_KarstMap.jpg](http://www.northeastern.edu/protect/wp-content/uploads/US_KarstMap.jpg)

**Figure 3.48. Sinkholes in Missouri**



Source: [http://sema.dps.mo.gov/programs/mitigation\\_management.php](http://sema.dps.mo.gov/programs/mitigation_management.php); \*Red star indicates Crawford County

Figure 3.49. Mines in Missouri



Source: [https://emgis.oe.mo.gov/dps/mitigation/MO\\_mines.pdf](https://emgis.oe.mo.gov/dps/mitigation/MO_mines.pdf); \*Red star indicates Crawford County



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

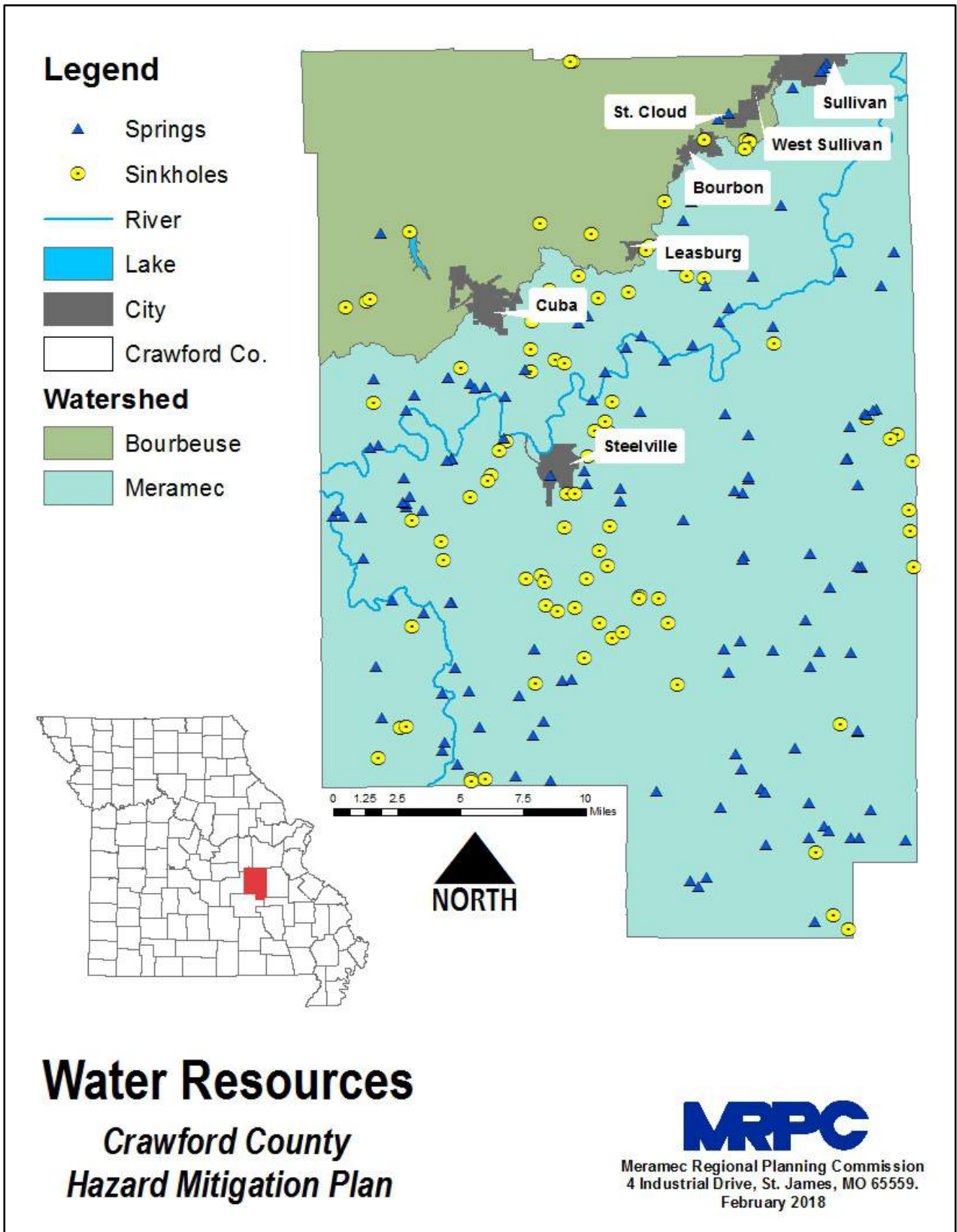
Sinkholes vary in size and location, and these variances will determine the impact of the hazard. A sinkhole could result in the loss of a personal vehicle, a building collapse, or damage to infrastructure such as roads, water, or sewer lines. Groundwater contamination is also possible from a sinkhole.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

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

### ***Previous Occurrences***

Although there are few sinkholes and sinkhole areas in Crawford County, incidents have occurred in other parts of southern Missouri. Fortunately, there are no recorded incidents of death due to sinkholes in the county. Based on **Figure 3.50**, recorded sinkholes are rural in nature and reside within unincorporated parts of the county.

Figure 3.50. Crawford County Watershed/Water Resources



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

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

## **Vulnerability**

### ***Vulnerability Overview***

Unfortunately, no statistics are available for the number of subsurface locations that may potentially collapse in the future, forming a sinkhole. However, areas have been identified that have the greatest vulnerability for future sinkholes including Cape Girardeau, Dent, Greene, Howell, Laclede, Oregon, Perry, Shannon, St. Louis, and Texas Counties<sup>44</sup>.

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

The most likely type of damage to occur in conjunction with a sinkhole collapse is property damage related to foundation disturbance. Signs include cracks in interior and exterior walls; doors and windows that no longer sit square or open and close properly; depressions forming in the yard; cracks in the street, sidewalk, foundation or driveway; and turbidity in local well water. All of these can be early indicators that a sinkhole is forming in the vicinity<sup>45</sup>. In the event of a sudden collapse, an open sinkhole can form in a matter of minutes and swallow lawn, automobiles and homes. This has occurred in some parts of Missouri, particularly in the southwest part of the state, but there have been no dramatic incidents like this in Crawford County

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

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

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

**Figure 3.50** illustrates 89 sinkholes in Crawford County. The jurisdiction most likely to be impacted by sinkholes is unincorporated Crawford County.

## **Problem Statement**

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

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<sup>44</sup> 2013 Missouri State Hazard Mitigation Plan

<sup>45</sup> <http://sinkhole.org/commonsigns.php>



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## 3.4.8 Thunderstorm/High Winds/Lightning/Hail

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Some Specific Sources for this hazard are:

- FEMA 320, Taking Shelter from the Storm, 3rd edition, [http://www.weather.gov/media/bis/FEMA\\_SafeRoom.pdf](http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf) Lightning Map, National Weather Service, [http://www.lightningsafety.noaa.gov/stats/08\\_Vaisala\\_NLDN\\_Poster.pdf](http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf) National Weather Service, [http://www.lightningsafety.noaa.gov/stats/08\\_Vaisala\\_NLDN\\_Poster.pdf](http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf)
- Death and injury statistics from lightning strikes, National Weather Service.
- Wind Zones in the U.S. map, FEMA, [http://www.fema.gov/plan/prevent/saferoom/tsfs02\\_wind\\_zones.shtm](http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm);
- Annual Windstorm Probability (65+knots) map U.S. 1980-1994, NSSL, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bigwind.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif)
- Hailstorm intensity scale, The Tornado and Storm Research Organization (TORRO), <http://www.torro.org.uk/site/hscale.php>;
- NCDC data;
- USDA Risk Management Agency, Insurance Claims, <http://www.rma.usda.gov/data/cause.htm>
- National Severe Storms Laboratory – hail map, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bighail.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif)

### **Hazard Profile**

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

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

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

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

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

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## ***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.

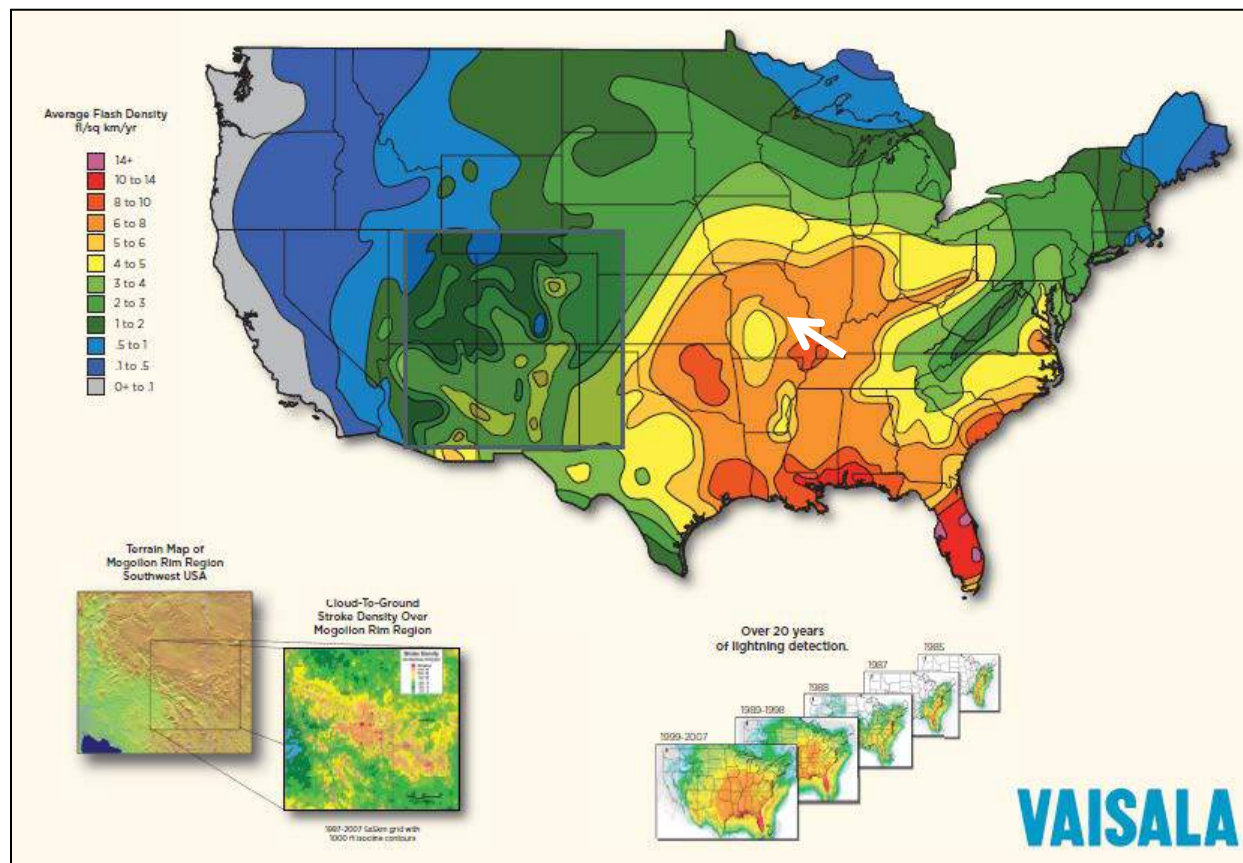
At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 miles per hour, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest 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 3.51** depicts the location and frequency of lightning in Missouri. Additionally, the map indicates that the flash density of Crawford County ranges between 6 and 8 flashes per square kilometer per year.

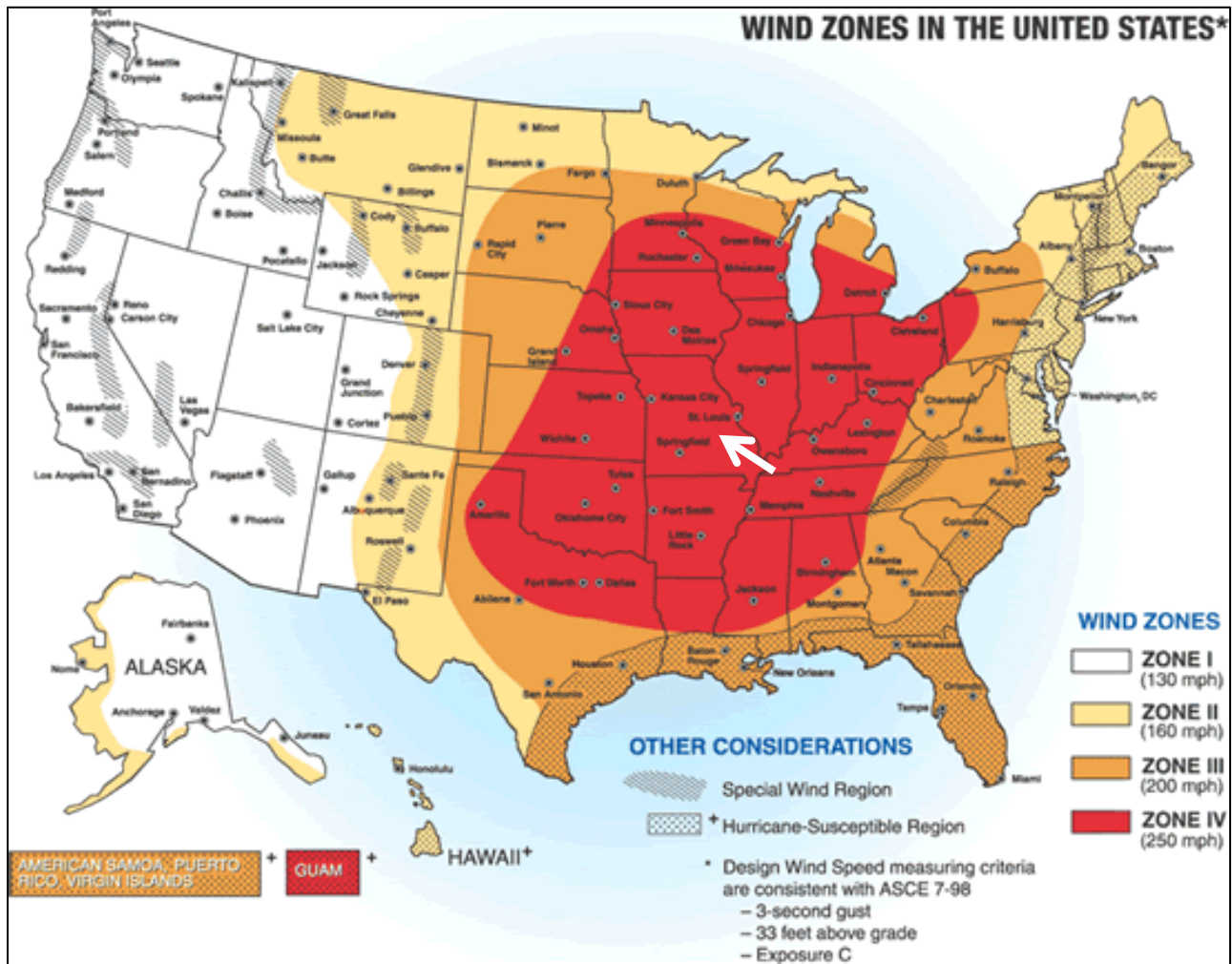
**Figure 3.51. Location and Frequency of Lightning in Missouri**



Source: National Weather Service, [http://www.lightningsafety.noaa.gov/stats/08\\_Vaisala\\_NLDN\\_Poster.pdf](http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf).  
\* 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 3.52**).

**Figure 3.52. Wind Zones in the United States**



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

\* Crawford County is indicated by a white arrow.

**Severity/Magnitude/Extent**

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

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

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

Based on information provided by the Tornado and Storm Research Organization (TORRO), **Table 3.61** below describes typical damage impacts of the various sizes of hail.

**Table 3.61. Tornado and Storm Research Organization Hailstorm Intensity Scale**

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

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

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

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

Between 1998 and 2017, there were 0 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.

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**Previous Occurrences**

Due to the lack of available parameters, heavy rain is utilized in the place of thunderstorms in **Table 3.62**. Moreover, thunderstorm wind and strong was included with high winds. NCDC data was obtained for lightning, and hail events between 1998 and 2017 as well (**Table 3.63**, **Table 3.64**, and **Table 3.65**). However, limitations to the use of NCDC reported lightning events include the fact that only lightning events that result in fatality, injury and/or property and crop damage are in the NCDC.

**Table 3.62. NCDC Crawford County Heavy Rain Events Summary, 1998 to 2017**

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
<b>Total</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	-

Source: NCDC, data accessed [3/16/18]



**Table 3.63. NCDC Crawford County High Wind Events Summary, 1998 to 2017**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Estimated Gust (kts.)
1998	2	0	0	0	56
1999	2	0	0	35.00K	56
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
2015	1	0	0	0	56
2016	1	0	0	0	65
2017	1	0	0	0	56
<b>Total</b>	<b>40</b>	<b>1</b>	<b>1</b>	<b>153.00K</b>	<b>-</b>

Source: NCDC, data accessed [3/16/18]

**Table 3.64. NCDC Crawford County Lightning Events Summary, 1998 to 2017**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damage
-	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Source: NCDC, data accessed [3/16/18]

**Table 3.65. NCDC Crawford County Hail Events Summary, 1998 to 2017**

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
1998	1	0	0	0	.75
1999	2	0	0	0	1.75
2000	2	0	0	0	1.00
2002	2	0	0	0	1.00
2003	5	0	0	0	1.00

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Max Hail Size (inch)
2004	1	0	0	0	1.75
2005	4	0	0	0	.88
2006	6	0	0	0	2.75
2007	1	0	0	0	.75
2008	5	0	0	0	1.75
2009	1	0	0	0	1.00
2010	4	0	0	0	1.25
2011	5	0	0	0	2.75
2012	5	0	0	0	1.75
2014	3	0	0	0	1.00
2016	3	0	0	0	1.50
2017	3	0	0	0	1.75
<b>Total</b>	<b>41</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>

Source: NCDC, data accessed [3/16/18]

### **Probability of Future Occurrence**

From the data obtained from the NCDC<sup>46</sup>, 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 3.66**). Heavy rainfall events can be found in **Table 3.62**.

Since multiple high wind occurrences are anticipated each year (40 events/20 years), the probability of high winds is 100% with an average of 2 events per year (**Table 3.67**). High wind events can be found in **Table 3.63**.

In Crawford County, no lightning events (**Table 3.64**) in 20 years were recorded.

Lastly, the annual average percent probability of hail occurrence is 100% (41 events/20 years) with an average of 2.05 events per year (**Table 3.69**). Hail events can be found in **Table 3.65**.

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

Location	Annual Avg. % P
<b>Crawford County</b>	15%

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

<sup>46</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>

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

Location	Annual Avg. % P	Avg. # of Events
Crawford County	100%	2

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

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**Table 3.68. Annual Average % Probability of Lightning in Crawford County**

Location	Annual Avg. % P
Crawford County	0%

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

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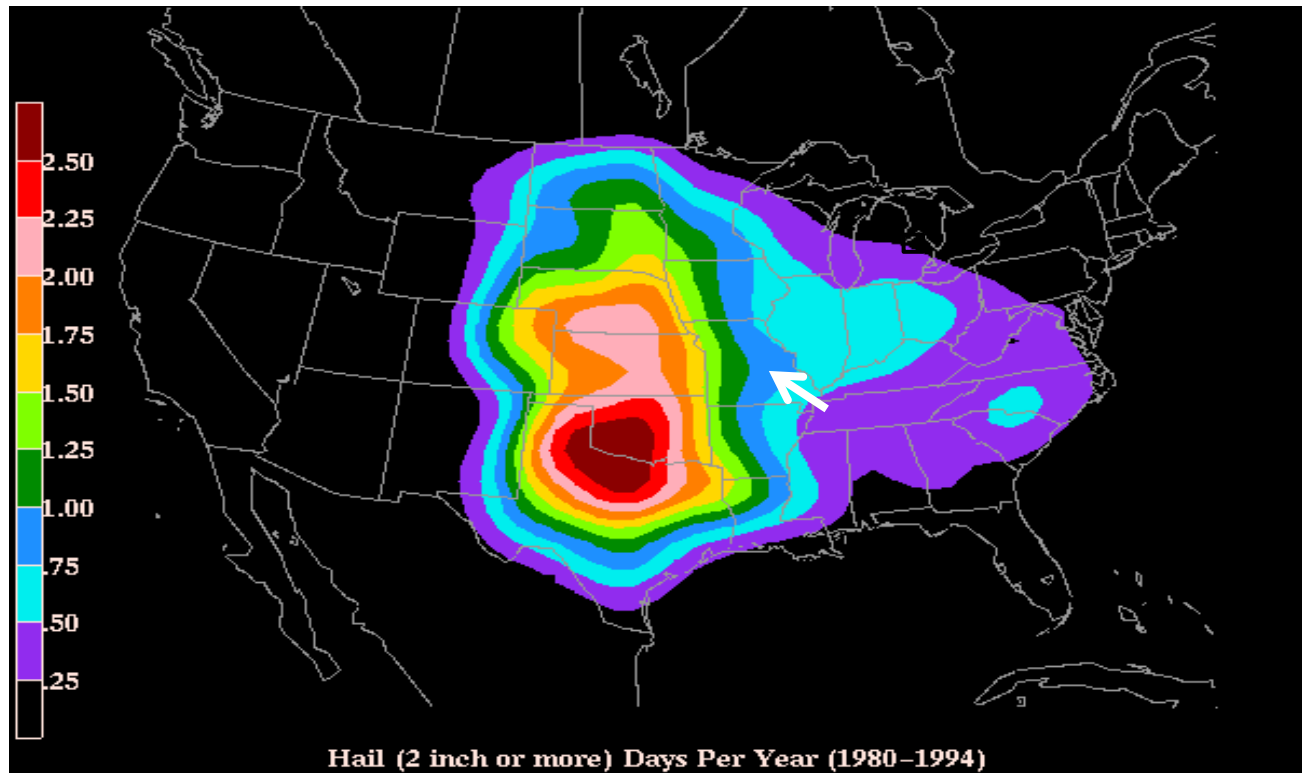
**Table 3.69. Annual Average % Probability of Hail in Crawford County**

Location	Annual Avg. % P	Avg. # of Events
Crawford County	100%	2.05

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

**Figure 3.53** 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 3.53. Annual Hailstorm Probability (2" diameter or larger), 1980- 1994**



Source: NSSL, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bighail.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif)

\* White arrow indicates Crawford County

## **Vulnerability**

### ***Vulnerability Overview***

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for vulnerability overview and analysis. Since severe thunderstorms occur frequently throughout Missouri, specific parameters were analyzed for each hazard. These parameters include damaging winds in excess of 67 mph (58 kts.), hail in excess of 0.75 inches, and damaging lightning strikes. **Table 3.70** illustrates housing density, building exposure, and crop exposure for Crawford County. Moreover, **Table 3.71** provides additional statistical data for the vulnerability analysis.

**Table 3.70. Crawford County Housing Density, Building Exposure and Crop Exposure**

<b>County</b>	<b>Housing Units/sq. mi.</b>	<b>Total Building Exposure (\$)</b>	<b>Crop Exposure (2007 Census of Ag.)</b>	<b>Social Vulnerability Index</b>
Crawford	16.1	\$2,166,540,000	\$1,777,000	1

Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.71. Additional Statistical Data Compiled for Vulnerability Analysis**

County	Total Hail Incidences	Total hail Property Loss (\$)	Total Crop Insurance Paid for Hail Damage (\$)	Total Wind Incidence (\$)	Total Wind Property Loss (\$)	Total Crop Insurance Paid for wind Damage (\$)	Total Lightning Incidences	Total Lightning Property Loss (\$)
Crawford	88	\$5,000	\$0	66	\$194,300	\$0	1	\$0

Source: 2013 Missouri State Hazard Mitigation Plan

Five factors were utilized in the overall vulnerability analysis of lightning. These factors include housing density, likelihood of occurrence, building exposure, average annual property loss ratio, and social vulnerability. For hail and wind, crop exposure and average annual crop insurance claims were also utilized. To better analyze the vulnerability analysis of severe thunderstorms, rating values were established; low, medium-low, medium, medium-high, and high (**Table 3.72**).

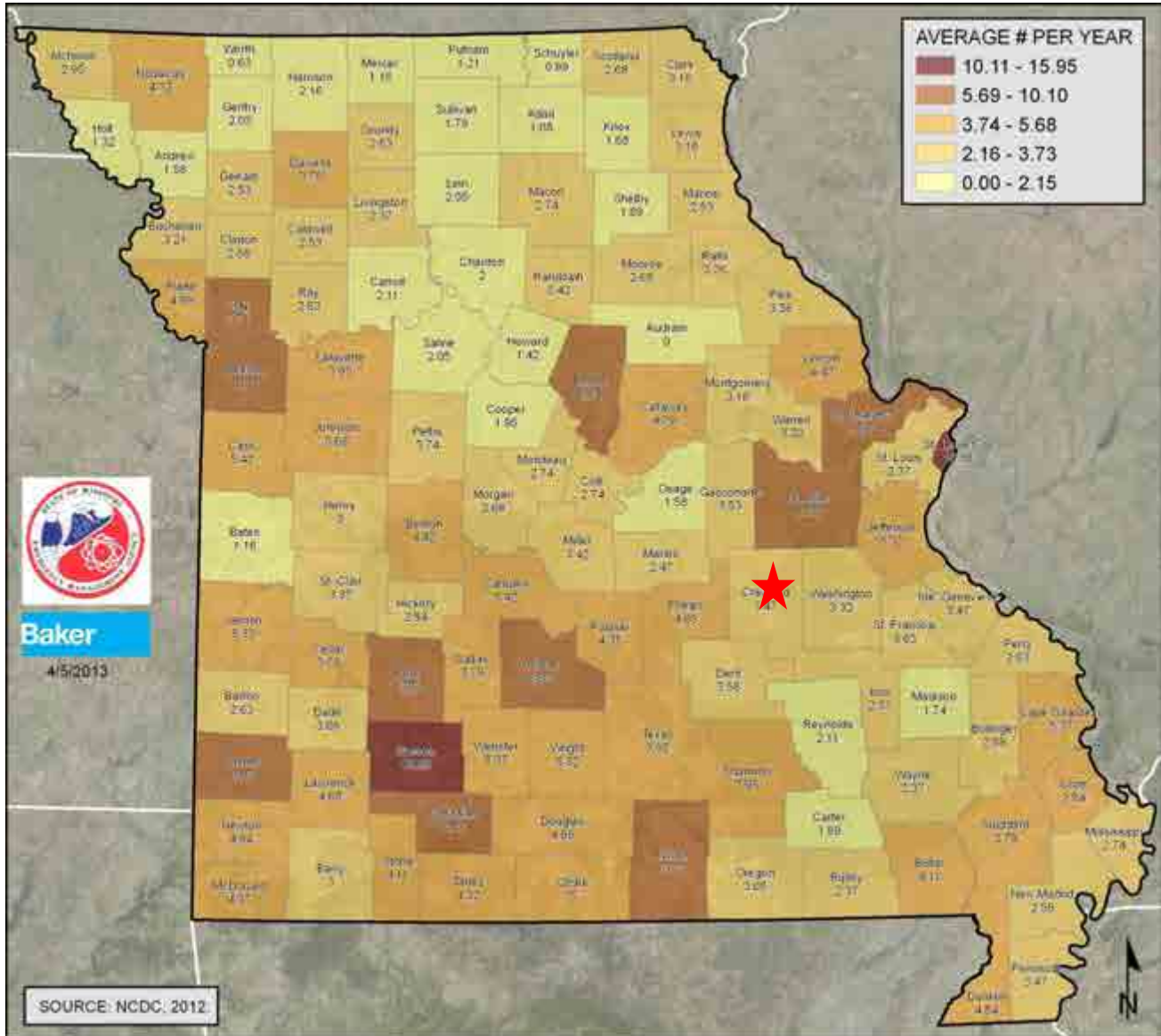
**Table 3.72. Ranges for Severe Thunderstorm Vulnerability Factor Ratings**

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

Source: 2013 Missouri State Hazard Mitigation Plan

Figure 3.54 through Figure 3.56 depicts the likelihood of occurrence of high winds, hail, and lightning events in Missouri.

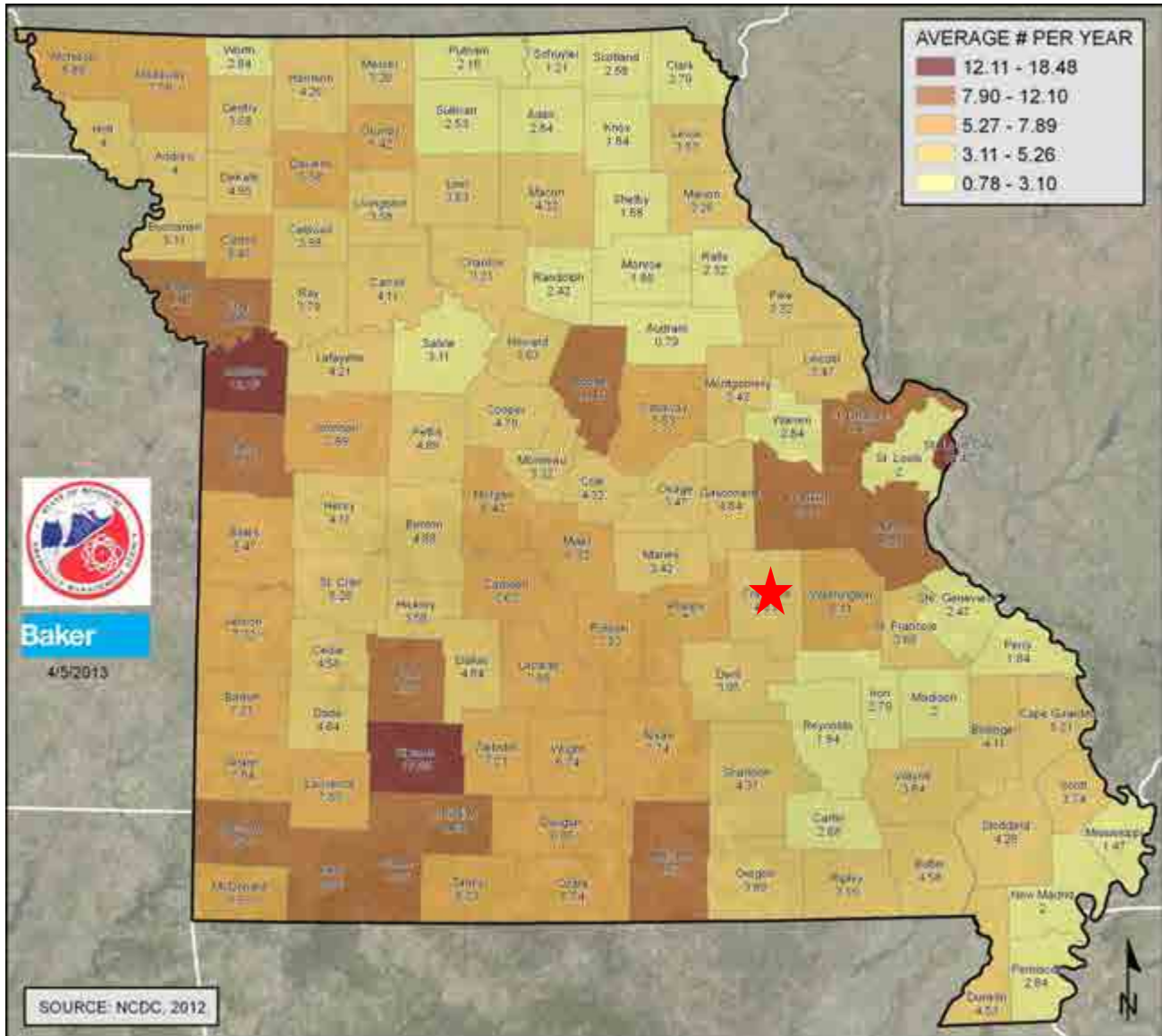
Figure 3.54. Likelihood of Occurrence of High Wind Events (67 MPH and higher)



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

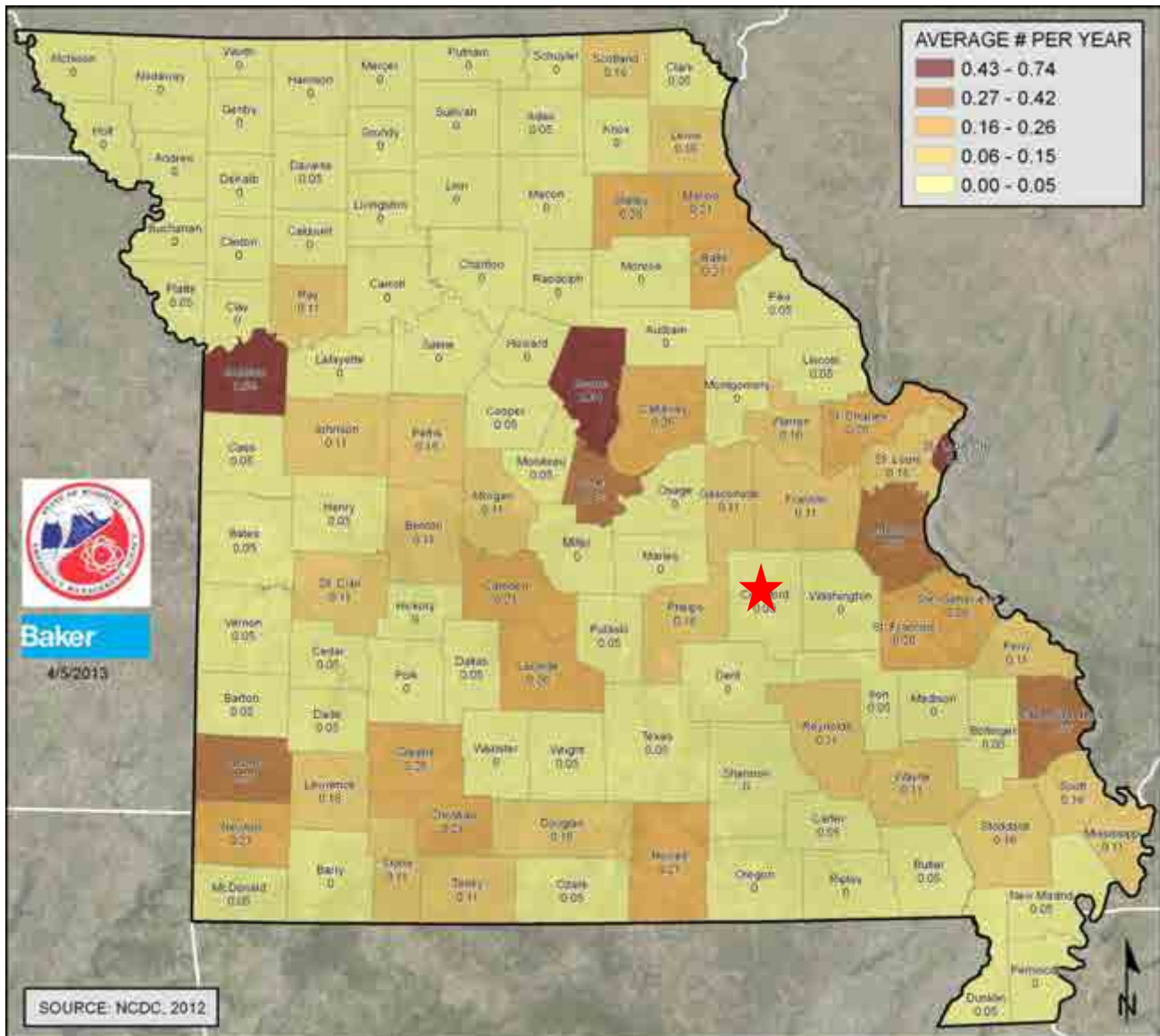


Figure 3.55. Likelihood of Occurrence of Damaging Hail Events (.75 inches and larger)



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

**Figure 3.56. Likelihood of Occurrence of Damaging Lightning Events**



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

After ranges were applied to all factors in the analysis for wind, hail, and lightning, they were weighted equally and factored together to determine an overall vulnerability rating. Following, a combined vulnerability rating was calculated. The following data provides the calculated ranges applied to determine overall vulnerability of Missouri counties to severe thunderstorms (**Table 3.73**). **Table 3.74** provides the calculated vulnerability rating for the severe thunderstorm hazard. **Figure 3.57** that follows provides the mapped results of this analysis by county<sup>47</sup>.

