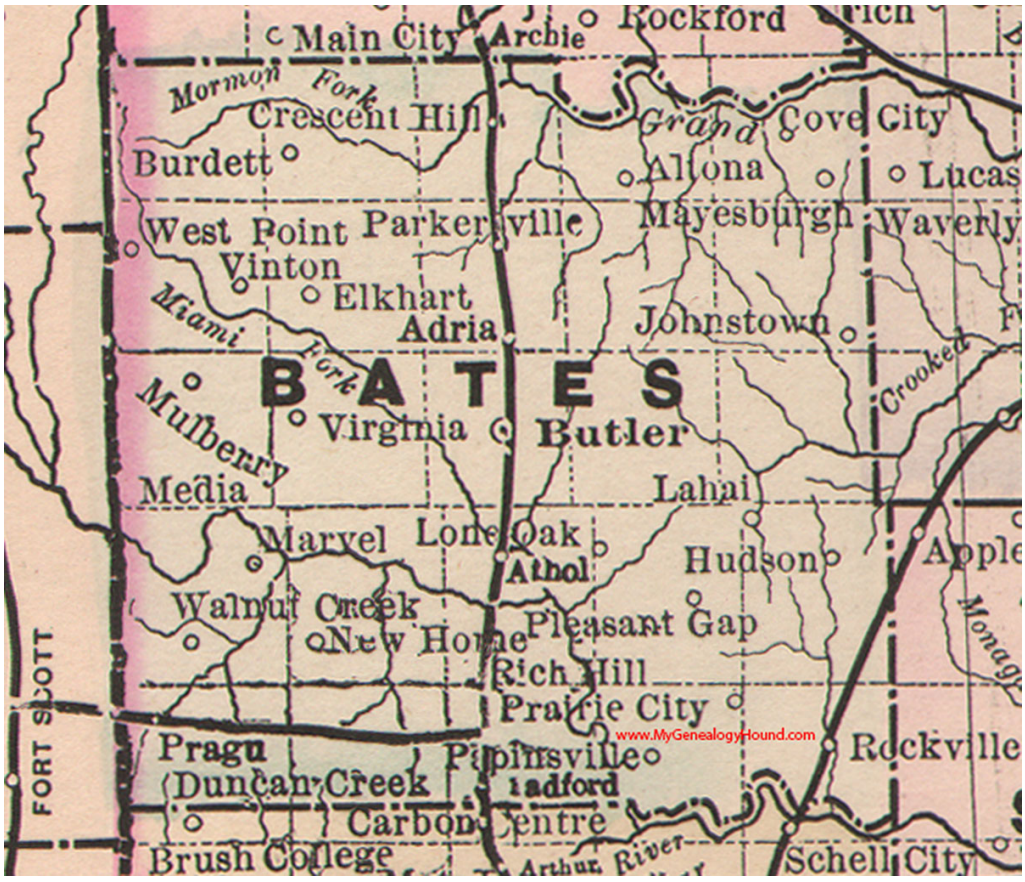

2020 Bates County Natural Hazard Mitigation Plan

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Bates County Hazard Mitigation Planning Committee

Jurisdictional Representatives

Name	Title	Department	Jurisdiction
Jim Wheatley	Presiding Commissioner	County Commission	Bates County
Larry Hacker	Southern Commissioner	County Commission	Bates County
Alvin Griffin	Northern Commissioner	County Commission	Bates County
Abe Lewis	Principal	Adrian School District	Adrian R-3
Amber Brownsberger	PTO President	Hudson School District	Hudson R-9
Amie Branson	PTO Secretary	Hudson School District	Hudson R-9
Brian Gillis	Principal	Rich Hill School District	Rich Hill R-4
Brittany Shernker	City Clerk	City Office	City of Rich Hill
Casey Crews	City Clerk	City Office	City of Rich Hill
Casey Koehn	City Administrator	City Office	City of Butler
Daniel Johnson	Superintendent	Miami School District	Miami R-1
Darin Carter	Superintendent	Butler School District	Butler R-5
David Hug	Teacher	Miami School District	Miami R-1
Don Lile	Superintendent	Adrian School District	Adrian R-3
Dustin Miller	Fire Chief	Rich Hill Fire Department	City of Rich Hill
Heath Oates	Superintendent	Rich Hill School District	Rich Hill R-4
John Siebeneck	Superintendent	Ballard School	Ballard R-2
Ladonna Green	Superintendent Secretary	Hudson School	Hudson R-9
Mike Brown	Fire Fighter	Miami School	Miami R-1
Rosie Cutshaw	City Clerk	City Office	City of Amsterdam
Scott Morrison	Superintendent	Hume School District	Hume R-8

Stakeholder Representatives

Name	Title	Department	Agency/Organization
Brenda Cecil	Deputy Director	Emergency Management	Bates Co. EMA
Brian Bearce	Emergency Coordinator	Emergency Management	City of Adrian
Cooleen Hall	EO Officer	Program Compliance	West Central Workforce
Crystal Yoakum	Business Services	Customer Outreach	Polyurethane Foam Assn.
Danny Roeger	Engineer	MoDOT	Bates County
David Johnson	Chief of Police	Rich Hill Fire Dept.	City of Rich Hill
Dennis Jacobs	Emergency Coordinator	Bates Co. EMA	Bates County
James Roberts	Fire Department Chairman	Rockville Fire Department	City of Rockville
Jana Rosier	Dir. Member Services	Member Services	Osage Valley Electric
Jason Bennett	Emergency Mgmt. Director	Emergency Management	City of Butler
Jason Wix	Deputy Emer. Management	Emergency Management	City of Butler
Jeff Deor	Business Owner	Customer Outreach	Roof Power Solar
Jennifer Hall	Community Organizer	City Office	City of Rich Hill
Jim Henry	Haz-Mat Coordinator	Emergency Management	Bates County
Kay Caskey	Business Services Rep.	Customer Outreach	Freedom Frontier Main St.
Keith Chappelton	Asst. Fire Chief	Fire Department	City of Amsterdam
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Melanie Schnebelen	Business Owner/Masseuse	Customer Service	City of Rich Hill
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Peggy Buhr	Director	Bates County Museum	Bates County

Ronald Nissen	Advisor	Emergency Management	Bates County
Shawn Dodd	Account Manager	Customer Outreach	SMC Electric
Tammy Morgan	Business Owner	Pest Control	City of Butler
Tonya Williams	Main Street President	ECD Butler	City of Butler

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EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Bates County, City of Amsterdam, City of Butler, City of Rich Hill, Adrian R-III, Ballard R-II, Butler R-V, Hudson R-9, Hume R-VIII, Miami R-I, and Rich Hill R-IV School Districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses from hazard events to Bates County and its communities and school districts. The plan is an update of a plan that was approved in November of 2013. The plan and the update were prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 to result in eligibility for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant Programs.

The County Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the following 11 jurisdictions that participated in the planning process:

- Bates County
- City of Amsterdam
- City of Butler
- City of Rich Hill
- Adrian R-III Schools
- Ballard R-II Schools
- Butler R-V Schools
- Hudson R-9 Schools
- Hume R-VIII Schools
- Miami R-I Schools
- Rich Hill R-IV Schools

The City of Adrian, Amoret, Village of Foster, Hume, Merwin, Passaic, the Village of Rockville, Archie R-V, Appleton City R-II, and Drexel R-IV Schools were all invited but did not participate fully in the planning process.

Bates County and the entities listed above developed a Multi-Jurisdictional Hazard Mitigation Plan that was approved by FEMA in November of 2013, (hereafter referred to as the *2013 Hazard Mitigation Plan*). This current planning effort serves to update that previously approved plan.

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

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

1. Protect the lives and livelihoods of all citizens.

2. Mitigate the effects of future natural hazards in the County.
3. Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.
4. Develop written policies and procedures for preparedness and mitigation response to natural disasters.

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

PREREQUISITES

This plan has been reviewed by and adopted with resolutions or other documentation of adoption by all participating jurisdictions and school districts. The documentation of each adoption is included in Appendix D, and a model resolution is included on the following page.

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

- Bates County
- City of Amsterdam
- City of Butler
- City of Rich Hill
- Adrian R-III Schools
- Ballard R-II Schools
- Butler R-V Schools
- Hudson R-9 Schools
- Hume R-VIII Schools
- Miami R-I Schools
- Rich Hill R-IV Schools

Model Resolution

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

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

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

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

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

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

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

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

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

ADOPTED by a vote of____in favor and____against, and_____abstaining, this____day of _____,_____.

By (Sig): _____
Print name: _____

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

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

1 INTRODUCTION AND PLANNING PROCESS

1 INTRODUCTION AND PLANNING PROCESS 1.1
1.1 Purpose 1.1
1.2 Background and Scope 1.1
1.3 Plan Organization 1.3
1.4 Planning Process 1.4
1.4.1 Multi-JurisdictionalParticipation 1.6
1.4.2 The Planning Steps 1.7

1.1 PURPOSE

Hazard Mitigation is the process of preparing for and taking action in order to reduce the long-term risk of natural disasters to financial and human consequences. Mitigation actions may be implemented prior to, during, or after a hazard event. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs (http://www.fema.gov/what-mitigation).

The Bates County Hazard Mitigation Plan is designed as a resource for the County and municipal governments, residents, developers, organizations and others interested in controlling the potentially disastrous effects of natural hazards in Bates County. Jurisdictions are encouraged to be a part of the planning process. By participating in the planning process and meeting the necessary requirements to be a participating jurisdiction, communities and school districts become eligible to apply for mitigation grant funding. Jurisdictions that do not adopt the plan will not be eligible for pre-disaster mitigation funds, non-participating jurisdictions are also not eligible applicants for HMGP and HMGP-post Fire which are post-disaster mitigation funds, as well as the newly released High Hazard Potential Dam Rehabilitation grant program (HHPD), and the soon to be released Building Resilient Infrastructure and Communities (BRIC) grant program (when available). Participation in the hazard mitigation plan is required as stated in The Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the *Federal Register* on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act or DMA). The regulations established the requirements for local hazard mitigation plans are in the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288).

1.2 BACKGROUND AND SCOPE

Under the initiative set forth by SEMA, the Missouri Association of Councils of Government (MACOG) agreed to meet the challenge of developing county and municipal plans throughout the state. The 19 Regional Planning Commissions of MACOG provide an effective way for local governments to work together to share technical staff and address common problems in need of an area-wide approach. They also can effectively deliver programs that might be beyond the resources of an individual county or municipal government.

The intent of the Regional Planning Commissions in Missouri is to be of service to their member counties and municipalities and to being an organized approach to address a broad cross section of area-wide issues. They are also available to assist their member entities in coordinating the needs of the area with state and federal agencies or with private companies or other public bodies. SEMA's initiative further states that, due to time and funding limitations, the plans developed by Missouri's Regional Planning Commissions should cover natural hazards only. Man-made and/or technological hazards are not addressed in this plan, except in the context of cascading damages.

As required by 44 CFR §201.6(d)(3), a local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts and changes in priorities, and resubmit it for approval every five (5) years in order to continue to be eligible for mitigation project grant funding. The 2019 Bates County Multi-Jurisdictional Natural Hazard Mitigation Plan, from here on referred to as the Bates County Hazard Mitigation Plan, is a revision of the previous five year updated adopted in November 2013, which was the first five-year update of the original plan completed in 2005.

Through SEMA's Scope of Work, Bates County contracted with Kaysinger Basin Regional Planning Commission and participated fully in the preparation of the plan. Once this plan is approved, Bates County and cities within the county and school districts will be eligible for future mitigation assistance from FEMA and will be able to more effectively carry out mitigation activities to lessen the adverse impact of future disasters within the county.

The Bates County Hazard Mitigation Plan was prepared by Kaysinger Basin Regional Planning Commission (KBRPC). KBRPC, a member of MACOG, was created October 14, 1968 by Governor Warren E Hearnes. The Commission serves a seven county region consisting of Bates, Cedar, Henry, Hickory, St. Clair and Vernon Counties.

The Bates County Hazard Mitigation Plan is a major rewrite of the 2013 plan and reflects changes in priorities and development, and the continued commitment of local governments to mitigate the impact of natural hazards in Bates County. Below shows plan participation past and present.

2005	**2013**	**2019**
Bates County	Bates County	Bates County
City of Adrian	City of Adrian	City of Amsterdam
City of Amoret	City of Amoret	City of Butler
City of Amsterdam	City of Amsterdam	City of Rich Hill
City of Butler	City of Butler	Adrian R-III Schools
Village of Foster	Village of Foster	Ballard R-II Schools
City of Hume	City of Hume	Butler R-V Schools
Village of Merwin	Village of Merwin	Hudson R-9 Schools
Village of Passaic	Village of Passaic	Hume R-VIII Schools
City of Rich Hill	City of Rich Hill	Miami R-I Schools
City of Rockville	City of Rockville	Rich Hill R-IV Schools

All Jurisdictions received a letter, phone calls, and email communications notifying the representatives of all upcoming meetings and participation requirements.

The Bates County Hazard Mitigation Plan is the representation of the Jurisdictions' commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Information in the Plan will be used to help

guide and coordinate mitigation activities and decisions for local land use policy in the future.

1.3 PLAN ORGANIZATION

The Bates County Hazard Mitigation Plan is organized into five chapters. The 2013 Plan classified the Chapters as Sections and the plan also included a Section 6 that was dedicated to Maps. This has been changed to Chapters and the information from Section 6 has been incorporated into the 2019 Plan through-out its entirety. The format of this plan was changed to conform to the local hazard mitigation plan outline template that was released by the Missouri State Emergency Management Agency (SEMA) in September of 2016. The Plan Chapters include:

- 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

Table 1.1. Changes Made in Plan Update

Plan Chapter	Summary of Changes Made
Introduction	• General format changes • Was reworded, rearranged and had more detailed information per section.
Section 1- Introduction and Planning Process	• Changed to Chapter 1 • General format changes • Was reworded, rearranged and had more detailed information per section.
Section 2- Planning Area Profile and Capabilities	• Changed to Chapter 2 • General format changes
Section 3 – Risk Assessment	• Changed to Chapter 3 • General format changes
Section 4- Mitigation Strategies	• Changed to Chapter 4 • General format changes
Section 5- Plan Maintenance Process	• Changed to Chapter 5 • General format changes
Section 6- Maps	• This section was removed and the Maps were implemented into the plan throughout its entirety.

1.4 PLANNING PROCESS

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

Kaysinger Basin Regional Planning Commission was contracted to facilitate the plan development process. KBRPC staff, met with the Jurisdictions in Bates County to develop the area stakeholders and representatives for each jurisdiction to establish the Mitigation Planning Committee (MPC). Meeting locations and schedules were also discussed, and the most effective way to inform and include the public was determined.

The planning process included the kick-off meeting, one subsequent MPC meeting and one on one meetings with each Jurisdiction. KBRPC was responsible for producing the draft and final plan update in a FEMA approvable document, and coordinating with SEMA and FEMA plan reviews.

Specific information about the agenda items discussed during the MPC meetings are presented in Section 1.4.2 regarding the planning steps. KBPRC also assisted in soliciting public involvement in the planning process, partially by providing information about the plan through informational handouts and by presenting at public meetings to all Jurisdictions interested. Notification of the MPC meetings on March 26, 2019 and April 23, 2019, were sent via public notice to the Butler News Newspaper, The Xchanger Newspaper, KMAM Radio-921 News, and Sac Osage News. Most jurisdictions within Bates County presented and discussed at City Council Meetings and Board of Education Meetings during the planning process. Along with the public notice all jurisdictions were also sent a copy of the Agenda for each meeting to be posted for the public viewing prior to the MPC meeting(s). The public notice and agenda were posted on Kaysinger Basin Regional Planning Commission's office door for public viewing. Drafts of the Bates County Hazard Mitigation Plan were posted on the KBPRC website for public comment during the drafting of the Plan and prior to the Plan being submitted for approval. Appendix A provides documentation of the planning process including public involvement solicitations and meeting notices along with the sign-in sheet for each meeting that took place.

Table 1.2 shows the MPC members and the entities they represent, along with their titles. This table includes representatives from local jurisdictions, stakeholders and school districts

Table 1.2 Jurisdictional Representatives Bates County Mitigation Planning Committee

Jurisdictional Representatives

Name	Title	Department	Jurisdiction
Jim Wheatley	Presiding Commissioner	County Commission	Bates County
Larry Hacker	Southern Commissioner	County Commission	Bates County
Alvin Griffin	Northern Commissioner	County Commission	Bates County
Abe Lewis	Principal	Adrian School District	Adrian R-3
Amber Brownsberger	PTO President	Hudson School District	Hudson R-9
Amie Branson	PTO Secretary	Hudson School District	Hudson R-9
Brian Gillis	Principal	Rich Hill School District	Rich Hill R-4
Brittany Shernker	City Clerk	City Office	City of Rich Hill
Casey Crews	City Clerk	City Office	City of Rich Hill
Casey Koehn	City Administrator	City Office	City of Butler
Daniel Johnson	Superintendent	Miami School District	Miami R-1
Darin Carter	Superintendent	Butler School District	Butler R-5
David Hug	Teacher	Miami School District	Miami R-1
Don Lile	Superintendent	Adrian School District	Adrian R-3
Dustin Miller	Fire Chief	Rich Hill Fire Department	City of Rich Hill
Heath Oates	Superintendent	Rich Hill School District	Rich Hill R-4
John Siebeneck	Superintendent	Ballard School	Ballard R-2
Ladonna Green	Superintendent Secretary	Hudson School	Hudson R-9
Mike Brown	Fire Fighter	Miami School	Miami R-1
Rosie Cutshaw	City Clerk	City Office	City of Amsterdam
Scott Morrison	Superintendent	Hume School District	Hume R-8

Stakeholder Representatives

Name	Title	Department	Agency/Organization
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Brian Bearce	Emergency Coordinator	Emergency Management	City of Adrian
Cooleen Hall	EO Officer	Program Compliance	West Central Workforce
Crystal Yoakum	Business Services	Customer Outreach	Polyurethane Foam Assn.
Danny Roeger	Engineer	MoDOT	Bates County
David Johnson	Chief of Police	Rich Hill Fire Dept.	City of Rich Hill
Dennis Jacobs	Emergency Coordinator	Bates Co. EMA	Bates County
James Roberts	Fire Department Chairman	Rockville Fire Department	City of Rockville
Jana Rosier	Dir. Member Services	Member Services	Osage Valley Electric
Jason Bennett	Emergency Mgmt. Director	Emergency Management	City of Butler
Jason Wix	Deputy Emer. Management	Emergency Management	City of Butler
Jeff Deor	Business Owner	Customer Outreach	Roof Power Solar
Jennifer Hall	Community Organizer	City Office	City of Rich Hill
Jim Henry	Haz-Mat Coordinator	Emergency Management	Bates County
Kay Caskey	Business Services Rep.	Customer Outreach	Freedom Frontier Main St.
Keith Chappelton	Asst. Fire Chief	Fire Department	City of Amsterdam
Kristy Franklin	Administrator	Serenity of Butler	City of Butler
Melanie Schnebelen	Business Owner/Masseuse	Customer Service	City of Rich Hill
Melissa Philips	Business Owner	Poplar Heights LHF	City of Butler
Pam Martin	Director	Sheltered Workshop	City of Butler
Peggy Buhr	Director	Bates County Museum	Bates County
Ronald Nissen	Advisor	Emergency Management	Bates County

Shawn Dodd	Account Manager	Customer Outreach	SMC Electric
Tammy Morgan	Business Owner	Pest Control	City of Butler
Tonya Williams	Main Street President	ECD Butler	City of Butler

1.4.1 Multi-Jurisdictional Participation

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

The Bates County Hazard Mitigation Plan serves as a written document of the planning process. Active participation of local jurisdiction representatives and stakeholders in the Hazard Mitigation planning process is essential for the plan to have value. The Bates County Hazard Mitigation Plan was written to be a working document to guide participating jurisdictions in the county in the work of mitigating potential hazards. To be eligible for mitigation funding, local governments must adopt the FEMA approved update of the plan. Participation from each jurisdiction is considered to be a crucial piece in making a successful implementation of this plan. Each jurisdiction must have its governing body adopt the updated plan. If significant modifications are warranted, a re-adoption will be requested. KBRPC collaborated with the local jurisdictions in Bates County to ensure participation in the planning process and to develop a plan that represents the needs and interests of Bates County and all jurisdictions located within the county.

County Commissioners, Cities, Villages and Public School Districts along with various Stakeholders in mitigation planning were invited to a Kick-off Meeting for the Plan update on March 26, 2019. At this meeting it was explained that the Disaster Mitigation Act (DMA) requires that each participating jurisdiction formally adopt the plan. Each jurisdiction was required to meet plan participation requirements as defined by KBPRC at the beginning of the planning process. Minimum participation requirements are as follows:

1. Provide information to support plan update through the following methods:

    a. Completion of worksheets;
    b. Attendance at public meetings;
    c. Executed letters of authorization
    d. Alternately scheduled meetings with KBRPC staff for data collection; or
    e. Communicate with KBRPC staff through email concerning data collection.

2. Formal adoption of the mitigation plan update.

All of the jurisdictions listed as participants in the plan update met the minimum participation requirements as indicated in the table below. Documentation in the form of people contacted, sign-in sheets for attendance at group meetings as well as time sheets for meetings with KBRPC staff is included in the Appendix A.

Table 1.3 shows the representation of each participating jurisdiction during the planning process.

Table 1.3 Jurisdictional Participation in Planning Process

Jurisdiction	Kickoff Meeting	Meeting #2	Data Collection Questionnaire Response	Formal Plan Adoption	Meetings with KBRPC	Documented Donated Time
Bates County	X	X	X	X	X	X
City Of Adrian					X	
City of Amoret						
City of Amsterdam	X	X	X	X	X	X
City of Butler	X	X	X	X	X	X
Village of Foster						
City of Hume						
Village of Merwin						
Village of Passaic						
City of Rich Hill	X		X	X	X	X
City of Rockville						
Adrian R-III School	X	X	X	X	X	X
Ballard R-2 School		X	X	X	X	X
Butler R-V School	X		X	X	X	X
Hudson R-9 School		X	X	X	X	X
Hume R-VIII School	X	X	X	X	X	X
Miami R-1 School	X	X	X	X	X	X
Rich Hill R-IV School	X	X	X	X	X	X

1.4.2 The Planning Steps

FEMA's Local Mitigation Planning Handbook (March 1, 2013), Local Mitigation Plan Review Guide (October 1, 2011), and Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013) were used as the sources for developing the Bates County Hazard Mitigation Plan update process. The development of this plan followed the 10-step planning process adapted from FEMA's Community Rating System (CRS) and Flood

Mitigation Assistance programs. The 10-step process allows the Bates County Hazard Mitigation Plan to meet funding requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System, and Flood Mitigation Assistance Program. Table 1.4 shows how the CRS process aligns with the Nine Task Process outlined in the 2013 Local Mitigation Planning Handbook. Following Table 1.4 is a summary of how KBRPC staff used the Nine Task Process to develop the update for the Bates County Hazard Mitigation Plan.

Table 1.4. County Mitigation Plan Update Process

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

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

In May 2017, KBRPC entered into cooperative agreements with SEMA and Bates County to prepare this Multi-Jurisdictional Hazard Mitigation Plan for public entities in Bates County. Discussions on the development of the Bates County Hazard Mitigation Plan began in February of 2017 with the Bates County Commissioners. During this time the timeline for developing the hazard mitigation plan and the planning process were discussed. The Kick-off Meeting was scheduled for March 26, 2019 to initiate participation of jurisdictions and public entities in the planning process. The list of invitees included local elected officials, municipal government staff, county government staff, emergency services personnel and public school administrators. The list of Stakeholders was contacted and notified of the second meeting that took place on April 23,2019. Along with the list of Stakeholders, all representatives of each jurisdiction and the public were notified through a public notice sent via email to each representative, the Butler News Newspaper, The Xchanger Newspaper, KMAM Radio-921 News, and Sac Osage News. The public notice was also delivered to the Bates County Commissioners, all jurisdictions in Bates County and all Boards of Education in the county. A complete list of invitees is listed in Appendix A.

The MPC met on several occasions through public meetings and one on one meetings with KBRPC to collaborate on the development of the Bates County Hazard Mitigation

Plan update. Participants assisted in data collection, reviewed and revised the 2013 Plan's goals and mitigation strategies, reviewed and commented on the plan throughout the updating process. Communication with the MPC was constant throughout the planning process through phone conversations, letters, email correspondences, one on one meetings in addition to committee meetings. Table 1.5 shows the meeting schedule and items that were discussed for the MPC meetings.

Table 1.5. Schedule of MPC Meetings

Meeting	Topic	Date
Informational Meeting	Meeting with the Bates County Commissioners for MOU Signature and discussion of the plan update process.	
Plan Maintenance Meeting	Previous plan maintenance was discussed during the meeting with the Commissioners and a Maintenance Agreement was presented.	
Kick-off Meeting	• Hazard Mitigation planning purpose • Grant programs linked to approved plan • Planning tasks- Multi-Jurisdictional Approach • Future Meeting Dates were discussed and scheduled along with next steps in the planning process • Participation requirements • Public involvement • Data Collection Questionnaires were given to all in attendance • Discussion of hazards and critical facility inventory	**03/26/2019**
Planning Meeting #2	• Presentation on the work plan was given and goals were reviewed • Packets containing the work plan, action worksheet and STAPLEE were given to all in attendance • Work Plan was reviewed and updated • Future Plan monitoring and evaluation was discussed and maintenance agreement was revisited. • Surveys were given to all in attendance • Document Collection for Completed Data Questionnaires • Public Comment Period was discussed • Resolutions were discussed for each jurisdiction • Next Meeting was discussed and KBRPC will meet one on one with each Jurisdiction as needed.	**04/23/2019**
Planning	• Plan update written and submitted to SEMA	**8/13/19**

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.

During the Kick-off meeting held March 26, 2019, the MPC discussed the options for soliciting public input on the Bates County Hazard Mitigation Plan. KBRPC staff explained the importance of public involvement during the planning process. It was determined that KBRPC would send out public notices that would be posted for public view to all jurisdictions involved in the Plan update. KBRPC also notified the county newspapers and radio stations, The Butler News Newspaper, The Xchanger Newspaper, KMAM Radio-921 News, and Sac Osage New to advertise each meeting through a press release. In addition, information about hazard mitigation, public surveys and meeting updates along with the PowerPoint presentations given at each of the public meetings were posted to the KBRPC website (www.kaysinger.com). Press Releases with were submitted to the Butler News Newspaper, The Xchanger Newspaper, KMAM Radio-921 News, and Sac Osage News, when the draft of the plan was posted for public comment prior to submission to SEMA for approval on August 13, 2019. Copies of the affidavits of publication for legal notices, screen captures and copies of the press releases are included in the Appendix A.

Other options for public solicitation were also discussed during the kick-off meeting. Public input would be sought by KBRPC and members of the MPC through announcements at gatherings and other public meetings such as City Council/Board of Alderman meetings, County Commission meetings, Board of Education meetings, and local emergency planning committee meetings.

KBRPC staff, attended City Council/Board of Aldermen meetings, County Commission Meetings, Local Emergency Planning Committee Meetings and other public gatherings to solicit public involvement. KBRPC also sent out emails to all jurisdictions and provided the power-point presentations to each school district to send out as a training to their staff. During all of these meetings informational handouts and the public survey were given with the opportunity for feedback. KBRPC also created a Survey through Survey Monkey and posted link on their website for the public survey to be taken.

KBRPC received thirty-five (35) public surveys during the planning period. Respondents were most concerned with severe thunderstorms, severe winter weather, tornados and extreme temperatures. Many respondents indicated that the highly likely and likely events included flooding, drought, extreme temperature, severe thunderstorms, severe winter weather and tornados. They also indicated that the most unlikely events would be levee failure, dam failure and earthquake.

When asked to comment on any other issues that the Bates County Hazard Mitigation Planning Committee should consider in developing a strategy to reduce future losses caused by hazard events, the following was mentioned:

1. Possible chemical spill in the event of a train crash.
2. Upgrading of critical infrastructure.
3. Funding sources to fill the gap due to the lack of revenue to do any major projects

Public input and comments have been integrated into the Risk Assessment chapter and have also contributed to the action items listed for each participating jurisdiction.

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.

As stated in Section 1.4 During the planning process, stakeholders were given the opportunity to be involved. Businesses, neighboring communities, non-profit organizations, academia, Chambers of Commerce, local and regional agencies, private organizations, fire departments and ambulance districts were notified via email and/or in person or through the public notice in the newspaper.

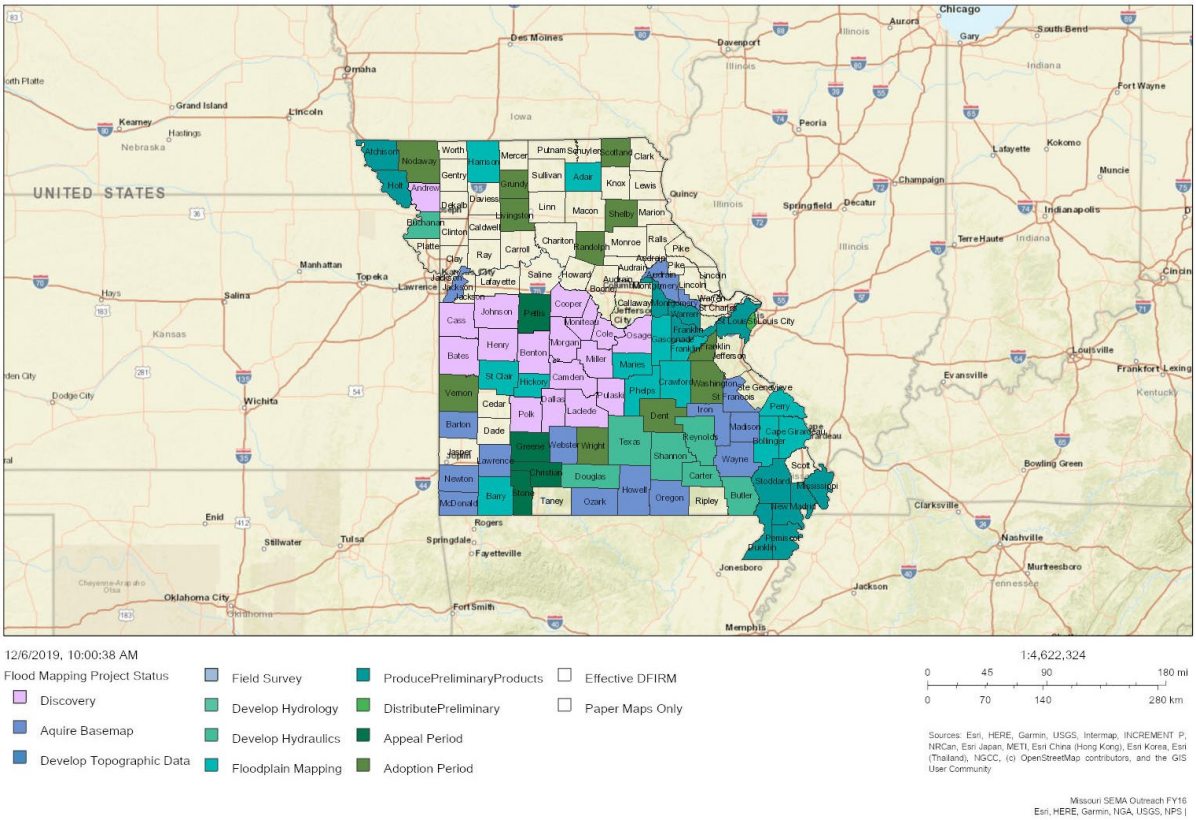
Stakeholders who were invited to participate in the Bates County Hazard Mitigation Plan can be found in the appendixes.

Each of the stakeholders listed previously received an email and or letter from KBRPC inviting them to attend the meetings with a public notice and agenda for the public meetings. Those that attended the meetings were given a public survey and asked for their input during the planning process.

Coordination with FEMA Risk MAP Project

Currently Bates County is in the Effective phase with the FEMA Risk MAP Project. FEMA has contracted for basic and enhanced analysis, DFRIM production and Risk MAP products.

Figure 1.1. Map of RiskMAP projects



Integration of Other Data, Reports, Studies, and Plans

A significant amount of information presented in the Bates County Hazard Mitigation Plan has been updated and revised based on the review and incorporation of existing plans, studies, reports and technical information. Additional input was solicited from other agencies and organizations that were not able to attend the public meetings by KBRPC reaching out to them via phone to schedule a one-on-one meeting or through phone conversations. A few examples of information that was incorporated from the review of existing plans include:

- 2016 Bates County Local Emergency Operations Plan
- Current Missouri State Hazard Mitigation Plan
- State Department of Natural Resources (DNR) dam information, the National Inventory of Dams (NID), dam inspection reports
- Missouri Department of Conservation (MDC) wildfire statistics
- Wildland/Urban Interface and Intermix areas from the SILVIS Lab- Department of Forest Ecology and Management – University of Wisconsin

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

During the second MPC meeting held on April 23,2019 profiles of identified hazards from the 2013 plan were presented. Storm event data from the National Centers for Environmental Information for the five-year period since the adoption of the 2013 Plan were included in the hazard profiles. The presentation incorporated data from studies, reports and technical information available through internet research. During the process of identifying

reviewed the following:

- Hazards listed in the 2013 Bates County Hazard Mitigation Plan
- Hazards listed in the current Missouri State Hazard Mitigation Plan
- Previous disaster declarations in Bates County

All attendees were asked to complete a public survey that would indicate their opinion on the likelihood for each hazard to impact their jurisdiction and the potential magnitude of each hazard's impact on their jurisdiction. Additional information about the conclusions drawn can be found in the Risk Assessment chapter of the Plan.

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

This section will provide an inventory assessment of vulnerable structures, equipment, critical facilities, population, and other important assets that may be at risk to hazards. The inventory of assets for each jurisdiction was derived from parcel data from the Bates County Assessor, local jurisdiction data collection questionnaires, and the U.S. Census.

Each participating jurisdiction in Bates County submitted a data collection questionnaire to KBRPC. Losses were estimated based on insured values or replacement cost. Loss estimates are included in each hazard profile of the Risk Assessment Chapter.

Step 6: Set Goals (Handbook Task 6)

On April 23, 2019 KBRPC met with members of the MPC to discuss the current goals for Bates County. It was determined that the previous goals that were set in the 2013 Plan did not seem to fit the actions Bates County would like to have in place. The MPC opted to replace the six (6) previous goals set in the 2013 Plan and replace them with four (4) new goals that would better fit Bates County as a whole. Following the meeting on April 23, 2019 the MPC reviewed the 2013 work plan and went over each action one by one to discuss changes that should be made, additions and deletions.

The Plan's updated goals for Bates County are as follows:

Goal 1- Protect the lives and livelihoods of all citizens

Goal 2- Mitigate the effects of future natural hazards in the County

Goal 3- Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters

Step 7: Review Possible Mitigation Actions and Activities

The MPC held a meeting on April 23, 2019 to discuss the mitigation actions from the 2013 Bates County Hazard Mitigation Plan. During this meeting the MPC also discussed potential new actions and reviewed the following information during the meeting:

- A list of actions proposed in the previous mitigation plan and discussed each individually regarding progress made and continued relevance.
- Responses to Data Collection Questionnaires – each jurisdiction reported progress made on each of the previous actions.
- Public input at meetings

Jurisdiction representatives on the MPC were encouraged to review the risk assessment and the previously identified mitigation actions during the meeting on March 26, 2019 to prepare for the meeting on April 23, 2019. Representatives were given the link to 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 meeting several new actions were discussed by the committee and numerous actions were reworded. Much of the discussion surrounded making the actions SMART (specific, measurable, achievable, relevant and time-bound). The MPC provided some significant changes to many of the actions from the previous plan.

Step 8: Draft an Action Plan

On April 23, 2019 the MPC was provided with blank STAPLEE worksheets to complete for each new or revised action item identified for their jurisdiction. The method was used to develop a priority score for the proposed actions. These worksheets clarified what department would be responsible for implementing each action, potential funding sources, timelines, and local planning mechanisms for implementation. KBRPC and the MPC worked together as a group to complete those worksheets and to provide information pertaining to implementing those actions on a local level.

Step 9: Adopt the Plan (Handbook Task 8)

During the meeting on April 23, 2019 KBRPC discussed the plan adoption process. KBPRC then attended meetings with each jurisdiction to address any questions pertaining to the plan adoption and presented a Resolution for each jurisdiction to be approved and adopted by the governing body of each jurisdiction in order to be eligible for Hazard Mitigation Assistance. Adoption Resolutions are included in Appendix C.

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

During the meeting on April, 23, 2019 plan implementation and maintenance of the plan was discussed with the MPC. The overall strategy has been updated and is presented in the Plan Maintenance Chapter of this plan.

2 PLANNING AREA PROFILE AND CAPABILITIES

2 PLANNING AREA PROFILE AND CAPABILITIES 2.1

2.1 *Bates County Planning Area Profile 2.2*

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2.1.3 Climate 2.4
2.1.4 Population/Demographics 2.5
2.1.5 History 2.6
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2.2 *Jurisdictional Profiles and Mitigation Capabilities 2.8*

2.2.1 Unincorporated Bates County 2.8
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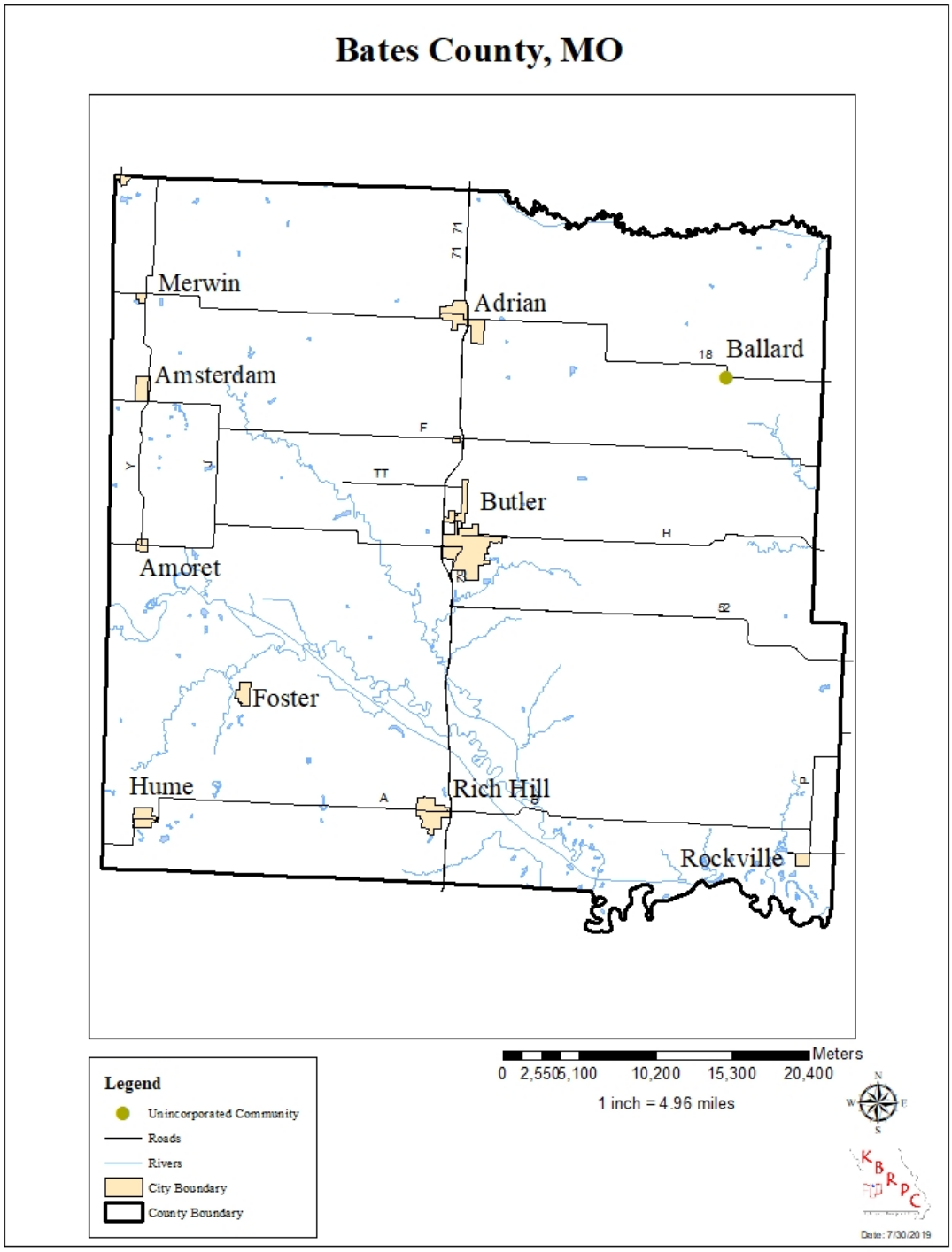
2.1 Bates County Planning Area Profile

Figure 2.1. Map of Bates County



The US Census estimates that in 2018 the population for Bates County was 16,320. This is a decline of -4.37% percent since the 2010 census population of 17,034. As of 2013-2017, the total Bates county population was 16,405, which has decreased 1.66% since 2000.

