CONTRIBUTORS

McDonald County Hazard Mitigation Planning Committee

Jurisdictional Representative

Name	Title	Jurisdiction/Agency/Organization
Andi Browning	City Clerk	City of Anderson
Bill Martin	Trustee	Village of Jane
David Abbott	Emergency Manager	City of Anderson
David Blake	Mayor	City of Southwest City
Georgia Holtz	City Clerk	City of Goodman
Gregg Sweeten	Mayor of Pineville and McDonald County Hazard Mitigation Manager	City of Pineville
J.R Goodman	Mayor	City of Goodman
Jason Boling	Fire Chief	Village of Jane
Kimberly Bell	County Clerk	McDonald County
Krystal Austen	City Clerk	City of Southwest City
Lewis Davis	Mayor	City of Noel
Melissa Ziemianin	City Clerk	City of Pineville
Rick Lett	Westerner Commissioner	McDonald County
Robert Evenson	Sheriff	McDonald County
Rusty Wilson	Mayor	City of Anderson
Stan Haywood	Mayor	City of Lanagan
Summer Howell	City Clerk	City of Lanagan
Adam Lett	Pineville School Principal	McDonald County Schools
Coleen Moore	Secretary	White Rock Fire Protection District

Stakeholder Representatives

Name	Title	Agency/Organization
Aaron Divine	Campus Director	Crowder College
Cameron Beyers	Environmental Manager	Tyson
George Merritt	Complex Safety Manager	Tyson

Mike Ross	Director	Freeman Ambulance
Susan Woods	Director	McDonald County Living Center
Will Gordon	Director of Facilities	McDonald County Schools

Stakeholders are individuals or groups that are affected by a mitigation action or policy and include businesses, private organizations, and citizens. Unlike planning team members, stakeholders may not be involved in all stages of the planning process, but they inform the planning team on a specific topic or provide input from different points of view in the community.

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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. McDonald County and participating jurisdictions and school/special districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses from hazard events to the County and its communities and school/special districts. The plan is an update of a plan that was approved on March 29, 2017. 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 jurisdictions that participated in the planning process:

- McDonald County
- City of Anderson
- City of Goodman
- City of Lanagan
- City of Noel
- City of Pineville
- City of Southwest City
- Village of Jane
- McDonald County School District
- White Rock Fire Protection District

The Village Ginger Blue was invited to participate in the planning process, but did not meet all of the established requirements for official participation. When the future five-year update is developed for this plan, this jurisdiction again will be invited again to participate.

McDonald County and the entities listed above developed a Multi-Jurisdictional Hazard Mitigation Plan that was approved by FEMA on March 29, 2017 (hereafter referred to as the McDonald County *2016 Hazard Mitigation Plan*). This current planning effort serves to update that previously approved plan.

The plan update process followed a methodology in accordance with FEMA guidance, which began with the formation of a Mitigation Planning Committee (MPC) comprised of representatives from McDonald County and participating jurisdictions. The MPC updated the risk assessment that identified and profiled hazards that pose a risk to McDonald 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. Increase internal capabilities to mitigate the effects of natural hazards. 2.
2. Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering other community goals.
3. Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
4. Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigatingrisks due to those hazards.

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, and ideas for implementation, responsible agency, timeline, cost estimate, potential funding sources, and more.

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

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

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

Model Resolution

McDonald County, Missouri RESOLUTION NO. ___

A RESOLUTION OF THE McDonald County ADOPTING THE McDonald County Hazard Mitigation Plan 2021

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 McDonald County has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the McDonald County Hazard Mitigation Plan 2021, 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 County of McDonald from the impacts of future hazards and disasters; and

WHEREAS the County of McDonald recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the County of McDonald will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by the County of McDonald demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY THE COUNTY OF MCDONALD, in the State of Missouri, THAT:

In accordance with *local rule for adopting resolutions*, the County of McDonald 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

1.1 PURPOSE

Hazard mitigation is "any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards". There is an understanding that hazardous events will occur, and at their worst can result in death and destruction of property and infrastructure. The tasks and work done to reduce the impact of hazard events to life and property is called Hazard Mitigation. McDonald County and the participating jurisdictions and school districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses from hazard events.

For jurisdictions to be eligible for mitigation grants,

- They must adopt the plan. Jurisdictions who do not formally adopt the plan will not be eligible for pre-disaster mitigation grants.
- Completion of data worksheets regarding hazard mitigation
- Attendance at public meetings

The citation below illustrates the authorizing legislation of local hazard mitigation plans:

"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 CPR §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]

- [1] FEMA's Local Mitigation Planning Handbook, March 2013 and FEMA's Local Mitigation Plan Review Guide, October 1, 2011.

1.2 BACKGROUND AND SCOPE

Located in the Southwestern edge of Missouri, The McDonald County area has experienced the adverse effects of natural disasters. Historical records indicate that natural hazards, particularly floods and tornadoes, has had a deep effect on the region. Unfortunately, there is no way to prevent disasters from occurring. The impact of disasters, however, can be mitigated. Their effects can be lessened and losses reduced through the development and application of prudent hazard mitigation strategies and actions. In doing so, the McDonald County area can be made to be a safer place to live, work and play.

This document is the 5-year update of a plan that was approved on March 29, 2017. The plan and the update were prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 to result in the eligibility for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant Programs.

Through mitigation planning, each participating jurisdiction has identified areas throughout the region vulnerable to potential hazards and developed strategies to reduce such vulnerability. This updated hazard mitigation plan documents the progress made on established mitigation actions and proposes new actions designed to reduce the impacts of hazards and increase resilience. The updated plan is the result of a collaborative effort by the following participating jurisdictions:

McDonald County

- City of Anderson
- City Goodman
- City Lanagan
- City Noel
- City of Pineville
- City of Southwest City
- Village of Jane
- McDonald County School District
- White Rock Fire Protection District

The following local governments and school districts participated in both the original plan as well as the plan update, which allows them to adopt the plan and secure eligibility for Hazard Mitigation Grant funding they could not otherwise obtain. (No changes were made from prior participants.)

In addition to securing grant funding eligibility, the plan is useful for incorporating hazard mitigation planning and principals into other documents, such as zoning regulations and land use plans.

1.3 PLAN ORGANIZATION

Set forth the outline of the plan. If there are changes in the format from the previously approved plan, explain what they are and why the changes were made.

- 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) Summary of each chapter and the changes made in the update.

Table 1.1. Changes Made in Plan Update

Plan Section	Summary of Updates
Chapter 1 - Introduction and Planning Process	The history of the original plan and the process of updating it was outlined.
Chapter 2 - Planning Area Profile and Capabilities	All Census and economic demographics was updated.
Chapter 3 - Risk Assessment	All Hazard Event Data was updated and new risk and vulnerability analysis was performed using new data.
Chapter 4 - Mitigation Strategy	Previous action plans were updated and new action plans were added.
Chapter 5 - Plan Implementation and Maintenance	Plan maintenance processes are being recreated and detailed to include follow-up meetings for plan reviews.

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.

McDonald County, Missouri contracted with the Harry S Truman Coordinating Council (HSTCC) to facilitate the update of the multi-jurisdictional, local hazard mitigation plan. In fulfillment of this role, HSTCC:

• Assisted in establishing a Mitigation Planning Committee (MPC) as defined by the Disaster Mitigation Act (DMA).

• Ensured the updated plan met the DMA requirements as established by federal regulations and followed the most current planning guidance of the Federal Emergency Management Agency (FEMA).

• Facilitated the entire plan development process.

• Identified the data that MPC participants could provide and conducted the research and documentation necessary to augment that data.

• Assisted in soliciting public input.

• Produced the draft and final plan update in a FEMA-approvable document, and coordinated the Missouri State Emergency Management Agency (SEMA) and (FEMA) plan reviews.

Table 1.2 shows the MPC members and the entities they represent, along with their titles. All participating jurisdictions were represented on the MPC, whether it's by direct or indirect participation.

Table 1.2. Jurisdictional Representatives of McDonald County Mitigation Planning Committee

Name	Title	Jurisdiction/Agency/Organization
Andi Browning	City Clerk	City of Anderson
Bill Martin	Trustee	Village of Jane
David Abbott	Emergency Manager	City of Anderson
David Blake	Mayor	City of Southwest City
Georgia Holtz	City Clerk	City of Goodman
Gregg Sweeten	Mayor of Pineville and McDonald County Hazard Mitigation Manager	City of Pineville
J.R Goodman	Mayor	City of Goodman
Jason Boling	Fire Chief	Village of Jane
Kimberly Bell	County Clerk	McDonald County

Krystal Austen	City Clerk	City of Southwest City
Lewis Davis	Mayor	City of Noel
Melissa Ziemianin	City Clerk	City of Pineville
Rick Lett	Westerner Commissioner	McDonald County
Robert Evenson	Sheriff	McDonald County
Rusty Wilson	Mayor	City of Anderson
Stan Haywood	Mayor	City of Lanagan
Summer Howell	City Clerk	City of Lanagan
Adam Lett	Pineville School Principal	McDonald County Schools
Coleen Moore	Secretary	White Rock Fire Protection District

Based on the area of expertise of each jurisdictional representative participating on the MPC, (**Table 1.3**) to demonstrate each member's expertise in the six mitigation categories (Preventive Measures, Property Protection, Natural Resource Protection, EmergencyServices, Structural Flood Control Projects and Public Information).

Table 1.3 MPC Capability with Six Mitigation Categories

Community Department/Office	Preventive Measures	Structure and Infrastructure Projects		Natural Resource Protection	Public Information	Emergency Services
		Property Protection	Structural Flood Control Projects			
McDonald County Office of Emergency Management	✓	✓	✓	✓	✓	✓
McDonald County Government	✓	✓	✓	✓	✓	
McDonald County Schools	✓	✓			✓	
Crowder College	✓	✓			✓	✓

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.

Hazard mitigation is defined as "sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards" and its purpose is to lessen the negative impact of a disaster on community's economic, social, and environmental well-being. Outreach programs that increase the public's awareness of hazard risks, projects to protect critical facilities, and the removal of structures from flood hazard areas are all examples of mitigation actions. Local

mitigation actions and concepts can also be incorporated into land use plans and building codes. Local governments have the responsibility to protect the health, safety, and welfare of their citizens. Proactive mitigation policies and actions help reduce risk and create safer, more disaster-resilient communities. Mitigation is an investment in a community's future safety and sustainability by facilitating:

- The protection of public safety and prevention of loss of life and injury.
- The reduction of harm to existing and future development.
- The prevention of damage to a community's unique assets.

The importance of active public participation in such an endeavor is obvious, but can be difficult to obtain in reality. A paper published in the Journal of Environmental Planning and Management in 2003* notes "*the disquieting reality that citizens are not always interested in participating, and that some types of plans fail to receive public attention."* The paper goes on to state that involving the public in technical decision making is often *"a formidable challenge".* Nowhere is this difficulty more apparent than in small rural communities like those in McDonald County. However, despite this, all of McDonald County's communities participated in the planning process, with the exception of the Village of Ginger Blue.

Local Government jurisdictions were sent letters and emails followed up with phone contact inviting them to participate in the planning process. Public notices for planning meeting were also posted in local newspapers. Committee members were placed on a contact list featuring email addresses and phone numbers. Appendix B provides documentation of the planning process including public involvement solicitations and meeting notices.

The DMA requires each jurisdiction to participate in the planning process and officially adopt the plan. Minimum criteria for participation must be met by each jurisdiction in order to be considered a "participant." These plan participation requirements were defined at the first planning meeting, and include the following:

- Designation of a representative from each participating jurisdiction to serve on the MPC;
- Participation in at least one MPC meeting or participation in one-one meetings with HSTCC staff.
- Provide sufficient information to support plan development by completion and return of data collection questionnaires and validating/ correcting critical facility inventories.
- identify new mitigation actions with prioritization for the plan update
- All participants should formally adopt the mitigation plan prior to submittal to SEMA and FEMA for final approval.

Provide a table **(Table 1.4)** showing the representation of each participating jurisdiction at the planning meetings, the provision of responses to the Data Collection Questionnaire, the active critical facility validation, the update/development of mitigation actions, and the documentation of donated time, as applicable. Reference sign-in sheets and other documentation located in an appendix.

Table 1. 4 Jurisdictional Participation in Planning Process

Jurisdiction	Kick-off Meeting	Meeting #2	Meeting #3	Data Collection Questionnaire Response	Update/Develop Mitigation Actions	Participation
McDonald County	Y	Y	Y	Y	Y	Participating
City of Anderson	N	N	N	N	Y	Participating
City of Goodman	N	Y	Y	Y	Y	Participating
Village of Jane	Y	Y	Y	Y	Y	Participating
City of Lanagan	N	N	N	N	Y	Participating
City of Noel	N	N	Y	N	Y	Participating
City of Pineville	Y	Y	Y	Y	Y	Participating
City of Southwest City	N	N	N	Y	Y	Participating
McDonald Co Schools R-1	Y	Y	N	Y	Y	Participating
White Rock Fire Protection District	N	Y	Y	Y	Y	Participating

1.4.2 The Planning Steps

Development of the plan followed the 10-step planning process adapted from FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. The 10-step process allowed the plan to meet funding eligibility requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System, and Flood Mitigation Assistance Program. **Table 1.5** shows how the CRS process aligns with the Nine Task Process outlined in the 2013 *Local Mitigation Planning Handbook*.

Table 1.5 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, and 4)

The initial "scoping" process consisted of soliciting local jurisdictions for a representative to participate on the MPC and attend meetings. After the initial scoping a meeting schedule was set and updated due to a severe winter storm that took place on the original date. The updated meeting or kick-off was scheduled for March 4th, 2021 at 1:00 P.M. at the Pineville Community Center. The 2016 HMP was reviewed and the timeline, goals, and data collection needs were discussed for the 2021 HMP update. Following this meeting the data collection questionnaires for local government was mailed to each jurisdiction with a letter explaining the questionnaire. The MPC was urged to contact and collect input from stakeholders in their jurisdictions. There were phone calls, some emails, and one-one meetings during the process outside of the three scheduled meetings, as the MPC members asked questions, discussed issues, and provided data for the planning effort, such as completed questionnaires.

Table 1.6 Schedule of MPC Meetings

Meeting	Topic	Date
Informational Meeting	Review of the 2016 plan; plan development including proposed timeline, requirements for local jurisdictions, and data collection needs; and review was conducted of weather events, mitigation efforts.	01/25/2021 9:00am-11:00am Pineville Community Center
Kick-off Meeting	Review of the 9 tasks for completing the plan update; public survey outreach; discussion of risk assessment requirements and went through a sample risk assessment; the MPC broke into groups to discuss the progress/updates of the 2016 actions.	03/04/2021 9:00am-11:00am Pineville Community Center
Planning Meeting #2	Data collection reminder/Risk Assessment Questionnaires return Review of previous meeting; currently working on risk assessment 10 hazards (chapter 3);	04/08/2021 9:00am-11:00am Pineville Community Center
Planning Meeting #3	Assessment of 2016 action still needed; review of public survey results; new action plans and STAPLEEs needed. Public survey results have been disseminated; chapter completion halfway done	06/10/2021 9:00am-11:00am

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.

In an effort to gain public involvement in the planning process a public notice was posted in local newspapers advertising each scheduled meeting. Documentation can be found in Appendix B. Various stakeholders from the county and neighboring communities were present and offered their input during the scheduled meetings.

During the second meeting which was held on April 8, 2021 at 9:00 am, a discussion was held about we can increase public engagement within the community .HSTCC announced that the public survey (posted on Survey Monkey) has been emailed out to multiple people in each jurisdiction as well as posted on various social media websites (Facebook, etc.) . HSTCC also stated is important to get the survey out to the public.

According to the public survey results, the hazards of greatest concern in McDonald County are flooding and tornadoes. The hazard of second greatest concern is serve thunderstorms. Open ended responses on the public survey showed concern for two hazards that were not listed in the survey, those hazards are snowstorms and cold weather hazards. The complete results from the public survey is documented in Appendix C.

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.

There was no coordination with FEMA RiskMAP projects during the update of this plan, as any ongoing efforts were unknown. However, it does appear that McDonald County has an effective FIRM. An attempt was made to invite neighboring communities to assist HSTCC in the planning phase but the invite was declined.

Figure 1.1. RiskMAP Study Status Map

Integration of Other Data, Reports, Studies, and Plans[3(a)]

A significant amount of information presented in the Plan has been updated and revised based on the review and incorporation of existing plans, studies, reports and technical information. Appendix A contains a listing of references to plans, studies, reports and technical information to incorporate into hazard profiles, risk assessment, profile and capability sections.

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

During the second meeting on June 6, 2016, the MPC identified and profiled their hazards, which was accomplished by reviewing:

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

The results of this process can be reviewed in Section 3 of this document, the Risk Assessment.

Step 5: Assess the Problem: Identify Assets and Estimate Losses
(Handbook Task 5)

Identified assets in the planning area include population, structures, critical facilities and infrastructure and other important assets that may be at risk to hazards. The inventory of assets for each jurisdiction was derived from demographic data from the US Census, Census of Agriculture, Division of Labor, GIS structures dataset, HAZUS, and Data Collection Questionnaires.

Potential losses to existing development were estimates came from the 2018 State Hazard Mitigation Plan. These estimates were created using HAZUS software, which uses georeferenced data to calculate the exposure for a selected area, characterizing the level or intensity of the hazard affecting the exposed area in order to calculate potential losses in terms of economic losses, structural damage, etc.

Step 6: Set Goals
(Handbook Task 6)

The HMPC committee reviewed the goals from the previously approved plan at the second (April 8th, 2021) and third (June 10th, 2021) meetings. The 2016 goals were accepted with minimal changes to the wording. The goals for the 2021 update are as follows:

1. Increase internal capabilities to mitigate the effects of natural hazards. 2.
2. Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering other community goals.
3. Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
4. Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigatingrisks due to those hazards.

Lessons learned for previous hazards such as tornados and flooding. Storm shelters have been implemented along with sirens in the surrounding areas to create a warning system. Changes in priorities appeared with the onset of the pandemic (Covid-19). Stakeholders wanted more resilience based around pandemic response and recovery for their local jurisdictions this discussion took place during meeting # 3 (June 10th, 2021).

Step 7: Review Possible Mitigation Actions and Activities
(Handbook Task 6)

During of the second meeting held on June 6, 2016, the MCP to discuss the previous mitigation actions for their communities. A few attendants provided updates on their previous mitigation actions. Documentation of the updates provided during this meeting are located in chapter 4.

- Communities plan on reporting on a yearly basis in house on an excel sheet as stated by the community. A follow up by the hazard mitigation planner will follow up on a yearly basis.
- Mitigation strategies were reviewed during meeting # 3 and review for relevancy. New mitigation strategies were discovered by reviewing ongoing projects at a community level, assessments were conducted and prioritized after meetings and emailed to the hazard mitigation planner to input.
- *Mitigation Ideas: A Resource for Reducing Risk to NaturalHazards (January 2013)* was used as a reference in the development of action projects.
- Participants were encouraged to focus on long-term mitigation solutions and reviewed for cost efficiency. As well as prioritized long term solutions at the community level.

Step 8: Draft an Action Plan
(Handbook Task 6)

The focus of the third meeting, held on June 10th, 2021, was to update the mitigation strategies and draft an action plan. Each member of the MPC was asked to provide a written status update and progress report of all the previous actions for their respective communities. They were also asked to provide an action worksheet for each new and ongoing action, and a STAPLEE prioritization worksheet for each new action (ongoing actions will carry forward the previous prioritization). After reviewing past and proposed mitigation activities and prioritizing them with the STAPLEE process, a draft action plan was composed. Action worksheets and STAPLEE worksheets are documented in Appendix D. The action worksheets, including the plan for implementation, submitted by each jurisdiction for the updated Mitigation Strategy are included in Chapter 4.

Step 9: Adopt the Plan
(Handbook Task 8)

Once the first draft of the plan was completed the governing body of each jurisdiction was presented with adoption resolutions. Each jurisdiction must adopt the plan by resolution to be eligible for hazard mitigation assistance. Adoption resolutions will be collected and submitted with the final plan to SEMA and FEMA and documented in Appendix E.

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

During the final meeting, held on July 19, 2016, the MPC agreed on a strategy for plan implementation and maintenance. This process, which is detailed in Section 5 of this document, includes reviews annually and in the event of any significant hazard, as well as provisions for the five-year update process.

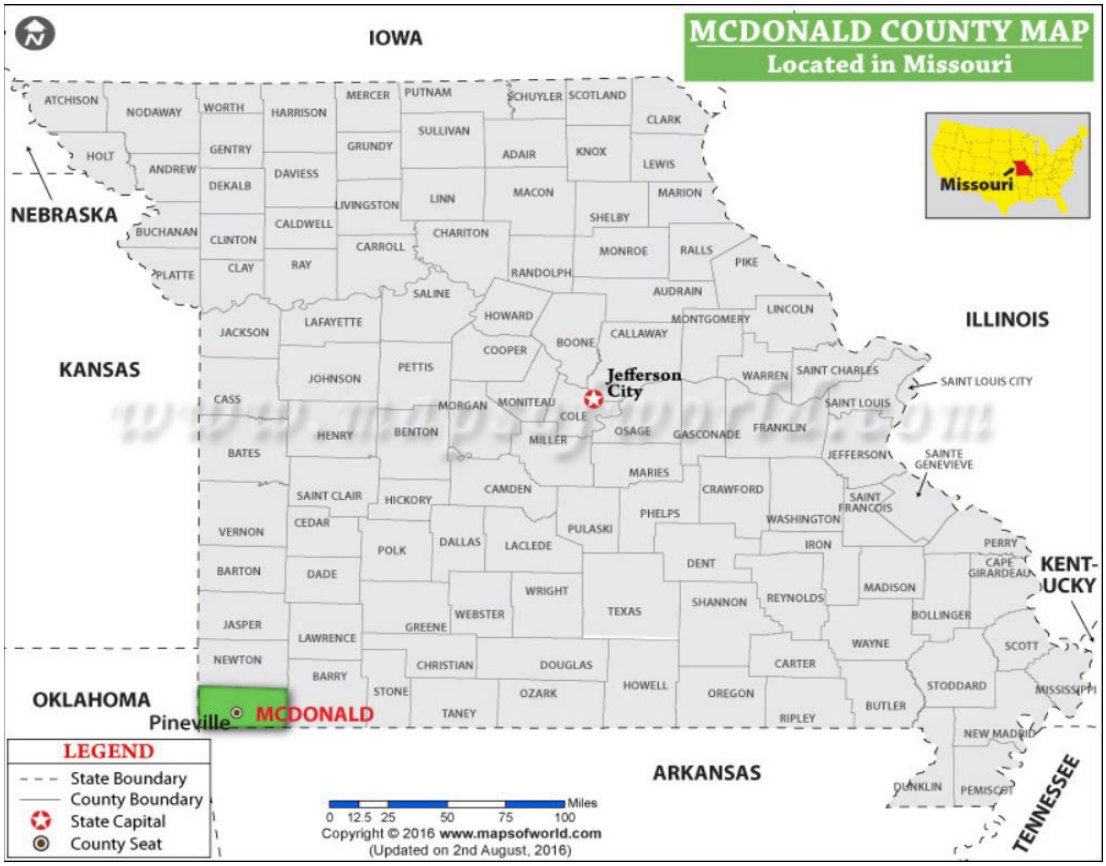
2. PLANNING AREA PROFILE AND CAPABILITIES

2.1 McDonald County Planning Area Profile

Figure 2.1. Map of McDonald County

Source: https://countymap.org/missouri/mcdonalds

Figure 2.2 Location of McDonald County Map



Source: https://www.mapsofworld.com/usa/states/missouri/counties/mcdonald-map.html

McDonald County Population

- Population of McDonald County as of the most recent census data. The annual population estimatesis listed on **table 2.1**
- Percentage growths will be displayed on **table 2.1** and compared to 2000 to 2010 to 2019 and has decreased in McDonald County by – 1.32% and will be compared to statewide and national population growth
- McDonald County median household income is below the national average set at $41,643. As compared to statewide and national figures which is $62,843 from the latest 5-year census data.
- County median house value in McDonald County is $110,500 and has seen a percentage growth since 2000 compared to state and national figures with the national average being $217,500 by from the latest 5-year census data.

Table 2.1 Population of McDonald County

Jurisdiction	2000 Census Population	2010 Census Population	2019 Population Estimates	2000-2010 % Change	2010-2019 % Change
McDonald County Total	21,681	23,083	22,782	6%	-1.32%
Anderson	1,856	1,961	2,069	6%	5.21%
Goodman	1,183	1,248	1,381	5%	9.63%
Jane	372	309	546	-17%	43.4%
Lanagan	411	419	438	2%	4.33%
Noel	1,480	1,832	2,141	24%	14.4%

Pineville	768	791	817	3%	3.18%
Southwest City	850	970	1,056	14%	8.42%
Unincorporated d McDonald County	14,761	15,553	22,837	5%	31.9%
Missouri	5,595,211	5,988,927	6,104,910	7%	1.89%
USA	281,421,906	308,745,538	324,697,795	10%	4.91%

2.1.1 Geography, Geology and Topography

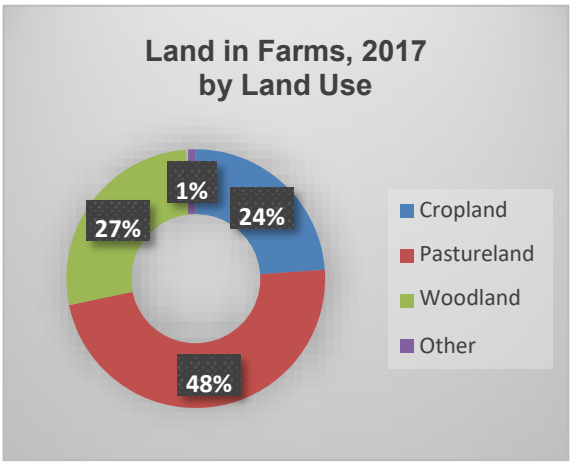
McDonald County is located in the far Southwest corner of Missouri and has total area of 540 square miles. Bordering counties include Newton County Missouri to the North, Barry County Missouri to the East, Benton County Arkansas to the South, and Delaware and Ottawa Counties Oklahoma to the West. The City of Pineville is the county seat and is centrally located in McDonald County. It is at the intersection of "Three Rivers", which includes Big Sugar Creek, Little Sugar Creek, and the Elk River. Pineville hosts facilities for the University of Missouri Extension Service and the "Tourist Welcome Center".

McDonald County is mostly rural with the majority of development located inside or near the limits of only 6 incorporated cities, and 2 villages, as well as a few unincorporated townships. The majority of these urban centers are located along the Interstate-49 and Highway 59 corridors in the Western half of the county.

The majority of development is also located along the Elk River Corridor and its 3 main tributaries Indian Creek, Big Sugar Creek, and Little Sugar Creek. The primary land uses in McDonald County, as shown in Figure 2.1.2, are agricultural (cropland and pastureland) and woodland. The most abundant industry in the county is also agriculture. Most of the county's residents strive to keep the rural life that the county has been known for over many generations. Some discourage growth, and even though most of these farms have less than $10,000 a year, that income provides a considerable enrichment of the quality of life loved by the rural families. As part of the Ozark Mountains, McDonald County's topography is mostly uniform.

Figure 2.3 McDonald County Land Use, 2017

Source: U.S Department of Agriculture 2017 Census of Agriculture, McDonald County Profile



The county is known for its hills and valley's ranging from gently rolling hills to steep bluffs. The soils in the area tend to be shallow and rocky. Rocks in the area are formed from clean limestone with chert nodules. The geologic formation in this region is known as the Mississippian Osagean Series Limestone, and is also part of the St. Joe Limestone formation which includes all of the Ozark Plateaus in Northern Arkansas, Oklahoma, and Southern Missouri. This limestone formation preserves many fossils from the Mississippian sub period. This type of Karst Topography creates many caves as well as flowing rivers and streams winding throughout the hills and valleys of the county. As the water cuts through the limestone, it's created many caves and set forth paths for many rivers and streams that cut deeply into valleys or hollows. Beautiful steep bluffs dot the country side and raise several hundred feet parallel to McDonald County's rivers and streams. There are also many natural forests located between valleys and rivers and streams, and some prairie land in the southwestern part of the county, near Southwest City, where the topography is flatter. McDonald County is known for its many beautiful clear water streams, the major river is the Elk River. In the 19th century many residents said elk antlers and elk bones were found scattered around

the main river. The area currently boasts many recreational opportunities and is known well for its many campsites and canoe outfitters along the Elk River and its three main tributaries: Indian Creek, Big Sugar Creek, and Little Sugar Creek.

The Elk River Watershed encompasses nearly all of McDonald County and continues into Oklahoma and drains into the Grand Lake O' the Cherokee's Watershed. There are two small areas in the Northwest and Southwest parts of the county that are not part of the Elk River Watershed, however these areas are still part of the Grand Lake O' the Cherokee's Watershed.

Figure 2.4 Elk River watershed

Source: https://mywaterway.epa.gov/community/McDonald%20County,%20MO,%20USA/overview

All of the Rivers and streams in McDonald County flow from East to West. See **Figure 2.4** for land coverage in the Elk River and Grand Lake O' the Cherokee's Watersheds.