<sup>47</sup> 2013 Missouri State Hazard Mitigation Plan

**Table 3.73. Ranges for Severe Thunderstorm Combined Vulnerability Rating**

	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Severe Thunderstorm Combined Vulnerability	9 to 11	12 to 14	15 to 17	18 to 20	21 to 26

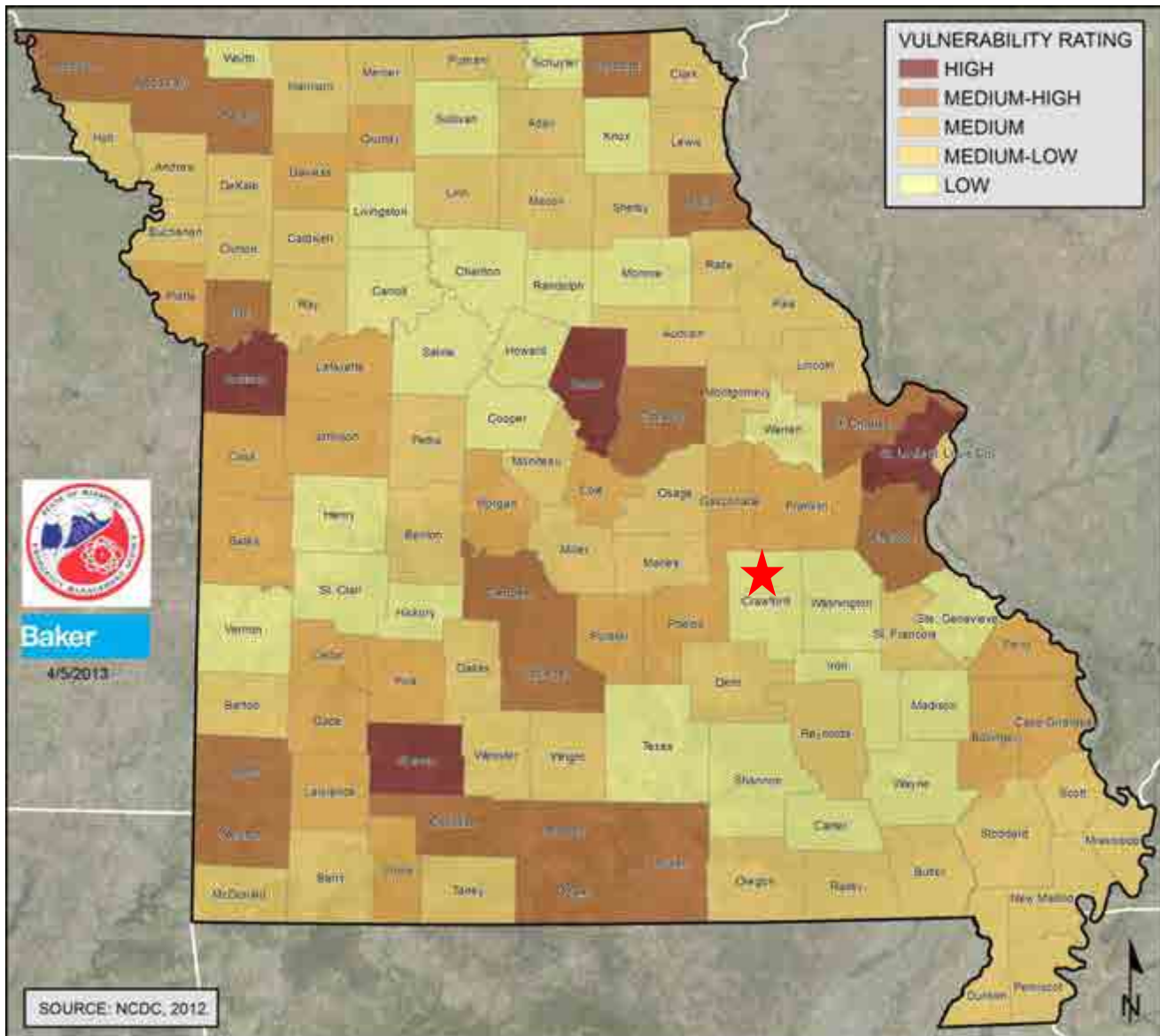
Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.74. Severe Thunderstorm Combined Vulnerability Rating**

County	Housing Density Rating	Wind Likelihood Rating	Annualized Wind Property Loss	Annualized Wind Crop Loss	Hail Likelihood Rating	Annualized Hail Property Loss	Annualized Hail Crop Loss	Lightning Likelihood Rating	Annualized Lightning Property Loss	Total Thunderstorm Vulnerability	Combined Vulnerability
Crawford	1	2	1	1	2	1	1	1	1	11	Low

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.57. Vulnerability Summary for Severe Thunderstorms**



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

**Potential Losses to Existing Development**

According to the NCDC Crawford County experienced approximately \$153,000 in property damages from severe thunderstorms between 1998 and 2017. Most of the property damage caused by storms is covered by private insurance and data is not available. In addition, most damage from severe thunderstorms occurs to vehicles, roofs, siding, and windows. However, there is a variety of impacts from severe thunderstorms. Moreover, secondary effects from hazards, falling trees and debris, can cause destruction within the planning area<sup>48</sup>.

<sup>48</sup> 2015 Boone County Hazard Mitigation Plan

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### ***Future Development***

As previously mentioned, the population within Crawford County is expected to increase by approximately 3,440 within the next 2 to 12 years. However, it is difficult to determine future impacts. However, anticipated development in each jurisdiction will result in increased exposure (**Page 3.23**). Likewise, increased development of residential structures will increase jurisdiction's vulnerability to damages from severe thunderstorms/ high winds/lightning/hail.

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

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

### **Problem Statement**

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



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### 3.4.9 Tornado

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Some specific sources for this hazard are:

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

#### **Hazard Profile**

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

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

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

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

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

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



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

**Geographic Location**

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.

**Severity/Magnitude/Extent**

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

Tornado magnitude is classified according to the EF- Scale (or the Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (**Table 3.75**) 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 3.75. Enhanced F Scale for Tornado Damage**

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

Source: The National Weather Service, [www.spc.noaa.gov/faq/tornado/ef-scale.html](http://www.spc.noaa.gov/faq/tornado/ef-scale.html)

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.76**. 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 3.76. Enhanced Fujita Scale with Potential Damage**

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

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

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

### ***Previous Occurrences***

**Table 3.77** illustrates NCDC data reported for tornado events and damages from 1998 to 2017 in the planning area. Prior to 1993, only highly destructive tornadoes were recorded.

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

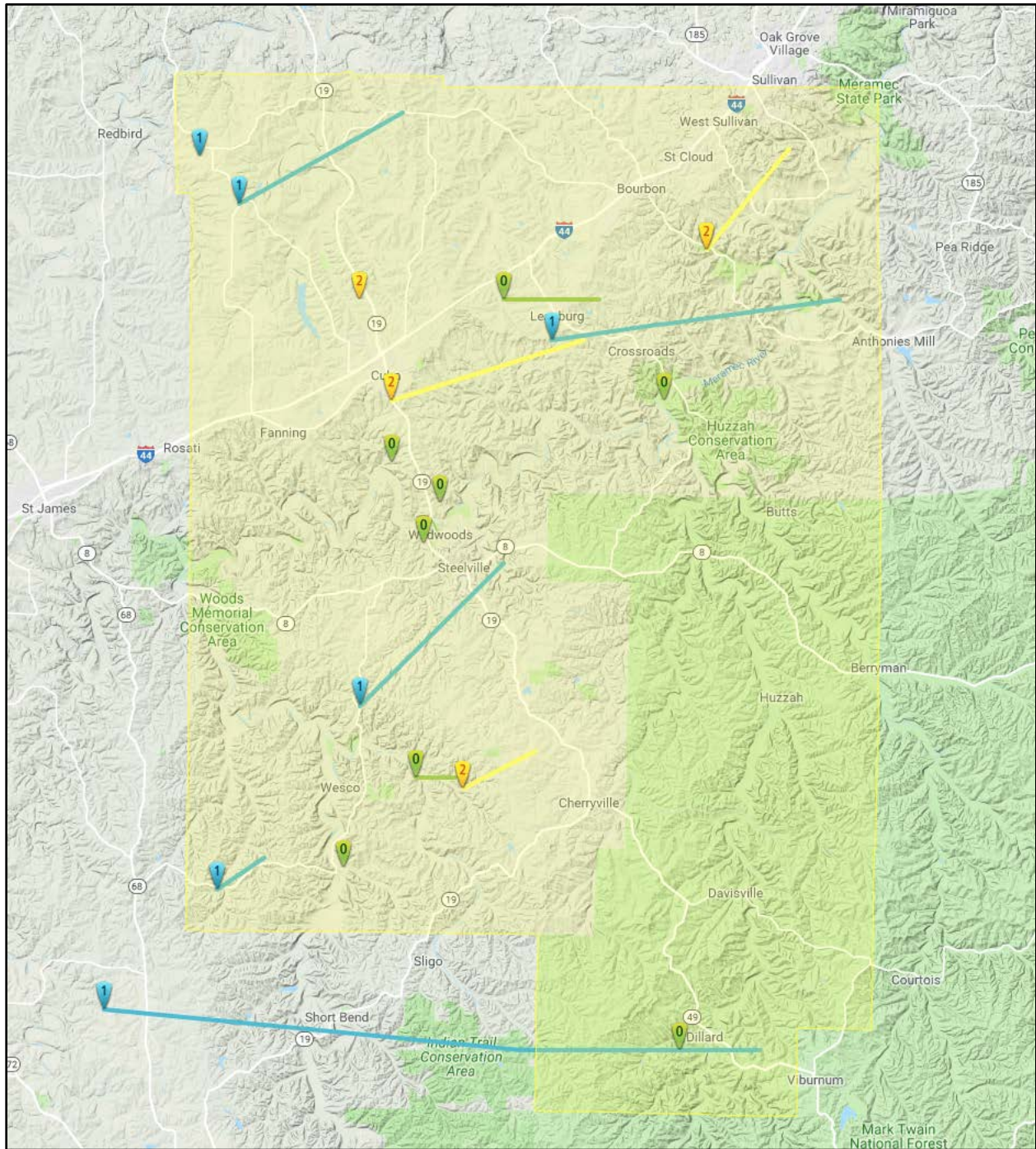
**Table 3.77. Recorded Tornadoes in Crawford County, 1998 – 2017**

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
6/1/1999	3NNW Steelville	3NNW Steelville	.2	75	F0	0	0	1.00K	0
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	150.00K	0
5/11/2016	2SE Bourbon	5ENE Bourbon	4.43	700	EF2	0	0	0	0
<b>Total</b>	-	-	-	-	-	<b>0</b>	<b>3</b>	<b>151.00K</b>	<b>0</b>

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

**Figure 3.58** depicts historic tornado paths across Crawford County.

**Figure 3.58. Crawford County Map of Historic Tornado Paths**



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

According to the USDA Risk Management Agency's record, there were no insurance payments in Crawford County for crop damages as a result of tornadoes between 1998 and 2017.

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### **Probability of Future Occurrence**

From the data obtained from the NCDC<sup>49</sup>, an annual average percent probability was calculated for tornadoes within Crawford County (**Table 3.78**). There is a 40 percent annual average probability of a tornado occurrence (8 events/20 years x 100). Tornado events can be found in **Table 3.77**. In addition, **Figure 3.59**, obtained from the 2013 Missouri State Hazard Mitigation Plan, also illustrates tornado probabilities across the State.

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**Table 3.78. Annual Average % Probability of Tornadoes in Crawford County**

Location	Annual Avg. % P
Crawford County	40%

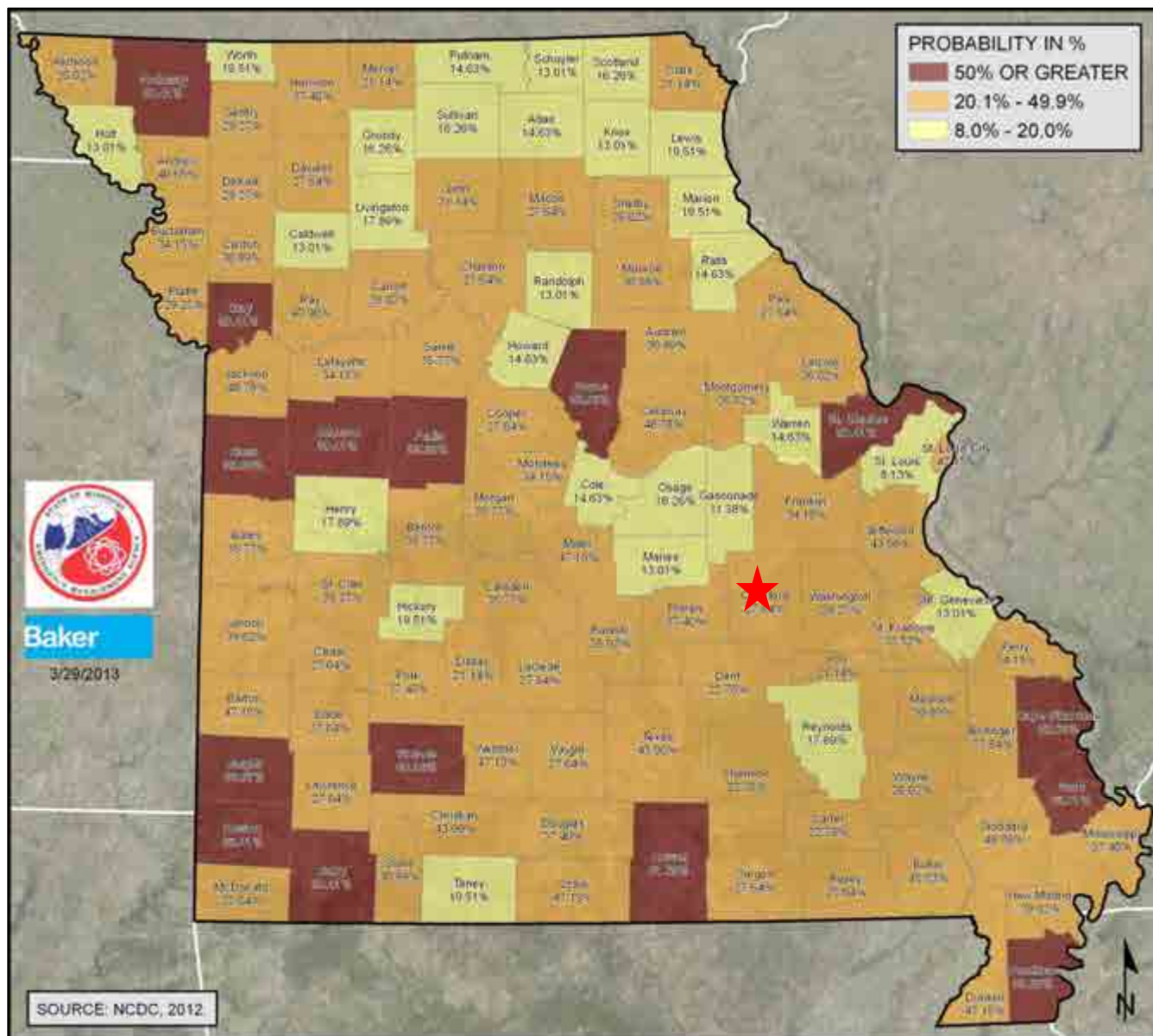
\*P = probability; see page 3.24 for definition.

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<sup>49</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>



**Figure 3.59. Missouri Tornado Probability**



Source: 2013 Missouri State Hazard Mitigation Plan

\*Red star indicates Crawford County

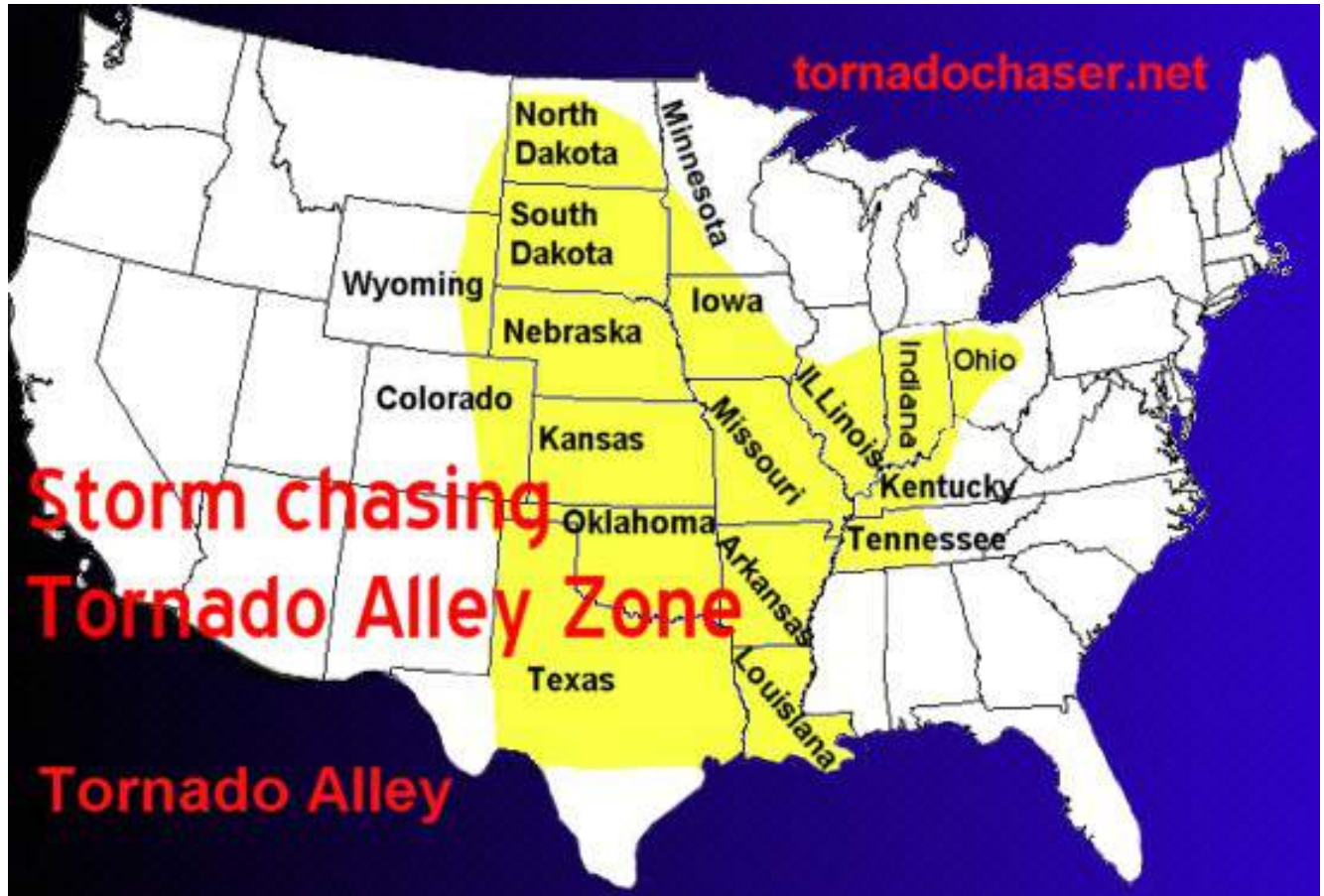
## **Vulnerability**

### ***Vulnerability Overview***

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 3.60** is referred to as “Tornado Alley”. Furthermore, **Figure 3.61** illustrates areas where perilous tornadoes historically have occurred in Missouri.

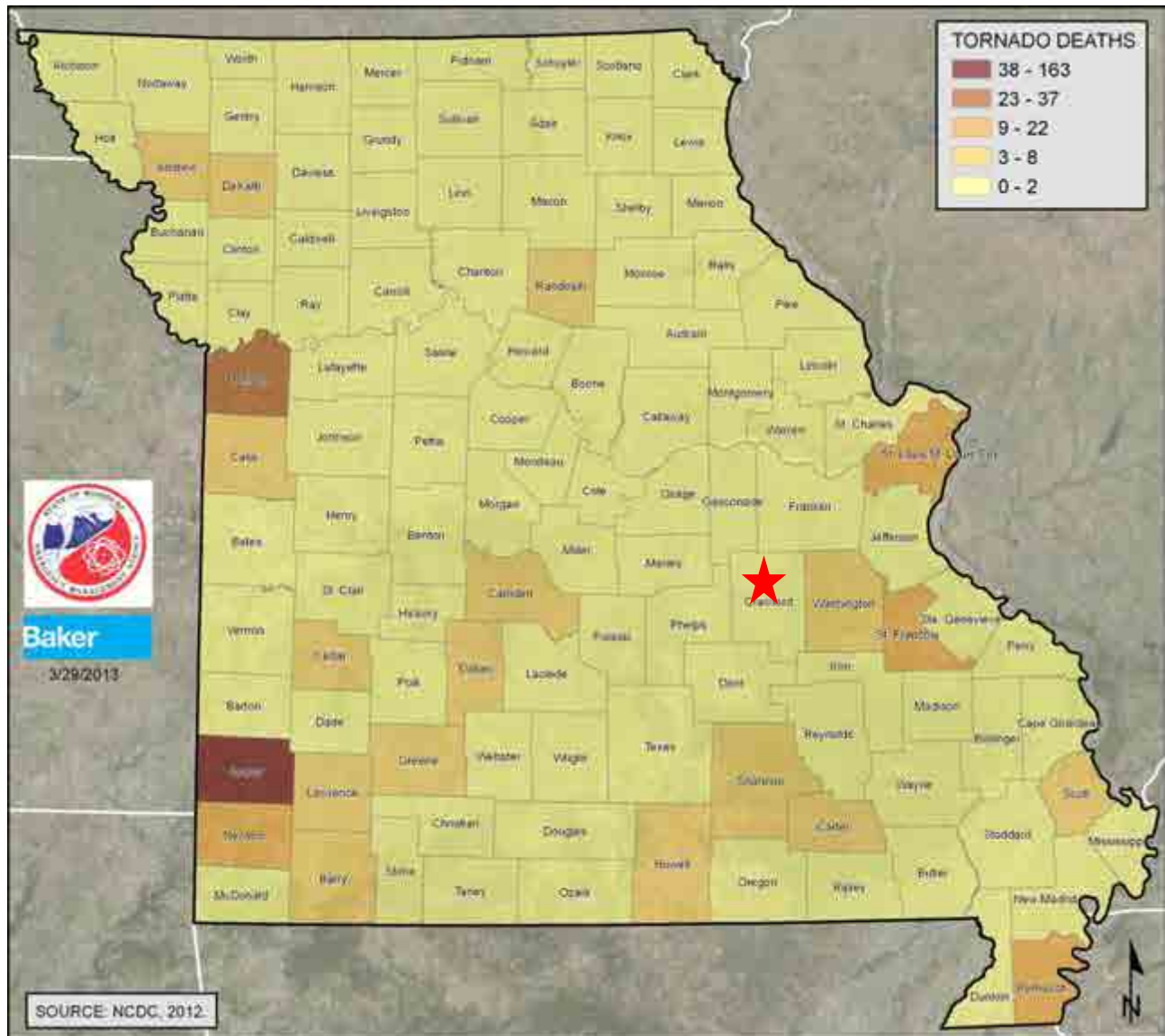


Figure 3.60. Tornado Alley in the U.S.



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

**Figure 3.61. Missouri Tornado Deaths by county, 1950 – March 17, 2012**



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

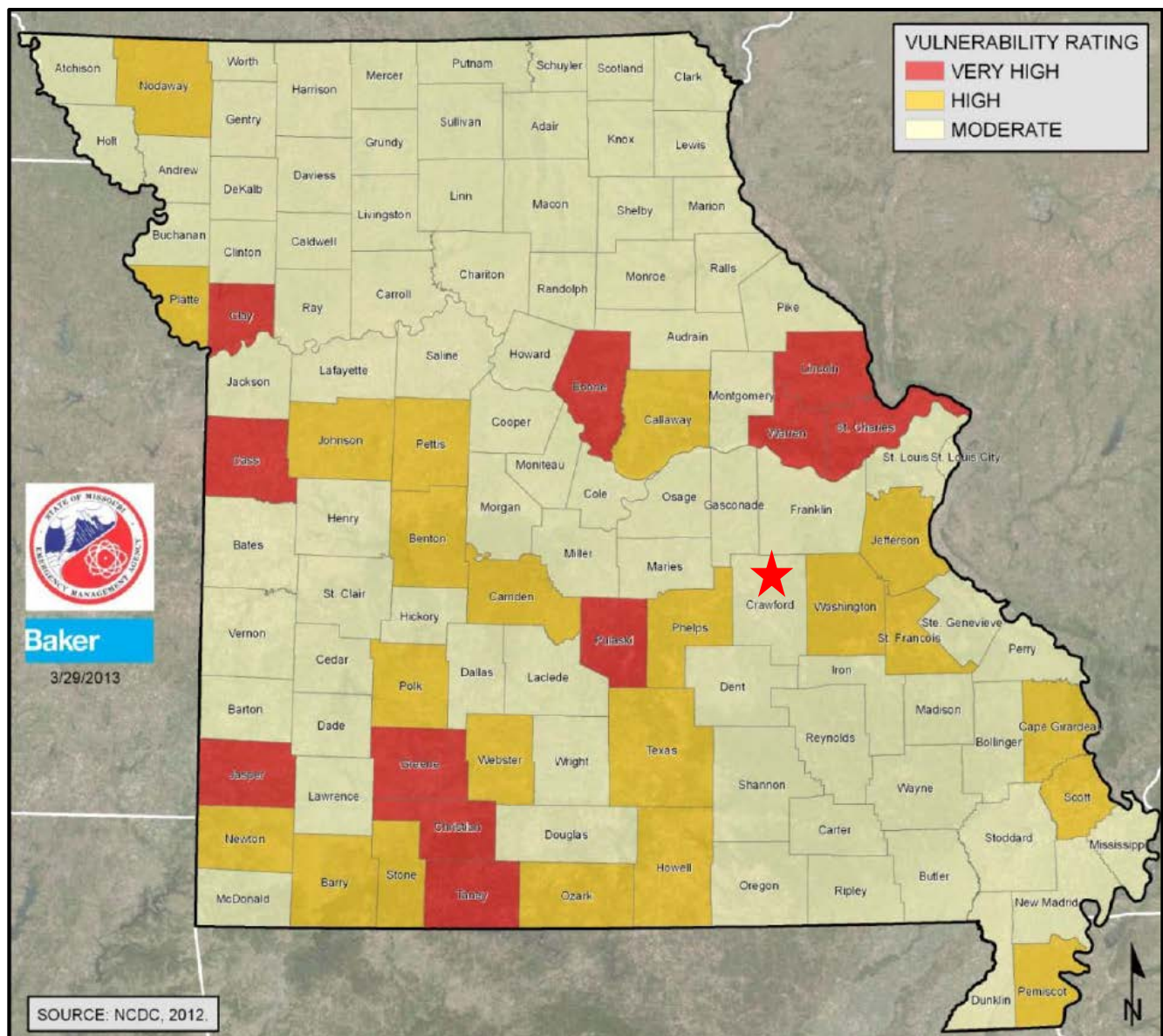
Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for tornado vulnerability. The analysis depicts the likelihood of future tornado impacts, average annual property loss ratio, population change, and house change. Factors were ranked from 1 to 3; moderate, high, and very high, respectively. The factor scores are totaled to estimate Crawford County’s vulnerability to tornadoes (**Table 3.79**). Since tornadoes are probable to occur across the state, the lowest risk factor is still considered moderate. **Figure 3.62** depicts the vulnerability summary for tornadoes across Missouri by county.

**Table 3.79. Factors and Ranges Considered in Tornado Vulnerability Analysis**

Factors Considered	Moderate (1)	High (2)	Very High (3)
Likelihood of Occurrence (# of events/ yrs. Of data)	6 - 24	25 - 49	50 - 68
Loss Ratio %	0 - .113	0.114 - .226	0.227 - 0.340
Population % Change	Below 6	7 - 22	23 - 39
Housing % Change	Below 12	13 - 25	26 - 39
Overall Vulnerability Rating	4 and 5 Rating	6 and 7 Rating	3 and 9 Rating

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.62. Vulnerability Summary for Tornadoes**



Source: 2013 Missouri State Hazard Mitigation Plan

\*Red star indicates Crawford County



**Table 3.80** provides information in regards to tornado probability, potential loss, and risk summary for Crawford County. This table was calculated to determine 10 counties with the largest annualized historic tornado losses between 1950 and July 31, 2012 (**Table 3.81** and **Figure 3.63**).

**Table 3.80. Tornado Probability, Potential Loss, and Risk Summary**

County	# of Tornadoes	Likelihood of Occurrence	Probability Rating	Total Exposure (\$)	Annualized Historic Loss	Loss Ratio	Loss Ratio Rating	Population Growth % Change	Pop. Change Rating	House % Change	Housing Ratio Rating	Total Vulnerability
Crawford	17	27.64 %	2	\$2,166,540,000	\$1,569,054	0.072 %	1	8.3 %	1	10.98 %	1	Moderate

Source: 2013 Missouri State Hazard Mitigation Plan

**Table 3.81. Top 10 Counties Ranked by Annualized Historic Tornado Loss 1950 – July 2012**

County	Annualized Historic Loss 1950 - July 31, 2012
Jasper	\$48,523,987
Greene	\$2,305,620
Pettis	\$2,031,696
Cass	\$1,890,914
Phelps	\$1,876,552
Newton	\$1,793,334
Crawford	\$1,569,054
Perry	\$1,172,592
Howell	\$1,200,223
Gasconade	\$1,132,245

Source: 2013 Missouri State Hazard Mitigation Plan



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## **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 3.37** for jurisdictions most vulnerable to damage due to the age of the structure. Furthermore, data was obtained from the U.S. Census Bureau for the number of mobile homes in Crawford County. From the information provided in **Table 3.82**, West Sullivan, Bourbon, and Crawford County are most vulnerable to losses due to the number of mobile homes residing within the jurisdiction.

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**Table 3.82. Percentage of Mobile Homes in Crawford County, 2016**

<b>Jurisdiction</b>	<b>Number of Mobile Homes</b>	<b>Percentage of Mobile Homes*</b>
Unincorporated Crawford County	1,744	14.6
Bourbon	123	16
Cuba	105	7.1
Steelville	63	8.0
Sullivan	85	2.7
West Sullivan	8	29.6

Source: U.S. Census Bureau, 2012-2016 5-Year American Community Survey

\*Number of mobile homes per jurisdiction/total housing units per jurisdiction

\*\*Total housing units for all jurisdictions = 11,931

## **Problem Statement**

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



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### 3.4.10 Winter Weather/Snow/Ice/Severe Cold

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Some specific sources for this hazard are:

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

#### **Hazard Profile**

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

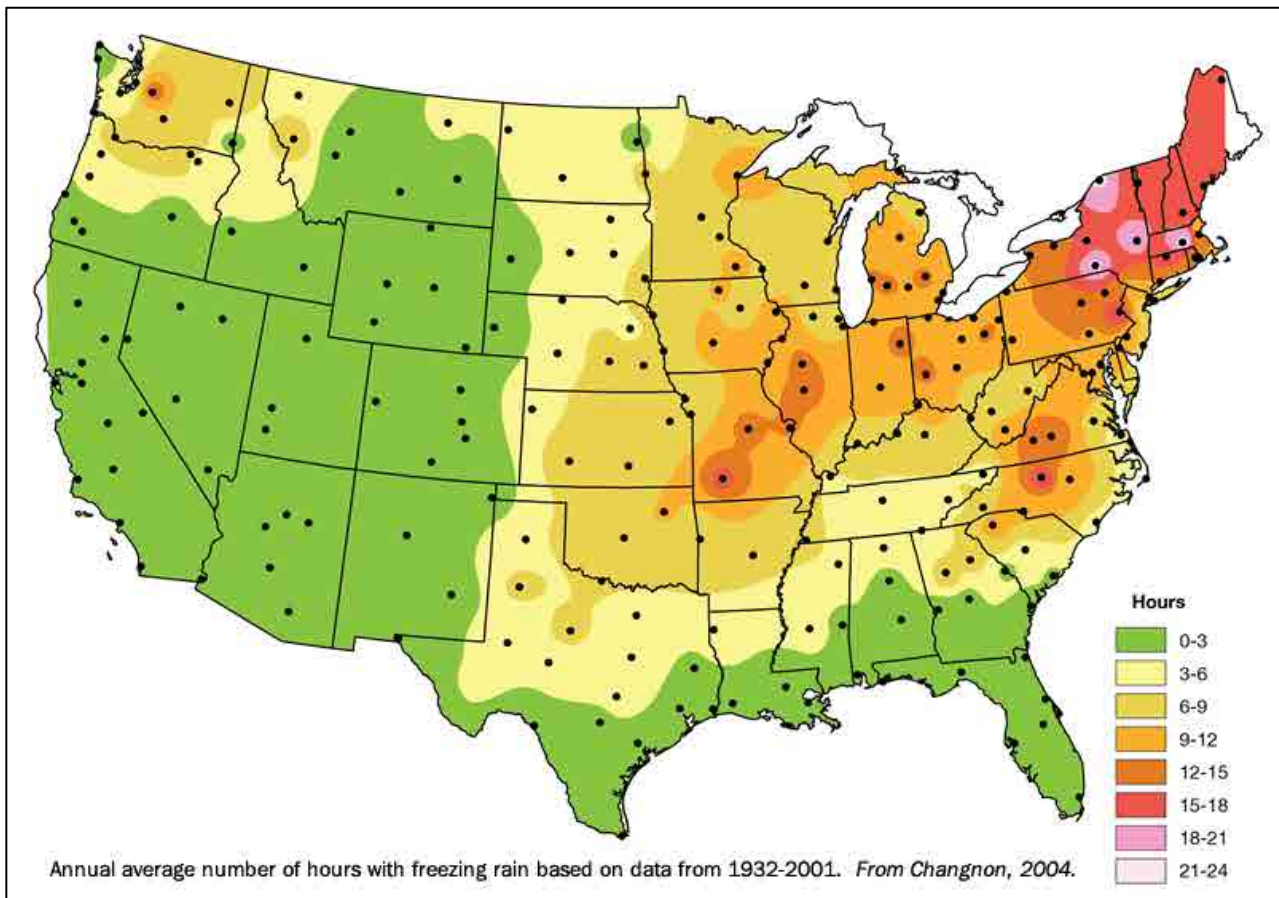
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows.

- **Blizzard**—Winds of 35 miles per hour or more with snow and blowing snow reducing visibility to less than  $\frac{1}{4}$  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 3.64** illustrates statewide average number of hours per year with freezing rain. Crawford County receives approximately 9 to 12 hours.

**Figure 3.64. NWS Statewide Average Number of Hours per Year with Freezing Rain**



Source: Changon, 2004, [http://mrcc.isws.illinois.edu/living\\_wx/icestorms/](http://mrcc.isws.illinois.edu/living_wx/icestorms/)

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

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

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

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

Also at risk are those without shelter, those who are stranded, or who live in a home that is poorly

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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.