The median household income for Bates County was estimated to be $45,605 in 2017 dollars (2013-2017). This is well below the state and national medians of $51,542 and $57,652. The percentage growth in median household income experienced by Bates County has increased 9.84% since 2010, while the state and national growth was 27 and 28.3 percent.

In Bates County, the median home value was $108,300 in 2017 dollars and has grown by 86.72% since 2000. This is significantly lower than the State of Missouri as a whole ($145,400) and the United States ($193,500). The house value growth rate is about the same as the state average rate of 33.04% and is higher than the national average rate of 33.08%.

2.1.2 Geography, Geology and Topography

Bates County is located in west/central Missouri with an area covering 851 square miles, of which 837 square miles is land and 15 square miles is water. It is located between I-49 the Kansas state border.

The county is bordered on the north by Cass County, on the south by Vernon County, on southeast by St. Clair County, on the northeast by Henry County. Bates County is also bordered by Linn County and Miami County, both of these counties are located in Kansas. The City of Butler is the County seat and most populous community.

Bates County consists of three main ecological land types according to the *Atlas of Missouri Ecoregions*, published by the Missouri Department of Conservation.

Ozark Highlands (Osage River Hills)

It includes lands associated with the Sac, Pomme de Terre, and Niangua Rivers, all of them major tributaries of the Osage, and also the Lake of the Ozarks, Truman Lake, and Pomme de Terre Lake.

Its proximity to prairie-dominated Ecoregions to the west and north and the presence of extensive areas of shallow to moderately deep and droughty soils make the influence of prairie and open woodlands stronger here than in hill subsections in the Ozarks to the east. It lies along the Osage River and its tributaries and comprises major portions of St. Clair, Cedar, Morgan, Camden, and Miller Counties, and portions of Cole, Osage, Maries, Laclede, Dallas, Hickory, Polk, Henry, and Counties.

Osage Plains (Scarped Osage Plains)

The Scarped Osage Plains Subsection is a smooth plain interrupted by low, ragged escarpments trending southwest-northeast in which limestone bedrock is regularly exposed. Local relief reaches 150 feet in the escarpment zones but elsewhere averages less than 100 feet. Valley bottoms are exceptionally broad for the size of the streams.

The Scarped Osage Plains Subsection occupies a large area of west-central Missouri south of the Missouri River. It includes most of Jackson, Cass, Bates, Johnson, and Pettis Counties, and smaller portions of Lafayette, Saline, Cooper, Morgan, Cedar, Henry, and Vernon Counties.

Osage Plains (Cherokee Plains)

The Cherokee Plains Subsection is one continuous plain of very low relief (usually less than 80 feet) mostly on Pennsylvanian sandstones and shale, but with associated thin-bedded limestone and coal. Streams have hardly dissected the surface, and valleys are topographically subdued. Wetlands are abundant throughout the wide, flat alluvial plains. Clay-pan soils add further distinction to the subsection.

This subsection lies in west-central Missouri, west of the Ozark Highlands. It comprises major portions of Henry, St. Clair, Bates, Vernon, and Barton Counties, and small portions of Pettis, Cedar, Dade, and Jasper Counties.

Figure 2.2 is a map of the watershed boundaries in Missouri. Bates County is part of the South Grand Watershed, Harry S Truman, Lower Marais des Cygnes, and the Little Osage Watersheds.

Source: https://dnr.mo.gov/omw/OMWWatersheds.htm

2.1.3 Climate

Mean annual precipitation for Bates County is 43.3 inches. The wettest month is June with an average of 5.9 inches; 32 percent of the annual precipitation occurs during the autumn months of the year. Annual snowfall averages 10.5 inches. Mean January minimum daily temperature is 20°. Mean July maximum daily temperature is 88.8°.

Bates County lies in a Humid Temperate climate and is vulnerable to northern pressure systems in the winter and strong pressure and storm systems from the Gulf of Mexico and the Great Plains region of the central United States. While Bates County does have extreme variations in weather at times, there is a seasonal pattern.

2.1.4 Population/Demographics

Table 2.1 provides the total county population and the populations for each city, village and unincorporated county for 2000, 2010 and 2017 with the number and percentage of change from 2000 to 2017. In terms of percent change, Bates County has declined in population. It is estimated that the unincorporated population of the county is 8,777 people. Overall the county has decreased its population by 1.49%.

Table 2.1. Bates County Population 2000-2017 by Community

Jurisdiction	2000 Population	2010 Population	2017 Population	2000-2017 # Change	2000-2017 % Change
Bates County	16,653	17,049	16,405	-248	-1.49%
Amsterdam	281	242	226	-55	-19.57%
Butler	4,209	4,219	4,190	-19	-0.45%
Rich Hill	1,461	1,396	1,450	-11	-0.75%

Source: U.S. Bureau of the Census, Decennial Census, *population includes the portions of these cities in adjacent counties

Bates County's population under age 5 is 964 people according to the 2017 ACS estimates. This is 5.9% of the population, which is very close to the state and national averages of 6.2% and 6.3%. The county has a significantly higher elderly population, or those above the age of 65, at 18.9% of the population compared to the 9% for Missouri and 8.6% for the nation.

Bates County has a total of 6,704 households. Of which 4,565 are considered family households, 1,197 households who have children who are under the age of 18 years old and 2,139 non-family households. The county has a total of 7,853 housing units and only 6,704 are considered occupied at an average household size of 2.4.

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

The index is a comparative metric that facilitates the examination of the differences in social vulnerability among counties. SoVI® is a valuable tool for policy makers and practitioners. It graphically illustrates the geographic variation in social vulnerability. SoVI® also is useful as an indicator in determining the differential recovery from disasters.

Bates County's SoVI® score is 1.190000057, placing them in the 69.6 percentile when compared to the rest of the nation. This score means that 69.6

percent of the nation is more resilient to hazards and disasters. The main determinants of the score are qualities of the population based on race and class, wealth, elderly residents, Hispanic ethnicity, special needs individuals, Native American ethnicity, and the service industry employment.

Table 2.2 provides additional demographic and economic indicators for Bates County and incorporated communities compared to the state of Missouri and the United States. The county as a whole had a higher percentage of unemployed and families living below the poverty level than the state of Missouri or the United States. In terms of education, the percentage of population in the county that were high school graduates were higher than the state of Missouri and the United States. The percentage of the county population that spoke a language other than English in the home was considerably lower than the state of Missouri and significantly lower than the United States.

Table 2.2. Unemployment, Poverty, Education, and Language Percentage Demographics

Bates County, Missouri

Jurisdiction	Total in Labor Force	Percent of Population Unemployed	Percent of Families Below the Poverty Level	Percentage of Population (High School graduate)	Percentage of Population (Bachelor's degree or higher)	Percentage of population (spoken language other than English
Bates County	7,660	40.5	10.3%	45.7%	9.7%	1.31%
City of Amsterdam	98	47.6%	19%	51.6%	7.5%	2.65%
City of Butler	1,714	44.5%	19.6%	42.2%	15.9%	0%
City of Rich Hill	570	48.5%	12.6%	52.7%	10.7%	0.41%
Missouri	4,823,223	6.6%	10.46%	18.9%	19.3%	5.95%
United States	253,323,709	7.4%	10.2%	17.29%	21%	21.15%

Source: U.S. Census, 2013-2017 American Community Survey, 5-year Estimates.

2.1.5 History

Bates County is a county located in the west central portion of the U.S. state of Missouri. As of the 2010 census, the population was 17,049. The county was founded in 1841, and named after Frederick Bates, the second Governor of Missouri. The county seat is Butler. Bates County has ten public school districts; within its boundaries, and seven public schools. The school districts of Archie R-V, Appleton City R-II, and Drexel R-IV Schools are not profiled in this plan, since the majority of their jurisdictional boundaries and their actual facilities are located in a different county.

2.1.6 Schools

Public schools

- Adrian R-III Schools – Adrian
- Adrian Elementary School (PK-05)
- Adrian Senior High School (06-12)
- Ballard R-II Schools – Butler

- Ballard Elementary School (PK-06)
- Butler R-V Schools – Butler
- Butler Elementary School (PK-06)
- Butler Senior High School (07-12)
- Hudson R-IX Schools – Appleton City
- Hudson Elementary School (PK-08)
- Hume R-VIII Schools – Hume
- Hume Elementary School (PK-06)
- Miami R-I Schools – Amoret
- Miami Elementary School (PK-06)
- Miami High School (07-12)
- Rich Hill R-IV Schools – Butler
- Rich Hill Elementary School (PK-06)
- Rich Hill High School (07-12)

Private schools

- Zion Lutheran School – Rockville (PK-07) – Lutheran

2.1.7 Occupations

Occupation information for the Bates County labor force comes from the American Community Survey 5-year estimates 2013-2017. Management, Business, Science, and Arts Occupations includes education and healthcare practitioner and technician occupations among others. Service Occupation includes healthcare support and protective services, such as firefighters and law enforcement in addition to food preparation and personal care services. The other occupation classifications are well defined. **Table 2.3** contains occupation statistics for the incorporated cities and the county as a whole.

The City of Butler and the City of Rich Hill have the highest percentages in the Management, Business, Science and Arts Occupations. The City of Amsterdam and the City of Butler have the highest percentages in Service Occupations. The Butler and City of Rich Hill have the highest percentages in the Sales and Office Occupations. The City of Amsterdam and the City of Rich Hill have the highest percentage in the Natural Resources, Construction and Maintenance Occupations. The City of Rich Hill and the City of Amsterdam have the highest percentages in the Production, Transportation and Material Moving Occupations. Farming, fishing, forestry, natural resources, construction and maintenance occupations account for the fewest occupations in Bates County.

Table 2.3. Occupation Statistics, Bates County, Missouri

Place	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Faming, Fishing, and Forestry Occupation	Natural Resources, Construction, and Maintenance Occupations	Production, Transportation, and Material Moving Occupations
Bates County	27.1%	20.1%	20.9%	2.3%	13.7%	15.9%
City of Amsterdam	12.6%	26.4%	16.1%	6.9%	19.5%	18.4%
City of Butler	23.5%	27.9%	28.7%	0.5%	8.9%	10.4%
City of Rich Hill	22.8%	16.1%	20.1%	4.5%	13.6%	22.8%

Source: U.S. Census, 2013-2017 American Community Survey, 5-year Estimates.

2.1.8 Agriculture

According to the United States Department of Agriculture 2012 Census, there were 1,169 farms covering 448,135 acres in Bates County. The average farm size was 383 acres, which is under the average farm size in the state of Missouri at 285 acres, with an average market value of $104,143,000 sold in Bates County. Of the total about 61% ($63,996,000) was from crop sales and the other 39% ($40,148,000) came from livestock sales. The average sales per farm in Bates County was $89,088.

The top crop items in Bates County were (acres):

1. Forage-land used for all hay and haylage, grass silage and greenchop -53,687 acres
2. Soybeans for beans- 121,143 acres
3. Corn for grain-62,802 acres
4. Field and grass seed crops- 2,389 acres
5. Wheat for grain- 19,464 acres

The top livestock items in Bates County were (numbers):

1. Cattle and Calves – 63,253
2. Hogs- withheld to avoid disclosing data for individual operations
3. Layers- 2,150
4. Horses-1,321
5. Sheep and Lambs- 1,163

Bates County is ranked 27 out of 114 in the state of Missouri and ranked 1,129 out of 3,079 U.S. counties for total value of agricultural products sold. In addition, 46.62% of principal operators reported a primary occupation of farming and 53.37% reported a primary occupation of something other than farming.

2.1.9 FEMA Hazard Mitigation Assistance Grants in Planning Area

Disaster Declaration	Project Type	Sub-Grantee	Date Approved	Project Total
DR-1412	Retrofitting Hallways	Rich Hill School District	04/14/2008	$22,909
DR-1980	Safe Room	Rich Hill School District	01/27/2015	$1,290,712
Total				$1,313,621

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 area of the county is profiled first, followed by the incorporated communities and the public school districts.

2.2.1 Unincorporated Bates County

Bates County's jurisdictions include all unincorporated areas within the county boundaries. Bates County is classified as a Class III county in Missouri. The County Commission is the governing body and the administrative authority. It is an elected three-member governing body with a Presiding Commissioner, Northern Commissioner and Southern Commissioner. The Commission establishes County policy, approves and adopts the annual budget for all county operations, approves actual expenditures for each department, purchasing, facilities and ground maintenance, ensures county-wide compliance with numerous statutory requirements and acts as liaison with county boards, commissions, and other governmental entities. The departments/staff in Bates County include:

- County Commission
- County Assessor
- Circuit Clerk
- County Clerk
- Collector
- Coroner
- Prosecuting Attorney
- Public Administrator
- Recorder
- Sheriff
- Surveyor
- Treasurer
- Emergency Management
- Local Emergency Planning Committee
- NFIP Flood Plain Administrator
- Circuit Court Judge
- Deputy County Clerk
- Probate/Magistrate Judge
- Probate/Magistrate Clerk

Mitigation Initiatives/Capabilities

- National Flood Insurance Program

The County NFIP Floodplain Administrator accepts, evaluates and monitors land use proposals and enforces the NFIP floodplain regulations.

The County Emergency Management Director (EMD) coordinates with local government officials and cooperating private organizations to: 1) prevent avoidable disasters and reduce the vulnerability of the residents to any disaster that may strike; 2) establish capabilities for protecting citizens from the effects of disasters; 3) respond effectively to the actual occurrence of disasters; and 4) provide for recovery in the aftermath of any emergency involving extensive damage within the county. The EMD is responsible for the development and maintenance of the Local Emergency Operations Plan.

Table 2.4 provides information on Bates County's mitigation capabilities based on the Data Collection Questionnaire.

Table 2.4. Unincorporated Bates County Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	N/A
Builder's Plan	No
Capital Improvement Plan	N/A
City Emergency Operations Plan	N/A
County Emergency Operations Plan	Yes
Local Recovery Plan	N/A
County Recovery Plan	N/A
City Mitigation Plan	N/A
County Mitigation Plan	Yes
Debris Management Plan	N/A
Economic Development Plan	Yes
Transportation Plan	Yes
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	N/A
Watershed Plan	N/A
Firewise or other fire mitigation plan	N/A
School Mitigation Plan	N/A
Critical Facilities Plan (Mitigation/Response/Recovery)	N/A
Policies/Ordinance	
Zoning Ordinance	No
Building Code	N/A
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	N/A
Storm Water Ordinance	No
Drainage Ordinance	N/A
Site Plan Review Requirements	N/A
Historic Preservation Ordinance	N/A
Landscape Ordinance	N/A
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
Hazard Awareness Program	N/A
National Flood Insurance Program (NFIP)	Yes, Flood Plain Affected Areas Upon Request
Community Rating System (CRS) program under the National Flood Insurance Program	No
National Weather Service (NWS) Storm Ready	Yes
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	N/A
ISO Fire Rating	N/A

Capabilities	Status Including Date of Document or Policy
Economic Development Program	Yes, Full Time Director
Land Use Program	N/A

Public Education/Awareness	N/A
Property Acquisition	N/A
Planning/Zoning Boards	N/A
Stream Maintenance Program	N/A
Tree Trimming Program	N/A
Engineering Studies for Streams (Local/County/Regional)	N/A
Mutual Aid Agreements	Yes, Sheriff-Tactical Vehicle Response
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Unknown
Hazard Analysis/Risk Assessment (County)	Unknown
Evacuation Route Map	Yes
Flood Insurance Maps	Yes
Critical Facilities Inventory	N/A
Vulnerable Population Inventory	N/A
Land Use Map	Unknown
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	Yes, Assessor
Engineer	Yes, Surveyor
Development Planner	No
Public Works Official	Yes, Bates County Road and Bridge
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes, Surveyor
Bomb and/or Arson Squad	No
Emergency Response Team	Yes, Sheriff
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes
County Emergency Management Commission	Yes
Sanitation Department	No
Transportation Department	No
Economic Development Department	Yes
Housing Department	No
Planning Consultant	Yes
Regional Planning Agencies	Yes, Kaysinger Basin Regional Planning Commission
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	Yes, VFW, American Legion
Local Environmental Organization	No
Homeowner Associations	Yes, Butler Enterprises
Neighborhood Associations	Yes, Butler Enterprises
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.	Yes, Lions, Optimist, Cattleman's, Masons, Rotary
Local Funding Availability	
Apply for Community Development Block Grants	Yes
Fund projects through Capital Improvements funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas or electric services	Yes

Impact fees for new development	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activities	No
Withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2019

2.2.2 City of Amsterdam

The City of Amsterdam is located in the Northwest portion of Bates County. The population of Amsterdam was 242 people in the 2010 census compared to the census of 2000 that shows a population of 281 people. The Mayor and the City Councilmen are the policy making bodies in the city government. The Mayor and City Councilmen are elected directly and serve staggered 2 year terms. Amsterdam has the following staff positions:

- City Clerk
- Sewer Operations Manager
- City Treasurer
- Fire Chief
- Attorney (Part Time)

Mitigation capabilities include:

- One (1) Outdoor Warning Siren located at the Fire Station on 13233 NW Main Street.
- Codes Building Site/Design
- Mutual Aid Agreements

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

Table 2.5. Amsterdam Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Operations Plan	No
County Emergency Operations Plan	No
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	Yes
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	Yes
Economic Development Plan	Yes
Transportation Plan	Yes
Land-use Plan	No

Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	**Status Including Date of Document or Policy**
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Capability	**Status Including Date of Document or Policy**
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Iowa Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	**Status Including Date of Document or Policy**
Zoning/Land Use Restrictions	No
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant	No
NFIP Community Rating System (CRS) Participating Community	N/A
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	No
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	**Status Including Date of Document or Policy**
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes, HMP 2013
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	**Status Including Date of Document or Policy**
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Coordinator	No
NFIP Floodplain Administrator	No
Bomb and/or Arson Squad	No
Emergency Response Team	No

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

Source: Data Collection Questionnaire 2019

2.2.3 City of Butler

The City of Butler is located in the center of Bates County. The population of Butler in 2010 census was 4,219 and according to the 2000 census the population was 4,209 people, which is a .24% increase. The city council is the decision making body in the city government. The City of Butler has the following offices and staff positions:

- City Administrator
- City Attorney
- City Clerk
- City Council
- Fire Chief
- Police Chief
- Public Works Director
- Parks and Recreation Director

Mitigation capabilities include:

- Six (6) Outdoor warning sirens, located at: 1) East of Business 71/Orange Street, between Summit and Lee Street 2) North of 52 Highway, west of Sunset Drive 3) Located on back of Heartland of Willow Lane Nursing Home Property, west of High Street 4) On south side of roof of building at intersection located west of Havana, north of Pine Street 5) South of Nursery Street at the end of Mechanic Street 6) North of Dakota Street, east

of Broadway Street

- National Flood Insurance Program
- Zoning/Land Use Restrictions
- Economic Development Program
- Planning/Zoning Boards
- Mutual Aid Agreements
- International Building Code 2012
- Building Code Effectiveness Grading (BCEG's)
- Public Education/Awareness

Table 2.6 provides information on the City of Butler's mitigation capabilities based on the Data Collection Questionnaire.

Table 2.6. Butler Mitigation Capabilities

Capability	**Status Including Date of Document or Policy**
Planning Capabilities	
Comprehensive Plan	Yes Updating
Builder's Plan	Yes 2012
Capital Improvement Plan	No
Local Emergency Operations Plan	Yes 2017 to be updated in 2019
County Emergency Operations Plan	N/A
Local Recovery Plan	No
County Recovery Plan	N/A
Local Mitigation Plan	Yes 2014
County Mitigation Plan	Yes
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes Updating
Transportation Plan	Yes
Land-use Plan	Yes
Flood Mitigation Assistance (FMA) Plan	Yes
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	Yes
Policies/Ordinance	**Status Including Date of Document or Policy**
Zoning Ordinance	Yes
Building Code	2012 IBC
Floodplain Ordinance	Yes
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Capability	**Status Including Date of Document or Policy**
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	Yes
Landscape Ordinance	No
Program	**Status Including Date of Document or Policy**
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant	Yes
NFIP Community Rating System (CRS) Participating Community	N/A
Hazard Awareness Program	Yes
National Weather Service (NWS) Storm Ready	No

Building Code Effectiveness Grading (BCEGs)	Yes
ISO Fire Rating	Yes 5
Economic Development Program	Yes
Land Use Program	Yes
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	Yes
Mutual Aid Agreements	Yes
Studies/Reports/Maps	**Status Including Date of Document or Policy**
Hazard Analysis/Risk Assessment (Local)	Yes
Hazard Analysis/Risk Assessment (County)	N/A
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	Yes
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	Yes
Land Use Map	Yes
Staff/Department	**Status Including Date of Document or Policy**
Building Code Official	Yes Full Time
Building Inspector	Yes Full Time
Mapping Specialist (GIS)	No
Engineer	Yes Part Time
Development Planner	Yes
Public Works Official	Yes Full Time
Emergency Management Coordinator	Yes Full Time
NFIP Floodplain Administrator	Yes Full Time
Bomb and/or Arson Squad	No
Emergency Response Team	Yes Part Time
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes Part Time
County Emergency Management Commission	N/A
Sanitation Department	Yes Contracted
Transportation Department	No
Economic Development Department	Yes
Housing Department	Yes
Planning Consultant	Yes
Regional Planning Agencies	Yes
Historic Preservation	Yes
Non-Governmental Organizations (NGOs)	**Status Including Date of Document or Policy**
American Red Cross	No
Salvation Army	No
Capability	**Status Including Date of Document or Policy**
Veterans Groups	Yes Part Time
Environmental Organization	Yes
Homeowner Associations	Yes
Neighborhood Associations	Yes
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.	Yes
Local Funding Availability	**Status Including Date of Document or Policy**
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes

Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire 2019

2.2.4 City of Rich Hill

The City of Rich Hill is located in the bottom central portion of Bates County. Rich Hill is a fourth class city in the state of Missouri. According to the 2010 census the city's population is 1,396 people. The City of Rich Hill has experienced a 4.45% decrease in population since the 2000 census when they had a population of 1,461. The Mayor and the City Alderman are the policy making bodies in the city government. Rich Hill has the following staff positions:

- Mayor
- Board of Alderman
- City Attorney
- City Clerk
- Deputy City Clerk
- Police Chief
- Fire Chief
- Superintendent
- Electric Supervisor

Mitigation capabilities include:

- One (1) Outdoor warning sirens, located at North of Maple Street, east of railroad tracks, east of 7th Street.
- Watershed Plan 2017
- Tree Trimming Ordinance
- Codes Building Site/Design
- Mutual Aid Agreements with Fire Department

Table 2.7 provides information on Rich Hill's mitigation capabilities based on the Data Collection Questionnaire.

Table 2.7. Rich Hill Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Operations Plan	Yes Combined with county EOP 2017
County Emergency Operations Plan	Yes 2017
Local Recovery Plan	Yes 2017 Combined with county
County Recovery Plan	Yes 2017
Local Mitigation Plan	Yes 2017 Combined with county
County Mitigation Plan	N/A
Local Mitigation Plan (PDM)	N/A
County Mitigation Plan (PDM)	N/A
Economic Development Plan	Yes
Transportation Plan	Yes
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	Yes 2017 Alliance

Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	**Status Including Date of Document or Policy**
Zoning Ordinance	No
Building Code	N/A
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	Yes Limited to Street Clearance
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Capability	**Status Including Date of Document or Policy**
Site Plan Review Requirements	Yes Limited in Scope
Historic Preservation Ordinance	No
Landscape Ordinance	No
Iowa Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	**Status Including Date of Document or Policy**
Zoning/Land Use Restrictions	No
Codes Building Site/Design	Yes Limited
National Flood Insurance Program (NFIP) Participant	No
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	No
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes Fire Department
Studies/Reports/Maps	**Status Including Date of Document or Policy**
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes 2013
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	Yes
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	**Status Including Date of Document or Policy**
Building Code Official	Yes
Building Inspector	Yes Certified Part Time
Mapping Specialist (GIS)	No
Engineer	Yes Firm on Retainer
Development Planner	No
Public Works Official	Yes Full Time
Emergency Management Coordinator	Yes Part Time
NFIP Floodplain Administrator	No
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No

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

Source: Data Collection Questionnaire 2019

Table 2.8. Mitigation Capabilities Summary Table

CAPABILITIES	Unincorporated Bates County	City of Amsterdam	City of Butler	City of Rich Hill
Planning Capabilities				
Comprehensive Plan	No	No	Yes, Updating	No
Builder's Plan	No	No	Yes 2012	No
Capital Improvement Plan	No	No	No	No
Local Emergency Plan	No	No	Yes 2017 to be updated in 2019	Yes combined with county EOP 2017
County Emergency Plan	Yes	Yes	N/A	Yes 2017
Local Recovery Plan	No	No	No	Yes 2017 Combined with county
County Recovery Plan	No	No	N/A	Yes 2017
Local Mitigation Plan	No	No	Yes 2014	Yes 2017 Combined with county
County Mitigation Plan	Yes	Yes	Yes	Yes
Local Mitigation Plan (PDM)	No	No	No	No
County Mitigation Plan (PDM)	No	No	No	No
Debris Management Plan	N/A	No	No	No
Economic Development Plan	02-11; KBRPC/County Economic Development District	02-11; KBRPC/County Economic Development District	Yes Updating	02-11; KBRPC/County Economic Development District
Transportation Plan	Yes	Yes	Yes	Yes
Land-use Plan	No	No	Yes	No
Flood Mitigation Assistance (FMA) Plan	No	No	Yes	No
Watershed Plan	Np	No	No	Yes 2017 Alliance
Firewise or other fire mitigation plan	No	No	No	No
School Mitigation Plan	No	No	N/A	N/A

CAPABILITIES	Unincorporated Bates County	City of Amsterdam	City of Butler	City of Rich Hill
Critical Facilities Plan (Mitigation/Response/Recovery)	N/A	No	Yes	Unknown
Policies/Ordinance				
Zoning Ordinance	No	No	Yes	No
Building Code	No	No	Yes, 2012 International	N/A
Floodplain Ordinance	Yes	No	Yes	No
Subdivision Ordinance	No	No	Yes	No
Tree Trimming Ordinance	N/A	No	No	Yes, Limited to Street Clearance
Nuisance Ordinance	N/A	Yes	Yes	Yes
Storm Water Ordinance	No	No	Yes	No
Drainage Ordinance	No	No	Yes	No
Site Plan Review Requirements	No	No	Yes	Yes, Limited in Scope
Historic Preservation Ordinance	No	No	Yes	No
Landscape Ordinance	No	No	Unknown	No
Iowa Wetlands and Riparian Areas Conservation Plan	No	No	No	No
Program				
Zoning/Land Use Restrictions	No	No	Yes	No
Codes Building Site/Design	No	Yes	Yes	Yes, Limited
National Flood Insurance Program (NFIP) Participant	Yes	No	Yes	No
NFIP Community Rating System (CRS) Participating Community	Unknown	Unknown	Unknown	No
Hazard Awareness Program	N/A	No	Yes	No

CAPABILITIES	Unincorporated Bates County	City of Amsterdam	City of Butler	City of Rich Hill
National Weather Service (NWS) Storm Ready	Yes	Unknown	No	Unknown
Building Code Effectiveness Grading (BCEGs)	No	No	Yes	No
ISO Fire Rating	N/A	Unknown	Yes, 5	Unknown
Economic Development Program	Yes Full Time Director	No	Yes	No
Land Use Program	N/A	No	Yes	No
Public Education/Awareness	N/A	No	Yes	No
Property Acquisition	N/A	No	Yes	No
Planning/Zoning Boards	N/A	No	Yes	No
Stream Maintenance Program	N/A USDA	No	No	No
Tree Trimming Program	N/A	No	Yes	No
Engineering Studies for Streams (Local/County/Regional)	N/A	No	Yes	No
Mutual Aid Agreements	Yes, Sheriff-Tactical Veh. Response	Yes	Yes	Yes, Fire
Studies/Reports/Maps				
Hazard Analysis/Risk Assessment (Local)	Unknown	No	Yes	Unknown
Hazard Analysis/Risk Assessment (County)	Unknown	N/A	N/A	Yes
Flood Insurance Maps	Yes	Yes	Yes	Yes
FEMA Flood Insurance Study (Detailed)	Yes	Yes	Yes	Yes
Evacuation Route Map	Yes	No	Yes	Yes
Critical Facilities Inventory	N/A	No	Yes	Unknown
Vulnerable Population Inventory	N/A	No	Yes	Unknown
Land Use Map	Unknown	No	Yes	Unknown
Staff/Department				
Building Code Official	No	No	Yes, Full Time	Yes
Building Inspector	No	No	Yes, Full Time	Yes, Contracted Part Time

CAPABILITIES	Unincorporated Bates County	City of Amsterdam	City of Butler	City of Rich Hill
Mapping Specialist (GIS)	Yes, Assessor	No	No	Unknown
Engineer	Yes, Surveyor	No	Yes, Part Time	Yes, Firm on Detainer
Development Planner	No	No	Yes	No
Public Works Official	Yes, Bates County Road/Bridge	No	Yes, Full Time	Yes, Full Time
Emergency Management Coordinator	Yes	No	Yes, Full Time	Yes, Part Time
NFIP Floodplain Administrator	Yes, Surveyor	No	Yes, Full Time	No
Bomb and/or Arson Squad	No	No	No	No
Emergency Response Team	Yes, Sheriff	No	Yes, Part Time	No
Hazardous Materials Expert	No	No	No	No
Local Emergency Planning Committee	Yes	No	Yes, Part Time	No
County Emergency Management Commission	Yes	No	N/A	Yes
Sanitation Department	No	No	Yes, Contracted	Yes, Full Time
Transportation Department	No	No	No	No
Economic Development Department	Yes, Vacant	No	Yes	No
Housing Department	No	No	Yes	No
Planning Consultant	Yes	Yes	Yes	Yes
Regional Planning Agencies	Yes, Kaysinger Basin Regional Planning Commission	Yes, Kaysinger Basin Regional Planning Commission	Yes, Kaysinger Basin Regional Planning Commission	Yes, Kaysinger Basin Regional Planning Commission
Historic Preservation	No	No	Yes	No
Non-Governmental Organizations (NGOs)				
American Red Cross	No	No	No	No
Salvation Army	No	No	No	No
Veterans Groups	Yes, VFW and American Legion	No	Yes	Yes, American Legion
Environmental Organization	No	No	Yes	No
Homeowner Associations	Yes, Butler Enterprises	No	Yes	No
Neighborhood Associations	Yes, Butler Enterprises	No	Yes	No

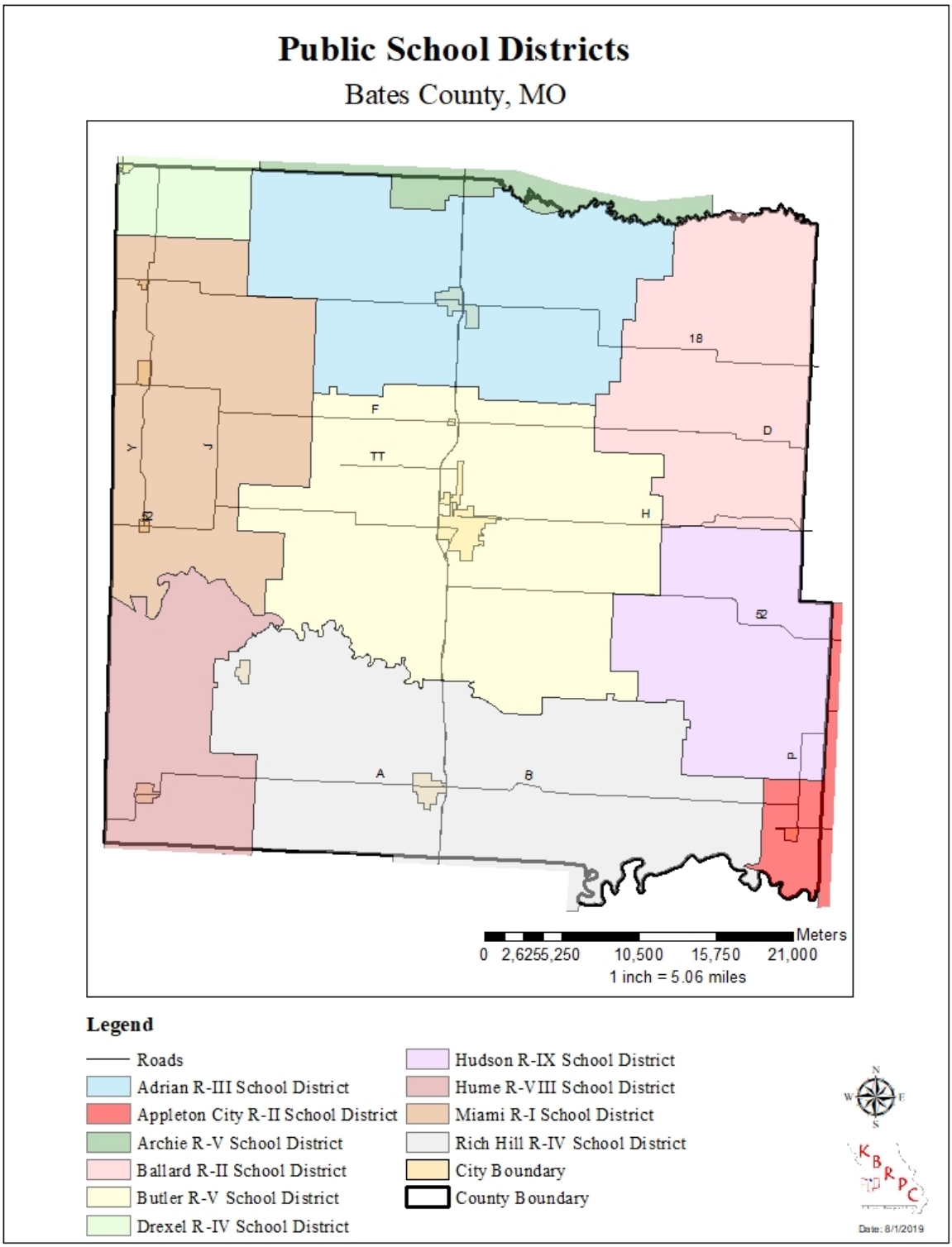
CAPABILITIES	Unincorporated Bates County	City of Amsterdam	City of Butler	City of Rich Hill
Chamber of Commerce	Yes, Butler and Adrian	No	Yes	Yes
Community Organizations (Lions, Kiwanis, etc.	Yes, Lions, Cattleman's, Amateur Radio Club, Optimist, Elks, Masons, Rebekah's, Rotary	No	Yes	Yes, Lions Club
Financial Resources				
Apply for Community Development Block Grants	Yes	No	Yes	Yes
Fund projects through Capital Improvements funding	Yes	No	Yes	Yes
Authority to levy taxes for specific purposes	Yes	Yes	Yes	Unknown
Fees for water, sewer, gas, or electric services	No	Yes, Sewer	Yes, Water, Sewer, Electric	Yes
Impact fees for new development	No	No	No	No
Incur debt through general obligation bonds	Yes	Yes	Yes	Yes
Incur debt through special tax bonds	Yes	No	Yes	Yes
Incur debt through private activities	No	No	No	Unknown
Withhold spending in hazard prone areas	No	No	No	Unknown

Source: Data Collection Questionnaires, 2

2.2.5 Public School District Profiles and Mitigation Capabilities

Bates County has ten public school districts; within its boundaries. The school districts of Archie R-V, Appleton City R-II, and Drexel R-IV Schools are not profiled in this plan, but they are shown on the map since the majority of their jurisdictional boundaries and their actual facilities are located in a different county. **Figure 2.4** is a map of the school district boundaries in Bates County.

Figure 2.4 Bates County School Districts



Source: Missouri GIS Database

Table 2.9. Bates County School Buildings and Enrollment Data, 2019

District Name	Building Name	Building Enrolment
Adrian R-III	Adrian Elementary	341
Adrian R-III	Adrian Senior High	356
Ballard R-II	Ballard Elementary	64
Ballard R-II	Ballard High	51
Butler R-V	Butler Early Childhood	77
Butler R-V	Butler Elementary	471
Butler R-V	Butler High	463
Hudson R-IX	Hudson Elementary	54
Hume R-VIII	Hume Elementary	78
Hume R-VIII	Hume High	66
Miami R-I	Miami Elementary	90
Miami R-I	Miami High	87
Rich Hill R-IV	Rich Hill Elementary	189
Rich Hill R-IV	Rich Hill High	148

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

Table 2.10. Summary of Mitigation Capabilities Bates County School Districts

Capability	Adrian R-III	Ballard R-II	Butler R-V	Hudson R-IX
Planning Elements				
Master Plan/ Date	Yes	No	Yes, 2015	Yes, 2013
Capital Improvement Plan/Date	Yes	No	Yes, 2015	No
School Emergency Plan / Date	Yes	Yes, 2018-2019	Yes, 2018	Yes
Weapons Policy/Date	Yes	Yes, 2018-2019	Yes, 2018	Yes
Personnel Resources				
Full-Time Building Official (Principal)	Yes	Yes, Principal	Yes, Superintendent	Yes, Principal
Emergency Manager	No	Unknown	No	No
Grant Writer	No	No	No	No
Public Information Officer	No	No	No	Yes, Principal
Financial Resources				
Capital Improvements Project Funding	Yes	No	Yes	Yes
Local Funds	Yes	Yes	Yes	No
General Obligation Bonds	Yes	No	Yes	No
Special Tax Bonds	Yes	Yes	Yes	No
Private Activities/Donations	Yes	No	Yes	Yes
State and Federal Funds/Grants	Yes	Yes	Yes	No
Other				
Public Education Programs	Yes	Yes	Yes	Yes
Privately or Self- Insured?	Yes	Yes	Yes	Yes
Fire Evacuation Training	Yes	Yes	Yes	Yes
Tornado Sheltering Exercises	Yes	Yes	Yes	Yes
Public Address/Emergency Alert System	Yes	Yes	Yes	Yes
NOAA Weather Radios	No	No	No	No
Lock-Down Security Training	Yes	Yes	Yes	Yes
Mitigation Programs	No	No	No	No
Tornado Shelter/Safe room	No	No	No	No
Campus Police	No	No	No	No

Capability	Hume R-III	Miami R-I	Rich Hill R-IV
Planning Elements			
Master Plan/ Date	No	Unknown	Yes, August 2016
Capital Improvement Plan/Date	Unknown	No	No
School Emergency Plan / Date	Yes, 2017	Yes	Yes, June 2018
Weapons Policy/Date	Yes, 2017	Yes	Yes, June 2018
Personnel Resources			
Full-Time Building Official (Principal)	Yes, Principal	Yes	Yes, High School Principal
Emergency Manager	Yes, Principal	No	Yes, Superintendent
Grant Writer	No	Yes, Secretary	No
Public Information Officer	Yes, Superintendent	No	Yes, Superintendent
Financial Resources			
Capital Improvements Project Funding	Yes	Yes	Yes
Local Funds	Yes	Yes	Yes
General Obligation Bonds	Yes	No	Yes
Special Tax Bonds	Yes	No	Yes
Private Activities/Donations	Yes	No	Unknown
State and Federal Funds/Grants	No	No	Yes
Other			
Public Education Programs	Yes	Yes	Yes
Privately or Self- Insured?	Yes	Yes	Yes
Fire Evacuation Training	Yes	Yes	Yes
Tornado Sheltering Exercises	Yes	Yes	Yes
Public Address/Emergency Alert System	Yes	Yes	Yes
NOAA Weather Radios	No	No	No
Lock-Down Security Training	Yes	Yes	Yes
Mitigation Programs	No	No	No
Tornado Shelter/Safe room	No	No	Yes
Campus Police	No	No	No

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

This is an update of the previous Bates County Hazard Mitigation Plan adopted in 2013. According to the 2013-2017 American Community Survey 5-year estimates, Bates County has grown to 16,045 compared to the April 1, 2010 population estimate of 17,049. The population of Bates County has decreased approximately by 1,004 people since the Plan was adopted in 2013. According to the building permit data from the U.S. Census Bureau 8 single family residences were added to the building stock from 2011-2016. The reported construction cost of these new structures was $1,136,700.00.