Drinking water sources in McDonald County include Grand Lake O' Cherokees and Elk River Watersheds, and the Ozark Plateaus aquifer system. These water sources are essential for healthy communities and the sustained economic vitality of the region. Water quality issues include the identification of possible contamination, alternative solutions to limit contamination through proper construction techniques, the expansion of rural water districts, well drilling regulation, and the protection of recreational water sources from contamination.

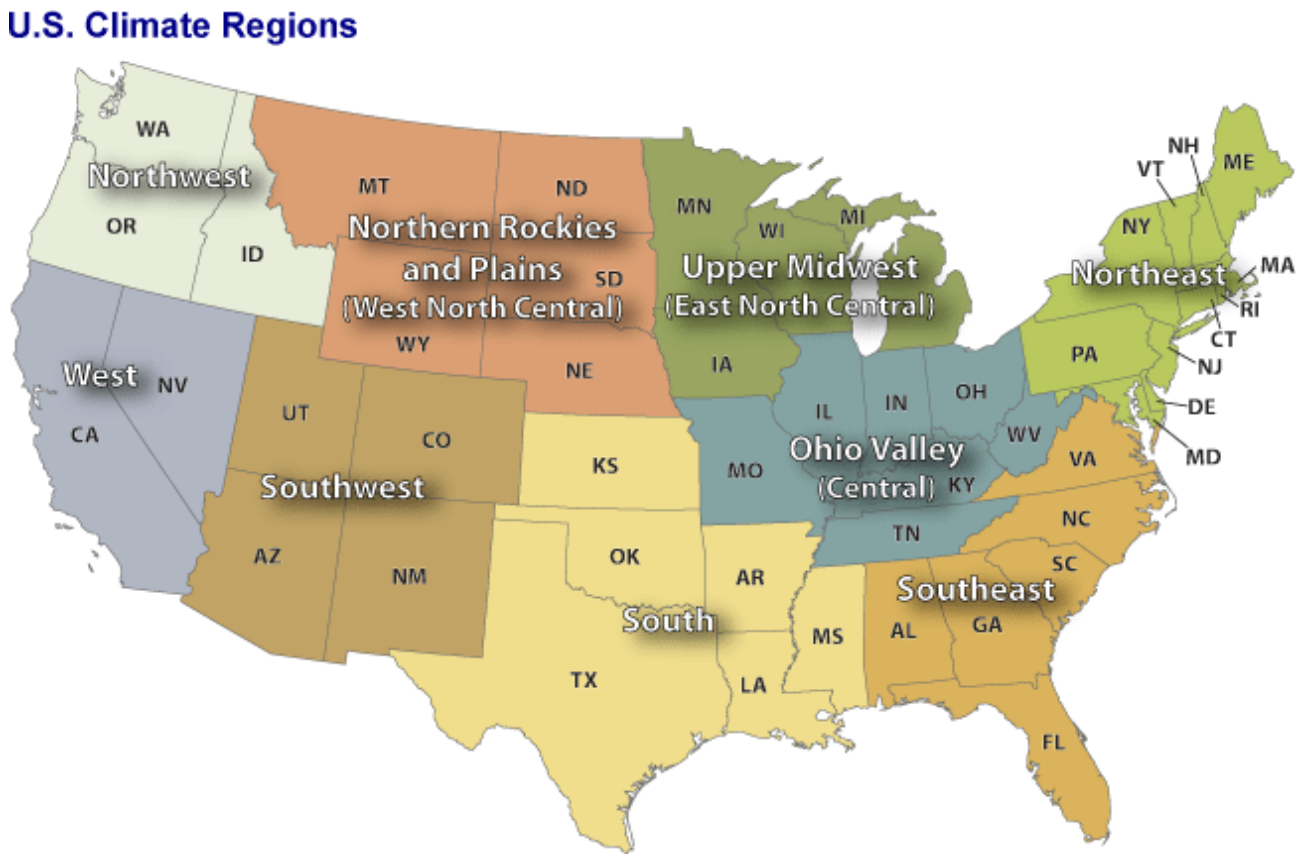
2.1.2 Climate

There are a number of factors to consider when discussing a region's climate, such as latitude, elevation, proximity to large waterbodies, mountains or other surface features, atmospheric oceanic currents. These factors work together to control the amount precipitation, range of temperature, and type of weather phenomena's a region receives throughout the year.
Temperature range and precipitation levels are typically the determining factors for which climate classification is assigned to a region.

Figure 2.5 shows U.S. climate regions as defined the National Centers for Environmental Information. Missouri is classified in the Ohio Valley or Central Climate Region, this region experiences a continental climate with strong seasonal variation in temperature and precipitation, warm summers and cool winters are typical of this region. McDonald County however, is located on the far southwest corner of the central climate region, bordered on the south and west by the

South Climate Region. The South Climate Region experiences more of a semi-tropical climate with less seasonal variation of temperature resulting in warmer winters. The boundary between climate types is not stationary, but rather fluctuates from year to year, or even month to month as the atmospheric currents fluctuate. McDonald County's climate is likely to experience characteristics typical of both the Central and South climate regions.

Figure 2.5. U.S. Climate Regions



Source: National Oceanic and Atmospheric Administration, National Centers for environmental Information: https://www.ncdc.noaa.gov/monitoring-references/maps/us-climate-regions.php

The average annual temperature in McDonald County is 57.58°F. The normal average high temperature in July is 88.9° F and the normal average low temperature in January is 23.4° F.
These temperatures do tend to fluctuate, occasional record highs in July reach above 100.0° F and occasional record lows in January reach below 0°F. The average annual precipitation for this region is 44.57 inches; precipitation is normally expected year round with the heaviest precipitation around the months of May and September. The average annual snowfall in the region is 7.86 inches with the majority of snowfall occurring in the months of December, January, and February. Overall the normal climate in McDonald County is fairly mild.

Table 2.2 McDonald County Average Monthly Precipitation

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Precip. in.	2.2	2.5	3.9	4.2	5.6	4.94	5.1	3.3	4.8	3.8	4.0	2.9

Source: https://www.bestplaces.net/climate/county/missouri/mcdonald

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Snowfall inches	3.1	2.7	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.9

Source: https://www.bestplaces.net/climate/county/missouri/mcdonald

2.1.3 Population/Demographics

The population in McDonald County grew significantly from 2000 to 2010, increasing from 21,681 persons in 2000 to 23,083 persons in 2010. However the most recent population estimates suggests a population decrease from 2010 to 2019. The total population for McDonald County has decreased by -1.32 percent; the areas with the most significant change occurred in the Village of Jane with a decrease of 3.88 percent and unincorporated McDonald County with an increase of 43 percent as stated in the census data. All cities in McDonald County have displayed a population increase from 2015 to 2019. This population increase displays that McDonald County will experience steady growth. This is on trend with the State and the National population growth. During the same time period, the State of Missouri's population increased by 1.89 percent, and the United States increased by 4.91 percent. **Table 2.3** shows McDonald County population changes by jurisdiction from 2000 to 2010 to 2019.

Table 2.3 McDonald County Population 2000-2019 by Jurisdiction

Jurisdiction	2000 Census Population	2010 Census Population	2019 Population Estimates	2000-2010 % Change	2010-2019 % Change
McDonald County Total	21,681	23,083	22,782	6%	-1.32%
Anderson	1,856	1,961	2,069	6%	5.21%
Goodman	1,183	1,248	1,381	5%	9.63%
Jane	372	309	546	-17%	43.4%
Lanagan	411	419	438	2%	4.33%
Noel	1,480	1,832	2,141	24%	14.4%
Pineville	768	791	817	3%	3.18%

Southwest City	850	970	1,056	14%	8.42%
Unincorporated d McDonald County	14,761	15,553	22,837	5%	31.9%
Missouri	5,595,211	5,988,927	6,104,910	7%	1.89%
USA	281,421,906	308,745,538	324,697,795	10%	4.91%

Source: U.S. Bureau of the Census, Decennial Census, annual population estimates/ 5-Year American Community Survey 2019; *population includes the portions of these cities in adjacent counties

The population in McDonald County grew significantly from 2000 to 2010, increasing from 21,681 persons in 2000 to 23,083 persons in 2010. However the most recent population estimates suggests a population decrease from 2010 to 2019. The total population for McDonald County has decreased by -1.32 percent; the areas with the most significant change occurred in the Village of Jane with a decrease of 3.88 percent and unincorporated McDonald County with an increase of 43 percent as stated in the census data. All cities in McDonald County have displayed a population increase from 2015 to 2019. This population increase displays that McDonald County will experience steady growth. This is on trend with the State and the National population growth. During the same time period, the State of Missouri's population increased by 1.89 percent, and the United States increased by 4.91 percent.

Figure 2.6 McDonald County Population Density

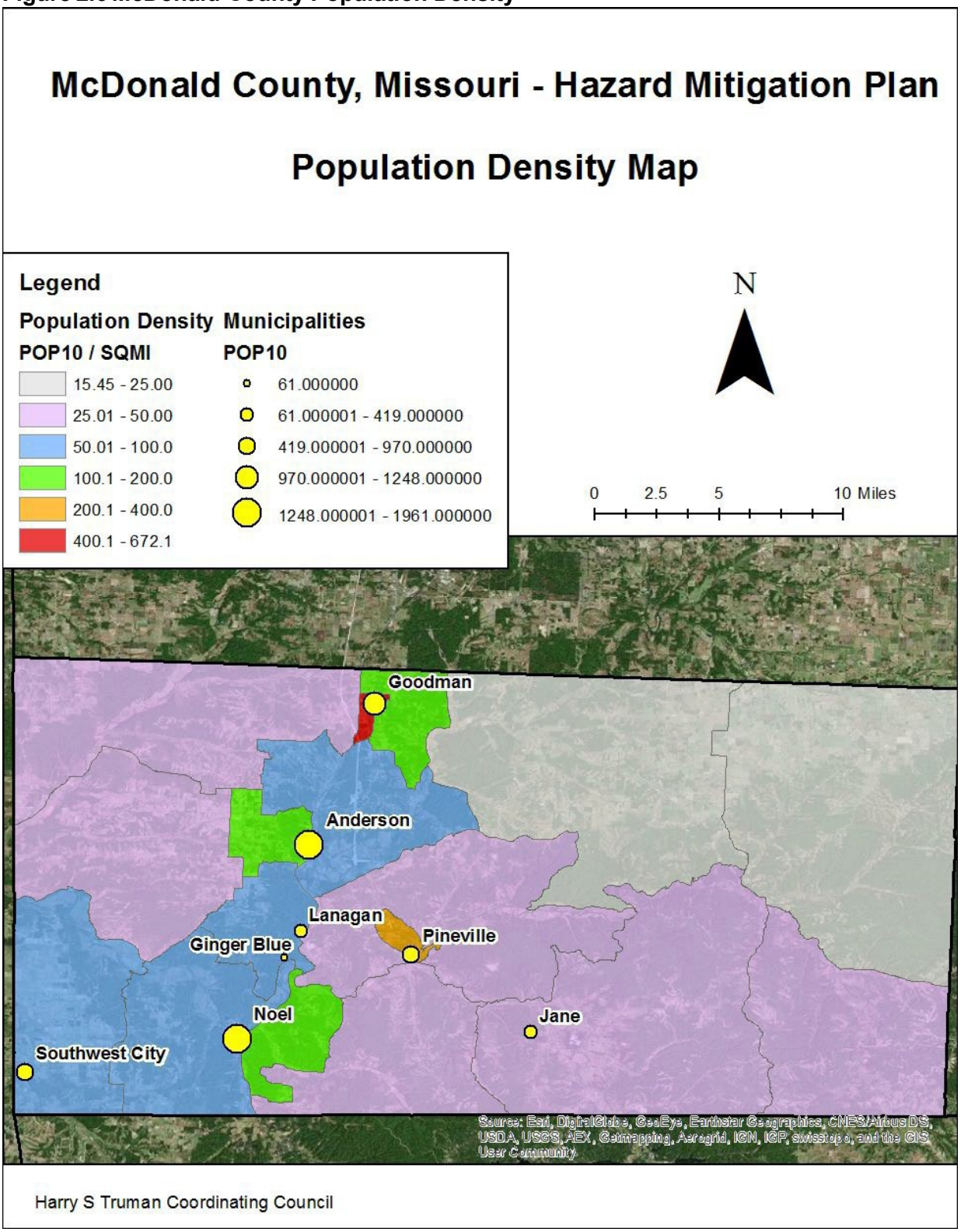


Table 2.4 McDonald County Population 2000-2019 by Jurisdiction

Jurisdiction	2019 Population under 5 years old	2019 Population over 65	Population over 18	Total Housing units
McDonald County Total	1,593	3,480	17,000	9,983
Anderson	141	270	1,491	797
Goodman	134	171	1,007	573
Jane	39	68	385	195
Lanagan	8	44	348	210
Noel	216	152	1,570	945
Pineville	31	121	625	411
Southwest City	129	124	124	405
Missouri	371,570	1,006,725	4,723,298	2,790,397
USA	19,767,670	50,783,796	251,268,403	137,428,986

Source: U.S. Bureau of the Census, Decennial Census, annual population estimates/ 5-Year American Community Survey 2019; *population includes the portions of these cities in adjacent counties

Table 2.5 McDonald Household Size Comparison

Jurisdiction	Family Households	Non-Family Households	Total Households	Average Family Size	Average Household size
McDonald County	6,074	2,330	8,404	3.17	2.73
State of Missouri	1,552,133	823,478	2,375,611	3.00	2.45
United States	77,538,296	39,177,996	116,716,292	3.14	2.58

Source: U.S. Bureau of the Census, American Fact Finder, Community Facts,

Based on the latest census 5-year estimated data, the population under 5 years old is steadily increasing. Along with the population that is over 18 years old with the median age in McDonald county being 38.1. As the population over 18 increases, the population over 65 is slowly declining based on 5 year estimates as shown on **Table 2.5**. Total housing units are trending upwards in McDonald County to coincide with estimated population growth. This is on trend with the State and the National population growth and compared with statewide and national averages.

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 29 socioeconomic variables which research literature suggests contribute to reduction in a community's ability to prepare for, respond to, and recover from hazards. SoVI ® data sources include primarily those from the United States Census Bureau.

Table 2.6 Unemployment, Poverty, Education, and Language Percentage Demographics, McDonald County, Missouri

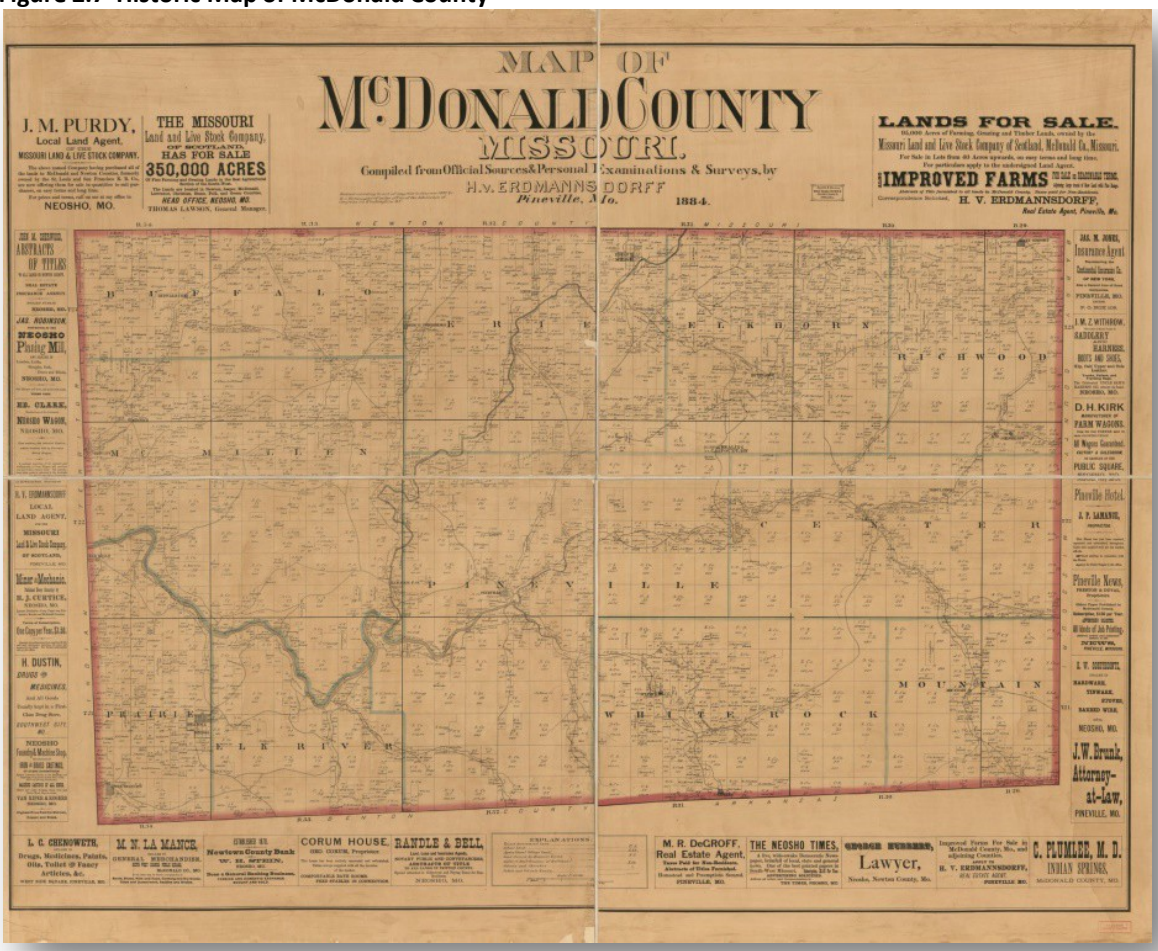
Jurisdiction	Percent of Population (18-64) In Labor Force	Percent of Population Unemployed	Percent of Population Below the Poverty Level	Percentage of Population (High School graduate)	Percentage of Population (Bachelor's degree or higher)	Percentage of population (spoken language other than English
McDonald County	55.9%	4.2%	21.7%	78.3%	12.3%	13.7%
State	63.0%	6.5%	15.6%	88%	26.7%	6.1%

Nation	76.84%	6.9%	15.6%	86.3%	29.3%	20.9%

Source: U.S. Bureau of the Census, American Fact Finder, 2010-2014 American Community Survey 5- year Estimates

2.1.4 History

Figure 2.7 Historic Map of McDonald County



McDonald County's history pre-dates the civil war. McDonald County was created on March 3, 1849 when the Missouri legislature divided Newton County approximately in half, creating McDonald County from the southern portion. McDonald County's name originated from one Alexander McDonald, a Revolutionary War soldier. In 1850, a confrontation between the communities Rutledge and Maryville competed violently for the county seat. So fiercely in fact, three people died in the confrontations. Eventually, Pineville, originally named Maryville after the wife of an early settler, became the official County seat in January of 1858. McDonald County is also home to the famous Mason and Dixon's line of 36 degree-30'; the Missouri Compromise line of 1820. This was a line established that slavery could not venture north above the line. It remained there until 1865. McDonald County has one high school and it is called McDonald County High School. There is one middle school and several elementary schools throughout the county as well.

2.1.5 Occupations

Table 2.7 shows occupation statistics for the incorporated cities and the county as a whole.

Table 2.7 Occupation Statistics, McDonald County, Missouri

Place	Management, Business, Science, and Arts Occupations	Service Occupations %	Sales and Office Occupations %	Natural Resources, Construction, and Maintenance Occupations %	Production, Transportation, and Material Moving Occupations %
McDonald County	21%	16%	24%	15%	24%
Anderson	22%	22%	16%	5%	35%
Goodman	15%	23%	26%	16%	21%
Jane	10%	8%	31%	12%	39%
Lanagan	6%	17%	20%	11%	46%
Noel	12%	22%	17%	5%	44%
Pineville	27%	18%	28%	12%	15%
Southwest City	16%	14%	18%	18%	34%

2.1.6 Agriculture

Table 2.8 Agricultural Statistics, McDonald County, Missouri

Place	# of farms	Total Acres Farmland	Avg. Farm Size acres	Total Cropland acres	Irrigated Land acres	Market Value of Products sold, avg per farm $1000	Top Crops	# of farm jobs	% of work force
McDonald County	926	186,599	202	49,452	303	$189,865	Corn, Wheat	571	6%
State of Missouri	99,171	43,944,490	285	15,259,319	1,180,886	$9,164,886	Soybeans	56,543	2%
National	2,109,303	914,527,657	434	389,690,414	55,822,231	$187,097	Corn	2,109,303	2%

Source: U.S. Census of Agriculture 2017

Table 2.9 Top Commodities, McDonald County, Missouri

	Poultry and Eggs	Cattle and Calves	Other Crops and Hay	Milk from Cows
Value of Sales	$155,725,000	$13,836,000	$2,312,000	$1,674,000

Source: U.S. Census of Agriculture 2017

2.1.7 FEMA Hazard Mitigation Assistance (HMA) Grants in Planning Area

Table 2.10 FEMA/HMA Grants in County from 1993-2021

Table 2.10 shows FEMA HMA Grants in McDonald County since the previous plan update. There has been a total of $17,380,290 awarded.

Project Type	Project Title	Applicant	Award Date	Project Total
206.2: Safe Room (Tornado and Severe Wind Shelter) - Public Structures	McDonald Co. R-I School Dist-Noel Primary Community Safe Room	MCDONALD COUNTY R-1 SCHOOL DISTRICT	08/2020	$2,326,450
206.2: Safe Room (Tornado and Severe Wind Shelter) - Public Structures	SOUTHW EST CITY ELEMENTARY SCHOOL COMMUNITY SAFE ROOM	MCDONALD COUNTY R-1 SCHOOL DISTRICT	02/2016	$3,197,597
206.2: Safe Room (Tornado and Severe Wind Shelter) - Public Structures	McDonald County R-1 Anderson High School Community Safe Room	MCDONALD COUNTY R-1 SCHOOL DISTRICT	08/2016	$5,820,904
206.2: Safe Room (Tornado and Severe Wind Shelter) - Public Structures	Neosho School District Safe Room-Goodman Elementary	Neosho School District	12/2018	$2,375,000
206.2: Safe Room (Tornado and Severe Wind Shelter) - Public	PINEVILLE ELEMENTARY SCHOOL COMMUNITY SAFE ROOM	MCDONALD COUNTY R-1 SCHOOL DISTRICT	02/2016	$3,660,339
Total				**$17,380,290**

Source: Federal Emergency Management Agency, 2021

2.1.8 FEMA Public Assistance (PA) Grants in Planning Area

Table 2.11 FEMA/PA Grants in County from 1993-2021

Project Type	Incident Type	Applicant	Award Date	Project Total
1412	Severe Storm(s)	McDonald	08/2002	$2,322,454,89
1676	Severe Ice Storm	McDonald	04/2007	$985,499.24
1736	Severe Ice Storm	McDonald	02/2008	$2,298.42
1742	Severe Storm(s)	McDonald	04/2008	$356,546.22
1749	Severe Storm(s)	McDonald	08/2008	$1,209,570.89
1961	Severe Storm(s)	McDonald	07/2011	$ 68,768.30
1980	Severe Storm(s)	McDonald	01/2012	$ 675,171.06
4144	Severe Storm(s)	McDonald	04/2013	$ 433,259.15
4238	Severe Storm(s)	McDonald	09/2016	$ 237,155.32
4250	Flood	McDonald	10/2016	$ 868,930.13
4317	Flood	McDonald	11/2017	$ 3,143,066.91
4451	Severe Storm(s)	McDonald	11/2020	$ 786,147.95
Total				**$11,088,868.50**

2.2 JURISDICTIONAL PROFILES AND MITIGATION CAPABILITIES

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

2.2.1 McDonald County

McDonald County includes 8 incorporated municipalities and many small unincorporated communities. The municipalities involved in the 2016 update of the McDonald County Hazard Mitigation Plan are the City of Anderson, City of Goodman, Village of Jane, City of Lanagan, City of Noel, City of Pineville, City of Southwest City, and the McDonald County R-1 School District. The Village of Ginger Blue has decided not to participate in this update.

By Missouri Statute (Section 48.020.1) McDonald County is defined as a third Class County, meaning its assessed valuation is less than six hundred million dollars. The county government functions through the McDonald County Commission, a three member Board with final authority. McDonald County government can administer county structures, infrastructures, and finances. The Harry S Truman Coordinating Council (HSTCC) is the regional planning commission that assists member communities with support related activities to facilitate community goals and projects through state and federal funding programs. The incorporated municipalities in McDonald County have autonomy from County Regulation, and conduct their own business on varying scales and through varying structures. Departments within McDonald County's government include:

- Board of Commissioners: Presiding Commissioner, Eastern Commissioner, and Western Commissioner
- County Assessor
- Circuit Clerk
- County Collector
- Coroner
- County Clerk
- County Supervisor
- Crime Victims Advocate
- Emergency Management/Floodplain Administrator
- Health Department Representative
- Prosecuting Attorney
- Public Administrator
- Recorder
- Road & Bridge Maintenance Representative
- Sheriff
- Treasurer
- University of Missouri Extension Office

Mitigation Initiatives/Capabilities

The McDonald County Emergency Management Department (EMD) is in charge of the preparation of emergency or disastrous events. The Emergency Management Department consists of an Emergency Manager/Floodplain Manager, County Commissioners, McDonald County Sheriff's Department, Municipal Police Departments, and Fire Departments. The duties of the EMD include the writing of an Emergency Operations Plan (EOP), coordinating intergovernmental emergency response and preparedness agencies, and implementing measures identified in the EOP that increase preparedness and response times. The EOP identities facilities of specific importance and which require special protection and/or attention in case of a hazardous event. The plan also develops and maintains mutual assistance agreements among the various and overlapping agencies, encourages exercises and drills to maintain awareness, develops procedures to circumvent transportation and utility closures, and identifies vulnerability within the existing civic infrastructure. The joint communication between the agencies generally encourages cooperation between jurisdictions to reduce all disaster response times, and preparedness.

The National Incident Management System (NIMS) has been adopted by McDonald County and all cities, villages and the school system within the County. All emergency responses to disasters, large or small, are conducted utilizing NIMS procedures. The McDonald County R-1 School District has its own Emergency Operations Plan. Yearly, the school reassesses risks and incorporates those risks and mitigation strategies into their plan. Drills (such as for tornadoes, fire, earthquake, evacuation and intruder) are practiced monthly within the school year to assist with better response time. They have set up direct communications with the county sheriff's department.

The majority of Hazard Mitigation Planning emphasizes on floodplain management regulations and the participation in the National Flood Insurance Program (NFIP). The McDonald County Floodplain Manager is the principal administrator in the daily implementation of flood loss reduction activities including enforcing the community's flood damage prevention ordinance and related policies of the community, and any of the activities related to administration of the National Flood Insurance Program (NFIP). The McDonald County Floodplain Ordinance is designed to safeguard health, safety, and property in times of flood by regulating construction in the floodplain. There are also city floodplain ordinances that limit the amount and type of construction in the floodplain. Jurisdictions with floodplain ordinances include Anderson, Goodman, Noel, Pineville, Southwest City, and Jane.

McDonald County also maintains a septic ordinance to protect the health, safety and welfare of its residents. Furthermore, several communities have storm water regulations that are designed to minimize the negative effects of storm water runoff caused by development. The regulations outline proper mitigation measures for erosion, detention, discharge, and conveyance of storm water.

Other mitigation measures conducted throughout McDonald County include:

- Geographic Information Systems (GIS) have facilitated the development of mapped floodplain areas. Many property owners in the County participate in the NFIP.

The School District of McDonald County have done extensive planning a training of both staff and students to be better prepared in the event of any disaster situation to include severe storms, fires, and on campus intruders. Bus evacuations are also a part of the emergency training for the district.

- The school district has installed Storm shelters at most of the schools in McDonald County.

- The County receives NWS (National Weather Service) warnings and alerts needed officials and emergency responders. Many residents have NWS radios and several cities have sirens.
- Tabletop Exercises practices for planning sponsored by the county for Emergency Preparedness and Ag Emergency Preparedness.

There are adequate fire, police, rescue, emergency medical, and information equipment is available to city and County agencies. Ambulance services are assisted by first responders to give the county full coverage and there is also helicopter evacuation service available.

There are 7 law enforcement agencies in McDonald County, one Sheriff's and six municipal Police Departments. The Anderson Police Department, Goodman Police Department, Lanagan Police Department, Noel Marshal's Office, Pineville Marshal's Office and the Southwest City Police Department are the municipal agencies. The McDonald County Sheriff's Department is based out of Pineville, Missouri. The State Highway Patrol Troop D has troopers that are stationed within McDonald County.

The Medical facilities in McDonald County consist of the McDonald County Health Department, Tri-County Health in Anderson, Freeman Health Clinic in Anderson, Dr. Hill's clinic in Pineville, Anderson, Goodman, and Southwest City, and the Noel Mercy Medical Clinic. The Freeman Ambulance Services supports all emergency transport to medical facilities in McDonald County. Freeman Ambulance Services transports patients to Freeman Medical, Mercy Hospital, and Northwest Medical of Springdale , Northwest Medical on Benton, Arkansas, and Integris Grove General Hospital in Grove, Oklahoma. Freeman Medical, Mercy Hospital, and the Northwest Medical Center of Springdale, Arkansas provide emergency helicopter evacuation services for the region.