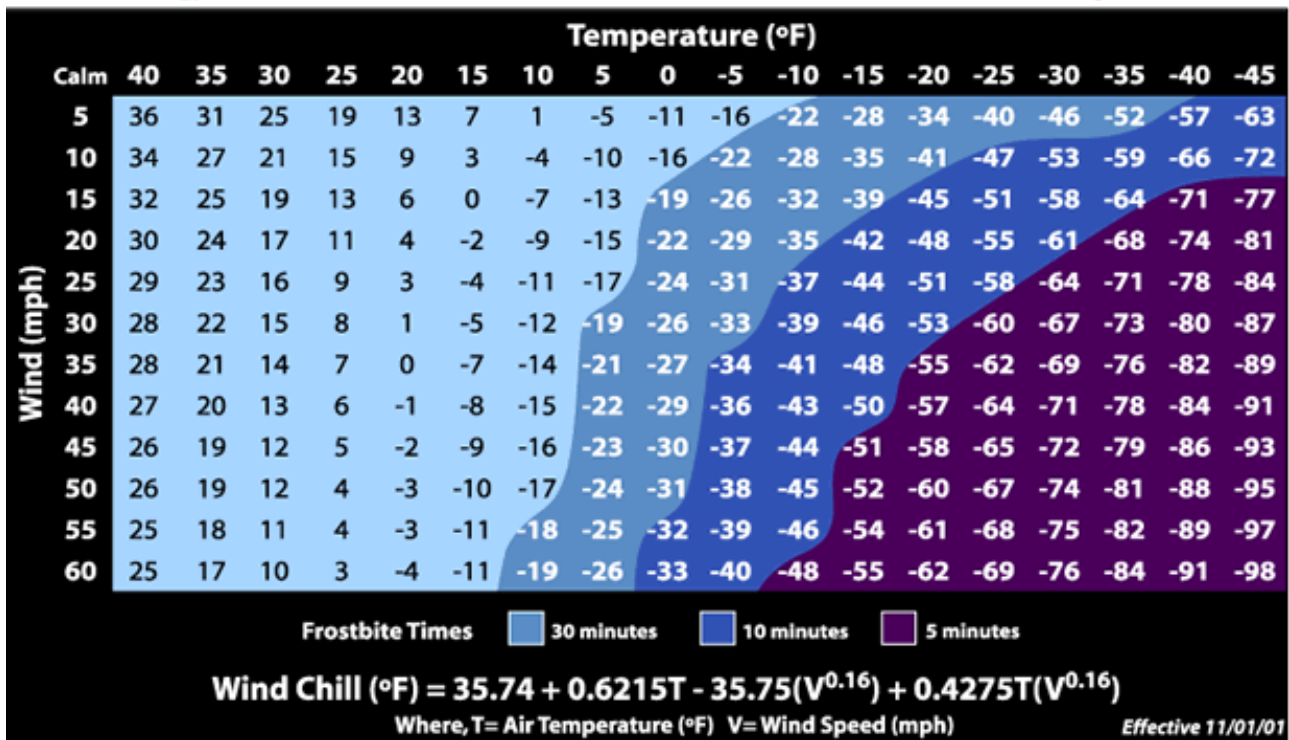
Overhead power lines and infrastructure are also vulnerable to damages from winter storms. In particular, ice accumulation during winter storms can damage power lines and equipment. Damages also occur to lines and equipment from falling trees and tree limbs weighted down by ice. Potential losses could 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 3.65** below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Winter storms, cold, frost, and freeze all can influence or negatively impact crop production. However, data obtained from the USDA's Risk Management Agency for insured crop losses indicates that there were no claims paid in Crawford County between 1998 and 2017 for severe winter weather.

Figure 3.65. Wind Chill Chart



Source: National Weather Service, <http://www.nws.noaa.gov/om/winter/windchill.shtml>

**Previous Occurrences**

Data was obtained from the NCDC for winter weather reported events and damages between 1998 and 2017 (Table 3.83). 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 3.83. NCDC County A Winter Weather Events Summary, 1998 - 2017

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Winter Storm	1/12/1998	0	0	0
Winter Storm	3/8/1998	0	0	0
Winter Storm	12/21/1998	0	0	0
Winter Storm	1/1/1999	0	0	0
Ice Storm	1/13/1999	0	0	0
Winter Storm	3/13/1999	0	0	0
Winter Storm	1/28/2000	0	0	0
Winter Storm	3/11/2000	0	0	0
Heavy Snow	12/13/2000	0	0	0
Extreme Cold/Wind	12/16/2000	0	0	0
Ice Storm	2/21/2001	0	0	0

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
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
Winter Storm	11/30/2006	0	0	0
Winter Storm	12/1/2006	0	0	0
Ice Storm	1/12/2007	0	745.00K	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
<b>Total</b>	<b>38</b>	<b>0</b>	<b>745.00K</b>	<b>0</b>

Source: NCDC, data accessed [3/16/18]

### Notable Winter Narratives:

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

Missouri and parts of Southwest Illinois. Flooding of low lying areas and low water crossings occurred across the eastern Ozarks late Friday night and Saturday morning.

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

From the data obtained from the NCDC<sup>51</sup>, annual average percent probabilities were calculated for winter weather within Crawford County (**Table 3.84**). There were 38 recorded events (**Table 3.83**) over a 20 year period. There is 100 percent annual average probability of winter weather occurrence (38 events/20 years x 100), with an average of 1.9 events per year.

**Table 3.84. Annual Average % Probability of Winter Weather in Crawford County**

Location	Annual Avg. % P	Avg. # of Events
Crawford County	100%	1.9

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

## **Vulnerability**

### ***Vulnerability Overview***

Data was obtained from the 2013 Missouri State Hazard Mitigation Plan for vulnerability information regarding Crawford County. Various data sources were utilized for statistical analysis including the following:

- National Climatic Data Center (NCDC)
- FEMA's Public Assistance Funds
- Crop Insurance Claims data from the USDA's Risk Management Agency
- HAZUS-MR4
- U.S. Census Data
- USDA's Census of Agriculture

The following Table (**Table 3.85**) includes data elements for severe winter weather.

**Table 3.85. Crawford County Housing Density, Building Exposure, Crop Exposure, Social Vulnerability Index, Total incidents, Total Property Loss, and Total Crop Insurance Paid Data**

County	Housing Units/sq. mi.	Total Building Exposure (\$)	Crop Exposure (2007) (\$)**	Total Incidences	Total \$ Property Los (\$)	Total Crop Insurance Paid (\$)
Crawford	16.1	\$2,166,540,000	\$1,777,000	38	\$976,143	\$0

<sup>51</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI>



Seven factors were utilized to determine overall severe winter storm vulnerability. These factors include housing density, likelihood of occurrence, building exposure, crop exposure, average annual property loss ratio, average annual crop insurance claims and social vulnerability. Furthermore, 5 rating values were developed for each factor. **Table 3.86** illustrates vulnerability analysis rating factors.

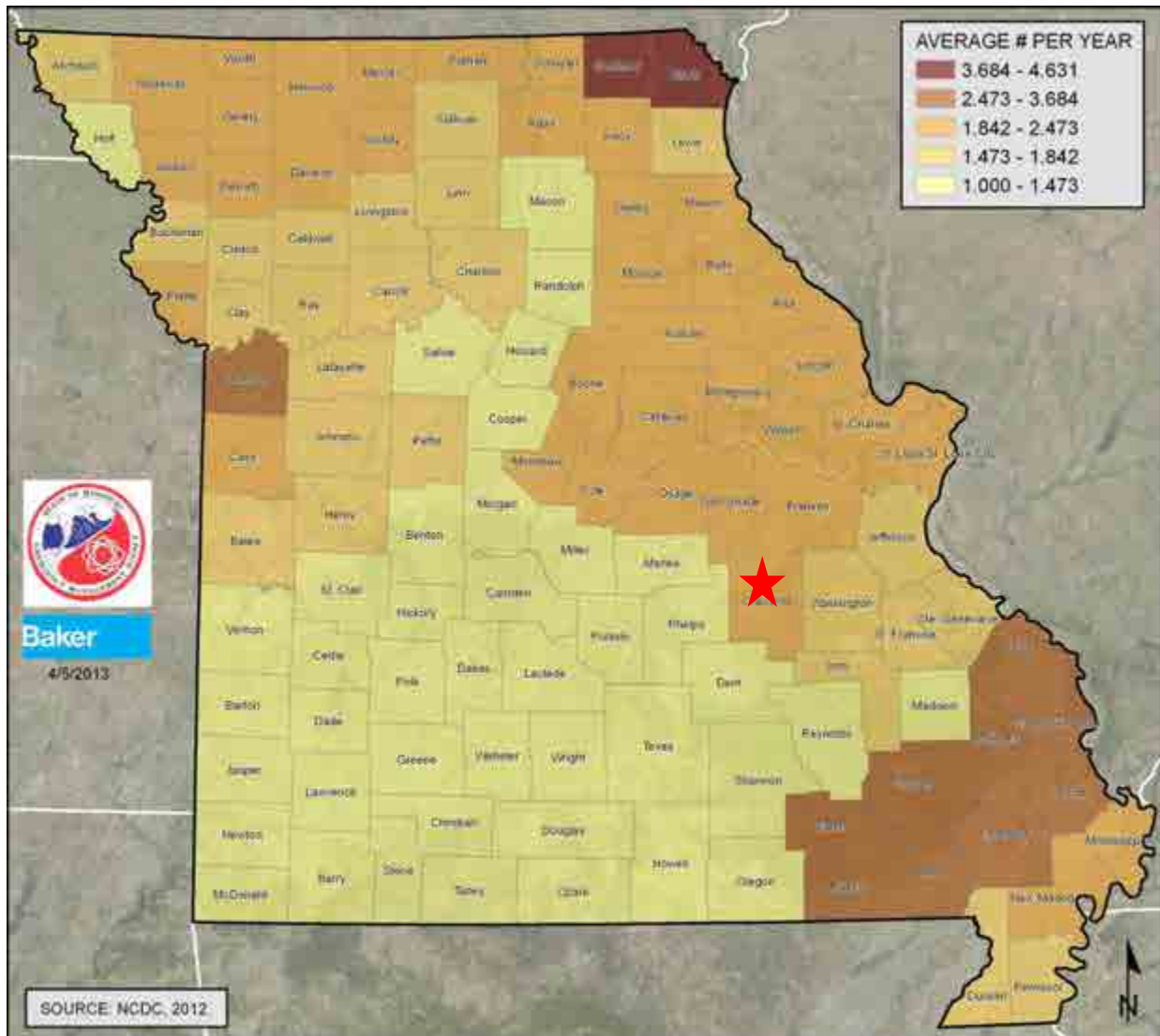
**Table 3.86. Vulnerability Analysis Rating Factors**

Factors considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high (4)	High (5)
Housing Density (# per sq. mile)	<50	50 - 99	100 - 299	300 - 499	>500
Crop Exposure (4)	<\$10M	\$10M to \$24M	\$25M to \$49M	\$50M to \$99M	>\$100M
Social Vulnerability	1	2	3	4	5
Likelihood of Occurrence (# of events/ yrs. Of data)	1.000 - 1.473	1.473 - 1.842	1.842 - 2.473	2.473 - 3.684	3.684 - 4.631
Annualized Property Loss Ratio (annual property loss/exposure)	0.0 - 0.000110	0.000111 - 0.000274	0.000275 - 0.000636	0.000637 - 0.001397	0.001398 - 0.003270

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.66** illustrates the likelihood of occurrence of severe winter weather across Missouri. Crawford County was estimated to have an average of 1.842 to 2.473 severe winter weather events per year.

**Figure 3.66. Likelihood of Occurrence of Severe Winter Weather**



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

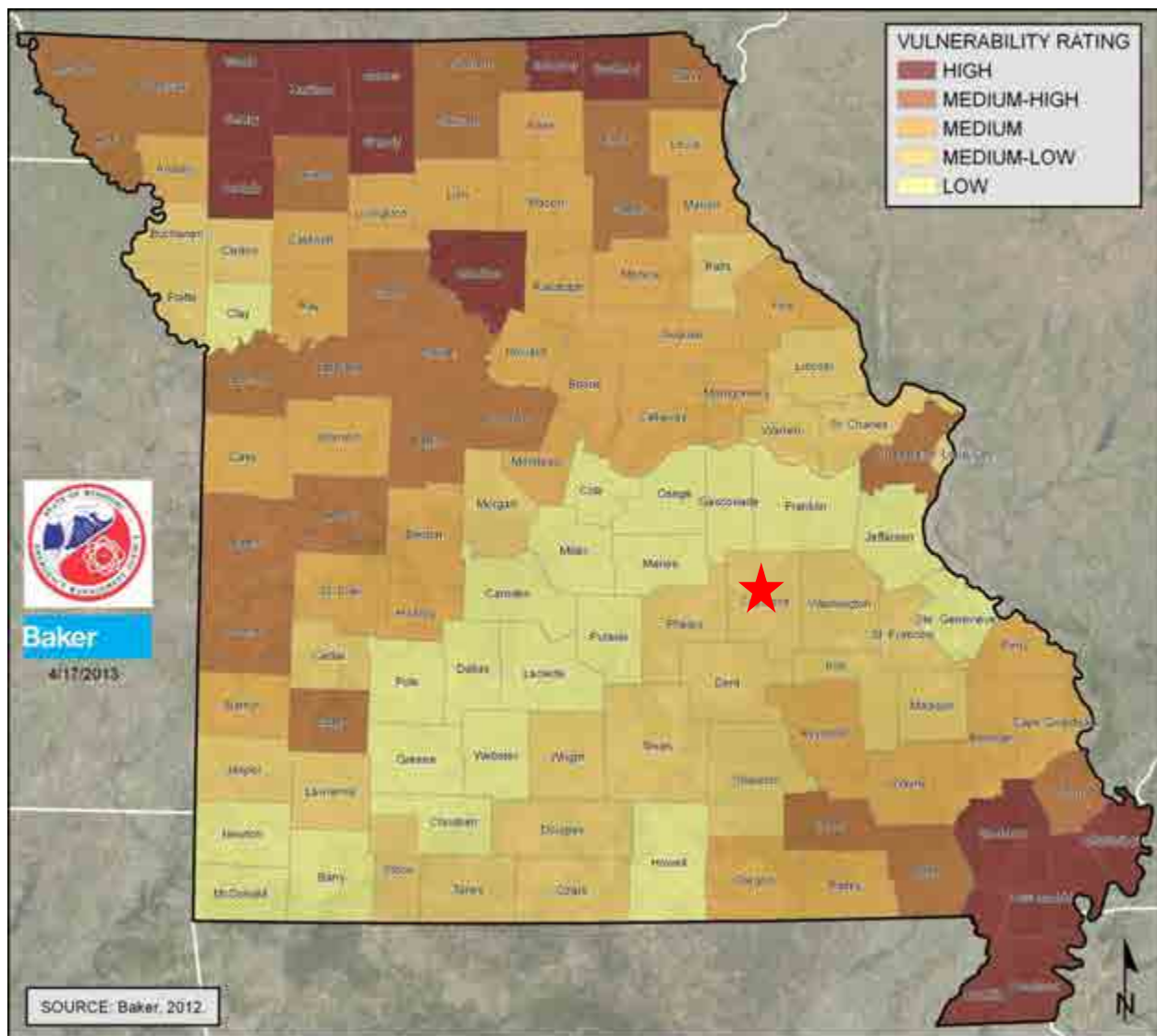
**Table 3.87** depicts the calculated vulnerability rating for each factor considered in the vulnerability analysis for severe winter weather hazards. The overall vulnerability rating for severe winter weather in Crawford County is medium-low. Moreover, **Figure 3.67** illustrates vulnerability ratings for each county within Missouri.

**Table 3.87. Crawford County Vulnerability Analysis for Severe Winter Weather**

County	Housing Density Rating	Likelihood Rating	Property Loss Rating	Crop Exposure Rating	Crop Loss Ratio Rating	Social Vulnerability Index	Total Score and Vulnerability	Vulnerability Rating
Crawford	1	3	1	1	1	4	11	Medium-Low

Source: 2013 Missouri State Hazard Mitigation Plan

**Figure 3.67. Vulnerability Summary for Severe Winter Storm**



Source: 2013 Missouri State Hazard Mitigation Plan

\*Red star indicates Crawford County



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

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

### ***Future Development***

Data for future development for the planning area is sparse. However, winter weather will affect the county as a whole. Any future development is at risk to damages and increased exposure. In addition, the county's population is anticipated to increase, which would increase the number of individuals at risk during a winter weather event.

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

Variations in impacts are not anticipated for severe winter weather across the planning area. Yet, areas with high number of mobile homes tend to experience increased damages. West Sullivan, Bourbon, and Crawford County have the highest abundance of mobile homes, making the area more prone to increase exposure to damage.

### **Problem Statement**

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

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## 4 MITIGATION STRATEGY

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<b>4</b>	<b>MITIGATION STRATEGY .....</b>	<b>4.1</b>
4.1	<i>Goals.....</i>	4.1
4.2	<i>Identification and Analysis of Mitigation Actions.....</i>	4.2
4.3	<i>Implementation of Mitigation Actions .....</i>	4.4

**44 CFR Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.**

This section presents the mitigation strategy updated by the Mitigation Planning Committee (MPC) based on the updated risk assessment. The mitigation strategy was developed through a collaborative group process. The process included review of general goal statements to guide the jurisdictions in lessening disaster impacts as well as specific mitigation actions to directly reduce vulnerability to hazards and losses. The following definitions are taken from FEMA's *Local Hazard Mitigation Review Guide (October 1, 2012)*.

- **Mitigation Goals** are general guidelines that explain what you want to achieve. Goals are long-term policy statements and global visions that support the mitigation strategy. The goals address the risk of hazards identified in the plan.
- **Mitigation Actions** are specific actions, projects, activities, or processes taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan’s mission and goals.

### 4.1 Goals

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**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. Therefore, the goals from the updated 2013 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 2013 State Hazard Mitigation Plan goals were reviewed. As the existing goals were broad, still applicable, and supported the 2013 State Hazard Mitigation Plan goals, the MPC saw no reason to make any changes. The Crawford County goals are as follows:

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

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

**Goal 3:** Promote education, outreach, research and development programs to improve the



knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.

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

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

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

## 4.2 Identification and Analysis of Mitigation Actions

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

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

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

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

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

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

- Completed, with a description of the progress,

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

Based on the status updates, there were five completed actions, five deleted actions, and 27 continuing actions.

**Table 4.1** provides a summary of the action statuses for each jurisdiction. See **Appendix C: Completed/Deleted Mitigation Actions** for a summary of the completed and deleted actions from the previous plan.

**Table 4.1. Summary of Completed and Deleted Actions from the Previous Plan**

<b>Completed Actions</b>	<b>Completion Details (date, amount, funding source)</b>
1.5: Partner with local radio stations to assure that appropriate warning of impending disasters is provided to all residents in the countywide listening area.	The county EMD has made arrangements with Results Radio (5 stations), KTUI in Sullivan and a radio station in Farmington to provide advance warnings.
3.8: Publicize city and/or county drills	This action has been/is being addressed through TV, Radio, Social Media, and Website.
4.1: Encourage joint meetings of different organizations/agencies for mitigation planning.	Jurisdictions regularly conduct joint meetings throughout the county (chiefs meetings, hazard mitigation meetings, safety coordinator meetings, SEMA training, schools/safety coordinators/first response/hospital meetings, and tabletop exercises).
4.2: Joint training or drills between agencies, public and private entities including schools and businesses.	This action item has been/is being addressed. See action item 4.1 above.
6.1 Work with SEMA Region I Coordinator to learn about new mitigation funding opportunities.	This action item has been/will be addressed by the Region I Coordinator.
<b>Deleted Actions</b>	<b>Reason for Deletion</b>
3.3 Encourage local residents to purchase weather radios.	This action item has been combined with 3.2.
4.4 Encourage meetings between EMD, city/county officials and SEMA to familiarize local officials with mitigation planning and implementation and budgeting for mitigation projects.	This action item has been combined with 3.4.
5.1 Encourage communities to budget for enhanced warning systems.	This action item has been combined with 1.3.
5.6: Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.	The planning group ranked this as a low priority.
6.6 Implement public awareness program about the benefits of hazard mitigation projects, both public and private.	This action item has been combined with 3.6.

Source: Previously approved County Hazard Mitigation Plan; MPC committee; data collection questionnaires

## 4.3 Implementation of Mitigation Actions

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**44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include an action strategy describing how the actions identified in paragraph (c)(2)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefits review of the proposed projects and their associated costs.**

Jurisdictional MPC members were encouraged to meet with others in their community to discuss the actions to be included in the updated mitigation strategy. Throughout the MPC consideration and discussion, emphasis was placed on the importance of a benefit-cost analysis in determining project priority. The Disaster Mitigation Act requires benefit-cost review as the primary method by which mitigation projects should be prioritized. The MPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the Missouri State Hazard Mitigation Plan. The benefit/cost review at the planning stage primarily consisted of a qualitative analysis, and was not the detailed process required grant funding application. For each action, the plan sets forth a narrative describing the types of benefits that could be realized from action implementation. The cost was estimated as closely as possible, with further refinement to be supplied as project development occurs.

FEMA's STAPLEE methodology was used to assess the costs and benefits, overall feasibility of mitigation actions, and other issues impacting project. During the prioritization process, the MPC worked together to review and assign scores. The process posed questions based on the STAPLEE elements as well as the potential mitigation effectiveness of each action. Scores were based on the responses to the questions as follows:

Definitely yes = 3 points  
Maybe yes = 2 points  
Probably no = 1  
Definitely no = 0

The following questions were asked for each proposed action.

S: Is the action socially acceptable?  
T: Is the action technically feasible and potentially successful?  
A: Does the jurisdiction have the administrative capability to successfully implement this action?  
P: Is the action politically acceptable?  
L: Does the jurisdiction have the legal authority to implement the action?  
E: Is the action economically beneficial?  
E: Will the project have an environmental impact that is either beneficial or neutral? (score "3" if positive and "2" if neutral)

Will the implemented action result in lives saved?  
Will the implanted action result in a reduction of disaster damage?

In addition to the STAPLEE process, each action item was also reviewed for Benefit/Cost. These two aspects of the prioritization process were scored as follows:

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

- Injuries and/or casualties
- Property damages

- Loss-of-function/displacement impacts
- Emergency management costs/community costs

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

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

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

In addition, the group considered the cost of mitigation versus the long-term savings in relation to potential lives saved and property damage avoided.

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

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

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

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

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

The results of the STAPLEE process and Benefit/Cost analysis were then mailed out to all MPC members for feedback and consensus.

The final scores are listed below in the analysis of each action. Correspondence regarding the STAPLEE process is included in Appendix C: A spreadsheet with the action items and final scores is illustrated in Figure 4.1.

## **Jurisdictional Floodplain Management Programs**

Every jurisdiction in Crawford County, except Cuba and West Sullivan, regulates development in the floodplain by reviewing permit applications for all development including new and existing structures. Elevation certificates are required for all new construction, and existing structures with 50% or more damage following a flood are required to elevate. Floodplain maps are available in hard copy at each jurisdiction’s courthouse or municipal building. Furthermore floodplain maps can

be found online through FEMA’s website <https://msc.fema.gov/portal>. Lastly, none of the jurisdictions currently participate in active monitoring activities within the floodplain.

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**Table 4.1. Jurisdictional Floodplain Ordinance Adoption Date**

<b>Community Name</b>	<b>Ordinance Adoption Date</b>
Crawford County	4/19/83
Bourbon	5/24/74
*Cuba	Not participating in the NFIP
Leasburg	1/35/75
Steelville	9/13/74
Sullivan	3/29/74
*West Sullivan	Not participating in the NFIP

Source: Data Collection Questionnaires

\* Listed as not participating in the NFIP per FEMA’s Community Status Book Report<sup>1</sup>; NSFHA (SEMA)

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<sup>1</sup> [www.fema.gov/cis/mo.html](http://www.fema.gov/cis/mo.html)

Figure 4.4 Prioritization of Mitigation Actions		3 = Def YES		1 = Prob NO											
		2 = Maybe YES		0 = Def NO											
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
1.1	Implement an education program on personal emergency preparedness.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.2	Promote development of emergency plans by businesses and public entities by providing information on business continuity and emergency planning through local chambers of commerce and emergency management offices.	3	3	3	3	3	2	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
1.3	Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.	3	2	2	3	3	2	2	17	IC, PD, LF, EMCC	8	-3	5	22	H
1.4	Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-2	6	24	H
1.6	Provide information on tree trimming and dead tree removal programs to utility companies and local government.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
1.7	Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
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).	3	2	2	3	3	3	3	19	IC, LF, EMCC	6	-1	5	24	H
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.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-3	5	26	H
2.1	Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.	3	3	2	3	3	2	3	19	IC, EMCC	4	-2	2	21	H
2.2	Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.	3	2	2	3	3	3	2	18	IC, PD, LF, EMCC	8	-2	6	24	H
2.3	Provide information on the benefits of establishing minimum building codes to those jurisdiction that currently lack minimum building code requirements.	1	1	1	1	3	2	2	11	IC, PD, LF, EMCC	8	-3	5	16	M
2.4	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.	1	1	1	1	3	2	3	12	IC, PD, LF, EMCC	8	-3	5	17	M



<b>Figure 4.4 Prioritization of Mitigation Actions</b>		3 = Def YES		1 = Prob NO											
		2 = Maybe YES		0 = Def NO											
Action No.	Mitigation Actions	S	T	A	P	L	E	E	STAPLEE Total	Losses Avoided (2 pts. Each)	Benefit	Cost	B/C Total	Total	Priority
3.1	Distribute SEMA brochures at public facilities and events and distribute regular press releases concerning hazards, where they strike, frequency and preparedness.	3	2	2	2	3	3	3	18	IC, PD, LF, EMCC	8	-1	7	25	H
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.	3	2	2	3	3	2	3	18	IC, PD, LF, EMCC	8	-2	6	24	H
3.5	Re-evaluate the hazard mitigation plan and merge with other community planning.	3	2	2	3	3	3	3	19	IC, PD, LF, EMCC	8	-2	6	25	H
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.	2	1	1	2	3	2	2	13	IC, PD, LF, EMCC	8	-3	5	18	M
3.7	Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.	3	3	3	3	3	3	3	21	IC, PD, LF, EMCC	8	-1	7	28	H
4.3	Pool different agency resources to achieve widespread mitigation results.	3	3	2	3	3	3	3	20	IC, PD, LF, EMCC	8	-1	7	27	H
5.2	Provide information to all communities on the benefits and costs of developing storm water management plans.	2	1	1	1	2	2	3	12	PD, EMCC	4	-2	2	14	M
5.3	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operation plans and procedures.	2	1	1	2	2	1	2	11	IC, PD, LF, EMCC	8	-3	5	16	M
5.4	Encourage cities to require contractor stormwater management plans in all new development.	2	2	1	1	3	2	3	14	PD, EMCC	4	-2	2	16	M
5.5	Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.	1	1	1	1	3	1	3	11	IC, PD, LF, EMCC	8	-5	3	14	M
6.2	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.	2	1	1	2	3	1	3	13	IC, PD, LC, EMCC	8	-3	5	18	M
6.3	Work with state/local/federal agencies to include mitigation in all economic and community development projects	2	1	1	2	3	2	2	13	IC, PD, LF, EMCC	8	-3	5	18	M
6.4	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.	2	1	1	1	3	1	3	12	IC, PD, LF, EMCC	8	-3	5	17	M
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	2	1	1	2	3	1	3	13	IC, EMCC	4	-2	2	15	M
6.7	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health, and property.	3	2	2	2	3	3	3	18	IC, LF, EMCC	8	-2	6	24	H

## Crawford County

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

**Action 1.1:** Implement an education program on personal emergency preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Residents are not always prepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities. This action item will improve the preparedness of individual households.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1
<b>Name of Action or Project:</b>	Personal Preparedness Education/Awareness Program
<b>Action or Project Description:</b>	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and through the county health department and local government offices.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
<b>Estimated Cost:</b>	\$500 - \$3,500 estimated cost
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD and county health department
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Activity has occurred in this area as most emergency response agencies, health departments and EMDs promote individual preparedness and provide <i>Ready in 3</i> brochures. SEMA distributes press releases periodically on personal preparedness. The county health department and county EMD post information on their websites, and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for all the jurisdictions.

**Action 1.2:** 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Absence of emergency plans by businesses.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Development of emergency plans by businesses.
<b>Action or Project Description:</b>	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.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - not started
<b>Report of Progress</b>	During the last update of the CEDS, a chapter on economic recovery and resiliency was added which is a tool for local leaders to reduce vulnerability to natural hazards and expedite recovery public and private infrastructure. Implementation progress has been restricted due to lack of funding to develop a program to encourage and assist businesses and public entities in developing emergency plans. EMDs are encouraged to share resources available through SEMA and FEMA on emergency planning for businesses and public entities and through chambers of commerce.

**Action 1.3:** Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Need to improve warning and communications systems throughout the county.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.
<b>Action or Project Description:</b>	Provide information to local governments and citizens on the existing warning systems in place in Crawford County and encourage better utilization of those systems. In addition, actively search for funding to improve both warning systems and communications throughout the county.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD
<b>Action/Project Priority:</b>	22 – High Priority
<b>Timeline for Completion:</b>	On-going - with goal of 2020 for having 80 percent or more of the population signed up for Everbridge.
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing– in progress
<b>Report of Progress</b>	Currently there are storm sirens in Indian Hills – a rural subdivision north of Cuba, as well as in Cuba, Steelville, Bourbon and Sullivan. Currently the only phone based warning/messaging systems available in the county are Nixle in Sullivan, Crawford Electric Cooperative has a messaging system for customers, and messaging systems used by Sullivan School District and Cuba School District. In addition, the county and cities need to continue to work to improve communications systems within the county to improve county-wide as well as state-wide communications during disasters and joint response efforts.

**Action 1.4:** Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of storm warning systems in rural areas of Crawford County
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.4
<b>Name of Action or Project:</b>	Promote weather radio use
<b>Action or Project Description:</b>	Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$2,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Crawford County Commission
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	County FaceBook page includes information on weather radios. All school districts in the county use weather radios.

**Action 1.6:** Provide information on tree trimming and dead tree removal programs to utility companies and local government.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with falling limbs and trees during severe storms, winter storms and tornados – loss of power, road blockages
<b>Hazard(s) Addressed:</b>	Severe Storms, Winter Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.6
<b>Name of Action or Project:</b>	Reducing risk through tree trimming and removal
<b>Action or Project Description:</b>	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$5,500 – \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County road and bridge department and Crawford County Electric Cooperative
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, county road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The county road and bridge crews include tree trimming and tree removal in their maintenance activities. The local electric cooperative carries out an aggressive tree trimming program.



**Action 1.7:** Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	
<b>Hazard(s) Addressed:</b>	Floods and Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.7
<b>Name of Action or Project:</b>	Review road and bridge upgrades for potential mitigation actions
<b>Action or Project Description:</b>	Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,000 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Crawford County Commission, road and bridge department
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvement plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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.

**Action 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of information/data on some hazards such as dam failure, tornadoes, sinkholes, land subsidence and wildfire in Crawford County.
<b>Hazard(s) Addressed:</b>	Dam failure, tornadoes, sinkholes, land subsidence, wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.9
<b>Name of Action or Project:</b>	Improving information/data for risk assessments and planning
<b>Action or Project Description:</b>	Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence and wildfire upon Crawford County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, local planners
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The MPC continues to monitor data availability and information sources for additional information that can be used in updating and improving the hazard mitigation plan.

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

**Action 2.1:** Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
<b>Hazard(s) Addressed:</b>	Earthquakes and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1
<b>Name of Action or Project:</b>	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
<b>Action or Project Description:</b>	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornados or severe weather.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 – \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies
<b>Action/Project Priority:</b>	21 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, capital improvement plans, hazard mitigation plan, local critical facility budgets
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Crawford Electric Cooperative built a new main office and included hardened rooms to resist tornado and earthquake damage.

**Action 2.2:** Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
<b>Hazard(s) Addressed:</b>	Floods
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2
<b>Name of Action or Project:</b>	Floodplain education/awareness program.
<b>Action or Project Description:</b>	Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 - \$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD and floodplain manager
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain management ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	The county EMD also serves as the floodplain manager and actively distributes brochures, press releases and information on floodplain management and development requirements.

**Action 2.3:** Provide information on the benefits of establishing minimum building codes to those jurisdiction that currently lack minimum building code requirements.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities to property and communities in the event of a natural disaster due to substandard construction.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3
<b>Name of Action or Project:</b>	Information/awareness program for the benefits of minimum building codes.
<b>Action or Project Description:</b>	Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$3,000-\$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Local Government
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Jurisdictional Builders Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Continuing Not Started
<b>Report of Progress</b>	There has been no progress in this area.



**Action 2.4:** Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
<b>Hazard(s) Addressed:</b>	Floods, Severe Storms, and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.4
<b>Name of Action or Project:</b>	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
<b>Action or Project Description:</b>	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$2,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Crawford County Commission
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain ordinances, building codes
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	The county floodplain ordinance requires that hazardous materials tanks in floodplains be secured.

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

**Action 3.1:** Distribute SEMA brochures at public facilities and events and distribute regular press releases concerning hazards, where they strike, frequency and preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of emergency management and best practices during hazardous events.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1
<b>Name of Action or Project:</b>	Distribute SEMA brochures at public facilities and events
<b>Action or Project Description:</b>	Provide information by distributing SEMA brochures and press releases on types of hazards, best practices during a disaster (Ready in 3) and other informational documents.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local emergency response agencies, county health department
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The county EMD and health department and some local emergency response agencies regularly distribute emergency related brochures and information at local events, through websites and FaceBook pages. The EMD and health department also distribute press releases on hazards and how to prepare for them.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of knowledge/understanding of the importance of hazard mitigation activities
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4
<b>Name of Action or Project:</b>	Awareness/education program on hazard mitigation for local elected officials and planning organizations
<b>Action or Project Description:</b>	Ask SEMA mitigation specialists to present information to city councils, county commission and local planning organizations.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission, EMD
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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.

**Action 3.5:** Re-evaluate the hazard mitigation plan and merge with other community planning activities.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.5
<b>Name of Action or Project:</b>	Re-evaluate the hazard mitigation plan and merge with other community planning activities.
<b>Action or Project Description:</b>	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$5,500 - \$10,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, Local Planners, MPC
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, hazard mitigation plan, school crisis management plans, comprehensive plans, builder’s plans, capital improvement plan, economic development plan, transportation plan, land-use plan, floodplain ordinances, storm water plans/ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

**Action 3.6:** 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the public's lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.6
<b>Name of Action or Project:</b>	Awareness program on local mitigation activities.
<b>Action or Project Description:</b>	Distribute press releases by cities/county regarding adopted mitigation measures
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$500-\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The county regularly does press releases on road and bridge activities that mitigate problems with drainage and flooding.

**Action 3.7:** Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of awareness/education on individual preparedness.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.7
<b>Name of Action or Project:</b>	Individual preparedness education program.
<b>Action or Project Description:</b>	Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, county health department, Red Cross
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	County EMD and health department shares brochures and information on <i>Ready in 3</i> and other individual preparedness information. Red Cross holds trainings in the area on a regular basis.



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

**Action 4.3:** Pool different agency resources to achieve widespread mitigation results.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to carry out mitigation projects
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.3
<b>Name of Action or Project:</b>	Pool different agency resources to achieve widespread mitigation results.
<b>Action or Project Description:</b>	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County and city EMDs, Crawford County Commission, floodplain managers, city councils/boards and school district boards of education
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, floodplain ordinances, LEOP, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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. The local electric cooperative has worked with the Red Cross to encourage local churches to be designated shelters and purchase generators.

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

**Action 5.3:** Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not merging hazard mitigation activities, where appropriate, with emergency plans and procedures
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.3
<b>Name of Action or Project:</b>	Merging appropriate hazard mitigation activities with emergency plans and procedures
<b>Action or Project Description:</b>	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, County Commission
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, school crisis/emergency plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 5.5:** Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with properties located in the floodplain.
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.5
<b>Name of Action or Project:</b>	Floodplain buyout
<b>Action or Project Description:</b>	Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission, EMD, floodplain manager
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	Due to this being a medium priority no progress has been made to date.

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

**Action 6.2:** Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities that can occur when infrastructure projects do not include mitigation considerations.
<b>Hazard(s) Addressed:</b>	Floods, Earthquakes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.2
<b>Name of Action or Project:</b>	Including mitigation in grant proposals
<b>Action or Project Description:</b>	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$1,500 - \$7,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, local planners, County commission
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	General revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	The county is definitely interested in incorporating mitigation into road and bridge grant proposals but often feel stymied by grant requirements that limit what can be done on the project.

**Action 6.3:** Work with state/local/federal agencies to include mitigation in all economic and community development projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.3
<b>Name of Action or Project:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Action or Project Description:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500-\$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Engineers, County Commission, Grant Writers
<b>Action/Project Priority:</b>	18 - Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, strategic plans, economic development plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission, Economic Developers, Community Development Organizations, County EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The county has made progress on this action item. The county has established policy to upgrade all culverts and built this into the road and bridge department budget. Tree trimming is also built into the budget.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects for individuals
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.5
<b>Name of Action or Project:</b>	Encourage development and implementation of mitigation cost-share programs
<b>Action or Project Description:</b>	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
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County EMD, County Commission,
<b>Action/Project Priority:</b>	15 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvements plans, comprehensive plans, strategic plans,
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Crawford County works with landowners and cost-shares the installation of culverts on private driveways.