Bates County is a class three county in Missouri. According to the Missouri Revised Statues (MORS 48.020 “All counties of this state are hereby classified, for the purpose of establishing organization and powers in accordance with the provisions of section 8, article VI, Constitution of Missouri, into four classifications determined as follows:

Classification 1. All counties having an assessed valuation of nine hundred million dollars and over shall automatically be in the first classification after that county has maintained such valuation for the time period required by section 48.030; however, any county of the second classification which, on August 28, 2010, has had an assessed valuation of at least six hundred million dollars for at least one year may, by resolution of the governing body of the county, elect to be classified as a county of the first classification after it has maintained such valuation for the period of time required by the provisions of section 48.030.

Classification 2. All counties having an assessed valuation of six hundred million dollars and less than the assessed valuation necessary for that county to be in the first classification shall automatically be in the second classification after that county has maintained such valuation for the time period required by section 48.030.

Classification 3. All counties having an assessed valuation of less than the assessed valuation necessary for that county to be in the second classification shall automatically be in the third classification.

Classification 4. All counties which have attained the second classification prior to August 13, 1988, and which would otherwise return to the third classification after August 13, 1988, because of changes in assessed valuation shall remain a county in the second classification and shall operate under the laws of this state applying to the second classification.

The required assessed valuation for each classification under subsection 1 of this section shall be increased annually by an amount equal to the percentage change in the annual average of the Consumer Price Index for All Urban Consumers (CPI-U) or zero, whichever is greater. The state tax commission shall calculate and publish this amount so that it is available to all counties."

This chapter is divided into four main parts:

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

3.1 Hazard Identification

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

The Plan profiles all natural hazards that can affect Bates County. The natural hazards that can affect the county have been identified in the 2013 Bates County Multi-Jurisdictional Hazard Mitigation Plan and the current Missouri State Plan. Natural hazards are naturally occurring climatological, hydrological or geologic events that have a negative effect on people and the built environment. Natural hazards identified include:

- Tornadoes
- Severe Thunderstorms
- High Winds
- Hail
- Lightning
- Flood
- Severe Winter Weather
- Drought
- Heat Wave
- Earthquakes
- Dam Failure

- Wildfire
- Sinkholes

No new natural hazards have been identified since the adoption of the previous plan. The current Missouri State Plan also addresses human-caused, and technological hazards; however, these will not be included in this plan update.

3.1.1 Review of Existing Mitigation Plans

The MPC reviewed the hazards identified in the previously approved plan, as well as the hazards identified in the state plan during the meeting(s) held on November 30, 2017. The hazards identified in the Bates County Plan are identified in the current Missouri State Plan. The State Plan also includes structural and urban fire in addition to wildfire. Human-caused and technological hazards identified in the State Plan include:

- CBRNE Attack
- Civil Disorder
- Cyber Disruption
- Hazardous Materials
- Mass Transportation Accidents
- Nuclear Power Plants
- Public Health Emergencies/Environmental Issues
- Special Events
- Terrorism
- Utility Interruptions and System Failures

In Missouri, local plans customarily include only natural hazards, as only natural hazards are required by federal regulations to be included. It was determined to include only natural hazards. The MPC agreed that human-caused and technological hazards are addressed in a Regional Homeland Security Oversight Committee (RHSOC) Threat and Hazard Identification Risk Assessment (THIRA) and that including only natural hazards would meet the needs of local entities participating in the plan update.

Natural hazards that are not included in this analysis include avalanches, coastal erosion, coastal storms, hurricanes, tsunamis and volcanoes. These are not included because they historically have not threatened Missouri. According to the current Missouri State Hazard Mitigation Plan, Hurricane Ike did indirectly cause severe weather in the state, it was the resulting hazards (flooding, winds, hail and tornadoes) that directly affected Missouri. While expansive soils, landslides and rock falls are recognized as hazards in Missouri, the occur infrequently and their impacts are minimal; so they will not be profiled further in this Plan.

3.1.2 Review Disaster Declaration History

From 1965 to present Bates County has experienced severe storms, flooding, tornadoes, ice storms, drought, straight-line winds, heavy rain and severe winter storms. All of these natural hazard events triggered federal disaster declarations. Federal and/or state declarations may be granted when the severity and the magnitude of an event surpasses the ability of the local government's capacity to

respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. If the disaster is severe enough that both the local and state government's capacity has been surpassed, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

Determinations for declaration type are based on scale and type of damages and institutions or industrial sectors affected. The Robert T Stafford Disaster Relief and Emergency Assistance Act, (PL 100-707) requires that all requests for a declaration by the President must be made by the Governor of the affected state. State and Federal officials conduct a Preliminary Damage Assessment (PDA) to show that the disaster is of such severity and magnitude that effective response is beyond state and local capabilities. There are two types of disaster declarations provided for in the Stafford Act: emergency declarations and major disaster declarations. Both declaration types authorize the President to provide supplemental federal disaster assistance. However, the events related to the two different types of declaration and scope and amount of assistance differ. Emergency Declarations are issued when an emergency for any occasion or instance when the President determines federal assistance is needed. Assistance available during an emergency declaration include public assistance and individual assistance. Public assistance is only available to Categories A (debris removal) and B (emergency protective measures). Categories C-G are not available under an emergency declaration. This assistance is generally provided on a 75% federal and 25% non-federal cost sharing basis. Major Disaster Declarations are issued when the President can declare a major disaster for any natural event, including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snow storm, or drought, or, regardless of cause, fire, flood, or explosion, that the President determines has caused damage of such severity that is beyond the combined capabilities of state and local governments to respond. A major disaster declaration provides a wide range of federal assistance programs for individual and public infrastructure, including funds for both emergency and permanent work. Not all programs are activated for every disaster. The determination of which programs are authorized is based on types of assistance specified in the Governor or Tribal Chief Executive's request and the needs identified during the joint PDA and subsequent PDAs. FEMA disaster programs include individual assistance, public assistance and hazard mitigation assistance. For more information you may visit FEMA's website (www.fema.gov/disaster-declaration-process).

Since 1973, Bates County has experienced eighteen (18) hazard events that triggered federal disaster declarations. The most recent was declared on August 7, 2015. Out of those eighteen events, one declaration included drought, three declarations included flooding, one included hurricane, ten declarations included severe storms, and three included severe ice storms. Four of these declarations triggered both individual and public assistance. For more information on FEMA declarations please visit https://www.fema.gov/data-visualization-summary-disaster-declarations-and-grants for an Excel file "Summary of Disaster Declarations and Grants" and go to the tab named "FEMA Declarations".

Table 3.1 lists the federal FEMA disaster declarations that included Bates County from 1973 to present.

Table 3.1. FEMA Disaster Declarations that included Bates County, MO 1973-Present

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
372	Heavy Rains, Tornadoes & Flooding	04/19/1973	Individual and Public Assistance
779	Severe Storms & Flooding	10/14/1986	Individual and Public Assistance

867	Severe Storms & Flooding	05/24/1990	Individual and Public Assistance
995	Severe Storms & Flooding	07/09/1993	Individual and Public Assistance
1054	Severe Storms, Tornadoes, Hail & Flooding	06/02/1995	Individual and Public Assistance
1403	Severe Winter Ice Storm	02/06/2002	Individual and Public Assistance
1463	Severe Storms, Tornadoes, & Flooding	05/06/2003	Individual and Public Assistance
1524	Severe Storms, Tornadoes & Flooding	06/11/2004	Individual Assistance
1631	Severe Storms, Tornadoes & Flooding	03/16/2006	Individual and Public Assistance
1773	Severe Storms and Flooding	06/25/2008	Individual and Public Assistance
3017	Drought	09/24/1976	Public Assistance
3232	Hurricane Katrina Evacuation	09/10/2005	Public Assistance
3281	Severe Winter Storms	12/12/2007	Public Assistance
3303	Severe Winter Storm	01/30/2009	Public Assistance
3317	Severe Winter Storm	02/03/2011	Public Assistance
1961	Severe Winter Storm and Snowstorm	03/23/2011	Public Assistance
1708	Severe Storms and Flooding	06/11/2007	Individual and Public Assistance
4238	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding	08/07/2015	Public Assistance

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

3.1.3 Research Additional Sources

There are a variety of sources researched for data on natural hazards. Primary sources included FEMA, SEMA, National Centers for Environmental Information (NCEI) and National Oceanic and Atmospheric Administration (NOAA). The U.S. Geological Survey (USGS) and the Center for Earthquake Research and Information (CERI) were major sources for earthquake information. The Missouri Department of Natural Resources (MDNR) Dam Safety Division provided information concerning dams and the Missouri Department of Conservation (MDC). Other information sources included county officials; existing city, county, regional and state plans; and information from local officials. The additional sources of data on locations and past impacts of hazards in Bates County include:

- Current Missouri Hazard Mitigation Plan
- Previously approved Bates County Hazard Mitigation Plan (2013)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources (MDNR)

- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- National Agricultural Statistics Service (Agriculture production/losses)
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Environmental Protection Agency
- Flood Insurance Administration
- Hazards US (HAZUS)
- Missouri Department of Transportation
- Missouri Division of Fire Marshal Safety
- Missouri Public Service Commission
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI);
- County and local Comprehensive Plans to the extent available
- County Emergency Management
- County Flood Insurance Rate Map, FEMA
- Flood Insurance Study, FEMA
- SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin
- U.S. Army Corps of Engineers
- U.S. Department of Transportation
- United States Geological Survey (USGS)
- Various articles and publications available on the internet, citations to the sources are provided in the body of the plan.

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

The NCEI damage amounts are estimates received from a variety of sources, including those listed above in the Data Sources section. For damage amounts, the NWS makes a best guess using all available data at the time of the publication. Property and crop damage figures should be considered as a broad estimate. Damages reported are in dollar values as they existed at the time of the storm

event. They do not represent current dollar values.

The database currently contains data from January 1950 to November 2018, 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.

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

3.1.4 Hazards Identified

Table 3.2. Hazards Identified for Each Jurisdiction

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme Temperatures	Wildfires	Flooding (Flash and River)	Land Subsidence/Sinkholes	Severe Winter Weather/Snow/Ice/ Severe Cold	Thunderstorm/Lightning/Hail/ High Wind	Tornado	Levee Failure
Bates County	X	X	X	X	X	X	X	X	X	X	
City of Amsterdam	X	X	X	X	X	X	X	X	X	X	
City of Butler	X	X	X	X	X	X	X	X	X	X	
City of Rich Hill	X	X	X	X	X	X	X	X	X	X	
Adrian R-III Schools	X	X	X	X	X	X	X	X	X	X	
Ballard R-II Schools	X	X	X	X	X	X	X	X	X	X	
Butler R-V Schools	X	X	X	X	X	X	X	X	X	X	
Hudson R-IX Schools	X	X	X	X	X	X	X	X	X	X	
Hume R-VIII Schools	X	X	X	X	X	X	X	X	X	X	
Miami R-I Schools	X	X	X	X	X	X	X	X	X	X	
Rich Hill R-IV Schools	X	X	X	X	X	X	X	X	X	X	

3.1.5 Multi-Jurisdictional Risk Assessment

The risk assessment assesses each participating jurisdiction's vulnerability to each hazard that can affect Bates County. Many of the hazards that are identified in this plan have the same probability of occurrence across Bates County. Although, there are a few hazards that vary across Bates County in terms of risk. Those hazards are as follows: dam failure, flooding, land subsidence/sinkholes, severe winter weather, and wildfires. These differences are detailed in each hazard profile under the geographic location and vulnerability.

Bates County's climate is mostly uniform. The City of Butler is considered to be the most urbanized at 92% urban and 8% rural. Bates County is considered to be 23% urban and 77% rural. While the City of Amsterdam, Rich Hill, are all considered to be 100% rural according to www.city-data.com . Naturally the urbanized areas of Bates County have a greater density of important assets, which are more vulnerable to weather related hazards. With growth and expansion in each jurisdiction in Bates County this increases the vulnerability to natural hazards.

The rural areas of Bates County are vulnerable to all hazards but especially hail damages and drought. This is the agricultural area of Bates County and presents more of a risk for crop failure.

These capabilities and resources to mitigate the impact of natural hazards vary across jurisdictions in Bates County. These differences will be discussed in greater detail in the vulnerability sections of each hazard.

3.2 Assets at Risk

This section assesses Bates County population, structures, critical facilities and infrastructure, and other important assets that may be at risk to hazards. The inventory of assets for each jurisdiction were derived from parcel data from the Bates County Assessor, local jurisdiction data questionnaires, datasets downloaded from Missouri Spatial Data Information Service (MSDIS) and the Missouri GIS Database.

3.2.1 Total Exposure of Population and Structures

Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2013-2017 American Community Survey 5-year estimates. Building counts, structure data and building exposure values are based on parcel data provided by Bates County Assessor.

Contents exposure values were calculated below in **Table 3.3.** It should be noted that the total valuation of buildings is based on County Assessor's data which may not be current. In addition, government owned properties are usually taxed differently or not at all, and may not be an accurate representation of true value. Note that the public school districts assets are included in the total exposure tables assets by community and county.

Table 3.3 shows the total population, total building count of all structures i.e. Residential/commercial/agricultural, estimated value of buildings, estimated value of contents and estimated total exposure to parcels for the unincorporated Bates County and each incorporated city.

Table 3.4 that follows provides the building value exposures for the county and each city in Bates County broken down by usage type. All values are displayed in thousands of dollars. Finally, **Table 3.5** provides the building count total for Bates County and each city in Bates County area broken out by building usage types (residential, commercial, industrial, and agricultural). All values are displayed in thousands of dollars.

Table 3.3. Maximum Population and Building Exposure by Jurisdiction

Jurisdiction	2013-2017 ACS Population	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Bates County	16,405	9,275	$486,737	$242,716	$729,453
City of Amsterdam	226	27	$3,448	$2,406	$5,854
City of Butler	4,190	1,720	$318,580	$185,202	$503,782
City of Rich Hill	1,450	397	$73,810	$41,451	$115,261
Adrian R-III	740	2	$-	$-	$44,351
Ballard R-II	129	2	$-	$-	$12,102
Butler R-V	1,125	3	$-	$-	$76,572
Hudson R-IX	54	1	$-	$-	$7,763
Hume R-VIII	154	2	$-	$-	$8,510
Miami R-I	187	2	$-	$-	$18,504
Rich Hill R-IV	374	2	$-	$-	$24,621
Totals	25,034	11,433	$882,575	$471,775	$1,546,773

Sources: Population, 2013-2017 American Community Survey 5-year estimates; Building Count and Building Exposure, Missouri GIS, Data Collection Questionnaire, HAZUS and Bates County Assessor, DESE

Table 3.4. Building Values/Exposure by Usage Type

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Total
Bates County	$427,415	$14,254	$8,435	$27,918	$478,022
City of Amsterdam	$2,027	$1,281	$0	$29	$3,337
City of Butler	$251,583	$45,445	$7,832	$167	$305,027
City of Rich Hill	$57,689	$11,371	$602	$37	$69,699
Totals	$738,714	$72,351	$16,869	$28,151	$856,085

Source: Missouri GIS Database, County Assessor Data

Table 3.5. Building Counts by Usage Type

Jurisdiction	Agriculture	Commercial	Education	Government	Industrial	Residential	Grand Total
Amsterdam	7	8	-	1	-	11	27
Bates County	6,834	89	14	19	14	2,319	9.289
Butler	41	290	-	11	13	1,365	1,720
Rich Hill	9	71	-	3	1	313	397
Grand Total	6,891	458	14	34	28	4,008	11,433

Source: Missouri GIS Database, Bates County Assessor Data, SEMA

Even though school's total assets are included in the tables above, additional discussion is needed, based on the data that is available from the districts' completion of the Data Collection Questionnaire and district maintained websites. The number of enrolled students at the participating public school districts is provided in **Table 3.6** below. Additional information includes the number of buildings, building values (building exposure) and contents value (contents exposure). These numbers will represent the total enrollment and building count for the public school districts regardless of the county in which they are located.

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

Public School District	Enrollment	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Adrian R-III	740	9	$22,610,630.23	$5,566,609.00	$28,177,239.23
Ballard R-II	129	1	$7,876,902.00	$818,418.00	$8,695,320.00
Butler R-V	1,125	15	$29,615,323.43	$5,185,529.88	$34,800,853.31
Hudson R-IX	54	1	$3,681,128.52	$423,992.79	$4,105,121.31
Hume R-VIII	154	18	$3,938,632.52	$986,858.43	$4,925,490.95
Miami R-I	187	5	$8,797,740.62	$2,463,253.95	$11,260,994.57
Rich Hill R-IV	374	6	$18,000,000.00	$8,950,000.00	$26,950,000.00

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

3.2.2 Critical and Essential Facilities and Infrastructure

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

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

Table 3.7 includes a summary of the inventory of critical and essential facilities and infrastructure in the planning area. The list was compiled from the Data Collection Questionnaire as well as the following sources:

- 2015 Bates County Disaster Related Land Use Plan

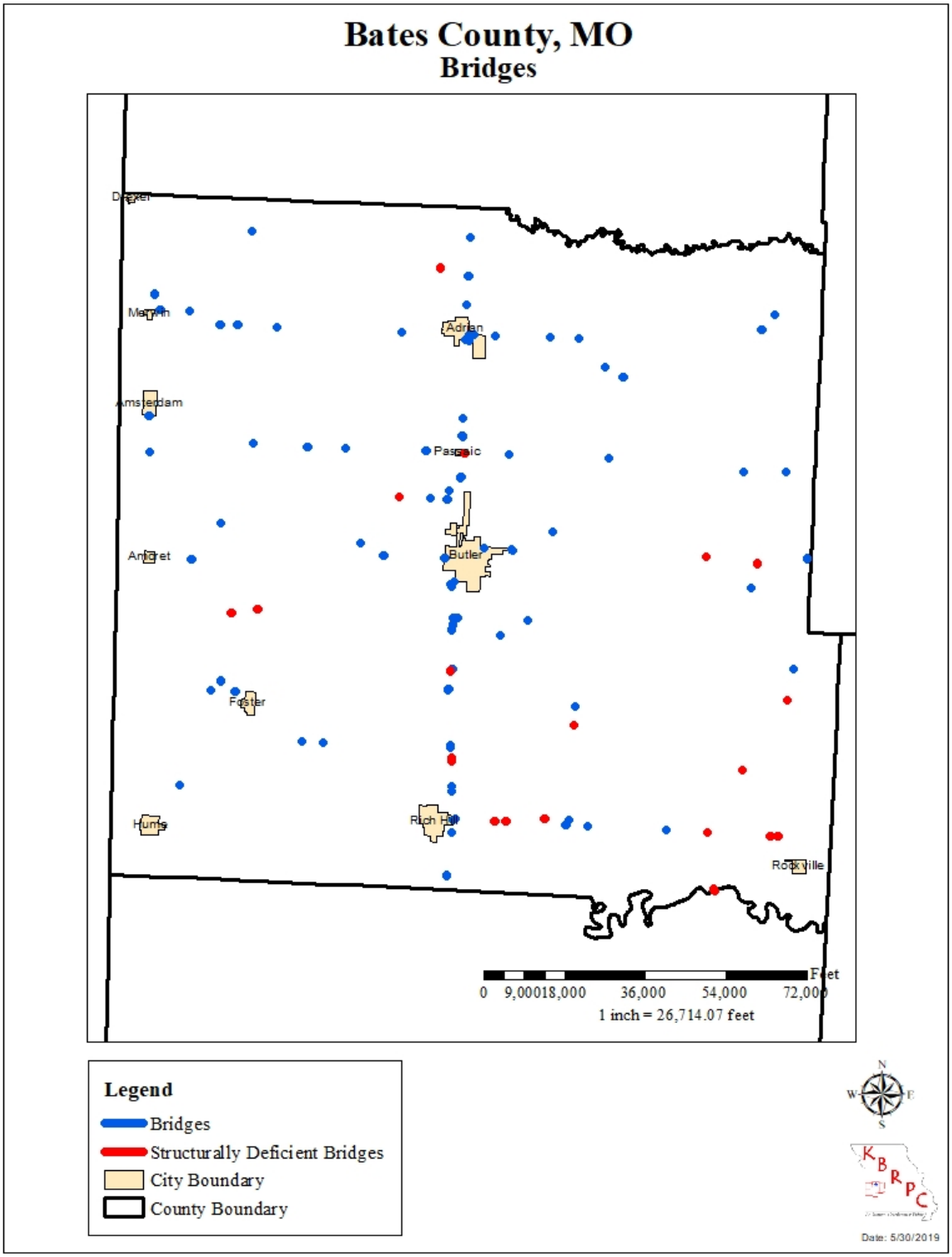
Table 3.7. Inventory of Critical/Essential Facilities and Infrastructure by Jurisdiction

Jurisdiction	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Highway Bridge	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Storm water Pump Stations	Tier II Chemical Facility	Wastewater Facility	Total
Bates County	0	0	0	0	0	1	1	1	0	0	62	0	0	0	0	0	0	1	0	4	0	0	0	70
City of Amsterdam	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	1	1	0	0	0	0	1	7
City of Butler	1	0	1	1	0	1	1	1	1	8	9	10	0	2	4	2	2	1	6	2	4	0	1	58
City of Rich Hill	0	0	0	0	0	0	1	1	1	1	2	0	0	0	0	1	1	0	4	1	0	0	1	14
Totals	1	0	1	1	0	2	4	4	2	10	74	10	0	2	4	3	4	3	10	7	4	0	3	149

Source: Data Collection Questionnaires; 2015 Bates County Disaster Related Land Use Plan

Figure 3.1 is a map that shows the locations of bridges in Bates County included in the National Bridge Inventory data set. This data was extracted from the National Bridge Inventory.

Figure 3.1. Bates County Bridges and Structurally Deficient Bridges



Source: National Bridge Inventory/MoDOT

The term “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.

3.2.3 Other Assets

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

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

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

Table 3.8. Threatened and Endangered Species in Bates County

Common Name	Scientific Name	Status
Indiana bat	Myotis sodalist	Endangered
Gray bat	Myotis grisescens	Endangered
Northern Long-Eared Bat	Myotis septentrionalis	Threatened

Source: U.S. Fish and Wildlife Service, https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=29013

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

Table 3.9. Parks in Bates County

Area Name	Address	City
Butler City Lake	Lake Road	Butler, MO
Four Rivers CA	4347 S 1625 Rd	Rich Hill, MO
Harmony Mission Lake CA	County Road 4007	Rich Hill, MO
Old Town Access	I-49	Butler, MO
Peabody CA	SW County Rd. 5497 and Hwy A	Rich Hill, MO
Ripgut Prairie NA	County Road 515	Rich Hill, MO
Settle’s Ford CA	37111 E 360 1st street	Garden City, MO
Settle’s Ford Gun Club Range	37111 E 360 1st street	Garden City, MO

Source: https://nature.mdc.mo.gov/discover-nature/find/places?area_name=&counties=5721&location%5Bdistance%5D=50&location%5Borigin%5D=

Park Name	Address	City
Adrian City Park	Adrian Reservoir	Adrian, MO
Veterans Memorial Park	Adrian Reservoir	Adrian, MO
Butler Municipal Park	801 S. Parkview St.	Butler, MO
Caboose Park	100 S. 7th St.	Rich Hill, MO
Circle Park	East Maple St.	Rich Hill, MO
Hume City Park	Main St.	Hume, MO

Source: County and Community Websites

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.

Properties in Bates County that are on the National Register of Historic Places are listed in (**Table 3.10**).

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

Property	Address	City	Date Listed
Bates County Courthouse	1 North Delaware	Butler	05/11/2001
Hudson City School	1 mile NW of MO 52 and Hwy. W	Appleton City	08/20/2002
Palace Hotel	2-4 W. Ohio St.	Butler	07/19/2002
Papinville Marais des Cygnes River Bridge	City Rd. 648	Papinville	10/22/2002

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

Economic Resources: **Table 3.11** shows major non-government employers in Bates County.

Table 3.11. Major Non-Government Employers in Bates County

Employer Name	Main Locations	Product or Service	Employees
Bates County Memorial Hospital	Butler, Mo.	Hospital	120
Walmart	Butler, Mo.	Retail	60

Source: Data Collection Questionnaires

Agriculture **Table 3.12** provides a summary of the agriculture in Bates County.

Table 3.12. Agriculture in Bates County

Category	2012	2017	Percent Change
Number of Farms	1,169	1,160	-0.77%
Land in Farms	448,135	459,524	+2.54%
Average Size of Farms	383	396	+3.39%
Crop Sales	$63,996,000	$101,134,000	+58.03%
Livestock Sales	$40,148,000	$58,658,000	+46.10%

Total	$104,143,000	$159,792,000	+53.44%
Total Farm Net Income	$24,762,000	$40,009,000	+61.57%
Government Payments	$4,369,000	$4,732,000	+8.31%

Source: https://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/cp29039.pdf

3.3 Land Use and Development

3.3.1 Development Since Previous Plan Update

Bates County has experienced a decline since 2010, with a decrease of 5.89% from 2010 to 2017 according to the 2013-2017 ACS population estimates. **Table 3.13** provides the population growth statistics for all cities and villages in Bates County as well as the county as a whole.

Table 3.13. County Population Growth, 2010-2017

Jurisdiction	Total Population 2013-2017 (estimates)	Total population 2010	2010-2017 # Change	2010-2017 % Change
Bates County	16,405	17,049	-644	-5.89%
City of Amsterdam	226	242	-16	-6.61%
City of Butler	4,190	4,219	-29	-0.69
City of Rich Hill	1,450	1,396	+54	+3.87%

Source: U.S. Bureau of the Census, Decennial Census; Population Statistics are for entire incorporated areas as reported by the Census bureau

Population growth or decline is generally accompanied by increases or decreases in the number of housing units, however this not the case in Bates county. While Bates county's population has not experienced an uptick, there has been an increase in assessed values, suggesting that many older homes have been replaced with newer generally larger homes. As well, there is an increase in the number of total housing units. Many older homes remain vacant or are turned into rental units while newer housing continues to be built. Like many counties in the West Central Missouri region, Bates County continues to experience a loss of young working families, and increase of in-migration of retirees. Young families contribute more to population loss, but retirees contribute to housing development.

Table 3.14. Change in Housing Units, 2010-2017

Jurisdiction	Housing Units 2013-2017 (estimates)	Housing Units 2010	2010-2017 # Change	2010-2017 % Change
Bates County	7,853	7,842	11	0.14%
City of Amsterdam	117	106	11	10.38%
City of Butler	2,027	2,047	-20	-0.98%
City of Rich Hill	770	701	69	9.84%

Source: U.S. Bureau of the Census, Decennial Census; Population Statistics are for entire incorporated areas as reported by the U.S. Census Bureau

Changes in development in Bates County include an increase in housing units, residential units, and commercial and agricultural buildings. Newer residences and commercial buildings have higher value which would result in a greater loss should hazards occur.

3.3.2 Future Land Use and Development

Bates County (unincorporated)- At this time, it is unknown if there is any planned construction in the floodplain or downstream of a dam in the hazard area. All though there is a slight drop in population since the last plan update, development continues to increase throughout the county especially along Interstate 49.

City of Amsterdam- has seen an increase in growth possibly due to the closing of the KCP&L Montrose Power Plant and the proximity to the KCP&L Lacygne Power Plant.

City of Butler- has seen decreases in growth possibly due to the closing of the KCP&L Montrose Power Plant and the proximity to the KCP&L Lacygne Power Plant.

City of Rich Hill- has seen an increase in growth possibly due to the proximity to Interstate 49, and commercial development.

School District's Future Development- Future development trends for the participating school districts include updating the buildings. As well as expanding current facilities, to accommodate enrollment numbers.

3.4 Hazard Profiles, Vulnerability, and Problem Statements

Each hazard will be analyzed individually in a hazard profile. The profile will consist of a general hazard description, location, severity/magnitude/extent, previous events, future probability, a discussion of risk variations between jurisdictions, and how anticipated development could impact risk. At the end of each hazard profile will be a vulnerability assessment, followed by a summary problem statement.

Hazard Profiles

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

The level of information presented in the profiles will vary by hazard based on the information available. With each update of this plan, new information will be incorporated to provide better evaluation and prioritization of the hazards that affect Bates County. 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 district.

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

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

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

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

Vulnerability Assessments

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

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

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

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

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

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

Potential Losses to Existing Development: Includes types and numbers of buildings and critical facilities.

Previous and Future Development: This section will include information on how changes in development have impacted the community's vulnerability to this hazard. It also includes a description of changes in development that occurred in known hazard prone areas since the previous plan have

increased or decreased the community's vulnerability and any anticipated future development in Bates County, and how that would impact hazard risk in Bates County.

Hazard Summary by Jurisdiction: For hazard risks that vary by jurisdiction, this section will provide an overview of the variation and the factual basis for that variation. For example, a community that has adopted more recent building codes and constructed safe rooms would be less vulnerable to the impact of tornados.

Problem Statements

Each hazard analysis concludes with a brief summary of the problems created by the hazard in Bates County, and possible ways to resolve those problems. Jurisdiction-specific information in those cases where the risk varies across Bates County is included.

3.4.1 Dam Failure

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

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

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

Information can be obtained from the National Resources Conservation Service at http://www.nrcs.usda.gov and an organization called DamSafetyAction.org, with the following Website: http://www.damsafetyaction.org/MO/

According to the State Plan, Missouri had some 5,423 recorded dams in 2013, the largest number of man-made dams of any state in the country. Missouri's topography allows lakes to be built easily and inexpensively, which accounts for the high number of dams. Despite the large number of dams, there are only 682 (about 13%) state regulated dams, with an additional 66 federally regulated dams. Federal dams in Missouri are primarily regulated by two federal agencies; the U.S. Army Corps of Engineers (USACE) and the U.S. Department of Agriculture Forest Service. The remaining 4,495 dams are unregulated.

Dams that fall under state regulation are non-federally regulated dams that are more than 35 feet in height. Most non-federal dams are privately owned structures built either for agricultural, water supply or recreational use. The Department of Natural Resources (MDNR) Water Resources Center maintains the Dam and Reservoir Safety Program in Missouri. The program ensures that dams over 35 feet in height are safely constructed, operated and maintained pursuant to Chapter 236 of Revised Statues of Missouri.

The Department of Natural Resources provides information about regulated and unregulated dams in Missouri. The information includes details of the dam dimensions, date of construction, approximate reservoir volume, contributing drainage basin area and hazard classification. In addition, USACE maintains the National Inventory of Dams (NID). The information in the NID database matches the list from the MDNR website with some additional details for dams in Bates County. Although both agencies provide a hazard classification for dams, the dam classification systems differ.

The Missouri Dam and Reservoir Safety Council Rules and Regulations uses three classes of downstream environmental zone used when considering permits. The downstream environment zone is the area below the dam that would become inundated should the dam fail. Inundation is defined as water two feet or more over the submerged ground outside of the stream channel. These classes are based on the number of structures and types of development contained within the inundation area as presented in **Table 3.15.** The downstream environment zone classification is also used to prescribe the frequency of inspection.

Table 3.15. MDNR Dam Hazard Classification Definitions

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

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

Dams in the NID are classified according to hazard potential, an indicator of the consequences of dam failure. A dam's hazard potential, an indicator of the consequences of dam failure. A dam's hazard potential classification, presented in **Table 3.16** does not indicate its condition. Dams assigned the high hazard potential classification are those where failure will potentially result in loss of human life. Significant hazard potential are those dams where failure results in no probable loss of human life but can cause economic loss. Dams assigned the low hazard potential classification are those where failure or results in no probable loss of human life and low economic or environmental losses. Losses are principally limited to the owner's property. It should be noted that there is always the possibility of loss of human life when a dam fails; this classification system does not account for the possibility of people occasionally passing through an inundation area which is usually unoccupied. For example, occasional recreational users and daytime users of downstream lands.

Table 3.16. NID Dam Hazard Classification Definitions

Hazard Class	Definition
Low Hazard	Failure results in only minimal property damage.
Significant Hazard	Failure could possibly result in the loss of life and appreciable property damage
High Hazard	If the dam were to fail, lives would be lost and extensive property damage could result.

Source: National Inventory of Dams

There is not a direct correlation between the State Hazard Classification and the NID Classifications. However, most dams that are in the State's Classes I and II are considered NID High Hazard Dams.

Geographic Location

Dams Located Within the Planning Area

According to the Missouri Department of Natural Resources there are twenty-six (26) dams located in Bates County and twenty-six (26) of those dams are included in the National Inventory of Dams. There are six (6) dams listed as high hazard dams and two (2) listed as significant hazard dams. The remaining eighteen (18) dams are listed as a low hazard potential.

Table 3.17 has information about the high, significant and low hazard dams in Bates County. It also indicates if there is an Emergency Action Plan (EAP) in place, height, last inspection date, dam owner, river, nearest downstream city, distance to the nearest downstream city and normal storage of water impounded by the dam in acre feet. An acre foot is defined as the volume of one acre of surface area to the depth of one foot.

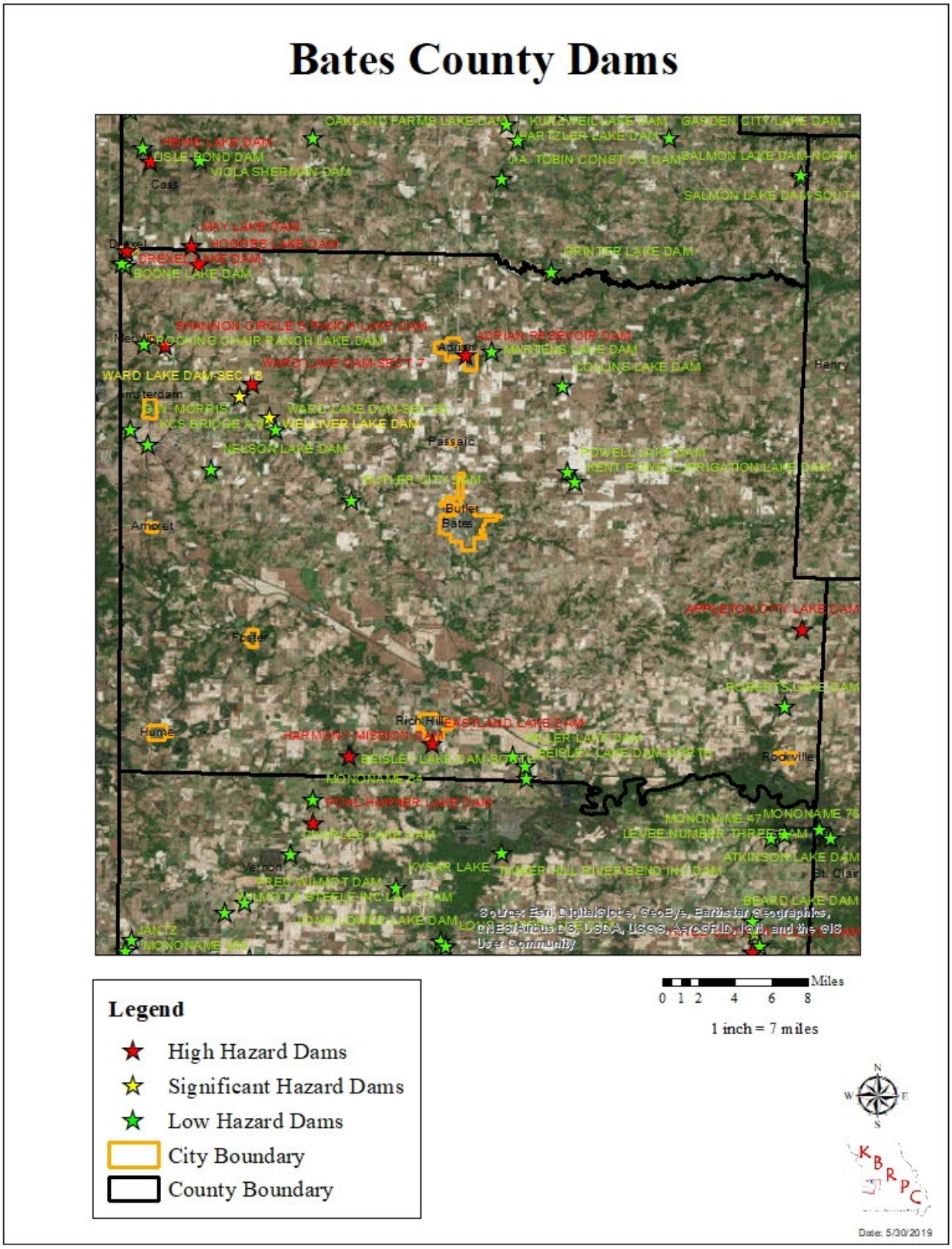
Table 3.17. High, Significant and Low Hazard Dams in Bates County

Dam Name	Emergency Action Plan (EAP)AP	Dam Height (Ft)	Normal Storage (Acre-Ft)	Last Inspection Date	River	Nearest Downstream City	Distance To Nearest City (Miles)	Dam Owner	Hazard Level
Powell Lake Dam	N/A	15	201	N/A	TR-Willow Branch	Papinsville	0	Kent Powell	Low
Boone Lake Dam	N/A	15	80	N/A	TR-North Sugar Creek	Merwin	0	William L. Boone	Low
Adrian Reservoir Dam	N/A	27	549	N/A	TR-Big Deer Creek	Urich	21	City of Adrian	High
Butler City Dam	N/A	30	883	N/A	TR-Miami Creek	Papinsville	21	City of Butler	Low
Drexel Lake Dam	N/A	22	306	04/05/79	North Sugar Creek	Drexel	0	City of Drexel	High
Appleton City Lake Dam	N/A	30	578	N/A	TR-Panther Creek	Taberville	18	City of Appleton	High
Miller Lake Dam	N/A	25	94	N/A	TR-Broad Waters of Muddy Cr	Taberville	0	Mark Miller	Low
KCS Bridge A-65	N/A	25	94	N/A	TR-Mulberry Creek	Papinsville	30	P+M Coal Co.	Low
Hodges Lake Dam	N/A	30	241	N/A	TR-Mormon Fork	Merwin	5	Monroe Hodges	High
Rocking Chair Ranch Lake Dam	N/A	20	128	N/A	TR-Miami Creek	Merwin	0	Rocking Chair Ranch	Low
Drexel City Reservoir Dam South	N/A	29	776	N/A	TR-North Sugar Creek	Merwin	5	City of Drexel	Low
Beisley Lake Dam-South	N/A	25	134	N/A	TR-Broad Waters Muddy Creek	Taberville	0	T.B. Beisley	Low

Beisley Lake Dam-North	N/A	30	530	N/A	TR-Broad Waters Muddy Creek	Taberville	0	T.B. Beisley	Low
Eastland Lake Dam	N/A	16	86	07/16/80	TR-Muddy Creek	Rich Hill	0	Howard Eastland	High
Shannon Circle S Ranch Dam	N/A	25	185	N/A	TR-Miami Creek	Papinsville	N/A	Shannon Circle S Ranch	Low
Welliver Lake Dam	N/A	21	152	N/A	TR-Miami Creek	Papinsville	N/A	Odel Welliver	Low
Ward Lake Dam-Sec 29	N/A	15	88	N/A	TR-Miami Creek	Papinsville	0	Virgil Ward	Low
Collins Lake Dam	N/A	15	241	N/A	TR-Mingo Creek	Urich	0	Chuck Collins	Low
Martens Lake Dam	N/A	25	80	N/A	TR-Big Deer Creek	Urich	0	Harley Martens	Low
Roberts Lake Dam	N/A	25	27	N/A	N/A	Taberville	0	Jim Roberts	Low
Nelson Lake Dam	N/A	15	169	N/A	TR-Mulberry Creek	Papinville	0	Elvis Nelson	Low
Harmony Mission Dam	Yes	42	935	09/29/15	Reed Creek	Rich Hill	0	MO Dept. of Conversation	High
Ward Lake Dam-Sec 13	N/A	20	133	N/A	TR-Miami Creek	Papinsville	N/A	Virgil Ward	Significant
Ward Lake Dam-Sect. 7	N/A	19	125	N/A	TR-Miami Creek	Papinsville	N/A	Virgil Ward	Significant
Bill McElwain Irrigation Lake Dam	N/A	20	186	N/A	TR-Mound Branch	Papinsville	N/A	Bill McElwain	Low
G.W. Morris	N/A	15	301	N/A	TR-Mulberry Creek	Amsterdam	N/A	G.W. Morris	Low

Sources: Missouri Department of Natural Resources, http://dnr.mo.gov/env/wrc/dam-safety/statemap.htm and National Inventory of Dams, http://nid.usace.army.mil/cm_apex/f?p=838:12

Figure 3.2. High Hazard Dam Locations in Bates County and Upstream Dams Outside of Bates County.