There are 11 fire departments that are either stationed in or who service McDonald County. The fire departments in McDonald County include the Anderson Fire Department, Goodman Area Fire Protection, Lanagan Volunteer Fire Department, Noel Fire Department, Pineville Fire Department, Southwest City Volunteer Fire Department, Tiff City Volunteer Fire Department, and White Rock Volunteer Fire Department. The fire departments that service McDonald County but are located outside the county include the Stella Fire Department in Newton County, and the Wheaton Fire Department and the Washburn Fire Department in Barry County. Each Fire Department and/or District in McDonald County has a First Responders Unit that also provides emergency and medical response services.

Table 2.12. Unincorporated McDonald County Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	N
Builder's Plan	N
Capital Improvement Plan	N
City Emergency Operations Plan	N/A
County Emergency Operations Plan	Y
Local Recovery Plan	N
County Recovery Plan	N
City Mitigation Plan	N/A
County Mitigation Plan	2015-2016
Debris Management Plan	Y
Economic Development Plan	N
Transportation Plan	N
Land-use Plan	N
Flood Mitigation Assistance (FMA) Plan	N
Watershed Plan	N
Firewise or other fire mitigation plan	N
School Mitigation Plan	Y
Critical Facilities Plan (Mitigation/Response/Recovery)	N
Policies/Ordinance	
Zoning Ordinance	N/A
Building Code	N/A
Floodplain Ordinance	2010
Subdivision Ordinance	N
Tree Trimming Ordinance	N
Nuisance Ordinance	N
Stormwater Ordinance	N
Drainage Ordinance	N
Site Plan Review Requirements	N
Historic Preservation Ordinance	N
Landscape Ordinance	N
Seismic Construction Ordinance	N
Program	
Zoning/Land Use Restrictions	N
Codes Building Site/Design	N
Hazard Awareness Program	N
National Flood Insurance Program (NFIP)	Y
NFIP Community Rating System (CRS) program	N
National Weather Service (NWS) Storm Ready	N
Firewise Community Certification	N
Building Code Effectiveness Grading (BCEGs)	N
ISO Fire Rating	9

Capabilities	Status Including Date of Document or Policy
Economic Development Program	N
Land Use Program	N
Public Education/Awareness	N
Property Acquisition	N
Planning/Zoning Boards	N
Stream Maintenance Program	N
Tree Trimming Program	N
Engineering Studies for Streams (Local/County/Regional)	N
Mutual Aid Agreements	N
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	N
Hazard Analysis/Risk Assessment (County)	Y
Flood Insurance Maps	N
FEMA Flood Insurance Study (Detailed)	N
Evacuation Route Map	N
Critical Facilities Inventory	Y
Vulnerable Population Inventory	N
Land Use Map	N
Staff/Department	
Building Code Official	N
Building Inspector	N
Mapping Specialist (GIS)	N
Engineer	N
Development Planner	N
Public Works Official	Y
Emergency Management Director	Y
NFIP Floodplain Administrator	Y
Emergency Response Team	Y
Hazardous Materials Expert	N
Local Emergency Planning Committee	Y
County Emergency Management Commission	N
Sanitation Department	N
Transportation Department	N
Economic Development Department	N
Housing Department	N
Historic Preservation	N
Non-Governmental Organizations (NGOs)	
American Red Cross	Y
Salvation Army	Y
Veterans Groups	N
Local Environmental Organization	N
Homeowner Associations	N
Neighborhood Associations	N
Chamber of Commerce	Y
Community Organizations (Lions, Kiwanis, etc.)	N

Capabilities	Status Including Date of Document or Policy
Local Funding Availability	
Apply for Community Development Block	Y
Fund projects through Capital	Y
Authority to levy taxes for a specific purpose	Y
Fees for water, sewer, gas, or electric services	N
Impact fees for new development	N
Ability to incur debt through general obligation bonds	Y
Ability to incur debt through special tax bonds	Y
Ability to incur debt through private activities	N
Withhold spending in hazard prone areas	Y

Source: Data Collection Questionnaire, 2021

2.2.2 Anderson

The city of Anderson is located at the intersections of Highways 59 and 76, just West of Interstate 49. Anderson is defined as a 4th class city run by a Mayor and a four member City Council. Anderson also has planning commission whose goal is to promote responsible development and efficient use of the cities resources. Additional city staff include:

- City clerk
- Water department/court clerk
- Building inspector
- Municipal judge

Population and demographics:

- 2000 Census: 1,856
- 2019 Census:2,069
- 2019 Median Household Income: $45,870
- 2019 Total Housing Units: 990

Utilities:

- Water and Sewer: City of Anderson
- Electric: Empire District Electric and New Mac Electric Co-op

Law enforcement is provided by the Anderson Police Department. The Anderson Fire Department provides fire protection services and a first responders unit for emergency medical and response services.

Specific mitigation initiatives from the data collection questionnaire for local governments:

- 2 outdoor warning sirens, activated by McDonald County 911
- Plans are in place for evacuation of all residents (in event of disaster) at the 80 bed skilled nursing home facility.
- Fire safety programs at local schools and public event

Table2.13 City of Anderson Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	No
County Emergency Operations Plan	Yes,2015
Local Recovery Plan	No
County Recovery Plan	No
City Mitigation Plan	No
County Mitigation Plan	Yes,2011
Local Mitigation Plan (PMD)	No
County Mitigation Plan (PDM)	No
Debris Management Plan	No
Economic Development Plan	No
Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes, IBM 2008
Floodplain Ordinance	Yes,2010
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	Yes
Seismic Construction Ordinance	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program (NFIP)	Yes
NFIP Community Rating System (CRS) program	No
National Weather Service (NW S) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	7

Capabilities	Status Including Date of Document or Policy
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	Yes, Part-Time
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes, Full-Time
Emergency Management Director	No
NFIP Floodplain Administrator	Yes, Volunteer
Emergency Response Team	Yes, Part-Time
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
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Local Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.	No

Capabilities	Status Including Date of Document or Policy
Local Funding Availability	
Apply for Community Development Block	Yes
Fund projects through Capital	Yes
Authority to levy taxes for a specific purpose	Yes, with vote
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	Yes
Withhold spending in hazard prone areas	Yes, All spending is approved by council

Source: Data Collection Questionnaire, 2021

2.2.3 Goodman

The city of Goodman is located in the Northcentral portion of the county just East of Interstate 49 with Highway 59 running through the city limits. Goodman is defined as a 4th class city run by a Mayor and a five member City Council. Additional city staff includes:

- City clerk
- City Supervisor
- City employee
- Emergency Management Director
- Emergency Management Assistant
- Municipal judge
- City attorney
- Tax collector
- Recreation Director
- Building code official/Building inspector
- Public works official

Population and demographics:

- 2000 Census: 1,183
- 2019 Census:1,381
  - 2019 Median Household Income: $37,556
  - 2019 Total Housing Units: 532

Utilities:

- Water and Sewer: City of Goodman
- Electric: Empire District Electric and New Mac Electric Co-op

Law enforcement is provided by the Goodman Police Department. Goodman Area Fire Protection Department provides fire protection services and a first responders unit for emergency medical and response services.

Specific mitigation initiatives (from the data collection questionnaire for local governments:

- 1 outdoor warning siren, activated by McDonald County 911 and/or Goodman Area Fire Protection
- Fire safety programs at local schools and public events

Table2.14 City of Goodman Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Plan	No
County Emergency Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	No
Local Mitigation Plan (PMD)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	No
Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes,IBM 2009
Floodplain Ordinance	Yes
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	Yes
Seismic Construction Ordinance	No
Capability	
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	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	Yes
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	6
Economic Development Program	No
Land Use Program	Yes
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No

Capability	Status Including Date of Document or Policy
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	Yes, Part-Time
Building Inspector	Yes-Part-Time
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes, Full-Time
Emergency Management Coordinator	Yes, Part-Time
NFIP Floodplain Administrator	Yes
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	No
County Emergency Management Commission	No
Sanitation Department	Yes, Part-Time
Transportation Department	No
Economic Development Department	No
Housing Department	No
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.	No
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	Yes
Ability to withhold spending in hazard prone areas	Yes

Source: Data Collection Questionnaire, 2021

2.2.4 Jane

The Village of Jane is located in the Southcentral portion of the county near the intersection of Interstate 49 and Highway 90. Jane is a small village run by a five member Board of Trustee's. Additional Village staff includes a city clerk.

Population and demographics:

- 2000 Census: 372
- 2019 Census: 546
- 2019 Median Household Income: $42,224
- 2019 Total Housing Units: 191

Utilities:

- Water and Sewer: Public Water Sewer District # 1
- Electric: New Mac Electric Co-op.

Law enforcement is provided by the McDonald County Sheriff's Department. The White Rock Fire Department provides fire protection services and a first responders unit for emergency medical and response services.

Specific mitigation initiatives from the data collection questionnaire for local governments:

- McDonald County 911 puts out severe weather warning.

Table 2.15 Village of Jane Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Plan	No
County Emergency Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	Yes
County Mitigation Plan	Yes
Local Mitigation Plan (PMD)	No
County Mitigation Plan (PDM)	No
Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	No
Floodplain Ordinance	No

Capability	Status Including Date of Document or Policy
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Seismic Construction Ordinance	No
Capability	
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	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	No
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	N/A
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	No
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	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
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

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

Source: Data Collection Questionnaire, 2021

2.2.5 Lanagan

The city of Lanagan is located along Highway 59 approximately 3 miles South of Anderson. Lanagan is defined as a 4th class city run by a Mayor and a five member City Council. Additional city staff include a City Clerk.

Population and demographics:

- 2000 Census: 411
- 2019 Census:419
- 2019 Median Household Income: $34,212
- 2019 Total Housing Units: 228

Utilities:

- Water City of Lanagan
- Sewer: Septic Tanks
- Electric: Empire District Electric

Law enforcement is provided by the Lanagan Police Department. The Lanagan Volunteer Fire Department provides fire protection services and a first responders unit for emergency medical and response services.

Specific mitigation initiatives from the data collection questionnaire for local governments:

- 1 outdoor warning siren, activated by manually by Lanagan Police Chief.

Table2.16 City of Lanagan Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Plan	No
County Emergency Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	Yes
County Mitigation Plan	Yes
Local Mitigation Plan (PMD)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	No
Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No

Capability	Status Including Date of Document or Policy
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Seismic Construction Ordinance	No
Capability	
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	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	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	No
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Coordinator	No
NFIP Floodplain Administrator	Yes
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
Historic Preservation	No
Non-Governmental Organizations (NGOs)	

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

Source: Data Collection Questionnaire, 2021

2.2.6 Noel

The city of Noel is located in the Southwestern portion of the county near the intersection of Highway 59 and 90. Noel is defined as the 4th class city run by a Mayor and a six member City Council. Noel also has planning commission whose goal is to promote responsible development and efficient use of the cities resources. Additional city staff include:

- City clerk
- Building code official
- Building inspector
- Public works official
- Sanitation Official

Population and demographics:

- 2000 Census: 1,856
- 2019 Census:2,141
- 2019 Median Household Income: $37,870
- 2019 Total Housing Units: 990

Utilities:

- Water and Sewer: Noel Water Company
- Sewer: City of Noel
- Electric: Empire District Electric

Law enforcement is provided by the Noel Marshall's Office .The Noel Fire Department provides fire protection services and a first responders unit for emergency medical and response services.

Specific mitigation initiatives from the data collection questionnaire for local governments:

- 2 outdoor warning sirens, activated by McDonald County 911
- Plans are in place for evacuation of all residents (in event of disaster) at the 80 bed skilled nursing home facility.
- Fire safety programs at local schools and public event

Table 2.17 City of Noel Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Plan	Yes
County Emergency Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	Yes
County Mitigation Plan	Yes
Economic Development Plan	No
Local Mitigation Plan (PMD)	No
County Mitigation Plan (PDM)	No
Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	IBC
Floodplain Ordinance	Yes
Subdivision Ordinance	Yes
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Seismic Construction Ordinance	No
Capability	
Site Plan Review Requirements	No
Historic Preservation Ordinance	Yes
Landscape Ordinance	Yes
Iowa Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	Yes
National Weather Service (NWS) Storm Ready	Yes
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	N/A
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	Yes
Tree Trimming Program	Yes
Engineering Studies for Streams (Local/County/Regional)	No

Capability	Status Including Date of Document or Policy
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Yes
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	Yes
Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Coordinator	Yes
NFIP Floodplain Administrator	Yes
Emergency Response Team	Yes
Hazardous Materials Expert	Yes
Local Emergency Planning Committee	No
County Emergency Management Commission	No
Sanitation Department	Yes
Transportation Department	No
Economic Development Department	No
Housing Department	Yes
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.	Yes
Local Funding Availability	
Ability to apply for Community Development Block Grants	No
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	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	No
Ability to incur debt through special tax bonds	No
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2021

2.2.7 Pineville

The city of Anderson is located at the intersections of Highways 59 and 76, just West of Interstate

- Anderson is defined as a 4th class city run by a Mayor and a four member City Council. Anderson also has planning commission whose goal is to promote responsible development and efficient use of the cities resources. Additional city staff include: City clerk
- Water department/court clerk
- Building inspector
- Municipal judge

Population and demographics:

- 2000 Census: 768
- 2019 Census:817
- 2019 Median Household Income: $35,870
- 2019 Total Housing Units: 521

Utilities:

- Water and Sewer: City of Pineville
- Electric: Empire District Electric

Law enforcement is provided by the Pineville Marshall's Office. The Pineville Fire Department provides fire protection services and a first responders unit for emergency medical and response services.

Specific mitigation initiatives from the data collection questionnaire for local governments:

- 2 outdoor warning sirens, activated by McDonald County 911
- Tornado shelter
- Annual fire safety programs at schools, and public information on household preparedness

Table 2.18 City of Pineville Mitigation Capabilities

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

Capability	Status Including Date of Document or Policy
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	No
Building Code	Yes
Floodplain Ordinance	Yes
Subdivision Ordinance	Yes
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Seismic Construction Ordinance	No
Capability	
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Iowa Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	7
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Planning
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	Yes
Development Planner	No
Public Works Official	Yes
Emergency Management Coordinator	Yes
NFIP Floodplain Administrator	Yes

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

Source: Data Collection Questionnaire, 2021

2.2.8 Southwest City

The city of Southwest City is located in the far Southwest corner of the county near the intersection of Highways 90 and 43. Southwest City is defined as a 4th class city run by a Mayor and a four member City Council. Additional city staff include: City clerk

- Public works

Population and demographics:

- 2000 Census: 850
- 2019 Census:1,056
- 2019 Median Household Income: $41,870
- 2019 Total Housing Units: 615

Utilities:

- Water and Sewer: City of Southwest City
- Electric: Empire District Electric

Law enforcement is provided by the Southwest City Police Department. The Southwest City Fire Department provides fire protection services and a first responders unit for emergency medical and response services.

Specific mitigation initiatives from the data collection questionnaire for local governments:

- 1 outdoor warning sirens, activated by McDonald County 911
- Tornado shelter at local school

Table 2.19 Southwest City Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	Yes
Local Emergency Plan	No
County Emergency Plan	Yes
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	Yes
County Mitigation Plan	Yes
Local Mitigation Plan (PMD)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	No
Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	No
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No

Capability	Status Including Date of Document or Policy
Storm Water Ordinance	No
Drainage Ordinance	No
Seismic Construction Ordinance	No
Capability	
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	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	N/A
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	No
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	Yes
Emergency Management Coordinator	No
NFIP Floodplain Administrator	Yes
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
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
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	
Ability to apply for Community Development Block Grants	No
Ability to fund projects through Capital Improvements funding	No
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Ability to incur debt through general obligation bonds	No
Ability to incur debt through special tax bonds	No
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2021

Table2.20 Mitigation Capabilities Summary

CAPABILITIES	McDonald County	Anderson	Goodman	Jane	Lanagan	Noel	Pineville	Southwest City
Planning Capabilities								
Comprehensive Plan	No	No	No	No	No	No	Yes	No
Builder's Plan	No	No	No	No	No	No	No	No
Capital Improvement Plan	No	No	No	No	No	No	No	No
Local Emergency Plan	No	Yes	No	No	No	Yes	Yes	Yes
County Emergency Plan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local Recovery Plan	No	No	No	No	No	No	No	No
County Recovery Plan	No	No	No	No	No	No	No	No
Local Mitigation Plan	No	Yes	Yes	Yes	Yes	Yes	No	Yes
County Mitigation Plan	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Local Mitigation Plan(PMD)	No	No	No	No	No	No	No	No
County Mitigation Plan (PDM)	No	No	No	No	No	No	No	No
Debris Management Plan	No	No	No	No	No	No	No	No
Economic Development Plan	No	No	No	No	No	No	No	No
Transportation Plan	No	No	No	No	No	No	No	No
Land-use Plan	No	No	No	No	No	No	No	No
Flood Mitigation Assistance (FMA) Plan	No	No	No	No	No	No	No	No
Watershed Plan	No	No	No	No	No	No	No	No
Firewise or other fire mitigation plan	No	No	No	No	No	No	No	No
School Mitigation Plan	No	No	No	No	No	No	No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No	No	No	No	No	No	No	No
Policies/Ordinance								
Zoning Ordinance	No	Yes	Yes	Yes	No	Yes	No	Yes
Building Code	No	Yes	Yes	No	No	IBC	Yes	No
Floodplain Ordinance	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Subdivision Ordinance	No	No	Yes	No	No	Yes	Yes	No
Tree Trimming Ordinance	No	No	No	No	No	Yes	No	No
Nuisance Ordinance	No	Yes	Yes	No	No	Yes	Yes	No
Storm Water Ordinance	No	No	No	No	No	Yes	No	No

CAPABILITIES	McDonald County	Anderson	Goodman	Jane	Lanagan	Noel	Pineville	Southwest City
Drainage Ordinance	No	No	Yes	No	No	Yes	No	No
Site Plan Review Requirements	No	Yes	Yes	No	No	No	Yes	No
Historic Preservation Ordinance	No	No	No	No	No	Yes	No	No
Landscape Ordinance	No	Yes	No	No	No	Yes	No	No
Seismic Construction Ordinance	No	No	No	No	No	No	No	No
Program								
Zoning/Land Use Restrictions	No	Yes	Yes	Yes	No	Yes	**No**	No
Codes Building Site/Design	No	No	Yes	No	No	Yes	Yes	No
National Flood Insurance Program (NFIP) Participant	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
NFIP Community Rating System (CRS) Participating Community	No	No	No	No	No	No	No	No
Hazard Awareness Program	No	No	Yes	No	No	Yes	No	No
National Weather Service (NWS) Storm Ready	No	No	No	No	No	Yes	No	No
Building Code Effectiveness Grading (BCEGs)	No	No	No	No	No	No	No	No
ISO Fire Rating	9	7	6	n/a	n/a	n/a	7	n/a
Economic Development Program	No	No	No	No	No	No	No	No
Land Use Program	No	No	Yes	No	No	No	No	No
Public Education/Awareness	No	No	No	No	No	Yes	No	No
Property Acquisition	No	No	No	No	No	No	No	No
Planning/Zoning Boards	No	Yes	No	No	No	Yes	Planning	Yes
Stream Maintenance Program	No	No	No	No	No	Yes	No	No
Tree Trimming Program	No	No	No	No	No	Yes	No	No
Engineering Studies for Streams (Local/County/Regional)	No	No	No	No	No	No	No	No
Mutual Aid Agreements	Yes	Yes	Yes	No	No	Yes	Yes	No
Studies/Reports/Maps								
Hazard Analysis/Risk Assessment (Local)	No	No	No	No	No	Yes	No	No
Hazard Analysis/Risk Assessment (County)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flood Insurance Maps	No	No	No	No	No	No	No	No
FEMA Flood Insurance Study (Detailed)	No	No	No	No	No	No	No	No
Evacuation Route Map	No	No	No	No	No	No	Yes	No

CAPABILITIES	McDonald County	Anderson	Goodman	Jane	Lanagan	Noel	Pineville	Southwest City
Critical Facilities Inventory	No	No	No	No	No	No	Yes	No
Vulnerable Population Inventory	No	No	No	No	No	No	No	No
Land Use Map	No	No	No	No	No	No	Yes	No
Staff/Department								
Building Code Official	No	No	Yes, part time	No	No	Yes,2015 IBC	Yes, part time	No
Building Inspector	No	Yes, part time	Yes, part time	No	No	Yes	Yes, part time	No
Mapping Specialist(GIS)	Yes	No	No	No	No	No	No	No
Engineer	No	No	No	No	No	No	Yes, Contract	No
Development Planner	No	No	No	No	No	No	No	No
Public Works Official	No	Yes, full time	Yes, full time	No	Yes	Yes	Yes, full time	Yes
Emergency Management Coordinator	Yes, full time	No	Yes, part time	No	No	Yes	Yes, volunteer	No
NFIP Floodplain Administrator	Yes, full time	Yes, volunteer	Yes, part time	No	Yes	Yes	Yes, volunteer	Yes
Emergency Response Team	Yes, 1 full time plus volunteers	Yes, part time	No	No	No	Yes	No	No
Hazardous Materials Expert	No	No	No	No	No	Yes	No	No
Local Emergency Planning Committee	Yes	No	No	No	No	No	Yes, volunteer	No
County Emergency Management Commission	No	No	No	No	No	No	Yes	No
Sanitation Department	No	No	Yes, part time	No	No	Yes	Yes	No
Transportation Department	Yes	No	No	No	No	No	No	No
Economic Development Department	No	No	No	No	No	No	No	No
Housing Department	No	No	No	No	No	Yes	No	No
Historic Preservation	No	No	No	No	No	No	No	No
Non-Governmental Organizations (NGOs)								
American Red Cross	Yes	No	No	No	Yes, County	No	No	No

CAPABILITIES	McDonald County	Anderson	Goodman	Jane	Lanagan	Noel	Pineville	Southwest City
Salvation Army	No	No	No	No	No	No	No	No
Veterans Groups	Yes	No	No	No	No	No	No	No
Environmental Organization	Yes	No	No	No	No	No	No	No
Homeowner Associations	No	No	No	No	No	No	No	No
Neighborhood Associations	No	No	No	No	No	No	No	No
Chamber of Commerce	Yes	No	Yes	No	Yes, County	No	Yes	No
Community Organizations (Lions, Kiwanis, etc.	No	No	No	No	No	Yes	No	No
Financial Resources								
Apply for Community Development Block Grants	Yes	Yes	Yes	No	Yes	No	No	No
Fund projects through Capital Improvements funding	Yes	Yes	Yes	No	No	No	No	No
Authority to levy taxes for specific purposes	Yes	Yes, with vote	Yes	No	Yes	Yes, with vote	Yes	Yes, with vote
Fees for water, sewer, gas, or electric services	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Impact fees for new development	No	No	Yes	No	No	No	No	No
Incur debt through general obligation bonds	Yes	Yes	Yes	No	No	Yes	Yes	No
Incur debt through special tax bonds	Yes	Yes	Yes	No	No	Yes	Yes	No
Incur debt through private activities	No	Yes	Yes	No	No	No	Yes	No
Withhold spending in hazard prone areas	No	Yes, all spending is approved by council	Yes	No	No	No	Yes	No

Source: Data Collection Questionnaire, 2021

2.2.9 White Rock Fire Protection District

The purpose of the White Rock Fire Protection District is to protect the village of Jane from fire hazards. This special district is covers the Village of Jane and it is not a public entity it entails volunteers from the local community. The structure of the government entails 5 elected board members.
Departments listed as:

- Fire Station 1 and 2
- Natural Gas Services

List of past and ongoing projects or programs designed to reduce disasters losses. List mitigation-related capabilities such as:

- One outdoor siren activated by 911
- 911 radio alerts to local emergency responders
- Storm alerts and Amber alerts
- Obtained a rescue truck to cover emergencies in fire district
- Annual fire training at White Rock Elementary School

Table 2.21 White Rock Fire Protection District Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Plan	No
County Emergency Plan	No
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	No
Economic Development Plan	No
Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	Yes
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Seismic Construction Ordinance	No
Capability	
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Iowa Wetlands and Riparian Areas Conservation Plan	No

Capability	Status Including Date of Document or Policy
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant	No
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	Yes
National Weather Service (NWS) Storm Ready	Yes
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	9
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Coordinator	No
NFIP Floodplain Administrator	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
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	Yes
Salvation Army	No
Veterans Groups	Yes
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.	No

Capability	Status Including Date of Document or Policy
Local Funding Availability	
Ability to apply for Community Development Block Grants	No
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	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2021

2.3 McDonald County (R-1) Schools Profiles and Mitigation Capabilities

There are 9 public elementary schools in McDonald County. These facilities include: Anderson Elementary, Goodman Elementary, Noel Elementary, Noel Primary, Pineville Elementary, Pineville Primary, Rocky Comfort Elementary, Southwest City Elementary, and White Rock Elementary. There is 1 middle school facility in McDonald County, the facility is located in Anderson and is named the Anderson Middle School. There is 1 public high school in McDonald County. This facility in known as the McDonald County High School and is located in Anderson. There are portions of McDonald County that are served by adjacent school districts including: Neosho R-5, East Newton R-6, Seneca R-7, Wheaton R-3, and Southwest Barry County R-5.

There is a University of Missouri Extension and Outreach office located in Pineville. There is also a campus for Crowder College located in Jane, Crowder College is a two-year institution based in Neosho, MO (Newton County).

Figure 2. 7 McDonald County School District Map

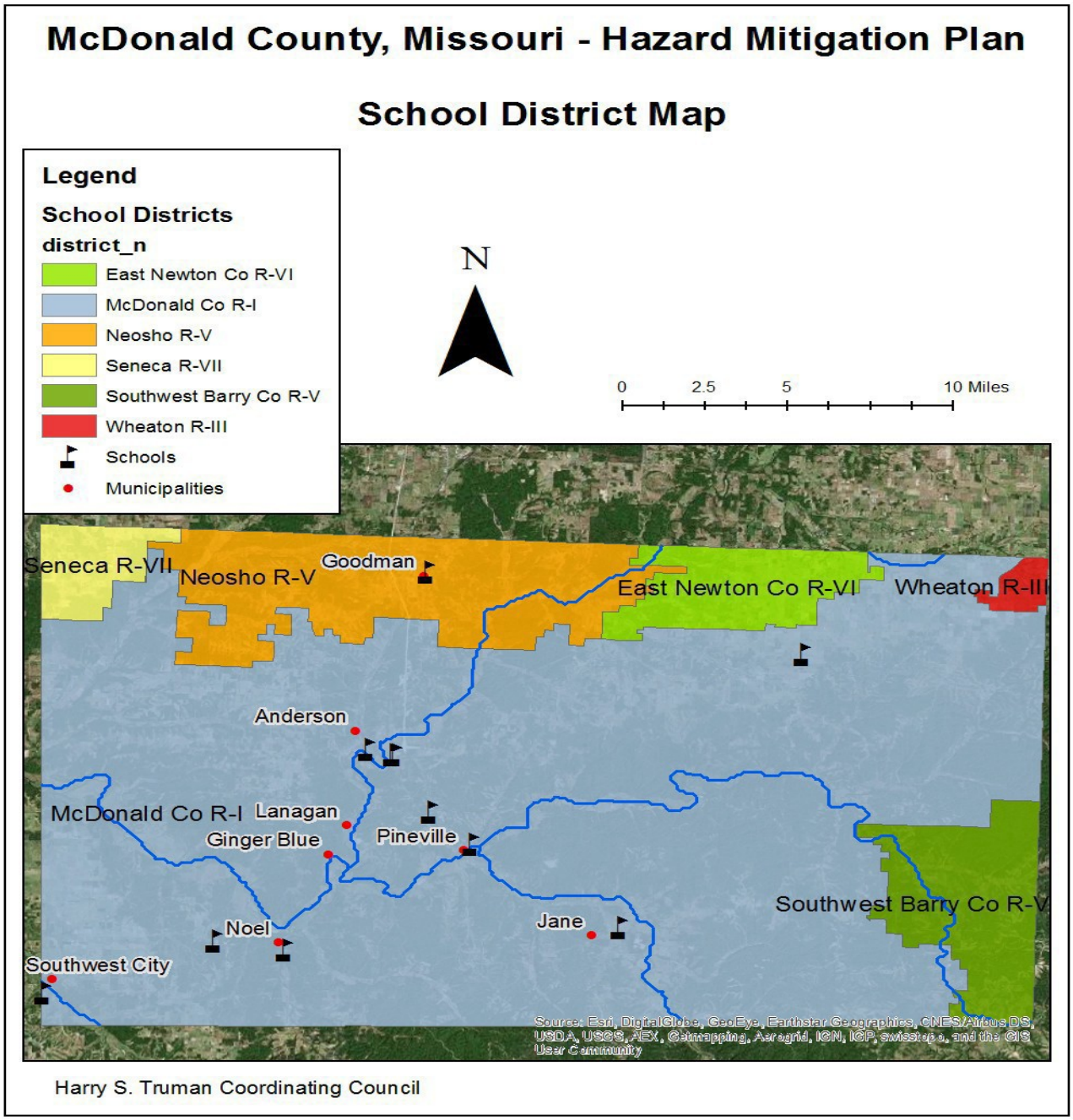


Table2.22 McDonald County School Buildings and Enrollment Data, 2021

District Name	Building Name	Building Enrolment
McDonald County R-1 Schools	Anderson Elementary	600
McDonald County R-1 Schools	Anderson Middle School	400
McDonald County R-1 Schools	McDonald County High School	1,200
McDonald County R-1 Schools	Noel Elementary	550

McDonald County R-1 Schools	Pineville Elementary	400
McDonald County R-1 Schools	Pineville Primary	300
McDonald County R-1 Schools	Rocky Comfort Elementary/JH	500
McDonald County R-1 Schools	Southwest City elementary/JH	500
McDonald County R-1 Schools	White Rock Elementary/JH	600

Source: http://mcds.dese.mo.gov/quickfacts/Pages/District-and-School-Information.aspx, 2021

Table2.23 Summary of Mitigation Capabilities-McDonald CountyR-1 Schools

Capability	McDonald CountyR-1 Schools
Planning Elements	
Master Plan/ Date	Yes
Capital Improvement Plan/Date	Yes
School Emergency Plan / Date	Yes
Weapons Policy/Date	Yes
Personnel Resources	
Full-Time Building Official (Principal)	Yes
Emergency Manager	Yes
GrantWriter	No
Public Information Officer	Yes
Financial Resources	
Capital Improvements Project Funding	Yes
Local Funds	Yes
General Obligation Bonds	Yes
Special TaxBonds	Yes
Private Activities/Donations	Yes
State and Federal Funds/Grants	Yes
Other	
Public Education Programs	Yes
Privately or Self- Insured?	Privately
Fire Evacuation Training	Yes
Tornado Sheltering Exercises	Yes
Public Address/Emergency Alert System	Yes
NOAAWeather Radios	Yes
Lock-Down Security Training	Yes
Mitigation Programs	Yes
Tornado Shelter/Safe room	Yes
Campus Police	Yes

Source: Data Collection Questionnaire, 2021

3 RISK ASSESSMENT

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

The risk assessment process identifies and profiles relevant hazards and assesses the effects of exposure to these hazards on the lives, property, and infrastructure of McDonald County. The goal of the risk assessment is to estimate the potential loss in the planning area from a natural or man-made hazard event (e.g. loss of life, personal injury, property damage, and economic loss). The risk assessment process allows communities and schools in McDonald 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.