**Action 6.7:** Prioritize mitigation projects based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.7
<b>Name of Action or Project:</b>	Prioritizing mitigation projects
<b>Action or Project Description:</b>	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$750 - \$2,750
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County and city EMDs, County Commission, Local Governments, Local Planners, City/County Engineers, MPC
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Hazard mitigation projects are prioritized in the hazard mitigation plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

## **Bourbon**

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

**Action 1.1:** Implement an education program on personal emergency preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Residents are not always prepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities. This action item will improve the preparedness of individual households.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1
<b>Name of Action or Project:</b>	Personal Preparedness Education/Awareness Program
<b>Action or Project Description:</b>	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and through the county health department and local government offices.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
<b>Estimated Cost:</b>	\$500 - \$3,500 estimated cost
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD and local emergency response agencies
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Activity has occurred in this area as most emergency response agencies, health department and EMDs promote individual preparedness and provide <i>Ready in 3</i> brochures. SEMA distributes press releases periodically on personal preparedness. The county health department and county EMD post information on their websites, and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for the city of Bourbon.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Absence of emergency plans by businesses.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Development of emergency plans by businesses.
<b>Action or Project Description:</b>	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.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Board of Alderman
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - not started
<b>Report of Progress</b>	During the last update of the CEDS, a chapter on economic recovery and resiliency was added which is a tool for local leaders to reduce vulnerability to natural hazards and expedite recovery public and private infrastructure. Implementation progress has been restricted due to lack of funding to develop a program to encourage and assist businesses and public entities in developing emergency plans. EMDs are encouraged to share resources available through SEMA and FEMA on emergency planning for businesses and public entities and through chambers of commerce.

**Action 1.3:** Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Need to improve warning and communications systems throughout the county.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.
<b>Action or Project Description:</b>	Provide information to local governments and citizens on the existing warning systems in place in Crawford County and encourage better utilization of those systems. In addition, actively search for funding to improve both warning systems and communications throughout the county.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD
<b>Action/Project Priority:</b>	22 – High Priority
<b>Timeline for Completion:</b>	On-going - with goal of 2020 for having 80 percent or more of the population signed up for Everbridge.
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing– in progress
<b>Report of Progress</b>	Currently there are storm sirens in Indian Hills – a rural subdivision north of Cuba, as well as in Cuba, Steelville, Bourbon and Sullivan. Currently the only phone based warning/messaging systems available in the county are Nixle in Sullivan, Crawford Electric Cooperative has a messaging system for customers, and messaging systems used by Sullivan School District and Cuba School District. In addition, the county and cities need to continue to work to improve communications systems within the county to improve county-wide as well as state-wide communications during disasters and joint response efforts.

**Action 1.4:** Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of storm warning systems in all areas of Bourbon
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.4
<b>Name of Action or Project:</b>	Promote weather radio use
<b>Action or Project Description:</b>	Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$2,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Although the county’s FaceBook page includes information on weather radios, Bourbon does not actively promote them. The city does have outdoor storm sirens, but these do not always provide adequate coverage and are not always audible indoors. All school districts in the county use weather radios.

**Action 1.6:** Provide information on tree trimming and dead tree removal programs to utility companies and local government.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with falling limbs and trees during severe storms, winter storms and tornados – loss of power, road blockages
<b>Hazard(s) Addressed:</b>	Severe Storms, Winter Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.6
<b>Name of Action or Project:</b>	Reducing risk through tree trimming and removal
<b>Action or Project Description:</b>	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$5,500 – \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Street Dept.
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, county road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The county road and bridge crews include tree trimming and tree removal in their maintenance activities. The local electric cooperative carries out an aggressive tree trimming program.

**Action 1.7:** Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	
<b>Hazard(s) Addressed:</b>	Floods and Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.7
<b>Name of Action or Project:</b>	Review road and bridge upgrades for potential mitigation actions
<b>Action or Project Description:</b>	Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,000 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of aldermen, city street department
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvement plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The city works to upgrade street projects by increasing the size of culverts when doing replacements.



**Action 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of information/data on some hazards such as dam failure, tornadoes, sinkholes, land subsidence and wildfire in Crawford County.
<b>Hazard(s) Addressed:</b>	Dam failure, tornadoes, sinkholes, land subsidence, wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.9
<b>Name of Action or Project:</b>	Improving information/data for risk assessments and planning
<b>Action or Project Description:</b>	Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence and wildfire upon Crawford County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The MPC continues to monitor data availability and information sources for additional information that can be used in updating and improving the hazard mitigation plan.

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

**Action 2.1:** Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
<b>Hazard(s) Addressed:</b>	Earthquakes and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1
<b>Name of Action or Project:</b>	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
<b>Action or Project Description:</b>	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornados or severe weather.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 – \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, local emergency response agencies
<b>Action/Project Priority:</b>	21 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, capital improvement plans, hazard mitigation plan, local critical facility budgets
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Crawford Electric Cooperative built a new main office and included hardened rooms to resist tornado and earthquake damage.

**Action 2.2:** Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
<b>Hazard(s) Addressed:</b>	Floods
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2
<b>Name of Action or Project:</b>	Floodplain education/awareness program.
<b>Action or Project Description:</b>	Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 - \$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD and floodplain manager
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain management ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	The county EMD provides information on floodplain through their webpage but the city of Bourbon could benefit from a more focused effort by the city in this area.

**Action 2.3:** Provide information on the benefits of establishing minimum building codes to those jurisdiction that currently lack minimum building code requirements.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities to property and communities in the event of a natural disaster due to substandard construction.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3
<b>Name of Action or Project:</b>	Information/awareness program for the benefits of minimum building codes.
<b>Action or Project Description:</b>	Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$3,000-\$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, Local Government
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Jurisdictional Builders Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Continuing Not Started
<b>Report of Progress</b>	Bourbon has a building ordinance.

**Action 2.4:** Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
<b>Hazard(s) Addressed:</b>	Floods, Severe Storms, and Tornos
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.4
<b>Name of Action or Project:</b>	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
<b>Action or Project Description:</b>	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$2,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, City Council
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain ordinances, building codes
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	The city floodplain ordinance requires that hazardous material tanks in floodplain be secured.

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

**Action 3.1:** Distribute SEMA brochures at public facilities and events and distribute regular press releases concerning hazards, where they strike, frequency and preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of emergency management and best practices during hazardous events.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1
<b>Name of Action or Project:</b>	Distribute SEMA brochures at public facilities and events
<b>Action or Project Description:</b>	Provide information by distributing SEMA brochures and press releases on types of hazards, best practices during a disaster (Ready in 3) and other informational documents.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local emergency response agencies, county health department
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The health department and some local emergency response agencies regularly distribute emergency related brochures and information at local events, through websites and FaceBook pages. The county EMD and health department also distribute press releases on hazards and how to prepare for them.



**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of knowledge/understanding of the importance of hazard mitigation activities
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4
<b>Name of Action or Project:</b>	Awareness/education program on hazard mitigation for local elected officials and planning organizations
<b>Action or Project Description:</b>	Ask SEMA mitigation specialists to present information to city councils, county commission and local planning organizations.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of aldermen, city EMD
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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 and its jurisdictions.

**Action 3.5:** Re-evaluate the hazard mitigation plan and merge with other community planning activities.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.5
<b>Name of Action or Project:</b>	Re-evaluate the hazard mitigation plan and merge with other community planning activities.
<b>Action or Project Description:</b>	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$5,500 - \$10,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Local Planners, MPC, board of aldermen
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, hazard mitigation plan, school crisis management plans, comprehensive plans, builder’s plans, capital improvement plan, economic development plan, transportation plan, land-use plan, floodplain ordinances, storm water plans/ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

**Action 3.6:** 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the public’s lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.6
<b>Name of Action or Project:</b>	Awareness program on local mitigation activities.
<b>Action or Project Description:</b>	Distribute press releases by cities/county regarding adopted mitigation measures
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$500-\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The city regularly does press releases on city activities that mitigate problems with drainage and flooding.

**Action 3.7:** Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of awareness/education on individual preparedness.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.7
<b>Name of Action or Project:</b>	Individual preparedness education program.
<b>Action or Project Description:</b>	Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, county health department, Red Cross
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	City EMD and health department shares brochures and information on <i>Ready in 3</i> and other individual preparedness information. Red Cross holds trainings in the area on a regular basis.

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

**Action 4.3:** Pool different agency resources to achieve widespread mitigation results.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to carry out mitigation projects
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.3
<b>Name of Action or Project:</b>	Pool different agency resources to achieve widespread mitigation results.
<b>Action or Project Description:</b>	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMDs, board of aldermen, floodplain manager and school district boards of education
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, floodplain ordinances, LEOP, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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. The local electric cooperative has worked with the Red Cross to encourage local churches to be designated shelters and purchase generators.

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

**Action 5.3:** Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not merging hazard mitigation activities, where appropriate, with emergency plans and procedures
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.3
<b>Name of Action or Project:</b>	Merging appropriate hazard mitigation activities with emergency plans and procedures
<b>Action or Project Description:</b>	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, school crisis/emergency plans
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 5.4:** Encourage cities to require contractor stormwater management plans in all new development.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack of stormwater planning in new development
<b>Hazard(s) Addressed:</b>	Severe storms, flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.4
<b>Name of Action or Project:</b>	Stormwater management planning in new development
<b>Action or Project Description:</b>	Encourage cities to require contractor stormwater management plans in all new development.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of alderman
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, stormwater management plan
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	



**Action 5.5:** Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with properties located in the floodplain.
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.5
<b>Name of Action or Project:</b>	Floodplain buyout
<b>Action or Project Description:</b>	Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, floodplain manager, board of aldermen
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

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

**Action 6.2:** Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities that can occur when infrastructure projects do not include mitigation considerations.
<b>Hazard(s) Addressed:</b>	Floods, Earthquakes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.2
<b>Name of Action or Project:</b>	Including mitigation in grant proposals
<b>Action or Project Description:</b>	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$1,500 - \$7,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners, street department, board of aldermen
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	General revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 6.3:** Work with state/local/federal agencies to include mitigation in all economic and community development projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.3
<b>Name of Action or Project:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Action or Project Description:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500-\$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Engineers, board of alderman, grant writers
<b>Action/Project Priority:</b>	18 - Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, strategic plans, economic development plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of Alderman, Economic Developers, Community Development Organizations, EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 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

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects for individuals
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.5
<b>Name of Action or Project:</b>	Encourage development and implementation of mitigation cost-share programs
<b>Action or Project Description:</b>	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
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	15 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvements plans, comprehensive plans, strategic plans,
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.7:** Prioritize mitigation projects based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Bourbon
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.7
<b>Name of Action or Project:</b>	Prioritizing mitigation projects
<b>Action or Project Description:</b>	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$750 - \$2,750
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen, local planners, city engineers, MPC
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Hazard mitigation projects are prioritized in the hazard mitigation plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

## Cuba

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

**Action 1.1:** Implement an education program on personal emergency preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Residents are not always prepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities. This action item will improve the preparedness of individual households.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1
<b>Name of Action or Project:</b>	Personal Preparedness Education/Awareness Program
<b>Action or Project Description:</b>	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and through the county health department and local government offices.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
<b>Estimated Cost:</b>	\$500 - \$3,500 estimated cost
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD and local emergency response agencies
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Activity has occurred in this area as most emergency response agencies, health department and EMDs promote individual preparedness and provide <i>Ready in 3</i> brochures. SEMA distributes press releases periodically on personal preparedness. The county health department and county EMD post information on their websites, and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for the city of Bourbon.



**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Absence of emergency plans by businesses.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Development of emergency plans by businesses.
<b>Action or Project Description:</b>	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.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Board of Alderman
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - not started
<b>Report of Progress</b>	During the last update of the CEDS, a chapter on economic recovery and resiliency was added which is a tool for local leaders to reduce vulnerability to natural hazards and expedite recovery public and private infrastructure. Implementation progress has been restricted due to lack of funding to develop a program to encourage and assist businesses and public entities in developing emergency plans. EMDs are encouraged to share resources available through SEMA and FEMA on emergency planning for businesses and public entities and through chambers of commerce.

**Action 1.3:** Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Need to improve warning and communications systems throughout the county.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.
<b>Action or Project Description:</b>	Provide information to local governments and citizens on the existing warning systems in place in Crawford County and encourage better utilization of those systems. In addition, actively search for funding to improve both warning systems and communications throughout the county.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD
<b>Action/Project Priority:</b>	22 – High Priority
<b>Timeline for Completion:</b>	On-going - with goal of 2020 for having 80 percent or more of the population signed up for Everbridge.
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing– in progress
<b>Report of Progress</b>	Currently there are storm sirens in Indian Hills – a rural subdivision north of Cuba, as well as in Cuba, Steelville, Bourbon and Sullivan. Currently the only phone based warning/messaging systems available in the county are Nixle in Sullivan, Crawford Electric Cooperative has a messaging system for customers, and messaging systems used by Sullivan School District and Cuba School District. In addition, the county and cities need to continue to work to improve communications systems within the county to improve county-wide as well as state-wide communications during disasters and joint response efforts.

**Action 1.4:** Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of storm warning systems in all areas of Bourbon
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.4
<b>Name of Action or Project:</b>	Promote weather radio use
<b>Action or Project Description:</b>	Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$2,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Although the county’s FaceBook page includes information on weather radios, Bourbon does not actively promote them. The city does have outdoor storm sirens, but these do not always provide adequate coverage and are not always audible indoors. All school districts in the county use weather radios.

**Action 1.6:** Provide information on tree trimming and dead tree removal programs to utility companies and local government.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with falling limbs and trees during severe storms, winter storms and tornados – loss of power, road blockages
<b>Hazard(s) Addressed:</b>	Severe Storms, Winter Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.6
<b>Name of Action or Project:</b>	Reducing risk through tree trimming and removal
<b>Action or Project Description:</b>	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$5,500 – \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Street Dept.
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, county road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The county road and bridge crews include tree trimming and tree removal in their maintenance activities. The local electric cooperative carries out an aggressive tree trimming program.

**Action 1.7:** Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	
<b>Hazard(s) Addressed:</b>	Floods and Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.7
<b>Name of Action or Project:</b>	Review road and bridge upgrades for potential mitigation actions
<b>Action or Project Description:</b>	Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,000 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of aldermen, city street department
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvement plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The city works to upgrade street projects by increasing the size of culverts when doing replacements.

**Action 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of information/data on some hazards such as dam failure, tornadoes, sinkholes, land subsidence and wildfire in Crawford County.
<b>Hazard(s) Addressed:</b>	Dam failure, tornadoes, sinkholes, land subsidence, wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.9
<b>Name of Action or Project:</b>	Improving information/data for risk assessments and planning
<b>Action or Project Description:</b>	Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence and wildfire upon Crawford County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The MPC continues to monitor data availability and information sources for additional information that can be used in updating and improving the hazard mitigation plan.



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

**Action 2.1:** Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
<b>Hazard(s) Addressed:</b>	Earthquakes and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1
<b>Name of Action or Project:</b>	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
<b>Action or Project Description:</b>	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornados or severe weather.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 – \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, local emergency response agencies
<b>Action/Project Priority:</b>	21 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, capital improvement plans, hazard mitigation plan, local critical facility budgets
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Crawford Electric Cooperative built a new main office and included hardened rooms to resist tornado and earthquake damage.

**Action 2.3:** Provide information on the benefits of establishing minimum building codes to those jurisdiction that currently lack minimum building code requirements.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities to property and communities in the event of a natural disaster due to substandard construction.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3
<b>Name of Action or Project:</b>	Information/awareness program for the benefits of minimum building codes.
<b>Action or Project Description:</b>	Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$3,000-\$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, Local Government
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Jurisdictional Builders Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Continuing Not Started
<b>Report of Progress</b>	Cuba recently passed ordinances on building and occupancy permits.

**Action 2.4:** Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
<b>Hazard(s) Addressed:</b>	Floods, Severe Storms, and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.4
<b>Name of Action or Project:</b>	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
<b>Action or Project Description:</b>	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$2,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, City Council
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain ordinances, building codes
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	The city floodplain ordinance requires that hazardous material tanks in floodplain be secured.

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

**Action 3.1:** Distribute SEMA brochures at public facilities and events and distribute regular press releases concerning hazards, where they strike, frequency and preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of emergency management and best practices during hazardous events.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1
<b>Name of Action or Project:</b>	Distribute SEMA brochures at public facilities and events
<b>Action or Project Description:</b>	Provide information by distributing SEMA brochures and press releases on types of hazards, best practices during a disaster (Ready in 3) and other informational documents.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local emergency response agencies, county health department
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The health department and some local emergency response agencies regularly distribute emergency related brochures and information at local events, through websites and FaceBook pages. The county EMD and health department also distribute press releases on hazards and how to prepare for them.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of knowledge/understanding of the importance of hazard mitigation activities
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4
<b>Name of Action or Project:</b>	Awareness/education program on hazard mitigation for local elected officials and planning organizations
<b>Action or Project Description:</b>	Ask SEMA mitigation specialists to present information to city councils, county commission and local planning organizations.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of aldermen, city EMD
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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 and its jurisdictions.

**Action 3.5:** Re-evaluate the hazard mitigation plan and merge with other community planning activities.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.5
<b>Name of Action or Project:</b>	Re-evaluate the hazard mitigation plan and merge with other community planning activities.
<b>Action or Project Description:</b>	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$5,500 - \$10,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Local Planners, MPC, board of aldermen
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, hazard mitigation plan, school crisis management plans, comprehensive plans, builder’s plans, capital improvement plan, economic development plan, transportation plan, land-use plan, floodplain ordinances, storm water plans/ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

**Action 3.6:** 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the public’s lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.6
<b>Name of Action or Project:</b>	Awareness program on local mitigation activities.
<b>Action or Project Description:</b>	Distribute press releases by cities/county regarding adopted mitigation measures
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$500-\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The city regularly does press releases on city activities that mitigate problems with drainage and flooding.



**Action 3.7:** Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of awareness/education on individual preparedness.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.7
<b>Name of Action or Project:</b>	Individual preparedness education program.
<b>Action or Project Description:</b>	Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, county health department, Red Cross
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	City EMD and health department shares brochures and information on <i>Ready in 3</i> and other individual preparedness information. Red Cross holds trainings in the area on a regular basis.

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

**Action 4.3:** Pool different agency resources to achieve widespread mitigation results.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to carry out mitigation projects
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.3
<b>Name of Action or Project:</b>	Pool different agency resources to achieve widespread mitigation results.
<b>Action or Project Description:</b>	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMDs, board of aldermen, floodplain manager and school district boards of education
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, floodplain ordinances, LEOP, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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. The local electric cooperative has worked with the Red Cross to encourage local churches to be designated shelters and purchase generators.

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

**Action 5.2:** Provide information to all communities on the benefits and costs of developing storm water management plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with non-existent stormwater management plans
<b>Hazard(s) Addressed:</b>	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.2
<b>Name of Action or Project:</b>	Provide information to all communities on the benefits and costs of developing storm water management plans.
<b>Action or Project Description:</b>	Investigate and consider the benefits and costs of developing stormwater management plans.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$2,500-\$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, board of aldermen
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, comprehensive plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – no progress
<b>Report of Progress</b>	Due to this being prioritized as medium, no progress has been made.

**Action 5.3:** Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not merging hazard mitigation activities, where appropriate, with emergency plans and procedures
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.3
<b>Name of Action or Project:</b>	Merging appropriate hazard mitigation activities with emergency plans and procedures
<b>Action or Project Description:</b>	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, school crisis/emergency plans
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 5.4:** Encourage cities to require contractor stormwater management plans in all new development.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack of stormwater planning in new development
<b>Hazard(s) Addressed:</b>	Severe storms, flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.4
<b>Name of Action or Project:</b>	Stormwater management planning in new development
<b>Action or Project Description:</b>	Encourage cities to require contractor stormwater management plans in all new development.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, stormwater management plan
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

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

**Action 6.2:** Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities that can occur when infrastructure projects do not include mitigation considerations.
<b>Hazard(s) Addressed:</b>	Floods, Earthquakes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.2
<b>Name of Action or Project:</b>	Including mitigation in grant proposals
<b>Action or Project Description:</b>	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$1,500 - \$7,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners, street department, board of aldermen
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	General revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 6.3:** Work with state/local/federal agencies to include mitigation in all economic and community development projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.3
<b>Name of Action or Project:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Action or Project Description:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500-\$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Engineers, board of alderman, grant writers
<b>Action/Project Priority:</b>	18 - Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, strategic plans, economic development plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.



**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of Alderman, Economic Developers, Community Development Organizations, EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 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

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects for individuals
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.5
<b>Name of Action or Project:</b>	Encourage development and implementation of mitigation cost-share programs
<b>Action or Project Description:</b>	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
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	15 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvements plans, comprehensive plans, strategic plans,
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.7:** Prioritize mitigation projects based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Cuba
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.7
<b>Name of Action or Project:</b>	Prioritizing mitigation projects
<b>Action or Project Description:</b>	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$750 - \$2,750
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen, local planners, city engineers, MPC
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Hazard mitigation projects are prioritized in the hazard mitigation plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

**Steelville**

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

**Action 1.1:** Implement an education program on personal emergency preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Residents are not always prepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities. This action item will improve the preparedness of individual households.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1
<b>Name of Action or Project:</b>	Personal Preparedness Education/Awareness Program
<b>Action or Project Description:</b>	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and through the county health department and local government offices.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
<b>Estimated Cost:</b>	\$500 - \$3,500 estimated cost
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD and local emergency response agencies
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Activity has occurred in this area as most emergency response agencies, health department and EMDs promote individual preparedness and provide <i>Ready in 3</i> brochures. SEMA distributes press releases periodically on personal preparedness. The county health department and county EMD post information on their websites, and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for the city of Bourbon.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Absence of emergency plans by businesses.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Development of emergency plans by businesses.
<b>Action or Project Description:</b>	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.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Board of Alderman
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - not started
<b>Report of Progress</b>	During the last update of the CEDS, a chapter on economic recovery and resiliency was added which is a tool for local leaders to reduce vulnerability to natural hazards and expedite recovery public and private infrastructure. Implementation progress has been restricted due to lack of funding to develop a program to encourage and assist businesses and public entities in developing emergency plans. EMDs are encouraged to share resources available through SEMA and FEMA on emergency planning for businesses and public entities and through chambers of commerce.

**Action 1.3:** Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Need to improve warning and communications systems throughout the county.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.
<b>Action or Project Description:</b>	Provide information to local governments and citizens on the existing warning systems in place in Crawford County and encourage better utilization of those systems. In addition, actively search for funding to improve both warning systems and communications throughout the county.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD
<b>Action/Project Priority:</b>	22 – High Priority
<b>Timeline for Completion:</b>	On-going - with goal of 2020 for having 80 percent or more of the population signed up for Everbridge.
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing– in progress
<b>Report of Progress</b>	Currently there are storm sirens in Indian Hills – a rural subdivision north of Cuba, as well as in Cuba, Steelville, Bourbon and Sullivan. Currently the only phone based warning/messaging systems available in the county are Nixle in Sullivan, Crawford Electric Cooperative has a messaging system for customers, and messaging systems used by Sullivan School District and Cuba School District. In addition, the county and cities need to continue to work to improve communications systems within the county to improve county-wide as well as state-wide communications during disasters and joint response efforts.

**Action 1.4:** Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of storm warning systems in all areas of Bourbon
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.4
<b>Name of Action or Project:</b>	Promote weather radio use
<b>Action or Project Description:</b>	Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$2,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Although the county’s FaceBook page includes information on weather radios, Steelville does not actively promote them. The city does have outdoor storm sirens, but these do not always provide adequate coverage and are not always audible indoors. All school districts in the county use weather radios.



**Action 1.6:** Provide information on tree trimming and dead tree removal programs to utility companies and local government.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with falling limbs and trees during severe storms, winter storms and tornados – loss of power, road blockages
<b>Hazard(s) Addressed:</b>	Severe Storms, Winter Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.6
<b>Name of Action or Project:</b>	Reducing risk through tree trimming and removal
<b>Action or Project Description:</b>	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$5,500 – \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Street Dept.
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, county road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The county road and bridge crews include tree trimming and tree removal in their maintenance activities. The local electric cooperative carries out an aggressive tree trimming program.

**Action 1.7:** Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	
<b>Hazard(s) Addressed:</b>	Floods and Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.7
<b>Name of Action or Project:</b>	Review road and bridge upgrades for potential mitigation actions
<b>Action or Project Description:</b>	Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,000 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of aldermen, city street department
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvement plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The city works to upgrade street projects by increasing the size of culverts when doing replacements.

**Action 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of information/data on some hazards such as dam failure, tornadoes, sinkholes, land subsidence and wildfire in Crawford County.
<b>Hazard(s) Addressed:</b>	Dam failure, tornadoes, sinkholes, land subsidence, wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.9
<b>Name of Action or Project:</b>	Improving information/data for risk assessments and planning
<b>Action or Project Description:</b>	Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence and wildfire upon Crawford County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The MPC continues to monitor data availability and information sources for additional information that can be used in updating and improving the hazard mitigation plan.

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

**Action 2.1:** Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
<b>Hazard(s) Addressed:</b>	Earthquakes and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1
<b>Name of Action or Project:</b>	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
<b>Action or Project Description:</b>	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornados or severe weather.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 – \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, local emergency response agencies
<b>Action/Project Priority:</b>	21 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, capital improvement plans, hazard mitigation plan, local critical facility budgets
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Crawford Electric Cooperative built a new main office and included hardened rooms to resist tornado and earthquake damage.

**Action 2.2:** Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
<b>Hazard(s) Addressed:</b>	Floods
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2
<b>Name of Action or Project:</b>	Floodplain education/awareness program.
<b>Action or Project Description:</b>	Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 - \$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD and floodplain manager
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain management ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	The county EMD provides information on floodplain through their webpage but the city of Steelville could benefit from a more focused effort by the city floodplain manager in this area.

**Action 2.3:** Provide information on the benefits of establishing minimum building codes to those jurisdiction that currently lack minimum building code requirements.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities to property and communities in the event of a natural disaster due to substandard construction.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3
<b>Name of Action or Project:</b>	Information/awareness program for the benefits of minimum building codes.
<b>Action or Project Description:</b>	Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$3,000-\$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, Local Government
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Jurisdictional Builders Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Continuing Not Started
<b>Report of Progress</b>	Steelville recently hired a building inspector.

**Action 2.4:** Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
<b>Hazard(s) Addressed:</b>	Floods, Severe Storms, and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.4
<b>Name of Action or Project:</b>	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
<b>Action or Project Description:</b>	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$2,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, City Council
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain ordinances, building codes
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	The city floodplain ordinance requires that hazardous material tanks in floodplain be secured.



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

**Action 3.1:** Distribute SEMA brochures at public facilities and events and distribute regular press releases concerning hazards, where they strike, frequency and preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of emergency management and best practices during hazardous events.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1
<b>Name of Action or Project:</b>	Distribute SEMA brochures at public facilities and events
<b>Action or Project Description:</b>	Provide information by distributing SEMA brochures and press releases on types of hazards, best practices during a disaster (Ready in 3) and other informational documents.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local emergency response agencies, county health department
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The health department and some local emergency response agencies regularly distribute emergency related brochures and information at local events, through websites and FaceBook pages. The county EMD and health department also distribute press releases on hazards and how to prepare for them.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of knowledge/understanding of the importance of hazard mitigation activities
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4
<b>Name of Action or Project:</b>	Awareness/education program on hazard mitigation for local elected officials and planning organizations
<b>Action or Project Description:</b>	Ask SEMA mitigation specialists to present information to city councils, county commission and local planning organizations.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of aldermen, city EMD
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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 and its jurisdictions.

**Action 3.5:** Re-evaluate the hazard mitigation plan and merge with other community planning activities.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.5
<b>Name of Action or Project:</b>	Re-evaluate the hazard mitigation plan and merge with other community planning activities.
<b>Action or Project Description:</b>	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$5,500 - \$10,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Local Planners, MPC, board of aldermen
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, hazard mitigation plan, school crisis management plans, comprehensive plans, builder’s plans, capital improvement plan, economic development plan, transportation plan, land-use plan, floodplain ordinances, storm water plans/ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

**Action 3.6:** 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the public’s lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.6
<b>Name of Action or Project:</b>	Awareness program on local mitigation activities.
<b>Action or Project Description:</b>	Distribute press releases by cities/county regarding adopted mitigation measures
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$500-\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The city regularly does press releases on city activities that mitigate problems with drainage and flooding.

**Action 3.7:** Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of awareness/education on individual preparedness.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.7
<b>Name of Action or Project:</b>	Individual preparedness education program.
<b>Action or Project Description:</b>	Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, county health department, Red Cross
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	City EMD and health department shares brochures and information on <i>Ready in 3</i> and other individual preparedness information. Red Cross holds trainings in the area on a regular basis.

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

**Action 4.3:** Pool different agency resources to achieve widespread mitigation results.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to carry out mitigation projects
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.3
<b>Name of Action or Project:</b>	Pool different agency resources to achieve widespread mitigation results.
<b>Action or Project Description:</b>	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMDs, board of aldermen, floodplain manager and school district boards of education
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, floodplain ordinances, LEOP, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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. The local electric cooperative has worked with the Red Cross to encourage local churches to be designated shelters and purchase generators.

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

**Action 5.2:** Provide information to all communities on the benefits and costs of developing storm water management plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with non-existent stormwater management plans
<b>Hazard(s) Addressed:</b>	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.2
<b>Name of Action or Project:</b>	Provide information to all communities on the benefits and costs of developing storm water management plans.
<b>Action or Project Description:</b>	Investigate and consider the benefits and costs of developing stormwater management plans.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$2,500-\$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, board of aldermen
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, comprehensive plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – no progress
<b>Report of Progress</b>	Due to this being prioritized as medium, no progress has been made.

**Action 5.3:** Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not merging hazard mitigation activities, where appropriate, with emergency plans and procedures
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.3
<b>Name of Action or Project:</b>	Merging appropriate hazard mitigation activities with emergency plans and procedures
<b>Action or Project Description:</b>	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, school crisis/emergency plans
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	



**Action 5.4:** Encourage cities to require contractor stormwater management plans in all new development.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack of stormwater planning in new development
<b>Hazard(s) Addressed:</b>	Severe storms, flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.4
<b>Name of Action or Project:</b>	Stormwater management planning in new development
<b>Action or Project Description:</b>	Encourage cities to require contractor stormwater management plans in all new development.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of alderman
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, stormwater management plan
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 5.5:** Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with properties located in the floodplain.
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.5
<b>Name of Action or Project:</b>	Floodplain buyout
<b>Action or Project Description:</b>	Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, floodplain manager, board of aldermen
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

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

**Action 6.2:** Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities that can occur when infrastructure projects do not include mitigation considerations.
<b>Hazard(s) Addressed:</b>	Floods, Earthquakes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.2
<b>Name of Action or Project:</b>	Including mitigation in grant proposals
<b>Action or Project Description:</b>	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$1,500 - \$7,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners, street department, board of aldermen
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	General revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 6.3:** Work with state/local/federal agencies to include mitigation in all economic and community development projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.3
<b>Name of Action or Project:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Action or Project Description:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500-\$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Engineers, board of alderman, grant writers
<b>Action/Project Priority:</b>	18 - Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, strategic plans, economic development plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of Alderman, Economic Developers, Community Development Organizations, EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 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

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects for individuals
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.5
<b>Name of Action or Project:</b>	Encourage development and implementation of mitigation cost-share programs
<b>Action or Project Description:</b>	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
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	15 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvements plans, comprehensive plans, strategic plans,
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.7:** Prioritize mitigation projects based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.7
<b>Name of Action or Project:</b>	Prioritizing mitigation projects
<b>Action or Project Description:</b>	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$750 - \$2,750
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen, local planners, city engineers, MPC
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Hazard mitigation projects are prioritized in the hazard mitigation plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

## Sullivan

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

**Action 1.1:** Implement an education program on personal emergency preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Residents are not always prepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities. This action item will improve the preparedness of individual households.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1
<b>Name of Action or Project:</b>	Personal Preparedness Education/Awareness Program
<b>Action or Project Description:</b>	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and through the county health department and local government offices.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
<b>Estimated Cost:</b>	\$500 - \$3,500 estimated cost
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD and local emergency response agencies
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Activity has occurred in this area as most emergency response agencies, health department and EMDs promote individual preparedness and provide <i>Ready in 3</i> brochures. SEMA distributes press releases periodically on personal preparedness. The county health department and county EMD post information on their websites, and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for the city of Bourbon.



**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Absence of emergency plans by businesses.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Development of emergency plans by businesses.
<b>Action or Project Description:</b>	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.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Board of Alderman
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - not started
<b>Report of Progress</b>	During the last update of the CEDS, a chapter on economic recovery and resiliency was added which is a tool for local leaders to reduce vulnerability to natural hazards and expedite recovery public and private infrastructure. Implementation progress has been restricted due to lack of funding to develop a program to encourage and assist businesses and public entities in developing emergency plans. EMDs are encouraged to share resources available through SEMA and FEMA on emergency planning for businesses and public entities and through chambers of commerce.

**Action 1.3:** Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Need to improve warning and communications systems throughout the county.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.
<b>Action or Project Description:</b>	Provide information to local governments and citizens on the existing warning systems in place in Crawford County and encourage better utilization of those systems. In addition, actively search for funding to improve both warning systems and communications throughout the county.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD
<b>Action/Project Priority:</b>	22 – High Priority
<b>Timeline for Completion:</b>	On-going - with goal of 2020 for having 80 percent or more of the population signed up for Everbridge.
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing– in progress
<b>Report of Progress</b>	Currently there are storm sirens in Indian Hills – a rural subdivision north of Cuba, as well as in Cuba, Steelville, Bourbon and Sullivan. Currently the only phone based warning/messaging systems available in the county are Nixle in Sullivan, Crawford Electric Cooperative has a messaging system for customers, and messaging systems used by Sullivan School District and Cuba School District. In addition, the county and cities need to continue to work to improve communications systems within the county to improve county-wide as well as state-wide communications during disasters and joint response efforts.

**Action 1.4:** Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of storm warning systems in all areas of Bourbon
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.4
<b>Name of Action or Project:</b>	Promote weather radio use
<b>Action or Project Description:</b>	Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$2,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Although the county’s FaceBook page includes information on weather radios, Sullivan does not actively promote them. The city does have outdoor storm sirens, but these do not always provide adequate coverage and are not always audible indoors. The city has Nexle phone based warning system as well. All school districts in the county use weather radios.

**Action 1.6:** Provide information on tree trimming and dead tree removal programs to utility companies and local government.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with falling limbs and trees during severe storms, winter storms and tornados – loss of power, road blockages
<b>Hazard(s) Addressed:</b>	Severe Storms, Winter Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.6
<b>Name of Action or Project:</b>	Reducing risk through tree trimming and removal
<b>Action or Project Description:</b>	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$5,500 – \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Street Dept.
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, county road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The county road and bridge crews include tree trimming and tree removal in their maintenance activities. The local electric cooperative carries out an aggressive tree trimming program.

**Action 1.7:** Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	
<b>Hazard(s) Addressed:</b>	Floods and Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.7
<b>Name of Action or Project:</b>	Review road and bridge upgrades for potential mitigation actions
<b>Action or Project Description:</b>	Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,000 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of aldermen, city street department
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvement plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The city works to upgrade street projects by increasing the size of culverts when doing replacements.

**Action 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of information/data on some hazards such as dam failure, tornadoes, sinkholes, land subsidence and wildfire in Crawford County.
<b>Hazard(s) Addressed:</b>	Dam failure, tornadoes, sinkholes, land subsidence, wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.9
<b>Name of Action or Project:</b>	Improving information/data for risk assessments and planning
<b>Action or Project Description:</b>	Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence and wildfire upon Crawford County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The MPC continues to monitor data availability and information sources for additional information that can be used in updating and improving the hazard mitigation plan.

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

**Action 2.1:** Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
<b>Hazard(s) Addressed:</b>	Earthquakes and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1
<b>Name of Action or Project:</b>	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
<b>Action or Project Description:</b>	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornados or severe weather.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 – \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, local emergency response agencies
<b>Action/Project Priority:</b>	21 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, capital improvement plans, hazard mitigation plan, local critical facility budgets
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Crawford Electric Cooperative built a new main office and included hardened rooms to resist tornado and earthquake damage.



**Action 2.2:** Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the general public not being aware of the dangers of floodplain development and benefits of the NFIP.
<b>Hazard(s) Addressed:</b>	Floods
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.2
<b>Name of Action or Project:</b>	Floodplain education/awareness program.
<b>Action or Project Description:</b>	Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 - \$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss of function/displacement impacts and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD and floodplain manager
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain management ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	The county EMD provides information on floodplain through their webpage but the city of Sullivan could benefit from a more focused effort by the city in this area.