Source: U.S. Army Corps of Engineers, Missouri Department of Natural Resources

Upstream Dams Outside the Planning Area

There are two high hazard dams located upstream from Bates County, Drexel Lake Dam and May Lake Dam in Cass County. **Figure 3.2** shows the locations of dams located outside of Bates County.

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. Note that for this reason, dam failures could flood areas outside of mapped flood hazards.

There is currently one high hazard dam regulated by the State in Bates County that has had an inspection. Harmony Mission Dam inspected on 09/29/2015. Inspection reports can be obtained, by contacting Missouri Department of Natural Resources. Current inundation maps were unable to be obtained.

Previous Occurrences

According to the National Performance of Dams Program there have been no dam failures reported for Bates County.

Probability of Future Occurrence

Since Bates County has no record of dam failure, the calculation is not possible. According to the information from the Missouri State Plan, Missouri's percentage of high hazard dams in the DNR Inventory puts the State at about the national average for that category. However, if development occurs downstream of dams the percentage of high hazard dams will increase. Additionally, the probability of dam failure may increase, as many of the smaller and privately owned dams continue to deteriorate without the benefit of further regulation or improvements. Regular inspection and maintenance greatly reduces the probability of dam failure.

Vulnerability

Vulnerability Overview

Vulnerability to dam failure in Bates County There for the estimated for damages is unable to be determined at this time.

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

It is possible that parts of unincorporated Bates County would sustain structural losses from this hazard. Structures downstream of these dam locations could potentially be at risk if a failure were to occur depending on the size of the reservoir behind the dam and the amount of structures in the path. Currently eight of our dams are in areas with permanent dwellings, dam failure could result in severe property damage and potential loss of life. Throughout the county several other dams lie upstream of structures that have the potential of being impacted.

The potential impact on structures and human life downstream from a dam failure directly correlates to the amount of water and/or debris that is behind the dam. As stated in the hazard profile, it is important to take into account the age of the data that has been compiled on state regulated and unregulated dams in the county and in the state. Because data on unregulated dams was collected in the late 1970's and early 1980's it is not necessarily reliable to use when looking at possible areas of impact.

Impact of Previous and Future Development

In Bates County the building permit count in the last 5 years is seven (7). Bates County is very rural in nature and little development has been occurring in the last 5 years, therefore an increased risk is not anticipated. Although, it is possible that future development could occur downstream of any high or significant hazard dams in Bates County. Low hazard dams would also increase the risk, in the event of development downstream. Development in the inundation area would increase the exposure to a possible dam failure event.

Hazard Summary by Jurisdiction

The unincorporated parts of Bates County are at low risk of dam failure. Dam failure has the potential to impact future development in the county and its jurisdictions. Many dams in Bates County are privately owned and not regulated by that state. The potential for development below aging or unsafe dams is an issue that needs to be addressed.

Problem Statement

Overall, dam failure is a relatively low risk to Bates County and incorporated communities. Regular inspections and maintenance may reduce the likelihood of an event occurring. Although, the probability of a dam failure in Bates County is low, potential for damage remains.

Residents and communities near high and significant hazard dams should be familiar with the dam's Emergency Action Plan (EAP), if available. Emergency Plans are written for dams include procedures for notification and coordination with local law enforcement and other governmental agencies, information on the potential inundation areas, plans for warnings and evacuation, and procedures for making emergency repairs. It would be advantageous for jurisdictions to work closely with dam operators and participate in dam emergency exercises.

3.4.2 Drought

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

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

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

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

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

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

Data sources: http://www.drought.unl.edu/ http://droughtreporter.unl.edu/

Geographic Location

The entire planning area is potentially at risk for drought. However, since the most common drought in Central Missouri is agricultural drought, the jurisdiction at risk most is the unincorporated agricultural area of Bates County. This is the area where farmers are at risk for crop failure from drought and would suffer the most immediate and severe economic loss.

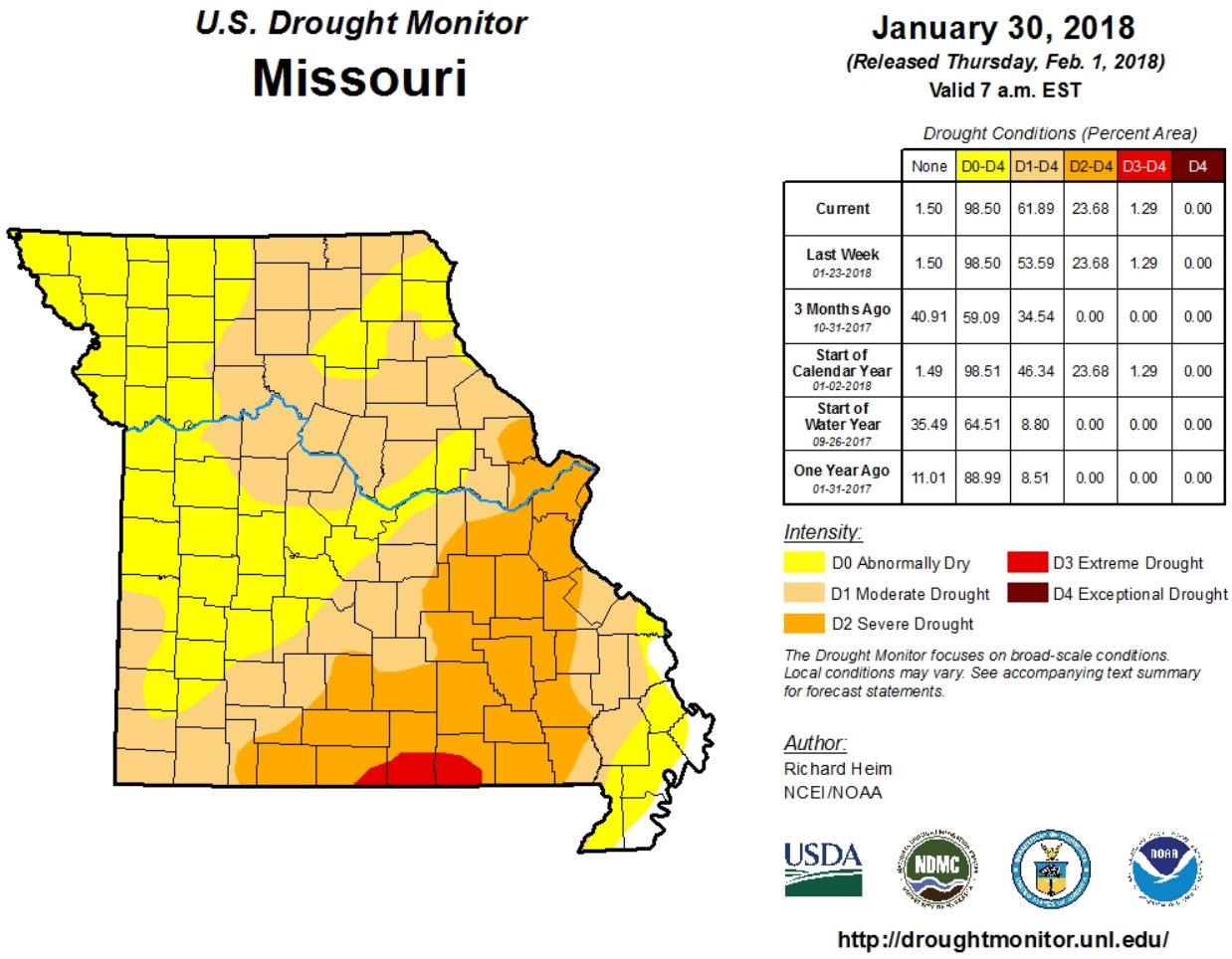
http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Missouri/ and http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/ https://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Missouri/ provides information on agriculture at the county level.

Severity/Magnitude/Extent

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

Figure 3.3 is a recent map from the U.S. Drought Monitor and an example of the size of the geographic area that could be in drought at any given moment in time. The map is only a snapshot of conditions at a given time and indicated the severity of drought conditions.

Figure 3.3. U.S. Drought Monitor Map of Missouri on February 1, 2018



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

The Most commonly used indicator of drought and drought severity is the Palmer Drought Severity Index (PDSI), jointly published by the NOAA and the United States Department of Agriculture. 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.

According to the MDNR Missouri Drought Plan revised in 2002, Missouri's drought response system is divided into four phases based on Palmer index values:

- **Phase I: Advisory Phase-** Requires a drought monitoring and assessment system to provide enough lead time for state and local planners to take appropriate action;
- **Phase II: Drought Alert-** When the PDSI reads -1.0 to -2.0, and stream flows, reservoir levels and groundwater levels are below normal over a several month period, or when the Drought Assessment Committee (DAC) determines that Phase II conditions exist based on other drought determination methods;
- **Phase II: Conservation Phase-** When the PDSI reads -2.0 to -4.0 and stream flows, reservoir levels, and groundwater levels continue to decline, along with forecasts indicating an extended period of below-normal precipitation, or when the DAC determines that Phase III conditions exist based on other drought determination models;
- **Phase IV: Drought Emergency-** When the PDSI is lower than -4.0, or when the DAC determines that Phase IV conditions exist based on other drought determination methods.

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.

Jurisdictions in Bates County rely on surface water for their water supply according to USGS Nation Water Information System. Drought can easily have an impact on communities who rely on surface water. (***http://maps.waterdata.usgs.gov/mapper/index.html*** is a USGS site called the National Water Information System Mapper.)

Previous Occurrences

The NCEI Storm Events Database includes 8 drought events occurring in Bates County from 1999 through 2018. Many of these were multiple reports from persistent drought events that lasted several months. The NCEI reports indicate that there were five distinct drought periods during the 19-year timeframe. **Table 3.18** provides previous drought occurrences in Bates County.

Table 3.18. Previous Drought Occurrences 1999-2017

Drought Year	Duration	Property Damage	Crop Damage
Bates County	4/1/2000	0	0
Bates County	7/1/2012	0	0
Bates County	8/1/2012	0	0
Bates County	9/1/2012	0	0
Bates County	11/1/2012	0	0
Bates County	1/1/2013	0	0
Bates County	2/1/2013	0	0
Bates County	3/1/2013	0	0

Source: https://www.ndcd.noaa.gov/stormevents/

Probability of Future Occurrence

Over the 19-year record period, Bates County was in a drought for 8 months. There are a total of 228 months in the record period. The calculated risk percent from the number of months of drought and the total number of months in the record period gives an 3.51% probability of drought in any given month in the county. Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increased chance of drought.

Vulnerability

Vulnerability Overview

The agriculture sector is particularly vulnerable to drought. Periods of dry weather can reduce stock ponds and force the early sale of livestock. Crop production can be disrupted and vegetative diseases can spread reducing yields. Individuals that operate water wells can experience water shortages during persistent drought periods like the three-month drought period in 2012. Due to Bates county being rural and most of its population living in the unincorporated areas, without city utilities are most vulnerable. This population relies on private wells, which are more likely to be impacted by reductions in the groundwater supply. Waste water treatment facilities may also be impacted, as it could limit the ability to discharge due to lower water levels and produce dangerous or unlawful levels of contaminants.

Potential Losses to Existing Development

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. Future droughts could result in crop losses. The exact extent of future loss and damage cannot be determined. There are many factors that would affect the outcome, such as type of crop planted, current market price, area and length of drought. There are no anticipated structural losses, loss of life or injuries associated with this hazard.

Impact of Previous and Future Development

Increases in acreage planted crops would add to exposure to drought-related agricultural losses. In addition, increases in population result in increased demand for treated water and increase waste water discharge, adding additional strain on water systems.

Impact of Climate Change

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

The Natural Resources Defense Council developed a new water supply sustainability index. The risk to water sustainability is based on the following criteria:

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

- Projected increase in summer water deficit

The risk to water sustainability for counties meeting two of the criteria are classified as “moderate”, while those meeting three of the criteria are classified as “high”, and those meeting four or more are classified as “extreme”. Counties meeting less than two criteria are considered to have low risk to water sustainability. According to the Natural Resources Defense Council, without climate change the water supply sustainability index for Bates County is low. With climate change, the water supply sustainability index increases to moderate (NRDC).

Hazard Summary by Jurisdiction

Although the probability of drought is the same for the entire county, farming and livestock enterprises in the unincorporated parts of the county would feel the greatest impact. Although communities with wells are susceptible to water shortages due to groundwater reduction, other communities with no source are more at risk to extreme water shortages in the event of a drought. School Districts would be the least impacted by drought; however, those districts in communities with single source wells or none at all may experience water shortages prior to those in larger communities. At this time no jurisdictions in the county are running wells, only private citizens in unincorporated Bates County.

Problem Statement

Although drought most likely will not cause structural damage, the impact is greatest on the agriculture sector and if persistent enough, could cause reductions in groundwater and water shortages in communities that provide potable water services. Potential actions to mitigate the impact of drought would be for communities to develop public information campaigns regarding water conservation techniques and measures, and provide notification mechanisms for community members to know when drought conditions may occur. Some methods may include restricting the use of public water resources for non-essential usage, such as landscaping, washing cars, filling swimming pools, etc. during extreme drought periods. Schools can also implement water conservation measures at all district facilities as well.

3.4.3 Earthquakes

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

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

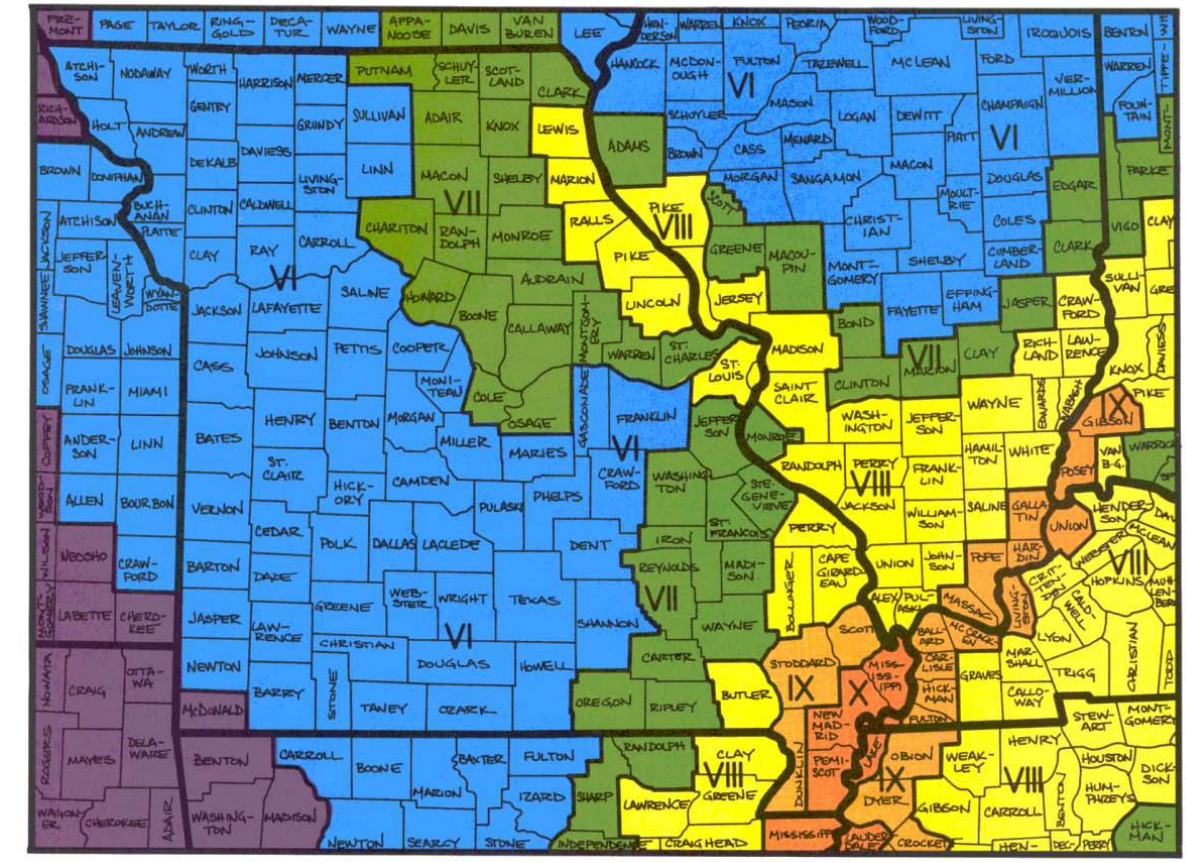
The subterranean faults were formed many millions of years ago on or near the surface of the earth. Subsequent to that time, these ancient faults subsided, while the areas adjacent were pushed up. As this fault zone (also known as rift) lowered, sediments filled in the lower areas. Under pressure, the sediments hardened into limestone, sandstone, and shales thus burying the rifts. The pressures on the North American plate and the movements along the San Andreas Fault by the Pacific plate have reactivated the buried rift(s) in the Mississippi embayment. This rift system is called the Reelfoot Rift and underlies the New Madrid Seismic Zone (Braile et al., 1986)

Geographic Location

Earthquakes occur all the time all over the world, both along plate edges and along faults. It is unlikely that an earthquake will affect Bates County. Likely locations of earthquakes in Missouri are located near the New Madrid Fault Zone, the Wabash Valley Fault and the fault zones in the vicinity of Farmington (including Big River Fault and the St. Genevieve Fault Zone).

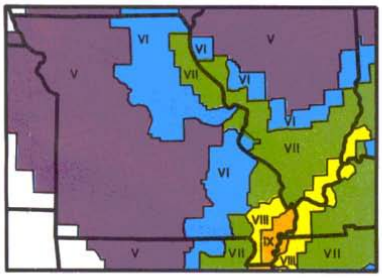
Figure 3.4 shows the highest projected Modified Mercalli intensities by county from a potential magnitude 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid Seismic Zone. The secondary maps in Figure 3.4 show the same regional intensities for 6.7 and 8.6 earthquake, respectively. Bates County is located in zone VI from a potential magnitude 7.6 earthquake along the New Madrid fault. Residents would feel movement, there could be minimal damage to structures, dishes and glassware would likely be broken.

Figure 3.4. Impact Zones for Earthquake Along the New Madrid Fault



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

6.7

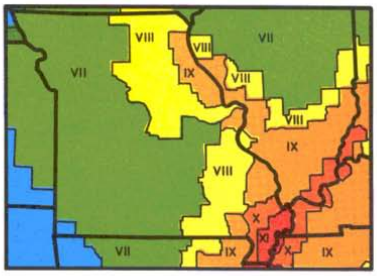


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 6.7 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

7.6

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

8.6



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

MODIFIED MERCALLI INTENSITY SCALE

I People do not feel any Earth movement.

II A few people might notice movement.

III Many people indoors feel movement. Hanging objects swing.

IV Most people indoors feel movement. Dishes, windows, and doors rattle. Walls and frames of structures creak. Liquids in open vessels are slightly disturbed. Parked cars rock.

V Almost everyone feels movement. Most people are awakened. Doors swing open or closed. Dishes are broken. Pictures on the wall move. Windows crack in some cases. Small objects move or are turned over. Liquids might spill out of open containers.

VI Everyone feels movement. Poorly built buildings are damaged slightly. Considerable quantities of dishes and glassware, and some windows are broken. People have trouble walking. Pictures fall off walls. Objects fall from shelves. Plaster in walls might crack. Some furniture is overturned. Small bells in churches, chapels and schools ring.

VII People have difficulty standing. Considerable damage in poorly built or badly designed buildings, adobe houses, old walls, spires and others. Damage is slight to moderate in well-built buildings. Numerous windows are broken. Weak chimneys break at roof lines. Cornices from towers and high buildings fall. Loose bricks fall from buildings. Heavy furniture is overturned and damaged. Some sand and gravel stream banks cave in.

VIII Drivers have trouble steering. Poorly built structures suffer severe damage. Ordinary substantial buildings partially collapse. Damage slight in structures especially built to withstand earthquakes. Tree branches break. Houses not bolted down might shift on their foundations. Tall structures such as towers and chimneys might twist and fall. Temporary or permanent changes in springs and wells. Sand and mud is ejected in small amounts.

IX Most buildings suffer damage. Houses that are not bolted down move off their foundations. Some underground pipes are broken. The ground cracks conspicuously. Reservoirs suffer severe damage.

X Well-built wooden structures are severely damaged and some destroyed. Most masonry and frame structures are destroyed, including their foundations. Some bridges are destroyed. Dams are seriously damaged. Large landslides occur. Water is thrown on the banks of canals, rivers, and lakes. Railroad tracks are bent slightly. Cracks are opened in cement pavements and asphalt road surfaces.

XI Few if any masonry structures remain standing. Large, well-built bridges are destroyed. Wood frame structures are severely damaged, especially near epicenters. Buried pipelines are rendered completely useless. Railroad tracks are badly bent. Water mixed with sand, and mud is ejected in large amounts.

XII Damage is total, and nearly all works of construction are damaged greatly or destroyed. Objects are thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move. Lakes are dammed, waterfalls formed and rivers are deflected.

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

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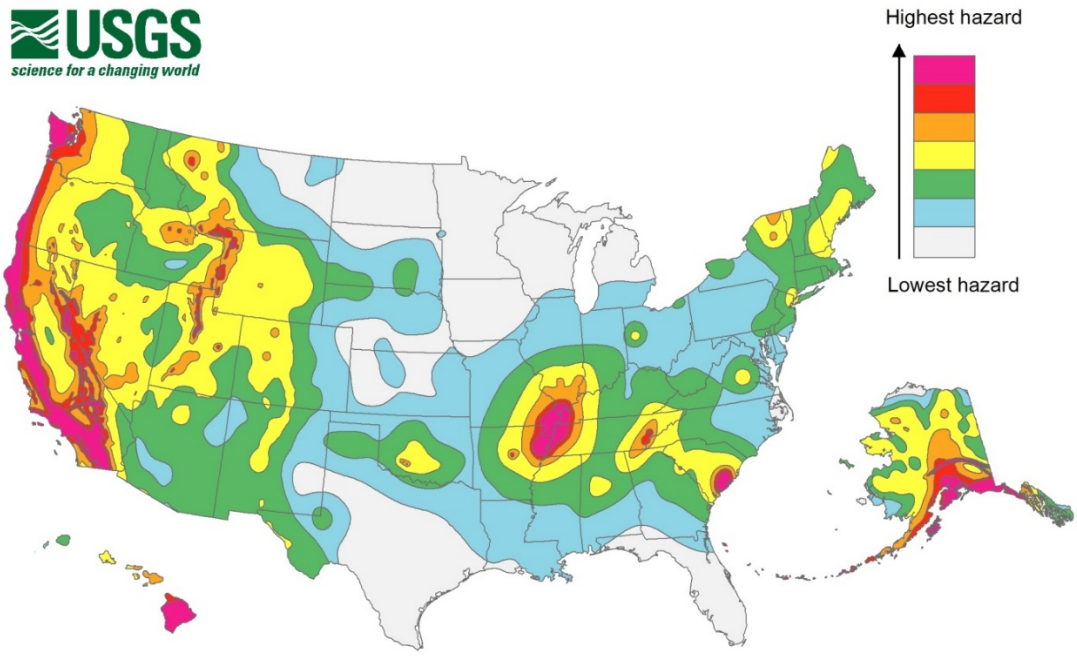
Telephone: 573-526-9100

Figure 3.6 illustrates seismicity in the United States. Bates County is located in the southwest portion of the state of Missouri.

Figure 3.6. United States Seismic Hazard Map



Source: United States Geological Survey at http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lg.jpghttps://earthquake.usgs.gov/hazards/hazmaps/conterminous/2014/images/HazardMap2014_lg.jpg

Severity/Magnitude/Extent

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

Richter Magnitude Scale

The Richter Magnitude Scale was developed in 1935 as a device to compare the size of earthquakes. The magnitude of an earthquake is measured using a logarithm of the maximum extent of waves recorded by seismographs. Adjustments are made to reflect the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, comparing a 5.3 and a 6.3 earthquake shows that the 6.3 quake is ten times bigger in magnitude. Each whole number increase in magnitude represents a tenfold increase in measured amplitude because of the logarithm. Each whole number step in the magnitude scale represents a release of approximately 31 times more energy.

Modified Mercalli Intensity Scale

The intensity of an earthquake is measured by the effect of the earthquake on the earth's surface. The

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

Previous Occurrences

Currently in Bates County, there has not been an earthquake that has registered high enough on the scale to be considered a threat. The current Missouri State Plan shows there have been 31 recorded 4.0 M or greater earthquakes on the New Madrid Fault Line in the last 43 years in Missouri.

Vulnerability Overview

Ground shaking is the most damaging effect from earthquakes. Ground shaking will impact all structures and critical infrastructure such as roads and electrical transmission systems. The greatest and most impactful earthquake risk to Bates County is the New Madrid fault in the boot-heel region of Missouri. A 7.6 magnitude earthquake would result in poorly built buildings damaged slightly; considerable quantities of dishes, glassware and windows are broken; people having trouble walking; pictures falling off walls; objects falling from shelves etc. Damage to structures will occur but will vary on the quality of construction. Some injuries may occur but fatalities are unlikely.

Potential Losses to Existing Development

Potential losses to existing development include the total exposure for all communities listed in Table 3.3 and Table 3.6 in the Assets at Risk section of this chapter. The total exposure of each jurisdiction was used to estimate losses due to a 7.6 earthquake along the New Madrid Fault. A damage factor of 0.5% was applied to each jurisdiction's total building and contents based on the expected impact for Zone VI on the modified Mercalli scale. **Table 3.19** depicts the estimated losses in each jurisdiction based on total exposure and a 0.5% damage factor.

Table 3.19. Estimated Potential Earthquake Losses

Jurisdiction	Potential Earthquake Losses
Bates County	$669,250.00
City of Amsterdam	$203,279.50
City of Butler	$7,697,129.00
City of Rich Hill	$3,749,724.00

Impact of Previous and Future Development

Previous development that may have been constructed without adherence to building codes may be at a greater risk of damage during an event. Future development is not expected to increase the risk other than contributing to the overall exposure of what could become damaged as a result of an event.

Hazard Summary by Jurisdiction

Earthquake intensity is not likely to vary greatly throughout the planning area, that the risk will be the same throughout. However, damages will differ if there are structural variations in the planning area

based on percentages of structures built prior to 1939. For example, if one community has a higher percentage of residences built prior to 1939 than the other jurisdictions, that community is likely to experience higher damages. **Table 3.20** shows the number and percentage of housing units built prior to 1939 or earlier.

Table 3.20. Percent of Housing Units Built in 1939 or Earlier

Jurisdiction	Built 1939 or earlier #	Built 1939 or earlier %
Bates County	1607	20.5
City of Amsterdam	27	23.1
City of Butler	422	20.8
City of Rich Hill	129	16.8

Source: https://factfinder.census.gov

School districts with facilities constructed prior to 1939 could suffer more damages than newer facilities, however, the majority of the currently utilized school facilities in the districts have been constructed after 1939 and are considered well-built structures and therefore, less vulnerable to potential ground shaking.

Problem Statement

Based on likely damage from a 7.6 magnitude earthquake along the New Madrid fault, older poorly built structures will suffer slight damage. The Village of Merwin has the highest percentage of houses built in 1939 or before. The Village of Passaic and the City of Amoret has the second highest percentage. These jurisdictions will likely experience the most damage to structures. Potential damages to future development can be mitigated by adopting and enforcing at least IBC 2012 building codes. Updating and enforcing building codes throughout Bates County would mitigate the impact on future development from an earthquake event.

3.4.4 Extreme Heat

Hazard Profile

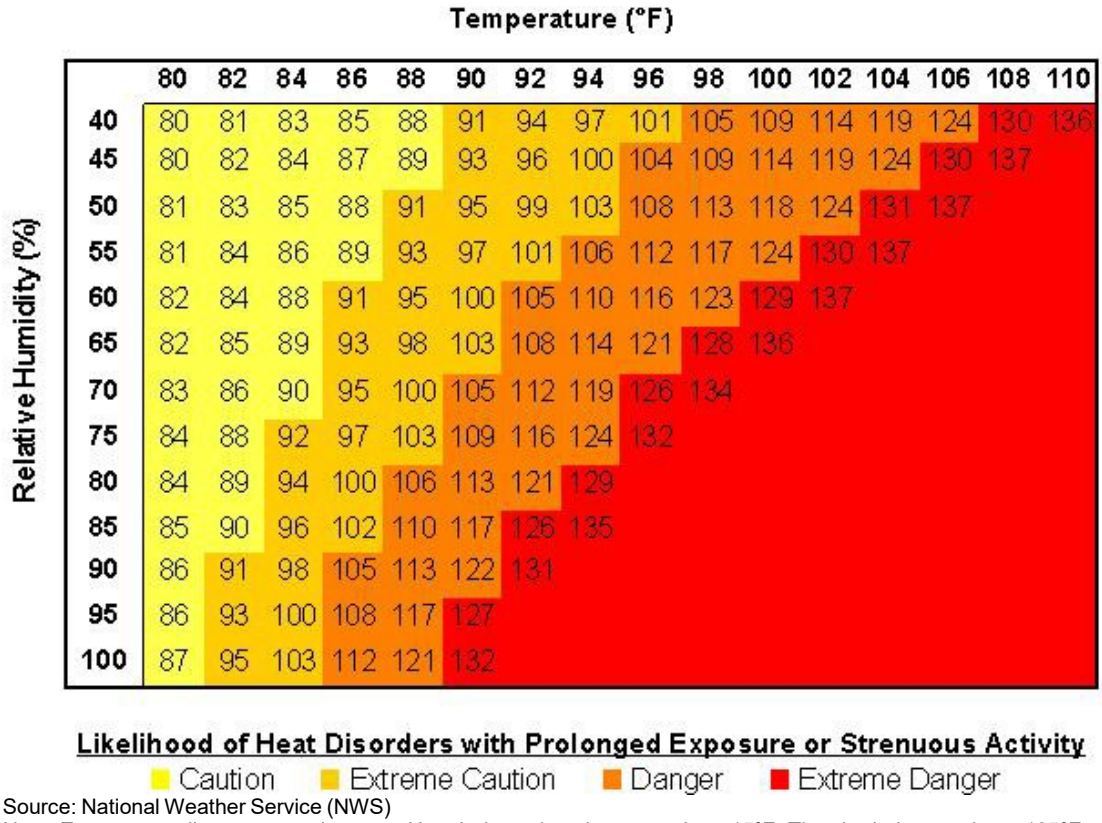
Some specific sources for this hazard are:

- National Centers for Environmental Information, Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
- Heat Index Chart & typical health impacts from heat, National Weather Service; National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml ;
- Daily temperatures averages and extremes, High Plains Regional Climate Summary, http://climod.unl.edu/ ;
- Hyperthermia mortality, Missouri; Missouri Department of Health and Senior Service, http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper1.pdf;
- Hyperthermia mortality by Geographic area, Missouri Department of Health and Senior Services,
- http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2.pdf;

Hazard Description

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. The remainder of this section profiles extreme heat. Extreme cold events are profiled in combination with Winter Storm in **Section 3.4.11.** According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. 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 3.7** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

Figure 3.7. 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 an area-wide hazard event, and that the risk of extreme heat does not vary across the planning area. Extreme heat can happen in Bates county during the hotter months and can happen anywhere within the county.

Severity/Magnitude/Extent

Extreme heat can cause stress to crops and animals. According to USDA Risk Management Agency, losses to insurable crops during the 10-year time period from 2005 to 2015 were $0. Extreme heat can also strain electricity delivery infrastructure overloaded during peak use of air conditioning during extreme heat events. Another type of infrastructure damage from extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

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

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

Table 3.21 lists typical symptoms and health impacts due to exposure to extreme heat.

Table 3.21. Typical Health Impacts of Extreme Heat

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

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

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

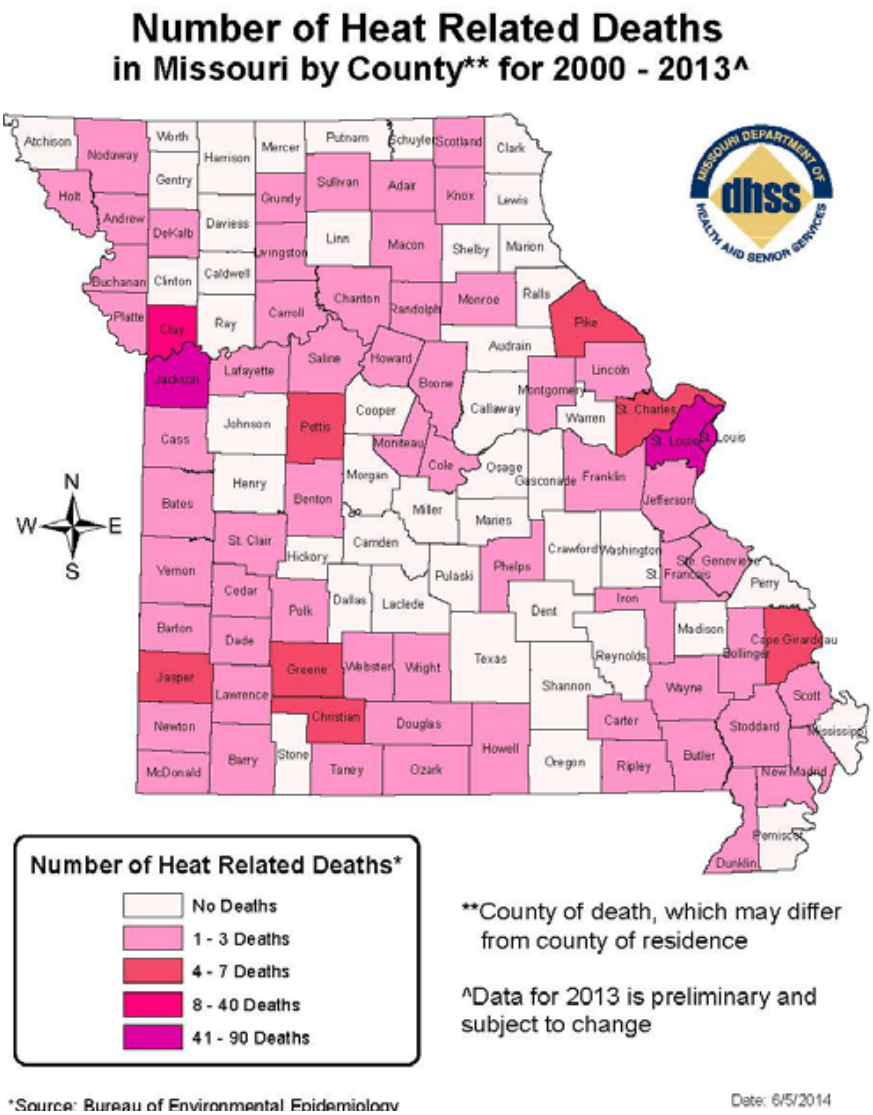
Previous Occurrences

There have been nine (9) heat related events in Bates County recorded in the National Centers for Environmental Information (NCEI) database from 1950 to 2018. There was one reported death in 1999 and no injuries or property and crop damage associated with these events in the NCEI data for Bates County. The event narratives describe fatalities that occurred during regional multi-county heat events for other nearby counties. Extreme heat events in Bates County were recorded in consecutive months in four consecutive years from 1999 to 2012.

1999- July & August
2000- August & September
2001- July & August
2012- June, July & August

Figure 3.8, is a map created by the Missouri Department of Health and Senior Services (DHSS) for heat related fatalities by county. The map indicates that there have been between one (1) and three (3) heat related fatalities in Bates County from 2000-2013.

Figure 3.8. Heat Related Deaths in Missouri 2000 - 2013



Probability of Future Occurrence

Bates County had a total of nine (9) heat related events in a thirteen (13) year span, the probability that an extreme heat event will occur in Bates County is 69% in any given year. Data limitations may exist, such as the fact that extreme heat events could be underreported in the NCEI.

Vulnerability

Vulnerability Overview

High humidity, which often accompanies heat in Missouri, can make the effects of heat even more harmful. 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. Consequently, the persistence of a heat wave increases the threat to public health. The people most at risk are children under five years of age

and adults over the age of 65, as well as people who work outdoors. The agriculture sector can also suffer crop loss during periods of extreme heat. Extreme heat may also cause buckling of roads.

Potential Losses to Existing Development

Based on the information in the 2013 Plan and DHSS, one to three heat related fatalities may occur within Bates County over the next 13 years.