The risk assessment for McDonald County and its jurisdictions followed the methodology described in the Local Mitigation Planning Handbook (March 2013).

This section is divided into four main parts:

- **Section 3.1 Hazard Identification** identifies the hazards that threaten the planning area and provides a factual basis for elimination of hazards from further consideration.
- **Section 3.2 Assets at Risk** provides the planning area's total exposure to natural hazards, considering critical facilities and other community assets at risk; as well as future land use and development forecasts.
- **Section 3.3 Future Land Use and Development** discusses areas of planned future development
- **Section 3.4 Hazard Profiles and Vulnerability Analysis** provides more detailed information about the hazards impacting the planning area. For each hazard, there are three sections:
    1. Hazard Profile: provides a general description and discusses the threat to the planning area, the geographic location at risk, potential severity/magnitude/extent, previous occurrences of hazard events, probability of future occurrence, risk summary by jurisdiction, impact of future development on the risk.
    2. Vulnerability Assessment: further defines and quantifies populations, buildings, critical facilities, and other community/school or special district assets at risk to natural hazards.
    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 McDonald County Hazard Mitigation Plans vary slightly from the Missouri State Plan (2018). In the 2016 update, the McDonald County Hazard Mitigation Plan only incorporated natural hazards due to the rural nature of the county. The MPC has agreed continue to incorporate only natural hazards for the 2021 update. However, the MCP has expressed a growing concern for hazards related to Public Health & Safety, therefore itis expected that the 2021 update may incorporate some man-made hazards relevant to public health and safety issues. The hazards defined by the McDonald County Hazard Mitigation Planning Committee are listed in **Table 3.1** showing a comparison with the 2016 update as well as the 2018 State Hazard Mitigation Plan.

Table 3.1

Hazard Mitigation Plans – Hazards Comparison

Missouri State Plan(2018)	McDonald County Plan (2016)	McDonald County Plan (2021)
Riverine Flooding	Flooding	Flooding (Riverine and Flash)
Dam Failure	Dam Failure	Dam Failure
Levee Failure	Earthquakes	Earthquakes
Earthquake	Sinkholes	Sinkholes/Land Subsidence
Land Subsidence/Sinkholes	Severe Thunderstorms	Severe Thunderstorms
Severe Thunderstorm	Tornadoes	Tornadoes
Tornadoes	Severe Winter Weather	Severe Winter Weather
Severe Winter Weather	Drought	Drought
Droughts	Heatwave	Extreme Heat
Extreme Temperatures	Wildfires	Wildfires
Fires		
Public Health Emergencies		

Hazards Excluded

Natural hazards that are excluded from the Missouri State Hazard Mitigation Plan because they do not threaten the State of Missouri will also continue to be excluded from the McDonald County Hazard Mitigation Plan. The risk of coastal storms, hurricanes, tsunamis, avalanches, and volcanic activity does not exist within McDonald County or the State of Missouri due to its geographic location, soil profile, and geologic structure. Therefore, these hazards were not profiled in the 2018 update. Additionally, there are no levees in or near McDonald County; therefore that hazard continues to be excluded from the McDonald County plan.

3.1.1 Review of Existing Mitigation Plans

The McDonald County Hazard Mitigation Plans vary slightly from the Missouri State Plan (2018). In

the 2016 update, the McDonald County Hazard Mitigation Plan only incorporated natural hazards due to the rural nature of the county. The MPC has agreed continue to incorporate only natural hazards for the 2021 update. However, the MCP has expressed a growing concern for hazards related to Public Health & Safety, therefore it is expected that the 2021 update may incorporate some man-made hazards relevant to public health and safety issues. The hazards defined by the McDonald County Hazard Mitigation Planning Committee are listed in Table 3.1 showing a comparison with the 2016 update as well as the 2018 State Hazard Mitigation Plan.

3.1.2 Review Disaster Declaration History

Disasters always occur at the local level and the citizens, local governments, and volunteer agencies are the first to respond and cope with the damage. Local governments are responsible for the initial response and recovery, and must maintain control of all assets used. Local governments must plan and prepare for this role with the support of the State and Federal government. Local jurisdictions then turn to State government when they do not have enough resources to respond to a disaster. They may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. If the disaster is so severe that both the local and state governments' capacities are exceeded; a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

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

Table 3.2 FEMA Disaster Declarations that included McDonald County, Missouri, 1965-Present

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
372	Severe Storm(s)	04/19/1973-04/19/1973	Individual Assistance (IA) Public Assistance (PA)
779	Flood	09/18/1986- 10/15/1986	Public Assistance (PA)
995	Flood	06/10/1993-10/25/1993	Individual Assistance (IA) Public Assistance (PA)
1054	Severe Storm(s)	05/13/1995-06/23/1995	Individual Assistance (IA) Public Assistance (PA)
1412	Severe Storm(s)	04/24/2002-06/10/2002	Individual Assistance (IA) Public Assistance (PA)
1463	Severe Storm(s)	05/04/2003-05/30/2003	Individual Assistance (IA)
1676	Severe Ice Storm	01/12/2007-01/22/2007	Public Assistance (PA)
1736	Severe Ice Storm	12/06/2007-12/15/2007	Public Assistance (PA)
1742	Severe Storm(s)	01/07/2008-01/10/2008	Public Assistance (PA)
1749	Severe Storm(s)	03/17/2008-05/09/208	Individual Assistance (IA) Public Assistance (PA)

1961	Severe Storm(s)	01/31/2011-02/05/2011	Public Assistance (PA)
1980	Severe Storm(s)	04/19/2011-06/06/2011	Public Assistance (PA)
3232	Hurricane	08/29/2005-10/01/2005	Public Assistance (PA)
3281	Severe Ice Storm	12/08/2007-12/15/2007	Public Assistance (PA)
3303	Severe Ice Storm	01/26/2009-01/28/2009	Public Assistance (PA)
3317	Severe Storm(s)	01/31/2011-02/05/2011	Public Assistance (PA)
3374	Flood	12/22/2015-01/09/2016	Public Assistance (PA)
3482	Biological	01/20/2020-Currently	Public Assistance (PA)
4144	Severe Storm(s)	08/02/2013-08/14/2013	Public Assistance (PA)
4238	Severe Storm(s)	05/15/2015-07/27/2015	Public Assistance (PA)
4250	Flood	12/23/2015-01/09/2016	Public Assistance (PA)
4317	Flood	04/28/2017-05/11/2017	Public Assistance (PA)
4451	Severe Storm(s)	04/29/2019-07/05/2019	Public Assistance (PA)
4490	Biological	01/20/2020-Currently	Public Assistance (PA)

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

3.1.3 Research Additional Sources

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

- Missouri Hazard Mitigation Plans (2010, 2013, and 2018)
- Previously approved planning area Hazard Mitigation Plan (2016)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources
- 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 (you should state that you will give citations to the sources in the body of the plan)

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

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

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

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

Note 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

The natural hazards considered under this plan are Dam Failure, Drought, Earthquakes, Extreme Heat, Flooding (Riverine and Flash), Sinkholes/Land Subsidence, Severe Thunderstorms (High Winds, Hail, and Lighting), Severe Winter Weather (Blizzard, Ice Storm, and Severe Cold), and Tornadoes, and Wildfires. The one man-made hazard considered under this plan is Public Health and Safety.

The majority of jurisdictions have the possibility of being affected by each of the hazards. However, not all jurisdictions would be affected by dam failure. An "X" indicates a potential impact, and "-"indicates the hazard is not applicable for that jurisdiction.

Table 3.3 Hazards Identified for Each Jurisdiction

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme Temperatures	Flooding (River and Flash)	Land Subsidence/Sinkholes	Severe Winter Weather	Thunderstorm/Lightning/Hail/ High Wind	Tornado	Wildfire
McDonald County	x	x	x	x	x	x	x	x	x	x
Anderson	-	x	x	x	x	x	x	-	x	x
Goodman	x	x	x	x	x	x	x	-	x	x
Jane	x	x	x	x	x	x	x	x	x	x
Lanagan	-	x	x	x	x	x	x	x	x	x
Noel	x	x	x	x	x	x	x	x	x	x
Pineville	x	x	x	x	x	x	x	x	x	x
Southwest City	x	x	x	x	x	x	x	x	x	x
McDonald R-1	-	x	x	x	x	x	x	x	x	x
White Rock Fire Protection	-	x	x	x	x	x	x	x	x	x

3.1.5 Multi-Jurisdictional Risk Assessment

For this multi-jurisdictional hazard mitigation plan, the risk assessment evaluates each jurisdiction's risks where they deviate from the risks facing the entire county. McDonald County is a smaller county with only 540 square miles. In regards to climate and geography, the county is rather uniform and development is primarily within a few miles of the I-49 and Hwy 59 corridors. Apart from noted exceptions, there is very little variance of hazards and vulnerability across the county.

McDonald County is fairly uniform in terms of climate, topography and building construction characteristics. Each hazard's profile assesses risks on a county level and when appropriate on a jurisdictional level. Some hazards (i.e. flooding) vary in risk throughout the county; these variations are explained in each profile. As for assets at risk, urbanized areas (e.g. Anderson, Goodman, Noel and Pineville) have more assets that are also at a greater density; therefore, these towns have a greater vulnerability to natural hazards.

The hazards that vary across the planning area in terms of risk include dam failure, flash flood, grass or wildland fire, river flood, flash flood, and sinkholes/land subsidence. These differences in vulnerability are detailed in each hazard profile under a separate heading.

3.2 ASSETS AT RISK

This section assesses McDonald 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 McDonald County Assessor, the Christian County Structures dataset downloaded from Missouri Spatial Data information Service (MSDIS), and local jurisdiction data collection questionnaires. The Missouri Mitigation Viewer was also referenced to ensure that total counts looked accurate.

Missouri Mitigation Viewer

With the 2018 Hazard Mitigation Plan Update, SEMA now provides online access to risk assessment data and associated mapping for the 114 counties in the State, including the independent City of St. Louis. Through the web-based Missouri Hazard Mitigation Viewer, local planners or other interested parties can obtain all State Plan datasets.

The Missouri Hazard Mitigation Viewer includes a Map Viewer with a legend of clearly labeled features, a north arrow, a base map that is either aerial imagery or a street map, risk assessment data symbolized the same as in the 2018 State Plan for easy reference, search and query capabilities, ability to zoom to county level data and capability to download PDF format maps. The Missouri Hazard Mitigation Viewer can be found at this link:

- http://bit.ly/MoHazardMitigationPlanViewer2018
- https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide

Assets at Risk available from the Mitigation Viewer include:

- State Owned Facilities

- State Leased Facilities
- Department of Higher Education Facilities
- State Owned Bridges

Flood Risk Datasets

Data sources include:

- FEMA Flood Insurance Rate Maps (FIRM)
  https://msc.fema.gov/portal/home
- FEMA National Flood Hazard Layer
  https://hazards.fema.gov/femaportal/wps/portal/NFHLWMS
- FEMA Hazus Program
  https://www.fema.gov/hazus
- SEMA Flood Mapping Project Status for Missouri Counties
  http://bit.ly/MOSEMAOutreach
- 2010 US Census Population and Housing Unit Counts
  https://www.census.gov/geo/maps-data/data/tiger-data.html

Use the best data available to describe all assets at risk in the planning area. For the Flood Risk Datasets, available data should fall into the following categories:

- Good: If a digital FIRM (DFIRM) is not available for the flood risk analysis, use the census block exposure data out of Hazus or available as a Tiger/Line (note links above). If this method is chosen, apply corporate boundaries of jurisdictions in the plan to the GIS data available to parse out assets at risk for each jurisdiction. If this method is chosen, use this exposure data for all hazards so that the analysis is consistent.
- Better: If a DFIRM is available for the flood risk assessment AND parcel data is available in GIS format w/ associated building values—but not in a format that can be imported into Hazus, analysis can be done to show parcels and associated values in the planning area compared against the actual regulatory floodplain. The limitation with this is that your potential loss estimates will not be based on a depth/damage function as they are in Hazus. But, this is still a much more accurate picture of what is vulnerable to flooding than using theHazus estimated floodplain and census block. If you use this method for the flood risk assessment, it is best to use the parcel data for the total exposure for all hazards so that the analysis is consistent. Contents values are not usually included w/ parcel data structure values. However, using the formulas that Hazus uses, they can be calculated. Residential (50%), Commercial (100%), Industrial (150%), Agricultural (100%).
- Best: If DFIRM with depth grids are available, as produced during the Risk MAP process, AND parcel data is available in GIS format AND parcel data is in a format compatible w/ Hazus' user-defined data, this gives the best analysis. This provides the actual parcels and associated values in the planning area against the actual regulatory floodplain and will also take into account the depth-damage function in Hazus.

3.2.1 Total Exposure of Population and Structures

Missouri Spatial Data Information Service (MSDIS) data was used for structure points and paired with McDonald County Assessors data for values.

Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2010 Census Bureau data. Building

counts and building exposure values are based on parcel data developed by the State of Missouri Geographic Information Systems (GIS) database. This data, organized by County, is available on Google Drive through the link provided on the previous page. Contents exposure values were calculated by factoring a multiplier to the building exposure values based on usage type. The multipliers were derived from the Hazus and are defined below in **Table 3.4.** Land values have been purposely excluded from consideration because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Another reason for excluding land values is that state and federal disaster assistance programs generally do not address loss of land (other than crop insurance). It should be noted that the total valuation of buildings is based on county assessors' data which may not be current. In addition, government-owned properties are usually taxed differently or not at all, and so may not be an accurate representation of true value. Note that public school district assets and special districts assets are included in the total exposure tables assets by community and county.

Table 3.4 shows the total population, building count, estimated value of buildings, estimated value of contents and estimated total exposure to parcels for the unincorporated county and each incorporated city. For multi-county communities, the population and building data may include data on assets located outside the planning area. **Table 3.5** that follows provides the building value exposures for the county and each city in the planning area broken down by usage type. Finally, **Table 3.6** provides the building count total for the county and each city in the planning area broken out by building usage types (residential, commercial, industrial, and agricultural).

Table 3.4 Maximum Population and Building Exposure by Jurisdiction

Jurisdiction	2019 Annual Population Estimate	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
McDonald County	22,782	9,883	$786,764,800	$393,382,400	$1,180,147,200
Anderson	2,069	990	$61,842,600	$30,921,300	$92,763,900
Goodman	1,381	532	$32,622,700	$16,311,350	$48,934,050
Jane	546	191	$10,175,000	$5,087,500	$15,262,500
Lanagan	438	228	$12,188,800	$6,094,400	$18,283,200
Noel	2,141	717	$51,666,300	$25,833,150	$77,499,450
Pineville	817	455	$32,929,800	$16,464,900	$49,394,700
Southwest City	1,056	392	$26,016,000	$13,008,000	$39,024,000
Unincorporated McDonald County	31,230	6,378	$531,386,200	$265,693,100	$797,079,300

Source: U.S. Bureau of the Census, Annual population estimates/ 5-Year American Community Survey 2019; Building Count and Building Exposure, Missouri GIS Database from SEMA Mitigation Management; Contents Exposure derived by applying multiplier to Building Exposure based on Hazus MH 2.1 standard contents multipliers per usage type as follows: Residential (50%), Commercial (100%), Industrial (150%), Agricultural (100%). For purposes of these calculations, government, school, and utility were calculated at the commercial contents rate.

Table 3.5 Building Values/Exposure by Usage Type

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Total
Anderson	$78,913	$10,151	$0	$23	$89,087
Goodman	$58,648	$2,663	$0	$68	$61,379
Jane					
Lanagan	$14,360	$499	$0	$3	$14,732
Noel	$52,877	$7,821	$0	$19	$60,717
Pineville	$35,699	$4,659	$0	$35	$40,393
Southwest City	$26,304	$4,493	$3,108	$47	$33,952
Unincorporated McDonald County	$693,573	$23,297	$21,757	$12,349	$750,976
Totals	**$963,862**	**$53,584**	**$24,866**	**$12,544**	**$1,065,608**

Source: Missouri GIS Database, SEMA Mitigation Management Section

Table 3.6 Building Counts by Usage Type

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Total
Anderson	588	61		13	677
Goodman	437	16		39	494
Jane					
Lanagan	107	3		2	112
Noel	394	47		11	453
Pineville	266	28		20	317
Southwest City	196	27	6	27	258
Unincorporated	5,168	140	42	7,111	12,467
Totals	**7,182**	**322**	**48**	**7,223**	**14,794**

Source: Missouri GIS Database, SEMA Mitigation Management Section; Public School Districts and Special Districts

Even though schools and special districts' total assets are included in the tables above, additional discussion is needed, based on the data that is available from the districts' completion of the Data Collection Questionnaire and district-maintained websites. The number of enrolled students at the participating public school districts is provided in **Table 3.7** 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 3.7 Population and Building Exposure by Jurisdiction-Public School Districts

McDonald County R-1 School District	Enrollment	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Anderson Elementary	600	1	$ 12,629,323.00	$ 1,568,860.00	$14,198,183.00
Anderson Middle School	400	1	$ 7,292,558.25	$ 939,460.00	$8,232,018.25
McDonald County High School	1200	1	$ 23,863,220.70	$ 3,077,140.00	$26,940,360.70
MCHS Business Center		1	$ 1,165,500.00	$ 112,750.00	$1,278,250.00
ROTC Building		1	$ 932,400.00	$ 176,300.00	$1,108,700.00
Fair Building		1	$ 750,904.19	$ 10,250.00	$761,154.19
MCHS New Vo-Tec Building		1	$ 4,099,920.37	$ 1,020,500.00	$5,120,420.37

MCHS Agri-Business Greenhouse		1	$ 1,546,500.00	$ 205,000.00	$1,751,500.00
Maintenance Facility		1	$ 697,950.00	$ 256,250.00	$954,200.00
Noel Elementary	550	1	$ 8,238,880.98	$ 1,209,951.00	$9,448,831.98
Alexander Hall		1	$ 237,681.44	$ 41,000.00	$278,681.44
Noel Elementary School Storage		1	$ 118,721.81	$ 20,500.00	$139,221.81
Noel Primary	400	1	$ 3,978,873.36	$ 801,780.00	$4,780,653.36
Pineville Elementary	400	1	$ 3,836,929.56	$ 449,155.00	$4,286,084.56
Pineville Elementary School Gym/Classrooms		1	$ 1,423,818.00	$ 159,900.00	$1,583,718.00
Pineville Primary	300	1	$ 2,956,516.20	$ 385,401.02	$3,341,917.22
Rocky Comfort Elementary/JH	500	1	$ 6,770,952.00	$ 1,025,000.00	$7,795,952.00
Southwest City Elementary		1	$ 6,167,902.02	$ 1,034,942.50	$7,202,844.52
American Legion		1	$ 168,257.65	$ 25,625.00	$193,882.65
White Rock Elementary/JH	600	1	$ 7,805,737.12	$ 1,117,300.00	$8,923,037.12
Bus Barn		1	$ 637,235.00	$ 200,200.00	$837,435.00
Administrative Office		1	$ 776,250.00	$ 256,250.00	$1,032,500.00
PAC		1	$ 3,265,011.00	$ 298,020.00	$3,563,031.00
Total	**4,950**	**23**	**$99,265,311.00**	**$12,752,577.17**	**$113,752,577.17**

Source: http://mcds.dese.mo.gov/quickfacts/Pages/District-and-School-Information.aspx., select the file for the most recent year called "20xx Building Enrollment PK-12", filter the spreadsheet by selecting only the public school districts in the planning area. The Building Exposure, Contents Exposure, and Total Exposure amounts come from the completed Data Collection Questionnaires from Public School Districts. In general, the school districts obtain this information from their insurance coverage amounts.

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 3.8 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:

- 2018 Missouri State Hazard Mitigation Plan and Hazard Mitigation Viewer http://bit.ly/MoHazardMitigationPlanViewer2018
- List other sources used to assemble critical facility inventory
- Chemical Facilities (Tier II Facilities) information (if included in the list of hazards identified by the participants) can be obtained by contacting the county LEPC. The LEPC will then request information (name, address, purpose for asking, etc.) and then provide the information. In order to find out who the LEPC contact is for your planning areas, see https://sema.dps.mo.gov/docs/programs/executive/MERC/LEPC_Manual/LEPC-addresses.pdf
- Hazus contains an inventory of critical facilities that can be exported for each jurisdiction.

- The Homeland Security Infrastructure Protection Program (HSIPP) is another source. But access may be restricted.

Table 3.8 Inventory of Critical/Essential Facilities and Infrastructure by Jurisdiction

Jurisdiction	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Highway Bridge	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	TOTAL
Anderson			x			x	x	x	x		x	x	x		x	x	x	x	x	x			x	15
Goodman							x		x		x					x	x	x						6
Jane			x				x		x		x	x				x	x		x	x			x	10
Lanagan			x				x		x			x				x	x	x	x	x			x	10
Noel			x				x		x		x						x		x	x			x	8
Pineville			x		x	x	x	x	x		x	x				x	x		x	x			x	13
Southwest City			x		x		x		x		x	x				x	x	x	x	x			x	11
Unincorporated McDonald County			x	x		x	x		x		x						x	x	x	x				10
																								84

Source: Missouri 2018 State Hazard Mitigation Plan and Hazard Mitigation Viewer; Data Collection Questionnaires; Hazus, etc.

Bridges: The term "scour critical" refers to one of the dat0abase 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.

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.

Set forth in the plan the number of scour critical bridges identified in the planning area. Include information about whether any are located within corporate city limits. See 2018 State Plan pages 3.621 through 3.622 for discussion and map of state-owned scour-critical bridges. An MS Excel Spreadsheet can be downloaded from the National Bridge Inventory to provide the numbers of bridges by state and county, including the number in each deficiency category. See http://www.fhwa.dot.gov/bridge/nbi/no10/county.cfm

Table 3.9 McDonald County Bridges

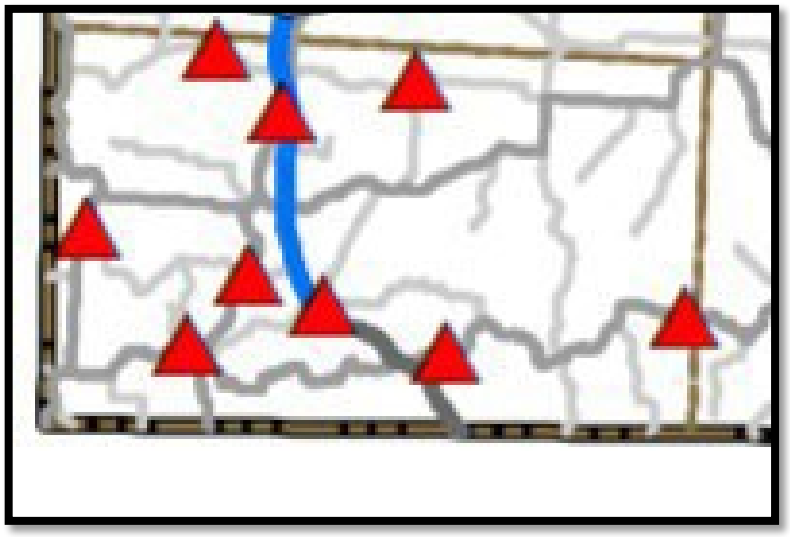
Bridge Number	County	Fed ID	Route	Feature
A0826	McDonald	597	MO 43 S	ELK RVR
A1828	McDonald	1519	MO 90 E	TRENT CR
H0792	McDonald	5113	RT EE E	INDIAN CR
J0243	McDonald	5314	MO 90 E	YARNELL BR
P0973	McDonald	8011	MO 90 E	LIT SUGAR CR
R0305	McDonald	8262	RT H E	GOODIN HOLLOW
R0567	McDonald	8450	RT C E	INDIAN CR
S0874	McDonald	8882	RT B E	SUGAR FK CR
T1006	McDonald	9394	PVT PRIVATE DR	BEAVER BR

Source: https://www.modot.org/sites/default/files/documents/Poor%20Bridges%20Public_2.pdf

An interactive website developed by Transportation for America allows users to locate and map structurally deficient bridges in their area. Transportation for America is an alliance of elected, business, and civic leaders from communities across the country, united to ensure that states and the federal government step up to invest in smart, homegrown, locally-driven transportation solutions. To use the interactive map, click the following link: http://t4america.org/maps-tools/bridges/

Information obtained from this tool can either be described in text or provided as a screen shot of the map below.

Figure 3.1. McDonald County Structurally Deficient Bridges



Source: https://www.modot.org/Bridges

3.2.3 Other Assets

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

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

Table 3.10 Threatened and Endangered Species in McDonald County

Common Name	Scientific Name	Status
Gray bat	*Myotis grisescens*	Endangered
Indiana bat	*Myotis sodalis*	Endangered
Northern long-eared bat	*Myotis septentrionalis*	Threatened
Neosho mucket	*Lampsilis rafinesqueana*	Endangered/ Critical Habitat: Elk River
Cave crayfish	*Cambarus aculabrum*	Endangered

Source: U.S. Fish and Wildlife Service, http://www.fws.gov/midwest/Endangered/lists/missouri-cty.html; see also https://ecos.fws.gov/ipac/ and select 'Get Started" > Step '1 Find Location', choose select by state or county and enter the county name, selecting the appropriate community > follow remaining o n-screen instructions.

owns, leases, or manages for public use. The Missouri Department of Natural Resources (MDNR) also owns and manages lands for public use and provides a similar database. Additional park areas were identified through community websites and google maps.

In addition to the parks and conservation areas listed in **Table 3.11 ,** there are also numerous privately owned campgrounds and canoe outfitters located along Elk River, Indian creek, Big Sugar Creek, Little Sugar Creek, and Honey Creek.

Table 3.11 Parks in McDonald County

Park / Conservation Area	Address	City
Dabbs Greer Town Hole	128 W Main St, Anderson, MO 64831	City of Anderson
Buffalo Hills	State Hwy B, Seneca, MO 64865	MDC
Cowskin	4261 S, State Hwy 43, Anderson, MO	MDC
Deep Ford	Pineville South Township, MO 64856	MDC
Flag Spring	Powell, MO 65730	MDC
Huckleberry Ridge	Pineville South Township, MO 64856	MDC
Lanagan Access	Pineville South Township, MO 64856	City of Lanagan
Lanagan Tower Site	Noel, MO 64854	MDC
Mount Shira	15144 MO-59, Noel, MO 64854	MDC
Elk River Access	116 Rhine St, Pineville, MO 64856	City of Pineville
Powell Tower Site	Pineville South Township, MO 64856	MDC
Big Sugar Creek State Park	6727 Big Sugar Creek Rd, Pineville, MO	MDNR
Anderson Ball Park	205 County Rd NE7111, Anderson, MO	City of Anderson
Goodman Ball Park	Goodman, MO 64843	City of Goodman
Myers Park	701-705 Olin St, Pineville, MO 64856	City of Pineville
The Pineville Green	Pineville, MO	City of Pineville
The Bandstand	Pineville, MO	City of Pineville
Southwest City Park	545-723 N Main St, Southwest City, MO	City of Southwest City

Source: http://mdc7.mdc.mo.gov/applications/moatlas/AreaList.aspx?txtUserID=guest&txtAreaNm=s
the best source for park information is usually 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.

When a natural hazard occurs, historic places require special consideration because many historic resources were built prior to modern building codes and flood plain regulations. Protecting historic resources is not only important for community identities, but in many cases they are important for local economies. The McDonald County Historical Society strives to protect and preserve the counties historical resources while sharing historical information, data, and research. The old McDonald County Courthouse is listed on the National Register of Historic Places and maintained by the Historical Society as the McDonald County Museum displaying much of the counties proud history rich in pioneer spirit and American values.