**Action 2.3:** Provide information on the benefits of establishing minimum building codes to those jurisdiction that currently lack minimum building code requirements.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities to property and communities in the event of a natural disaster due to substandard construction.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3
<b>Name of Action or Project:</b>	Information/awareness program for the benefits of minimum building codes.
<b>Action or Project Description:</b>	Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$3,000-\$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, Local Government
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Jurisdictional Builders Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Continuing Not Started
<b>Report of Progress</b>	Sullivan recently passed ordinances for building and occupancy permits.

**Action 2.4:** Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
<b>Hazard(s) Addressed:</b>	Floods, Severe Storms, and Tornos
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.4
<b>Name of Action or Project:</b>	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
<b>Action or Project Description:</b>	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$2,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, City Council
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain ordinances, building codes
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	The city floodplain ordinance requires that hazardous material tanks in floodplain be secured.

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

**Action 3.1:** Distribute SEMA brochures at public facilities and events and distribute regular press releases concerning hazards, where they strike, frequency and preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of emergency management and best practices during hazardous events.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1
<b>Name of Action or Project:</b>	Distribute SEMA brochures at public facilities and events
<b>Action or Project Description:</b>	Provide information by distributing SEMA brochures and press releases on types of hazards, best practices during a disaster (Ready in 3) and other informational documents.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local emergency response agencies, county health department
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The health department and some local emergency response agencies regularly distribute emergency related brochures and information at local events, through websites and FaceBook pages. The county EMD and health department also distribute press releases on hazards and how to prepare for them.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of knowledge/understanding of the importance of hazard mitigation activities
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4
<b>Name of Action or Project:</b>	Awareness/education program on hazard mitigation for local elected officials and planning organizations
<b>Action or Project Description:</b>	Ask SEMA mitigation specialists to present information to city councils, county commission and local planning organizations.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of aldermen, city EMD
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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 and its jurisdictions.

**Action 3.5:** Re-evaluate the hazard mitigation plan and merge with other community planning activities.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.5
<b>Name of Action or Project:</b>	Re-evaluate the hazard mitigation plan and merge with other community planning activities.
<b>Action or Project Description:</b>	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$5,500 - \$10,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Local Planners, MPC, board of aldermen
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, hazard mitigation plan, school crisis management plans, comprehensive plans, builder’s plans, capital improvement plan, economic development plan, transportation plan, land-use plan, floodplain ordinances, storm water plans/ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.

**Action 3.6:** 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the public’s lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.6
<b>Name of Action or Project:</b>	Awareness program on local mitigation activities.
<b>Action or Project Description:</b>	Distribute press releases by cities/county regarding adopted mitigation measures
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$500-\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The city regularly does press releases on city activities that mitigate problems with drainage and flooding.

**Action 3.7:** Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of awareness/education on individual preparedness.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.7
<b>Name of Action or Project:</b>	Individual preparedness education program.
<b>Action or Project Description:</b>	Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, county health department, Red Cross
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	City EMD and health department shares brochures and information on <i>Ready in 3</i> and other individual preparedness information. Red Cross holds trainings in the area on a regular basis.



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

**Action 4.3:** Pool different agency resources to achieve widespread mitigation results.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to carry out mitigation projects
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.3
<b>Name of Action or Project:</b>	Pool different agency resources to achieve widespread mitigation results.
<b>Action or Project Description:</b>	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMDs, board of aldermen, floodplain manager and school district boards of education
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, floodplain ordinances, LEOP, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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. The local electric cooperative has worked with the Red Cross to encourage local churches to be designated shelters and purchase generators. The city of Sullivan fire department has been the recipient of a variety of communications equipment, trailers and other emergency response equipment from the Region I HSOC as well.

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

**Action 5.2:** Provide information to all communities on the benefits and costs of developing storm water management plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with non-existent stormwater management plans
<b>Hazard(s) Addressed:</b>	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.2
<b>Name of Action or Project:</b>	Provide information to all communities on the benefits and costs of developing storm water management plans.
<b>Action or Project Description:</b>	Investigate and consider the benefits and costs of developing stormwater management plans.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$2,500-\$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, board of aldermen
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, comprehensive plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – no progress
<b>Report of Progress</b>	Sullivan has stormwater management ordinances.

**Action 5.3:** Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not merging hazard mitigation activities, where appropriate, with emergency plans and procedures
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.3
<b>Name of Action or Project:</b>	Merging appropriate hazard mitigation activities with emergency plans and procedures
<b>Action or Project Description:</b>	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, school crisis/emergency plans
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 5.4:** Encourage cities to require contractor stormwater management plans in all new development.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack of stormwater planning in new development
<b>Hazard(s) Addressed:</b>	Severe storms, flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.4
<b>Name of Action or Project:</b>	Stormwater management planning in new development
<b>Action or Project Description:</b>	Encourage cities to require contractor stormwater management plans in all new development.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, stormwater management plan
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	Sullivan has stormwater management ordinances.

**Action 5.5:** Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with properties located in the floodplain.
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.5
<b>Name of Action or Project:</b>	Floodplain buyout
<b>Action or Project Description:</b>	Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, floodplain manager, board of aldermen
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

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

**Action 6.2:** Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities that can occur when infrastructure projects do not include mitigation considerations.
<b>Hazard(s) Addressed:</b>	Floods, Earthquakes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.2
<b>Name of Action or Project:</b>	Including mitigation in grant proposals
<b>Action or Project Description:</b>	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$1,500 - \$7,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners, street department, board of aldermen
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	General revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 6.3:** Work with state/local/federal agencies to include mitigation in all economic and community development projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.3
<b>Name of Action or Project:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Action or Project Description:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500-\$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Engineers, board of alderman, grant writers
<b>Action/Project Priority:</b>	18 - Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, strategic plans, economic development plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of Alderman, Economic Developers, Community Development Organizations, EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.



**Action 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

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects for individuals
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.5
<b>Name of Action or Project:</b>	Encourage development and implementation of mitigation cost-share programs
<b>Action or Project Description:</b>	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
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen
<b>Action/Project Priority:</b>	15 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvements plans, comprehensive plans, strategic plans,
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.7:** Prioritize mitigation projects based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.7
<b>Name of Action or Project:</b>	Prioritizing mitigation projects
<b>Action or Project Description:</b>	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$750 - \$2,750
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of aldermen, local planners, city engineers, MPC
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Hazard mitigation projects are prioritized in the hazard mitigation plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

## West Sullivan

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

**Action 1.1:** Implement an education program on personal emergency preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Residents are not always prepared to manage on their own for up to 72 hours following an event – especially an event which results in power outage or loss of utilities. This action item will improve the preparedness of individual households.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.1
<b>Name of Action or Project:</b>	Personal Preparedness Education/Awareness Program
<b>Action or Project Description:</b>	Local emergency responders and EMDs will promote Ready in 3 and other personal preparedness education programs through the distribution of brochures, press releases and presentations at special events and through the county health department and local government offices.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning and hazard mitigation activities.
<b>Estimated Cost:</b>	\$500 - \$3,500 estimated cost
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD and local emergency response agencies
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods or services
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Activity has occurred in this area as most emergency response agencies, health department and EMDs promote individual preparedness and provide <i>Ready in 3</i> brochures. SEMA distributes press releases periodically on personal preparedness. The county health department and county EMD post information on their websites, and FaceBook pages. A more focused and coordinated effort would help to achieve comprehensive coverage for the city of West Sullivan.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Absence of emergency plans by businesses.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.2
<b>Name of Action or Project:</b>	Development of emergency plans by businesses.
<b>Action or Project Description:</b>	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.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$4,500 - \$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Board of Alderman
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, Meramec Region Community Economic Development Strategy (CEDS) – includes Chapter 8 – Economic Recovery and Resiliency Strategy
<b>Progress Report</b>	
<b>Action Status</b>	Continuing - not started
<b>Report of Progress</b>	During the last update of the CEDS, a chapter on economic recovery and resiliency was added which is a tool for local leaders to reduce vulnerability to natural hazards and expedite recovery public and private infrastructure. Implementation progress has been restricted due to lack of funding to develop a program to encourage and assist businesses and public entities in developing emergency plans. EMDs are encouraged to share resources available through SEMA and FEMA on emergency planning for businesses and public entities and through chambers of commerce.

**Action 1.3:** Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Need to improve warning and communications systems throughout the county.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.3
<b>Name of Action or Project:</b>	Actively seek funding to assist cities in obtaining early warning systems and improved communication systems and updating existing warning systems.
<b>Action or Project Description:</b>	Provide information to local governments and citizens on the existing warning systems in place in Crawford County and encourage better utilization of those systems. In addition, actively search for funding to improve both warning systems and communications throughout the county.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD
<b>Action/Project Priority:</b>	22 – High Priority
<b>Timeline for Completion:</b>	On-going - with goal of 2020 for having 80 percent or more of the population signed up for Everbridge.
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing– in progress
<b>Report of Progress</b>	Currently there are storm sirens in Indian Hills – a rural subdivision north of Cuba, as well as in Cuba, Steelville, Bourbon and Sullivan. Currently the only phone based warning/messaging systems available in the county are Nixle in Sullivan, Crawford Electric Cooperative has a messaging system for customers, and messaging systems used by Sullivan School District and Cuba School District. In addition, the county and cities need to continue to work to improve communications systems within the county to improve county-wide as well as state-wide communications during disasters and joint response efforts.

**Action 1.4:** Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of storm warning systems in all areas of Bourbon
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.4
<b>Name of Action or Project:</b>	Promote weather radio use
<b>Action or Project Description:</b>	Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$2,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of trustees
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Although the county’s FaceBook page includes information on weather radios, West Sullivan does not actively promote them. All school districts in the county use weather radios.

**Action 1.6:** Provide information on tree trimming and dead tree removal programs to utility companies and local government.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks and vulnerabilities associated with falling limbs and trees during severe storms, winter storms and tornados – loss of power, road blockages
<b>Hazard(s) Addressed:</b>	Severe Storms, Winter Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.6
<b>Name of Action or Project:</b>	Reducing risk through tree trimming and removal
<b>Action or Project Description:</b>	Provide information on tree trimming and dead tree removal programs to utility companies and local government.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$5,500 – \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Street Dept.
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, county road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The county road and bridge crews include tree trimming and tree removal in their maintenance activities. The local electric cooperative carries out an aggressive tree trimming program.

**Action 1.7:** Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	
<b>Hazard(s) Addressed:</b>	Floods and Earthquake
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.7
<b>Name of Action or Project:</b>	Review road and bridge upgrades for potential mitigation actions
<b>Action or Project Description:</b>	Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,000 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of trustees, city street department
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvement plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The city works to upgrade street projects by increasing the size of culverts when doing replacements.



**Action 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of information/data on some hazards such as dam failure, tornadoes, sinkholes, land subsidence and wildfire in Crawford County.
<b>Hazard(s) Addressed:</b>	Dam failure, tornadoes, sinkholes, land subsidence, wildfire
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.9
<b>Name of Action or Project:</b>	Improving information/data for risk assessments and planning
<b>Action or Project Description:</b>	Monitor developments in data availability concerning the impact of dam failure, tornadoes, sinkholes, land subsidence and wildfire upon Crawford County and all jurisdictions through local, state and federal agencies for use in hazard mitigation planning.
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	\$1,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners
<b>Action/Project Priority:</b>	26 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	The MPC continues to monitor data availability and information sources for additional information that can be used in updating and improving the hazard mitigation plan.

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

**Action 2.1:** Provide information on self-inspection programs to critical facilities to assess earthquake and tornado resistance.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with construction of critical facilities which may make them vulnerable to earthquakes and tornadoes
<b>Hazard(s) Addressed:</b>	Earthquakes and Tornadoes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.1
<b>Name of Action or Project:</b>	Self-inspection awareness program for critical facilities to determine earthquake, tornado and severe weather resistance of structures.
<b>Action or Project Description:</b>	Provide information on conducting self-inspections or where to seek help in having facilities inspected to determine their resistance to earthquakes, tornados or severe weather.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$1,500 – \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, local emergency response agencies
<b>Action/Project Priority:</b>	21 – High Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, capital improvement plans, hazard mitigation plan, local critical facility budgets
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Crawford Electric Cooperative built a new main office and included hardened rooms to resist tornado and earthquake damage.

**Action 2.3:** Provide information on the benefits of establishing minimum building codes to those jurisdiction that currently lack minimum building code requirements.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities to property and communities in the event of a natural disaster due to substandard construction.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.3
<b>Name of Action or Project:</b>	Information/awareness program for the benefits of minimum building codes.
<b>Action or Project Description:</b>	Provide information on the benefits of establishing minimum building codes to those jurisdictions that currently lack minimum building code requirements.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$3,000-\$10,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, Local Government
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Jurisdictional Builders Plan
<b>Progress Report</b>	
<b>Action Status</b>	Revised - Continuing Not Started
<b>Report of Progress</b>	There has been no progress in this area.

**Action 2.4:** Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Unsecured hazardous materials tank such as propane and unsecured mobile homes pose risks during floods, severe storms and tornadoes.
<b>Hazard(s) Addressed:</b>	Floods, Severe Storms, and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	2.4
<b>Name of Action or Project:</b>	Establishing regulations for the securing of hazardous materials tanks and mobile homes.
<b>Action or Project Description:</b>	Have local jurisdictions review their floodplain ordinances and if not included, add language for securing hazardous materials tanks and mobile homes in floodplain areas to reduce hazards during storms and flooding.
<b>Applicable Goal Statement:</b>	Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
<b>Estimated Cost:</b>	\$2,500 - \$5,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, City Council
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	1 – 5 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, floodplain ordinances, building codes
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	

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

**Action 3.1:** Distribute SEMA brochures at public facilities and events and distribute regular press releases concerning hazards, where they strike, frequency and preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of awareness of emergency management and best practices during hazardous events.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.1
<b>Name of Action or Project:</b>	Distribute SEMA brochures at public facilities and events
<b>Action or Project Description:</b>	Provide information by distributing SEMA brochures and press releases on types of hazards, best practices during a disaster (Ready in 3) and other informational documents.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local emergency response agencies, county health department
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	The health department and some local emergency response agencies regularly distribute emergency related brochures and information at local events, through websites and FaceBook pages. The county EMD and health department also distribute press releases on hazards and how to prepare for them.

**Action 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with lack of knowledge/understanding of the importance of hazard mitigation activities
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.4
<b>Name of Action or Project:</b>	Awareness/education program on hazard mitigation for local elected officials and planning organizations
<b>Action or Project Description:</b>	Ask SEMA mitigation specialists to present information to city councils, county commission and local planning organizations.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of trustees, city EMD
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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 and its jurisdictions.

**Action 3.5:** Re-evaluate the hazard mitigation plan and merge with other community planning activities.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not regularly reviewing and updating the mitigation plan and incorporating mitigation activities into emergency operations plans and procedures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.5
<b>Name of Action or Project:</b>	Re-evaluate the hazard mitigation plan and merge with other community planning activities.
<b>Action or Project Description:</b>	Re-evaluate the hazard mitigation plan, merge with other community planning activities and documents and incorporate hazard mitigation into the long-range planning and development activities of the county and each jurisdiction.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$5,500 - \$10,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, Local Planners, MPC, board of trustees
<b>Action/Project Priority:</b>	25 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOPs, hazard mitigation plan, school crisis management plans, comprehensive plans, builder’s plans, capital improvement plan, economic development plan, transportation plan, land-use plan, floodplain ordinances, storm water plans/ordinances
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	Hazard mitigation goals and actions have been incorporated into the regional Community and Economic Development Strategy. Mitigation actions are part of the county LEOP. As more local officials become familiar with mitigation and understand how it fits within other planning activities, this action item will continue to expand.



**Action 3.6:** 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.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the public’s lack of knowledge in regards to hazard mitigation and the benefits of adopting mitigation measures.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.6
<b>Name of Action or Project:</b>	Awareness program on local mitigation activities.
<b>Action or Project Description:</b>	Distribute press releases by cities/county regarding adopted mitigation measures
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$500-\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of trustees
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	

**Action 3.7:** Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of awareness/education on individual preparedness.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	3.7
<b>Name of Action or Project:</b>	Individual preparedness education program.
<b>Action or Project Description:</b>	Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.
<b>Applicable Goal Statement:</b>	Promote education, outreach, research and development programs to improve the knowledge and awareness among the citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities
<b>Estimated Cost:</b>	\$1,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, county health department, Red Cross
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	LEOP, hazard mitigation plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	County health department shares brochures and information on <i>Ready in 3</i> and other individual preparedness information. Red Cross holds trainings in the area on a regular basis.

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

**Action 4.3:** Pool different agency resources to achieve widespread mitigation results.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to carry out mitigation projects
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	4.3
<b>Name of Action or Project:</b>	Pool different agency resources to achieve widespread mitigation results.
<b>Action or Project Description:</b>	Bring together different agencies and organizations that have similar goals and work together to pool resources to move mitigation projects forward.
<b>Applicable Goal Statement:</b>	Strengthen communication and coordinate participation between agencies, stakeholders, jurisdictions, and the public to create widespread interest in mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMDs, board of aldermen, and school district board of education
<b>Action/Project Priority:</b>	27 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, floodplain ordinances, LEOP, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	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. The local electric cooperative has worked with the Red Cross to encourage local churches to be designated shelters and purchase generators.

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

**Action 5.2:** Encourage all communities to develop stormwater management plans.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with non-existent stormwater management plans
<b>Hazard(s) Addressed:</b>	Flood, Severe Storm (Hail/Wind), and Severe Winter Weather
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.2
<b>Name of Action or Project:</b>	Encourage all communities to develop stormwater management plans
<b>Action or Project Description:</b>	Investigate and consider the benefits and costs of developing stormwater management plans.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$2,500-\$5,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, board of trustees
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, comprehensive plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – no progress
<b>Report of Progress</b>	Due to this being prioritized as medium, no progress has been made.

**Action 5.3:** Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with not merging hazard mitigation activities, where appropriate, with emergency plans and procedures
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.3
<b>Name of Action or Project:</b>	Merging appropriate hazard mitigation activities with emergency plans and procedures
<b>Action or Project Description:</b>	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of trustees
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOP, school crisis/emergency plans
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 5.4:** Encourage cities to require contractor stormwater management plans in all new development.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with the lack of stormwater planning in new development
<b>Hazard(s) Addressed:</b>	Severe storms, flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.4
<b>Name of Action or Project:</b>	Stormwater management planning in new development
<b>Action or Project Description:</b>	Encourage cities to require contractor stormwater management plans in all new development.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	\$500-\$4,500
<b>Benefits:</b>	Losses avoided by implementing this action include property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of trustees
<b>Action/Project Priority:</b>	16 – Medium Priority
<b>Timeline for Completion:</b>	N/A
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, stormwater management plan
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

**Action 5.5:** Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities associated with properties located in the floodplain.
<b>Hazard(s) Addressed:</b>	Flood
<b>Action or Project</b>	
<b>Action/Project Number:</b>	5.5
<b>Name of Action or Project:</b>	Floodplain buyout
<b>Action or Project Description:</b>	Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.
<b>Applicable Goal Statement:</b>	Establish priorities for reducing risks to the people and their property with emphasis on long-term and maximum benefits to the public rather than short-term benefits of special interests.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damages, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of trustees
<b>Action/Project Priority:</b>	14 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, floodplain ordinance
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	

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

**Action 6.2:** Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Risks/vulnerabilities that can occur when infrastructure projects do not include mitigation considerations.
<b>Hazard(s) Addressed:</b>	Floods, Earthquakes
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.2
<b>Name of Action or Project:</b>	Including mitigation in grant proposals
<b>Action or Project Description:</b>	Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$1,500 - \$7,000
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, local planners, street department, board of trustees
<b>Action/Project Priority:</b>	18 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	General revenue funds
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, road and bridge budget
<b>Progress Report</b>	
<b>Action Status</b>	New
<b>Report of Progress</b>	



**Action 6.3:** Work with state/local/federal agencies to include mitigation in all economic and community development projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of synergy/communication/coordination of mitigation in community development projects and integration of mitigation actions into economic and community development projects.
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.3
<b>Name of Action or Project:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Action or Project Description:</b>	Work with state/local/federal agencies to include mitigation in all economic and community development projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500-\$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City Engineer, board of trustees, grant writers
<b>Action/Project Priority:</b>	18 - Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, strategic plans, economic development plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Board of Alderman, Economic Developers, Community Development Organizations, EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 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

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of funding for mitigation projects for individuals
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.5
<b>Name of Action or Project:</b>	Encourage development and implementation of mitigation cost-share programs
<b>Action or Project Description:</b>	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
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of trustees
<b>Action/Project Priority:</b>	15 – Medium Priority
<b>Timeline for Completion:</b>	5 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, capital improvements plans, comprehensive plans, strategic plans,
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – not started
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Action 6.7:** Prioritize mitigation projects based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	West Sullivan
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of organization/priority of mitigation projects based on cost-effectiveness, and severity in regards to threat to life, health, and property.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.7
<b>Name of Action or Project:</b>	Prioritizing mitigation projects
<b>Action or Project Description:</b>	Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$750 - \$2,750
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	City EMD, board of trustees, local planners, city engineer, MPC
<b>Action/Project Priority:</b>	28 – High Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation Plan
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in progress
<b>Report of Progress</b>	Hazard mitigation projects are prioritized in the hazard mitigation plan. The MPC reviewed and updated that list of prioritized items, including considering the greatest threat to life, health and property. This is an on-going activity. The list of prioritized action items should be reviewed at a minimum of every five years and following any major disaster events in the county.

## **Crawford County R-I**

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

**Action 1.8:** 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County R-I
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

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

**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County R-I
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	School Board, Superintendent, Economic Developers, Community Development Organizations, EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

**Crawford County R-II**

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

**Action 1.8:** 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County R-II
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

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

**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Crawford County R-II
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	School Board, Superintendent, Economic Developers, Community Development Organizations, EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.



## **Steelville R-III**

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

**Action 1.8:** 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville R-III
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

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

**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Steelville R-III
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	School Board, Superintendent, Economic Developers, Community Development Organizations, EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

## Sullivan C-2

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

**Action 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).

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan C-2
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	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.
<b>Hazard(s) Addressed:</b>	Severe Storms and Tornados
<b>Action or Project</b>	
<b>Action/Project Number:</b>	1.8
<b>Name of Action or Project:</b>	Increasing the number of certified tornado safe rooms and storm shelters in high population areas
<b>Action or Project Description:</b>	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).
<b>Applicable Goal Statement:</b>	Reduce risks and vulnerabilities of people in hazard-prone areas through current technology, better planning, and hazard mitigation activities.
<b>Estimated Cost:</b>	Unknown
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	EMD, school superintendents, school boards
<b>Action/Project Priority:</b>	24 – High Priority
<b>Timeline for Completion:</b>	1 – 10 years
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard mitigation plan, LEOPs, school emergency plan, capital improvement plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing – in progress
<b>Report of Progress</b>	Due to the high cost of construction of certified tornado safe rooms, this action item has not made progress.

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

**Action 6.4:** Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Sullivan C-2
<b>Risk / Vulnerability</b>	
<b>Problem being Mitigated:</b>	Lack of resources to implement mitigation projects.
<b>Hazard(s) Addressed:</b>	All hazards
<b>Action or Project</b>	
<b>Action/Project Number:</b>	6.4
<b>Name of Action or Project:</b>	Budgeting and implementing hazard mitigation projects.
<b>Action or Project Description:</b>	Provide information to jurisdictions on the benefits of budgeting for and implementing hazard mitigation projects.
<b>Applicable Goal Statement:</b>	Secure resources for investment in hazard mitigation.
<b>Estimated Cost:</b>	\$2,500 - \$9,500
<b>Benefits:</b>	Losses avoided by implementing this action include injuries and/or casualties, property damage, loss-of-function/displacement impacts, and emergency management costs/community costs.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	School Board, Superintendent, Economic Developers, Community Development Organizations, EMD, local planners
<b>Action/Project Priority:</b>	17 – Medium Priority
<b>Timeline for Completion:</b>	On-going
<b>Potential Fund Sources:</b>	Grants, local general revenue funds, and private donations of cash, goods, or services.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Hazard Mitigation plan, capital improvement plans, comprehensive plans, economic development plans, CEDS, strategic plans, land-use plans
<b>Progress Report</b>	
<b>Action Status</b>	Continuing in Progress
<b>Report of Progress</b>	As this is a medium priority, no progress has been made to date.

# 5 PLAN MAINTENANCE PROCESS

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

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

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**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

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

**Table 1.1. Planning Mechanisms Identified for Integration of Hazard Mitigation Plan**

Jurisdiction	Planning Mechanisms
Unincorporated Crawford County	County Emergency Operations Plan County Mitigation Plan. Comprehensive Economic Development Strategy Regional Transportation Plan
Bourbon	Comprehensive Plan City Emergency Operations Plan Local Mitigation Plan County Mitigation Plan Comprehensive Economic Development Strategy Regional Transportation Plan
Cuba	Capital Improvement Plan City Emergency Operations Plan Local Mitigation Plan Economic Development Plan Comprehensive Economic Development Strategy Regional Transportation Plan
Steelville	Comprehensive Plan Capital Improvements Plan Local Mitigation Plan Comprehensive Economic Development Strategy Regional Transportation Plan
Sullivan	Comprehensive Plan City Emergency Operations Plan Local Mitigation Plan Comprehensive Economic Development Strategy Regional Transportation Plan
West Sullivan	Local Mitigation Plan Comprehensive Economic Development Strategy Regional Transportation Plan
Crawford Co. R-I	School Emergency Plan Weapons Policy



Jurisdiction	Planning Mechanisms
Crawford Co. R-II	School Emergency Plan Weapons Policy
Steelville R-III	Master Plan School Emergency Plan Weapons Policy
Sullivan School District	Master Plan School Emergency Plan Weapons Policy

Source: Data Collection Questionnaires, 2017

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

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A: References .....	6.2
B: Planning Process .....	6.6
C: Adoption Resolutions .....	6.31
D: Critical/Essential Facilities.....	6.32
E: MDC Wildfire Data Search .....	6.34

## A: References

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1. American FactFinder, U.S. Dept. of Commerce, United States Census Bureau
2. Missouri Department of Natural Resources, Dam and Reservoir Safety, <http://dnr.mo.gov/env/wrc/dam-safety/statemap.htm>
3. Stanford University's National Performance of Dams Program, <http://npdp.stanford.edu/index.html>
4. National Inventory of Dams, <http://geo.usace.army.mil/>
5. MO DNR Dam & Reservoir Safety Program
6. National Resources Conservation Service, <http://www.nrcs.usda.gov>
7. DamSafetyAction.org, <http://www.damsafetyaction.org/MO/>
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## **B: Planning Process**

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**HMPC Mailing list**

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Administrator  
Meramec Nursing Center  
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MO State Emergency Management  
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Administrator  
Happy Acres Residential Care  
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U.S. Army Corps of Engineers  
US Army Engineer District, St. Louis  
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Intercounty Electric Co-op  
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Cuba, MO 65453

Cuba Free Press  
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Cuba, MO 65453

Sullivan Independent News  
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Sullivan, MO 63080

Steelville Star-Crawford Mirror  
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Street Commissioner Larry ~~Cunejo~~  
City of Sullivan  
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Sullivan, MO 63080

Light Commissioner J.V. Thurmond  
City of Sullivan  
210 W Washington St.  
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Water and Sewer Commissioner Kent  
Koch  
City of Sullivan  
210 W Washington St.  
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Crawford Co. Road District 1  
101 W Euclid St  
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Crawford Co. Road District 2  
276 Hwy H  
Leasburg, MO 65535

Town of West Sullivan  
Board of Trustees  
PO BOX 765  
Sullivan, MO 63080

For Immediate Release

March 15, 2017

For more information contact

Ryan Dunwoody at (573) 265-2993

**Public meeting scheduled for Crawford County Hazard Mitigation Plan update**

STEELVILLE – City and county officials, school leaders, emergency management agencies and interested residents are invited to attend a public meeting April 11 to discuss updates to the Crawford County Hazard Mitigation Plan.

The meeting will be held at 2 p.m. in the Steelville Community Center located at 101 W. Keysville St., Steelville, Mo 65565.

The county must have an approved hazard mitigation plan in order for Crawford County schools, cities, agencies and others to access state hazard mitigation grant funds. The plan includes an assessment of natural hazards, showcases past accomplishments and sets goals and action items to reduce the impact of natural hazards in the future.

Meramec Regional Planning Commission (MRPC) is updating the plan in partnership with the Crawford County Commission. Questions may be directed to MRPC Environmental Programs Specialist Ryan Dunwoody at [rdunwoody@meramecregion.org](mailto:rdunwoody@meramecregion.org) or 573-265-2993.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. A professional staff of 25, directed by the MRPC board, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at [www.meramecregion.org](http://www.meramecregion.org) or on Facebook at [www.facebook.com/meramecregion](http://www.facebook.com/meramecregion).

## MEMORANDUM

TO: Crawford County Hazard Mitigation Planning Committee

FROM: Ryan Dunwoody, MRPC Environmental Programs Specialist

DATE: March 14, 2017

SUBJECT: Hazard mitigation planning meeting April 11, 2017

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 March, 2018 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 **Tuesday, April 11 at 2:00 p.m.** at the **Steelville Community Center in 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 filling out the questionnaire.

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, 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: [rdunwoody@merameregion.org](mailto:rdunwoody@merameregion.org). I look forward to seeing you at the meeting.

RD

Enclosures

**Advisory Committee Meeting  
Crawford County Hazard Mitigation Plan Update**

**AGENDA**

**2:00 p.m. ~ April 11, 2017**

**Steelville Community Center**

- I. Welcome and Introductions – Tammy Snodgrass**
- II. Overview of Hazard Mitigation Planning and Crawford County Hazard Mitigation Plan**  
*Staff will provide an overview of the planning process and a brief review of the existing hazard mitigation plan*
- III. Discussion of Goals and Objectives and Progress Made in Five Years**  
*Staff will lead the review of existing goals and a group discussion on what progress has been made in addressing hazard mitigation over the past five years.*
- IV. Discussion of Possible Changes to Goals and Action Items for Next Five Years**  
*After reviewing the plan document and looking at what has been accomplished, the group will be asked to discuss if needs have changed and what, if any changes need to be made to goals and action items for the revised plan.*
- V. Integration of Other Data, Reports, Studies, Plans**  
*What other information is available locally that could be included in the hazard mitigation plan? What other plans need to incorporate aspects of the hazard mitigation plan?*
- VI. Review of Disasters/Deaths/Injuries over the Past Five Years**  
*Staff will provide data on disaster declarations for the past five years. Participants are asked to share any additional information on specific damage that occurred to infrastructure, critical infrastructure, neighborhoods, etc. Of particular interest is any information on deaths or injuries attributed to natural disasters.*
- VII. Setting of Date and Time for Next Meeting**
- VIII. Adjourn**

## NOTICE OF PUBLIC MEETING

Date and time of posting: **March 15, 4:00 p.m.**

Notice is hereby given that the **Crawford County Hazard Mitigation Planning Committee** will meet at 2:00 p.m. on **Tuesday, April 11, 2017** at the Steelville Community Center located at 101 W. Keyville St., Steelville, Mo 65565.

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Overview of Hazard Mitigation Planning and Crawford County Hazard Mitigation Plan
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Discussion of Possible Changes to Goals and Action Items for Next Five Years
- Integration of Other Data, Reports, Studies, Plans
- Review of Disasters/Deaths/Injuries over the Past Five Years
- Setting of Date and Time for Next Meeting
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Ryan Dunwoody  
#4 Industrial Drive  
St. James, MO 65559  
(573) 265-2993

[rdunwoody@meramecregion.org](mailto:rdunwoody@meramecregion.org)

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

**Crawford County Hazard Mitigation Plan Review Meeting  
April 11, 2017 ~ 2:00 p.m.**

Name	Representing	Email Address	Phone #	Address
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- Scott Blue	Crawford Elec	s.blue@crawfordelec.com	xt. 104	//
HARRY FLESHER	SULLIVAN FIRE	LFLESHER@FIDMAIL.COM	314-520-1936	
Kim Robinson	Crawford Co. R-II School	krobinson@euba.k12.mo.us	573-885-2534	#1 Wildcat Pride Dr.
J.T. HARDY	City of Sullivan	jthardy@ SULLIVAN MO.US	(573) 468-4612	210 W. Washington SULLIVAN, MO 63080
Scott A. Case	Crawford Co - E-911 Crawford Co Deputy EMD	SCASE@MISSOURI.GOV	573-775-4911	PO. Box 1313 Steelville, MO. 65565
Shawn Myall	Crawford Co EMD	mbaumr@hotmail.com	(C) 314-605-0755 573-885-3355	984 W Washington St Cuba MO 65453
Danny Brown	Crawford Road Dist. 1 Foreman	crawfordroad1@outlook.com	(573) 259-3520	PO Box AS Steelville MO 65565
Rob Cummings	Crawford County	ROCCummings1973@gmail.com	(573) 292-9670	PO Box AD Steelville MO. 65565



Name	Representing	Email Address	Phone #	Address
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Kenny McGrew	Crawford Co		573-257-1780	P.O. Box 145 Steelville Mo. 65565
JARED BOAST	Crawford Co	boastroad2@gmail.com	573-292- 9697	" "
- Amy England	Three Rivers Publishing	aengland@ steelvillestar.com	573.259.2417	P.O. Box 136 Steelville, MO 65565
Paul Satterfield	Bourbon Police	ps.ccsd@yahoo.com	(573) 259-3029	P.O. Box 984 Bourbon Mo 65441



For Immediate Release

May 18, 2017

For more information contact

Ryan Dunwoody at (573) 265-2993

**Second public meeting planned June 6 for Crawford County Hazard Mitigation Plan update**

CUBA – City and county officials, school leaders, emergency management agencies and interested residents are invited to attend a public meeting June 6 to discuss updates to the Crawford County Hazard Mitigation Plan.

The meeting will be held at 2 p.m. in the Crawford County R-II School's Central Office in Cuba, 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.

The county must have an approved hazard mitigation plan in order for Crawford County schools, local governments, agencies and others to access state hazard mitigation grant funds. The plan includes an assessment of natural hazards, showcases past accomplishments and sets goals and action items to reduce the impact of natural hazards in the future.

Meramec Regional Planning Commission (MRPC) is updating the plan in partnership with the Crawford County Commission. Questions may be directed to MRPC Environmental Programs Specialist Ryan Dunwoody at [rdunwoody@meramecregion.org](mailto:rdunwoody@meramecregion.org) or 573-265-2993.

Formed in 1969, MRPC is a voluntary council of governments serving Crawford, Dent, Gasconade, Maries, Osage, Phelps, Pulaski and Washington counties and their respective cities. A professional staff of 25, directed by the MRPC board, offers technical assistance and services, such as grant preparation and administration, housing assistance, transportation planning, environmental planning, ordinance codification, business loans and other services to member communities.

To keep up with the latest MRPC news and events, visit the MRPC website at [www.meramecregion.org](http://www.meramecregion.org) or on Facebook at [www.facebook.com/meramecregion](https://www.facebook.com/meramecregion).

## MEMORANDUM

TO: Crawford County Hazard Mitigation Planning Committee

FROM: Ryan Dunwoody, MRPC Environmental Programs Specialist

DATE: May 10, 2017

SUBJECT: Second Hazard Mitigation Planning Meeting June 06, 2017

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 **second meeting** of the **Crawford County Hazard Mitigation Planning Committee** is scheduled for **Tuesday, June 06 at 2:00 p.m.** at the **Crawford Co. R-II School's Central Office in Cuba, MO 65453. Take Old Cuba Rd. to the back of the building. Enter through the double glass doors.** The focus of this meeting will be to review existing goals and action items and determine if any changes need to be made. In addition, the group will need to report on what action items have been accomplished and what mitigation activities have occurred since the plan was updated five years ago. This can include activities such as improvements to roads and bridges that were prone to flooding, new programs that have reduced risk to residents and/or businesses and new tornado shelters that have been constructed in the past five years.

As the county, each city and school district will be asked to formally approve and adopt the 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 by **May 30, 2017**. 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: [rdunwoody@merameregion.org](mailto:rdunwoody@merameregion.org). I look forward to seeing you at the meeting.