Impact of Previous and Future Development

Population growth can result in increases in the age-groups that are most vulnerable to extreme heat. Population growth also increases the strain on electricity infrastructure, as more electricity is needed to accommodate the growing population. Bates County as a whole has experienced a small decrease in population since the 2010 census.

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 2013-2017 ACS 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 3.22** below summarizes vulnerable populations in the participating jurisdictions. Note that school are not included in the table because students are not customarily in these age groups.

Table 3.22. Bates County Population Under Age 5 and Over Age 65, 2013-2017 ACS Census Data

Jurisdiction	Population Under 5 yrs	Population 65 yrs and over
Bates County	964	3,104
City of Amsterdam	4	61
City of Butler	412	746
City of Rich Hill	94	279

Source: U.S. Census Bureau, (*) includes entire population of each city or county

All schools in the planning area have proper air-conditioning and all follow proper procedures in the event of extreme heat. However, daycare and eldercare facilities may be at risk of heat related injuries if facilities are not properly cooled.

Problem Statement

Older and younger segments of the population are more vulnerable to the impact of extreme heat. In addition, people living below the poverty level may be more vulnerable during periods of extreme heat due to a lack of air conditioning or utilities in their homes. Institutionalized populations, such as those living in nursing home, become more vulnerable to extreme heat due to power outages. The cities with nursing homes and daycare centers can increase the potential impact of extreme heat events.

3.4.5 Fires (Urban/Structural and Wild)

The specific sources for this hazard are:

- Missouri Department of Conversation Wildfire Data Search at http://mdc7.mdc.mo.gov/applications/FireReporting/Report.aspx
- Statistics, Missouri Division of Fire Safety;
- National Statistics, US Fire Administration;
- Fire/Rescue Mutual Aid Regions in Missouri;
- Forestry Division of the Missouri Dept. of Conservation;
- National Fire Incident Reporting System (NFIRS), http://dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.php http://www.dfs.dps.mo.gov/programs/resources/fire-incident-reporting-system.asp
- Firewise, www.firewise.org
- University of Wisconsin Slivis Lab, http://silvis.forest.wisc.edu/maps/wui/2010/download

Hazard Profile

Hazard Description

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

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

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

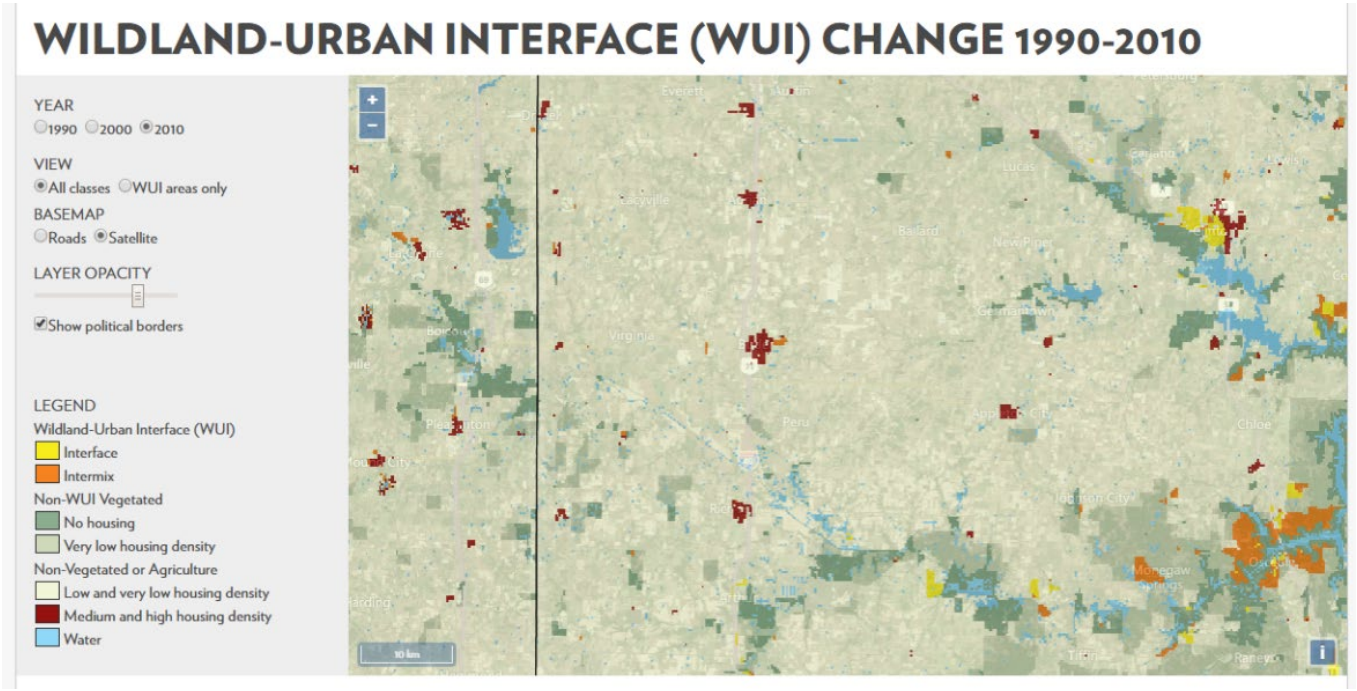
Most of Missouri fires occur during the spring season between February and May. The length and severity of both structural and wildland fires depend largely on weather conditions. Spring in Missouri is usually characterized by low humidity and high winds. These conditions result in higher fire danger.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

Geographic Location

Damages due to wildfires would be higher in communities with more wildland–urban interface (WUI) areas. The term 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. Each of the communities in Bates County have some risk of wildfire. The rural areas of Bates County are most at risk from wildfires. Debris burning is consistently the number one cause of wildfires in Missouri. Fires caused by lightening are rare despite 50 to 70 thunderstorm days per year.

Figure 3.9 shows the Wildland/Urban Intermix for Bates County.

Figure 3.9. Bates County Wildland/Urban Intermix



University of Wisconsin Slivis Lab, http://silvis.forest.wisc.edu/maps/wui/2010/download

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 Bates and shortleaf pine. However, Missouri does not have the extensive stands of evergreens found in the western US that fuel the large fire storms seen on television news stories.

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

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

Previous Occurrences

According to MDC Wildfire Data, there have been 3,398 wildfires reported in Missouri from 2005 to present. A total of 8,459 acres were affected as a result of these reported wildfires. Bates County has no reported wildfires report from January 2005 to present. Large and widespread wildfires, such as occur in the western United States, have not been a problem in Bates County in recent history. However, the Fire Districts in Bates County fight smaller wildfires/natural cover fires every year.

No schools in Bates County reported any fire incidents that impacted their facilities.

Probability of Future Occurrence

There was no reported wildfires in Bates County since 2005 according to the MDC. This equates to less than a 1% probability of wildfire events in Bates County in any given year.

Vulnerability

Vulnerability Overview

Wildfires in Bates County tend to be limited in their spatial extent thus minimizing their impact. According to the Missouri Department of Conservation, 49% of all wildfires in Missouri result from debris burning that gets out of hand and starts a wildfire. People and structures in the path of a wildfire are all at risk of minimum to extensive damage. Wildfires occur throughout wooded and open vegetation areas of Missouri. They can occur at any time of the year, but mostly occur during long, dry hot spells. Any small fire, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness or negligence. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion. Structures and people in WUI areas in Bates County are more vulnerable to the impact of wildfires due to the level of fuel mixed with structures.

Potential Losses to Existing Development

There have been no wildfires reported for Bates County since 2005. There have been no known historical losses to estimate future losses. Currently, there is not a reliable or accurate way to estimate costs associated with a wildfire event.

Impact of Previous and Future Development

It is anticipated that there will be future development in WUI areas throughout unincorporated areas of

the county. Future growth in WUI areas of the county will increase the risk and exposure to wildfires. It is expected that WUI development in cities will be mitigated by development regulations reducing the risk to wildfire hazard.

Hazard Summary by Jurisdiction

The rural areas of Bates County and the rural/urban interfaces are most at risk from wildfires. With school districts being located in the rural/urban interfaces they also are at a higher risk of wildfires. Debris burning is consistently the number one cause of wildfires in Missouri. Fires caused by lightning are rare despite 50 to 70 thunderstorm days per year.

Problem Statement

Wildfire occurrences are not frequent within Bates County. Although, these events can destroy, damage and threaten structures in hazard prone areas. Populations and structures in WUI areas of the county have an increased risk to wildfires due to the level of fuel mixed with structures. Cities that have building codes or design requirements may also encourage non-combustible materials for new construction.

The unincorporated part of the county has the highest risk and exposure to wildfires. County officials and the fire department can promote fire resistant construction materials and landscape design techniques to mitigate the risk to wildfire in future development. Information about these materials and techniques are included in the MDC publication, *Living with Wildfire.* Including this information in education and awareness programs for the public may potentially mitigate wildfire damage in the county.

3.4.6 Flooding (Flash and River)

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

A flood is partial or complete inundation of normally dry land areas. Riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt, or ice. There are several types of riverine floods, including headwater, backwater, interior drainage, and flash

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

Flooding caused by dam and levee failure is discussed in Section 3.4.1 and Section 3.4.8 respectively. It will not be addressed in this section.

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

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

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

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

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

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

Geographic Location

Riverine flooding is most likely to occur in Special Flood Hazard Areas (SFHAs) where the 100-year floodplain has been mapped. The entire planning is at high risk of riverine flooding. Bates County residents, structures, and infrastructure lying in or near the Sac River Floodplain are all vulnerable to the effects of a major flood. All public school district structures in Bates County are vulnerable to the effects of this hazard. While ravine flooding does not pose a direct threat to educational and other

jurisdictions there is a low, indirect threat to access of structures and to populations during times of flash flooding. Other structures not within designated floodplains are also vulnerable to the effects of flash flooding brought on by storm water or sheet flooding. The Flood Insurance Rate Map (FIRM) for Bates County shows the flood zones for this jurisdiction at greater risk. **Figure 3.10** through **3.13** are mapped SFHAs for communities and unincorporated areas in Bates County. According to the NCEI storm event data from 1996 to May 2018, there were 23 total events; 18 flash flood events and 5 flood events reported in Bates County.

Figure 3.10. Bates County Flood Zone

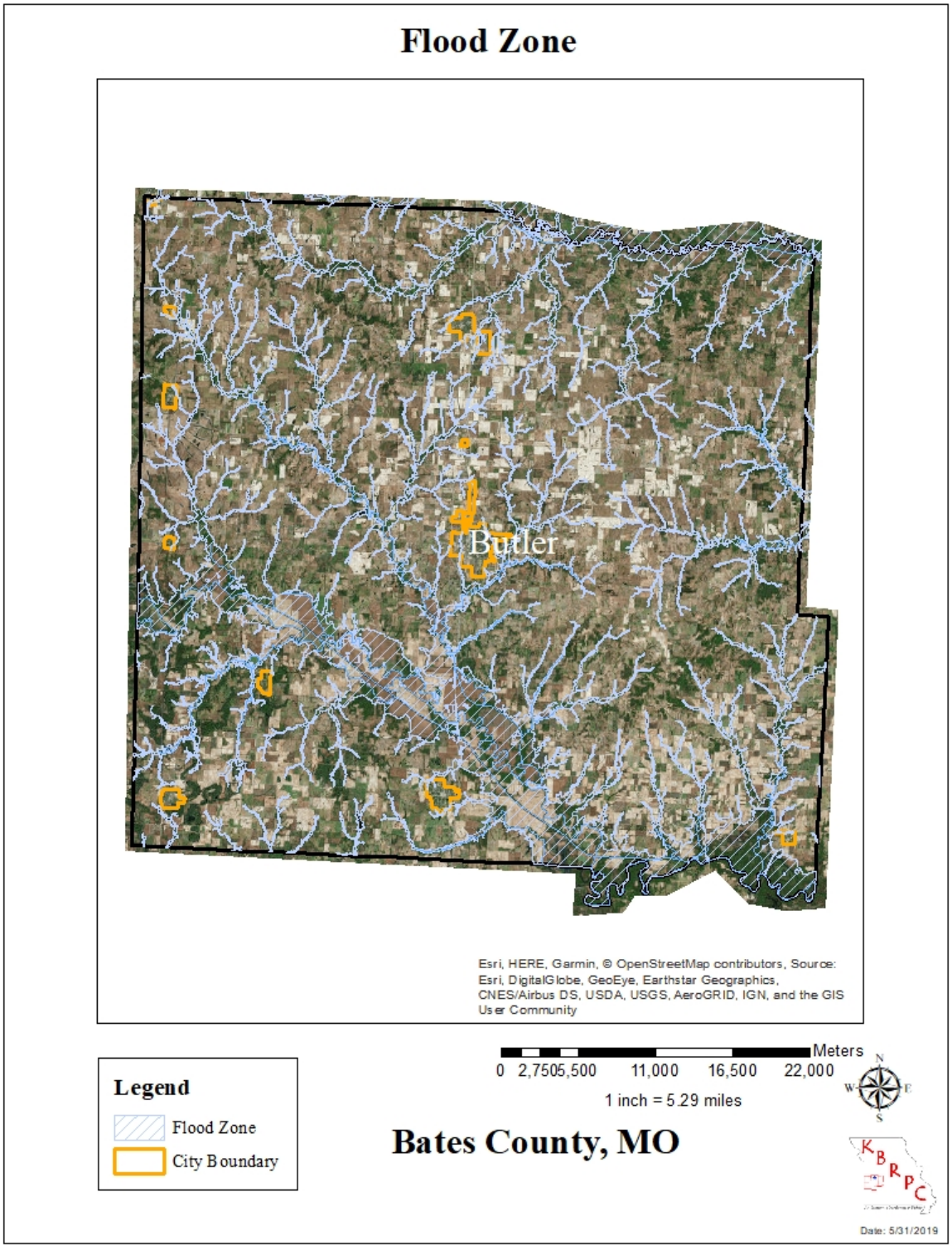


Figure 3.11. Amsterdam Flood Map

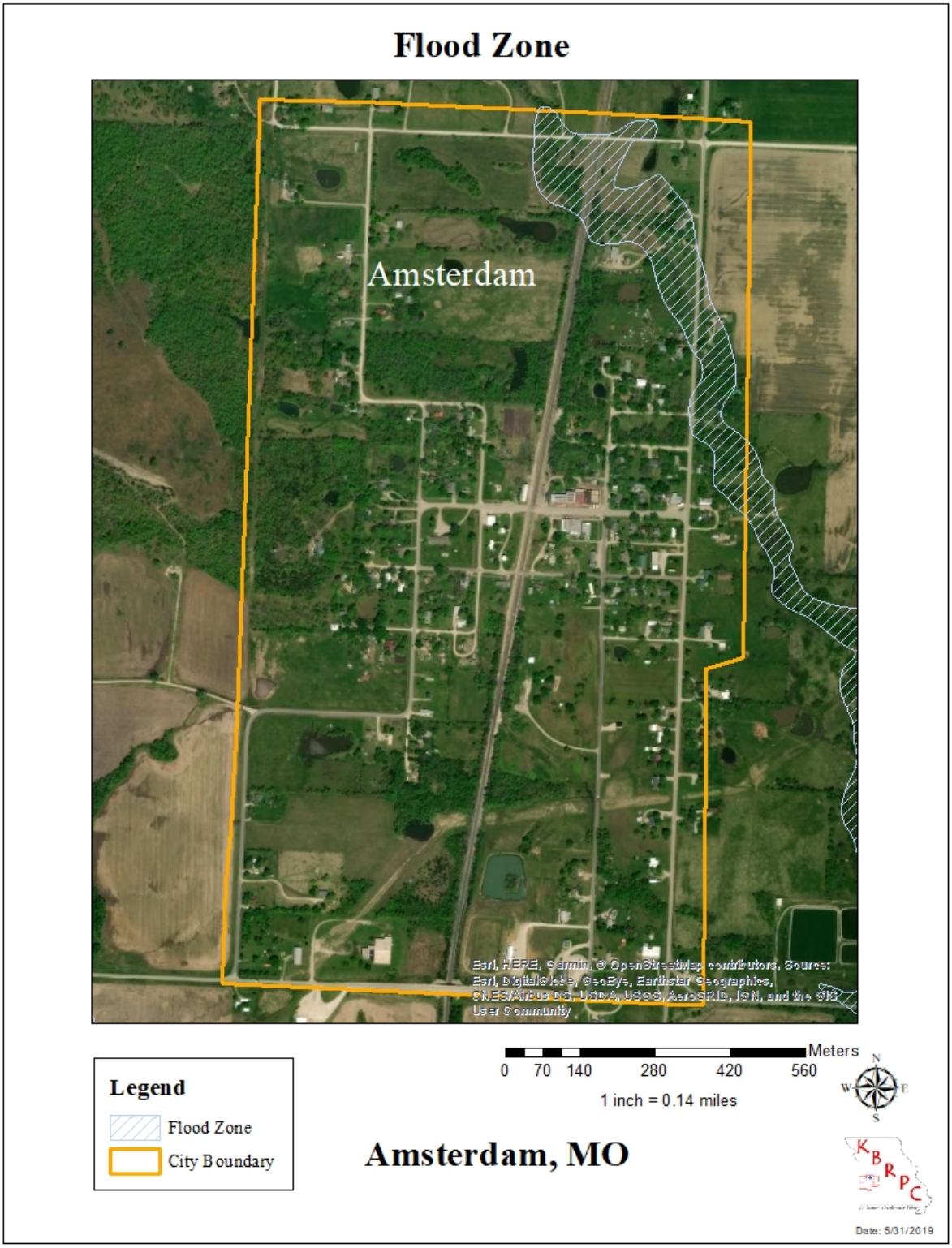


Figure 3.12. Butler Flood Map with Zones

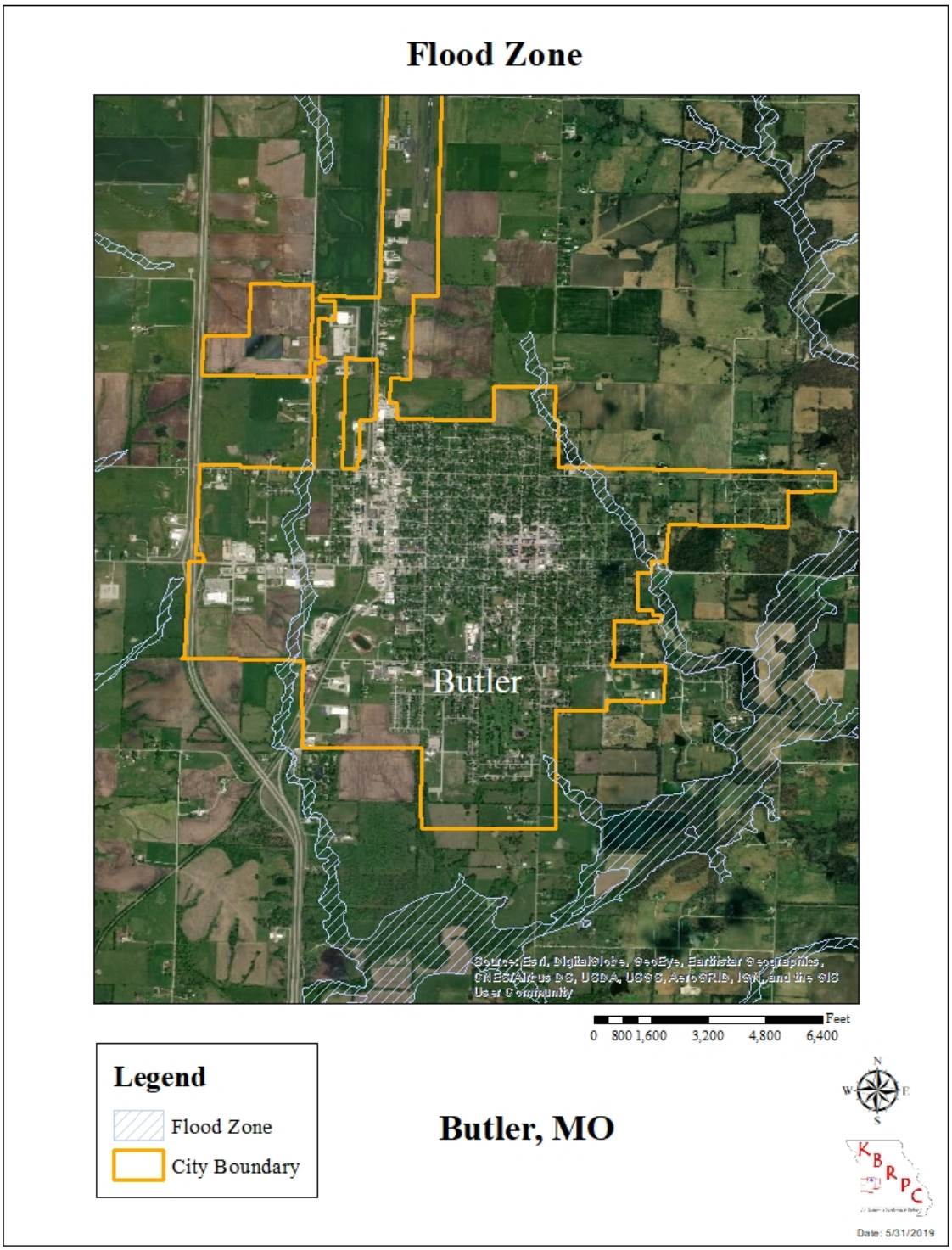
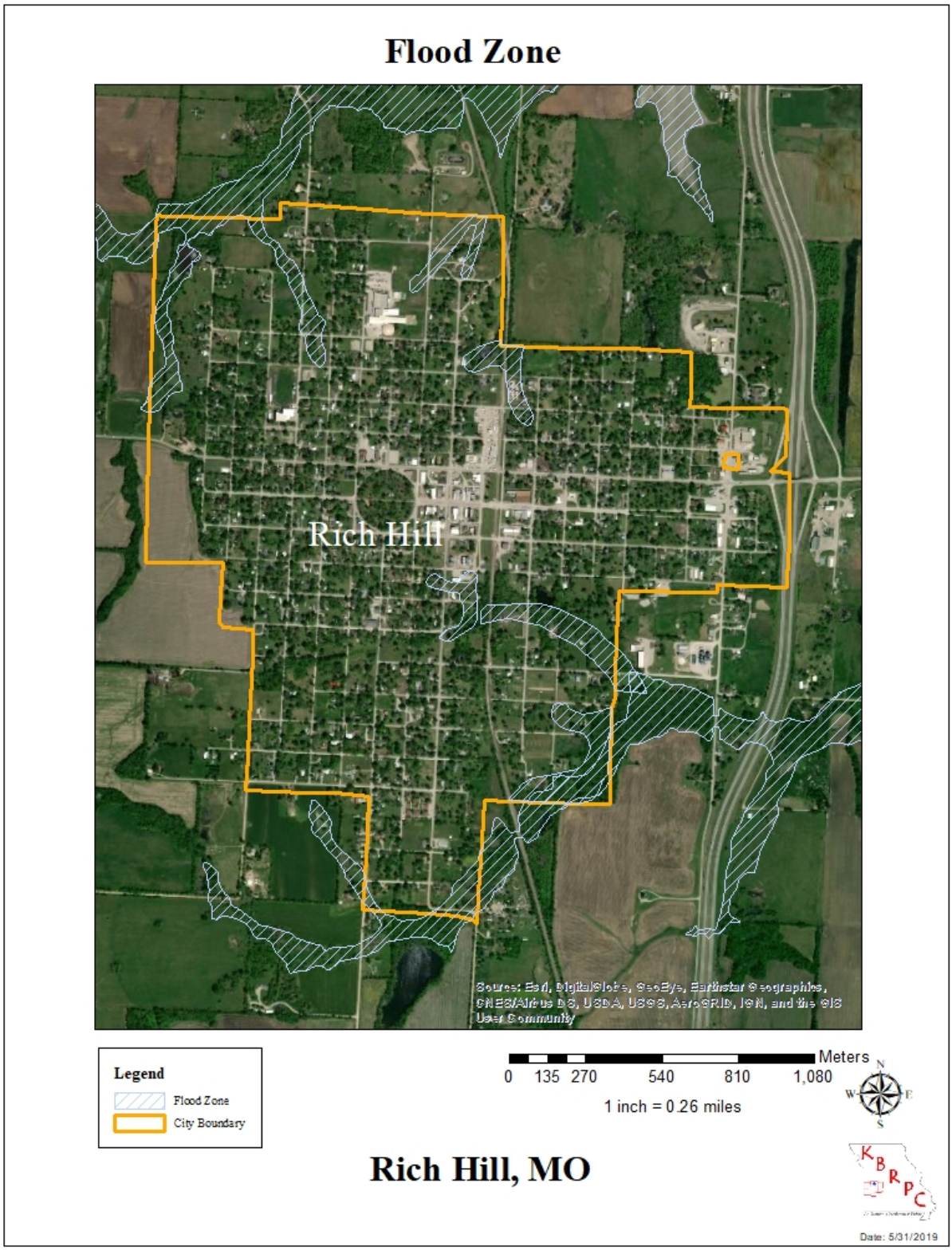


Figure 3.13. Rich Hill Flood Map



Flash flooding events pose the most pervasive hazard of the two flood types in the county. Flash flooding occurs in the floodplain while low-lying areas in all jurisdictions are susceptible to flash floods outside of the 100-year floodplain. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. A review of NCEI storm even database determined which jurisdictions are most prone to flooding and flash flooding from 1996 to May 2018 and are shown in **Table 3.23**

Table 3.23. Bates County NCEI Flood Events by Location, 1996-2018

Location	# of Events
Unincorporated Bates County	7
City of Amsterdam	1
City of Butler	8
City of Rich Hill	1

Source: NCEI

The NCEI storm event data lists flash flood events according to the nearest community or place. Most of these events cover larger areas than the smaller geographic areas reported in the data. Some specific locations are listed within the narratives for flash flood events. Where specific roads and locations are listed they are provided in the table. Although some events may not be inside the corporate limits of the community identified in the narrative, they are in such proximity that the community named would be the most affected by impassible roads. It is safe to assume that numerous low water crossings would be impacted by heavy rains that exacerbate flash flooding across the county. In addition, multiple records are related to the same event and vice versa.

Severity/Magnitude/Extent

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

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

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

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

National Flood Insurance Program (NFIP) Participation

Table 3.24 provides details on NFIP participation for the communities in Bates County. **Table 3.25** provides the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction, where applicable.

Table 3.24. NFIP Participation in Bates County

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	Regular-Emergency Program Entry Date
290786	Bates County	Y	5/3/2010 (M)	3/1/01
290749	City of Adrian	Y	5/3/2010 (M)	8/19/85
290026	City of Butler	Y	5/3/2010 (M)	9/4/85
290628	City of Amsterdam	N	5/3/2010 (M)	5/3/11-S
290655	City of Rich Hill	N	5/3/2010 (M)	2/14/76-S

Source: NFIP Community Status Book, 6/4/2019; 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 3.25. NFIP Policy and Claim Statistics as of January 2018

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Bates County	11	$1,644,400.00	9	$373,962.70
City of Adrian	1	$210,000.00	0	0
City of Butler	2	$405,000.00	10	$228,239.73

Source: NFIP Community Status Book, [6/3/2019]; BureauNet, http://bsa.nfipstat.fema.gov/reports/reports.html; *Closed Losses are those flood insurance claims that resulted in payment. Loss statistics are for the period from January 1, 1978 to January 1, 2019.

Two of the communities in Bates County have received payments.

Repetitive Loss/Severe Repetitive Loss Properties

Repetitive Loss Properties are those for which two or more losses of at least $1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978. According to the Flood Insurance Administration, jurisdictions included in the planning area have a combined total of 8 losses.

Table 3.26 provides a summary of the repetitive loss properties in Bates County.

Table 3.26. Bates County Repetitive Loss Properties

Jurisdiction	# of Propertie	Type of Property	# Mitigated	Building Payments	Content Payments	Total Payments	Average Payment	# of Loss
Bates County	3	Residential	0	$120,471.83	$145,413.55	$265,884.83	$86,462.83	8

Source: Flood Insurance Administration as of 1/31/2018

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

Previous Occurrences

According to the NCEI storm event data, there were 23 flood events recorded in Bates County from 1996 to 2018. None of these events resulted in property damage. The most recent damaging event occurred in May of 2018 when several rounds of severe thunderstorms occurred across southwest Missouri. **Table 3.27** summarizes flood events by year from 1996 to 2018 in Bates County.

Table 3.27. NCEI Bates County Flash Flood Events Summary, 1996 to 2018

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	1	0	0	0	0
2005	2	0	0	0	0
2006	1	0	0	0	0
2007	8	0	0	0	0
2009	1	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	1	0	0	0	0
2014	0	0	0	0	0
2015	3	0	0	0	0
2016	0	0	0	0	0
2017	1	0	0	0	0

Source: NCEI, data accessed 06/03/2019

Table 3.28. NCEI Bates County Riverine Flood Events Summary, 1996 to 2018

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
2008	1	0	0	0	0
2017	3	0	0	0	0
2018	1	0	0	0	0

Source: NCEI, data accessed 06/03/2019

Probability of Future Occurrence

There have been a total of 23 reported flood events in Bates County from 1996 to 2018 in the NCEI storm event database. Of those, 18 were flash floods. From 1996-2018, there were fourteen years; 1996-2003, 2005, 2010-2012, 2014, and 2016 with no reported flash flood events. This means that there is a 39.1% probability that there will be a flash flood in any given year, with an average of almost 3 (2.5) per year. Of the 23 events, 0 resulted in property damages.

Vulnerability

Vulnerability Overview

Flooding has been included in most of the presidential disaster declarations that have included Bates

County. Periods of heavy rain falling at the rate of one inch per hour floods low water crossings throughout the county making many roads impassable. This creates a severe threat to motorists that attempt to drive through flood waters over the roadway. Riverine flooding occurs less frequently than flash flooding and there are three repetitive loss properties in the county; however, property damage is still likely to occur to non-SRL properties. Areas in low lying areas outside of the floodplain may also be frequently flooded. Flooding of streets has been reported in several of the communities and many highways are frequently being flooded. Increases in development add to surface runoff and can exacerbate flash flooding in areas that previously have not experienced flooding.

Potential Losses to Existing Development

Bates County residents, structures, and infrastructure lying in or near the Sac River Floodplain are all vulnerable to the effects of a major flood. All public school district structures in Bates County are vulnerable to the effects of this hazard. While ravine flooding does not pose a direct threat to educational and other jurisdictions there is a low, indirect threat to access of structures and to populations during times of flash flooding. Other structures not within designated floodplains are also vulnerable to the effects of flash flooding brought on by storm water or sheet flooding. There are no school district buildings located in the SFHA. There is no heightened risk to school district facilities due to flood as no facilities are located inside the SFHA.

Table 3.28 estimates the number of buildings (by occupancy) that are likely to be impacted by a 100-year flood event.

Table 3.29. Number of buildings (by occupancy) likely to be impacted by a 100-year flood event

County	Countywide Building Exposure	Structural Damage	Loss Ratio	Contents Loss	Inventory Loss
Bates	$1,650,150,000	$16,291,000	0.99%	$10,483,000	$586,000

Total Direct Loss	Total Income loss	Total Direct and Income Loss	# MSDIS Residential Structures Exposed	# Hazus Bldgs Risk	#Substantially damaged
$27,360,000	$41,000	$27,401,000	21	36	4

# Displaced People	# Shelter Needs
742	82

Impact of Previous and Future Development

Impact of previous and future development is directly related to floodplain management and regulations set forth by the county and individual communities. Currently, there is no knowledge of any future development by any public school districts that would be vulnerable to this hazard.

Hazard Summary by Jurisdiction

Bates County is more vulnerable to flooding, than other hazards. Once the rivers and lakes are full, locals can expect to see streams and other small tributaries backup. The entire planning area is at

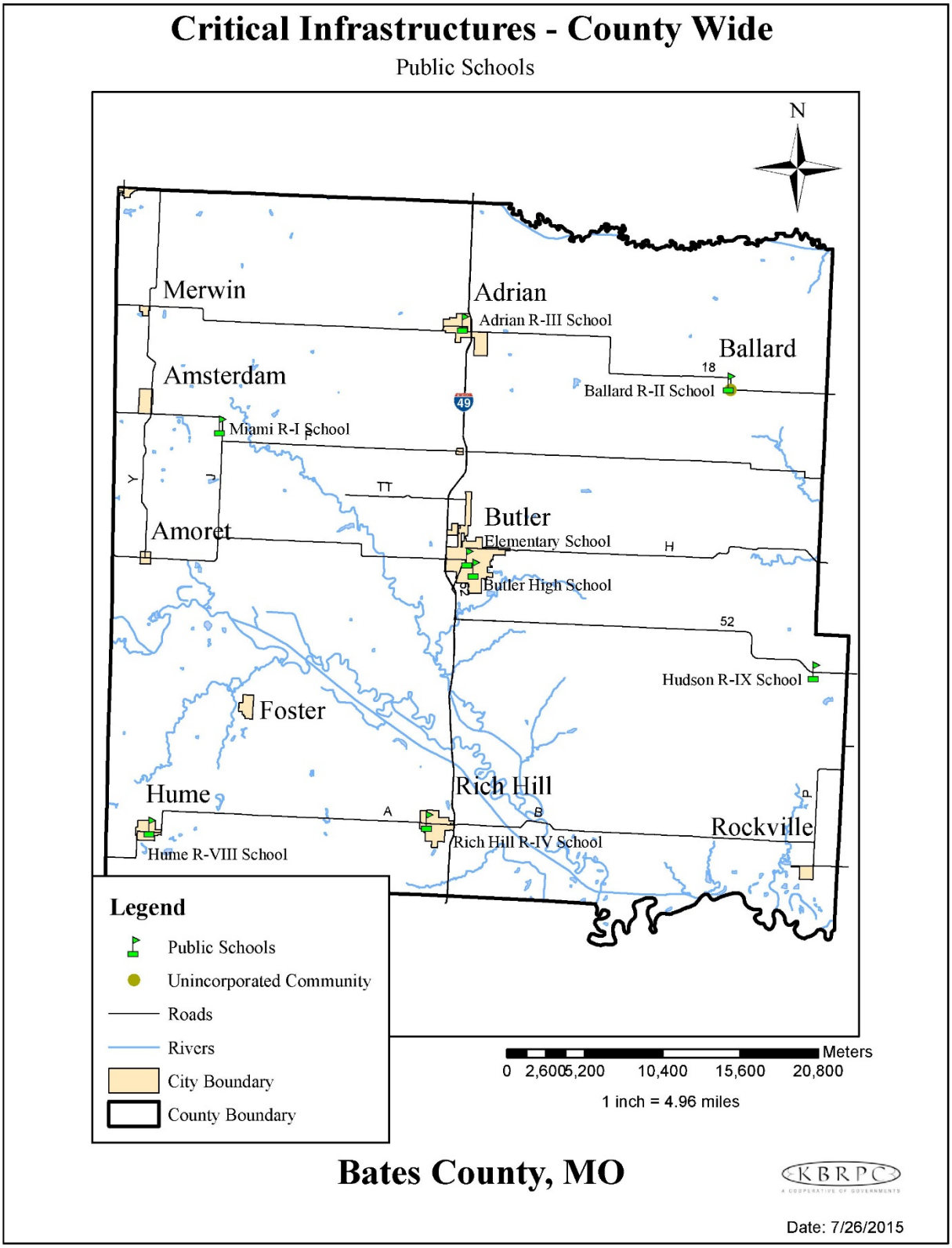
high risk from ravine and levee flooding not just Bates County. If levees break up river or flash flooding occurs, there could be damages to roads, crops, culvert, and property. The Flood Insurance Rate Map (FIRM) for Bates County Shows the flood zones for this jurisdiction at greater risk.

Problem Statement

Floods are frequent events and have been listed in the presidential disaster declarations that have included Bates County. Bates County is a participant in the NFIP along with the jurisdictions of City of Adrian and the City of Butler. These communities have passed floodplain management ordinances and have the ability to substantially regulate development in the floodplain. The City of Amsterdam and the City of Rich Hill are currently NFIP-sanctioned for non-participation in the NFIP. The two communities do not participate due to lack of funding to provide staff and resources, as well as the belief that is not politically acceptable to regulate others land. The lack of funding to employ a staff member deters these communities from participation in the NFIP. Financial assistance for acquisition or construction purposes, including, in some cases, Federal disaster assistance, may not be available in those areas. Participation in the NFIP enables residents to purchase flood insurance. Street flooding in incorporated areas can be addressed through storm water management projects and enforce storm water management regulations.

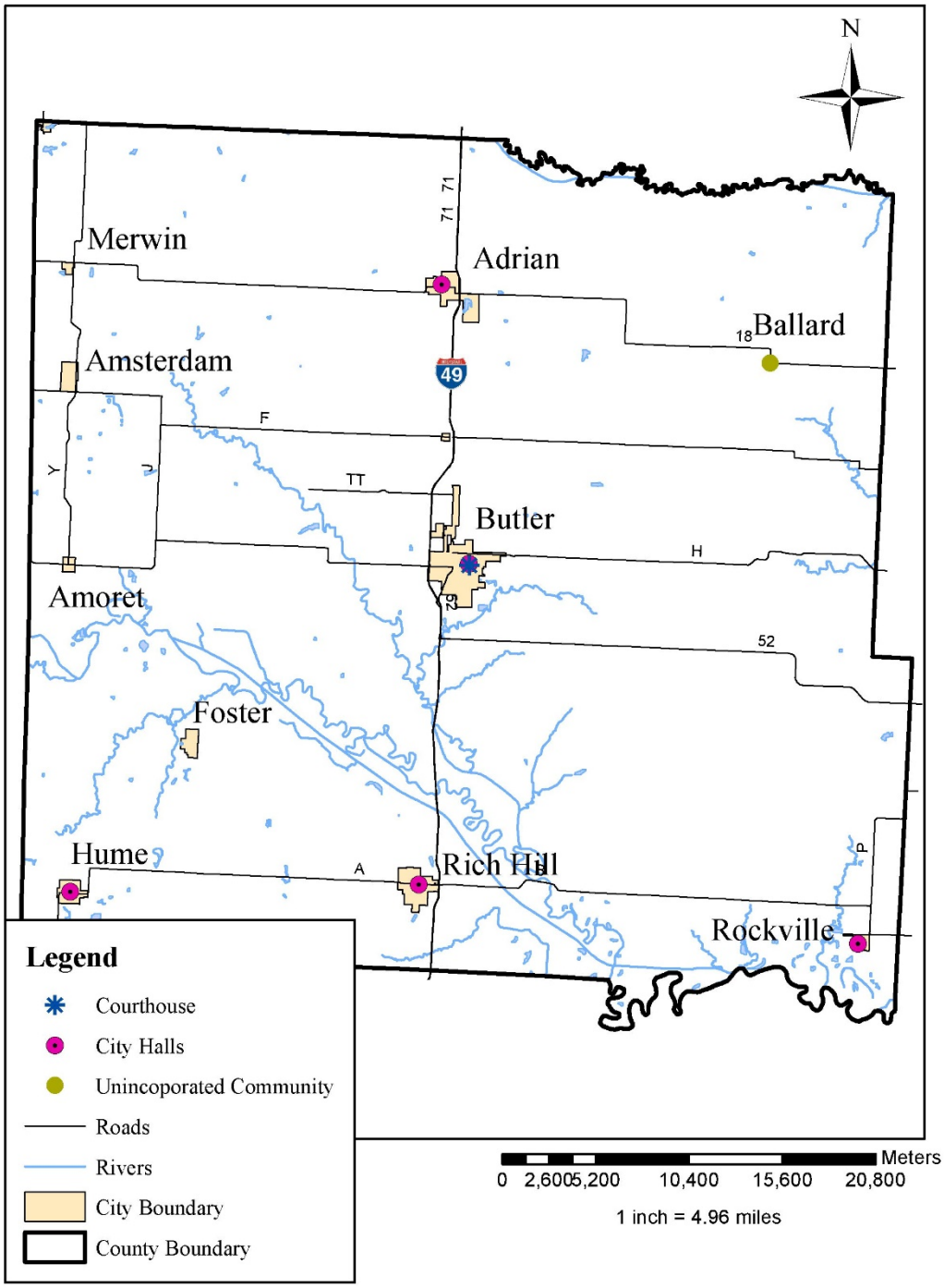
To reduce the damage of floods to infrastructure and human life, several strategies can be implemented, such as hazard awareness programs and waterway maintenance. Additionally, based on survey responses, additional education on the value of flood insurance may be necessary. Signage of flood prone areas should also be maintained and made visible to everyone. Projects involving the improvements to river/stream embankments can also reduce flooding to surrounding areas. The area would benefit greatly by updating or developing a storm water management plan as well as adding or upgrading low-water crossing signs.