In addition to the two properties listed in **Table 3.12**, the McDonald County Historical Society also owns, maintains, and preserves several other historical properties. These properties include the Havenhust Mill

Communities that have a historical society in place, or participate in partnership with national or state programs that focus on preservation, have a good infrastructure in place to protect historical resources. The National Park service's Certified Local Government Program is a partnership with the State Historic Preservation Offices and local communities, it is a Federal Preservation Program to help communities preserve irreplaceable character of historic places. Another such program is the National Main Street Center's Main Street America Programs. This movement is the leading voice for preservation-based economic development and community revitalization across the country.

Source: http://www.citylab.com/housing/2016/04/why-historic-preservation-needs-to-be-part-of-disaster planning/477318/?utm_source=nl link5_041116.

3.12 McDonald County Properties on the National Register of Historic Places

Property	Address	City	Date Listed
Old McDonald County Courthouse	400 N. Main St.	Pineville	05/01/2012
Powell Bridge	.04 mi SW of Powell on Cowan Ridge	Powell vicinity	04/20/2011

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

Economic Resources: Natural disasters have the potential to impact the area's economic resources. Therefore, the counties major employers, as shown in **Table 3.13,** should be given special consideration.

Table 3.13 Major Non-Government Employers in McDonald County

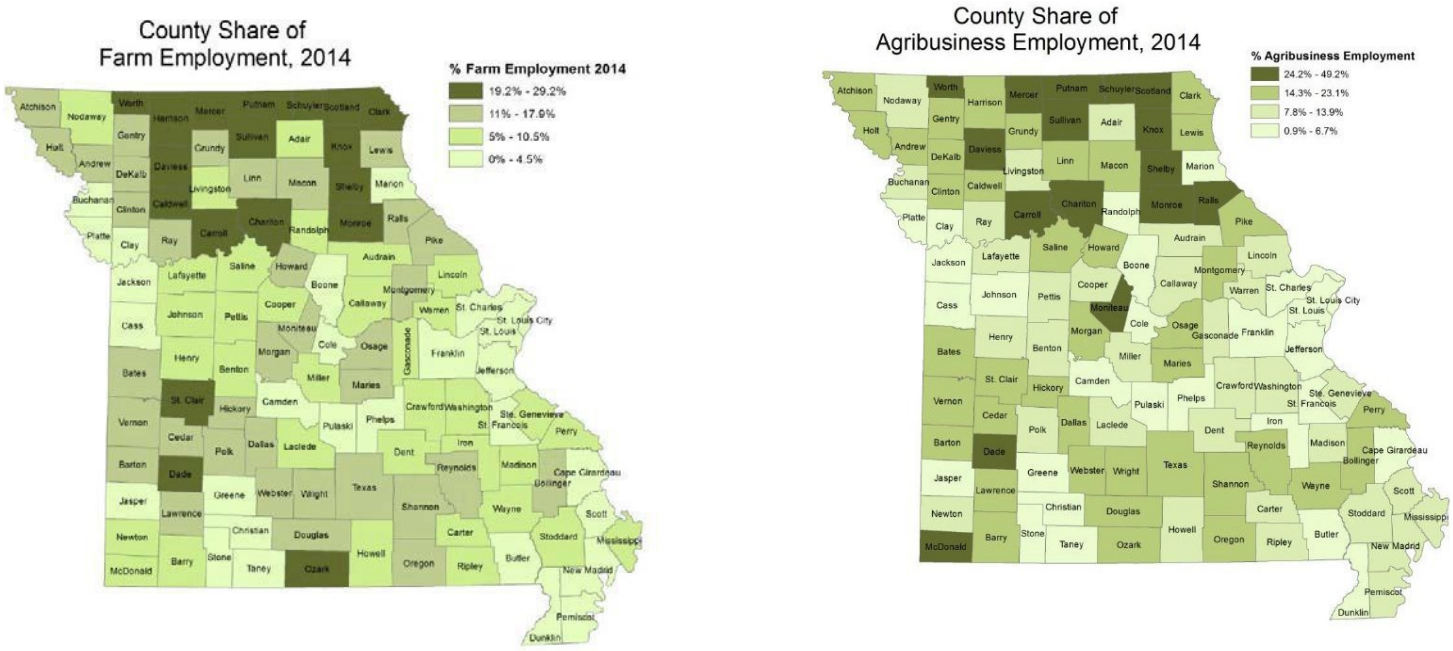
Employer Name	Main Locations	Product or Service	Employees
Simmons Foods	Southwest City	Poultry processing	450
Tyson Foods	Noel, MO	Chicken processing	500
Walmart	Jane, MO	Retail	120
Roxell	Anderson, MO	Chicken Feeder manufacturer	180
Hunte	Goodman, MO	Puppy Broker	110

Source: Data Collection Questionnaires; local Economic Development Commissions

Agriculture is comprised of not only farming (animal and crop production), but also includes supporting industries which provide inputs and outputs related to the agriculture industry. Missouri's farm and agribusiness sectors include crops, livestock, industries supporting farm production, and farm-related industries. Top agribusiness industries are pesticides and chemical manufacturing plants, farm supplies manufacturing, and meat and poultry processing plants.

Figure 3.2 show the State-wide County share of farm employment and agribusiness employment. McDonald County has a low percentage of farm employment, but second highest percentage of agribusiness employment. The percentage breakdown for McDonald County is 9 percent farm employment and 27 percent agriculture-related employment, for a total of 36 percent agribusiness. The first highest percentage for agribusiness employment is Sullivan County in Northern Missouri with 20 percent farm employment and 29 percent agriculture- related employment, for a total of 49 percent agribusiness employment. McDonald County's largest agribusiness product is poultry and egg production with cattle and calves coming in second. For additional economic indicators for agriculture in McDonald County see Table 2.11 in Section 2-Profile and Capabilities.

Figure 3.2 Agriculture-Related Jobs in McDonald County



Source: Department of Economic Development Missouri Economic Research and Information Center, Missouri Economic

3.3 LAND USE AND DEVELOPMENT

3.3.1 Development Since Previous Plan Update

Table 3.14 shows McDonald County's population changes since the previous plan update in comparison with the change in housing units. Population growth or decline is generally accompanied by increases or decreases in the number of housing units. Most jurisdictions in McDonald County do show some correlation between population and housing units, the correlations identified, or lack of, are summarized below:

- County wide, McDonald County saw a simultaneous increase in population and housing units from 2000-2010, followed by a simultaneous decrease in population and housing units after 2010.
- Anderson saw a continuous increase in population and housing units since 2000. The much larger increase in housing units from 2010-2014 could be an indication of future population growth.
- Goodman saw significant population growth from 2000-2010, but the housing unit increase was almost none. This was followed by a slight population decrease and significant housing unit increase after 2010.
- Jane's population has seen a continuous and large decrease since 2000. Census housing unit data was only available for 2014, however the 2000 housing units were taken from the previous plan update. The enormous increase in housing units from 2000-2014 is a sharp contrast to the population decrease. This could be an indication of future population growth.
- Lanagan saw a slight increase in population and a significant decrease in housing units from 2000-2010. Followed by a slight population decrease and significant housing unit increase after 2010.
- Noel saw a large simultaneous increase in population and housing units from 2000-2010, followed by a slight simultaneous decrease in population and housing units after 2010.
- Pineville saw an increase in population and a decrease in housing units, followed by a slight population decrease after 2010. The much larger housing unit increase from 2010-2014 could be an indication of future population growth.
- Southwest City saw a simultaneous increase in population and housing units from 2000-2010, with the population being the larger increase. Followed by a slight population decrease and a significant housing unit increase after 2010.
- The unincorporated areas of McDonald County saw a simultaneous increase in population and housing units from 2000-2010, followed by a simultaneous decrease after2010.

Overall, among all the jurisdictions in McDonald County there appears to be a greater increase in housing units than there has been population growth. Despite the consistent population decrease from 2010-2015, this increase in housing units could be an indicator of future population growth. Based on this data, the most likely jurisdictions for future population growth include: Anderson, Jane, Pineville and Noel.

Table 3.14 County Population Growth, 2010-2019

Jurisdiction	Total Population 2010	Total Population 2019	2010-2019 # Change	2000-2019 % Change
McDonald County Total	23,083	22,782	30	-1.32%
Anderson	1,961	2,069	108	5.21%

Goodman	1,248	1,381	133	9.63%
Jane	309	546	237	43.4%
Lanagan	419	438	19	4.33%
Noel	1,832	2,141	309	14.4%
Pineville	791	817	26	3.18%
Southwest City	850	970	120	8.42%
Unincorporated McDonald County	14,761	15,553	792	31.9%
Missouri	5,595,211	5,988,927	393,716	1.89%
USA	281,421,906	308,745,538	27,323,632	4.91%

Source: U.S. Bureau of the Census, Decennial Census, Annual Population Estimates, American Community Survey 5-year Estimates; Population Statistics are for entire incorporated areas as reported by the Census bureau

The population in McDonald County grew significantly from 2000 to 2010, increasing from 21,681 persons in 2000 to 23,083 persons in 2010. However the most recent population estimates suggests a population decrease from 2010 to 2019. The total population for McDonald County has decreased by -1.32 percent; the areas with the most significant change occurred in the Village of Jane with a decrease of 3.88 percent and unincorporated McDonald County with an increase of 43 percent as stated in the census data. All cities in McDonald County have displayed a population increase from 2015 to 2019. This population increase displays that McDonald County will experience steady growth. This is on trend with the State and the National population growth. During the same time period, the State of Missouri's population increased by 1.89 percent, and the United States increased by 4.91 percent. **Table 3.14** shows McDonald County population changes by jurisdiction from 2000 to 2010 to 2019.

Table 3.14 Change in Housing Units, 2010-2019

Jurisdiction	Housing Units 2010	Housing Units 2019	2010-2019 # Change	2000-2019 % Change
McDonald County Total	9,906	9,983	+77	6.40%
Anderson	651	797	+146	26.80%
Goodman	430	573	+143	6.20%
Jane	191	195	+4	39.40%
Lanagan	176	210	+34	2.70%
Noel	771	945	+174	13.80%
Pineville	373	411	+38	19.40%
Southwest City	386	405	+19	15.30%
Unincorporated McDonald County	13,079	13,519	+440	130%

Source: U.S. Bureau of the Census, Decennial Census, American Community Survey 5-year Estimates; Population Statistics are for entireincorporated areas as reported by the U.S. Census Bureau

The population in McDonald County grew significantly from 2010 to 2019, increasing from 13,079 persons in 2010 to 13,519 persons in 2019. However the most recent population estimates suggests a population decrease from 2010 to 2019. The areas with the most significant change occurred in the City of Noel with an increase in unincorporated McDonald County. All cities in McDonald County have displayed a population increase from 2010 to 2019. This population increase displays that McDonald County will experience steady growth. This is on trend with the State and the National population growth. During the same time period, the State of Missouri's population increased by 1.89 percent, and the United States increased by 4.91 percent.

3.3.2 Future Land Use and Development

McDonald County anticipates steady development and growth over the next five-years. **Figure 3.3** shows the expected population change for each county in the state of Missouri. McDonald County is steady with growth in the state of Missouri, at a projected growth of 5% from 2000 - 2030. The county has its own comprehensive and land use plans exclusive to the county.

Unincorporated McDonald County

The County has also seen the addition of about 500 buildings, mostly residential additions.

Anderson

The City of Anderson experienced no substantial changes in development since the previous plan. No changes have impacted the community's vulnerability.

Goodman

The City of Goodman experienced no substantial changes in development since the previous plan. No changes have impacted the community's vulnerability.

Jane

The Village Jane experienced no substantial changes in development since the previous plan. No changes have impacted the community's vulnerability.

Lanagan

The City of Lanagan experienced no substantial changes in development since the previous plan. No changes have impacted the community's vulnerability.

Noel

The City of Noel experienced no substantial changes in development since the previous plan. No changes have impacted the community's vulnerability.

Pineville

The city of Pineville has seen growth in its residential development since the last plan. They have also worked on storm water runoff improvements on various streets.

Southwest City

Southwest City has seen the addition of new residential subdivisions in the area of their city

School District's Future Development

McDonald County Public Schools

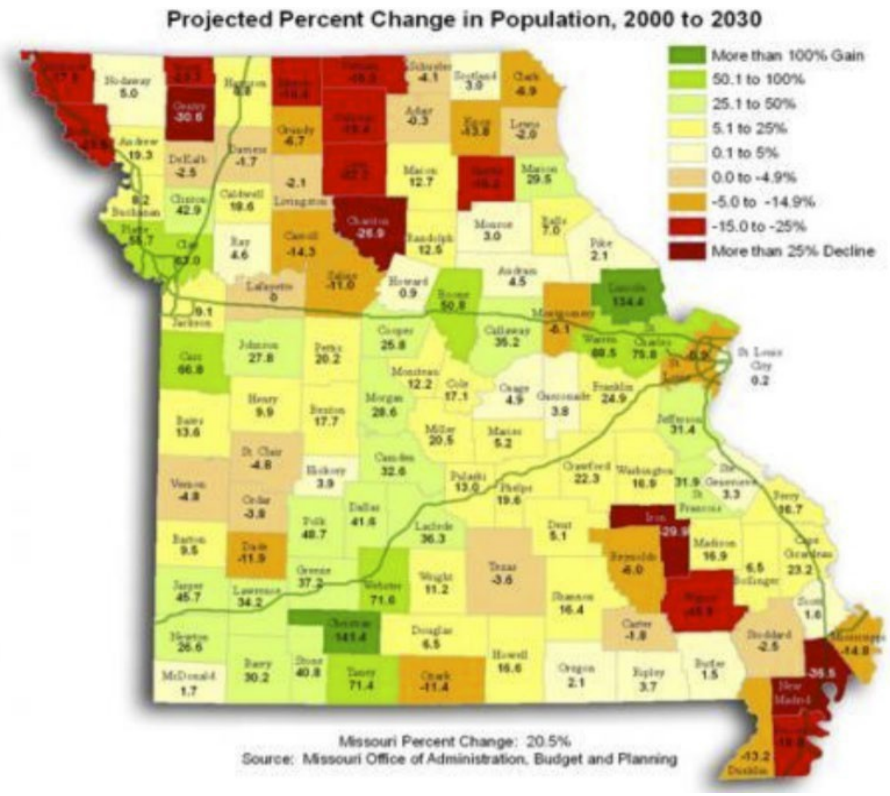
McDonald County R-I has had many changes since the last plan update. A FEMA safe room was also added. Safe entry was added to safe room access. An emergency communication system was installed county wide to warn staff and students of emergencies.

Special District's Future Development

White Rock Fire District

White Rock Fire District has purchases two new fire trucks and increased coverage to coincide with new purchases.

Figure 3.3 Projected population change from 2000-2030



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, strength/magnitude/extent, previous events, future probability, a discussion of risk variations between jurisdictions, and how anticipated development could impact risk. At the end of each hazard profile will be a vulnerability assessment, followed by a summary problem statement.

Hazard Profiles

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

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

- **Hazard Description:** This section consists of a general description of the hazard and the types of impacts it may have on a community or school/special district.
- **Geographic Location:** This section describes the geographic areas in the planning area that are affected by the hazard. Where available, use maps to indicate the specific locations of the planning area that are vulnerable to the subject hazard. For some hazards, the entire planning area is at risk.
- **Strength/Magnitude/Extent:** This includes information about the strength, magnitude, and extent of a hazard. For some hazards, this is accomplished with description of a value on an established scientific scale or measurement system, such as an EF2 tornado on the Enhanced Fujita Scale. This section should also include information on the typical or expected strength/magnitude/extent of the hazard in the planning area. Strength, magnitude, and extent can also include the speed of onset and the duration of hazard events. Describing the strength/magnitude/extent of a hazard is not the same as describing its potential impacts on a community. Strength/magnitude/extent defines the characteristics of the hazard regardless of the people and property it affects.
- **Previous Occurrences:** This section includes available information on historic incidents and their impacts. Historic event records form a solid basis for probability calculations.
- **Probability of Future Occurrence:** The frequency of recorded past events is used to estimate the likelihood of future occurrences. Probability can be determined by dividing the number of recorded events by the number of years of available data 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 should be reported as 100% in any given year, with a statement of the average number of events annually. For hazards such as drought that may have gradual onset and extended duration, probability can be based on the number of months in drought in a given time-period and expressed as the probability for any given month to be in drought.
- **Changing Future Conditions Considerations:** Changing future conditions should also be considered, including the effects of long-term changes in weather patterns and climate on the identified hazards.

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 thecommunity.

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 should be based on the best available data. The vulnerability assessments can also be based on data that was collected for the 2018 State Hazard Mitigation Plan Update. With the 2018 Hazard Mitigation Plan Update, SEMA is pleased to provide online access to the risk assessment data and associated mapping for the 114 counties in the State, including the independent City of St. Louis. Through the web-based Missouri Hazard Mitigation Viewer, local planners or other interested parties can obtain all State Plan datasets. This effort removes from local mitigation planners a barrier to performing all the needed local risk assessments by providing the data developed during the 2018 State Plan Update.

The Missouri Hazard Mitigation Viewer includes a Map Viewer with a legend of clearly labeled features, a north arrow, a base map that is either aerial imagery or a street map, risk assessment data symbolized the same as in the 2018 State Plan for easy reference, search and query capabilities, ability to zoom to county level data and capability to download PDF format maps. The Missouri Hazard Mitigation Viewer can be found at this link: http://bit.ly/MoHazardMitigationPlanViewer2018.

The vulnerability assessments in the McDonald 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.

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

- **Vulnerability Overview:**
  The plan must provide an overall summary of each jurisdiction's vulnerability to the identified hazards. The overall summary of vulnerability identifies structures, systems, populations or other community assets as defined by the community that are susceptible to damage and loss for hazard events.

- **Potential Losses to Existing Development:**
  (Including types and numbers, of buildings, critical facilities, etc.) For each participating jurisdiction, the plan must describe the potential impacts of the hazard. Impact means the consequences of effect of the hazard on the jurisdiction and its assets. Assets are determined by the community and include, for example, people, structures, facilities, systems, capabilities, and/or activities that have value to the community. For example, impacts could be described by referencing historical disaster impacts and/or an estimate of potential future losses.

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

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

Problem Statements

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

3.4.1 Flooding (Riverine and Flash)

Some specific sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.1, Page 3.80**
  https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- Watershed map, Environmental Protection Agency, 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, Bureau Net, 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.NCEI.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
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Risk MAP, DFIRM, and Hazus based depth grids used in Hazus Analysis
  - Flood losses by County 1978-2018

- Number of flood insurance claims by County
- Total building exposure to flooding (1% annual chance) by County
- Buildings impacted by flooding (1% annual chance) by County
- Flood insurance coverage by County
- Number of flood insurance policies by County
- NFIP participation status by County
- Number of state facilities impacted by flooding (1% annual chance) by County
- Critical facilities impacted by flooding (1% annual chance) by County

- MSDIS Structure Inventory and All Hazard Risk Dataset (available in both GIS and Excel format) https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

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.

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

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

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

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

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

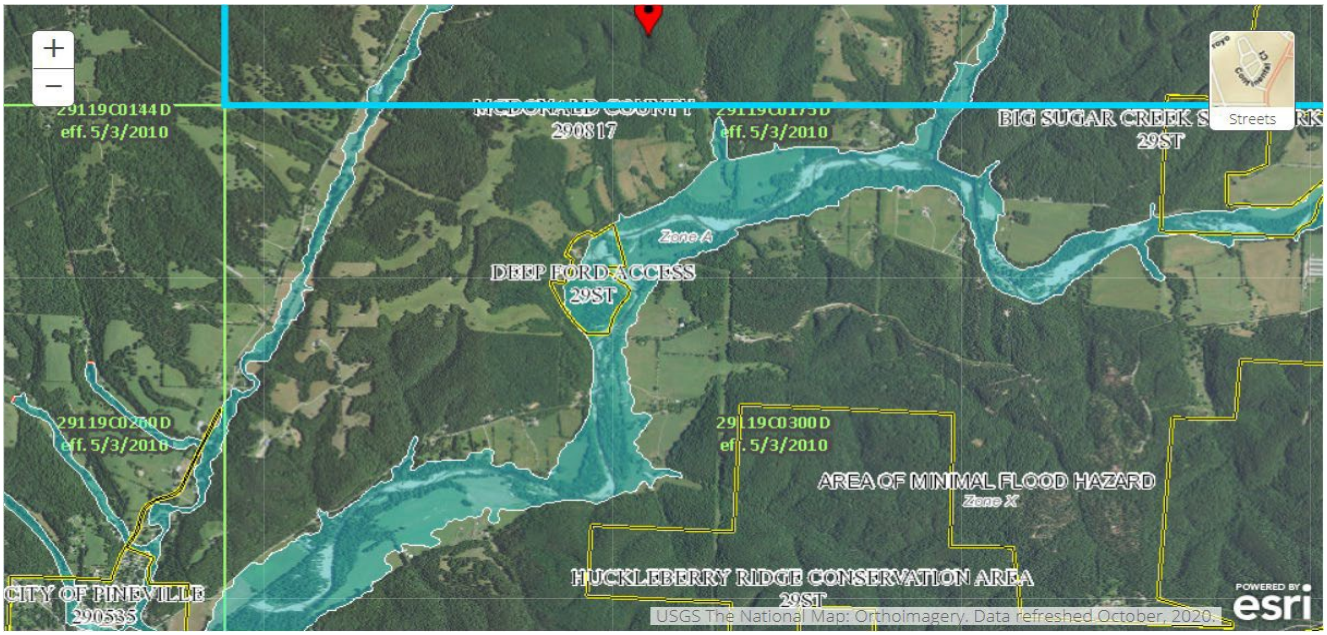
Although flash floods are somewhat unpredictable, there are factors that can point to the likelihood of flash floods occurring. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. This, along with knowledge of the watershed characteristics, modeling techniques,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

advanced warning systems has increased the warning time for flash floods.