RD  
Enclosures

**Advisory Committee Meeting  
Crawford County Hazard Mitigation Plan Update**

**AGENDA**

**2:00 p.m. ~ June 06, 2017**

**Crawford Co. R-II Schools, Cuba, MO 65453**

**Central Office**

**Take Old Cuba Rd. to back of building. Enter through double glass doors.**

- I. Welcome and Introductions – Tammy Snodgrass**
  
- II. Overview of Hazard Mitigation Planning and Crawford County Hazard Mitigation Plan**  
*Staff will provide an overview of the planning process and a brief review of the existing hazard mitigation plan*
  
- III. Discussion of Action Items and Progress Made in Five Years**  
*Staff will lead the review of existing action items from the plan and ask the attendees to provide information on any progress that has been made on each action item. A list of action items was distributed at the last meeting and is attached to this email.*
  
- IV. Discussion of Possible Changes to Action Items for Next Five Years**  
*After reviewing action items and looking at what has been accomplished, the group will be asked to discuss if needs have changed and what, if any changes need to be made to goals and action items for the revised plan.*
  
- V. Prioritization of Action Items**  
*Attendees will be asked to provide input on the prioritization of action items in the plan.*
  
- VI. Review of Disasters/Deaths/Injuries over the Past Five Years**  
*Staff will provide data on disaster declarations for the past five years. Participants are asked to share any additional information on specific damage that occurred to infrastructure, critical infrastructure, neighborhoods, etc. Of particular interest is any information on deaths or injuries attributed to natural disasters.*
  
- VII. Setting of Date and Time for Next Meeting**
  
- VIII. Adjourn**

## NOTICE OF PUBLIC MEETING

Date and time of posting: **May 10, 2017 ~ 4:00 p.m.**

Notice is hereby given that the **Crawford Co. Hazard Mitigation Planning Committee** will meet at 2:00 p.m. on **Tuesday, June 06, 2017** at the Crawford Co. R-II School's Central Office in Cuba, MO 65453. Take Old Cuba Rd. to the back of the building. Enter in the double glass doors.

The tentative agenda of this meeting includes:

- Welcome and Introductions
- Integration of Other Data, Reports, Studies, Plans
- Discussion of Goals and Objectives and Progress Made in Past Five Years
- Review and Prioritize Action Items
- Jurisdiction and School District Questionnaire Assistance
- Adjourn

Representatives of the news media may obtain copies of this notice by contacting:

Ryan Dunwoody  
#4 Industrial Drive  
St. James, MO 65559  
(573) 265-2993

[rdunwoody@meramecregion.org](mailto:rdunwoody@meramecregion.org)

If you require any accommodations (i.e. qualified interpreter, large print, hearing assistance) in order to attend this meeting, please notify this office at 573-265-2993 no later than 48 hours prior to the scheduled commencement of the meeting.

**Crawford County Hazard Mitigation Plan Review Meeting  
June 6, 2017 ~ 2:00 p.m.**

Name	Representing	Email Address	Phone #	Address
CURTIS FINLEY	STEELVILLE, R-3	cfinley@steelville MO. US	775-2176	_____
DARIN LAYMAN	CRAWFORD COUNTY SHERIFF	Sheriff.layman@outlook. com	(573) 775-2125	212 S-THIRD ST PO Box 86 STEELVILLE, MO 65565
J.T. HARDY	City of Sullivan	jthardy@ SULLIVAN.MO.US	(573) 468-4612	210 W Washington Sullivan, MO 63080
JARED BOAST	Crawford County Commissioner	boastroad2@gmail	573-259- 6813	P.O. Box AS Steelville
Kenny McGraw	Crawford County Rd. 2		573-257-1780	
Rob Cummings	Crawford County Commissioner	rd.cummings1973@gmail	573-292-9670	
Danny Brown	Crawford Co rd #1	crawfordrd1@outlook	573-259-3520	P.O. Box AS Steelville 65565
LESA M Hill	EMD/Flood Plan Manager	mbaum@hofma.it.com	314-605-0758 573-885-3355	904 W Washington Cuba Mo 65453
Scott M. Cass	Crawford Co. E-911 Crawford Co. Deputy EMD	CRAWCO@usps.com	573-775-4911	P.O. Box 1513 Steelville Mo. 65565

Name	Representing	Email Address	Phone #	Address
Michael J Keen	mayor CITY of Steelville	STEELCITYmayor@gmail.com	573-289-5924	895 Frisco St. Steelville, Mo. 65865
Michael Sherman	Police Chief city of Steelville	mcsherman728@yahoo.com	636-359-2653	895 Frisco St. Steelville Mo. 65865
Leo Sanders	president comm. Crawford Co	sanderslee@gmail.com	573-205-5756	302 N. Main St. PO Box 115 Steelville Mo, 65565
Patricia Thompson	Crawford County A-I	Thompson@warhawkhs.k12.mo.us	513-732-4426	1444 Old Hwy 66 Bourbon, MO 65441
Matt Shively	USACE - St. Louis Dist	maths.shively@usace.army.mil	314-331-8632	1222 Spruce Street St. Louis, Mo 63103
Doug Cuneio	Sullivan Schools	cuneio@d@sullivaneastes.org	573-468-5171	138 Taylor St. Sullivan Mo 63080
Jon Earnhart	Cuba Schools	jearnhart@cuba.k12.mo.us	573-885-2534	1 Willet Pride Dr. Cuba, 65453
Kimberly Robinson	Cuba Schools	KRobinson@Cuba K12.mo.us	573-885-2534	1 Willet Pride Dr. Cuba, Mo 65453
Scott Blue	Crawford Electric Co	s.blue@crawfordelec.com	800-677-2667 x104	18301 N. Service Rd Bourbon, Mo 65441
Radney Neff	Cuba EMA	rneff_02@live.com	573-205-7102	



- Electric - Newsletter w/ safety ads  
 - Cuba - Ready in 3

USB → Crawford Co.  
 EMD

- Schools  
 - Safety firms on windows

Summary of Mitigation Programs and Action Items Developed for Crawford County and All Jurisdictions

School  
 - Fire  
 - Tornado  
 - earthquake  
 - Active shooter  
 ↑ School Districts  
 in Great State  
 out sent w/  
 kids have  
 to parents  
 - bus exc.  
 - memo operations  
 Crawford  
 Co. B-11

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	1. Implement an education program on personal emergency preparedness.  <i>safety preparedness</i> <i>Weather Ready Nation sponsored by the U.S.</i> - accident safety - mass casualty - 2 full scale exercises - 4 table tops - weather spotters/training	Reducing Vulnerability of the People  <i>Social media</i> - working sirens - weather radios	1	High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	2. Promote the development of emergency plans by businesses.  <i>Steelville manufacturing</i> - GIS door locales	Sullivan - All jurisdictions - newspaper - entire county		High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	3. Encourage cities to obtain early warning systems and improved communications systems to minimize loss of life.  <i>None in county except Cuba Steelville Bourbon</i> - Woods Hills lake (Private) - private fire alarm system - Steelville - Sullivan school - messaging system <i>Cuba replaced 1 Bourbon</i> <i>Sullivan replaced all 4 since last Sullivan Nixle/system</i>	message from electric for power outages etc		High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	4. Promote the use of weather radios by local residents and schools to ensure advanced warning about threatening weather.  - Schools - Newspaper posts 3 times a year for radios <del>...</del>			High	Severe Storms Tornadoes

Cuba  
 ICAWS - FEMA

Executive Summary use of local KHW, Balls, etc

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	5. Partner with local radio stations to assure that appropriate warning of impending disasters is provided to all residents in the countywide listening area.  Yes	Reducing Vulnerability of the People	1	High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	6. Encourage and continue tree trimming programs as well as dead tree removal program. Inter-county - All jurisdictions - electric + voltage protector - Sullivan repaired @ least 2 culverts			High	Severe Storms Tornados
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	7. Examine potential road and bridge upgrades that would reduce danger to residents during occurrences of natural disasters. County - culvert replacement (3 over 10) - Buildup out of floodzone when possible - upgrades - Cuba has not made upgrades in 5 years			Flood Earthquake	
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan Bourbon R-I Cuba R-II	8. Encourage the construction of tornado safe rooms and/or storm shelters in areas with high population densities such as schools and large employers. - Cuba certified in Highschool - Built 2018 - 450 capacity - Inter-county Electric 4 safe rooms - Bourbon basement			High	Severe Storms Tornados

**Executive Summary**

- Sullivan - storm water mitigation plan
- 259-4500 - Mark McKUN - Bourbon



12

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Steelville R-II Sullivan C-2					
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	1. Encourage a self-inspection program at critical facilities to assure that the building infrastructure is earthquake and tornado resistant.  <i>Cuba Schools - consulting firm/assessment - wind/tornado</i>	Property and Infrastructure Protection	2	High	Earthquake Tornado
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	2. Educate residents about the dangers of floodplain development and the benefits the National Flood Insurance Program.  <i>- All in NFIP Sullivan + Steelville</i> <i>- Brochure, Newspaper, door to door, murals + Hozaah</i> <i>- No floodplain in Cuba</i> <i>- Leasburg - no high ground</i>			High	Flood
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	3. Encourage minimum standards for building codes in all cities.  <i>Sullivan</i> <i>Cuba</i> <i>Sourbon - ordinance</i> <i>Leasburg - No - Minimum Standard Mobil</i> <i>Steelville - just need inspector</i>			Medium	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	4. Encourage local governments to develop and implement regulations for securing hazardous materials tanks and mobile homes.  <i>Cuba + industrial parks</i>			Medium	Flood Severe Storms Tornado

Sullivan  
Fire Dept  
School training all students

31

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	1. Distribute SEMA brochures at public facilities and events. <i>Crawford Co fair Sustainable events table top trainings - Fire Dept: vs weather safety trainings</i>	Outreach and Education	3	High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	2. Distribute regular press releases from county and city EMD offices concerning hazards, where they strike, frequency and preparedness. <i>yes</i>	Outreach and Education	3	High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	3. Encourage local residents to purchase weather radios. <i>yes</i>			High	Severe Storms Tornadoes
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	4. Ask SEMA mitigation specialists to present information to city councils, county commission and local planning organizations. <i>MRPC, Smith-Hendrix, County + City meetings</i>			High	All Hazards
Crawford County Bourbon	5. Re-evaluate the hazard mitigation plan and merge with other community planning			High	All Hazards

Executive Summary

discuss +  
using plan - organizing - Sullivan  
- buy electric lines  
- buy smart meter  
- Crawford electric

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan					
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	6. Distribute press releases by cities/county regarding adopted mitigation measures. <i>Cuba School County Commission meetings</i>	Outreach and Education	3	Medium	All Hazards
Crawford County	7. Encourage county health department and Red Cross to implement education/awareness campaigns on individual preparedness.			High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	8. Publicize city and/or county drills. <i>take off TV, Radio, Social Media</i>			Medium	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan Bourbon R-I Cuba R-II	1. Encourage joint meetings of different organizations/ agencies for mitigation planning— <i>chiefs meeting every two months safety coordinator meeting / SEMA training → school districts - mitigation included in Cuba schools board meetings - Bourbon schools- safety reports to board during meetings</i>	Communication Enhancement	4	Medium	All Hazards

take off →

Yes for both table top & full scale

Executive Summary

- Steelville + Sullivan school districts
- meetings w/ hospitals
- Sullivan tabletop exercises

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Steelville R-III Sullivan C-2					
Crawford County Bourbon Cuba Leasburg, St. Cloud Steelville Sullivan West Sullivan Bourbon R-I Cuba R-II Steelville R-III Sullivan C-2	2. Joint training or drills between agencies, public and private entities including schools and businesses. <i>yes</i>	Communication Enhancement	4	Medium	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	3. Pool different agency resources to achieve widespread mitigation results. <i>keep on</i> <i>School resource officers</i> <i>- joint ownership/maintenance/operation for generators</i> <i>- crop + churches</i>			High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	4. Encourage meetings between EMD, city/county officials and SEMA to familiarize local officials with mitigation planning and implementation and budgeting for mitigation projects. <i>Area coordinator meetings</i> <i>MPC (once)</i> <i>FFEM once a year</i>			High	All Hazards
Bourbon Cuba Leasburg St. Cloud Steelville	1. Encourage communities to budget for enhanced warning systems. <i>Cuba = Saint Meds</i> <i>Sullivan = none</i> <i>West Sullivan?</i>	Long-Term Planning	5	High	All Hazards

4.3

4.4

5.1

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Sullivan West Sullivan					
Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	2. Encourage all communities to develop stormwater management plans.  Cuba Sullivan steelville partially done			Low M	Flood Severe Storms
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	3. Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.  - Drills + exercises - HMPCM - Swift water training - Hazmat training	Long-Term Planning	5	Medium	All Hazards
Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	4. Encourage cities to require contractor stormwater management plans in all new development.  County ordinance for all new road development			Low M	Flood Severe Storms
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	5. Encourage local governments to purchase properties in the floodplain as funds become available and convert land into public space/recreation area.			Medium	Flood
Crawford County Bourbon	6. Encourage communities to discuss zoning repetitive loss properties in the floodplain as open space.			High	Flood

- Sullivan ND

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan					
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	1. Work with SEMA Region I coordinator to learn about new mitigation funding opportunities.  <i>County</i>	Finding Funding	6	High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	2. Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.  <i>leave in</i> <i>Always a size bigger on culverts</i> <i>4x6 3x6 dependent upon area</i>	Finding Funding	6	Medium	Flood Earthquake
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	3. Work with state/local/federal agencies to include mitigation in all economic and community development projects.  <i>Sullivan - retention ponds</i>			Medium	All Hazards
Crawford County Bourbon Cuba Leasburg	4. Encourage local governments to budget for mitigation projects.  <i>- sirens, road + bridge, storm water,</i> <i>tree trimming programs,</i>			Medium	All Hazard

6-2

Executive Summary

x



Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
Owensville Rosebud Gasconade Co. R-I Gasconade Co. R-II Maries Co. R-II					
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	8. Encourage the designation of public buildings as safe shelters and develop accessibility plans for the public during times of need.		5	Medium	Severe Weather Tomado
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	1. Work with SEMA Region I coordinator to learn about new mitigation funding opportunities	Finding Funding	6	High	All Hazards
Gasconade County Bland Gasconade Hermann Morrison Owensville Rosebud	2. Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns are also met.		6	Medium	Flood Earthquake
Gasconade County Bland Gasconade Hermann Morrison	3. Work with state/local/federal agencies to include mitigation in all economic & community development projects.		6	Medium	All Hazards

Jurisdiction	Action/Measure	Mitigation Program	Goal #	Priority	Hazard Addressed
St. Cloud Steelville Sullivan West Sullivan Bourbon R-I Cuba R-II Steelville R-III Sullivan C-2					
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	5. Encourage cities and county to implement cost-share programs with private landowners for hazard mitigation projects that benefit the community as a whole.  - County puts in at no cost, paid for by land owners - mitigate power outages - Sullivan too - sidewalks - increase of over size water mains	Finding Funding	6	Medium	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	6. Implement public awareness program about the benefits of hazard mitigation projects, both public and private. take off  - Co-op - mitigation/fire training - social media - outage Maps			High	All Hazards
Crawford County Bourbon Cuba Leasburg St. Cloud Steelville Sullivan West Sullivan	7. Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.  Priorities - Bridge Trailer park buyout			High	All Hazards

6-7



## **C: Adoption Resolutions**

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**Adoption resolutions have been mailed out to the jurisdictions and will be included in the final draft submitted to FEMA.**

## D: Critical/Essential Facilities

The table below (**Table 6.1**) provides information for critical facilities in the planning area. Specific information includes a Hazus ID if applicable, jurisdiction, building name/owner, and address.

**Table 6.1 Crawford County Critical Facilities by Type and Jurisdiction**

HazusID	Jurisdiction	Building Name	Address	City	State	Zip
<b>Emergency Facilities</b>						
	Crawford Co.	Crawford Co. E-911	PO Box 1314	Steelville	MO	65565
	Crawford Co.	Emergency Management Director	904 W. Washington	Cuba	MO	65453
<b>Fire Department Facilities</b>						
MO000684	Bourbon	Bourbon Fire Prot. Dist.	555 Elm St.	Bourbon	MO	65441
MO000426	Cuba	Cuba Vol. Fire Dept. Station 1	600 S Franklin St.	Cuba	MO	65453
	Cuba	Cuba Vol. Fire Dept. Station 2	State Hwy DD	Cuba	MO	65453
MO000427	Leasburg	Leasburg Vol. Fire Dept.	East Cedar Ave.	Leasburg	MO	65535
MO000685	Steelville	Steelville Fire Prot. Dist., Station 1	77 East State Hwy 8	Steelville	MO	65565
	Steelville	Steelville Fire Prot. Dist., Station 2	State Hwy 19	Cherryville	MO	65446
	Steelville	Steelville Fire Prot. Dist., Station 3	1441 East State Hwy 8	Steelville	MO	65565
<b>Law Enforcement Facilities</b>						
MO000579	Crawford Co.	Crawford Co. Sheriff	212 Third Street	Steelville	MO	65565
MO000415	Bourbon	Bourbon Police Dept.	355 E Pine St.	Bourbon	MO	65441
MO000394	Cuba	Cuba Police Dept.	602 S. Franklin St.	Cuba	MO	65453
MO000026	Steelville	Steelville Police Dept.	103 S Second St.	Steelville	MO	65565
	Sullivan	Sullivan Police Dept.	106 Progress Dr.	Sullivan	MO	63080
<b>Medical Facilities</b>						
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
<b>School Facilities</b>						
	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
<b>HazusID</b>	<b>Jurisdiction</b>	<b>Building Name</b>	<b>Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
	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

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

## E: MDC Wildfire Data Search

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Discovered Date	County	Station	Cause	Acres Burned	Member
7/21/2002	Crawford	Cuba Fire Department	Miscellaneous	1	
8/10/2002	Crawford	Cuba Fire Department	Debris	1	
8/17/2002	Crawford	Cuba Fire Department	Unknown	1	
9/5/2002	Crawford	Cuba Fire Department	Debris	4	
10/2/2002	Crawford	Cuba Fire Department	Unknown	1	
10/5/2002	Crawford	Cuba Fire Department	Unknown	2	
10/12/2002	Crawford	Cuba Fire Department	Railroad	2	
11/8/2002	Crawford	MDC REPORTING REGION - ST. LOUIS	Equipment	225	
11/8/2002	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	0.5	
11/18/2002	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	1	
11/20/2002	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	0.25	
3/7/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	55	
3/8/2003	Crawford	Sullivan Fire Protection District	Unknown		
3/15/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	20	
3/24/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	50	
3/26/2003	Crawford	Sullivan Fire Protection District	Debris	4	
3/31/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	5	
4/2/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	0.5	
4/2/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	10	
4/3/2003	Crawford	Steelville Fire Protection District	Not Reported	10	
4/4/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	20	
4/14/2003	Crawford	Steelville Fire Protection District	Debris	2	
4/14/2003	Crawford	Steelville Fire Protection District	Debris	2	
7/31/2003	Crawford	Bourbon Fire Protection District	Not Reported	0.25	
8/9/2003	Crawford	Cuba Fire Department	Campfire	1	
8/14/2003	Crawford	Cuba Fire Department	Equipment	2	
8/19/2003	Crawford	Bourbon Fire Protection District	Not Reported	0.25	
8/20/2003	Crawford	Bourbon Fire Protection District	Debris	0.25	
8/21/2003	Crawford	Cuba Fire Department	Debris	1	
8/22/2003	Crawford	Cuba Fire Department	Debris	10	
8/25/2003	Crawford	Bourbon Fire Protection District	Debris	0.5	
10/3/2003	Crawford	Bourbon Fire Protection District	Debris	2	
10/30/2003	Crawford	Steelville Fire Protection District	Debris	2	
11/3/2003	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	2	
11/4/2003	Crawford	Steelville Fire Protection District	Debris	30	

11/4/2003	Crawford	Steelville Fire Protection District	Railroad	4
11/12/2003	Crawford	Bourbon Fire Protection District	Debris	11
11/12/2003	Crawford	Steelville Fire Protection District	Debris	2
11/13/2003	Crawford	Steelville Fire Protection District	Debris	2
11/29/2003	Crawford	Steelville Fire Protection District	Debris	2
11/29/2003	Crawford	Cuba Fire Department	Debris	2
11/29/2003	Crawford	Steelville Fire Protection District	Debris	2
11/30/2003	Crawford	Bourbon Fire Protection District	Debris	0.25
12/1/2003	Crawford	Cuba Fire Department	Arson	3
12/1/2003	Crawford	Steelville Fire Protection District	Debris	0.5
12/2/2003	Crawford	Steelville Fire Protection District	Debris	2
12/3/2003	Crawford	Steelville Fire Protection District	Arson	7
1/2/2004	Crawford	Cuba Fire Department	Unknown	3
1/10/2004	Crawford	Cuba Fire Department	Debris	1
1/11/2004	Crawford	Steelville Fire Protection District	Debris	10
1/11/2004	Crawford	Steelville Fire Protection District	Debris	5
2/18/2004	Crawford	Steelville Fire Protection District	Debris	35
2/22/2004	Crawford	Steelville Fire Protection District	Debris	12
2/22/2004	Crawford	Steelville Fire Protection District	Arson	3
2/23/2004	Crawford	Steelville Fire Protection District	Debris	2
2/23/2004	Crawford	Cuba Fire Department	Debris	1
2/23/2004	Crawford	Steelville Fire Protection District	Debris	1
2/23/2004	Crawford	Steelville Fire Protection District	Debris	2
2/24/2004	Crawford	Bourbon Fire Protection District	Debris	15
2/25/2004	Crawford	Sullivan Fire Protection District	Debris	7
2/27/2004	Crawford	Steelville Fire Protection District	Debris	2
2/28/2004	Crawford	Sullivan Fire Protection District	Unknown	1
2/28/2004	Crawford	Steelville Fire Protection District	Debris	5
2/28/2004	Crawford	Cuba Fire Department	Debris	1
2/28/2004	Crawford	Cuba Fire Department	Debris	0.25
2/29/2004	Crawford	Sullivan Fire Protection District	Debris	4
3/1/2004	Crawford	Steelville Fire Protection District	Equipment	1
3/2/2004	Crawford	Steelville Fire Protection District	Debris	5
3/2/2004	Crawford	Bourbon Fire Protection District	Debris	0.7
3/2/2004	Crawford	Cuba Fire Department	Debris	1
3/8/2004	Crawford	Steelville Fire Protection District	Debris	4.5
3/10/2004	Crawford	Steelville Fire Protection District	Arson	4
3/12/2004	Crawford	SULLIVAN FORESTRY	Miscellaneous	5
3/12/2004	Crawford	Bourbon Fire Protection District	Debris	3
3/12/2004	Crawford	Sullivan Fire Protection District	Miscellaneous	10

3/12/2004	Crawford	Steelville Fire Protection District	Debris	2
3/19/2004	Crawford	Bourbon Fire Protection District	Debris	13
3/19/2004	Crawford	SULLIVAN FORESTRY	Arson	80
3/21/2004	Crawford	Sullivan Fire Protection District	Debris	1
3/21/2004	Crawford	Steelville Fire Protection District	Debris	2
3/22/2004	Crawford	Steelville Fire Protection District	Debris	2
3/22/2004	Crawford	Cuba Fire Department	Debris	14
3/29/2004	Crawford	Sullivan Fire Protection District	Debris	1
4/6/2004	Crawford	Bourbon Fire Protection District	Debris	4
4/8/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	1
4/8/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	1
4/8/2004	Crawford	Bourbon Fire Protection District	Debris	1
4/8/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	0.25
4/8/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	50
4/9/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	3
4/10/2004	Crawford	Sullivan Fire Protection District	Debris	1
4/15/2004	Crawford	Steelville Fire Protection District	Debris	0.5
4/17/2004	Crawford	Bourbon Fire Protection District	Debris	15
4/18/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	0.25
4/18/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	0.75
4/18/2004	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	5
4/18/2004	Crawford	Bourbon Fire Protection District	Debris	70
4/18/2004	Crawford	Cuba Fire Department	Debris	2
4/21/2004	Crawford	Bourbon Fire Protection District	Debris	1
5/21/2004	Crawford	Bourbon Fire Protection District	Equipment	1
5/24/2004	Crawford	Bourbon Fire Protection District	Debris	1
6/1/2004	Crawford	Sullivan Fire Protection District	Debris	1
6/3/2004	Crawford	Leasburg Community Volunteer Fire Departmetn	Arson	16
7/10/2004	Crawford	Bourbon Fire Protection District	Unknown	0.1
8/1/2004	Crawford	Bourbon Fire Protection District	Unknown	0.1
8/1/2004	Crawford	Bourbon Fire Protection District	Unknown	0.1
9/25/2004	Crawford	Cuba Fire Department	Unknown	1
9/27/2004	Crawford	Steelville Fire Protection District	Unknown	2
10/3/2004	Crawford	Steelville Fire Protection District	Unknown	2
10/7/2004	Crawford	Steelville Fire Protection District	Unknown	2
10/7/2004	Crawford	Steelville Fire Protection District	Unknown	2
10/23/2004	Crawford	Bourbon Fire Protection District	Unknown	0.25
10/25/2004	Crawford	Steelville Fire Protection District	Arson	2
10/25/2004	Crawford	Steelville Fire Protection District	Debris	2
11/6/2004	Crawford	Bourbon Fire Protection District	Debris	1

11/7/2004	Crawford	Bourbon Fire Protection District	Debris	1.5
11/8/2004	Crawford	Cuba Fire Department	Debris	1
11/10/2004	Crawford	Cuba Fire Department	Unknown	1
11/15/2004	Crawford	Cuba Fire Department	Unknown	1
12/4/2004	Crawford	Cuba Fire Department	Debris	2
12/25/2004	Crawford	Steelville Fire Protection District	Debris	2
12/30/2004	Crawford	Bourbon Fire Protection District	Debris	1
12/30/2004	Crawford	Steelville Fire Protection District	Not Reported	2
2/20/2005	Crawford	Steelville Fire Protection District	Arson	2
2/20/2005	Crawford	Steelville Fire Protection District	Debris	2
2/26/2005	Crawford	Cuba Fire Department	Debris	5
2/26/2005	Crawford	Cuba Fire Department	Debris	5
3/4/2005	Crawford	Quad County Fire Protection District	Debris	3
3/5/2005	Crawford	Cuba Fire Department	Debris	2
3/5/2005	Crawford	Sullivan Fire Protection District	Miscellaneous	1
3/6/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Campfire	16
3/6/2005	Crawford	Steelville Fire Protection District	Smoking	3
3/6/2005	Crawford	Sullivan Fire Protection District	Debris	3
3/6/2005	Crawford	Bourbon Fire Protection District	Debris	1
3/12/2005	Crawford	St Clair Fire Protection District	Unknown	1
3/12/2005	Crawford	Cuba Fire Department	Debris	1
3/12/2005	Crawford	Steelville Fire Protection District	Not Reported	2
3/12/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	110
3/12/2005	Crawford	Bourbon Fire Protection District	Debris	0.25
3/13/2005	Crawford	Bourbon Fire Protection District	Equipment	1
3/14/2005	Crawford	Cuba Fire Department	Unknown	0.5
3/14/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	325
3/14/2005	Crawford	Cuba Fire Department	Debris	3
3/16/2005	Crawford	Cuba Fire Department	Debris	3
3/17/2005	Crawford	Cuba Fire Department	Unknown	0.5
3/17/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Equipment	1
3/18/2005	Crawford	Cuba Fire Department	Equipment	0.5
3/18/2005	Crawford	Steelville Fire Protection District	Debris	2
3/18/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	16
3/18/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	4
3/19/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	5
3/20/2005	Crawford	Bourbon Fire Protection District	Debris	3
3/20/2005	Crawford	Bourbon Fire Protection District	Debris	10
3/20/2005	Crawford	Cuba Fire Department	Equipment	1
3/21/2005	Crawford	Cuba Fire Department	Debris	4

3/29/2005	Crawford	Steelville Fire Protection District	Debris	2
3/30/2005	Crawford	Steelville Fire Protection District	Equipment	150
3/30/2005	Crawford	ROLLA FORESTRY	Debris	46
3/30/2005	Crawford	Cuba Fire Department	Unknown	2
3/30/2005	Crawford	Bourbon Fire Protection District	Debris	2
3/30/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	98
3/30/2005	Crawford	Potosi Fire Protection District	Debris	60
3/30/2005	Crawford	St. James Fire Protection District	Miscellaneous	80
3/30/2005	Crawford	Steelville Fire Protection District	Unknown	900
3/30/2005	Crawford	Potosi Fire Protection District	Debris	200
3/30/2005	Crawford	Steelville Fire Protection District	Equipment	25
3/31/2005	Crawford	Bourbon Fire Protection District	Equipment	1
3/31/2005	Crawford	Steelville Fire Protection District	Unknown	30
3/31/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	2
3/31/2005	Crawford	Steelville Fire Protection District	Debris	0.5
3/31/2005	Crawford	Steelville Fire Protection District	Debris	1.5
3/31/2005	Crawford	Steelville Fire Protection District	Debris	0.5
3/31/2005	Crawford	Steelville Fire Protection District	Debris	0.5
3/31/2005	Crawford	Cuba Fire Department	Debris	2
4/3/2005	Crawford	Bourbon Fire Protection District	Debris	1
4/3/2005	Crawford	Steelville Fire Protection District	Debris	1
4/3/2005	Crawford	Steelville Fire Protection District	Debris	7
4/4/2005	Crawford	Bourbon Fire Protection District	Debris	0.5
4/4/2005	Crawford	Quad County Fire Protection District	Arson	8
4/5/2005	Crawford	Leasburg Community Volunteer Fire Department	Unknown	26
4/6/2005	Crawford	Quad County Fire Protection District	Arson	100
4/9/2005	Crawford	Steelville Fire Protection District	Unknown	4
4/9/2005	Crawford	Bourbon Fire Protection District	Debris	0.25
4/10/2005	Crawford	Cuba Fire Department	Debris	0.5
4/14/2005	Crawford	Bourbon Fire Protection District	Unknown	0.5
4/17/2005	Crawford	Bourbon Fire Protection District	Debris	1
4/18/2005	Crawford	Steelville Fire Protection District	Arson	10
4/18/2005	Crawford	Steelville Fire Protection District	Arson	5
4/18/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	25
4/19/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	44
4/19/2005	Crawford	Steelville Fire Protection District	Arson	6
4/19/2005	Crawford	Steelville Fire Protection District	Arson	50
5/2/2005	Crawford	Cuba Fire Department	Miscellaneous	1
5/4/2005	Crawford	Cuba Fire Department	Unknown	0.25
5/7/2005	Crawford	Bourbon Fire Protection District	Debris	0.25



5/25/2005	Crawford	Bourbon Fire Protection District	Debris	0.25
6/24/2005	Crawford	Sullivan Fire Protection District	Miscellaneous	1
6/25/2005	Crawford	Cuba Fire Department	Equipment	0.5
6/27/2005	Crawford	Bourbon Fire Protection District	Debris	0.8
7/2/2005	Crawford	Steelville Fire Protection District	Unknown	30
7/2/2005	Crawford	Leasburg Community Volunteer Fire Department	Smoking	1
7/2/2005	Crawford	Cuba Fire Department	Arson	2
7/3/2005	Crawford	Bourbon Fire Protection District	Equipment	15
7/3/2005	Crawford	Leasburg Community Volunteer Fire Department	Unknown	1
7/4/2005	Crawford	Leasburg Community Volunteer Fire Department	Not Reported	1
7/6/2005	Crawford	Steelville Fire Protection District	Equipment	2
7/6/2005	Crawford	Bourbon Fire Protection District	Debris	0.1
7/7/2005	Crawford	Sullivan Fire Protection District	Debris	1
7/7/2005	Crawford	Sullivan Fire Protection District	Miscellaneous	1
7/10/2005	Crawford	Leasburg Community Volunteer Fire Department	Miscellaneous	1
8/3/2005	Crawford	Cuba Fire Department	Debris	0.25
8/12/2005	Crawford	Cuba Fire Department	Debris	0.25
8/29/2005	Crawford	Bourbon Fire Protection District	Unknown	1
9/12/2005	Crawford	Cuba Fire Department	Unknown	2
11/9/2005	Crawford	Quad County Fire Protection District	Arson	4
11/12/2005	Crawford	Cuba Fire Department	Unknown	0.1
11/23/2005	Crawford	Cuba Fire Department	Unknown	2
11/23/2005	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	2
11/23/2005	Crawford	Quad County Fire Protection District	Debris	35
11/24/2005	Crawford	Cuba Fire Department	Debris	1.5
11/26/2005	Crawford	Cuba Fire Department	Debris	2
11/26/2005	Crawford	Cuba Fire Department	Debris	1
11/26/2005	Crawford	Quad County Fire Protection District	Arson	50
12/2/2005	Crawford	Steelville Fire Protection District	Debris	5
1/8/2006	Crawford	Steelville Fire Protection District	Debris	2
1/14/2006	Crawford	Sullivan Fire Protection District	Debris	1
1/18/2006	Crawford	Cuba Fire Department	Debris	3
1/27/2006	Crawford	Steelville Fire Protection District	Debris	50
2/14/2006	Crawford	Bourbon Fire Protection District	Equipment	1.5
2/23/2006	Crawford	Cuba Fire Department	Debris	30
2/23/2006	Crawford	Bourbon Fire Protection District	Debris	1
2/24/2006	Crawford	Cuba Fire Department	Debris	60
2/24/2006	Crawford	Bourbon Fire Protection District	Debris	2
2/24/2006	Crawford	Sullivan Fire Protection District	Unknown	10
2/26/2006	Crawford	Cuba Fire Department	Unknown	20

2/26/2006	Crawford	Bourbon Fire Protection District	Debris	10
2/27/2006	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	1
2/27/2006	Crawford	Sullivan Fire Protection District	Equipment	1
2/27/2006	Crawford	Sullivan Fire Protection District	Debris	5
2/28/2006	Crawford	Cuba Fire Department	Debris	1
2/28/2006	Crawford	Steelville Fire Protection District	Debris	0.25
2/28/2006	Crawford	Sullivan Fire Protection District	Debris	5
3/1/2006	Crawford	Bourbon Fire Protection District	Debris	0.5
3/1/2006	Crawford	Steelville Fire Protection District	Debris	3
3/2/2006	Crawford	Sullivan Fire Protection District	Debris	1
3/11/2006	Crawford	Cuba Fire Department	Debris	30
3/14/2006	Crawford	Cuba Fire Department	Unknown	0.1
3/15/2006	Crawford	Bourbon Fire Protection District	Debris	0.5
3/16/2006	Crawford	Bourbon Fire Protection District	Debris	10
3/17/2006	Crawford	MDC REPORTING REGION - OZARK	Arson	47
3/26/2006	Crawford	Bourbon Fire Protection District	Debris	5
3/26/2006	Crawford	Bourbon Fire Protection District	Debris	5
3/30/2006	Crawford	Sullivan Fire Protection District	Equipment	1
4/1/2006	Crawford	Leasburg Community Volunteer Fire Department	Unknown	0.25
4/1/2006	Crawford	Cuba Fire Department	Debris	7
4/7/2006	Crawford	Quad County Fire Protection District	Arson	10
4/8/2006	Crawford	Puxico Fire Department	Arson	2
4/9/2006	Crawford	Bourbon Fire Protection District	Debris	1
4/10/2006	Crawford	Sullivan Fire Protection District	Debris	5
4/11/2006	Crawford	Steelville Fire Protection District	Debris	4
4/14/2006	Crawford	Cuba Fire Department	Debris	3
4/16/2006	Crawford	Cuba Fire Department	Debris	1
4/26/2006	Crawford	Bourbon Fire Protection District	Debris	0.25
5/21/2006	Crawford	Cuba Fire Department	Unknown	0.1
6/9/2006	Crawford	Sullivan Fire Protection District	Equipment	0.9
6/13/2006	Crawford	Cuba Fire Department	Unknown	0.2
7/1/2006	Crawford	Bourbon Fire Protection District	Debris	0.1
7/1/2006	Crawford	Cuba Fire Department	Unknown	0.1
7/2/2006	Crawford	Cuba Fire Department	Unknown	0.1
7/2/2006	Crawford	Current River Volunteer Fire Department	Lightning	0.1
7/3/2006	Crawford	Cuba Fire Department	Arson	1
7/3/2006	Crawford	Bourbon Fire Protection District	Equipment	0.1
7/4/2006	Crawford	Sullivan Fire Protection District	Unknown	0.1
7/6/2006	Crawford	Sullivan Fire Protection District	Unknown	0.2
7/7/2006	Crawford	Cuba Fire Department	Equipment	0.2