Although the Bates County area has been declining in growth since 2010 continued floodplain mapping is beneficial to the area by keeping businesses and citizens informed to where floodplains are located and any potential changes. New businesses or existing businesses who want expand will want the most accurate and current data available. Any new construction whether industrial, agricultural or personal requires this kind of information. This will help further economic development in these areas by showing the best areas for citizens and investors to build.


Critical Infrastructures - County Wide
Public Schools
N
Merwin
Adrian
Adrian R-III School
Ballard
Amsterdam
Ballard R-II School
Miami R-I School
Butler
Amoret
Elementary School
Butler High School
Hudson R-IX School
Foster
Hume
Rich Hill
Rockville
Hume R-VIII School
Rich Hill R-IV School
Legend
Public Schools
Unincorporated Community
Roads
Rivers
City Boundary
County Boundary
Meters
0 2,600 5,200 10,400 15,600 20,800
1 inch = 4.96 miles
Bates County, MO
KBRPC
Date: 7/26/2015

Critical Infrastructures - County Wide

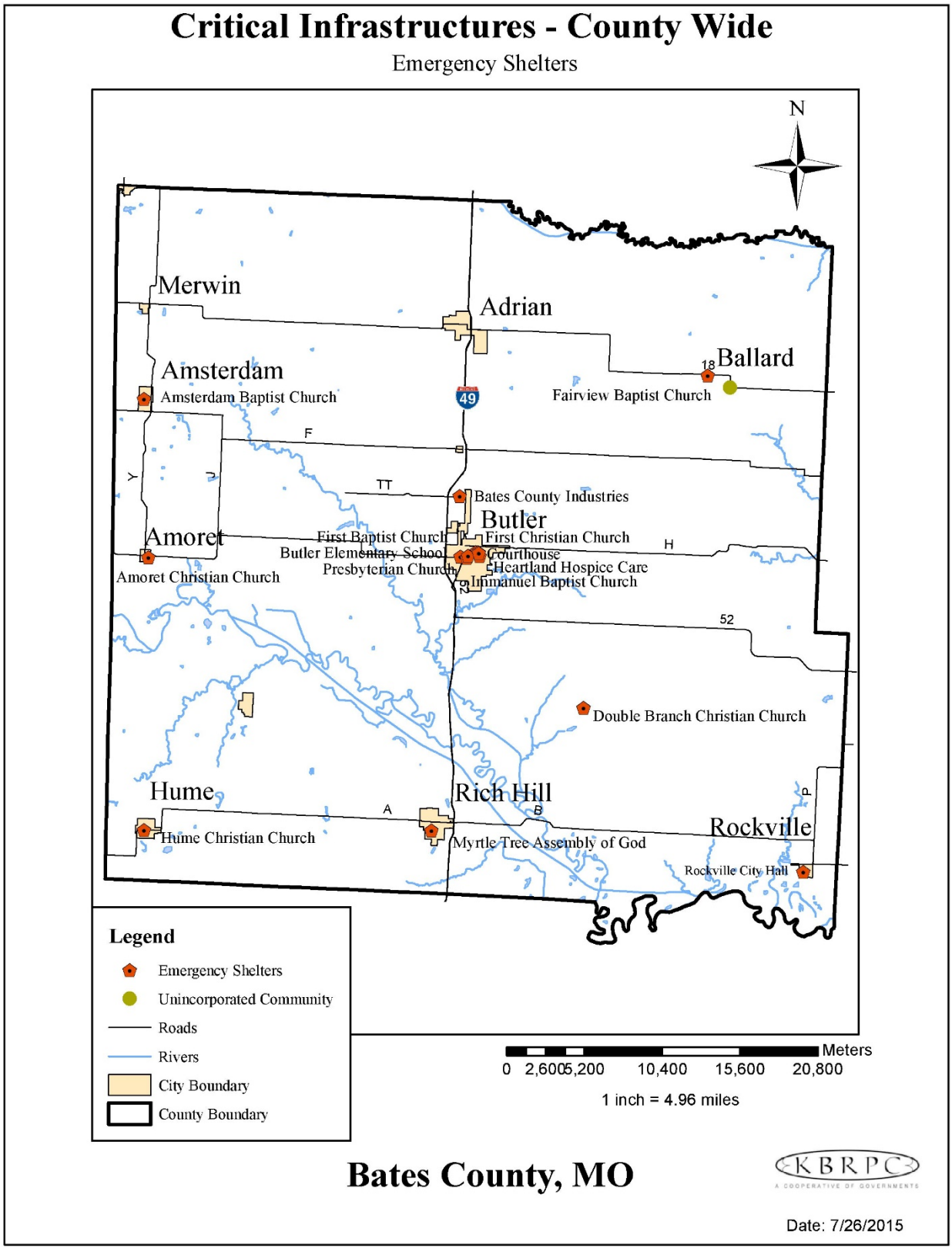
Government Buildings



Bates County, MO

KBRPC
A COOPERATIVE OF GOVERNMENTS

Date: 8/14/2015


Critical Infrastructures - County Wide
Emergency Shelters
N
Merwin
Adrian
Amsterdam
Amsterdam Baptist Church
Ballard
Fairview Baptist Church
49
18
F
TT
Bates County Industries
Butler
Amoret
First Baptist Church
First Christian Church
Butler Elementary School
Courthouse
Presbyterian Church
Heartland Hospice Care
Immanuel Baptist Church
Amoret Christian Church
H
52
Double Branch Christian Church
Hume
Rich Hill
Rockville
Hume Christian Church
Myrtle Tree Assembly of God
Rockville City Hall
A
B
Legend
Emergency Shelters
Unincorporated Community
Roads
Rivers
City Boundary
County Boundary
Meters
0 2,600 5,200 10,400 15,600 20,800
1 inch = 4.96 miles
Bates County, MO
KBRPC
A COOPERATIVE OF GOVERNMENTS
Date: 7/26/2015

3.4.7 Land Subsidence/Sinkholes

Some sources for land subsidence/ sinkholes are:

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

Hazard Profile

Hazard Description

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

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

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

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

There are no mining activities that have occurred in the planning area.

Geographic Location

The current Missouri State Plan shows that Bates County has 181 sinkholes. Bates County currently

only has 0 recorded sinkholes and 181 mines. The following map shows the sinkhole locations in Missouri.

Figure 3.20

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 current State Plan included only seven documented sinkholes “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

A comment in the current State Plan states that sinkholes are a regular occurrence in Missouri, but that they are rarely are the events of any significance. On page 3.225 and 3.226 of the state plan are some

notable events. Bates County currently only has 0 recorded sinkholes and 181 mines.

Probability of Future Occurrence

Sinkhole incidents are not tracked by the NCEI, and MDNR data was unavailable, so it is difficult to calculate a future probability of occurrence. However, there is a moderate probability, in any given year, that there may be new sinkholes in Bates County in the years to come.

Vulnerability

Vulnerability Overview

There are no significant sinkhole reports with in Bates County.

Potential Losses to Existing Development

Currently there is no threat of potential loss to existing development in Bates county from a sinkhole.

Impact of Previous and Future Development

Future development over abandoned mines and in areas of known risk to sinkhole formation in Bates County will increase vulnerability to this hazard. Population and development in these areas will increase exposure to sinkhole occurrence. There are currently no regulations prohibiting construction over or near known sinkholes. Future development may also change storm runoff patterns and cause expansion or formation of sinkholes.

Hazard Summary by Jurisdiction

According to the current Missouri State Plan, page 3.228, Bates County has a low-medium rating value for sinkholes. The risk of sinkhole damage for individual communities and school districts is limited to the amount of exposure of builds and infrastructure. There are no recorded reports of significant sinkholes or damage caused by sinkholes, with in Bates County.

Problem Statement

There is currently low to moderate risk of sinkholes or sinkhole events in Bates county, because of the no previously recorded sinkhole events within the county. There are no strategies to plan for sinkhole incidents within Bates county.

Sinkhole formation in urban areas compared to rural areas has the potential to be expedited due to human interaction with the subsurface through construction of facilities and infrastructure. Natural drainage patterns are altered, which can increase water volume and flow to areas more susceptible to sinkhole formation, thus increasing the potential for mobilization of sediment in the subsurface or increasing amount of dissolution of the underlying bedrock. A secondary problem that can arise once sinkhole formation has already occurred is flooding. During periods of excessive rainfall in the watershed of an existing sinkhole can cause water levels to rise faster than it can infiltrate into the ground through the soil of the sinkhole. When this happens, water can temporarily "back-up" to fill the sinkhole and may even "spill-over" into surrounding low-lying areas. In some cases, homes with "walk- out" basements are built along the sides of a sinkhole and, in those cases, the walk-out basement may become the low-lying "spill-over" area.

It is likely that more sinkholes will occur as development increases within the county. Sinkholes can

be remediated with fill material. Once a sinkhole has been remediated, building should be prohibited at the site. Existing sinkholes can expand if surface runoff erodes the edges of the sinkhole. Storm water; runoff should be diverted away from known sinkholes. Jurisdictions may adopt regulations prohibiting construction at least 30 feet from known sinkholes. Information about identifying potential sinkhole formation and promoting Missouri FAIR plan sinkhole insurance can be included in public outreach and hazard awareness programs. Undeveloped land that is in a sinkhole risk area can be used for park space or other recreational purposes.

3.4.8 Levee Failure

Some sources of data for this hazard include:

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

Hazard Profile

Hazard Description

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

Levees can be small agricultural levees that protect farmland from high-frequency flooding. Levees can also be larger, designed to protect people and property in larger urban areas from less frequent flooding events such as the 100-year and 500-year flood levels. For purposes of this discussion, levee failure will refer to both overtopping and breach as defined in FEMA's Publication "So You Live Behind a Levee" (http://content.asce.org/ASCELeveeGuide.html http://mrcc.isws.illinois.edu/1913Flood/awareness/materials/SoYouLiveBehindLevee.pdf). Following are the FEMA publication descriptions of different kinds of levee failure.

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

Earthen levees can be damaged in several ways. For instance, strong river currents and waves can erode the surface. Debris and ice carried by floodwaters—and even large objects such as boats or barges—can collide with and gouge the levee. Trees growing on a levee can blow over, leaving a hole where the root wad and soil used to be. Burrowing animals can create holes that enable water to pass

through a levee. If severe enough, any of these situations can lead to a zone of weakness that could cause a levee breach. In seismically active areas, earthquakes and ground shaking can cause a loss of soil strength, weakening a levee and possibly resulting in failure. Seismic activity can also cause levees to slide or slump, both of which can lead to failure.

Geographic Location

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

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

It is likely that agricultural levees and other non-regulated levees within the planning area exist that are not inventoried or inspected. These levees that are not designed to provide protection from the 1-percent annual chance flood would overtop or fail in the 1-percent annual chance flood scenario. Therefore, any associated losses would be taken into account in the loss estimates provided in the Flood Hazard Section.

Severity/Magnitude/Extent

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

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

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

The USACE now conducts two types of levee inspections. Routine Inspection is a visual inspection to verify and rate levee system operation and maintenance. It is typically conducted each year for all

levees in the USACE Levee Safety Program. Periodic Inspection is a comprehensive inspection led by a professional engineer and conducted by a USACE multidisciplinary team that includes the levee sponsor. The USACE typically conducts this inspection every five years on the federally authorized levees in the USACE Levee Safety Program.

Both Routine and Periodic Inspections result in a rating for operation and maintenance. Each levee segment receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or Unacceptable. Figure 3.21 below defines the three ratings.

Figure 3.14. Definitions of the Three Levee System Ratings

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

Previous Occurrences

There have been no previous occurrences in Bates County.

Probability of Future Occurrence

There are no records of previous events in Bates County so the probability of future occurrence cannot be calculated.

Vulnerability

Vulnerability Overview

There is no chance for Bates county to be vulnerable because there are no recorded levees located within the county.

Potential Losses to Existing Development

There is no chance for Bates county to incur potential losses to existing development because there are no recorded levees located within the county.

Impact of Previous and Future Development

There will be no impact on future development within Bates county because there are no recorded levees located within Bates county.

Hazard Summary by Jurisdiction

There are no communities with levee protected areas because there are no recorded levees located within Bates county.

Problem Statement

There is currently no risk from levee breaches or levee failure events in Bates county because the county does not have any recorded levees within the county. There are no strategies to plan for levee breach incidents within Bates county.

3.4.9 Thunderstorm/High Winds/Lightning/Hail

Some Specific Sources for this hazard are:

- FEMA 320, Taking Shelter from the Storm, 3rd edition, http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf
- Lightning Map, National Weather Service, http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx
- Death and injury statistics from lightning strikes, National Weather Service.
- Wind Zones in the U.S. map, FEMA, https://www.fema.gov/pdf/library/ism2_s1.pdf ;
- Annual Windstorm Probability (65+knots) map U.S. 1980-1994, NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif
- Hailstorm intensity scale, The Tornado and Storm Research Organization (TORRO), http://www.torro.org.uk/site/hscale.php;
- NCEI data;
- USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/data/cause
- National Severe Storms Laboratory – hail map, http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif

Hazard Profile

Hazard Description

Thunderstorms

A thunderstorm is defined as a storm that contains lightning and thunder which is caused by unstable atmospheric conditions. When cold upper air sinks and warm moist air rises, storm clouds or 'thunderheads' develop resulting in thunderstorms. This can occur singularly, as well as in clusters or lines. The National Weather Service defines a thunderstorm as "severe" if it includes hail that is one inch or more, or wind gusts that are at 58 miles per hour or higher. At any given moment across the world, there are about 1,800 thunderstorms occurring. Severe thunderstorms most often occur in Missouri in the spring and summer, during the afternoon and evenings, but can occur at any time. Other hazards associated with thunderstorms are heavy rains resulting in flooding (discussed separately in **Section 3.4.6**) and tornadoes (discussed separately in **Section 3.4.10**).

High Winds

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

Lightning

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

Hail

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

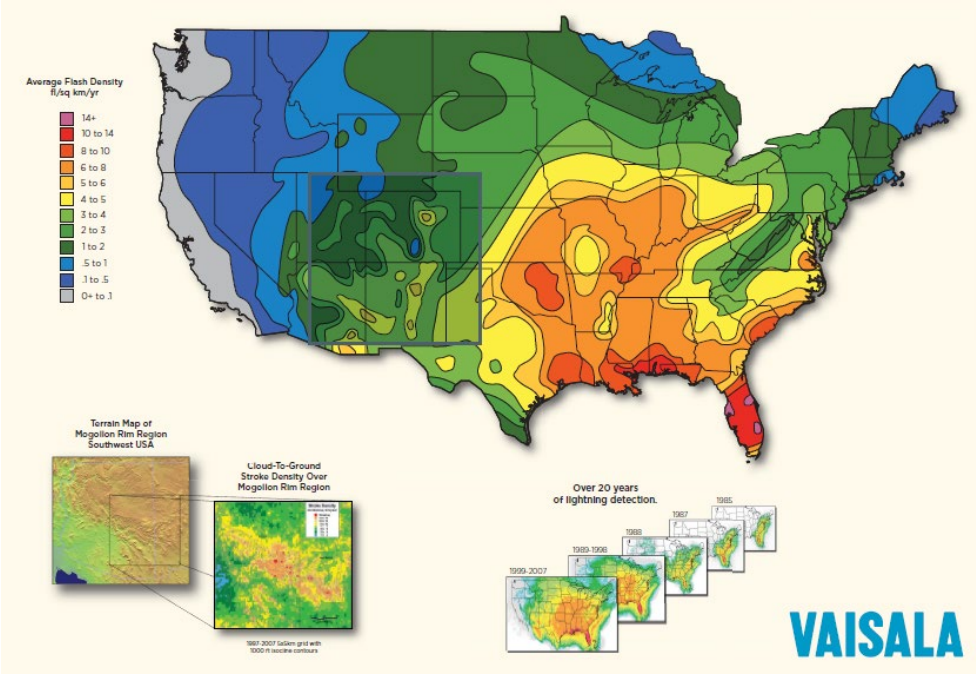
At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 miles per hour, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest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

Geographic Location

Thunderstorms/high winds/hail/lightning events are an area-wide hazard that can happen anywhere in the county. Although these events occur similarly throughout the planning area, they are more frequently reported in more urbanized areas. In addition, damages are more likely to occur in more densely developed urban areas.

Figure 3.15 shows lightning frequency in the state. Bates County lies in the 5-6 flash density zone in the map.

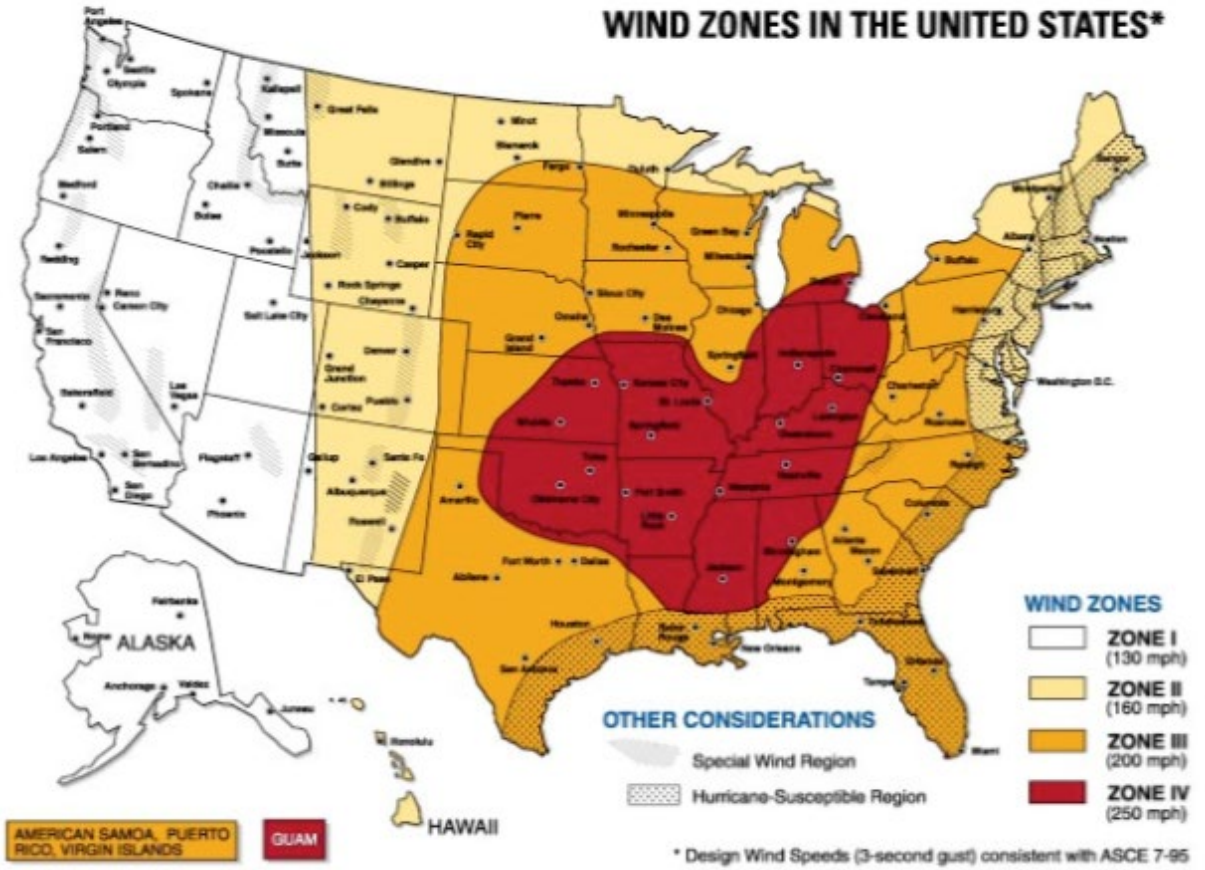
Figure 3.15. Location and Frequency of Lightning in Missouri



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

Figure 3.16 shows wind zones in the United States. Bates County is located in Zone IV, which can experience wind speeds of up to 250 mph

Figure 3.16. Wind Zones in the United States



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

Severity/Magnitude/Extent

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

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

Most lightning damages occur to electronic equipment located inside buildings. But structural damage can also occur when a lightning strike causes a building fire. In addition, lightning strikes can cause damages to crops if fields or forested lands are set on fire. Communications equipment and warning transmitters and receivers can also be knocked out by lightning strikes. http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx and http://www.lightningsafety.noaa.gov/

Based on information provided by the Tornado and Storm Research Organization (TORRO), **Table 3.30** below describes typical damage impacts of the various sizes of hail.

Table 3.30. Tornado and Storm Research Organization Hailstorm Intensity Scale

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

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

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

The onset of thunderstorms with lightning, high wind, and hail is generally rapid. Duration is less than six hours and warning time is generally six to twelve hours. Nationwide, lightning kills 75 to 100 people each year. Lightning strikes can also start structural and wildland fires, as well as damage electrical systems and equipment.

Previous Occurrences

Thunderstorm Winds

There were 53 thunderstorm wind events reported to the NCEI from 1996-2018 in Bates County.

No crop damage occurred during these events, and $563,800.00 in property damage.

Table 3.30 provides information about damaging thunderstorm wind events in the county.

Table 3.31. NCEI Reported Events with Damages from Thunderstorm Winds, 1996-2018

Location	# of Events	#of Deaths	# of Injuries	Property Damage	Crop Damage
Unincorporated Bates County	16	0	0	6,800	0
City of Amsterdam	6	0	0	0	0
City of Butler	18	0	0	510,000	0
City of Rich Hill	13	0	0	47,000	0

Source:https://www.ncdc.noaa.gov

Hail

There were 138 hail events reported to the NCEI from 1996–2018 in Bates County. No crop damages and $6,881,200.00 in property damages occurred during these events.

Table 3.31 provides information about damaging hail events in the county.

Table 3.32. NCEI Reported Events with Damages from Hail, 1996-2018

Location	# of Events	#of Deaths	# of Injuries	Property Damage	Crop Damage
Unincorporated Bates County	85	0	0	6,850,000	0
City of Amsterdam	9	0	0	1,200	0
City of Butler	26	0	0	30,000	0
City of Rich Hill	18	0	0	0	0

Source:https://www.ncdc.noaa.gov

There was one high wind event reported in Bates County to the NCEI from 1996-2018. the event had no reported damages occur. This are wind event was not associated with a thunderstorm.

Table 3.32 provides information about damaging high wind events in the county.

Table 3.33. NCEI Reported Events with Damages from High Winds 1996-2018

Location	# of Events	#of Deaths	# of Injuries	Property Damage	Crop Damage
Unincorporated Bates County	1	0	0	0	0

Source:https://www.ncdc.noaa.gov

Lightning

Limitations to the use of NCEI reported lightning events include the fact that only lightning events

that result in fatality, injury and/or property and crop damage are in the NCEI. There was one event recorded in Bates County in the NCEI data from 1996-2018. These events resulted in $2,000 in property damage and no injuries or fatalities.

Table 3.33 provides information about damaging lightning events in the county.

Table 3.34. NCEI Reported Events with Damages from Lightning 1996-2018

Location	# of Events	#of Deaths	# of Injuries	Property Damage	Crop Damage
Unincorporated Bates County	1	0	0	2,000	0

Source:https://www.ncdc.noaa.gov

Probability of Future Occurrence

Thunderstorm Winds

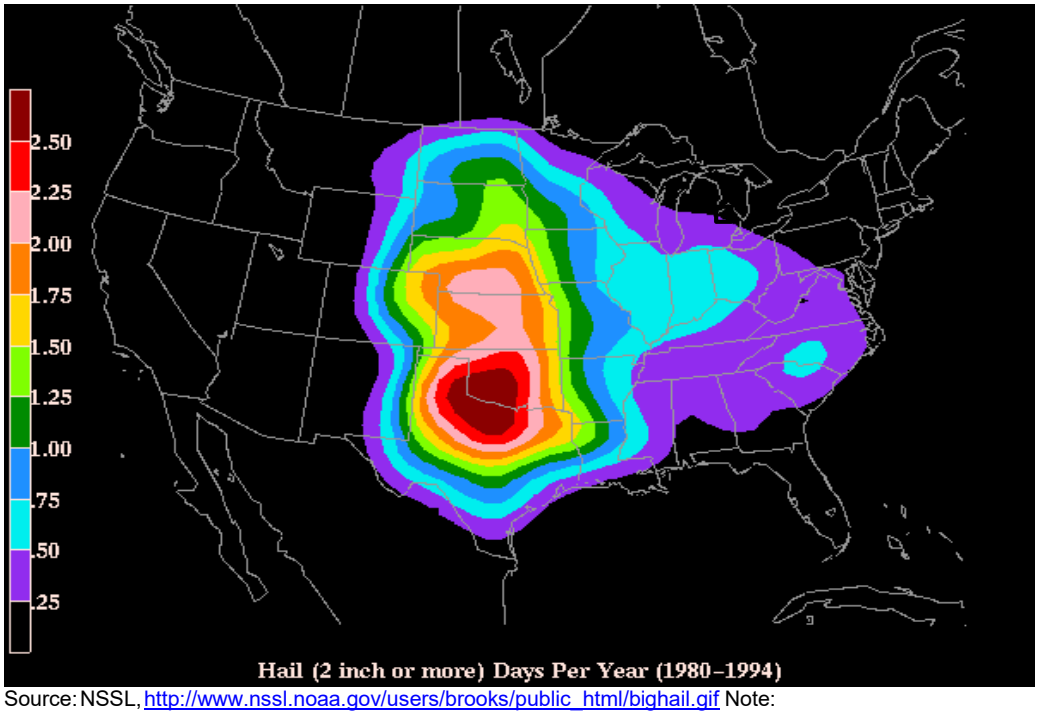
There were 53 thunderstorm wind events over the 23-year period reported to the NCEI from 1996-2018. This is an average of about 3 (2.8) thunderstorm wind occurrences in any given year with a 100% probability rate. There were 47 events that resulted in injuries or deaths and $563,800.00 in property damage.

Hail

There have been 138 recorded hail events over the 23-year period from 1996-2018. This is an average of about 2 (2.30) hail events in any given year with a 100% probability rate. There were three events that resulted in $6,881,200.00 in property damage.

Figure 3.17 is a map based on hailstorm data from 1980-1994. It shows the probability of hailstorm occurrence (2” diameter or larger based on number of days per year. Bates County is bisected by the green and lime green zones on the map meaning that the county should experience hail greater than 2” in diameter one to 1.5 days per year).

Figure 3.17. Annual Hailstorm Probability (2'' diameter or larger), U 1980- 1994



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

Vulnerability

Vulnerability Overview

All jurisdictions in Bates County are vulnerable to the effects of thunderstorms. All above ground structures are vulnerable to the effects of thunderstorms and all other hazards associated with them (hail, rain, flooding, flying debris, winds, etc.) Thunderstorms, high wind, hail, and lightning pose varying risk for Bates County. Downbursts resulting from thunderstorms can be just as damaging as an EF-1 tornado. Thunderstorm winds have resulted in $563,800.00 in property damage in Bates County. Poorly built structures, barns, outbuildings are more vulnerable to the impact of high winds during thunderstorms. Both high winds and hail can damage roofs. Hail can also damage crops and dent cars and trucks. Total hail damage recorded in the NCEI database from 1996–2018 has been $6,881,200.00. One hail event accounted for $6,850,000.00 in damages. Lightning can cause wildfires and structural fires, damage electrical utilities causing power outages, and sometimes fatalities.

Potential Losses to Existing Development

While past impacts have been relatively minimal, future disasters can cause extensive damage. There is a wide range of impact possible from a thunderstorm and wind speeds effect all structure types differently. Non-permanent and wood framed structures are very vulnerable to high winds in terms of destruction. While high winds are the force behind the damage, it is the windblown debris that causes the most damage.

Previous and Future Development

Due to the random nature of this hazard potential impacts of this hazard on future development is not quantifiable with the resources available.

Hazard Summary by Jurisdiction

Although thunderstorms/high winds/lightning/hail events are area-wide, communities with a greater percentage of structures built prior to 1939 are considered to be more vulnerable to the impact of high wind and hail damage. High wind events in the county have the potential to damage critical facilities, school facilities, local government properties, and private property alike. (See **Table 3.2**)

Problem Statement

Poorly built structures, barns, and outbuildings are more vulnerable to the impact of high winds during thunderstorms. High winds can topple utility poles and lead to power outages. Both high winds and hail can damage roofs. Hail can also damage crops and dent cars and trucks. People are also at risk to injury and death during high wind events. Crop insurance mitigates the risk to farmers and the agriculture sector within the county. Lightning events have caused structural fires and can strike electrical utilities leading to power outages.

The risk of property damage, injury, and death in the county can be mitigated by identifying safe refuge areas in public buildings, nursing homes and other facilities that house vulnerable populations that do not have a safe room. The purchasing and installation of NOAA weather radios in schools, government buildings and public areas may assist in providing early warning to allow for public to seek shelter during high wind events. Education and hazard awareness programs in public schools would also increase public safety in the event of severe thunderstorm events.

3.4.10 Tornado

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

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

High winds not associated with tornadoes are profiled separately in this document in **Section 3.4.9,** Thunderstorm/High Wind/Hail/Lightning.

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

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

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

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

Geographic Location

The entire planning area is at risk from Tornadoes, Tornadoes can strike anywhere. There is a greater chance of loss of life and destruction of property in population centers, especially with a large tornado path.

Severity/Magnitude/Extent

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

Tornado magnitude is classified according to the EF- Scale (or the Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF-Scale (see **Table 3.35**) 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 3.35. Enhanced F Scale for Tornado Damage

FUJITA SCALE			DERIVED EF SCALE		OPERATIONAL EF SCALE	
F Number	Fastest ¼-mile (mph)	3 Second Gust (mph)	EF Nu	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

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

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.36**. The damage descriptions are summaries. For the actual EF scale it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator. Information on the Enhanced Fujita Scale's damage indicators and degrees or damage is located online at www.spc.noaa.gov/efscale/ef-scale.html.

Table 3.36. Enhanced Fujita Scale with Potential Damage

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

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

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

Previous Occurrences

Table 3.37 includes NCEI reported tornado events and damages since 1993 in the planning area. Prior to that date, only really destructive tornadoes were recorded. It is necessary to go back as far as possible because of the random and intermittent nature of tornado events.

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

In the 25-year period from 1993 to present, there have been 10 tornadoes recorded in Bates County with EF/F Scale ratings ranging from EF0 to EF2 in magnitude. EF0/F0 has been the most frequent EF/F scale magnitude, with six events. They collectively account for $515,500.00 in property damage.

Three EF1/F1 tornados have occurred in Bates County in the last 25 years. The first occurring in Merwin, causing $25,000.00 in damage. A brief tornado touched down in the northwest part of the county, about 5 miles east of Merwin. It moved east for about 5 miles along state Route 18 before lifting about 4 miles west of Adrian near the junction with route FF. Numerous large trees were knocked down, as well as several utility poles and signs. The second occurred near Amsterdam, causing $50,000.00 in property damage. A supercell thunderstorm which earlier had produced an EF4 tornado in Linn county Kansas, moved east-northeast into Bates county and spawned another tornado, EF1 in intensity, 3 miles east southeast of Amsterdam at 8:27 PM CST and then traveled over rural areas to the northeast, before lifting 3 miles west of Adrian at 8:37 PM CST. Major damage to one residence was noted, along with minor damage to other outbuildings. Trees and power poles were downed as well. The third occurred in Adrian causing no reported damage. A NWS survey indicated that an EF-1 tornado touched down near Highway 39 and County Road 10500. The path was about 2 and a half miles long and about 200 yards wide. The tornado lifted along County Road 400 just east of County Road 1201. The tornado destroyed a portable carport and damaged or destroyed several outbuildings and barns. Several homes also received minor roof damage and numerous trees were uprooted or snapped.

One EF2/F2 tornado occurred in Bates County over the 25-year span causing $5,000 in damage. This tornado touched down at 1952 CST just on the north side of Butler...and then proceeded northeast over rural country...before crossing over into Cass county 2 miles north of Ballard at 2005 CST. Damage was limited to trees...power lines...and one barn.

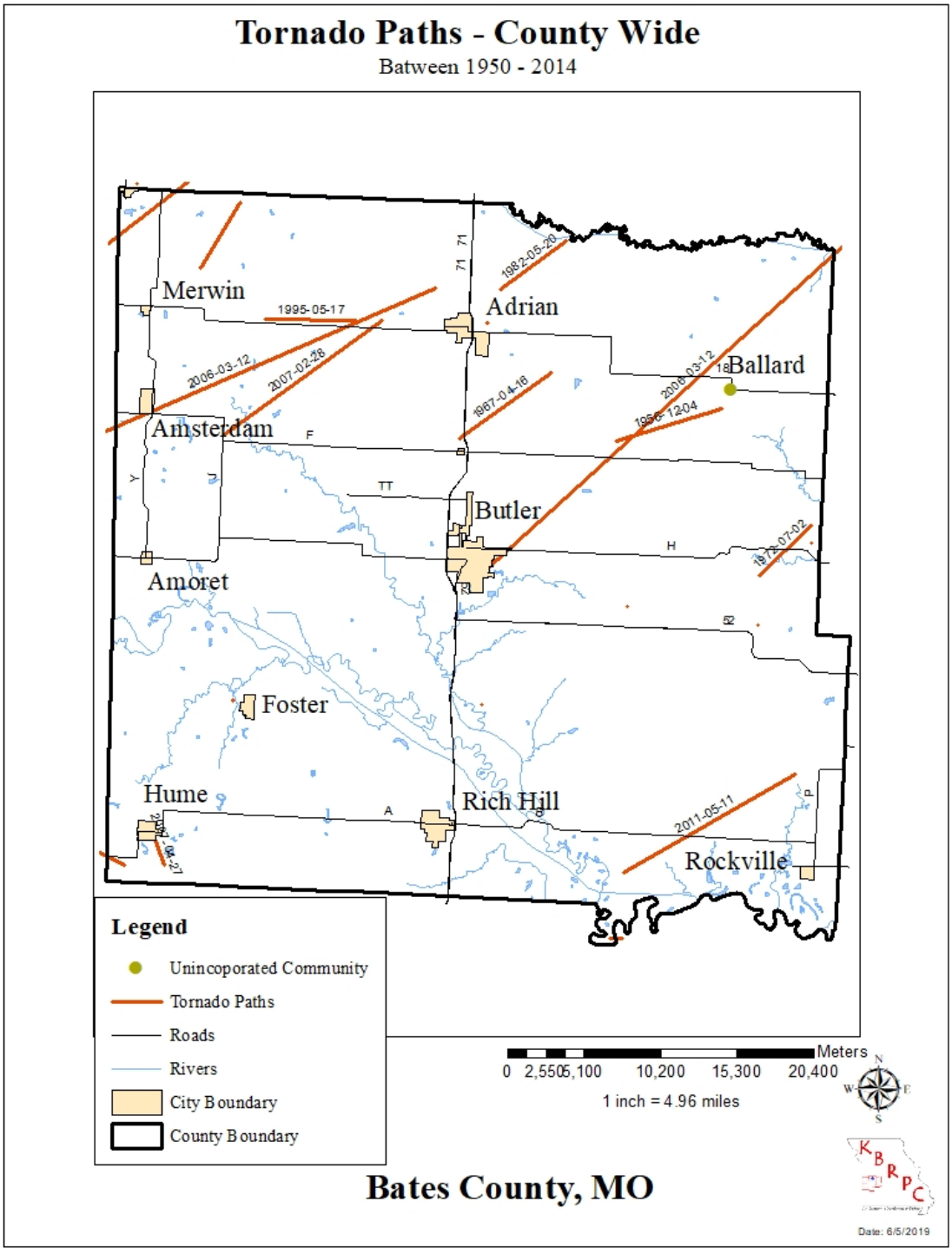
Table 3.37. Recorded Tornadoes in Bates County, 1993 – Present

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
5/17/1995	Unincorporated Bates County	Adrian	5	75	F1	0	0	25,000	0
5/26/2004	Unincorporated Bates County	Papinsville	1	25	F0	0	0	0	0
3/12/2006	Amsterdam	Adrian	14.4	220	F0	0	0	400,000	0
3/12/2006	Butler	Ballard	10	450	F2	0	0	5,000	0
2/28/2007	Amsterdam	Adrian	12.87	100	EF1	0	0	50,000	0
4/27/2007	Unincorporated Bates County	Hume	1.14	25	EF0	0	0	0	0
6/5/2008	Unincorporated Bates County	Foster	0.27	50	EF0	0	0	25,000	0
5/11/2011	Unincorporated Bates County	Rockville	8.49	50	EF0	0	0	500	0
4/7/2015	Unincorporated Bates County	Virginia	0.55	20	EF0	0	0	10,000	0
5/16/2015	Adrian	Adrian	0.88	100	EF1	0	0	0	0
	Total					0	0	515,500	0

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

Figure 3.25 shows historic tornado paths in Bates County.

Figure 3.25. Bates County Map of Historic Tornado Events



Source: ESRI, MSDIS

Probability of Future Occurrence

According to the NCEI storm event records there have been 10 tornado events from 1993 to present. Based on the past occurrence of tornadoes in Bates County, there is a 38% probability that the county will experience a tornado in any given year as of 2018. The potential severity of effects from tornadoes will continue to be moderate. Bates County will continue to experience injuries and property damages from tornadoes. However, technological advances will facilitate earlier warnings than previously available. This, combined with a vigorous public education program and improved construction techniques, provides the potential for significant reductions in the number of deaths and injuries, as well as reduced property damage.

Vulnerability

Vulnerability Overview

All jurisdictions in Bates County are vulnerable to the effects of tornadoes. All above ground structures are vulnerable to the effects of a tornado and all hazards associated with them. According to NOAA a tornado is a violently rotating column if air extending from a thunderstorm to the ground. Tornadoes may appear nearly transparent until dust and debris are picked up or a cloud forms within the funnel. The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. Rich Hill R-IV school district is the only one of the school districts in Bates County that has a FEMA 361 standard storm shelter.

Figure 3.26 illustrates areas where dangerous tornadoes historically have occurred.

Figure 3.26. Tornado Alley in the U.S.

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

The current State Plan used a methodology to the vulnerability of each county in the state to determine each county's vulnerability to tornadoes. While this approach attempts to prioritize tornado vulnerable counties, it does not identify any particular geographic patterns to tornado risk. The state's analysis combined annualized losses and frequency of occurrence to determine the greatest likelihood of being impacted by a tornado. The state's vulnerability rating ranged from very high, high, and moderate. The vulnerability rating for Bates County was rated at moderate.