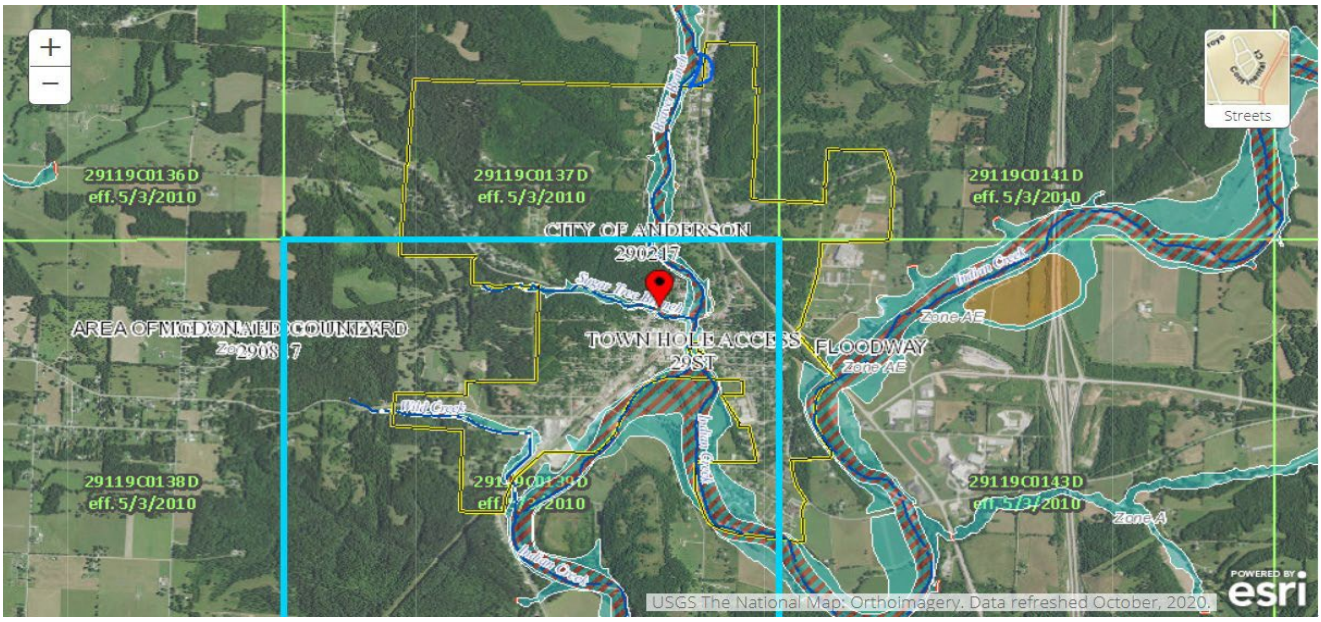
Geographic Location

Figure 3.4. DFIRM for Cities of McDonald County

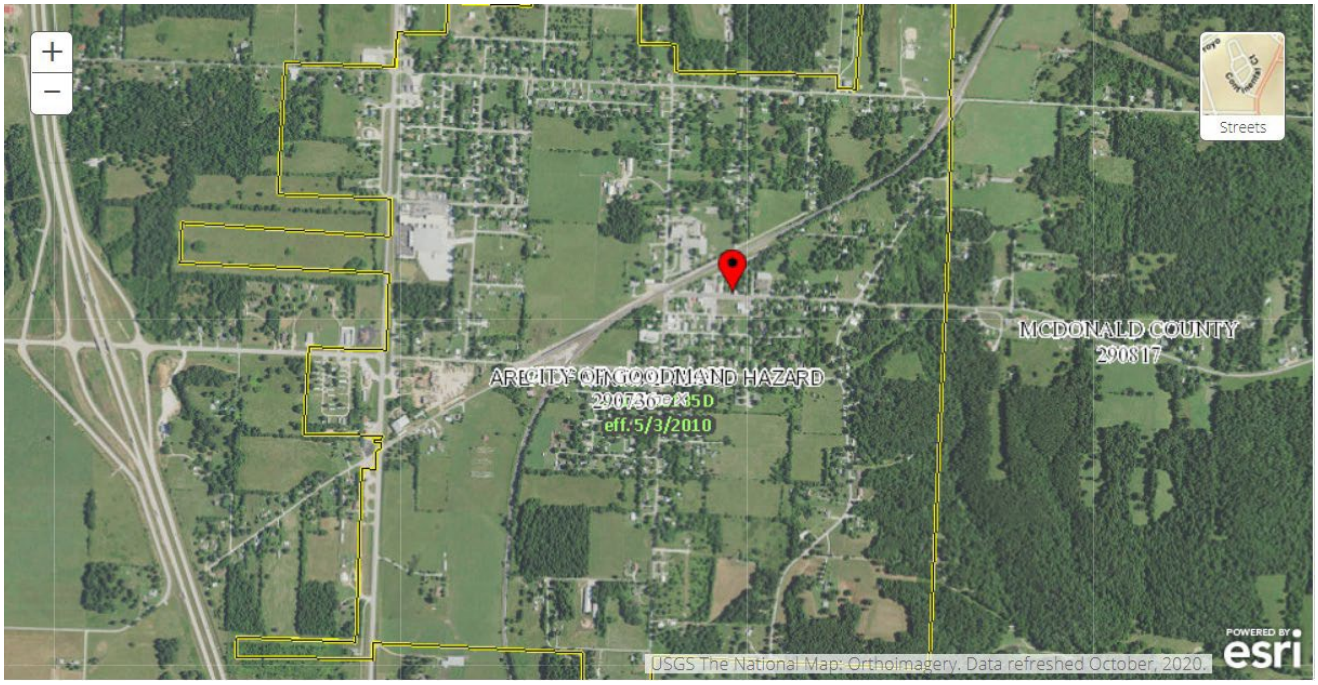
McDonald County



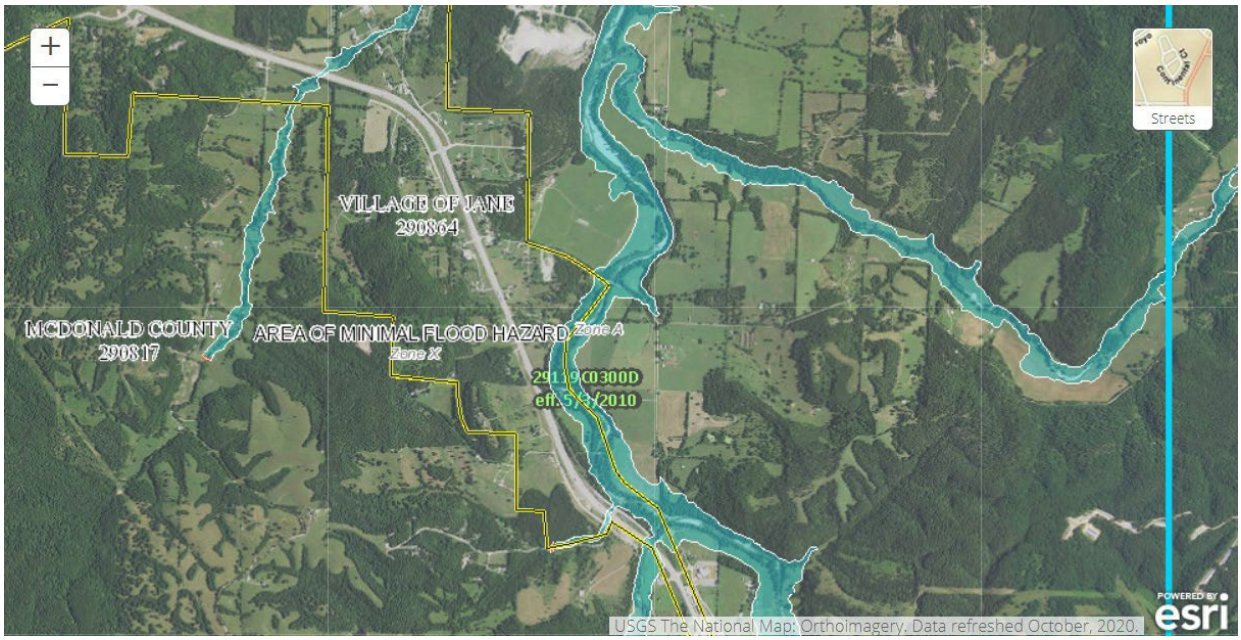
City of Anderson



City of Goodman

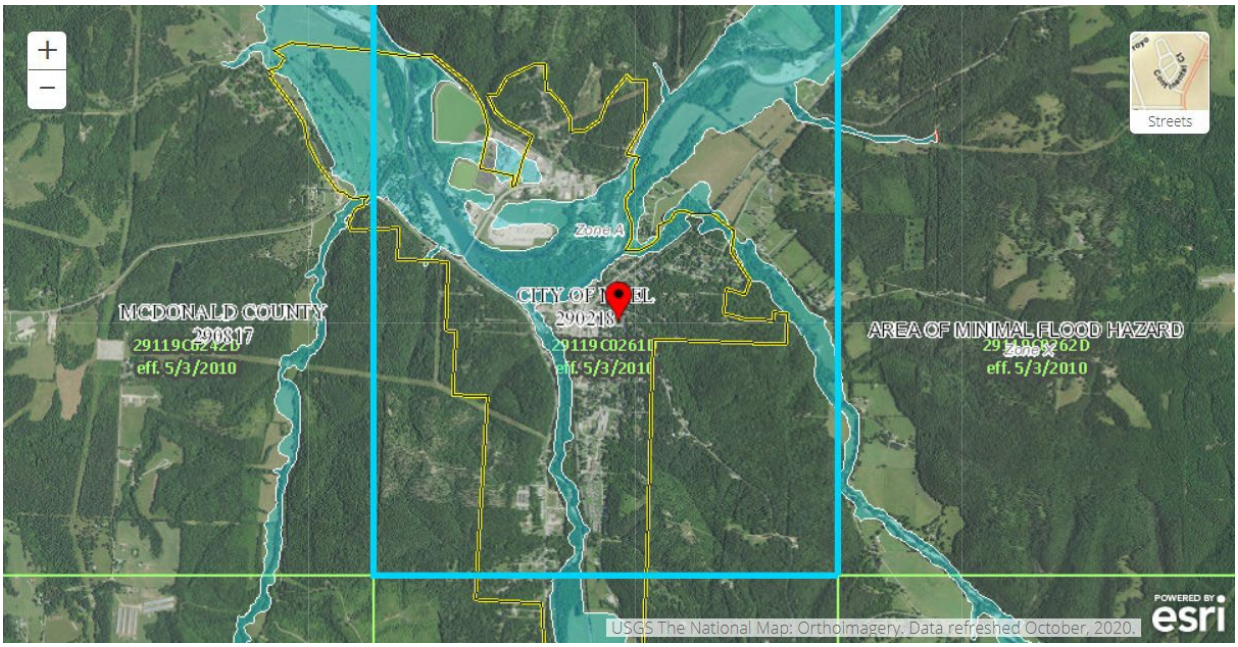


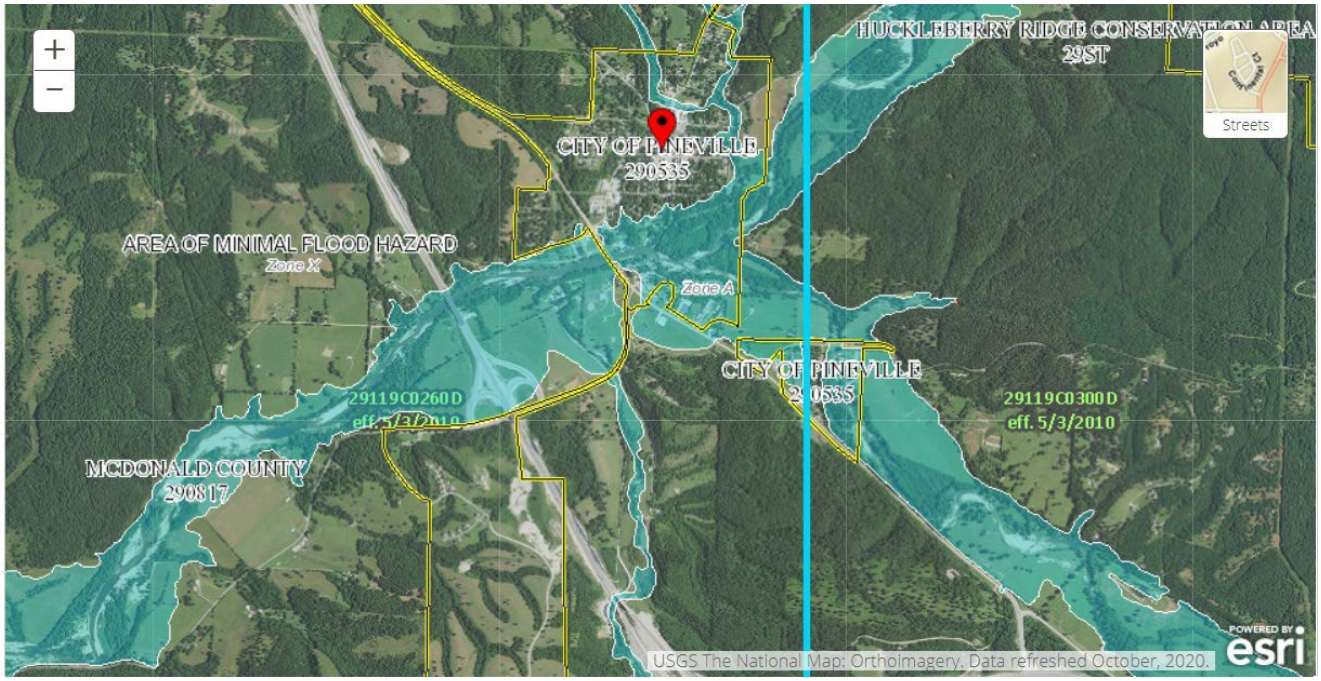
Village of Jane



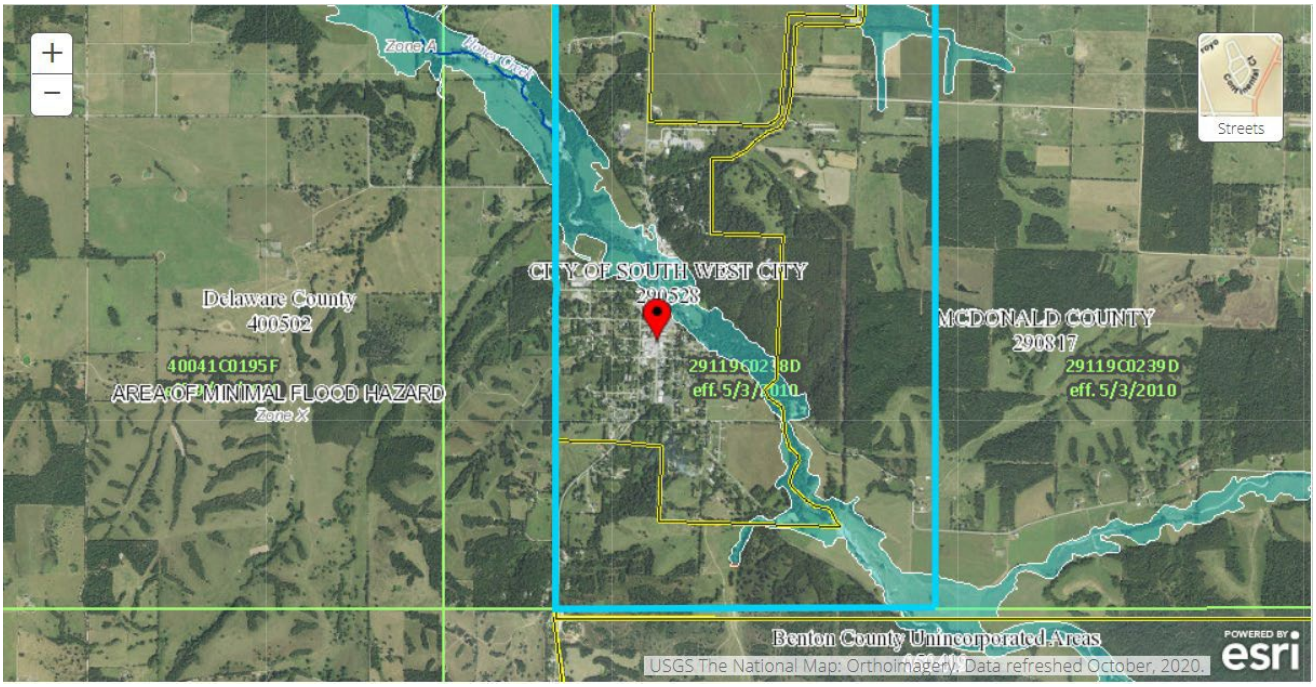

LANAGAN TOWERSITE
29ST
CITY OF LANAGAN
290559
AREA OF MINIMAL FLOOD HAZARD
Zone X
29119C0255D
eff. 5/3/2010
29119C0260D
eff. 5/3/2010
Zone A
MCDONALD COUNTY
290817
Streets
USGS The National Map: Orthoimagery. Data refreshed October, 2020.
esri

City of Noel


MCDONALD COUNTY
290817
eff. 5/3/2010
Zone A
AREA OF MINIMAL FLOOD HAZARD
eff. 5/3/2010
Streets
USGS The National Map: Orthoimagery. Data refreshed October, 2020.
esri



City of Southwest City



Flash flooding events pose the most pervasive hazard of the two flood types in the county due to permeability of soils, slopes, increasing urban development and extensive network of streams and rivers. Sustained rainfall or downpours at the rate of one inch per hour have caused street flooding in incorporated areas and made a significant number of low water crossings impassible. Flash flooding occurs in the floodplain while low-lying areas in all jurisdictions are susceptible to flash floods outside 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. According to the NCEI storm event data from 1999 - 2021, a total of 54 flash floods were recorded in the county. An additional 60 flash floods were 3.36 recorded in jurisdictions within the county. A review of the NCEI storm event database determined which jurisdictions are most prone to flooding and flash flooding from 1999 to 2021 are listed in **Table 3.15** and **Table 3.16.**

Table 3.15 McDonald County NCEI Flood Events by Location, 1965-2021

Location	# of Events
Unincorporated McDonald County	49
Pineville	3
Ginger Blue	1
Anderson	1
Total	**54**

Table 3.16 McDonald County NCEI Flash Flood Events by Location, 1965-2021

Location	# of Events
Unincorporated McDonald County	11
Pineville	15
Anderson	7
Noel	14
Jane	3
Goodman	2
Southwest City	2
Ginger Blue	1
Lanagan	5

Source: National Centers for Environmental Information, 2021

Strength/Magnitude/Extent

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

According to the U.S. Geological Survey, two critical factors affect flooding due to rainfall: rainfall duration and rainfall intensity – the rate at which it rains. These factors contribute to a flood's height, water velocity and other properties that reveal its magnitude.

National Flood Insurance Program (NFIP) Participation

Table 3.17 shows details on NFIP participation for the communities in the McDonald County. **Table 3.18** shows the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction, where applicable. The community with the most insurance payments is Noel with a total of 100 insurance payment totaling 3.77 million dollars. The second most insurance payments is McDonald Counties' unincorporated areas with 53 insurance payments totaling 2.36 million dollars.

Jane - **Because they had not participated for several years after unincorporated areas were determined to be in Special Flood Hazard Areas, they were "sanctioned" by NFIP,** which meant they weren't eligible for ***some*** FEMA assistance, such as repair and rebuilding grants and Hazard Mitigation Grants.

Table 3.17 NFIP Participation in McDonald County

Community ID #	Community Name	NFIP Participant (Y/N/Sanctioned)	Current Effective Map Date	Regular-Emergency Program Entry Date
100290217	Anderson	Y	05/03/201	
290736	Goodman	Y	NSFHA	07/13/2010
290864	Jane	Sanctioned	05/03/10	05/03/11
290218	Noel	Y	05/03/20	09/04/1985
290535A	Pineville	Y	05/03/20	05/03/2010
290528	Southwest City	Y	05/03/20	09/04/1985
290817	McDonald County	Y	05/03/201	03/01/2010

Source: NFIP Community Status Book, 2021; Bureau Net, 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 3.18 NFIP Policy and Claim Statistics as of Date

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Anderson	31	1	9	$1,151,357
McDonald County	100	2	53	$4,579,459
Noel	201	0	100	$5,826,588
Lanagan	0	0	0	$375,440
Jane	0	0	0	$372,909
Goodman	0	0	0	0
Pineville	13	0	8	265,978.70
Southwest City	5	0	2	83,146.34

Source: NFIP Community Status Book, [insert date]; Bureau Net, 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 1965 to 2020

Repetitive Loss/Severe Repetitive Loss Properties

Repetitive Loss Properties are those properties with at least two flood insurance payments of $1,000 or more in a 10-year period. According to the Flood Insurance Administration, jurisdictions included in the planning area have a combined total of 12 repetitive loss properties. As of 0, properties have been mitigated, leaving 12 un-mitigated repetitive loss properties.

Table 3.19 McDonald County Repetitive Loss Properties

Jurisdiction	# of Properties	Type of Property	# Mitigated	Building Payments	Content Payments	Total Payments	Average Payment	# of Losses
Anderson	1	Non-	N/A	188,573.73	0.00	188,573.73	62,857.91	3
Noel	4	Non-	N/A	648,809.57	92,335.59	741,145.16	92,643.15	2
Noel	1	Non-	N/A	306,395.72	1,682.00	308,077.72	61,615.54	5
Pineville	3	Residential	N/A	233,057.35	7,279.12	240,336.47	40,056.08	2

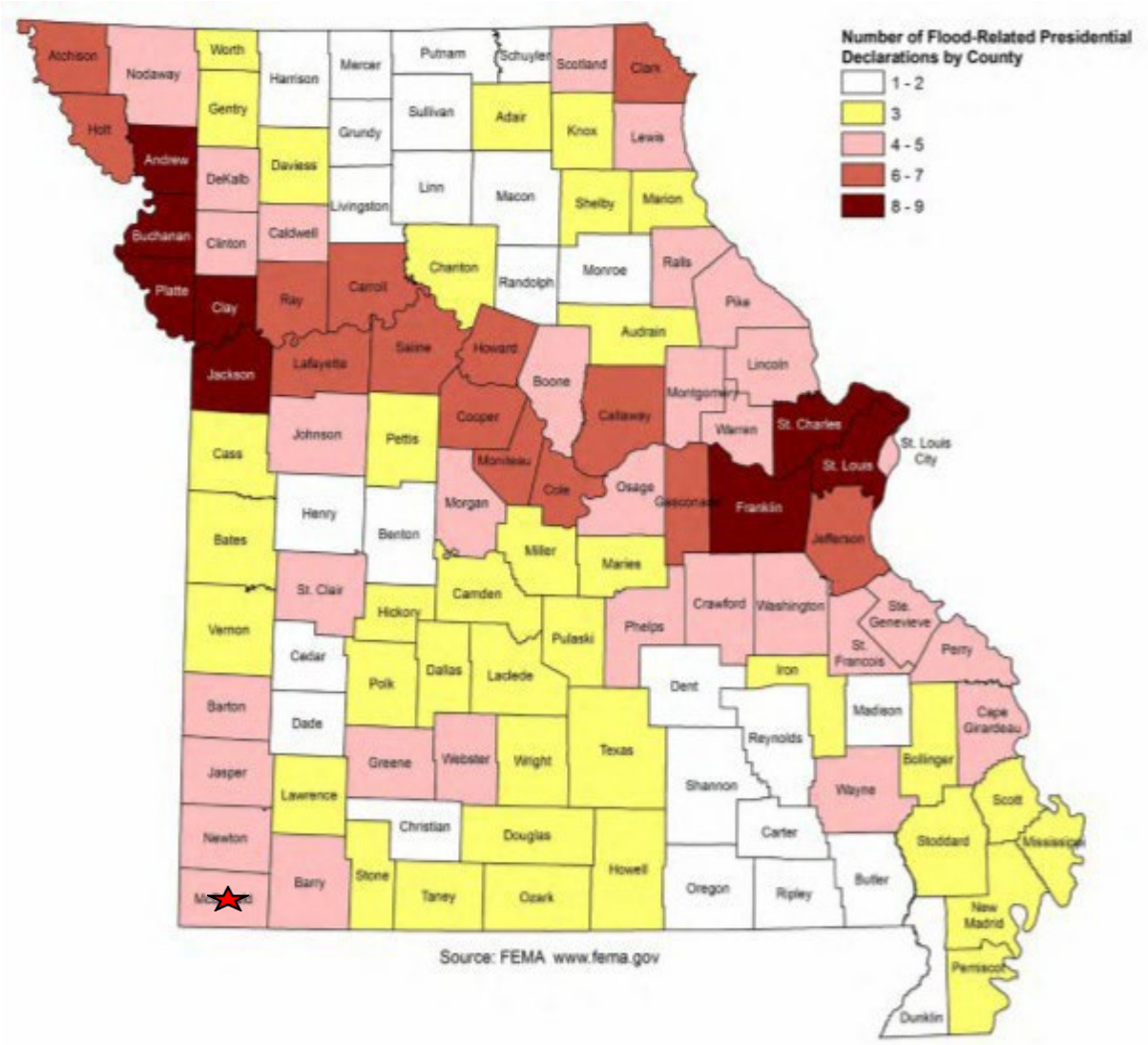
Source: Flood Insurance Administration as of 2021

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.

Previous Occurrences

McDonald County experiences frequent flood events both riverine and flash. Through the past 10 years there have been a total of 53 flood events in McDonald County, 37 of those were flash floods and 16 were riverine floods. There were 2 deaths and 13.085 million dollars in property damage. The majority of flood events occurred in multiple locations throughout the county. **Table 3.20** shows all previous flood events (riverine & flash) that occurred in McDonald County from 2006 to 2020

Figure 3.5. Number of Flood-Related Presidential Declarations by County



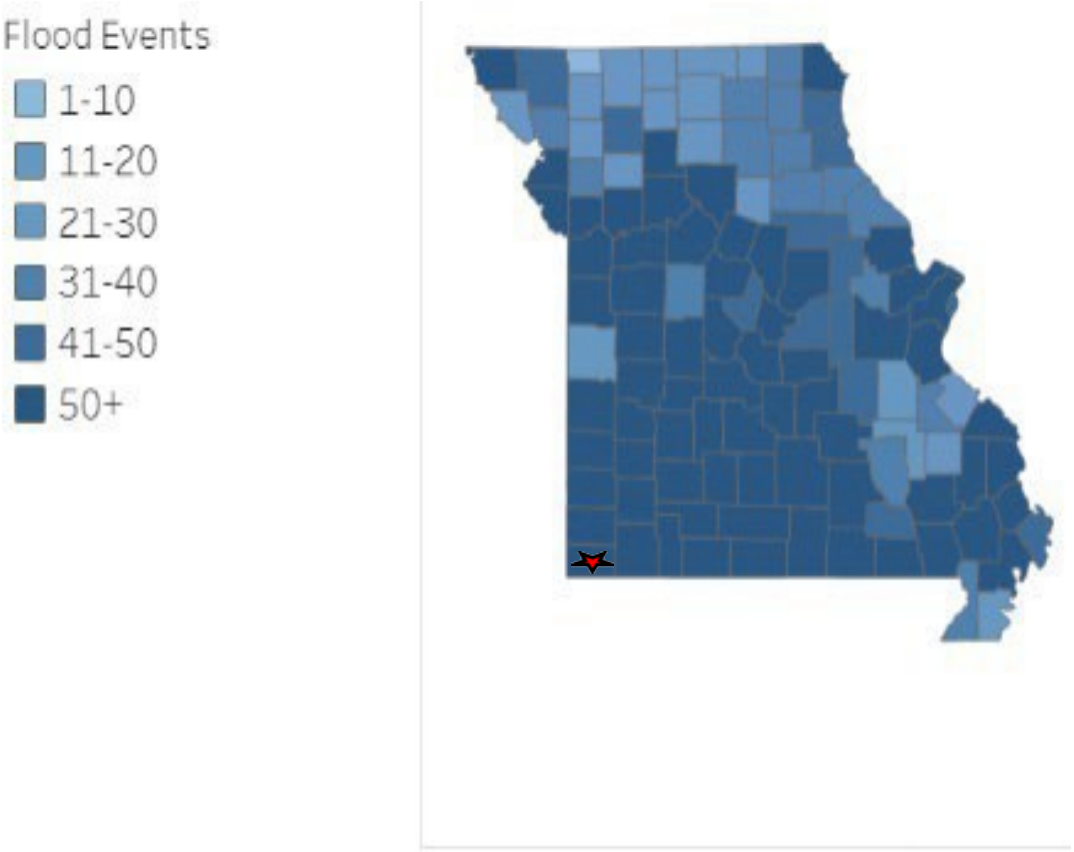
Source: 2018 Missouri State Hazard Mitigation Plan, red star denotes McDonald County.

Table 3.20 NCEI McDonald County Flash Flood Events Summary, 1965 to 2020

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
Anderson	1	Non-	N/A	188,573.73	0.00
Noel	2	Non-	N/A	364,761.75	87,930.93
Noel	1	Non-	N/A	1,461,330.35	34,750.83
Noel	1	Non-	N/A	37,200.00	0.00

Source: NCEI, data accessed 2020

Figure 3.6. Historical Flood Impact



Source: https://www.fema.gov/data-visualization/historical-flood-risk-and-costs* red star indicated McDonald County

The FEMA Data Visualization Tool as shown above in **Figure 3.6** McDonald County had 50+ events of flood impact.

Table 3.21 NCEI McDonald County Riverine Flood Events Summary, 2006 to 2020

Year	# of Events	Flood Type	# of Deaths	# of Injuries	Property Damages	Crop Damages
5/10/2006	County wide numerous roads along creeks impassable; numerous low-water crossing	Flash Riverine	0	0	0	0
5/22/2006	low-water crossings impassable near Pineville	Flash	0	0	0	0
6/1/2006	several streets in Pineville impassable.	Flash	0	0	0	0
6/12/2007	County wide numerous roads, bridges, low-water crossing impassable.	Flash	1	0	10.0 K	0

9/6/2007	Several low-water crossings impassable near Big Sugar Creek	Flash	0	0	0	0
1/7/2008	County wide numerous roads, bridges, & low-water crossings impassable & washed away;	Flash	0	0	500.0 K	0
2/5/2008	Hwys 43 & 76 near Anderson impassable; several street in Anderson impassable.	Flash	0	0	0	0
3/3/2008	Hwys F & 59 impassable	Riverine	0	0	0	0
3/17/2008	County wide roads & bridges damaged	Flash	0	0	500 K	0
3/19/2008	County wide flooding in low-lying & poor drainage areas	Riverine	0	0	0	0
4/10/2008	County wide roads, bridges, low-water crossings impassable.	Flash	0	0	0	0
4/17/2008	County wide numerous road closures	Flash	0	0	0	0
7/6/2008	low lying roads along Little Sugar Creek impassable, campgrounds evacuated due to rising	Flash	0	0	0	0
9/13/2008	Hwy U near Mikes Creek impassable	Flash	0	0	0	0
4/12/2009	Hwy 59 near Butler Creek impassable	Flash	0	0	0	0
10/8/2009	Hwy 43 S of hwy B closed	Flash	0	0	0	0
3/25/2010	Elk River near Pineville flooding campgrounds; Hwy CC closed 3 mi. E of Hwy C; Hwy U closed 3 mi. S of Hwy 76.	Flash Riverine	0	0	0	0
3/26/2010	Hwy CC closed 3 mi. E of Hwy C.	Riverine	0	0	0	0

5/16/2010	County wide majority of low-water crossings impassable; Hwy EE W of Lanagan impassable.	Flash Riverine	0	0	0	0
5/20/2010	Low-water crossings closed on Hwys EE, CC, &U.	Riverine	0	0	0	0
7/12/2010	Low-water crossing on Hwy 43 & Buffalo creek impassable.	Flash	0	0	0	0
7/16/2016	Low-water crossing on Hwy near Hwy 43 & Langley Rd impassable; Hwy H near Mt Shira impassable.	Flash	0	0	0	0
8/8/2010	Significant street flooding in Southwest City	Flash	0	0	0	0
4/21/2011	Low-water crossing on S Kings Hwy impassable	Flash	0	0	1.0 M	0
4/24/2011	Hwy43 closed.	Flash	0	0	1.0 M	0
4/25/2011	County wide flooding. Hwy CC closed; Hwy E closed; Hwys W & H north of Pineville closed; Hwy H near Mt Shira closed; Hwy TT closed; Hwy 90 closed; Hwy 59 near Mt Shira closed; Hwy DD near Noel closed; Hwy 43 closed; Hwy90 near Noel closed; Hwy Y closed.	Flash	0	0	1.0 M	0
5/22/2011	Hwy 43 near Buffalo Creek impassable; Elk River Rd W of Pineville closed; 3 ft. of water on Hwy W in downtown Pineville	Flash	0	0	250.0 K	0
5/23/2011	County Wide Flooding. Hwy 76 near Pump Station Rd impassable; 18 in. of water on Hwy 43 at Buffalo Creek impassable; Hwy E closed; Hwy 59 N of Noel washed away; many roads in Noel impassable.	Flash	0	0	250.0 K	0

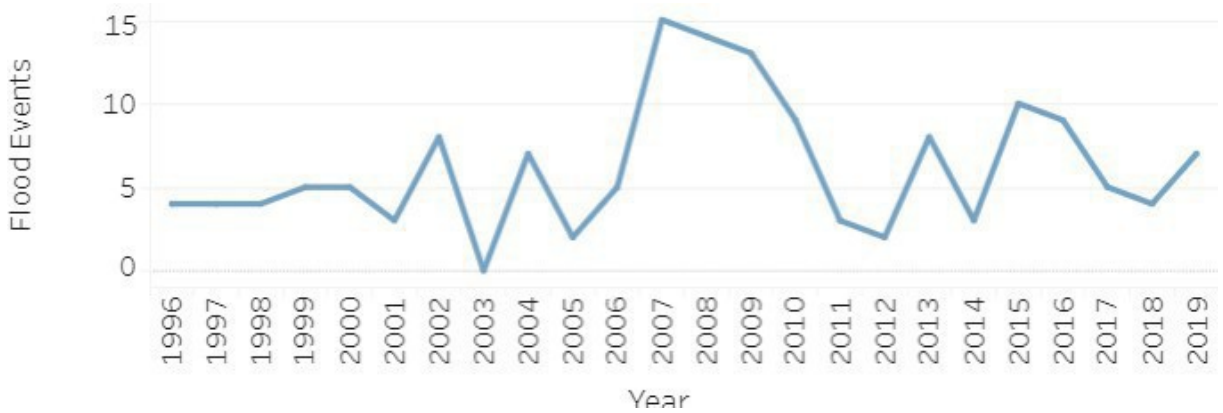
11/8/2011	Hwy U impassable	Riverine	0	0	0	0
4/11/2013	Hwy CC along Indian creek closed	Riverine	0	0	0	0
4/18/2013	Several low-water crossing impassable; Hwy Cat Indian Creek	Flash	0	0	0	0
5/10/2013	Roads along Big Sugar Creek, Little Sugar Creek, and Indian closed; Hwy CC closed.	Riverine	0	0	0	0
5/30/2013	Hwy CC at Elkhorn Creek impassable.	Flash	0	0	0	0
8/8/2013	Hwy 59 near Noel impassable due to water & debris; Hwy H closed; High water rescues at several campgrounds near Noel; Hwy E closed; Hwy 90 at Brush Creek near Jane a vehicle washed off road; many roads & low-water crossings severely damaged; several homes flooded; Hwy 43 closed; Hwy K closed; Hwy C closed.	Flash	1	0	500.0 K	0
6/5/2014	Water rescue S of Goodman; Hwy 59 S of Goodman impassable;	Flash	0	0	10.0 K	0
6/6/2014	Low-water crossing on Park St in Anderson closed; Hwy E impassable.	Flash	0	0	10.0 K	0
10/13/2014	Hwy U closed along Mikes Creek.	Riverine	0	0	0	0
3/14/2015	County wide several low-water crossing impassable.	Riverine	0	0	0	0

3/25/2015	Hwy E impassable 6 mi. Sof Hwy 76.	Flash	0	0	0	0
3/26/2015	Hwy E closed near Mikes Creek & Big Sugar Creek; Big Sugar & Little Sugar Creeks at minor flood stage;	Riverine	0	0	0	0
5/29/2015	Hwy U closed north of Mikes Creek & S of Hwy 76; County Wide several roads & low-water crossing damaged; Hwy CC closed near Indian creek.	Riverine	0	0	90.0 K	0
6/19/2015	Hwy U along Mikes creek impassable; Hwy KK closed along Big Sugar Creek; water-rescue on Cyclone Rd; County wide several roads, bridges,& low-water crossing damaged.	Flash Riverine	0	0	25.0 K	0
7/7/2015	Hwy KK at Big Sugar Creek closed; county wide numerous roads, bridges, & low-water crossings weredamaged.	Flash	0	0	200.0 K	0
7/9/2015	Hwy's C & CC impassable near Elkhorn Creek.	Flash	0	0	200.0 K	0
11/17/2015	County wide several low-water crossing impassable; County wide several low-lying roads impassable.	Flash Riverine	0	0	0	0
12/13/2015	Little Sugar Creek exceeded flood stage	Riverine	0	0	0	0

12/26/2015	Hwy W northeast of Pineville closed; Hwy 90 near County Rd E closed; Hwy KK near Big Sugar Creek closed.	Flash	0	0	10.0 M	0
12/27/2015	County Wide flood damage; Tyson Foods Wastewaters system was impacted by flood water near Noel; at least 20 high-water rescues; several homes & businesses sustained flood damage; numerous roads damaged.	Flash Riverine	0	0	10.0 M	0
7/3/2016	Low-water crossings on Big Sugar Creek impassible; Happy Hollow Rd near Lanagan impassable; Hwy CC closed along Indian Creek.	Flash Riverine	0	0	0	0
7/26/2016	Main St in Pineville impassable; 10 ft. ofwater was flowing over old 88 hwy.	Flash	0	0	0	0
Totals:		**2**	**0**	**13.085 M**	**0**	**0**

Source: NCEI, 2020

Figure 3.7 McDonald County Riverine Flood Events 1996 - 2019



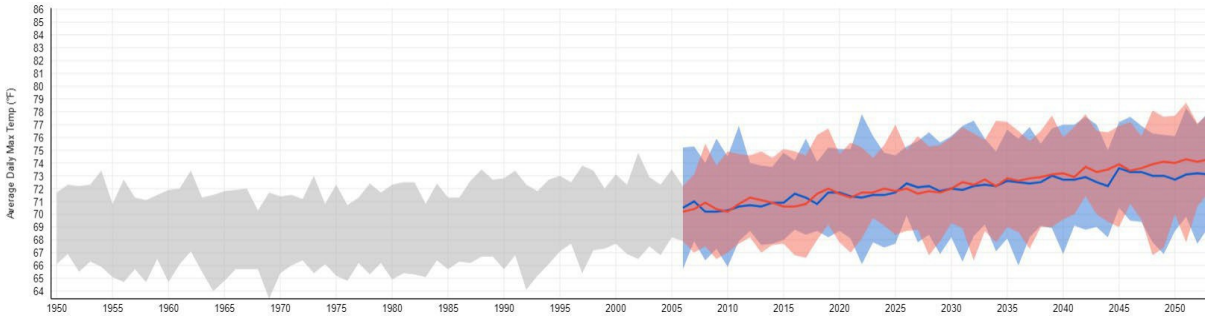
Probability of Future Occurrence

Table 3.21 shows there were 37 flash floods in a 10 year period, indicating a 100% annual probability of flash floods occurring in the future. There were also 16 riverine floods in a 10 year period indicating a100% annual probability of riverine floods occurring in the future.