7/25/2006	Crawford	Cuba Fire Department	Debris	5
7/25/2006	Crawford	Bourbon Fire Protection District	Unknown	8
7/31/2006	Crawford	Cuba Fire Department	Unknown	0.1
8/6/2006	Crawford	Sullivan Fire Protection District	Unknown	1
8/6/2006	Crawford	Cuba Fire Department	Unknown	5
8/7/2006	Crawford	Sullivan Fire Protection District	Miscellaneous	0.1
8/9/2006	Crawford	Cuba Fire Department	Debris	6
8/10/2006	Crawford	Bourbon Fire Protection District	Equipment	0.2
8/14/2006	Crawford	Leasburg Community Volunteer Fire Department	Debris	10
8/15/2006	Crawford	Cuba Fire Department	Unknown	0.1
8/16/2006	Crawford	Bourbon Fire Protection District	Debris	2
9/16/2006	Crawford	Bourbon Fire Protection District	Debris	0.25
10/13/2006	Crawford	Bourbon Fire Protection District	Debris	15
11/4/2006	Crawford	Quad County Fire Protection District	Debris	3
11/18/2006	Crawford	Cuba Fire Department	Debris	0.25
11/23/2006	Crawford	Cuba Fire Department	Arson	1
11/25/2006	Crawford	Bourbon Fire Protection District	Miscellaneous	6
11/26/2006	Crawford	Bourbon Fire Protection District	Debris	10
11/26/2006	Crawford	Quad County Fire Protection District	Debris	1
11/28/2006	Crawford	Sullivan Fire Protection District	Equipment	0.7
11/30/2006	Crawford	Leasburg Community Volunteer Fire Department	Unknown	16
12/7/2006	Crawford	Leasburg Community Volunteer Fire Department	Equipment	1
12/27/2006	Crawford	Cuba Fire Department	Unknown	3
1/9/2007	Crawford	Steelville Fire Protection District	Debris	3
1/10/2007	Crawford	Steelville Fire Protection District	Debris	1
1/10/2007	Crawford	Steelville Fire Protection District	Debris	1
1/11/2007	Crawford	Steelville Fire Protection District	Unknown	3
1/30/2007	Crawford	Steelville Fire Protection District	Unknown	1
2/10/2007	Crawford	Cuba Fire Department	Unknown	0.5
2/10/2007	Crawford	Cuba Fire Department	Debris	1
2/11/2007	Crawford	Cuba Fire Department	Debris	1
2/11/2007	Crawford	Leasburg Community Volunteer Fire Department	Unknown	2
2/11/2007	Crawford	Leasburg Community Volunteer Fire Department	Unknown	1
2/23/2007	Crawford	Steelville Fire Protection District	Debris	1
2/23/2007	Crawford	Steelville Fire Protection District	Unknown	1
3/2/2007	Crawford	Quad County Fire Protection District	Unknown	1
3/3/2007	Crawford	Cuba Fire Department	Unknown	2
3/4/2007	Crawford	Quad County Fire Protection District	Unknown	30
3/5/2007	Crawford	Cuba Fire Department	Debris	4
3/6/2007	Crawford	Cuba Fire Department	Debris	1

3/7/2007	Crawford	Steelville Fire Protection District	Debris	15
3/7/2007	Crawford	Sullivan Fire Protection District	Unknown	0.1
3/7/2007	Crawford	Steelville Fire Protection District	Miscellaneous	40
3/7/2007	Crawford	Steelville Fire Protection District	Unknown	15
3/7/2007	Crawford	Quad County Fire Protection District	Unknown	5
3/7/2007	Crawford	Cuba Fire Department	Unknown	2
3/9/2007	Crawford	Sullivan Fire Protection District	Debris	1
3/10/2007	Crawford	Steelville Fire Protection District	Debris	2
3/11/2007	Crawford	Steelville Fire Protection District	Arson	3
3/11/2007	Crawford	Cuba Fire Department	Debris	2
3/11/2007	Crawford	Cuba Fire Department	Debris	2
3/11/2007	Crawford	Steelville Fire Protection District	Debris	2
3/11/2007	Crawford	Cuba Fire Department	Children	10
3/11/2007	Crawford	Steelville Fire Protection District	Debris	2
3/11/2007	Crawford	Steelville Fire Protection District	Arson	40
3/11/2007	Crawford	Cuba Fire Department	Debris	1
3/14/2007	Crawford	Steelville Fire Protection District	Unknown	2
3/23/2007	Crawford	Cuba Fire Department	Lightning	0.25
4/2/2007	Crawford	Steelville Fire Protection District	Not Reported	5
4/9/2007	Crawford	Steelville Fire Protection District	Debris	3
4/16/2007	Crawford	Cuba Fire Department	Debris	0.25
4/19/2007	Crawford	Cuba Fire Department	Unknown	1
4/19/2007	Crawford	Steelville Fire Protection District	Unknown	1
4/23/2007	Crawford	Steelville Fire Protection District	Debris	1
4/28/2007	Crawford	Steelville Fire Protection District	Debris	2
4/30/2007	Crawford	Sullivan Fire Protection District	Debris	0.5
4/30/2007	Crawford	Cuba Fire Department	Unknown	0.25
5/1/2007	Crawford	Steelville Fire Protection District	Debris	1
5/19/2007	Crawford	Steelville Fire Protection District	Unknown	2
5/19/2007	Crawford	Cuba Fire Department	Unknown	0.25
5/23/2007	Crawford	Cuba Fire Department	Unknown	0.25
5/24/2007	Crawford	Steelville Fire Protection District	Unknown	2
7/8/2007	Crawford	Cuba Fire Department	Debris	0.25
8/2/2007	Crawford	Cuba Fire Department	Debris	0.75
8/5/2007	Crawford	Sullivan Fire Protection District	Unknown	2
8/9/2007	Crawford	Cuba Fire Department	Equipment	1
8/9/2007	Crawford	Steelville Fire Protection District	Debris	1
8/12/2007	Crawford	Steelville Fire Protection District	Miscellaneous	2
8/12/2007	Crawford	Steelville Fire Protection District	Unknown	1
8/14/2007	Crawford	Steelville Fire Protection District	Miscellaneous	1

8/29/2007	Crawford	Cuba Fire Department	Unknown	0.25
9/2/2007	Crawford	Bourbon Fire Protection District	Miscellaneous	5
9/3/2007	Crawford	Steelville Fire Protection District	Unknown	1
9/28/2007	Crawford	Steelville Fire Protection District	Unknown	1
9/29/2007	Crawford	Cuba Fire Department	Unknown	5
10/7/2007	Crawford	Steelville Fire Protection District	Unknown	1
11/1/2007	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	1
11/2/2007	Crawford	Cuba Fire Department	Debris	0.25
11/4/2007	Crawford	Cuba Fire Department	Debris	0.25
11/6/2007	Crawford	Cuba Fire Department	Debris	0.5
11/8/2007	Crawford	Cuba Fire Department	Debris	0.5
11/9/2007	Crawford	Steelville Fire Protection District	Debris	1
11/9/2007	Crawford	Steelville Fire Protection District	Unknown	4
11/9/2007	Crawford	Steelville Fire Protection District	Debris	1
11/10/2007	Crawford	Cuba Fire Department	Debris	0.75
11/10/2007	Crawford	Steelville Fire Protection District	Unknown	1
11/10/2007	Crawford	Cuba Fire Department	Debris	0.25
11/16/2007	Crawford	Cuba Fire Department	Debris	5
11/16/2007	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	5
11/17/2007	Crawford	Cuba Fire Department	Debris	0.5
11/18/2007	Crawford	Steelville Fire Protection District	Smoking	2
11/28/2007	Crawford	Steelville Fire Protection District	Debris	1
12/1/2007	Crawford	Leadwood Fire Protection District	Not Reported	5
12/31/2007	Crawford	Cuba Fire Department	Miscellaneous	0.25
1/1/2008	Crawford	Steelville Fire Protection District	Unknown	1
1/3/2008	Crawford	Steelville Fire Protection District	Debris	1
1/3/2008	Crawford	Bourbon Fire Protection District	Debris	1
1/4/2008	Crawford	Cuba Fire Department	Arson	0.1
1/4/2008	Crawford	Cuba Fire Department	Arson	0.1
1/4/2008	Crawford	Cuba Fire Department	Arson	0.25
1/4/2008	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	5
1/4/2008	Crawford	Cuba Fire Department	Arson	0.1
1/6/2008	Crawford	Bourbon Fire Protection District	Unknown	1
1/6/2008	Crawford	Bourbon Fire Protection District	Arson	1
1/14/2008	Crawford	Steelville Fire Protection District	Miscellaneous	2
1/15/2008	Crawford	Cuba Fire Department	Debris	0.1
1/19/2008	Crawford	Cuba Fire Department	Miscellaneous	0.01
1/21/2008	Crawford	Cuba Fire Department	Equipment	0.1
1/26/2008	Crawford	Cuba Fire Department	Debris	2
1/27/2008	Crawford	Steelville Fire Protection District	Unknown	1

1/27/2008	Crawford	Cuba Fire Department	Debris	5
1/27/2008	Crawford	Steelville Fire Protection District	Debris	5
1/27/2008	Crawford	Steelville Fire Protection District	Unknown	1
1/27/2008	Crawford	Cuba Fire Department	Debris	1
1/27/2008	Crawford	Cuba Fire Department	Debris	1
1/28/2008	Crawford	Steelville Fire Protection District	Debris	1
1/28/2008	Crawford	Sullivan Fire Protection District	Unknown	0.1
2/9/2008	Crawford	Cuba Fire Department	Debris	3
2/9/2008	Crawford	Cuba Fire Department	Debris	1
3/1/2008	Crawford	Cuba Fire Department	Not Reported	0.25
3/1/2008	Crawford	Bourbon Fire Protection District	Unknown	1
3/1/2008	Crawford	Steelville Fire Protection District	Unknown	2
3/1/2008	Crawford	Cuba Fire Department	Not Reported	5
3/1/2008	Crawford	Steelville Fire Protection District	Unknown	2
3/2/2008	Crawford	Sullivan Fire Protection District	Debris	2
3/2/2008	Crawford	Cuba Fire Department	Debris	0.5
3/2/2008	Crawford	Cuba Fire Department	Debris	0.25
3/8/2008	Crawford	Bourbon Fire Protection District	Miscellaneous	30
3/9/2008	Crawford	Cuba Fire Department	Unknown	2
3/9/2008	Crawford	Bourbon Fire Protection District	Unknown	1
3/11/2008	Crawford	Bourbon Fire Protection District	Unknown	5
3/11/2008	Crawford	Cuba Fire Department	Debris	1.2
3/11/2008	Crawford	Cuba Fire Department	Debris	1.5
3/11/2008	Crawford	Cuba Fire Department	Debris	1
3/12/2008	Crawford	Cuba Fire Department	Debris	0.5
3/12/2008	Crawford	Steelville Fire Protection District	Unknown	1
3/12/2008	Crawford	Cuba Fire Department	Debris	25
3/12/2008	Crawford	Steelville Fire Protection District	Debris	1
3/14/2008	Crawford	Steelville Fire Protection District	Debris	33
3/14/2008	Crawford	Cuba Fire Department	Debris	1
3/16/2008	Crawford	Steelville Fire Protection District	Debris	1
3/22/2008	Crawford	Steelville Fire Protection District	Debris	6
3/22/2008	Crawford	Steelville Fire Protection District	Debris	10
3/24/2008	Crawford	Steelville Fire Protection District	Debris	1
3/24/2008	Crawford	Cuba Fire Department	Debris	50
3/25/2008	Crawford	Bourbon Fire Protection District	Equipment	1
3/27/2008	Crawford	Bourbon Fire Protection District	Unknown	1
4/1/2008	Crawford	Steelville Fire Protection District	Unknown	1
4/1/2008	Crawford	Steelville Fire Protection District	Unknown	1
4/5/2008	Crawford	Bourbon Fire Protection District	Unknown	1

4/6/2008	Crawford	Steelville Fire Protection District	Debris	1
4/6/2008	Crawford	Steelville Fire Protection District	Debris	10
4/6/2008	Crawford	Cuba Fire Department	Debris	5
4/7/2008	Crawford	Cuba Fire Department	Debris	2
4/11/2008	Crawford	Steelville Fire Protection District	Miscellaneous	2
4/15/2008	Crawford	Bourbon Fire Protection District	Campfire	1
4/16/2008	Crawford	Cuba Fire Department	Debris	20
4/16/2008	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	20
4/16/2008	Crawford	Steelville Fire Protection District	Miscellaneous	40
4/17/2008	Crawford	Bourbon Fire Protection District	Campfire	1
4/21/2008	Crawford	Steelville Fire Protection District	Debris	1
4/22/2008	Crawford	Steelville Fire Protection District	Debris	1
4/26/2008	Crawford	Cuba Fire Department	Unknown	0.5
4/29/2008	Crawford	Steelville Fire Protection District	Unknown	1
4/29/2008	Crawford	Steelville Fire Protection District	Debris	1
4/30/2008	Crawford	Bourbon Fire Protection District	Unknown	1
5/4/2008	Crawford	Steelville Fire Protection District	Debris	1
6/8/2008	Crawford	Steelville Fire Protection District	Miscellaneous	1
6/16/2008	Crawford	Bourbon Fire Protection District	Lightning	1
7/2/2008	Crawford	Steelville Fire Protection District	Debris	1
7/20/2008	Crawford	Steelville Fire Protection District	Unknown	1
8/4/2008	Crawford	Steelville Fire Protection District	Unknown	1
9/12/2008	Crawford	Steelville Fire Protection District	Debris	1
10/3/2008	Crawford	Cuba Fire Department	Unknown	0.1
10/3/2008	Crawford	Cuba Fire Department	Arson	1
10/26/2008	Crawford	Sullivan Fire Protection District	Unknown	1
10/30/2008	Crawford	Steelville Fire Protection District	Unknown	1
11/1/2008	Crawford	Cuba Fire Department	Unknown	1
11/1/2008	Crawford	Cuba Fire Department	Unknown	1
11/10/2008	Crawford	Cuba Fire Department	Unknown	0.5
11/22/2008	Crawford	Cuba Fire Department	Debris	2
11/23/2008	Crawford	Quad County Fire Protection District	Arson	220
11/26/2008	Crawford	Bourbon Fire Protection District	Unknown	1
11/28/2008	Crawford	Cuba Fire Department	Debris	2
11/28/2008	Crawford	Cuba Fire Department	Debris	2
11/28/2008	Crawford	Bourbon Fire Protection District	Unknown	1
11/29/2008	Crawford	Steelville Fire Protection District	Arson	1
12/6/2008	Crawford	Sullivan Fire Protection District	Debris	1
12/7/2008	Crawford	Bourbon Fire Protection District	Unknown	1
12/7/2008	Crawford	Bourbon Fire Protection District	Unknown	1

12/7/2008	Crawford	Bourbon Fire Protection District	Unknown	1
12/29/2008	Crawford	Steelville Fire Protection District	Debris	6
12/30/2008	Crawford	Steelville Fire Protection District	Debris	4
12/30/2008	Crawford	Steelville Fire Protection District	Unknown	1
1/1/2009	Crawford	Bourbon Fire Protection District	Unknown	1
1/2/2009	Crawford	Sullivan Fire Protection District	Miscellaneous	1
1/2/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	10
1/6/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	0.5
1/9/2009	Crawford	Cuba Fire Department	Debris	0.25
1/9/2009	Crawford	Bourbon Fire Protection District	Arson	1
1/14/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
1/17/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
1/18/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
1/18/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
1/19/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
1/20/2009	Crawford	Steelville Fire Protection District	Unknown	1
1/21/2009	Crawford	Steelville Fire Protection District	Miscellaneous	1
1/22/2009	Crawford	Steelville Fire Protection District	Debris	2
1/22/2009	Crawford	Cuba Fire Department	Unknown	2
1/22/2009	Crawford	Steelville Fire Protection District	Unknown	1
1/22/2009	Crawford	Steelville Fire Protection District	Unknown	30
1/23/2009	Crawford	Steelville Fire Protection District	Miscellaneous	1
1/23/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
1/24/2009	Crawford	Steelville Fire Protection District	Unknown	1
1/24/2009	Crawford	Bourbon Fire Protection District	Arson	1
1/25/2009	Crawford	Steelville Fire Protection District	Debris	15
1/26/2009	Crawford	Steelville Fire Protection District	Unknown	6
2/6/2009	Crawford	Steelville Fire Protection District	Debris	5
2/7/2009	Crawford	Owensville Volunteer Fire Department	Debris	1
2/15/2009	Crawford	Cuba Fire Department	Unknown	2
2/19/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
2/20/2009	Crawford	Cuba Fire Department	Unknown	0.25
2/22/2009	Crawford	Cuba Fire Department	Debris	0.5
2/22/2009	Crawford	Steelville Fire Protection District	Debris	5
2/22/2009	Crawford	Cuba Fire Department	Debris	0.25
2/22/2009	Crawford	Steelville Fire Protection District	Debris	1
2/23/2009	Crawford	Steelville Fire Protection District	Unknown	6
2/24/2009	Crawford	Cuba Fire Department	Unknown	2
2/24/2009	Crawford	Steelville Fire Protection District	Unknown	8
2/25/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	10



2/25/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
3/4/2009	Crawford	Bourbon Fire Protection District	Campfire	1
3/4/2009	Crawford	Steelville Fire Protection District	Unknown	50
3/4/2009	Crawford	Steelville Fire Protection District	Debris	300
3/4/2009	Crawford	Steelville Fire Protection District	Unknown	20
3/5/2009	Crawford	Steelville Fire Protection District	Unknown	5
3/5/2009	Crawford	Steelville Fire Protection District	Debris	20
3/6/2009	Crawford	Steelville Fire Protection District	Unknown	1
3/7/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	20
3/8/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Smoking	1.5
3/8/2009	Crawford	Leasburg Community Volunteer Fire Departmetn	Railroad	1.5
3/8/2009	Crawford	Cuba Fire Department	Smoking	1.5
3/8/2009	Crawford	Bourbon Fire Protection District	Unknown	1
3/8/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	40
3/9/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	1.5
3/9/2009	Crawford	Cuba Fire Department	Debris	1.5
3/9/2009	Crawford	Steelville Fire Protection District	Debris	1
3/9/2009	Crawford	Cuba Fire Department	Debris	5
3/9/2009	Crawford	Steelville Fire Protection District	Debris	2
3/9/2009	Crawford	Cuba Fire Department	Debris	1
3/14/2009	Crawford	Cuba Fire Department	Unknown	1
3/14/2009	Crawford	Cuba Fire Department	Unknown	1
3/14/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	15
3/14/2009	Crawford	Bourbon Fire Protection District	Unknown	2
3/14/2009	Crawford	Steelville Fire Protection District	Unknown	2
3/15/2009	Crawford	Steelville Fire Protection District	Debris	1
3/15/2009	Crawford	Steelville Fire Protection District	Debris	1
3/15/2009	Crawford	Cuba Fire Department	Unknown	0.25
3/16/2009	Crawford	Cuba Fire Department	Unknown	0.5
3/16/2009	Crawford	Bourbon Fire Protection District	Unknown	10
3/16/2009	Crawford	Sullivan Fire Protection District	Unknown	20
3/16/2009	Crawford	Steelville Fire Protection District	Debris	3
3/16/2009	Crawford	Cuba Fire Department	Debris	0.5
3/17/2009	Crawford	Cuba Fire Department	Campfire	0.5
3/17/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
3/18/2009	Crawford	Steelville Fire Protection District	Debris	1
3/18/2009	Crawford	Cuba Fire Department	Unknown	25
3/18/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	2
3/18/2009	Crawford	Steelville Fire Protection District	Unknown	1
3/18/2009	Crawford	Steelville Fire Protection District	Unknown	10

3/18/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	2
3/19/2009	Crawford	Steelville Fire Protection District	Unknown	1
3/19/2009	Crawford	Steelville Fire Protection District	Miscellaneous	15
3/19/2009	Crawford	Steelville Fire Protection District	Unknown	5
3/20/2009	Crawford	Steelville Fire Protection District	Unknown	3
3/20/2009	Crawford	Steelville Fire Protection District	Unknown	1
3/20/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
3/21/2009	Crawford	Sullivan Fire Protection District	Debris	0.5
3/22/2009	Crawford	Steelville Fire Protection District	Debris	3
3/22/2009	Crawford	Bourbon Fire Protection District	Unknown	1
3/23/2009	Crawford	Steelville Fire Protection District	Debris	73
3/23/2009	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	70
3/23/2009	Crawford	Cuba Fire Department	Unknown	10
3/23/2009	Crawford	Bourbon Fire Protection District	Unknown	10
3/23/2009	Crawford	Steelville Fire Protection District	Arson	1
3/23/2009	Crawford	Steelville Fire Protection District	Unknown	3
3/24/2009	Crawford	Sullivan Fire Protection District	Debris	6
3/24/2009	Crawford	Mapaville Fire Prot. Dist.	Unknown	1
3/30/2009	Crawford	Steelville Fire Protection District	Unknown	5
3/30/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
3/31/2009	Crawford	Bourbon Fire Protection District	Unknown	1
4/1/2009	Crawford	Cuba Fire Department	Unknown	25
4/1/2009	Crawford	Steelville Fire Protection District	Smoking	1
4/1/2009	Crawford	Steelville Fire Protection District	Unknown	2
4/2/2009	Crawford	Steelville Fire Protection District	Unknown	1
4/4/2009	Crawford	Bourbon Fire Protection District	Unknown	2
4/4/2009	Crawford	Steelville Fire Protection District	Lightning	1
4/4/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
4/7/2009	Crawford	Bourbon Fire Protection District	Unknown	1
4/7/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
4/8/2009	Crawford	Cuba Fire Department	Debris	0.5
4/17/2009	Crawford	Steelville Fire Protection District	Unknown	5
4/22/2009	Crawford	Quad County Fire Protection District	Unknown	34
4/26/2009	Crawford	Steelville Fire Protection District	Debris	15
4/26/2009	Crawford	Steelville Fire Protection District	Unknown	2
4/26/2009	Crawford	Bourbon Fire Protection District	Unknown	7
4/26/2009	Crawford	Steelville Fire Protection District	Debris	2
4/27/2009	Crawford	Steelville Fire Protection District	Miscellaneous	3
4/27/2009	Crawford	Cuba Fire Department	Unknown	0.25
6/13/2009	Crawford	Steelville Fire Protection District	Miscellaneous	1

7/19/2009	Crawford	Steelville Fire Protection District	Unknown	1
7/31/2009	Crawford	Steelville Fire Protection District	Debris	2
8/9/2009	Crawford	Steelville Fire Protection District	Unknown	1
8/9/2009	Crawford	Steelville Fire Protection District	Unknown	1
8/25/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
8/30/2009	Crawford	Bourbon Fire Protection District	Unknown	1
9/1/2009	Crawford	Cuba Fire Department	Debris	1
9/30/2009	Crawford	Cuba Fire Department	Debris	0.25
10/20/2009	Crawford	Cuba Fire Department	Debris	3
10/20/2009	Crawford	Cuba Fire Department	Equipment	0.5
11/3/2009	Crawford	Cuba Fire Department	Debris	0.5
11/4/2009	Crawford	Steelville Fire Protection District	Unknown	1
11/5/2009	Crawford	Steelville Fire Protection District	Debris	1
11/5/2009	Crawford	Sullivan Fire Protection District	Debris	0.01
11/5/2009	Crawford	Sullivan Fire Protection District	Debris	0.01
11/6/2009	Crawford	Steelville Fire Protection District	Debris	2
11/6/2009	Crawford	Steelville Fire Protection District	Debris	1
11/6/2009	Crawford	Cuba Fire Department	Miscellaneous	3
11/9/2009	Crawford	Steelville Fire Protection District	Unknown	1
11/11/2009	Crawford	Steelville Fire Protection District	Unknown	3
11/28/2009	Crawford	Cuba Fire Department	Debris	1
11/29/2009	Crawford	Bourbon Fire Protection District	Miscellaneous	1
1/19/2010	Crawford	Cuba Fire Department	Debris	0.25
2/26/2010	Crawford	Steelville Fire Protection District	Debris	2
2/27/2010	Crawford	Steelville Fire Protection District	Debris	4
2/27/2010	Crawford	Steelville Fire Protection District	Debris	3
2/28/2010	Crawford	Steelville Fire Protection District	Debris	1
2/28/2010	Crawford	Cuba Fire Department	Debris	2
2/28/2010	Crawford	Bourbon Fire Protection District	Unknown	4
3/3/2010	Crawford	Cuba Fire Department	Debris	20
3/3/2010	Crawford	Steelville Fire Protection District	Unknown	25
3/3/2010	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	40
3/4/2010	Crawford	Sullivan Fire Protection District	Unknown	0.25
3/4/2010	Crawford	Quad County Fire Protection District	Miscellaneous	1
3/6/2010	Crawford	Bourbon Fire Protection District	Not Reported	25
3/6/2010	Crawford	Steelville Fire Protection District	Debris	2
3/6/2010	Crawford	Steelville Fire Protection District	Unknown	20
3/6/2010	Crawford	Cuba Fire Department	Debris	4
3/6/2010	Crawford	Cuba Fire Department	Not Reported	0.5
3/7/2010	Crawford	Steelville Fire Protection District	Debris	9

3/7/2010	Crawford	Steelville Fire Protection District	Debris	1
3/7/2010	Crawford	Steelville Fire Protection District	Debris	2
3/7/2010	Crawford	Bourbon Fire Protection District	Unknown	2
3/7/2010	Crawford	Cuba Fire Department	Not Reported	10
3/10/2010	Crawford	Cuba Fire Department	Debris	0.5
3/10/2010	Crawford	Quad County Fire Protection District	Unknown	3
3/20/2010	Crawford	Cuba Fire Department	Debris	2
3/23/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	3
3/23/2010	Crawford	Bourbon Fire Protection District	Unknown	38
3/23/2010	Crawford	Cuba Fire Department	Arson	10
3/24/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	2
3/30/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	2
3/30/2010	Crawford	Cuba Fire Department	Debris	1
4/1/2010	Crawford	Steelville Fire Protection District	Debris	2
4/1/2010	Crawford	Cuba Fire Department	Debris	2
4/1/2010	Crawford	Steelville Fire Protection District	Debris	4
4/3/2010	Crawford	Leasburg Community Volunteer Fire Departmetn	Miscellaneous	22
4/4/2010	Crawford	Steelville Fire Protection District	Debris	1.5
4/6/2010	Crawford	Doolittle Rural Fire Protection District	Unknown	30
4/6/2010	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	26
4/6/2010	Crawford	Cuba Fire Department	Debris	40
4/9/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	1
4/9/2010	Crawford	Cuba Fire Department	Debris	1
4/9/2010	Crawford	Steelville Fire Protection District	Debris	1
4/10/2010	Crawford	Bourbon Fire Protection District	Unknown	1
4/11/2010	Crawford	Cuba Fire Department	Debris	10
4/11/2010	Crawford	Steelville Fire Protection District	Debris	2
4/11/2010	Crawford	Bourbon Fire Protection District	Arson	2
4/11/2010	Crawford	Cuba Fire Department	Debris	1
4/11/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	14
4/11/2010	Crawford	Sullivan Fire Protection District	Equipment	1
4/11/2010	Crawford	Cuba Fire Department	Debris	1
4/12/2010	Crawford	Steelville Fire Protection District	Unknown	6
4/12/2010	Crawford	Bourbon Fire Protection District	Unknown	1
4/13/2010	Crawford	Cuba Fire Department	Debris	5
4/13/2010	Crawford	Steelville Fire Protection District	Debris	1
4/13/2010	Crawford	Steelville Fire Protection District	Unknown	30
4/18/2010	Crawford	Steelville Fire Protection District	Debris	2
4/18/2010	Crawford	Steelville Fire Protection District	Unknown	1
4/19/2010	Crawford	Cuba Fire Department	Debris	1

4/19/2010	Crawford	Quad County Fire Protection District	Unknown	3
4/20/2010	Crawford	Steelville Fire Protection District	Unknown	1
4/21/2010	Crawford	Steelville Fire Protection District	Unknown	12
5/14/2010	Crawford	Bourbon Fire Protection District	Unknown	1
6/26/2010	Crawford	Steelville Fire Protection District	Unknown	0.5
7/1/2010	Crawford	Steelville Fire Protection District	Miscellaneous	0.5
7/3/2010	Crawford	Cuba Fire Department	Miscellaneous	0.25
7/7/2010	Crawford	Steelville Fire Protection District	Unknown	1
7/7/2010	Crawford	Cuba Fire Department	Unknown	0.25
8/18/2010	Crawford	Bourbon Fire Protection District	Unknown	1
9/22/2010	Crawford	Steelville Fire Protection District	Debris	1
10/7/2010	Crawford	Bourbon Fire Protection District	Unknown	2
10/14/2010	Crawford	Bourbon Fire Protection District	Unknown	1
10/14/2010	Crawford	Cuba Fire Department	Debris	2
10/18/2010	Crawford	SALEM FORESTRY	Unknown	154
10/18/2010	Crawford	Cuba Fire Department	Miscellaneous	183
10/22/2010	Crawford	Doolittle Rural Fire Protection District	Unknown	100
10/22/2010	Crawford	Cuba Fire Department	Unknown	120
10/22/2010	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	89
10/23/2010	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	18
10/23/2010	Crawford	Cuba Fire Department	Debris	18
10/23/2010	Crawford	Bourbon Fire Protection District	Unknown	22
10/24/2010	Crawford	Cuba Fire Department	Debris	0.5
10/25/2010	Crawford	Steelville Fire Protection District	Unknown	2
10/29/2010	Crawford	Steelville Fire Protection District	Unknown	8
10/31/2010	Crawford	Steelville Fire Protection District	Debris	2
11/1/2010	Crawford	Bourbon Fire Protection District	Unknown	25
11/4/2010	Crawford	Steelville Fire Protection District	Miscellaneous	2
11/6/2010	Crawford	Steelville Fire Protection District	Debris	4
11/7/2010	Crawford	Quad County Fire Protection District	Unknown	1.5
11/7/2010	Crawford	Cuba Fire Department	Debris	0.25
11/8/2010	Crawford	Steelville Fire Protection District	Equipment	4
11/8/2010	Crawford	Steelville Fire Protection District	Unknown	5
11/8/2010	Crawford	Steelville Fire Protection District	Unknown	2
11/9/2010	Crawford	Cuba Fire Department	Debris	0.25
11/9/2010	Crawford	Cuba Fire Department	Debris	0.5
11/9/2010	Crawford	Cuba Fire Department	Debris	0.5
11/19/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	3
11/20/2010	Crawford	Cuba Fire Department	Debris	1
11/23/2010	Crawford	Cuba Fire Department	Debris	1

11/28/2010	Crawford	Bourbon Fire Protection District	Unknown	1
11/28/2010	Crawford	Cuba Fire Department	Equipment	1
12/7/2010	Crawford	Bourbon Fire Protection District	Miscellaneous	1
12/10/2010	Crawford	Sullivan Fire Protection District	Debris	0.25
2/16/2011	Crawford	Leasburg Community Volunteer Fire Department	Unknown	5
2/18/2011	Crawford	Steelville Fire Protection District	Unknown	1
2/18/2011	Crawford	Cuba Fire Department	Debris	15
2/18/2011	Crawford	Cuba Fire Department	Unknown	12
3/2/2011	Crawford	Cuba Fire Department	Debris	4
3/2/2011	Crawford	Steelville Fire Protection District	Unknown	10
3/2/2011	Crawford	Steelville Fire Protection District	Unknown	3
3/3/2011	Crawford	Steelville Fire Protection District	Debris	2
3/3/2011	Crawford	Steelville Fire Protection District	Unknown	20
3/3/2011	Crawford	Steelville Fire Protection District	Unknown	20
3/4/2011	Crawford	Steelville Fire Protection District	Unknown	5
3/4/2011	Crawford	Steelville Fire Protection District	Unknown	1
3/4/2011	Crawford	Cuba Fire Department	Unknown	20
3/4/2011	Crawford	Bourbon Fire Protection District	Unknown	1
3/11/2011	Crawford	Cuba Fire Department	Debris	1
3/11/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	4
3/12/2011	Crawford	Steelville Fire Protection District	Unknown	10
3/12/2011	Crawford	Cuba Fire Department	Equipment	4
3/12/2011	Crawford	Quad County Fire Protection District	Unknown	400
3/12/2011	Crawford	Cuba Fire Department	Unknown	3
3/12/2011	Crawford	Cuba Fire Department	Debris	1
3/12/2011	Crawford	Steelville Fire Protection District	Debris	2
3/13/2011	Crawford	Steelville Fire Protection District	Debris	20
3/13/2011	Crawford	Cuba Fire Department	Debris	3
3/19/2011	Crawford	Sullivan Fire Protection District	Not Reported	1
3/20/2011	Crawford	Steelville Fire Protection District	Debris	4
3/23/2011	Crawford	Steelville Fire Protection District	Unknown	5
3/23/2011	Crawford	Cuba Fire Department	Debris	40
3/23/2011	Crawford	Steelville Fire Protection District	Debris	3
3/23/2011	Crawford	Quad County Fire Protection District	Unknown	15
3/23/2011	Crawford	Sullivan Fire Protection District	Debris	3
3/23/2011	Crawford	Sullivan Fire Protection District	Debris	0.01
3/24/2011	Crawford	Bourbon Fire Protection District	Debris	1
4/2/2011	Crawford	Bourbon Fire Protection District	Debris	1
4/2/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
4/3/2011	Crawford	Steelville Fire Protection District	Unknown	60

4/3/2011	Crawford	Cuba Fire Department	Debris	2
4/3/2011	Crawford	Steelville Fire Protection District	Unknown	1
4/3/2011	Crawford	Cuba Fire Department	Debris	0.5
4/3/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
4/3/2011	Crawford	Steelville Fire Protection District	Debris	3
4/3/2011	Crawford	Cuba Fire Department	Debris	4
4/6/2011	Crawford	Quad County Fire Protection District	Unknown	50
4/9/2011	Crawford	Quad County Fire Protection District	Unknown	5
4/21/2011	Crawford	Cuba Fire Department	Unknown	1.2
4/29/2011	Crawford	Cuba Fire Department	Equipment	2
6/26/2011	Crawford	Steelville Fire Protection District	Debris	1
7/2/2011	Crawford	Bourbon Fire Protection District	Debris	4
7/3/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
7/20/2011	Crawford	Cuba Fire Department	Unknown	0.25
8/27/2011	Crawford	Cuba Fire Department	Debris	0.5
8/30/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
8/31/2011	Crawford	Steelville Fire Protection District	Unknown	3
9/3/2011	Crawford	Cuba Fire Department	Equipment	1.5
9/13/2011	Crawford	Cuba Fire Department	Equipment	0.25
9/30/2011	Crawford	Bourbon Fire Protection District	Miscellaneous	1
10/15/2011	Crawford	Sullivan Fire Protection District	Debris	0.01
10/29/2011	Crawford	Cuba Fire Department	Unknown	0.25
10/31/2011	Crawford	Cuba Fire Department	Unknown	20
11/1/2011	Crawford	Bourbon Fire Protection District	Debris	5
11/1/2011	Crawford	Cuba Fire Department	Unknown	0.5
11/2/2011	Crawford	Cuba Fire Department	Debris	10
11/2/2011	Crawford	Cuba Fire Department	Debris	0.25
11/12/2011	Crawford	Sullivan Fire Protection District	Miscellaneous	1.5
11/13/2011	Crawford	Quad County Fire Protection District	Miscellaneous	65
11/14/2011	Crawford	Steelville Fire Protection District	Miscellaneous	1
11/14/2011	Crawford	Steelville Fire Protection District	Miscellaneous	60
11/14/2011	Crawford	Cuba Fire Department	Equipment	0.5
11/17/2011	Crawford	Steelville Fire Protection District	Unknown	2
11/17/2011	Crawford	Quad County Fire Protection District	Debris	125
11/18/2011	Crawford	Quad County Fire Protection District	Miscellaneous	4
11/18/2011	Crawford	Cuba Fire Department	Unknown	0.25
11/18/2011	Crawford	Cuba Fire Department	Unknown	1.5
11/19/2011	Crawford	Bourbon Fire Protection District	Debris	1
11/30/2011	Crawford	Cuba Fire Department	Debris	1
12/8/2011	Crawford	Steelville Fire Protection District	Unknown	1