Potential Losses to Existing Development

While past impacts have been relatively minimal, future disasters can cause extensive damage. There is a wide range of impact possible from a tornado and wind speeds effect all structure types differently. Non-permanent and wood framed structures are very vulnerable to high winds in terms of destruction, while high winds are the force behind damage, it is the windblown debris that causes the most damage and deaths from a tornado.

Previous and Future Development

Development across the county and within incorporated jurisdictions increases the potential for losses. Future development and population increases will increase exposure to damage. It is anticipated that several communities will experience additional new development, but many use building codes which may help reduce the risk of building damage.

Hazard Summary by Jurisdiction

Although tornado events are area-wide hazard, communities with a greater percentage of structures built prior to 1939 are considered to be more vulnerable to tornado damage.
(See **Table 3.20**)

School district facilities are at risk to the damages of tornadoes. The Rich Hill R-IV School District is the only school within Bates County that is equipped with a FEMA rated shelter.

Problem Statement

Tornados 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. Tornado events in Bates County have resulted in $515,500.00 in property damage over the last 25 years. Bates County is rated at a moderate in the current State Hazard Mitigation Plan.

The risk of property damage, injury, and death in the county can be mitigation by the construction of FEMA safe rooms in new schools, daycares, and nursing homes. Additionally, encouraging the purchase and installation of NOAA weather radios, and promoting local severe weather alert applications for mobile communications can provide early warnings for severe weather which could result in lives saved. For communities that do not have the capacity to construct FEMA safe rooms, simply identifying and creating plans that identify strong, safe places in schools, large facilities, and other establishments serving the public may help in mitigating impacts of tornados.

3.4.11 Winter Weather/Snow/Ice/Severe Cold

Some specific sources for this hazard are:

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

Hazard Profile

Hazard Description

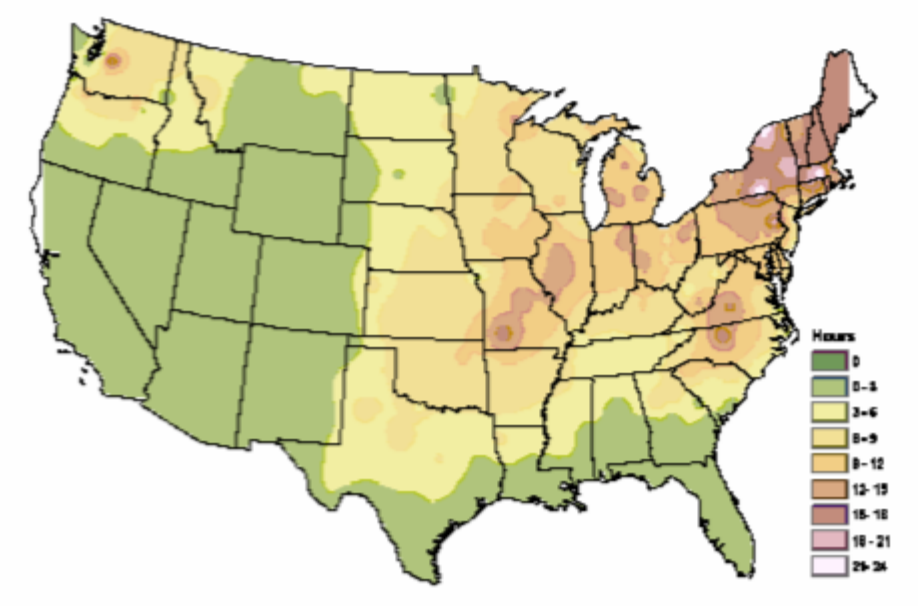
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows.

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

Geographic Location

The entire county is vulnerable to heavy snow, ice, extreme cold temperatures and freezing rain. **Figure 3.27** depicts the average number of hours per year with freezing rain. Bates County is located in a zone that can expect 12 – 15 hours of freezing rain per year.

Figure 3.15. NWS Statewide Average Number of Hours per Year with Freezing Rain



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

Severity/Magnitude/Extent

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

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

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

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

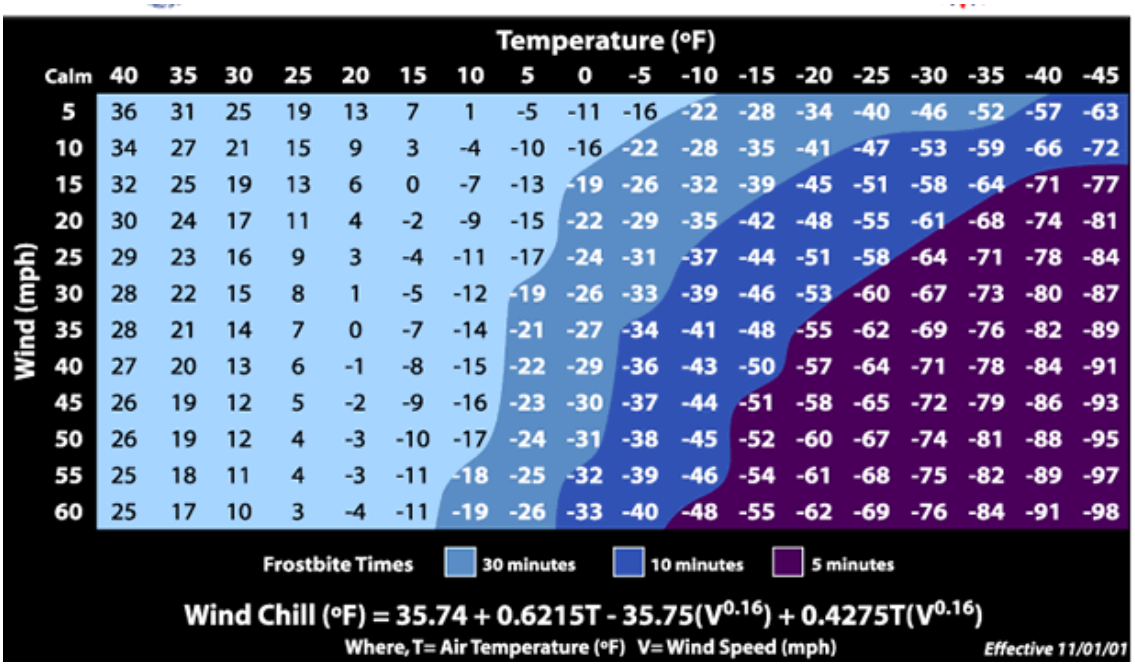
Buildings with overhanging tree limbs are more vulnerable to damage during winter storms when limbs fall. Businesses experience loss of income as a result of closure during power outages. In general, heavy winter storms increase wear and tear on roadways though the cost of such damages is difficult to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

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

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

Wind can greatly amplify the impact of cold ambient air temperatures. Provided by the National Weather Service**, Figure 3.28** below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Figure 3.16. Wind Chill Chart



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

While winter storms, cold, frost, and freeze have the potential to take a substantial toll on crop production in Bates County, there have been no records of crop insurance paid specifically for winter weather damages since 1998.

Previous Occurrences

Table 3.38 includes NCEI reported events and damages for the past 26 years.

Table 3.38. NCEI Bates County Winter Weather Damaging Events, 1993-2018

Type of Event	Inclusive Dates	# of Injuries	Property Damages	Crop Damages
Ice Storm	12/21/1997	0	0	0
Extreme Cold/Wind	10/6/2000	0	0	0
Ice Storm	11/8/2000	0	0	0
Extreme Cold/Wind	12/10/2000	0	0	0
Winter Storm	12/11/2000	0	0	0
Winter Storm	1/28/2001	0	0	0
Winter Storm	2/9/2001	0	0	0
Ice Storm	1/30/2002	0	580,000	0
Winter Storm	1/2/2003	0	0	0
Winter Storm	2/23/2003	0	0	0
Winter Storm	12/10/2003	0	0	0
Winter Storm	1/25/2004	0	0	0
Winter Weather	1/10/2006	0	0	0
Ice Storm	11/29/2006	0	0	0
Winter Storm	1/12/2007	0	0	0
Ice Storm	12/9/2007	0	2,000	0
Winter Weather	2/7/2010	0	0	0

Winter Storm	3/20/2010	0	0	0
Winter Weather	1/10/2011	0	0	0
Winter Storm	1/19/2011	0	0	0
Winter Weather	2/13/2012	0	0	0
Winter Storm	2/21/2013	0	0	0
Winter Storm	2/25/2013	0	0	0
Winter Storm	3/23/2013	0	0	0
Ice Storm	12/21/2013	0	0	0
Winter Storm	3/1/2014	0	0	0
Ice Storm	1/14/2017	0	0	0

Source: NCEI, data accessed 2019

Table 3.39. NCEI Bates County Winter Weather Events Summary, 1993-2018

Type of Event	# of Occurrences	# of Deaths	# of Injuries	Property Damages	Crop Damages
Blizzard	0	0	0	0	0
Extreme Cold	2	0	0	582,000	0
Ice Storm	7	0	0	0	0
Winter Storm	18	0	0	0	0

Source: NCEI, data accessed 2019

January 2002 Winter Storm

A long-lived major ice and snow storm blasted much of northwest, northern and central Missouri from late Tuesday, January 29th, until Thursday, January 31st. Ice accumulations of over an inch were observed from the Kansas City metropolitan area, east and north through Moberly Missouri. At one point 409,504 total customers were without electrical power in the CWA, with some residents without power up to two weeks. For the Kansas City area, the ice storm was ranked as the worst ever. Further north across northern Missouri, heavy snow fell generally along and north of a line, from St. Joseph to Trenton to Kirksville. Snow accumulations ranged from 8 to 14 inches. The storm caused $580,000.00 in damages.

Probability of Future Occurrence

The probability for all of the different types of winter weather are included as one probability, since one storm generally includes multiple types of events. There were 27 severe winter weather events in Bates County from 1996 to 2018. This equates to a 100% probability of occurrence in any given year.

Vulnerability

Vulnerability Overview

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. People over 65 and those living in poverty have an increased risk of hypothermia and frostbite due to extreme cold and wind chill.

In the current State Plan, seven factors were considered in determining overall severe winter storm

vulnerability as follows: housing density, likelihood of occurrence, building exposure, crop exposure, average annual property loss ratio, average annual crop insurance claims and social vulnerability. The state ranked each of these criteria using a scale from one to five, one being lowest and five being the highest, to rank each county's vulnerability to severe winter weather. Bates County received a vulnerability rating for each criteria as follows: Housing Density Rating: medium-low, Likelihood rating: low, Property Loss Ratio Rating: medium-low, Crop Exposure Rating: low, Social Vulnerability Index: medium-high.

Potential Losses to Existing Development

A series of small winter storms can impact several jurisdictions. This increases the financial burden on communities and can have a more far reaching economic impact. Listed below are the many impacts severe winter storms can have on Bates County.

- **Life and Property-** Many deaths from winter storms are a result of traffic accidents caused by a combination of poor driving surfaces and driving too fast for the conditions. Accidents during winter storms can be particularly devastating for often multiple cars are involved. There are also specific sections of the community that are more vulnerable than others of the complications caused by Severe Winter Weather such as the elderly. Elderly are the most susceptible to complications from excessive and/or prolonged cold or heat. According to the US Census Bureau website the estimated 2013-2017 ACS elderly population for Bates County is 18.9% which equals 3,104 elderly county residents.

- **Roads and Bridges-** Roads and bridges serve as vital arteries for all residents. Winter storms often limit the effectiveness of transportation by making driving conditions difficult and unsafe. Emergency vehicles also have trouble operating in these conditions that slow down response times thus limiting their effectiveness in an emergency.

- **Power Lines-** Ice storms often adversely impact consistent power supplies. The ice can build up on the wires causing them to fall or the ice can lead to falling tree limbs which then knock down power lines. Fallen wires and limbs can damage vehicles and pedestrians. When this occurs power outages can be dangerous. For instance, if the population relies on electricity for heat and the electricity does not work for a long time, people run the risk of hypothermia. This is a particular concern for more vulnerable populations such as the elderly.

- **Water Lines-** Winter storms and their associated cold weather lead to the ground freezing and thawing. As the ground freezes and thaws, pipes in the ground shift and sometimes break causing a lack of potable water. Also, when a pipe breaks, damage to property can be extensive and expensive with the cost falling on the property owner, not the city.

Currently, there is not a reliable or accurate way to estimate costs associated with winter storms. Too many variables exist to accurately portray how much damage would be incurred by a winter storm. For instance, the cost of a snowstorm that dropped 20 inches would be different than an ice storm that causes different types of damage and challenges to infrastructure. Locations of heavier snow accumulation, time of day, and other characteristics would all play a role in determining the cost of a winter storm.

Previous and Future Development

Increased development and any resulting increase in population will increase exposure to damage from severe winter weather. Future commercial development can expect functional downtime and decreased revenues during periods of severe winter weather. Future construction of facilities that will

serve vulnerable populations will need to be prepared for extreme weather conditions. Road construction in the county will increase the need for snow removal and salt to keep transportation lifelines open during periods of severe winter weather. Any increase in agriculture crop production will also increase the risk of exposure.

Hazard Summary by Jurisdiction

Severe winter weather can cause power outages and put structures at risk to fires when individuals in homes resort to fuel heaters. The risk of extreme cold deaths and frostbite varies among segments of the populations. People over 65 and those living below the poverty level have an increased vulnerability to severe winter weather. School Districts can suffer damage to property due to snow and ice accumulations. Table 3.39 includes information on populations over 65 and the percent living below the poverty level by jurisdiction.

Table 3.40. Population over 65 and Families Living Below the Poverty Level by Jurisdiction

Jurisdiction	# of Families Living Below Poverty Level	Population over 65 Below Poverty Level	Population over 65
Unincorporated Bates County	470	263	3,104
City of Amsterdam	12	6	65
City of Butler	188	82	746
City of Rich Hill	52	43	279

Source: American Fact Finder, 2013-2017

Problem Statement

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. People over 65 and those living in poverty have an increased risk of hypothermia and frostbite due to extreme cold and wind chill.

Organizing outreach to at-risk populations, including establishing and promoting accessible heating and cooling centers can help reduce the potential exposure to harsh winter weather. Additionally, identifying debris disposal and burning locations can assist in facilitating recovery efforts after a significant winter storm or ice incident.

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

44 CFR Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section presents the mitigation strategy updated by the Mitigation Planning Committee (MPC) based on the [updated] risk assessment. The mitigation strategy was developed through a collaborative group process. The process included review of [updated] general goal statements to guide the jurisdictions in lessening disaster impacts as well as specific mitigation actions to directly reduce vulnerability to hazards and losses. The following definitions are taken from FEMA's *Local Hazard Mitigation Review Guide (October 1, 2012)*.

- **Mitigation Goals** are general guidelines that explain what you want to achieve. Goals are long-term policy statements and global visions that support the mitigation strategy. The goals address the risk of hazards identified in the plan.

- **Mitigation Actions** are specific actions, projects, activities, or processes taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan's mission and goals.

4.1 Goals

44 CFR Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

This planning effort is an update to Bates County's existing hazard mitigation plan approved in November 2013. Therefore, the goals from the 2013 Bates County Hazard Mitigation Plan were reviewed to see if they were still valid, feasible, practical, and applicable to the defined hazard impacts. The MPC conducted a discussion session during their second meeting to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the current State Hazard Mitigation Plan goals were reviewed. The MPC also reviewed the goals from current surrounding county plans. The Plan's updated goals for Bates County are as follows:

Goal 1- Protect the lives and livelihoods of all citizens
Goal 2- Mitigate the effects of future natural hazards in the County
Goal 3- Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry
Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters

4.2 Identification and Analysis of Mitigation Actions

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

During the second MPC meeting, the results of the risk assessment update were provided to the MPC members for review and the key issues were identified for specific hazards. Changes in risk since adoption of the previously approved plan were discussed. The second meeting concluded with the distribution of a list of possible mitigation actions to prompt discussions within and among the jurisdictions. The discussions occurred during jurisdictional break-out meetings. The list included possible new mitigation goal and actions, as well as actions from the previously approved plan. Actions from the previous plan included completed actions, on-going actions, actions upon which progress had not been made, and or not measurable. The MPC discussed SEMA's identified funding priorities and the types of mitigation actions generally recognized by FEMA.

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

The focus of Meeting #2 was update of the mitigation strategy. For a comprehensive range of mitigation actions to consider, the MPC reviewed the following information during Meeting #2:

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

For Meeting #2, individual jurisdictions, including school and special districts, developed final mitigation strategy for submission to the MPC. They were encouraged to review the details of the risk assessment vulnerability analysis specific to their jurisdiction. They were also provided a link to the FEMA's publication, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).* This document was developed by FEMA as a resource for identification of a range of potential mitigation actions for reducing risk to natural hazards and disasters.

The MPC reviewed the actions from the previously approved plan for progress made since the plan had been adopted, and decided to delete all current goals and actions from the previous update. The MPC concluded that the previous six goals were redundant and could be combined in to four goals instead of six. The MPC also concluded after reviewing the previous actions from the last plan update; that the actions were repetitive, unobtainable, or not measurable. The MPC elected to completely remove the old goals and actions from the current plan update and start over with new strategies that better align with SEMA and FEMA's funding priorities. Prior to Meeting #2, the list of actions for each jurisdiction was emailed to that jurisdiction's MPC representative along with the worksheets. Each jurisdiction was instructed to provide information regarding the "Action Status" with one of the following status choices:

- Completed, with a description of the progress,

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

Based on the status updates, there were 5 completed actions, 18 deleted actions and 25 new actions.

Table 4.1 provides a summary of the action statuses for each jurisdiction:

Table 4.1. Action Status Summary

Jurisdiction	Completed Actions	Deleted Actions	New/Continuing Actions
Bates County	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.1; 1.2; 2.1; 2.2 3.1; 4.1; 4.2**
City of Amsterdam	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.1; 2.3; 3.1; 4.2**
City of Butler	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.8; 2.4; 4.1**
City of Rich Hill	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.3; 2.5; 3.1; 4.3**
Adrian R-III Schools	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.1; 2.1; 3.2; 4.4**

Ballard R-II Schools	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.1; 2.1; 3.2; 4.3**
Butler R-V Schools	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.1; 2.2; 3.3; 4.6**
Hudson R-IX Schools	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.4; 2.4; 2.6**
Hume R-VIII Schools	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.5; 2.1; 3.4; 4.4**
Miami R-1 Schools	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.6; 2.1; 3.5; 4.7**
Rich Hill R-IV Schools	**1.1; 1.2.1; 2.3.1; 3.1.1; 3.2.3**	**1.2; 1.2.2; 1.2.3; 1.3.1; 2.1.1; 2.2.1; 2.2.2; 2.2.3; 2.3.2; 3.2.1; 3.2.2; 4.1.1; 4.1.2; 5.1.1; 5.1.2; 5.2.1; 6.1.1; 6.1.2;**	**1.7; 2.1; 3.2; 4.4**

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

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

Completed Actions	Completion Details (date, amount, funding source)
1.1	Provided seminar on cybersecurity. Gave storm spotter class with the national weather service and local radio stations. Cooperative table tops with pipeline companies and railroad.
1.2.1	Adrian School District installed new bell and phone system. Rich Hill School District constructed a new FEMA dome. Bates County is changing from Nixle to Textcaster to keep citizens informed of storms, railroad derailment and jail beaks.
2.3.1	Butler implemented 2012 International Building Codes. Rich Hill implemented minimum housing standards.
3.1.1	Bates County EMD attends the annual county fair to give information to the community. There is a new website that has a blog and links to Facebook.
3.2.3	A SEMA specialist gave a speech to the LEPC.
Deleted Actions	**Reason for Deletion**
1.2	Redundant, not measurable or obtainable due to funding and community participation
1.2.2	Redundant, not measurable or obtainable due to funding and community participation
1.2.3	Redundant, not measurable or obtainable due to funding and community participation
1.3.1	Redundant, not measurable or obtainable due to funding and community participation
2.1.1	Redundant, not measurable or obtainable due to funding and community participation
2.2.1	Redundant, not measurable or obtainable due to funding and community participation
2.2.2	Redundant, not measurable or obtainable due to funding and community participation
2.2.3	Redundant, not measurable or obtainable due to funding and community participation
2.3.2	Redundant, not measurable or obtainable due to funding and community participation
3.2.1	Redundant, not measurable or obtainable due to funding and community participation
3.2.2	Redundant, not measurable or obtainable due to funding and community participation
4.1.1	Redundant, not measurable or obtainable due to funding and community participation
4.1.2	Redundant, not measurable or obtainable due to funding and community participation
5.1.1	Redundant, not measurable or obtainable due to funding and community participation
5.1.2	Redundant, not measurable or obtainable due to funding and community participation
5.2.1	Redundant, not measurable or obtainable due to funding and community participation
6.1.1	Redundant, not measurable or obtainable due to funding and community participation

6.1.2	Redundant, not measurable or obtainable due to funding and community participation
Source: Previously approved County Hazard Mitigation Plan; Data Collection Questionnaires.	

For actions that have not been completed, the incomplete actions have either been combined with other actions, moved to a new goal, or are an ongoing continuous action at this time. Several actions have been implemented and are categorized as ongoing sustainable actions. The deleted actions were deemed unobtainable, not measureable, or redundant, by the MPC committee, due to either lack of funding or lack of community participation in the action. The committee has determined that writing and enforcing all jurisdictions to mandatorily do the deleted actions is out of their and other jurisdictional authority.

4.3 Implementation of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include an action strategy describing how the actions identified in paragraph (c)(2)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefits review of the proposed projects and their associated costs.

Jurisdictional MPC members were encouraged to meet with others in their community to finalize the actions to be submitted for the updated mitigation strategy. Throughout the MPC consideration and discussion, emphasis was placed on the importance of a benefit-cost analysis in determining project priority. The Disaster Mitigation Act requires benefit-cost review as the primary method by which mitigation projects should be prioritized. The MPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the Missouri State Hazard Mitigation Plan. The benefit/cost review at the planning stage primarily consisted of a qualitative analysis, and was not the detailed process required grant funding application. For each action, the plan sets forth a narrative describing the types of benefits that could be realized from action implementation. The cost was estimated as closely as possible, with further refinement to be supplied as project development occurs.

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 used worksheets to assign scores. The worksheets posed questions based on the STAPLEE elements as well as the potential mitigation effectiveness of each action. Scores were based on the responses to the questions as follows:

Definitely yes = 3 points
Maybe yes = 2 points
Probably no = 1
Definitely no = 0

The following questions were asked for each proposed action.

S: Is the action socially acceptable?
T: Is the action technically feasible and potentially successful?
A: Does the jurisdiction have the administrative capability to successfully implement this action?
P: Is the action politically acceptable?
L: Does the jurisdiction have the legal authority to implement the action?
E: Is the action economically beneficial?
E: Will the project have an environmental impact that is either beneficial or neutral? (score "3" if positive and "2" if neutral)

Will the implemented action result in lives saved?
Will the implanted action result in a reduction of disaster damage?

The final scores are listed below in the analysis of each action. The worksheets are attached to this plan in the Appendix. The STAPLEE final score for each action, absent other considerations, such as a localized need for a project, determined the priority. Low priority action items were those that had a total score of between 0 and 24. Moderate priority actions were those scoring between 25 and 29. High priority actions scored 30 or above. A blank STAPLEE worksheet is shown in Figure 4.1

Figure 4.1. Blank STAPLEE Worksheet

STAPLEE Worksheet		
Name of Jurisdiction:		
Action or Project		
Action/Project Number:		
Name of Action or Project:		
Mitigation Category:		
STAPLEE Criteria **Evaluation Rating** Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0		**Score**
S: Is it **Socially** Acceptable		
T: Is it **Technically** feasible and potentially successful?		
A: Does the jurisdiction have the **Administrative** capacity to execute this action?		
P: Is it **Politically** acceptable?		
L: Is there **Legal** authority to implement?		
E: Is it **Economically** beneficial?		
E: Will the project have either a neutral or positive impact on the natural **Environment**?		
Will historic structures be saved or protected?		
Could it be implemented quickly?		
STAPLEE SCORE		
Mitigation Effectiveness Criteria	**Evaluation Rating**	**Score**
Will the implemented action result in lives saved?	Assign from 5-10 points based on the likelihood that lives will be saved.	
Will the implemented action result in a reduction of disaster damages?	Assign from 5-10 points based on the relative reduction of disaster damages.	
MITIGATION EFFECTIVENESS SCORE		
TOTAL SCORE (STAPLEE + Mitigation Effectiveness)		

☐ **High Priority (30+ points)**	☐ **Medium Priority (25 - 29 points)**	☐ **Low Priority (<25 points)**

Completed by
(Name, Title, Phone Number) _____

In addition to the STAPLEE cost benefit review prioritization, implementation plans were discussed with the MPC for each action. An action worksheet was used to develop the implementation plan.

The action worksheet format is shown in **Table 4.2.**

Figure 4.2. Blank Action Worksheet

Action Worksheet	
Name of Jurisdiction:	
Risk / Vulnerability	
Problem being Mitigated:	
Hazard(s) Addressed:	
Action or Project	
Action/Project Number:	
Name of Action or Project:	
Action or Project Description:	
Applicable Goal Statement:	
Estimated Cost:	
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	
Action/Project Priority:	
Timeline for Completion:	
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: Protect the lives and livelihood of all citizens

Action Worksheet	
Name of Jurisdiction:	City of Butler
Risk / Vulnerability	
Problem being Mitigated:	Lack of storm shelters in norther section of Butler
Hazard(s) Addressed:	Large scale storm shelter for northern section of Butler
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Butler Dome Project
Action or Project Description:	By building the Dome on the north side of Butler we would have a facility that would serve as a shelter, in the event of any disaster and it could also be used as a community building during any other time, for youth activities and other community projects. Many residents on the north side of Butler have no basements, and there are few public shelters available-most being near pine street.
Applicable Goal Statement:	Goal 1
Estimated Cost:	$1,500,000 (Est) for dome similar that constructed in Rich Hill
Benefits:	Able to be used in any disaster
Plan for Implementation	
Responsible Organization/Department:	Mayor of Butler
Action/Project Priority:	High
Timeline for Completion:	2020 to 2022
Potential Fund Sources:	State or Federal or private industry
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Economic Development Plan, Transportation Plan, NFIP
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: Protect the lives and livelihood of all citizens

Action Worksheet	
Name of Jurisdiction:	Bates County
Risk / Vulnerability	
Problem being Mitigated:	Lack of Widespread Notification
Hazard(s) Addressed:	Lack of Notification
Action or Project	
Action/Project Number:	1.2
Name of Action or Project:	RAVE
Action or Project Description:	Research and Implement RAVE system. The RAVE system is an emergency alert system that sends texts to area residents in the event of danger.
Applicable Goal Statement:	Goal 1
Estimated Cost:	Unknown
Benefits:	Area wide notification of anyone with cell phone.
Plan for Implementation	
Responsible Organization/Department:	EMA Director
Action/Project Priority:	High
Timeline for Completion:	0-5 years
Potential Fund Sources:	County Budget, Grants
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Economic Development Plan, Transportation Plan, NFIP
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: Protect the lives and livelihood of all citizens

Action Worksheet	
Name of Jurisdiction:	City of Amsterdam
Risk / Vulnerability	
Problem being Mitigated:	Accessible Storm Shelters for Residents
Hazard(s) Addressed:	Tornado Shelters
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Amsterdam Tornado Shelters
Action or Project Description:	Build Centralized Shelter in Amsterdam to provide a safe shelter from storms for the residents of Amsterdam and anyone visiting the area.
Applicable Goal Statement:	Goal 1
Estimated Cost:	$500,000.00
Benefits:	Save Lives
Plan for Implementation	
Responsible Organization/Department:	Mayor and City Council of Amsterdam
Action/Project Priority:	High
Timeline for Completion:	3 years
Potential Fund Sources:	Grants
Local Planning Mechanisms to be Used in Implementation, if any:	Economic Development Plan, Transportation Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: Protect the lives and livelihood of all citizens

Action Worksheet	
Name of Jurisdiction:	City of Butler
Risk / Vulnerability	
Problem being Mitigated:	Storm Water Management
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.8
Name of Action or Project:	Storm Water Management
Action or Project Description:	Develop a storm water management plan. Identify current issues with the storm water drainage and identify ways to improve water runoff and reducing potential hazards.
Applicable Goal Statement:	Goal 1
Estimated Cost:	Unknown
Benefits:	Public Safety
Plan for Implementation	
Responsible Organization/Department:	City of Butler Street Department
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	MO DNR
Local Planning Mechanisms to be Used in Implementation, if any:	Builder's Plan, City Emergency, Economic Development Plan, Land Use Plan, Flood Mitigation Assistance Plan, Transportation Plan, Critical Facilities Plan, Comprehensive Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: Protect the lives and livelihood of all citizens

Action Worksheet	
Name of Jurisdiction:	City of Rich Hill
Risk / Vulnerability	
Problem being Mitigated:	Lack of Sufficient Number of Storm Sirens
Hazard(s) Addressed:	Tornado
Action or Project	
Action/Project Number:	1.3
Name of Action or Project:	Storm Siren Project
Action or Project Description:	Relocate and add needed outdoor warning sirens, so 100% of Rich Hill Citizens will have coverage.
Applicable Goal Statement:	Goal 1
Estimated Cost:	$45,000
Benefits:	Save lives by notifying people outdoors to take cover
Plan for Implementation	
Responsible Organization/Department:	Mayor of Rich Hill
Action/Project Priority:	High
Timeline for Completion:	3 years
Potential Fund Sources:	Local, State, and Federal Funding
Local Planning Mechanisms to be Used in Implementation, if any:	Economic Development Plan, Transportation Plan, County Mitigation Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: Protect the lives and livelihood of all citizens

Action Worksheet	
Name of Jurisdiction:	Adrian R-III School District
Risk / Vulnerability	
Problem being Mitigated:	Lack of storm shelter
Hazard(s) Addressed:	Tornado
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Storm Room
Action or Project Description:	Build a storm shelter in the shape of a dome for the Adrian Community and students in the community
Applicable Goal Statement:	Goal 1
Estimated Cost:	$5,000,000.00
Benefits:	Safety to the students and community
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	Up to 5 years
Potential Fund Sources:	FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Capital Improvement Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: Protect the lives and livelihood of all citizens

Action Worksheet	
Name of Jurisdiction:	Ballard R-II School District
Risk / Vulnerability	
Problem being Mitigated:	Lack of storm shelter
Hazard(s) Addressed:	Tornado
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Build/Install Storm Shelter
Action or Project Description:	Install storm shelters within the school building. If funds permit make large enough for community.
Applicable Goal Statement:	Goal 1
Estimated Cost:	$750,000
Benefits:	Safety of lives of students and citizens
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	HMGP, FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: **Protect the lives and livelihood of all citizens**

Action Worksheet	
Name of Jurisdiction:	Butler R-V School District
Risk / Vulnerability	
Problem being Mitigated:	Weather Hazards
Hazard(s) Addressed:	Severe Weather
Action or Project	
Action/Project Number:	1.1
Name of Action or Project:	Storm Shelter
Action or Project Description:	Construction of a facility to protect lives in the community, like a dome. A storm shelter would benefit the school district as well as the community to add additional safety.
Applicable Goal Statement:	Goal 1
Estimated Cost:	$6,000,000.00
Benefits:	Protection of lives of students & community
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	School year 2021-2022
Potential Fund Sources:	Local, State, Federal
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Capital Improvement Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: **Protect the lives and livelihood of all citizens**

Action Worksheet	
Name of Jurisdiction:	Hudson R-IX School District
Risk / Vulnerability	
Problem being Mitigated:	Loss of Electricity
Hazard(s) Addressed:	Multiple Hazards
Action or Project	
Action/Project Number:	1.4
Name of Action or Project:	Purchase Generator
Action or Project Description:	Purchase generator and necessary switch for generator. Upgrade electrical. A generator and electrical upgrade will insure power to the district buildings in case of in climate weather and keep the buildings functioning at capacity.
Applicable Goal Statement:	Goal 1
Estimated Cost:	$35,000.00
Benefits:	Patrons could get back to school sooner. Parents could focus on recovery.
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	Medium
Timeline for Completion:	4 months
Potential Fund Sources:	Federal Grant and Local
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: **Protect the lives and livelihood of all citizens**

Action Worksheet	
Name of Jurisdiction:	Hume R-VIII School District
Risk / Vulnerability	
Problem being Mitigated:	Protect the lives and livelihood of all citizens
Hazard(s) Addressed:	Flooding, tornados, earthquakes, wildfire
Action or Project	
Action/Project Number:	1.5
Name of Action or Project:	Two Way Radio Purchase
Action or Project Description:	We need to purchase two way radios for the safety of our students. In addition, we need expanded towers to use them.
Applicable Goal Statement:	Goal 1
Estimated Cost:	$85,000.00
Benefits:	We will be able to communicate with all busses and employees to prevent disaster.
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	5 years (at most)
Potential Fund Sources:	FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: **Protect the lives and livelihood of all citizens**

Action Worksheet	
Name of Jurisdiction:	Miami R-I School District
Risk / Vulnerability	
Problem being Mitigated:	High water over Roads
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	1.6
Name of Action or Project:	Water Depth Signage
Action or Project Description:	Placing signage showing depth of water over public roads at places prone to flood. Sinage will help alert students and community members when flooding has occurred.
Applicable Goal Statement:	Goal 1
Estimated Cost:	$85,000.00
Benefits:	In true disaster, citizens will ford water to escape or relocate. Save lives.
Plan for Implementation	
Responsible Organization/Department:	MoDOT, Bates County Commission
Action/Project Priority:	Medium
Timeline for Completion:	Unknown
Potential Fund Sources:	Unknown
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 1: **Protect the lives and livelihood of all citizens**

Action Worksheet	
Name of Jurisdiction:	Rich Hill R-IV School District
Risk / Vulnerability	
Problem being Mitigated:	Replace glass with bulletproof glass
Hazard(s) Addressed:	Terrorism, Earthquake, Tornado
Action or Project	
Action/Project Number:	1.7
Name of Action or Project:	Bulletproof Glass
Action or Project Description:	Replace regular glass with bulletproof glass. Bulletproof glass will protect students from various hazards including earthquakes and tornadoes. The glass will help prevent injury to staff and students.
Applicable Goal Statement:	Goal 1
Estimated Cost:	$350,000.00
Benefits:	Safety
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	FEMA, other Federal agencies
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	Bates County
Risk / Vulnerability	
Problem being Mitigated:	Lack of generator for county Administration Building
Hazard(s) Addressed:	Adding a generator in County Administration Building
Action or Project	
Action/Project Number:	2.1
Name of Action or Project:	Admin Building Generator Project
Action or Project Description:	By installing a 60 to 80k natural gas generator in the facility, we are allowing normal operations to continue in the event of a widespread power outage. This will provide a central location for gathering and dispatching in case of an emergency.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$20,000 (Est) for 80KW fixed generator
Benefits:	Able to be used in any outage circumstance
Plan for Implementation	
Responsible Organization/Department:	Bates County Emergency Management
Action/Project Priority:	High
Timeline for Completion:	2020 to 2022
Potential Fund Sources:	State or Federal
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Economic Development Plan, Transportation Plan, NFIP
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	Bates County
Risk / Vulnerability	
Problem being Mitigated:	Lack of generator for the local AM/FM radio station
Hazard(s) Addressed:	Adding a generator for the local AM/FM radio station
Action or Project	
Action/Project Number:	2.1
Name of Action or Project:	KMAM/KMOE Generator Project
Action or Project Description:	By installing a 60 to 80k natural gas generator in the facility, we are allowing normal operations to continue in the event of a widespread power outage. This will allow the radio station the ability to continue broadcasting in order to alert the surrounding community in case of a natural disaster.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$20,000 (Est) for 80KW fixed generator
Benefits:	Able to be used in any outage circumstance
Plan for Implementation	
Responsible Organization/Department:	Bates County Emergency Management
Action/Project Priority:	High
Timeline for Completion:	2020 to 2022
Potential Fund Sources:	State or Federal
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Economic Development Plan, Transportation Plan, NFIP
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	Bates County
Risk / Vulnerability	
Problem being Mitigated:	Lack of Shelter
Hazard(s) Addressed:	Lack of Storm Shelters
Action or Project	
Action/Project Number:	2.2
Name of Action or Project:	Storm Shelter
Action or Project Description:	Completion of a Dome/Storm Shelter. A FEMA dome or storm shelter will provide a location for members of Bates County to seek safe shelter in case of a natural disaster. Citizens will have a protected space to avoid harm.
Applicable Goal Statement:	Goal 2
Estimated Cost:	Unknown
Benefits:	Provide safe place for residents
Plan for Implementation	
Responsible Organization/Department:	Bates County Emergency Management
Action/Project Priority:	High
Timeline for Completion:	0-5 years
Potential Fund Sources:	County/City/Grants
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Economic Development Plan, Transportation Plan, NFIP
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	City of Amsterdam
Risk / Vulnerability	
Problem being Mitigated:	Proper drainage within city
Hazard(s) Addressed:	Culverts
Action or Project	
Action/Project Number:	2.3
Name of Action or Project:	Culverts
Action or Project Description:	Install culverts to prevent flooding and promote proper drainage. Proper drainage will ensure less damage to roads and possible damage to surrounding buildings due to water runoff.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$400,000.00
Benefits:	Prevent flooding and erosion
Plan for Implementation	
Responsible Organization/Department:	City Mayor and City Council
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	Grants
Local Planning Mechanisms to be Used in Implementation, if any:	Economic Development Plan, Transportation Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	City of Butler
Risk / Vulnerability	
Problem being Mitigated:	Public Safety
Hazard(s) Addressed:	Storm Sirens
Action or Project	
Action/Project Number:	2.4
Name of Action or Project:	Storm Sirens
Action or Project Description:	Adding additional and updated storm sirens allows for outside citizens to hear when there is hazardous weather near. This promotes safety to all of those outside and encourages them to seek shelter.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$25,000.00 each or $175,000.00 total
Benefits:	Public Safety
Plan for Implementation	
Responsible Organization/Department:	Butler Emergency Management
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	EMPG, FEMA, SEMA, Donations, City of Butler
Local Planning Mechanisms to be Used in Implementation, if any:	Builder's Plan, City Emergency, Economic Development Plan, Land Use Plan, Flood Mitigation Assistance Plan, Transportation Plan, Critical Facilities Plan, Comprehensive Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	Adrian R-III School District
Risk / Vulnerability	
Problem being Mitigated:	Severe weather, loss of electricity/generator
Hazard(s) Addressed:	Loss of safety
Action or Project	
Action/Project Number:	2.1
Name of Action or Project:	Construction infrastructure/1000 KW Generator
Action or Project Description:	Purchase a backup generator in case of hazardous weather that will keep staff and students safe in the event of a natural disaster.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$1,000,000.00
Benefits:	Electricity to school when power is out
Plan for Implementation	
Responsible Organization/Department:	Adrian R-III School District
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	FEMA, State agencies
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Capital Improvement Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Action Worksheet	
Name of Jurisdiction:	Ballard R-II School District
Risk / Vulnerability	
Problem being Mitigated:	Loss of Safety
Hazard(s) Addressed:	Severe weather, tornado
Action or Project	
Action/Project Number:	2.1
Name of Action or Project:	Generator
Action or Project Description:	Back up electricity for when the power goes out in hazardous weather to keep staff and students safe.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$1,000,000.00
Benefits:	Maintain Wi-Fi, generate electricity
Plan for Implementation	
Responsible Organization/Department:	Ballard R-II
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan
Action Status	
Report of Progress	
Completed by:	

Action Worksheet	
Name of Jurisdiction:	Butler R-V School District
Risk / Vulnerability	
Problem being Mitigated:	Safety during storm events, etc.
Hazard(s) Addressed:	Safety of students and staff
Action or Project	
Action/Project Number:	2.2
Name of Action or Project:	Classroom Storm Shelters
Action or Project Description:	Placement of storm shelters, student safety rooms throughout the district to provide the safest environment possible for students and staff.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$1,000,000.00
Benefits:	Safety of students and staff
Plan for Implementation	
Responsible Organization/Department:	Butler R-V
Action/Project Priority:	High
Timeline for Completion:	2 years
Potential Fund Sources:	Local, State, Federal
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Capital Improvement Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	Hudson R-IX School District
Risk / Vulnerability	
Problem being Mitigated:	Better Storm Warning
Hazard(s) Addressed:	Tornado
Action or Project	
Action/Project Number:	2.4
Name of Action or Project:	Outdoor Tornado Siren
Action or Project Description:	Outdoor Tornado/Warning Siren to alert staff, students and community members of incoming hazardous weather if they are outside.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$2,500.00
Benefits:	Advance Storm Warning for the Community
Plan for Implementation	
Responsible Organization/Department:	Hudson R-IX Administration
Action/Project Priority:	Medium
Timeline for Completion:	2 months
Potential Fund Sources:	Federal Grant
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	Hudson R-IX School District
Risk / Vulnerability	
Problem being Mitigated:	Better/More Communication
Hazard(s) Addressed:	Multiple Hazards
Action or Project	
Action/Project Number:	2.6
Name of Action or Project:	Purchase Radios for Busses
Action or Project Description:	Purchase Radios for Busses to help communications in regard to a disaster.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$1,500.00
Benefits:	Bus drivers would be better informed and could inform the school of problems.
Plan for Implementation	
Responsible Organization/Department:	Hudson R-IX Administration
Action/Project Priority:	High
Timeline for Completion:	2 months
Potential Fund Sources:	Federal Grant and Local
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	Hume R-VIII School District
Risk / Vulnerability	
Problem being Mitigated:	Protect the effects of future natural hazards in the county.
Hazard(s) Addressed:	Severe weather, tornado, earthquake
Action or Project	
Action/Project Number:	2.1
Name of Action or Project:	100 KW Generator
Action or Project Description:	Install a 100 KW generator to power our school in the event of a loss of electricity.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$1,000,000.00
Benefits:	We will be able to have school activities when power is lost.
Plan for Implementation	
Responsible Organization/Department:	Hume R-VIII School
Action/Project Priority:	High
Timeline for Completion:	5 years at most
Potential Fund Sources:	FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	Miami R-I School District
Risk / Vulnerability	
Problem being Mitigated:	Movement on evacuation and locate
Hazard(s) Addressed:	Flooding, Earthquake, Tornado
Action or Project	
Action/Project Number:	2.7
Name of Action or Project:	Safe Routes
Action or Project Description:	Identify and mark preferred evacuation routes to safe locations. Establish patrol of rescue and restoration plan.
Applicable Goal Statement:	Goal 2
Estimated Cost:	$85,000.00
Benefits:	Eases patrol and rescue. Saves lives. Channels the needy to points of relief.
Plan for Implementation	
Responsible Organization/Department:	Bates County, School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	Unknown
Potential Fund Sources:	Unknown
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 2: Mitigate the effects of future natural hazards in the County.