Changing Future Conditions Considerations

According to the National Climate Assessment, extreme rainfall events and flooding have increased during the last century, and these trends are expected to continue.

Figure 3.8 U.S Resilience Tool-Kit Annual Total Precipitation for McDonald County



Vulnerability

Vulnerability Overview

The 2018 State Hazard Mitigation Plan used HAZUS-MH 2.1 while integrating DFIRM depth grids to create accurate vulnerability estimates. The primary indicators used to assess flood losses are show in **Tables 3.21 and 3.22** and include direct building losses combined with income losses, loss ratio of the direct building losses compared to overall building inventory, and population displaced by the food and shelter needs.

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.

Potential Losses to Existing Development

Potential losses by jurisdiction were developed by selecting all parcels located within the 100 year

floodplain to compile building counts by type for each participating municipality, and the unincorporated balance of McDonald County. See **Figures 3.15 – 3.20. Table 3.30** summarizes by jurisdiction the number of structures within the 1 % floodplain.

Potential losses to critical infrastructure were developed by selecting critical facilities within the 1% floodplain, see **Table 3.23 and Table 3.24** summarizes the critical facility types located within the 1% flood plain.

The city of Goodman is not included in this analysis because there is not a 1% floodplain within the city limits. However, Goodman, as well as many other low lying areas outside of the floodplain, may still be subject to losses resulting from flash flooding.

Table 3.23. Critical Facilities within 1% Floodplain

Jurisdiction	*#of Critical Facilities*
Anderson	1 - Government/Military 1 - Healthcare 2 - Childcare
Jane	1 -Water Supply or Treatment
Noel	1 -Water Supply or Treatment
Pineville	1 - Healthcare 1 - Water Supply or Treatment1 - School

Table 3.24. Structures by Jurisdiction within 1% Floodplain

Jurisdiction	# of Residential Buildings within 1% Floodplain	# of Commercial Buildings within 1% Floodplain	# of Industrial Buildings within 1%Floodplain	# of Agricultural Buildings
Anderson	53	7	0	10
Jane	3	0	0	1
Lanagan	13	0	0	1
Noel	44	6	0	6
Pineville	39	4	0	3
Southwest City	4	2	0	5
Unincorporated McDonald County	308	13	13	430

Table 3.25 Building Count by Flood Hazard Zone

Jurisdiction	1% - Zone A	1% - Zone AE	1% - Zone AE *and* Floodway	0.20%
Anderson		107	16	1

Ginger Blue	9			
Lanagan	22			
McDonald - Unincorporated	991	66	18	1
Noel	115			
Pineville	114			
Southwest City	31			
Grand Total	**1282**	**173**	**34**	**2**

Impact of Previous and Future Development

Future development could be impacted by riverine and flash flooding if development occurs in low- lying areas, near rivers or streams, or near interior drainage systems that are inadequate during heavy rains. Future development would also increase impervious surfaces causing additional water run-off and drainage problems during heavy rainfall events. There are currently no plans for future development in McDonald County. Future development would also increase impervious surfaces causing additional water run-off and drainage problems during heavy rainfall events. Not all jurisdictions in the county participate in the NFIP. Not all jurisdictions in the county have identified SFHAs. Zoning regulations that prohibit development in SFHAs and violations of floodplain management regulations are effective mitigation strategies in participating municipalities.

Hazard Summary by Jurisdiction

All local governments in the county are not equally at risk to flood hazards. Many parts of the county are vulnerable to street and road flooding during periods of heavy rainfall. McDonald County is particularly vulnerable to closure during flooding events. Due to the topography and many creeks and streams in the county, numerous low water crossings are damaged and create a significant hazard to public safety during flood events. This heightens the risk and exposure to infrastructure maintained by the McDonald County Commission. There is no heightened risk to school district facilities due to flood as no facilities are located inside identified flood risk areas. No previous damage to school facilities by flooding was reported on the Data Collection Questionnaires used in the planning process.

Problem Statement

As previously stated, jurisdictions with 100-year floodplains have the highest risk of flood- related damage. In the case of a flood event, significant portions of the previously identified jurisdictions and unincorporated portions of the county may be at risk for flood-related damage in a 100-year event based upon existing floodplains throughout the county. HAZUS data suggests that 26% of buildings in Jasper County and 28% of buildings in Newton County within the floodplain may sustain damage of some variety during a 100-year event.

Since the adoption of the 2010 plan, significant changes in building development and population shifts have taken place in nearly every jurisdiction. However, because of the existence of floodplain regulations, no new development has taken place in the floodplains without elevation certificates and building permits. As such, damages to future structures have been eliminated from consideration. It is important to continue to engage the public in flood mitigation and for jurisdictions to actively seek flood plain buyouts.

3.4.2 Dam Failure

Some specific sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.3, Page 3.148**
  https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- Missouri Department of Natural Resources, Dam and Reservoir Safety,
  https://dnr.mo.gov/geology/wrc/dam-safety/?/env/wrc/dam-safety/
- Stanford University's National Performance of Dams Program;
  http://npdp.stanford.edu/
- USACE National Inventory of Dams
  http://nid.usace.army.mil/cm_apex/f?p=838:12
- National Resources Conservation Service
  http://www.nrcs.usda.gov
- DamSafetyAction.org
  https://damsafety.org/missouri
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Total number of Missouri NID dams by County
  - Total number of High, Significant, and Low Hazard dams by County
  - Total number of State Regulated dams by County
  - Total number of Class 1, Class 2, and Class 3 dams by County
  - Total number of structures impacted by USACE dams by County
  - Total number of structures impacted by State dams by County
  - Total value of structures impacted by USACE dams by County
  - Total value of structures impacted by State dams by County
  - Total population impacted by USACE dams by County
  - Total population impacted by State dams by County
- MSDIS Structure Inventory and All Hazard Risk Dataset
  (available in both GIS and Excel format)
  https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

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.

Regardless of the size of the dam, dam owners have primary responsibility for the safe design, operation, and maintenance of their dams. They are responsible for providing early warning of problems at the dam,

for developing an effective emergency action plan, and for coordinating that plan with local officials. The state has ultimate responsibility for public safety and many states regulate construction, modification, maintenance, and operation of dams. DNR's Dam Safety Division maintains a database of all dams regardless of federal, state, local or private ownership.

While levees are built solely for flood protection, dams often serve multiple purposes, one of which may be flood control. Severe flooding and other storms can increase the potential that dams and levees will be damaged and fail as a result of the physical force of the flood waters or overtopping. Dams are usually engineered to withstand a flood with a computed risk of occurrence. If a larger flood occurs, then that structure will likely be overtopped. If during the overtopping, the dam fails oris washed out, the water behind is released as a flash flood. Failed dams can create floods that are catastrophic to life and property, in part because of the tremendous energy of the released water.

Both the Missouri Department of Natural Resources and the National Inventory of Dams (USACE) have separate hazard classifications for dams. The risk analysis includes information about **all** High Hazard and Class I dams from both the NID and the MDNR databases.

Information can be obtained from:

- National Resources Conservation Service: http://www.nrcs.usda.gov
- DamSafetyAction.org: https://damsafety.org/missouri

Table 3.26 MoDNR 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 (1) to nine (9) permanent dwelling, or one (1) or more campgrounds with permanent water, sewer and electrical services or one (1) or more industrial buildings. Inspection of these dams must occur once every three years
Class III	The area downstream from the dam that would be affected by inundation does not contain any of the structures identified for Class I or Class II dams. Inspection of these dams must occur once every five years.

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

Table 3.27 NID Dam Hazard Classification Definitions

Hazard Class	Definition
Low Hazard	Failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property

Significant Hazard	Failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure
High Hazard	Failure or mis-operation can cause extensive loss of life, damage to more than one home, damage to industrial or commercial facilities, interruption of a public utility, damage to traffic on high-volume roads or high-volume railroad line, inundation of frequently used recreation facilities, or two or more individual hazards described in the significant hazard class.

Source: National Inventory of Dams

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:

Overtopping- Inadequate spillway design, debris blockage of spillways or settlement of the dam crest.

Piping- Internal erosion caused by embankment leakage and deterioration of pertinent structures appended to the dam.

Erosion- inadequate spillway capacity causing overtopping of the dam, flow erosion, and inadequate slope.

Structural Failure- caused by and earthquake, slope instability of faulty construction.

Geographic Location

Dams Located Within the Planning Area

There are 3 dams in McDonald County. Both Fisher Lake and Keaton Lake dams are 'Class 3' dams according to Missouri DNR and 'Low Hazard' according to the NID. The Southwest City Structure E-1 dam has a 'Class 1' / 'High Hazard' rating. The Fisher Lake dam is regulated with an agricultural exemption; it holds 20 acres and does not affect any properties due to its rural location. The Keaton Lake and Southwest City dam hold 6-7 acres. The Keaton Lake dam may affect 1-2 homes and the Southwest city dam is not likely to affect any development. Inundation maps are not available for these dams, therefore it is difficult to estimate the assets at risk.

The town of Noel has a dam that is not on any state/federal register/map. There is no current owner of record and no maintenance agreement. Committee members (including the Noel mayor) estimated that a dam failure could affect 35 homes and six businesses. Without inundation maps, it is difficult to estimate the assets at risk.

The northern portion of Benton County Arkansas is within the Elk River Watershed and upstream of McDonald County, therefore dams located in this region may impact McDonald County. The area of greatest concern is in and around the city of Bella Vista Arkansas where there are several large dams. Bella Vista is located within the Little Sugar Creek sub-watershed, which is infamous for major flooding events during the traditionally wetter months. While most buildings are above the normal flood plain, a dam failure in Bella Vista could cause damage to homes and businesses along U.S. 71between the state line and the village of Jane. This would include a Wal-Mart store and Wal-Mart's corporate Security

Hub, both of which would have a severe negative economic impact on the local community.

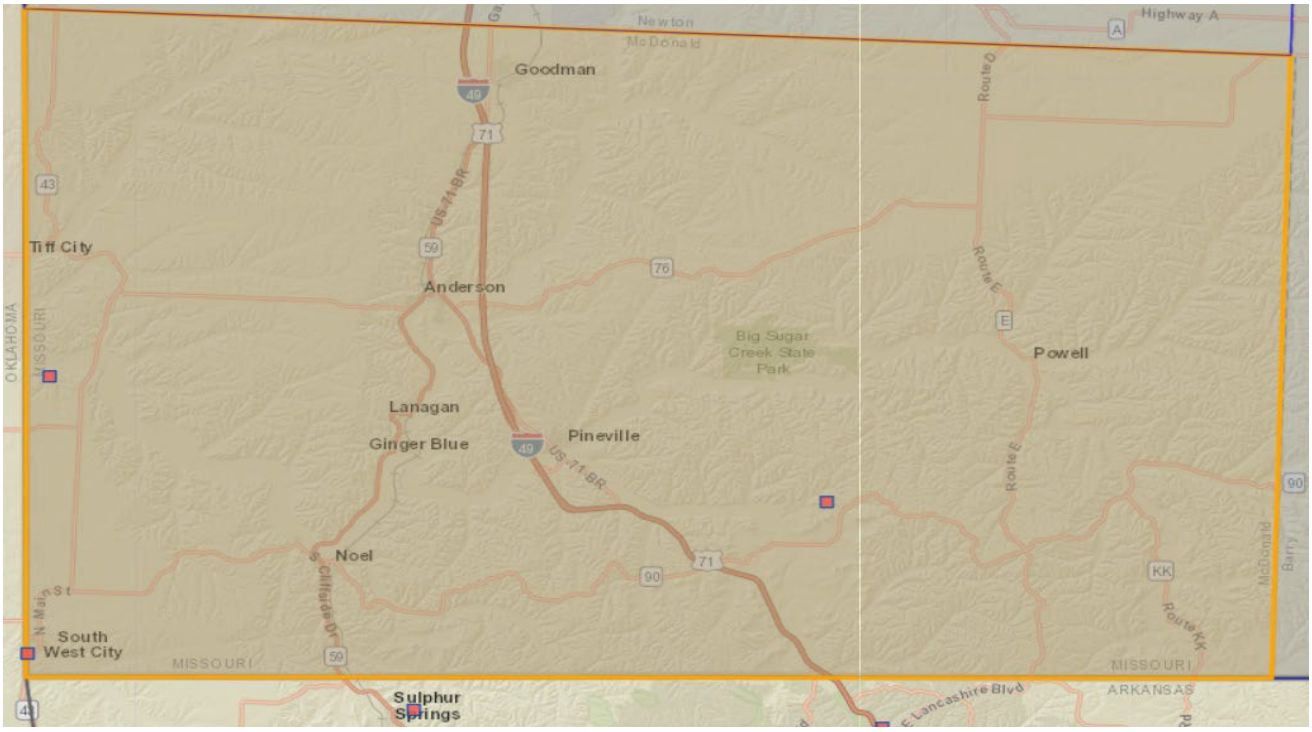
Table 3.26 shows the MDNR dam classifications in McDonald County, and **Table 3.27** shows the dam classifications. **Table 3.28** shows the NID classifications for the dams in Bella Vista Arkansas. **Figure 3.9** shows the locations of all the dams in McDonald County and Bella Vista.

Table 3.28 High Hazard Dams in the McDonald County Planning Area

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
Fisher Lake Dam	No	41	266	10/31/2011	TR-ELK Prairie River	Tiff City	4	Private
Keaton Lake	Not Required	32	103	-	TR- LITTLE Sugar Creek	Havenhurst (unincorporated)	1	Private
Southwest City Structure E-1	Yes	27	151	-	TR- HONEY Creek	Southwest City	0	Local Government

Sources: Missouri Department of Natural Resources, https://dnr.mo.gov/geology/wrc/dam-safety/damsinmissouri.htm and National Inventory of Dams, http://nid.usace.army.mil/cm_apex/f?p=838:12. Contact the MoDNR Dam and Reservoir Safety Program at 800-361-4827 to request the inundation maps for your county to show geographic locations at risk, extent of failure and to perform GIS analysis of those assetsat risk to dam failure.

Figure 3.9 High Hazard Dam Locations in McDonald County and Areas Impacted in the Event of Breach.



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

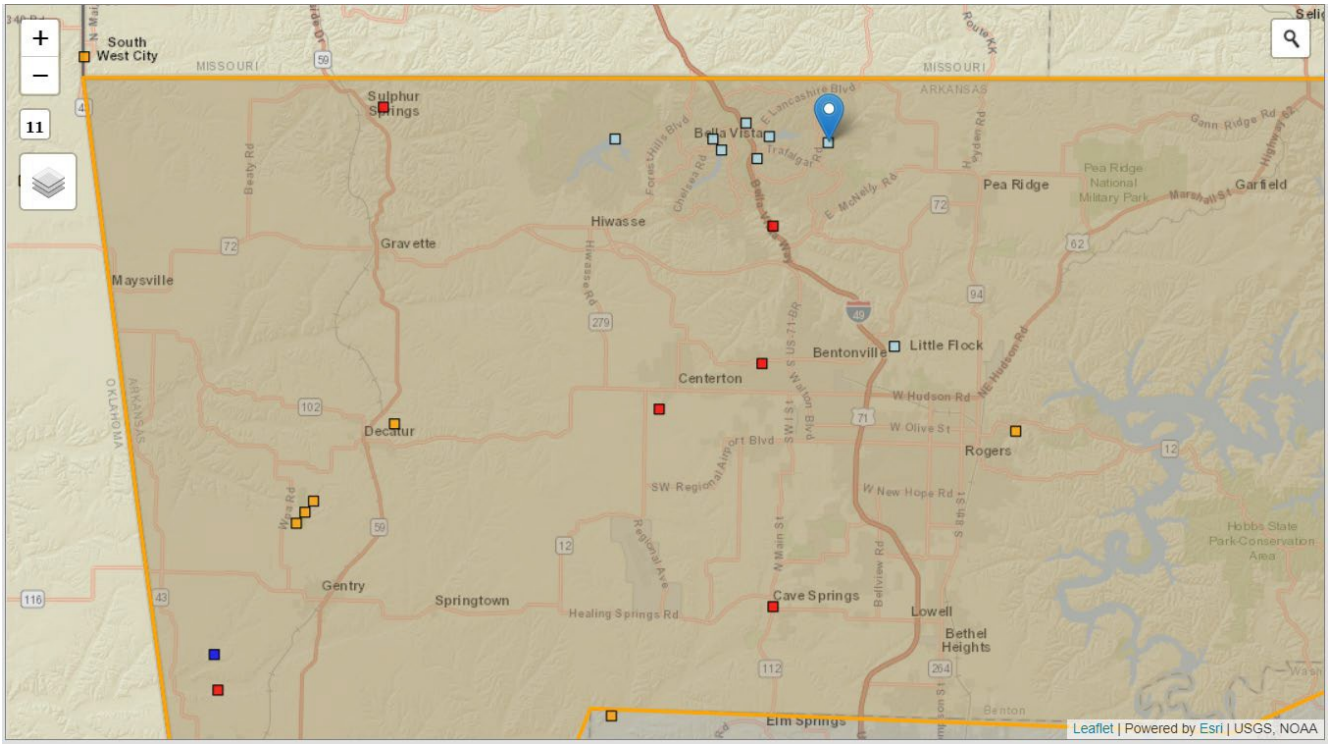
McDonald County: According to the MDNR there are 3 total dams in McDonald County. The National Inventory of Dams list 0% of High Hazard Potential with an Emergency Action Plan with 0 listed as low hazard potential, 2 listed as high hazard potential, and 1 listed as significant hazard potential.

Upstream Dams Outside the Planning Area

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
Lake Ann Dam	Yes	65	2,900	12/28/2016	Pinion Creek	Bella Vista	0	Bella Vista Village Property Owners Association
Loch Lomond Dam	Yes	96	23,099	12/28/2016	Little Sugar Creek	Bella Vista	2	Bella Vista Village Property Owners Association

Norwood Dam	Not Required	85	1,320	12/15/2015	Little Sugar Creek	Bella Vista	0	Bella Vista Village Property Owners Association
Lake Avalon Dam	Not Required	72	2,000	12/15/2015	Sturgeon Creek	Bella Vista	0	Bella Vista Village Property Owners Association
Wetmore Lake Dam	Not Required	21	65	10/15/2001	Little Sugar Creek	Bella Vista	0	Private
Lake Windsor Dam	Not Required	95	9,400	12/15/2015	Tanyard Creek	Bella Vista	0	Bella Vista Village Property Owners Association
Rayburn Dam	Not Required	95	3,100	12/15/2015	Little Sugar Creek	Bella Vista	0	Bella Vista Village Property Owners Association
Lake Brittany Dam	Not Required	87	1,700	12/15/2015	Pinion Hollow Creek	Bella Vista	0	Bella Vista Village Property Owners Association

Figure 3.10 Upstream Dams Outside Benton, AR



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

Strength/Magnitude/Extent

The strength/magnitude of dam failure would be similar in some cases to flood events (see the flood hazard vulnerability analysis and discussion). The strength/magnitude/extent of dam failure is related to the volume of water behind the dam as well as the potential speed of onset, depth, and velocity. Note that for this reason, dam failures could flood areas outside of mapped flood hazards.

Inundation maps are not available for the dams in McDonald County, therefore is difficult to accurately assess the severity/magnitude of dam failure in McDonald County

Previous Occurrences

Having reviewed the Missouri State Hazard Mitigation Plan 2018, the 2016 McDonald County Hazard Mitigation Plan and Stanford University's National Performance of Dams Program, there are no records of any dam failure in McDonald County.

Probability of Future Occurrence

Given that there are very few dams in the community and none have ever failed, there is a low probability of a dam failure in McDonald County. While regular inspections would allow for increased monitoring of dam deficiencies, only one of the dams is subject to regulations. However this dam (Fisher Lake Dam) has an agricultural exemption. A probability calculation is not possible because there are no records of a dam failure in the county.

Changing Future Conditions Considerations

Today's Missouri River is one of the most controlled waterways in our nation. Artificial channels, levees and dams vainly attempt to control flood damages. The result is a river with narrow pinch points 1,200 feet wide that give rising water no place to go. Consequently, major floods regularly overtop and breach the levee system. During the March 2019 flood, for example, 850 miles of levees in Iowa, Kansas, Missouri and Nebraska were damaged. Repair costs will exceed $1 billion, according to the U.S. Army Corps of Engineers. The situation will grow increasingly dire as the impacts of climate change take hold. A 2012 Bureau of Reclamation report predicted a 10 percent increase in runoff in the Lower Missouri River.

Vulnerability

Vulnerability Overview

Vulnerability to dam failure in McDonald County is very limited. The 2018 State Hazard Mitigation plan identifies only one state regulated class 3 dam with zero estimated building and population exposure.

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

There is very little development surrounding the dams in McDonald County, therefore there is very little potential losses to existing development. The greatest potential losses would occur in the event of a dam failure in Bella Vista Arkansas which could cause damage to homes and businesses along U.S. 71 between the state line and the village of Jane. This would include a Wal-Mart store and Wal- Mart's corporate Security Hub, both of which would have a severe negative economic impact on the local community.

Impact of Previous and Future Development

There is little anticipated future development in McDonald County; therefore it is not likely there would be significant impacts to future development in the event of a dam failure

Hazard Summary by Jurisdiction

Some communities could be impacted by a dam failure in or near McDonald County. Those communities are Southwest City, Noel, Jane, and some unincorporated areas.

Problem Statement

The problem of unsafe dams in Missouri was underscored by a dam failure in southeast Missouri. On December 14, 2005, the Taum Sauk reservoir dam owned by Ameren Missouri failed. A 600- foot breech in the northwest side of the retention facility released 1.5 billion gallons of stored water into the Johnson Shut-Ins State Park in just 10 minutes. The waters caused extensive damage to the park. If the dam had failed during the summer months, during the park's peak use, it is likely that many lives would have been lost.

The dams in McDonald County are small and located in rural areas; they do not pose a great threat to development in the area. However, due to the lack of inundation maps, an accurate risk assessment is not possible. The problem of the Noel dam also remains; there is no recorded ownership or inspections of this dam.

3.4.3 Earthquakes

Some specific sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.4, Page 3.192**
  https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- U.S. Seismic Hazard Map, United States Geological Survey,
  https://earthquake.usgs.gov/hazards/hazmaps/conterminous/2014/images/HazardMap2014_lg.jpg;
- Impact of Earthquakes on the Central USA
  http://www.cusec.org/documents/aar/NMSZ_CAT_PLANNING_SCENARIO.pdf
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Total population impacted by earthquakes by County
  - Total number of structures impacted by earthquakes by County
  - Total value of structures impacted by earthquakes by County
  - Property loss ratio to earthquakes by County
- MSDIS Structure Inventory and All Hazard Risk Dataset
  (available in both GIS and Excel format)
  https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

Hazard Profile

Hazard Description

The State of Missouri Emergency Management Agency (SEMA) defines earthquakes as shifts in the Earth's crust causing the surface to become unstable. This instability manifests into a release of energy ranging in intensity from slight tremors to large shocks. The earth's crust is made up of gigantic plates, commonly referred to as tectonic plates. 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 Pressures on the North Atlantic ridge affecting the eastern side of the North American plate and movements along the San Andreas Fault by the Pacific plate have reactivated the subterranean faults in the Mississippi embayment. 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 tobuildings and other structures on the earth's surface.

Another type of earthquake is defined by the U. S. Geological Survey (USGS) as *induced earthquakes*. Induced earthquakes are caused by wastewater injection wells. This wastewater is produced at oil and gas extraction wells and mostly consists of saltwater that up comes up along with the oil and gas. In some case, the injected wastewater consists of extracted hydraulic fracturing fluids. Most injection wells are not associated with induced earthquakes, a combination of many factors is necessary for induced earthquakes to occur. These factors include: the injection rate and total volume injected; the presence of faults that are large enough to produce earthquakes; and the presence of pathways for the fluids to travel from the injection site to the faults. Earth's crust is pervasively fractured at depth by faults which can sustain high stresses without slipping because natural "tectonic" stress and the weight of the overlying rock push the opposing fault blocks together. The injected wastewater counteracts the frictional forces on faults and priest hem apart causing induced earthquake's to occur.

Geographic Location

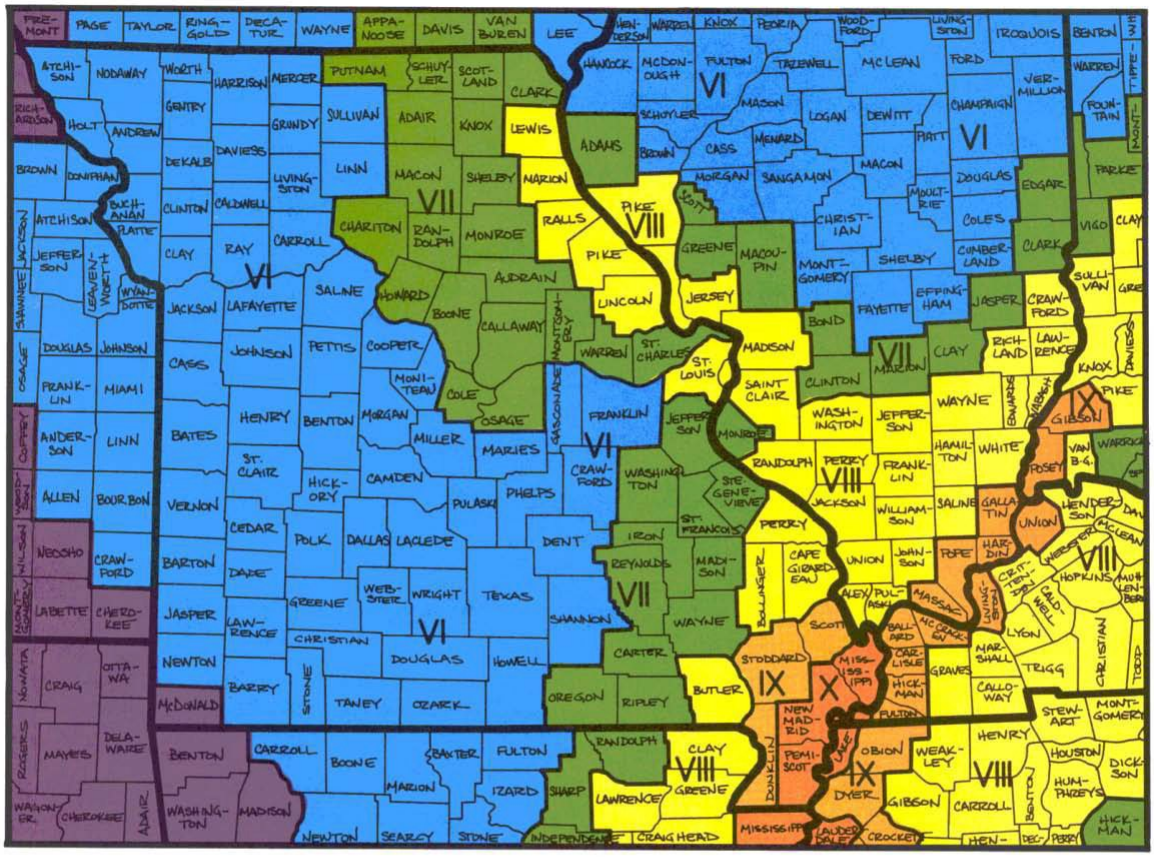
Two earthquake zones could affect McDonald County: the New Madrid Seismic Zone and the Nemaha Ridge Seismic Zone.