12/10/2011	Crawford	Bourbon Fire Protection District	Unknown	1
12/11/2011	Crawford	Steelville Fire Protection District	Unknown	1
12/19/2011	Crawford	Steelville Fire Protection District	Unknown	4
12/31/2011	Crawford	Steelville Fire Protection District	Debris	8
12/31/2011	Crawford	Cuba Fire Department	Debris	0.25
12/31/2011	Crawford	Steelville Fire Protection District	Debris	4
12/31/2011	Crawford	Steelville Fire Protection District	Debris	4
12/31/2011	Crawford	Steelville Fire Protection District	Debris	1
1/3/2012	Crawford	Steelville Fire Protection District	Debris	15
1/3/2012	Crawford	Steelville Fire Protection District	Debris	3
1/3/2012	Crawford	Steelville Fire Protection District	Debris	1
1/4/2012	Crawford	Quad County Fire Protection District	Unknown	5
1/4/2012	Crawford	Steelville Fire Protection District	Unknown	1
1/5/2012	Crawford	Bourbon Fire Protection District	Debris	4
1/5/2012	Crawford	Sullivan Fire Protection District	Debris	0.5
1/5/2012	Crawford	Steelville Fire Protection District	Debris	35
1/5/2012	Crawford	Steelville Fire Protection District	Debris	1
1/6/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	25
1/7/2012	Crawford	Sullivan Fire Protection District	Debris	3
1/7/2012	Crawford	Cuba Fire Department	Debris	138.55
1/7/2012	Crawford	Cuba Fire Department	Debris	0.5
1/7/2012	Crawford	Steelville Fire Protection District	Unknown	1
1/23/2012	Crawford	Steelville Fire Protection District	Unknown	1
1/29/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
1/30/2012	Crawford	Cuba Fire Department	Debris	2
2/1/2012	Crawford	Cuba Fire Department	Debris	0.5
2/2/2012	Crawford	Cuba Fire Department	Debris	0.5
2/2/2012	Crawford	Cuba Fire Department	Debris	3
2/2/2012	Crawford	Cuba Fire Department	Debris	0.5
2/2/2012	Crawford	Steelville Fire Protection District	Debris	1
2/12/2012	Crawford	Steelville Fire Protection District	Debris	2
2/12/2012	Crawford	Cuba Fire Department	Debris	0.5
2/20/2012	Crawford	Sullivan Fire Protection District	Debris	5
2/22/2012	Crawford	Steelville Fire Protection District	Unknown	7
2/23/2012	Crawford	Steelville Fire Protection District	Unknown	1
2/23/2012	Crawford	Steelville Fire Protection District	Debris	3
2/23/2012	Crawford	Steelville Fire Protection District	Unknown	20
2/23/2012	Crawford	Cuba Fire Department	Unknown	0.5
2/25/2012	Crawford	Steelville Fire Protection District	Unknown	2
2/26/2012	Crawford	Steelville Fire Protection District	Debris	10



2/27/2012	Crawford	Steelville Fire Protection District	Unknown	1
2/29/2012	Crawford	Steelville Fire Protection District	Unknown	1
2/29/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	7
3/1/2012	Crawford	Bourbon Fire Protection District	Unknown	5
3/2/2012	Crawford	Steelville Fire Protection District	Unknown	1
3/4/2012	Crawford	Bourbon Fire Protection District	Arson	1
3/5/2012	Crawford	Steelville Fire Protection District	Unknown	30
3/5/2012	Crawford	Steelville Fire Protection District	Debris	5
3/5/2012	Crawford	Bourbon Fire Protection District	Unknown	4
3/5/2012	Crawford	Steelville Fire Protection District	Debris	2
3/6/2012	Crawford	Bourbon Fire Protection District	Unknown	2
3/6/2012	Crawford	Bourbon Fire Protection District	Unknown	1
3/6/2012	Crawford	Steelville Fire Protection District	Unknown	20
3/10/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Miscellaneous	3
3/10/2012	Crawford	Quad County Fire Protection District	Unknown	5
3/10/2012	Crawford	Steelville Fire Protection District	Debris	1
3/10/2012	Crawford	Leasburg Community Volunteer Fire Department	Miscellaneous	3
3/10/2012	Crawford	Steelville Fire Protection District	Debris	2
3/12/2012	Crawford	Sullivan Fire Protection District	Debris	1
3/15/2012	Crawford	Cuba Fire Department	Smoking	0.5
3/16/2012	Crawford	Cuba Fire Department	Unknown	7
3/24/2012	Crawford	Steelville Fire Protection District	Unknown	10
3/28/2012	Crawford	Steelville Fire Protection District	Unknown	1
3/29/2012	Crawford	Cuba Fire Department	Debris	5
3/31/2012	Crawford	Sullivan Fire Protection District	Debris	1
3/31/2012	Crawford	Cuba Fire Department	Equipment	1
4/2/2012	Crawford	Steelville Fire Protection District	Unknown	5
4/3/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	0.5
4/11/2012	Crawford	Cuba Fire Department	Miscellaneous	0.5
5/10/2012	Crawford	Cuba Fire Department	Unknown	0.5
5/11/2012	Crawford	Cuba Fire Department	Miscellaneous	1
5/11/2012	Crawford	Steelville Fire Protection District	Unknown	1
5/15/2012	Crawford	Cuba Fire Department	Miscellaneous	0.25
5/16/2012	Crawford	Bourbon Fire Protection District	Equipment	2
5/21/2012	Crawford	Bourbon Fire Protection District	Children	0.5
5/24/2012	Crawford	Steelville Fire Protection District	Miscellaneous	6
5/24/2012	Crawford	Steelville Fire Protection District	Miscellaneous	5
5/27/2012	Crawford	Steelville Fire Protection District	Arson	5
5/27/2012	Crawford	Steelville Fire Protection District	Unknown	2
6/5/2012	Crawford	Steelville Fire Protection District	Unknown	1

6/7/2012	Crawford	Steelville Fire Protection District	Unknown	1
6/8/2012	Crawford	Cuba Fire Department	Equipment	5
6/8/2012	Crawford	Steelville Fire Protection District	Unknown	1
6/10/2012	Crawford	Steelville Fire Protection District	Unknown	1
6/13/2012	Crawford	Cuba Fire Department	Children	0.25
6/14/2012	Crawford	Bourbon Fire Protection District	Unknown	1
6/15/2012	Crawford	Sullivan Fire Protection District	Equipment	1.7
6/17/2012	Crawford	Bourbon Fire Protection District	Debris	0.5
6/18/2012	Crawford	Bourbon Fire Protection District	Unknown	15
6/18/2012	Crawford	Cuba Fire Department	Unknown	1.5
6/20/2012	Crawford	Bourbon Fire Protection District	Equipment	10
6/21/2012	Crawford	Steelville Fire Protection District	Debris	10
6/23/2012	Crawford	Steelville Fire Protection District	Unknown	1
6/23/2012	Crawford	Steelville Fire Protection District	Unknown	3
6/24/2012	Crawford	Cuba Fire Department	Children	1
6/25/2012	Crawford	Sullivan Fire Protection District	Debris	0.01
6/26/2012	Crawford	Cuba Fire Department	Unknown	1
6/26/2012	Crawford	Steelville Fire Protection District	Unknown	2
6/27/2012	Crawford	Steelville Fire Protection District	Debris	3
6/27/2012	Crawford	Steelville Fire Protection District	Debris	2
6/28/2012	Crawford	Cuba Fire Department	Campfire	30
6/28/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	20
6/28/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Campfire	30
6/28/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	2
6/28/2012	Crawford	Cuba Fire Department	Unknown	0.25
6/28/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	2
6/28/2012	Crawford	Steelville Fire Protection District	Unknown	30
6/29/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	5
6/29/2012	Crawford	Steelville Fire Protection District	Unknown	1
6/29/2012	Crawford	Cuba Fire Department	Debris	5
6/30/2012	Crawford	Bourbon Fire Protection District	Debris	1
7/3/2012	Crawford	Steelville Fire Protection District	Debris	1
7/5/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
7/6/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
7/6/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	10
7/8/2012	Crawford	Cuba Fire Department	Lightning	1
7/15/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	2
7/17/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Miscellaneous	7
7/25/2012	Crawford	Steelville Fire Protection District	Miscellaneous	50
7/25/2012	Crawford	Cuba Fire Department	Debris	40

7/25/2012	Crawford	Steelville Fire Protection District	Miscellaneous	50
7/25/2012	Crawford	Steelville Fire Protection District	Miscellaneous	50
7/25/2012	Crawford	MDC REPORTING REGION - ST. LOUIS	Equipment	40
7/26/2012	Crawford	Steelville Fire Protection District	Miscellaneous	1
7/31/2012	Crawford	Cuba Fire Department	Debris	1
8/4/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
8/5/2012	Crawford	Steelville Fire Protection District	Debris	1
8/9/2012	Crawford	Steelville Fire Protection District	Unknown	1
8/20/2012	Crawford	Cuba Fire Department	Equipment	0.5
8/24/2012	Crawford	Cuba Fire Department	Smoking	0.25
8/30/2012	Crawford	Bourbon Fire Protection District	Miscellaneous	1
9/12/2012	Crawford	Steelville Fire Protection District	Unknown	1
9/19/2012	Crawford	Steelville Fire Protection District	Debris	2
9/19/2012	Crawford	Steelville Fire Protection District	Debris	1
10/22/2012	Crawford	Cuba Fire Department	Equipment	4
10/31/2012	Crawford	Cuba Fire Department	Debris	1.5
11/10/2012	Crawford	Steelville Fire Protection District	Debris	2
11/10/2012	Crawford	Cuba Fire Department	Debris	2
11/10/2012	Crawford	Cuba Fire Department	Equipment	3
11/10/2012	Crawford	Cuba Fire Department	Debris	2
11/10/2012	Crawford	Cuba Fire Department	Debris	0.5
11/11/2012	Crawford	Cuba Fire Department	Not Reported	0.5
11/17/2012	Crawford	Bourbon Fire Protection District	Debris	1
11/18/2012	Crawford	Steelville Fire Protection District	Unknown	5
11/18/2012	Crawford	Cuba Fire Department	Debris	0.5
11/25/2012	Crawford	Steelville Fire Protection District	Unknown	4
12/1/2012	Crawford	Cuba Fire Department	Not Reported	0.5
12/1/2012	Crawford	Cuba Fire Department	Debris	0.25
1/19/2013	Crawford	Steelville Fire Protection District	Arson	1
1/24/2013	Crawford	Cuba Fire Department	Unknown	1
1/25/2013	Crawford	Cuba Fire Department	Debris	0.25
1/27/2013	Crawford	Sullivan Fire Protection District	Debris	2
2/6/2013	Crawford	Steelville Fire Protection District	Debris	75
3/6/2013	Crawford	Quad County Fire Protection District	Miscellaneous	100
3/8/2013	Crawford	Steelville Fire Protection District	Debris	2
3/9/2013	Crawford	Steelville Fire Protection District	Unknown	3
3/15/2013	Crawford	Cuba Fire Department	Debris	1
3/23/2013	Crawford	Sullivan Fire Protection District	Campfire	4
4/1/2013	Crawford	Steelville Fire Protection District	Debris	12
4/1/2013	Crawford	Bourbon Fire Protection District	Unknown	3

4/2/2013	Crawford	Steelville Fire Protection District	Unknown	6
4/4/2013	Crawford	Steelville Fire Protection District	Debris	3
4/4/2013	Crawford	Steelville Fire Protection District	Unknown	3
4/5/2013	Crawford	Bourbon Fire Protection District	Debris	3
4/6/2013	Crawford	Steelville Fire Protection District	Debris	2
4/6/2013	Crawford	Cuba Fire Department	Debris	0.25
4/7/2013	Crawford	Bourbon Fire Protection District	Unknown	2
4/7/2013	Crawford	Cuba Fire Department	Equipment	1
4/7/2013	Crawford	Cuba Fire Department	Debris	15
4/7/2013	Crawford	Steelville Fire Protection District	Debris	1
4/10/2013	Crawford	Steelville Fire Protection District	Debris	2
4/14/2013	Crawford	Bourbon Fire Protection District	Debris	5
4/14/2013	Crawford	Bourbon Fire Protection District	Debris	5
4/14/2013	Crawford	Cuba Fire Department	Debris	7
4/20/2013	Crawford	Steelville Fire Protection District	Unknown	30
4/20/2013	Crawford	Cuba Fire Department	Unknown	50
4/20/2013	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	50
4/22/2013	Crawford	Sullivan Fire Protection District	Debris	6
5/2/2013	Crawford	Cuba Fire Department	Unknown	0.25
5/14/2013	Crawford	Cuba Fire Department	Debris	0.25
7/4/2013	Crawford	Sullivan Fire Protection District	Unknown	0.1
7/12/2013	Crawford	Cuba Fire Department	Debris	1
8/22/2013	Crawford	Bourbon Fire Protection District	Smoking	1
8/31/2013	Crawford	Steelville Fire Protection District	Equipment	4
9/3/2013	Crawford	Steelville Fire Protection District	Equipment	2
9/12/2013	Crawford	Cuba Fire Department	Unknown	0.25
9/13/2013	Crawford	Cuba Fire Department	Debris	0.5
9/13/2013	Crawford	Bourbon Fire Protection District	Unknown	1
9/29/2013	Crawford	Bourbon Fire Protection District	Unknown	1
10/3/2013	Crawford	Cuba Fire Department	Unknown	0.5
10/23/2013	Crawford	Steelville Fire Protection District	Unknown	1
11/9/2013	Crawford	Bourbon Fire Protection District	Unknown	1
11/11/2013	Crawford	Steelville Fire Protection District	Debris	4
11/13/2013	Crawford	Steelville Fire Protection District	Unknown	1
11/15/2013	Crawford	Bourbon Fire Protection District	Unknown	1
11/15/2013	Crawford	Sullivan Fire Protection District	Debris	1
11/18/2013	Crawford	Steelville Fire Protection District	Unknown	59
11/18/2013	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	60
11/26/2013	Crawford	Steelville Fire Protection District	Debris	2
11/30/2013	Crawford	Steelville Fire Protection District	Debris	0.5

11/30/2013	Crawford	Bourbon Fire Protection District	Unknown	1
12/18/2013	Crawford	Sullivan Fire Protection District	Miscellaneous	5
12/28/2013	Crawford	Sullivan Fire Protection District	Debris	0.9
12/30/2013	Crawford	Steelville Fire Protection District	Debris	1
12/30/2013	Crawford	Steelville Fire Protection District	Debris	1
1/14/2014	Crawford	Steelville Fire Protection District	Debris	2
1/19/2014	Crawford	Cuba Fire Department	Debris	3
1/20/2014	Crawford	Steelville Fire Protection District	Unknown	2
1/24/2014	Crawford	Cuba Fire Department	Equipment	30
1/24/2014	Crawford	Steelville Fire Protection District	Unknown	8
1/24/2014	Crawford	Steelville Fire Protection District	Debris	0.25
1/24/2014	Crawford	Steelville Fire Protection District	Miscellaneous	0.5
1/25/2014	Crawford	Cuba Fire Department	Debris	40
1/25/2014	Crawford	Cuba Fire Department	Debris	40
1/25/2014	Crawford	Steelville Fire Protection District	Equipment	0.25
1/26/2014	Crawford	Cuba Fire Department	Campfire	6
1/26/2014	Crawford	Quad County Fire Protection District	Unknown	2
1/26/2014	Crawford	Cuba Fire Department	Debris	1
1/26/2014	Crawford	Cuba Fire Department	Debris	1
1/26/2014	Crawford	Cuba Fire Department	Debris	1
1/26/2014	Crawford	Cuba Fire Department	Campfire	2
1/26/2014	Crawford	Steelville Fire Protection District	Debris	1
1/27/2014	Crawford	Steelville Fire Protection District	Debris	6
2/19/2014	Crawford	Steelville Fire Protection District	Debris	1.5
2/19/2014	Crawford	Steelville Fire Protection District	Debris	1
2/19/2014	Crawford	Quad County Fire Protection District	Unknown	5
2/20/2014	Crawford	Sullivan Fire Protection District	Unknown	1
2/21/2014	Crawford	Sullivan Fire Protection District	Debris	4
2/22/2014	Crawford	Cuba Fire Department	Debris	0.5
2/23/2014	Crawford	Steelville Fire Protection District	Debris	1
2/23/2014	Crawford	Steelville Fire Protection District	Unknown	2
2/25/2014	Crawford	Steelville Fire Protection District	Debris	3
2/27/2014	Crawford	Sullivan Fire Protection District	Debris	10
2/27/2014	Crawford	Cuba Fire Department	Debris	5
2/27/2014	Crawford	Beaufort-Leslie Fire Protection District	Unknown	30
2/28/2014	Crawford	Cuba Fire Department	Debris	1.5
3/1/2014	Crawford	Steelville Fire Protection District	Debris	20
3/1/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	35
3/1/2014	Crawford	Cuba Fire Department	Unknown	35
3/1/2014	Crawford	Steelville Fire Protection District	Unknown	20

3/1/2014	Crawford	Steelville Fire Protection District	Debris	1
3/1/2014	Crawford	Steelville Fire Protection District	Unknown	40
3/7/2014	Crawford	Steelville Fire Protection District	Debris	1
3/8/2014	Crawford	Cuba Fire Department	Debris	5
3/8/2014	Crawford	Steelville Fire Protection District	Debris	3
3/8/2014	Crawford	Steelville Fire Protection District	Unknown	1
3/9/2014	Crawford	Steelville Fire Protection District	Debris	1
3/9/2014	Crawford	Cuba Fire Department	Debris	0.5
3/9/2014	Crawford	Cuba Fire Department	Miscellaneous	3
3/9/2014	Crawford	Steelville Fire Protection District	Debris	2
3/10/2014	Crawford	Cuba Fire Department	Debris	0.5
3/10/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	15
3/10/2014	Crawford	Steelville Fire Protection District	Unknown	1.5
3/10/2014	Crawford	Steelville Fire Protection District	Debris	10
3/10/2014	Crawford	Cuba Fire Department	Debris	1
3/11/2014	Crawford	Steelville Fire Protection District	Debris	0.2
3/13/2014	Crawford	Cuba Fire Department	Unknown	0.25
3/14/2014	Crawford	Steelville Fire Protection District	Unknown	27
3/14/2014	Crawford	Cuba Fire Department	Debris	1
3/14/2014	Crawford	Steelville Fire Protection District	Debris	25
3/14/2014	Crawford	Steelville Fire Protection District	Unknown	1
3/14/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Unknown	50
3/15/2014	Crawford	Steelville Fire Protection District	Debris	25
3/15/2014	Crawford	Steelville Fire Protection District	Debris	6
3/15/2014	Crawford	Cuba Fire Department	Debris	0.5
3/15/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	4
3/15/2014	Crawford	Steelville Fire Protection District	Debris	45
3/15/2014	Crawford	Steelville Fire Protection District	Unknown	30
3/15/2014	Crawford	Cuba Fire Department	Debris	20
3/15/2014	Crawford	Quad County Fire Protection District	Unknown	100
3/15/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	20
3/15/2014	Crawford	Steelville Fire Protection District	Debris	1
3/15/2014	Crawford	Cuba Fire Department	Debris	0.25
3/15/2014	Crawford	Crystal City Fire Department	Equipment	0.25
3/15/2014	Crawford	Steelville Fire Protection District	Debris	0.5
3/19/2014	Crawford	Steelville Fire Protection District	Unknown	1
3/20/2014	Crawford	Steelville Fire Protection District	Debris	0.25
3/20/2014	Crawford	Steelville Fire Protection District	Debris	4
3/22/2014	Crawford	Sullivan Fire Protection District	Debris	0.25
3/22/2014	Crawford	Steelville Fire Protection District	Debris	2

3/23/2014	Crawford	Steelville Fire Protection District	Debris	7
3/24/2014	Crawford	Cuba Fire Department	Debris	1
3/24/2014	Crawford	Steelville Fire Protection District	Debris	4
3/24/2014	Crawford	Steelville Fire Protection District	Debris	2
3/25/2014	Crawford	Steelville Fire Protection District	Debris	6
3/26/2014	Crawford	Cuba Fire Department	Debris	10
3/26/2014	Crawford	Cuba Fire Department	Debris	30
3/26/2014	Crawford	Steelville Fire Protection District	Unknown	10
3/28/2014	Crawford	Steelville Fire Protection District	Debris	15
3/30/2014	Crawford	Steelville Fire Protection District	Debris	109
3/30/2014	Crawford	Cuba Fire Department	Debris	35
3/30/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Miscellaneous	35
4/5/2014	Crawford	Steelville Fire Protection District	Debris	30
4/10/2014	Crawford	Steelville Fire Protection District	Miscellaneous	70
4/10/2014	Crawford	Cuba Fire Department	Equipment	1
4/11/2014	Crawford	Cuba Fire Department	Debris	1
4/12/2014	Crawford	Steelville Fire Protection District	Debris	2
4/14/2014	Crawford	Cuba Fire Department	Debris	0.1
4/18/2014	Crawford	Steelville Fire Protection District	Debris	0.5
4/19/2014	Crawford	Cuba Fire Department	Debris	6
4/19/2014	Crawford	Steelville Fire Protection District	Debris	5
4/20/2014	Crawford	Sullivan Fire Protection District	Debris	2
4/24/2014	Crawford	Steelville Fire Protection District	Unknown	22
4/24/2014	Crawford	Cuba Fire Department	Unknown	20
4/24/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Miscellaneous	30
5/4/2014	Crawford	Cuba Fire Department	Smoking	0.25
5/4/2014	Crawford	Cuba Fire Department	Smoking	0.25
5/28/2014	Crawford	Steelville Fire Protection District	Debris	6
7/3/2014	Crawford	Cuba Fire Department	Unknown	6
7/28/2014	Crawford	Steelville Fire Protection District	Debris	0.5
7/31/2014	Crawford	Steelville Fire Protection District	Unknown	1
8/1/2014	Crawford	Steelville Fire Protection District	Debris	1
9/6/2014	Crawford	Cuba Fire Department	Unknown	0.25
9/12/2014	Crawford	Cuba Fire Department	Debris	0.25
9/26/2014	Crawford	Steelville Fire Protection District	Debris	2
10/5/2014	Crawford	Steelville Fire Protection District	Debris	2
10/28/2014	Crawford	Cuba Fire Department	Debris	5
10/29/2014	Crawford	Steelville Fire Protection District	Unknown	2
11/10/2014	Crawford	Steelville Fire Protection District	Unknown	223
11/10/2014	Crawford	Steelville Fire Protection District	Unknown	25

11/10/2014	Crawford	MDC REPORTING REGION - ST. LOUIS		200
11/13/2014	Crawford	MDC REPORTING REGION - ST. LOUIS	Arson	87
12/26/2014	Crawford	Cuba Fire Department	Debris	1
12/26/2014	Crawford	Cuba Fire Department	Miscellaneous	1
12/26/2014	Crawford	Steelville Fire Protection District	Unknown	1
1/7/2015	Crawford	Bourbon Fire Protection District	Debris	0.25
1/7/2015	Crawford	Bourbon Fire Protection District	Debris	0.25
1/8/2015	Crawford	Bourbon Fire Protection District	Unknown	0.25
1/18/2015	Crawford	Sullivan Fire Protection District	Miscellaneous	1
1/18/2015	Crawford	Sullivan Fire Protection District	Miscellaneous	2
1/19/2015	Crawford	Steelville Fire Protection District	Unknown	3
1/19/2015	Crawford	Cuba Fire Department	Equipment	10
2/4/2015	Crawford	Steelville Fire Protection District	Unknown	2
2/7/2015	Crawford	Steelville Fire Protection District	Debris	5
2/7/2015	Crawford	Cuba Fire Department	Debris	5
2/10/2015	Crawford	Steelville Fire Protection District	Unknown	1
2/13/2015	Crawford	Steelville Fire Protection District	Debris	2
2/15/2015	Crawford	Bourbon Fire Protection District	Unknown	1
2/15/2015	Crawford	Sullivan Fire Protection District	Debris	0.1
3/7/2015	Crawford	Cuba Fire Department	Debris	5
3/8/2015	Crawford	Bourbon Fire Protection District	Not Reported	10
3/9/2015	Crawford	Cuba Fire Department	Debris	10
3/9/2015	Crawford	Steelville Fire Protection District	Unknown	75
3/12/2015	Crawford	Bourbon Fire Protection District	Debris	1
3/12/2015	Crawford	Steelville Fire Protection District	Debris	1
3/15/2015	Crawford	Bourbon Fire Protection District	Debris	1
3/15/2015	Crawford	Bourbon Fire Protection District	Miscellaneous	56
3/15/2015	Crawford	Steelville Fire Protection District	Unknown	3
3/21/2015	Crawford	Cuba Fire Department	Debris	25
3/21/2015	Crawford	Steelville Fire Protection District	Debris	3
3/21/2015	Crawford	Bourbon Fire Protection District	Debris	62
3/22/2015	Crawford	Cuba Fire Department	Debris	1
3/22/2015	Crawford	Cuba Fire Department	Debris	2
3/22/2015	Crawford	Bourbon Fire Protection District	Miscellaneous	5
3/23/2015	Crawford	Cuba Fire Department	Unknown	1
3/31/2015	Crawford	Cuba Fire Department	Unknown	10
3/31/2015	Crawford	Cuba Fire Department	Unknown	1
3/31/2015	Crawford	Steelville Fire Protection District	Unknown	60
3/31/2015	Crawford	Steelville Fire Protection District	Debris	5
3/31/2015	Crawford	Steelville Fire Protection District	Unknown	2



3/31/2015	Crawford	Steelville Fire Protection District	Debris	20
4/1/2015	Crawford	Bourbon Fire Protection District	Miscellaneous	0.75
4/1/2015	Crawford	Cuba Fire Department	Debris	1
4/4/2015	Crawford	Bourbon Fire Protection District	Debris	1
4/12/2015	Crawford	Steelville Fire Protection District	Unknown	2
4/12/2015	Crawford	Steelville Fire Protection District	Equipment	0.25
4/18/2015	Crawford	Steelville Fire Protection District	Debris	3
4/28/2015	Crawford	Steelville Fire Protection District	Unknown	0.5
4/30/2015	Crawford	Steelville Fire Protection District	Debris	0.25
5/2/2015	Crawford	Steelville Fire Protection District	Debris	2
5/3/2015	Crawford	Steelville Fire Protection District	Unknown	2
5/25/2015	Crawford	Cuba Fire Department	Debris	1
5/29/2015	Crawford	Steelville Fire Protection District	Unknown	0.25
6/25/2015	Crawford	Cuba Fire Department	Debris	1
9/5/2015	Crawford	Steelville Fire Protection District	Debris	0.5
9/23/2015	Crawford	Sullivan Fire Protection District	Debris	0.75
9/27/2015	Crawford	Bourbon Fire Protection District	Debris	0.25
10/1/2015	Crawford	Cuba Fire Department	Equipment	1
10/11/2015	Crawford	Bourbon Fire Protection District	Children	2
10/11/2015	Crawford	Steelville Fire Protection District	Debris	2
10/13/2015	Crawford	Bourbon Fire Protection District	Debris	1.25
10/15/2015	Crawford	Cuba Fire Department	Unknown	1
10/15/2015	Crawford	Cuba Fire Department	Debris	1
10/16/2015	Crawford	Cuba Fire Department	Unknown	1
10/16/2015	Crawford	Steelville Fire Protection District	Equipment	1
10/18/2015	Crawford	Steelville Fire Protection District	Debris	10
10/18/2015	Crawford	Cuba Fire Department	Debris	1
10/19/2015	Crawford	Steelville Fire Protection District	Debris	10
10/19/2015	Crawford	Steelville Fire Protection District	Unknown	3
10/20/2015	Crawford	Steelville Fire Protection District	Unknown	3
10/20/2015	Crawford	Cuba Fire Department	Debris	1
10/20/2015	Crawford	Cuba Fire Department	Debris	1
10/25/2015	Crawford	Bourbon Fire Protection District	Debris	1
11/4/2015	Crawford	Steelville Fire Protection District	Unknown	0.75
11/4/2015	Crawford	Sullivan Fire Protection District	Debris	4
11/6/2015	Crawford	Bourbon Fire Protection District	Debris	0.1
11/7/2015	Crawford	Bourbon Fire Protection District	Debris	0.5
11/9/2015	Crawford	Steelville Fire Protection District	Debris	6
11/13/2015	Crawford	Steelville Fire Protection District	Debris	4
11/14/2015	Crawford	Bourbon Fire Protection District	Debris	0.1

11/15/2015	Crawford	Steelville Fire Protection District	Unknown	2
11/19/2015	Crawford	Bourbon Fire Protection District	Debris	0.5
11/26/2015	Crawford	Steelville Fire Protection District	Unknown	0.25
12/8/2015	Crawford	Steelville Fire Protection District	Unknown	5
1/31/2016	Crawford	Bourbon Fire Protection District	Debris	15
2/6/2016	Crawford	Cuba Fire Department	Unknown	5
2/7/2016	Crawford	Steelville Fire Protection District	Debris	5
2/18/2016	Crawford	Steelville Fire Protection District	Debris	2
2/18/2016	Crawford	Steelville Fire Protection District	Debris	3
2/19/2016	Crawford	Steelville Fire Protection District	Debris	1
2/20/2016	Crawford	Cuba Fire Department	Debris	1.5
2/20/2016	Crawford	Steelville Fire Protection District	Unknown	1
2/26/2016	Crawford	Bourbon Fire Protection District	Debris	5
2/28/2016	Crawford	Cuba Fire Department	Debris	1
2/28/2016	Crawford	Bourbon Fire Protection District	Debris	4.5
2/29/2016	Crawford	Steelville Fire Protection District	Unknown	5
2/29/2016	Crawford	Cuba Fire Department	Unknown	0.5
3/2/2016	Crawford	Steelville Fire Protection District	Debris	15
3/5/2016	Crawford	Steelville Fire Protection District	Debris	0.25
3/5/2016	Crawford	Steelville Fire Protection District	Unknown	2
3/5/2016	Crawford	Steelville Fire Protection District	Unknown	0.2
3/6/2016	Crawford	Cuba Fire Department	Unknown	1
3/6/2016	Crawford	Steelville Fire Protection District	Unknown	130
3/6/2016	Crawford	MDC REPORTING REGION - ST. LOUIS	Debris	130
3/15/2016	Crawford	Steelville Fire Protection District	Unknown	6
3/17/2016	Crawford	Steelville Fire Protection District	Unknown	3
3/17/2016	Crawford	Steelville Fire Protection District	Unknown	1
3/22/2016	Crawford	Steelville Fire Protection District	Equipment	5
3/26/2016	Crawford	Cuba Fire Department	Debris	1.5
3/28/2016	Crawford	Cuba Fire Department	Debris	0.5
3/29/2016	Crawford	Steelville Fire Protection District	Debris	5
4/3/2016	Crawford	Steelville Fire Protection District	Unknown	10
4/4/2016	Crawford	Steelville Fire Protection District	Unknown	650
4/4/2016	Crawford	Steelville Fire Protection District	Equipment	5
4/4/2016	Crawford	Hillsboro Fire Protection District	Unknown	900
4/4/2016	Crawford	Bourbon Fire Protection District	Unknown	658
4/5/2016	Crawford	Cuba Fire Department	Unknown	0.25
4/8/2016	Crawford	Cuba Fire Department	Unknown	0.1
4/9/2016	Crawford	Bourbon Fire Protection District	Debris	2
4/13/2016	Crawford	Bourbon Fire Protection District	Debris	0.5

4/16/2016	Crawford	Steelville Fire Protection District	Debris	15
4/17/2016	Crawford	Cuba Fire Department	Unknown	1
5/26/2016	Crawford	Bourbon Fire Protection District	Lightning	0.1
6/20/2016	Crawford	Cuba Fire Department	Equipment	1
6/21/2016	Crawford	Cuba Fire Department	Unknown	0.1
6/22/2016	Crawford	Cuba Fire Department	Debris	1
6/23/2016	Crawford	Cuba Fire Department	Unknown	1
7/29/2016	Crawford	Cuba Fire Department	Debris	1
8/10/2016	Crawford	Sullivan Fire Protection District	Unknown	0.01
9/6/2016	Crawford	Bourbon Fire Protection District	Unknown	0.1
9/12/2016	Crawford	Cuba Fire Department	Equipment	1
10/7/2016	Crawford	Cuba Fire Department	Unknown	0.25
10/28/2016	Crawford	Bourbon Fire Protection District	Equipment	0.1
11/2/2016	Crawford	Cuba Fire Department	Unknown	0.5
11/11/2016	Crawford	Cuba Fire Department	Unknown	0.1
11/13/2016	Crawford	Cuba Fire Department	Campfire	0.25
11/17/2016	Crawford	Cuba Fire Department	Unknown	3
11/17/2016	Crawford	Bourbon Fire Protection District	Debris	1
11/22/2016	Crawford	Cuba Fire Department	Equipment	0.5
11/23/2016	Crawford	Bourbon Fire Protection District	Unknown	0.1
11/30/2016	Crawford	Bourbon Fire Protection District	Debris	0.1
12/29/2016	Crawford	Bourbon Fire Protection District	Unknown	1.5
12/30/2016	Crawford	Cuba Fire Department	Miscellaneous	1
12/30/2016	Crawford	Cuba Fire Department	Miscellaneous	3
12/30/2016	Crawford	Cuba Fire Department	Miscellaneous	2
1/1/2017	Crawford	Cuba Fire Department	Unknown	0.2
1/10/2017	Crawford	Cuba Fire Department	Debris	2
1/11/2017	Crawford	Steelville Fire Protection District	Campfire	47
1/11/2017	Crawford	MDC REPORTING REGION - ST. LOUIS	Campfire	47
1/11/2017	Crawford	Cuba Fire Department	Unknown	50
1/11/2017	Crawford	Cuba Fire Department	Miscellaneous	1
1/24/2017	Crawford	Bourbon Fire Protection District	Unknown	1
2/1/2017	Crawford	Cuba Fire Department	Debris	1
2/1/2017	Crawford	Sullivan Fire Protection District	Debris	0.5
2/3/2017	Crawford	Cuba Fire Department	Debris	15
2/3/2017	Crawford	Cuba Fire Department	Smoking	1
2/5/2017	Crawford	Bourbon Fire Protection District	Unknown	0.5
2/7/2017	Crawford	Bourbon Fire Protection District	Unknown	1
2/10/2017	Crawford	Cuba Fire Department	Unknown	20
2/11/2017	Crawford	Cuba Fire Department	Debris	3

2/16/2017	Crawford	Cuba Fire Department	Debris	1
2/16/2017	Crawford	Gerald-Rosebud Fire Prot. Dist.	Unknown	30
2/19/2017	Crawford	Cuba Fire Department	Equipment	0.75
2/19/2017	Crawford	Cuba Fire Department	Unknown	1
2/22/2017	Crawford	Bourbon Fire Protection District	Debris	0.5
2/23/2017	Crawford	Cuba Fire Department	Equipment	1
2/26/2017	Crawford	Bourbon Fire Protection District	Unknown	4
2/26/2017	Crawford	Bourbon Fire Protection District	Debris	1
3/4/2017	Crawford	Cuba Fire Department	Debris	1
3/4/2017	Crawford	Cuba Fire Department	Debris	0.2
3/16/2017	Crawford	Sullivan Fire Protection District	Debris	0.1
3/18/2017	Crawford	Bourbon Fire Protection District	Unknown	0.5
3/20/2017	Crawford	Bourbon Fire Protection District	Children	2
4/7/2017	Crawford	Bourbon Fire Protection District	Unknown	1
8/13/2017	Crawford	Sullivan Fire Protection District	Debris	0.5
9/24/2017	Crawford	Sullivan Fire Protection District	Debris	0.25
9/24/2017	Crawford	Sullivan Fire Protection District	Debris	0.25
12/3/2017	Crawford	Sullivan Fire Protection District	Debris	2
12/19/2017	Crawford	Sullivan Fire Protection District	Debris	0.25
12/21/2017	Crawford	Sullivan Fire Protection District	Debris	0.25