Action Worksheet	
Name of Jurisdiction:	Rich Hill R-IV School District
Risk / Vulnerability	
Problem being Mitigated:	Loss of Electricity
Hazard(s) Addressed:	Severe weather, Tornado, Earthquake, Flood
Action or Project	
Action/Project Number:	2.1
Name of Action or Project:	Generator
Action or Project Description:	Backup generator for school electricity
Applicable Goal Statement:	Goal 2
Estimated Cost:	$1,000,000.00
Benefits:	Prevention of food spoilage, maintain services.
Plan for Implementation	
Responsible Organization/Department:	Rich Hill R-IV School District
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	FEMA, Fed, State, Local Agencies
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	Bates County
Risk / Vulnerability	
Problem being Mitigated:	Lack of awareness in disasters
Hazard(s) Addressed:	Hazard Awareness Education
Action or Project	
Action/Project Number:	3.1
Name of Action or Project:	Hazard Awareness Education
Action or Project Description:	To provide education through a website and seminars for businesses, schools and other organizations to help plan for natural disasters and how to react accordingly when involved in a natural disaster.
Applicable Goal Statement:	Goal 3
Estimated Cost:	Time to create materials and travel
Benefits:	Increases outreach to public
Plan for Implementation	
Responsible Organization/Department:	Bates County EMA
Action/Project Priority:	High
Timeline for Completion:	6-24 months
Potential Fund Sources:	County and State
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Economic Development Plan, Transportation Plan, NFIP
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	City of Amsterdam
Risk / Vulnerability	
Problem being Mitigated:	Increasing Education
Hazard(s) Addressed:	Education on Natural Disasters
Action or Project	
Action/Project Number:	3.1
Name of Action or Project:	Education on Natural Disasters
Action or Project Description:	Communicate with emergency management to set up booth at Jubilee. Providing information to community members where storm safe locations are located as well as how to handle a natural disaster in your home.
Applicable Goal Statement:	Goal 3
Estimated Cost:	$0
Benefits:	Saves Lives
Plan for Implementation	
Responsible Organization/Department:	Mayor, City Council, Jubilee Committee and EMA
Action/Project Priority:	High
Timeline for Completion:	Yearly
Potential Fund Sources:	N/A
Local Planning Mechanisms to be Used in Implementation, if any:	Economic Development Plan, Transportation Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	City of Butler
Risk / Vulnerability	
Problem being Mitigated:	Critical facilities-Police/Fire Station
Hazard(s) Addressed:	Public Safety Building
Action or Project	
Action/Project Number:	3.7
Name of Action or Project:	Public Safety Building
Action or Project Description:	Build a public safety building to provide shelter during in climate weather. To also provide a building for natural disaster education.
Applicable Goal Statement:	Goal 3
Estimated Cost:	$1,500,000.00
Benefits:	Public Safety
Plan for Implementation	
Responsible Organization/Department:	City of Butler
Action/Project Priority:	High
Timeline for Completion:	5 year
Potential Fund Sources:	Unknown
Local Planning Mechanisms to be Used in Implementation, if any:	Builder's Plan, City Emergency, Economic Development Plan, Land Use Plan, Flood Mitigation Assistance Plan, Transportation Plan, Critical Facilities Plan, Comprehensive Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	City of Rich Hill
Risk / Vulnerability	
Problem being Mitigated:	Enhance public communication and awareness
Hazard(s) Addressed:	Extreme heat, Tornado, and Thunderstorm
Action or Project	
Action/Project Number:	3.1
Name of Action or Project:	Weather Aware Community Preparedness
Action or Project Description:	Donate weather radios to local businesses. Provide yearly community outreach program to the public about weather awareness.
Applicable Goal Statement:	Goal 3
Estimated Cost:	$500 per year
Benefits:	Provide weather safety tips to public to enhance preparedness, allow local businesses to have notification of inclimate weather.
Plan for Implementation	
Responsible Organization/Department:	Rich Hill Fire Department and Emergency Management
Action/Project Priority:	Medium
Timeline for Completion:	1 year
Potential Fund Sources:	Local
Local Planning Mechanisms to be Used in Implementation, if any:	Economic Development Plan, Transportation Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	Adrian R-III School District
Risk / Vulnerability	
Problem being Mitigated:	Weather radios
Hazard(s) Addressed:	Tornado, Earthquake, Severe Weather
Action or Project	
Action/Project Number:	3.2
Name of Action or Project:	Purchase weather radios
Action or Project Description:	Purchase weather radios for district to maintain open communication
Applicable Goal Statement:	Goal 3
Estimated Cost:	$85,000.00
Benefits:	Keep public informed of bad weather coming
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	Up to 5 years
Potential Fund Sources:	FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Capital Improvement Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	Ballard R-II School District
Risk / Vulnerability	
Problem being Mitigated:	Lack of Communication during severe weather
Hazard(s) Addressed:	Communication
Action or Project	
Action/Project Number:	3.2
Name of Action or Project:	Weather Radios
Action or Project Description:	Weather radios installed in 2 buildings (total of 10 radios)
Applicable Goal Statement:	Goal 3
Estimated Cost:	$85,000.00
Benefits:	With radios there would be better communication for citizens/students to prepare for severe weather
Plan for Implementation	
Responsible Organization/Department:	Ballard R-II
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	FEMA, HMGP
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	Butler R-V School District
Risk / Vulnerability	
Problem being Mitigated:	Communication challenges, safety awareness
Hazard(s) Addressed:	Improved communication among public entities
Action or Project	
Action/Project Number:	3.3
Name of Action or Project:	Safety Coordinator Officer
Action or Project Description:	Fund a position of a (SCO) to maintain awareness of safety procedures and communicate with outside agencies regarding planning.
Applicable Goal Statement:	Goal 3
Estimated Cost:	$50,000.00 annual salary
Benefits:	Communication and planning between agencies
Plan for Implementation	
Responsible Organization/Department:	Butler R-V
Action/Project Priority:	High
Timeline for Completion:	1 year
Potential Fund Sources:	Local, State, Federal
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Capital Improvement Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	Hume R-VIII School District
Risk / Vulnerability	
Problem being Mitigated:	Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.
Hazard(s) Addressed:	Tornado, earthquake, terrorist
Action or Project	
Action/Project Number:	3.4
Name of Action or Project:	Bullet proof glass on all school doors and windows
Action or Project Description:	Install bullet proof glass in all windows and doors in our school.
Applicable Goal Statement:	Goal 3
Estimated Cost:	$250,000.00
Benefits:	Protect our students and faculty from active shooters as well as earthquakes.
Plan for Implementation	
Responsible Organization/Department:	Hume R-VIII School/FEMA
Action/Project Priority:	High
Timeline for Completion:	5 years (at most)
Potential Fund Sources:	FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	Miami R-I School District
Risk / Vulnerability	
Problem being Mitigated:	Safe routes
Hazard(s) Addressed:	Tornado, earthquake, hazardous weather
Action or Project	
Action/Project Number:	3.5
Name of Action or Project:	Safe Routes for Citizens
Action or Project Description:	Identify a promulgate safe routes, rally points and collector sites within the county.
Applicable Goal Statement:	Goal 3
Estimated Cost:	$15,000.00
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	Unknown
Potential Fund Sources:	Unknown
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 3: Strengthen communication and awareness to coordinate participation between public agencies, citizens, non-profit organizations, business and industry.

Action Worksheet	
Name of Jurisdiction:	Rich Hill R-IV School District
Risk / Vulnerability	
Problem being Mitigated:	Communication w/ busses, emergency responders, municipalities
Hazard(s) Addressed:	Flooding, Tornadoes, Wildfire
Action or Project	
Action/Project Number:	3.2
Name of Action or Project:	2-way radios, weather radios
Action or Project Description:	Upgrade radio tower purchases secure band 2-way radios for all admins, buses, vehicles.
Applicable Goal Statement:	Goal 3
Estimated Cost:	$85,000.00
Benefits:	Communication
Plan for Implementation	
Responsible Organization/Department:	Rich Hill R-IV
Action/Project Priority:	High
Timeline for Completion:	Up to 5 years
Potential Fund Sources:	FEMA, Other fed Agencies, State, County Govs.
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	Bates County
Risk / Vulnerability	
Problem being Mitigated:	Financial loss to property caused by natural disasters
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	4.1
Name of Action or Project:	NFIP
Action or Project Description:	Maintain flood insurance program at or above the current level and enforce regulations. Regulate new construction in SFHAs or Floodplain identification and mapping.
Applicable Goal Statement:	Goal 4
Estimated Cost:	$30,000.00 per year
Benefits:	Mitigate the effects of flooding
Plan for Implementation	
Responsible Organization/Department:	Bates County
Action/Project Priority:	High
Timeline for Completion:	1 year to ongoing
Potential Fund Sources:	FEMA; Local Funding
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Economic Development Plan, Transportation Plan, NFIP, Floodplain Ordinance
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	Bates County
Risk / Vulnerability	
Problem being Mitigated:	Loss of power shuts station down
Hazard(s) Addressed:	Loss of public radio station services
Action or Project	
Action/Project Number:	4.2
Name of Action or Project:	Radio Station Power
Action or Project Description:	To supply local public radio station funds to purchase emergency generator for power loss instances.
Applicable Goal Statement:	Goal 4
Estimated Cost:	Unknown
Benefits:	Never loss of communication to Bates County Citizens
Plan for Implementation	
Responsible Organization/Department:	Bates County EMA (EMD)
Action/Project Priority:	High
Timeline for Completion:	When funds
Potential Fund Sources:	Unknown
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Economic Development Plan, Transportation Plan, NFIP
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	City of Butler
Risk / Vulnerability	
Problem being Mitigated:	Financial loss to property caused by natural disasters
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	4.1
Name of Action or Project:	NFIP
Action or Project Description:	Maintain flood insurance program at or above the current level and enforce regulations. Regulate new construction in SFHAs or Floodplain identification and mapping.
Applicable Goal Statement:	Goal 4
Estimated Cost:	$15,000.00 per year
Benefits:	Mitigate the effects of flooding
Plan for Implementation	
Responsible Organization/Department:	City Council
Action/Project Priority:	High
Timeline for Completion:	1 year to ongoing
Potential Fund Sources:	FEMA; Local Funding
Local Planning Mechanisms to be Used in Implementation, if any:	Builder's Plan, City Emergency, Economic Development Plan, Land Use Plan, Flood Mitigation Assistance Plan, Transportation Plan, Critical Facilities Plan, Comprehensive Plan, Capital Improvement Plan, Floodplain ordinance
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	City of Amsterdam
Risk / Vulnerability	
Problem being Mitigated:	Early alert system in place for residents
Hazard(s) Addressed:	Storm Sirens
Action or Project	
Action/Project Number:	4.3
Name of Action or Project:	Storm Sirens
Action or Project Description:	Update storm siren and equipment and system
Applicable Goal Statement:	Goal 4
Estimated Cost:	$750,000.00
Benefits:	Saves Lives
Plan for Implementation	
Responsible Organization/Department:	Mayor and Fire Department
Action/Project Priority:	High
Timeline for Completion:	2 years
Potential Fund Sources:	Grants
Local Planning Mechanisms to be Used in Implementation, if any:	Economic Development Plan, Transportation Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	City of Rich Hill
Risk / Vulnerability	
Problem being Mitigated:	Update of Emergency Operational Plan
Hazard(s) Addressed:	Natural disasters
Action or Project	
Action/Project Number:	4.4
Name of Action or Project:	Local Emergency Operations Plan
Action or Project Description:	Update of current local emergency operational plan
Applicable Goal Statement:	Goal 4
Estimated Cost:	$0
Benefits:	Update to EOP
Plan for Implementation	
Responsible Organization/Department:	Local and County EMA, City Council, Mayor
Action/Project Priority:	Medium
Timeline for Completion:	6 months
Potential Fund Sources:	County
Local Planning Mechanisms to be Used in Implementation, if any:	Economic Development Plan, Transportation Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	Adrian R-III School District
Risk / Vulnerability	
Problem being Mitigated:	Updating emergency protocols and purchasing radios
Hazard(s) Addressed:	Tornado, Wildfire, Earthquake
Action or Project	
Action/Project Number:	4.5
Name of Action or Project:	Upgrade Emergency Management response 2 way radios
Action or Project Description:	A way to update and upgrade emergency response
Applicable Goal Statement:	Goal 4
Estimated Cost:	$85,000.00
Benefits:	After Plan
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	Up to 5 years
Potential Fund Sources:	FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Capital Improvement Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	Ballard R-II School District
Risk / Vulnerability	
Problem being Mitigated:	Communication with buses, students and staff
Hazard(s) Addressed:	Storms, Tornados, Flooding
Action or Project	
Action/Project Number:	4.4
Name of Action or Project:	Update Emergency Response Plan
Action or Project Description:	Update response plan
Applicable Goal Statement:	Goal 4
Estimated Cost:	$30,000.00
Benefits:	Communications
Plan for Implementation	
Responsible Organization/Department:	Ballard R-II
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	FEMA, HMGP
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	Butler R-V School District
Risk / Vulnerability	
Problem being Mitigated:	Lack of written emergency procedures
Hazard(s) Addressed:	Student safety and spectator safety
Action or Project	
Action/Project Number:	4.6
Name of Action or Project:	School Sponsored Event Safety
Action or Project Description:	Develop written procedures and plans for the safety of students and citizens at outdoor/indoor events
Applicable Goal Statement:	Goal 4
Estimated Cost:	$5,000.00
Benefits:	Safety for students and community attending events
Plan for Implementation	
Responsible Organization/Department:	Butler R-V
Action/Project Priority:	High
Timeline for Completion:	1 year
Potential Fund Sources:	Local, State
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Capital Improvement Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	Hume R-VIII School District
Risk / Vulnerability	
Problem being Mitigated:	Develop written policies and procedures for preparedness and mitigation response to natural disasters.
Hazard(s) Addressed:	Tornado, Earthquake, Flood
Action or Project	
Action/Project Number:	4.4
Name of Action or Project:	Update emergency management protocol
Action or Project Description:	Update our emergency management protocol
Applicable Goal Statement:	Goal 4
Estimated Cost:	$85,000.00
Benefits:	Everyone will know what to do in an emergency.
Plan for Implementation	
Responsible Organization/Department:	Hume R-VIII School
Action/Project Priority:	High
Timeline for Completion:	Up to 5 years
Potential Fund Sources:	FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	Miami R-I School District
Risk / Vulnerability	
Problem being Mitigated:	Lack of awareness of plans and routes
Hazard(s) Addressed:	Any Natural Disaster
Action or Project	
Action/Project Number:	4.7
Name of Action or Project:	Wrap it Up
Action or Project Description:	Incorporate 3.1, 1.1, 2.1 in an integrated operating procedure
Applicable Goal Statement:	Goal 4
Estimated Cost:	$1,500.00
Benefits:	Saves lives and prevents damage to facilities and property
Plan for Implementation	
Responsible Organization/Department:	School Board and School Superintendent
Action/Project Priority:	High
Timeline for Completion:	Unknown
Potential Fund Sources:	Unknown
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

Goal 4- Develop written policies and procedures for preparedness and mitigation response to natural disasters.

Action Worksheet	
Name of Jurisdiction:	Rich Hill R-IV School District
Risk / Vulnerability	
Problem being Mitigated:	Lack of procedures
Hazard(s) Addressed:	Tornado, Wildfire, Earthquake, Flood
Action or Project	
Action/Project Number:	4.4
Name of Action or Project:	Update emergency response plan
Action or Project Description:	Update response plan
Applicable Goal Statement:	Goal 4
Estimated Cost:	$85,000.00
Benefits:	A clarified and updated version to direct staff and students as to what to do in a natural disaster situation.
Plan for Implementation	
Responsible Organization/Department:	Rich Hill R-IV
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	FEMA, Fed, State, County, Local Agencies
Local Planning Mechanisms to be Used in Implementation, if any:	County Emergency Operations Plan, Master Plan, Emergency Plan
Progress Report	
Action Status	
Report of Progress	
Completed by:	

5 PLAN MAINTENANCE PROCESS

5 PLAN MAINTENANCE PROCESS 5.1

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

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

5.1 Monitoring, Evaluating, and Updating the Plan

44 CFR Requirement 201.6(c)(4): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

5.1.1 Responsibility for Plan Maintenance

The Mitigation Planning Committee (MPC) has served as an advisory body during the plan update process, but is not a standing committee. Many MPC representatives and stakeholders are also represented on the Local Emergency Planning Committee (LEPC), as well as several other committees and groups in Bates County. Kaysinger Basin Regional Planning Commission will be responsible for overseeing the plan monitoring, evaluation and maintenance of the Plan. However, it will be up to the County Commission, Office of Emergency Management, and the local jurisdictions to carry out the goals and actions outlined. Maintenance will involve agreement of the participating jurisdictions, including schools to:

- Meet annually, and after a disaster event, to monitor and evaluate the implementation of the plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low- or no-cost recommended actions;
- Maintain vigilant monitoring of multi-objective, cost-share, and other funding opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities

overlap, influence, or directly affect increased community vulnerability to disasters;

- Report on plan progress and recommended changes to the County Board of Supervisors and governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

5.1.2 Plan Maintenance Schedule

The MPC agrees to meet annually and after a state or federally declared hazard event as appropriate to monitor progress and update the mitigation strategy. Kaysinger Basin Regional Planning Commission will be responsible for initiating the plan reviews and will invite members of the MPC to the meeting.

In coordination with all participating jurisdictions, a five-year written update of the plan will be submitted to the Missouri State Emergency Management Agency (SEMA) and FEMA Region VII per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule.

5.1.3 Plan Maintenance Process

Progress on the proposed actions can be monitored by evaluating changes in vulnerabilities identified in the plan. The MPC during the annual meeting should review changes in vulnerability identified as follows:

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions,
- Increased vulnerability due to hazard events, and/or
- Increased vulnerability as a result of new development (and/or annexation).

Future 5-year updates to this plan will include the following activities:

- Consideration of changes in vulnerability due to action implementation,
- Documentation of success stories where mitigation efforts have proven effective,
- Documentation of unsuccessful mitigation actions and why the actions were not effective,
- Documentation of previously overlooked hazard events that may have occurred since the previous plan approval,
- Incorporation of new data or studies with information on hazard risks,
- Incorporation of new capabilities or changes in capabilities,
- Incorporation of growth data and changes to inventories, and
- Incorporation of ideas for new actions and changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the participating jurisdictions will adopt the following process:

- Each proposed action in the plan identified an individual, office, or agency responsible for action implementation. This entity will track and report on an annual basis to Kaysinger Basin Regional Planning Commission 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 will determine necessary remedial action, making any required modifications to the plan.

Changes will be made to the plan to remedy actions that have failed or are not considered feasible. Feasibility will be determined after a review of action consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring of this plan. Updating of the plan will be accomplished by written changes and submissions, as the MPC deems appropriate and necessary. Changes will be approved by the Bates County Commissioners and the governing boards of the other participating jurisdictions.

5.2 Incorporation into Existing Planning Mechanisms

44 CFR Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Where possible, plan participants, including school and special districts, will use existing plans and/or programs to implement hazard mitigation actions. Those existing plans and programs were described in Section 2.2 of this plan. Based on the capability assessments of the participating jurisdictions, communities in Bates County will continue to plan and implement programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through the following plans:

- General or master plans of participating jurisdictions;
- Ordinances of participating jurisdictions;
- Bates County Emergency Operations Plan;
- 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 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 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, Kaysinger Basin Regional Planning Commission will provide the updated Mitigation Strategy with current status of each mitigation action to the County Commissioners as well as all Mayors, City Clerks, and School District Superintendents. Kaysinger Basin Regional Planning Commission will request that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms.

Table 5.1 below lists the planning mechanisms by jurisdiction into which the Hazard Mitigation Plan will be integrated.

Table 5.1 Planning Mechanisms Identified for Integration of Hazard Mitigation Plan

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
Unincorporated Bates County	County Emergency Operations Plan Economic Development Plan Transportation Plan Floodplain Ordinance NFIP	None due to lack of education on the process and hazard mitigation.	Members will continually update the emergency operations plan and participate in economic development as well as TAC and NFIP if they already are a participating jurisdiction.
City of Amsterdam	Economic Development Plan Transportation Plan	None due to lack of education on the process and hazard mitigation.	Continually encourage public participation in developing plans within community.
City of Butler	Builder's Plan City Emergency Operations Plan City Mitigation Plan Economic Development Plan Land Use Plan Flood Mitigation Assistance Plan Transportation Plan Critical Facilities Plan Comprehensive Plan	None due to lack of education on the process and hazard mitigation.	Members will continually update the emergency operations plan and participate in economic development as well as TAC and NFIP if they already are a participating jurisdiction.
City of Rich Hill	Economic Development Plan Transportation Plan	None due to lack of education on the process and hazard mitigation.	Continually encourage public participation in developing plans within community.

	Watershed Plan Tree Trimming Ordinance Site Plan Review Requirements	None due to lack of education on the process and hazard mitigation.	
Adrian R-III	County Emergency Operations Plan Master Plan Capital Improvement Plan Emergency Plan Weapons Policy	None due to lack of education on the process and hazard mitigation.	Districts wishing to construct FEMA 361-standard safe rooms for the protection of staff and students have identified said safe rooms within their respective capital improvement plans, which have carried over in the mitigation actions of the HMP.
Ballard R-II	County Emergency Operations Plan Emergency Plan Weapons Policy	None due to lack of education on the process and hazard mitigation.	Districts wishing to construct FEMA 361-standard safe rooms for the protection of staff and students have identified said safe rooms within their respective capital improvement plans, which have carried over in the mitigation actions of the HMP.
Butler R-V	County Emergency Operations Plan Master Plan Capital Improvement Plan Emergency Plan Weapons Policy	None due to lack of education on the process and hazard mitigation.	Districts wishing to construct FEMA 361-standard safe rooms for the protection of staff and students have identified said safe rooms within their respective capital improvement plans, which have carried over in the mitigation actions of the HMP.
Hudson R-IX	County Emergency Operations Plan Master Plan Emergency Plan Weapons Policy	None due to lack of education on the process and hazard mitigation.	Districts wishing to construct FEMA 361-standard safe rooms for the protection of staff and students have identified said safe rooms within their respective

			capital improvement plans, which have carried over in the mitigation actions of the HMP.
Hume R-VIII	County Emergency Operations Plan Emergency Plan Weapons Policy	None due to lack of education on the process and hazard mitigation.	Districts wishing to construct FEMA 361-standard safe rooms for the protection of staff and students have identified said safe rooms within their respective capital improvement plans, which have carried over in the mitigation actions of the HMP.
Miami R-I	County Emergency Operations Plan Master Plan Emergency Plan Weapons Policy	None due to lack of education on the process and hazard mitigation.	Districts wishing to construct FEMA 361-standard safe rooms for the protection of staff and students have identified said safe rooms within their respective capital improvement plans, which have carried over in the mitigation actions of the HMP.
Rich Hill R-IV	County Emergency Operations Plan Master Plan Emergency Plan Weapons Policy	None due to lack of education on the process and hazard mitigation.	Districts wishing to construct FEMA 361-standard safe rooms for the protection of staff and students have identified said safe rooms within their respective capital improvement plans, which have carried over in the mitigation actions of the HMP.

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 Kaysinger Basin 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.

U.S. Department of Homeland Security
FEMA Region VII
11224 Holmes Road
Kansas City, MO 64131

FEMA

May 13, 2020

Mr. James Remillard, Acting Director
State Emergency Management Agency
P. O. Box 116
Jefferson City, Missouri 65102

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

Dear Mr. Remillard:

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

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

Plan Name	Date Submitted	Date Approved	Date of Plan Adoption	Date of Plan Expiration	Review Status
Bates County	May 6, 2020	May 13, 2020	May 21, 2019	May 13, 2025	Approved

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

Sincerely,

Catherine R. Sanders, Director
Mitigation Division

Jurisdiction: Bates County	**Title of Plan:** Bates County, MO Natural Hazard Mitigation Plan	**Date of Plan:** 2019
Local Point of Contact: Michelle Slater **Title:** Regional Planner **Agency:** Kaysinger Basin RPC	**Address:** 221 N. Second St. Clinton, MO 64735	
Phone Number: 660-885-3393	**E-Mail:** mslater@kaysinger.com	
Funding Source:	Bates Co. Hazard Mitigation Plan DR-4250-MO-PROJECT #12	
State Reviewer: Mary Smith **Mary Smith**	**Title: Planner II** **Planner II**	**Date: 02/28/2020** **04/21/2020**
FEMA Reviewer: Michelle Wolfe	**Title:** Plan Reviewer	**Date:** 10 March 2020
Date Received in FEMA Region VII	February 28, 2020	
Technical Assistance	16 March 2020, 28 April 2020	
Plan Approvable Pending Adoption		
Plan Approved		

Only Plan Participating Jurisdiction(s):	NFIP Status*			
	Y	**NP**	**S-Date**	**R-Date**
1. Bates County (Resolution dated 6/26/2019)	X			
2. City of Amsterdam (Resolution dated 6/3/2019)			S-5/3/11	
3. City of Butler (Resolution dated 5/21/2019)	X			
4. City of Rich Hill (Resolution dated 6/12/2019)			S-2/14/76	
5. Adrian R-III School District (Resolution dated 6/20/2019)		N/A		
6. Ballard R-II School District (Resolution dated 6/26/2019)		N/A		
7. Butler R-V School District (Resolution dated 6/26/2019)		N/A		
8. Hudson R-9 School District (Resolution dated 6/10/2019)		N/A		
9. Hume R-VIII School District (Resolution dated 6/12/2019)		N/A		
10. Miami R-I School District (Resolution dated 5/24/2019)		N/A		
11. Rich Hill R-IV School District (Resolution dated 6/12/2019)		N/A		
12.				
13.				

* **Notes: Y= Participating NP = Not Participating in NFIP S- Sanctioned R- Rescinded**

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Sec. iv, 1.4	✓	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Sec 1.4	✓	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Sec 1.4	✓	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Sec 1.12	✓	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Sec 5.3	✓	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Sec 5.1	✓	

ELEMENT A: REQUIRED REVISIONS

Notes

- It is not clear why "attendees were asked to complete a public survey that would indicate their opinion on the likelihood for each hazard to impact their jurisdiction" (p. 1.13). Probability/likelihood is not a matter of opinion and it is misleading to suggest that in the jurisdictional questionnaires. Hazard occurrences and probability should be factually supported components of the risk assessment, enabling communities to engage in responsible, fact-based decision-making. Strongly recommend that this element of the questionnaire be reworked in future and other concurrent planning efforts.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Sec 3.1.4 and Sec 3.4	✓	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Sec 3.4	✓	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Sec 3.4		✓
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Page 3.58	✓	

ELEMENT B: REQUIRED REVISIONS

B3. Identifying vulnerable assets and potential losses is more than a list of the total exposure of population, structures, and critical facilities in the planning area. An example of an overall summary is a list of key issues or problem statements that clearly describes the community's greatest vulnerabilities and that will be addressed in the mitigation strategy. (Exposure does not equate with risk.)

- The values in Tables 3.3, 3.4 and 3.5 need to be revisited. Building counts don't match between Table 3.3 and 3.5, and (as an example), eleven residential properties in Amsterdam are likely to have greater value/exposure than $2,027. Other values in these tables appear to be questionable as well.
  Made the required revisions on Page 3.12.

  I went through tables 3.3, 3.4 and 3.5, I changed all of the values and building counts within each of these areas. With this data change all the values should add up correctly across the three.

- The flood profile would benefit from more jurisdiction specific discussion of flooding concerns/issues. While flood maps are included for each jurisdiction, the maps would be improved by including locations of critical facilities. Butler includes a mitigation action to develop a stormwater management plan and Amsterdam includes an action to improve culverts; however, concerns or issues with stormwater management and culverts are not mentioned in the profile. (See also Element C2)
  Added information to the problem statement on page 3.61, also added maps on pages 3.62, 3.63 and 3.64 showing critical infrastructures for Bates County Missouri ✓

Notes:

- In the dam failure profile, it would be appropriate to note that according to the 2018 Kansas State Hazard Mitigation Plan, Linn County, Kansas has 12 high hazard dams, all with EAPs, and Miami, County, Kansas has 3 high hazard dams with two having EAPs. While the presence of dams outside of the planning area is acknowledged, it does not appear that potential risk from across the state line has been addressed.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Sec 2.2	✓ See Note 1	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Pg 3.58 and Sec 4.3		✓
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Sec 4.1	✓	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Sec 4.3	✓	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Sec 4.3	✓	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Pg. 5.4 to 5.5	✓ See Note 2	

ELEMENT C: REQUIRED REVISIONS

C2. The plan **must** describe each jurisdiction's participation in the NFIP and describe their floodplain management program for continued compliance. Simply stating "The community will continue to comply with NFIP," will not meet this requirement. The description could include, but is not limited to:

- Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs);
- Floodplain identification and mapping, including any local requests for map updates; or
- Description of community assistance and monitoring activities

  Added flood plain ordinances for two action worksheets, one for Bates County on page 4.45 and one for the City of Butler on page 4.47

  Added the regulations for new construction, etc in the project description on pages 4.45 and 4.47 as well

Original Version: *Maintain flood insurance program at or above the current level and enforce regulations*
Revised Version: *Maintain flood insurance program at or above the current level and enforce regulations. Regulate new construction in SFHAs or Floodplain identification and mapping.*
Comment: *Maintaining, enforcing and regulating new construction are baseline floodplain management requirements and are not furthering existing mitigation capabilities. The County has a 2010 DFIRM and declining growth, (p. 2.3), so it is not clear why floodplain identification and mapping would be needed.*

Added a paragraph on page 3.61 addressing why floodplain identification and mapping is desired as well as needed for these areas.

Jurisdictions that are currently not participating in the NFIP where an FHBM or FIRM has been issued may meet this requirement by describing the reasons why the community does not participate.

- Amsterdam and Rich Hill are encouraged to reconsider participation in the NFIP and are reminded that Federal financial assistance for acquisition or construction purposes, including, in some cases, Federal disaster assistance, may not be available in identified Special Flood Hazard Areas. Please see the attached FEMA Fact Sheet on NFIP Sanctioned Communities.

  Added statement saying that there is a lack of funding to hire a staff member on page 3.61 ✓

  Notes:
- Somewhat concerned that 3 of 4 jurisdictions are uncertain as to their participation in the CRS program. That is

something that should have been raised and resolved with the State NFIP Coordinator in the course of the planning process. *We can confirm that that there are no CRS jurisdictions within the planning area as of October 2019.*

- The plan integration table on p. 5.4 indicates that several jurisdictions will integrate the County Mitigation Plan into itself.
- Removed the hazard mitigation plan planning mechanism in the jurisdictions where it is integrated into itself on page 5.4

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Sec 3.3	✓	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Sec 4.2	✓	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Sec 4.2	✓	
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Appendix C	✓	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Appendix C	✓	
ELEMENT E: REQUIRED REVISIONS **Note:** If the plan is not adopted by a participating jurisdiction, that jurisdiction would not be eligible for project grants under the following hazard mitigation assistance programs: HMGP, PDM, FMA, and SRL.			
ELEMENT F. ADDITIONAL STATE REQUIREMENT (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1. The use of SEMA's Hazard Mitigation Plan Outline Format is **required** for County level/multi-jurisdictional Local Hazard Mitigation Plans. Does the Plan follow the Plan Outline Format in accordance this state requirement?			
ELEMENT F: REQUIRED REVISIONS			

Resources for Implementing Your Approved Plan

A variety of mitigation resources are available to communities. SEMA's mitigation website: http://sema.dps.mo.gov/programs/mitigation_management.asp provides planning and project related information as well as details on how major FEMA mitigation programs are implemented in the State.

SEMA's training website provides information on upcoming training opportunities within the State: http://training.dps.mo.gov/sematraining.nsf/TrainingSchedule?OpenForm. A benefit cost analysis (BCA) course is periodically offered. This course is often critical in helping communities achieve effective mitigation projects; it also provides supplemental information on developments within various grant programs, and is typically led by SEMA personnel and FEMA contractor personnel.

Review of the Local Mitigation Plan Review Guide (10/1/11) https://www.fema.gov/media-library/assets/documents/23194 is encouraged as guidance for the Hazard Mitigation Plan Review Tool. The FEMA HMA guidance (FY15 is the most current) is also encouraged as guidance provides information about application and eligibility requirements. This guidance is available from http://sema.dps.mo.gov/programs/mitigation_management.asp or through FEMA's grant applicant resources page at http://www.fema.gov/government/grant/hma/grant_resources.shtm.

As noted above, various funding programs are available from several state and federal agencies to assist local jurisdictions in accomplishing their mitigation activities and goals. A detailed listing of programs, information on each program, and contact information is available from the 2018 State Hazard Mitigation Plan on page 4.72/PDF 775. Heidi Carver, State Hazard Mitigation Officer, (Heidi.Carver@sema.dps.mo.gov), Jennifer Storey, Lead State Hazard Mitigation Specialist, (Jennifer.Storey@sema.dps.mo.gov), and Mary Smith, State Hazard Mitigation Specialist, (Mary.Smith@sema.dps.mo.gov) can provide additional contacts for specific programs.

There are several RiskMAP projects that are currently in Discovery phase. As a Cooperating Technical Partner (CTP), the NFIP and Floodplain Section at SEMA, has a role in implementing these projects. Jurisdictions that are part of these projects have been contacted directly regarding these efforts and have been asked to participate in one or more RiskMAP/ Discovery meetings. These meetings have been scheduled throughout Missouri to present similar information, and all meetings offer opportunities for questions about the program and process.

Karen McHugh, Linda Olsen, Lori Blatter, or Darryl Rockfield (with the NFIP and Floodplain Section at SEMA) can be contacted for additional information on RiskMAP or Discovery meetings through http://sema.dps.mo.gov/about/staff.asp.

Links to additional resources are provided below:

- Review of the FEMA HMA guidance is encouraged as guidance provides information about application and eligibility requirements. This guidance is available from http://www.iowahomelandsecurity.org/grants/HMA.html or through FEMA's grant applicant resources page at http://www.fema.gov/government/grant/hma/grant_resources.shtm.
- Various funding programs are available from several state and federal agencies to assist local jurisdictions in accomplishing their mitigation activities and goals. A detailed listing of programs, information on each program,

and contact information is also available from the 2018 State Hazard Mitigation Plan (see Appendix D) (https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf).

- Missouri Department of Natural Resources Water Protection Financial Information Center: Administers funding and provides technical and financial assistance for projects including construction of new drinking water or wastewater infrastructure, existing infrastructure upgrades or rehabilitation; storm water-related projects that benefit water quality; and green infrastructure.
    - Clean Water State Revolving Fund,
    - Drinking Water State Revolving Fund
    - Small Borrower Loans
    - Rural Sewer Grants
    - Small Community Engineering Assistance Program
    - Engineering Report Services Grants.
- Missouri Conservation Heritage Foundation Stream Stewardship Trust Fund: An in-lieu fee stream mitigation program. If a developer's project impacts a Missouri stream, in many cases, they must mitigate for that damage. One way to mitigate is to pay a fee to the Trust Fund, which creates a funding mechanism to protect Missouri's best streams.
- Missouri Department of Community Development: List of funding and assistance opportunities to support community development, planning and infrastructure. Includes the Grow Missouri Disaster Loan program.
- Federal Grants Resource Center and Grants.gov: Lists of grant opportunities from federal agencies (HUD, DOT/FHWA, EPA, etc.) to support rural development, sustainable communities and smart growth, climate change and adaptation, historic preservation, risk analyses, wildfire mitigation, conservation, Federal Highways pilot projects, etc.
- FEMA Hazard Mitigation Assistance (HMA): FEMA's Hazard Mitigation Assistance provides funding for projects under the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA). States, federally recognized tribes, local governments, and some not for profit organizations are eligible applicants.
- GrantWatch: The website posts current foundation, local, state, and federal grants on one website, making it easy to consider a variety of sources for grants, guidance, and partnerships. Grants listed include The Partnership for Resilient Communities, the Institute for Sustainable Communities, the Rockefeller Foundation Resilience, The Nature Conservancy, The Kresge Climate-Resilient Initiative, the Threshold Foundation's Thriving Resilient Communities funding, the RAND Corporation, and ICLEI Local Governments for Sustainability.
- USDA Natural Resource Conservation Service (NRCS) and Rural Development Grants: NRCS provides conservation technical assistance, financial assistance, and conservation innovation grants. USDA Rural Development operates over fifty financial assistance programs for a variety of rural applications.