The New Madrid is a major seismic zone that is a prolific source of intraplate earthquakes. It lies within the central Mississippi Valley, extending through southeast Missouri. While the epicenter of an earthquake in the New Madrid would be far away from McDonald County, aftershocks would be felt throughout the county. Earthquake intensity would not vary across the county.

The other seismic zone of relevance, the Nemaha Ridge, is located in central Kansas, extending from Omaha, NE to Oklahoma City, OK. The Nemaha Ridge is a buried granite mountain range characterized by long term uplift which has been attributed to isostatic uplift. The most active portion of the Nemaha Ridge is currently located in Central and Northern Oklahoma where induced earthquakes are on the rise.

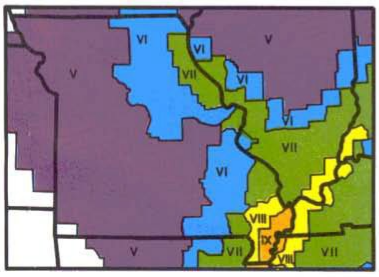
Figure 3.5 shows the geographic location of seismic hazards in the U.S. McDonald County's location is outlined in black and the map shows a relatively low seismic hazard for the county.

Figure 3.11 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

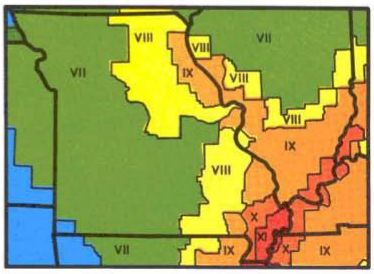


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 6.7 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

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: https://sema.dps.mo.gov/docs/EQ_Map.pdf

Figure 3.12 Projected Earthquake Intensities

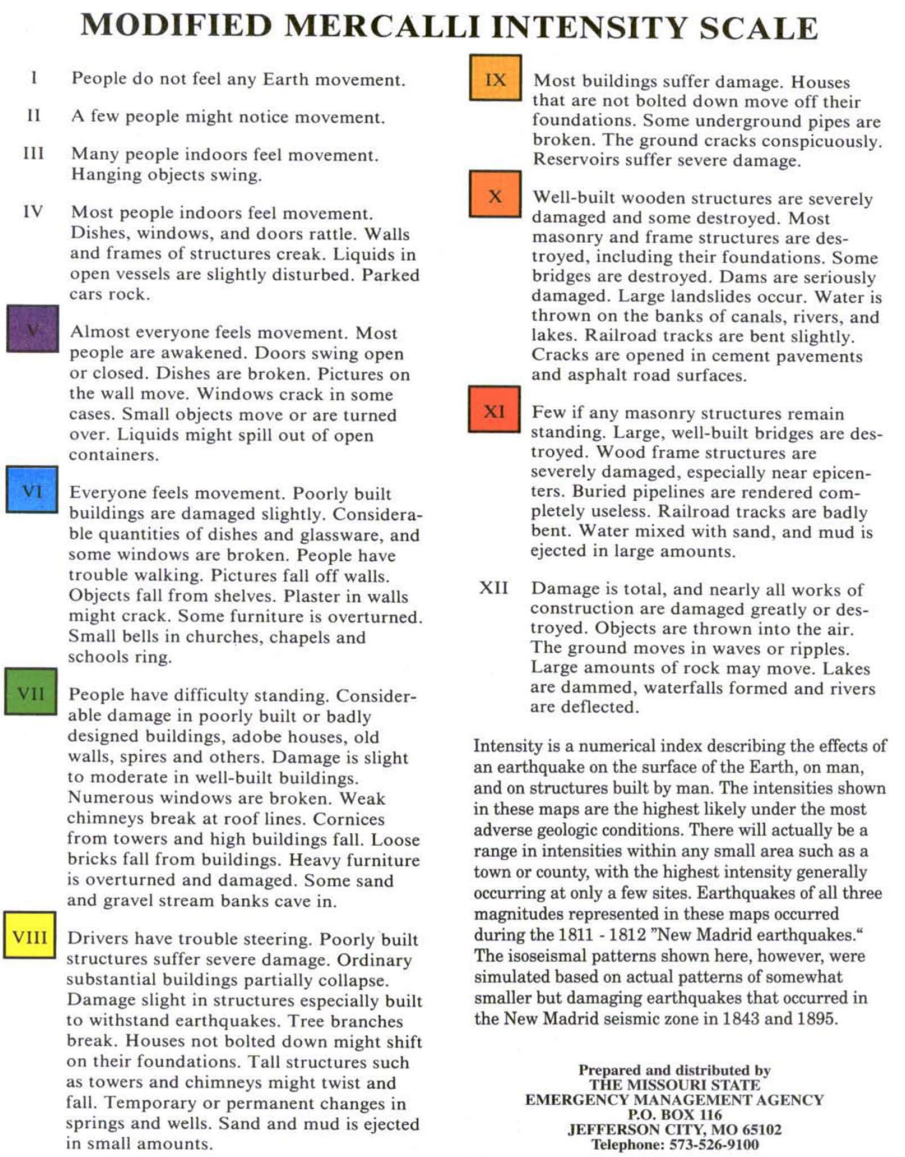
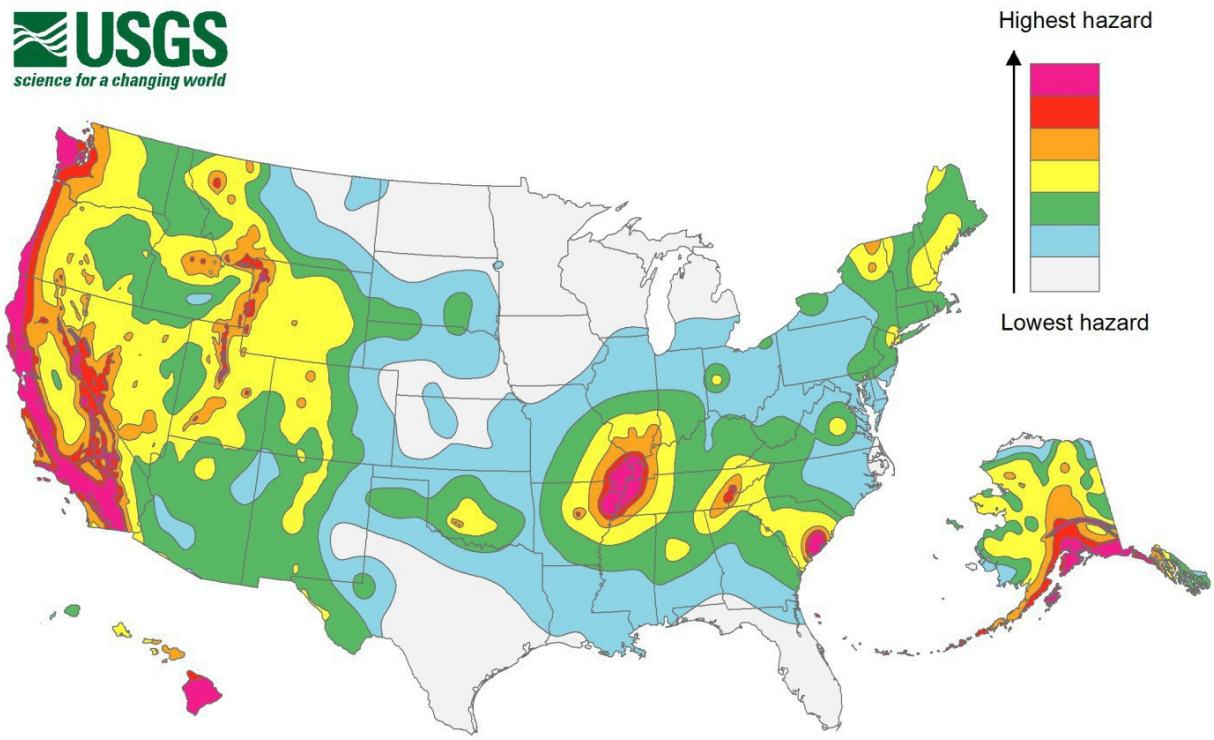


Figure 3.13 United States Seismic Hazard Map



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

Strength/Magnitude/Extent

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

Richter Magnitude Scale

The Richter Magnitude Scale was developed in 1935 as a device to compare the size of earthquakes. The magnitude of an earthquake is measured using a logarithm of the maximum extent of waves recorded by seismographs. Adjustments are made to reflect the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter scale, magnitude is expressed in whole numbers and decimal fractions. 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 UnitedStates 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 nothave a mathematical basis, but is based on observed effects. Its use gives the laymen a more meaningful idea of the severity.

McDonald County has the lowest classification of any county in Missouri – a V classification on the Modified Mercalli Intensity Scale. This means that there is a lower probability of experiencing an earthquake or its aftershocks in McDonald County.

Figure 3.12 shows the highest projected Modified Mercalli intensities by county from a potential magnitude 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid Seismic Zone. McDonald County has the lowest classification of any county in Missouri, a V classification on the Modified Mercalli Intensity Scale. This means that McDonald County will almost certainly feel some movement, but is not likely to experience any property damage during an earthquake. The secondary maps in **Figure 3.13** show the same regional intensities for a 6.7 and 8.6 earthquake. McDonald County still shows the lowest classification of all the counties in Missouri. The classification for a magnitude 6.7 earthquake is an IV, which means movement felt will not be as intense. The classification for a magnitude 8.6 earthquake is a VI, which means the movement felt will be more intense and minor property damage is more likely to occur.

Projected Modified Mercalli intensities are not available for the Nemaha Ridge as they are for the New Madrid. However, the USGS developed an internet based program called “Did You Feel It?” (DYFI) to tap into the abundant information available about earthquakes from people who actually experience them. DYFI works with the vast number of internet users to get a more complete description of what people actually experienced, the effects of an earthquake, and the extent of damage. This information can easily be translated in the Modified Mercalli Intensity Scale.

Overall the severity of earthquakes that may be felt in McDonald County are not expected to be intense enough to cause property damage, injury, or death.

Previous Occurrences

New Madrid Seismic Zone

Historically, this area has been the site of some of the largest earthquakes in North America. Between 1811 and 1812, 4 catastrophic earthquakes, with magnitude estimates greater than 7.0, occurred during a 3-month period. Hundreds of aftershocks followed over a period of several years. The largest earthquakes to have occurred since then were on January 4, 1843 and October 31, 1895 with magnitude estimates of 6.0 and 6.2 respectively. In addition to these events, seven events of Mw >= 5.0 have occurred in the area during the 20th century.

Throughout the past twenty-five years, earthquakes with magnitudes of 4.6 or less have occurred in central and extreme southeastern Missouri in 1990, 1992, 1998 and 2003.

Nemaha Ridge

Historically, the most severe Kansas earthquake recorded was on April 24, 1867 near Manhattan, and was an estimated magnitude 5.5. According to the Kansas Geological Survey, at least 125 earthquakes were recorded between 1867 and 1989. Most of these were micro-earthquakes, which are defined as earthquakes that are too small to be felt.

Throughout the past 25 years, two earthquakes of note were the 3.1 magnitude on March 31, 1993, close to the Cooper Nuclear Power Station in Brownville, NE and a 3.1 on March 23, 2007, near Effingham, KS.

Since 2009, seismic activity in Central and Northern Oklahoma, as well as Southern Kansas, has significantly increased due to induced seismicity. **Figure 3.13** shows that prior to 2009 there was at most 3 earthquakes per year with a magnitude of 3 or greater. Then, in 2009 that number rose to 20 and continued to rise thereafter, with the most significant increase occurring in the last four years. In 2013 there were 109 earthquakes, in 2014 there were 585 earthquakes, in 2015 there were 890 earthquakes, and in 2016 there were 518 earthquakes. Of this increase in earthquakes, there has also been an increase in the magnitude. In 2011, out of 63 earthquakes there were 3 with a magnitude between 4.0 and 4.8 and one with a magnitude of 5.6. In 2014, out of 585 earthquakes there were 15 with a magnitude between
4.0 And 4.4. In 2015, out of 890 earthquakes there were 30 with a magnitude between 4.0 and 4.7. Finally in 2016, out of
518 earthquakes, there have been 15 with a magnitude between 4.0 and 5.1 and one earthquake with magnitude of 5.8.

Based on the information available on the USGS DYFI website, these earthquakes in Oklahoma are felt in McDonald County. The intensity felt in McDonald County does vary slightly depending on the magnitude of the earthquake as well as the geographic location of the epicenter. Generally, with a magnitude of 4.0 or greater some people in McDonald County notice slight tremors, and with magnitude of 5.0 or greater most people in McDonald County will feel slight tremors.

Ultimately, the most significant earthquake events (M 5.0+) occur far enough away from McDonald County that only slight tremors are felt. No property damage has been reported from earthquakes felt in McDonald County, and there are no earthquake events on record whose epicenter is in McDonald County.

Probability of Future Occurrence

New Madrid

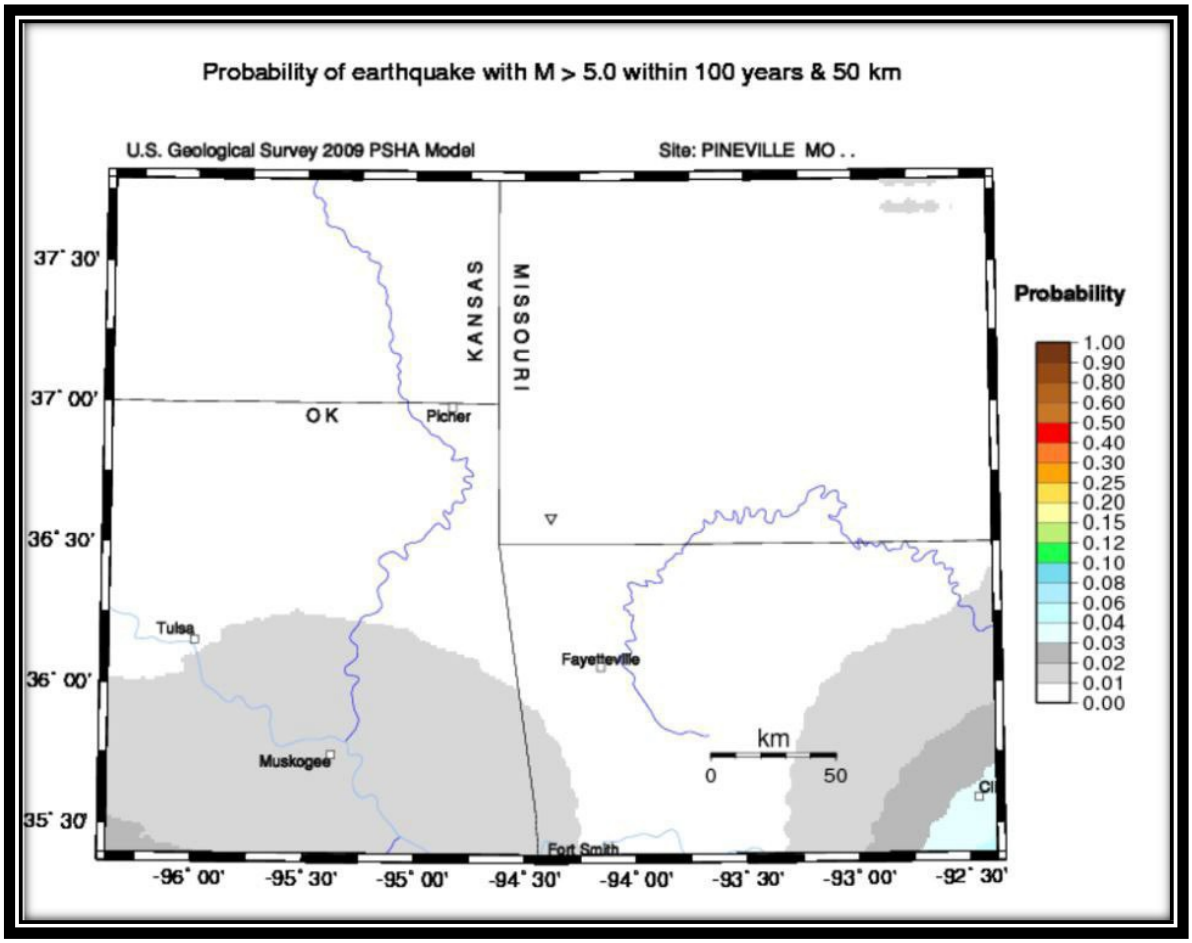
On average about 200 earthquakes per year are detected along the New Madrid fault line; however these earthquakes have not been strong enough to affect McDonald County. The last New Madrid earthquake that may have been felt in McDonald County occurred in 1968 in Southern Illinois, this magnitude 5.5 earthquake was felt in all or portions of 23 states. The Center for Earthquake Research and Information (CERI) at the University of Memphis has computed conditional probabilities of a magnitude 6.0 earthquake in the New Madrid seismic zone. The probability for an earthquake of magnitude 6.0 or greater along the New Madrid fault line is 25 to 40 percent over a 50 year time period. An earthquake of this magnitude would most certainly be felt in McDonald County, however, damages would be minimal if any (refer back to **Figure 3.13**) An earthquake with a magnitude equal to or greater than that of the 1811- 1812 quakes could result in injury, death, or property damage in McDonald County.

Nemaha Ridge

The most active portion of the Nemaha Ridge is located in Central and Northern Oklahoma where induced earthquakes are on the rise. If these earthquakes continue increasing in frequency and magnitude it could pose a greater threat to McDonald County.

Figure 3.14 shows the earthquake probability map of McDonald County. There is no risk of the epicenter of an earthquake to be in or near McDonald County.

Figure 3.14 McDonald County Earthquake Probability Map



Source: USGS – 2009 Geohazard Probability Index

Hazard Summary by Jurisdiction

Since the earthquake intensity is not likely to vary greatly throughout McDonald County, the risk will be the same throughout. However, damages could differ if there are structural variations in the planning area built environment. For example, older structures and those structures which are not in prime condition are likely to experience higher damages.

Changing Future Conditions Considerations

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.

Vulnerability

Vulnerability Overview

The 2018 State Hazard Mitigation Plan quantified the population and building exposed to potential hazards by county in the tables below, providing a numeric breakdown of the population and buildings that could be vulnerable hazards.

Potential Losses to Existing Development

The Hazus building inventory counts are based on the 2010 census data adjusted to 2019 numbers using the Dun & Bradstreet Business Population Report. Inventory values reflect 2014 valuations, based on RSMeans (a supplier of construction cost information) replacement costs. Population counts are 2010 estimates from the U.S. Census Bureau.

Population and Building Count

Population 2019	Building Count (HAZUS-MH 2.1)							
	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
28,781	9,923	231	64	30	26	34	9	10,317

Estimated Values for Key Occupancies

Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
$1,281,441	$67,581	$38,892	$8,030	$17,082	$20,786	$64,259	$1,498,071

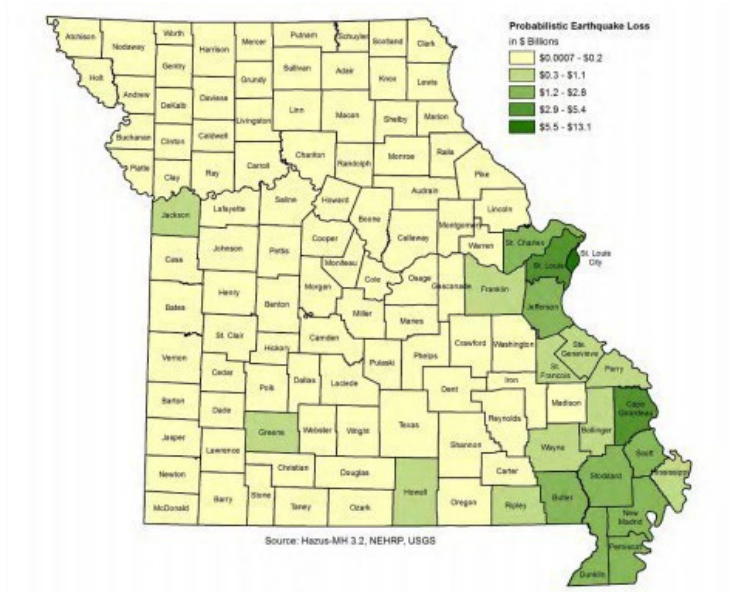
Problem Statement

McDonald County has a very low risk of direct impact resulting from an earthquake.

Impact of Previous and Future Development

Future development is not expected to increase the risk other than contributing to the overall exposure of what could become damaged as a result of an event.

Figure 3.15. HAZUS-MH Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario—Total Building Loss



Source: https://www.fema.gov/emergency-managers/risk-management/earthquake/nehrp

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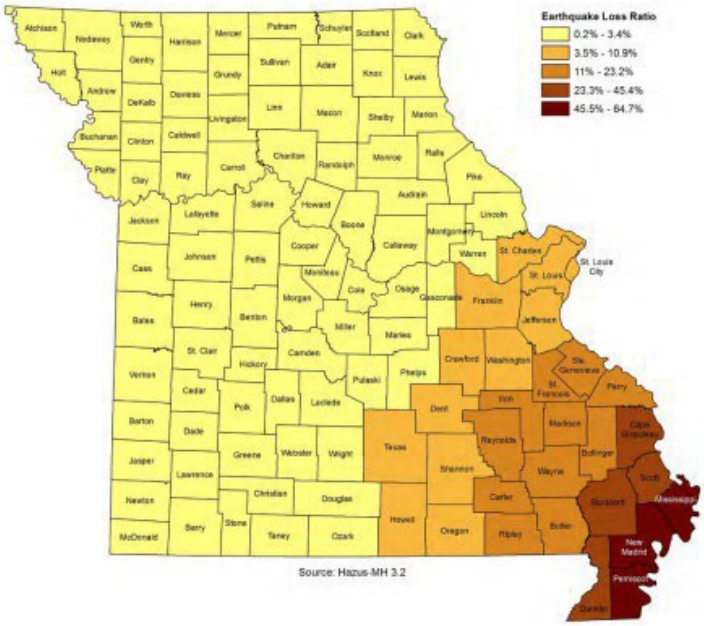


Figure 3.15 HAZUS-MH Earthquake Loss Estimation with a 2% Probability of Exceedance in 50 Years Scenario—Loss Ratio

Source: https://www.fema.gov/emergency-managers/risk-management/earthquake/nehrp

3.4.4 Land Subsidence/Sinkholes

Some specific sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.5, Page 3.218**
  https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- http://www.dnr.mo.gov/geology/geosrv/envgeo/sinkholes.htm
  http://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/
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Total number of sinkholes by County
  - Vulnerability to sinkholes by County
  - Total number of mines by County
  - Vulnerability to mines by County
  - Total value of structures impacted by sinkholes by County
  - Total population impacted by sinkholes by County
- MSDIS Structure Inventory and All Hazard Risk Dataset
  (available in both GIS and Excel format)
  https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

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.

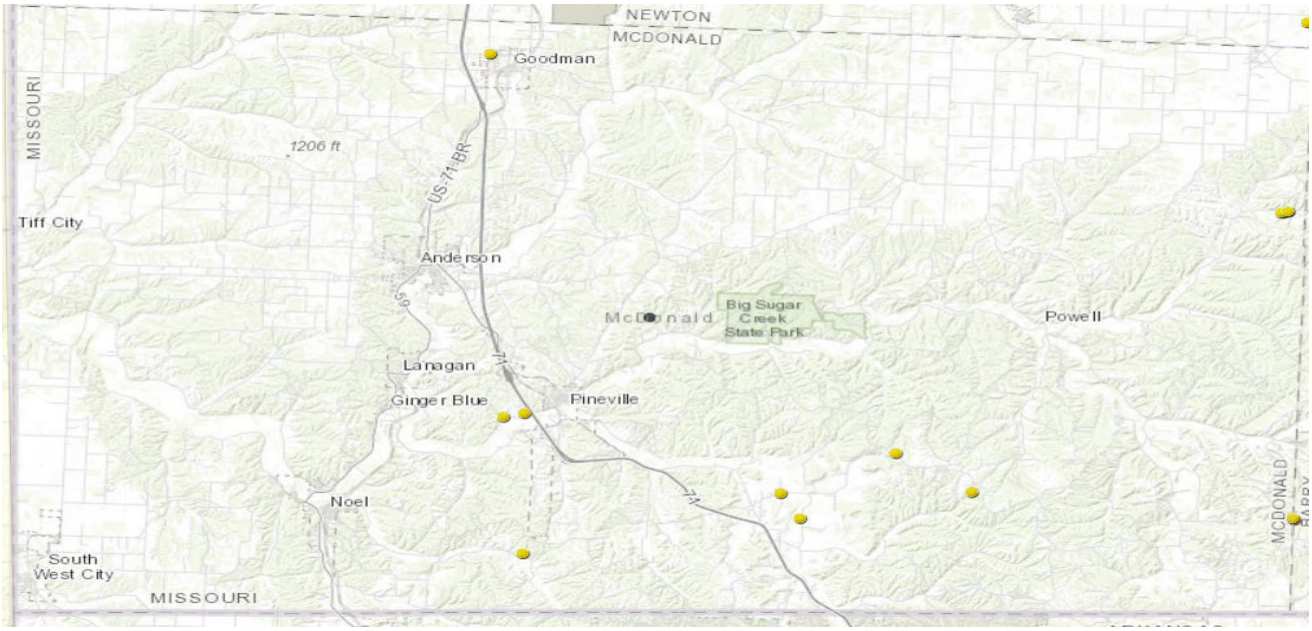
According to the U.S. Geological Survey (USGS), the most damage from sinkholes tends to occur in

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.

McDonald County has some mining history, with mining and smelting of lead, zinc and Tripoli from 1880 through World War I. The sinkhole and near-surface fault zone ores were recovered first using either interconnected shafts or open pit mining techniques. The sheet ground deposits were deeper and were mined later (1900-1950) using room-and-pillar methods. When they were abandoned most were not properly mitigated. Additionally, independent miners went in and mined the pillars that supported the mines leaving future hazards

Geographic Location

Figure 3.16 Known Sinkholes in McDonald County



Source: https://www.arcgis.com/apps/webappviewer/index.html?id=3ac3a61da4af4834811503a24a3cb935&extent=-10935425.9421%2C4194110.701%2C-9418915.3009%2C5070996.2895%2C102100&showLayers=karst_1997%3Bkarst_399%3Bstate_mask_8886

Strength/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 2018 State Plan included only seven documented sinkhole "notable events". The plan stated that sinkholes are common to Missouri and the probability is high that they will occur in the future. To date, Missouri sinkholes have historically not had major impacts on development nor have they caused serious damage. Thus, the severity of future events is likely to be low.

Previous Occurrences

Sinkholes are a regular occurrence in Missouri, but that they rarely are the events of any significance. Despite the regular occurrences, there have been no major recent documented occurrences of sinkholes opened in McDonald County.

Probability of Future Occurrence

Calculating the probability of future occurrences based on previous is impossible due to no known sinkhole events occurring in the recent past.

Vulnerability

Vulnerability Overview

Sinkholes in Missouri are a common feature where limestone and dolomite outcrop. Dolomite is a rock similar to limestone with magnesium as an additional element with the calcium normally present in the minerals that form the rocks. While some sinkholes may be considered a slow changing nuisance; other more sudden catastrophic collapses can destroy property, delay construction projects, contaminated groundwater resources, and damage underground utilities. The entire county is underlain with limestone and dolomite bedrock.

Potential Losses to Existing Development

The sinkhole hazard layer was used in conjunction with the MSDIS structure file to determine structures that fall within sinkhole areas as well as structures that are within a buffered distance of 50feet of sinkholes. The number of mines per county was reported as available from the Department of Natural Resources. Based on natural breaks in the data, a rating value of 1 through 5 was assigned with the designations shown below. According to the 2018 Mo State HMP Plan there is minimal chance of a sinkhole occurrence.

Impact of Previous and Future Development

Because the majority of sinkholes in McDonald County occur in urban areas, increased development has affected sinkhole areas as they contain numerous structures. Future development poses an even bigger threat of having infrastructure damage, as well as posing a threat to people. This harms the county's groundwater-based water system, introducing pollutants. The county plan mentions work towards incorporating ordinances into preventing land use around known sinkhole risk areas and hopes to ensure successful development around these areas.

Hazard Summary by Jurisdiction

The risk of sinkhole damage for individual communities and school districts is limited to the amount of exposure of buildings and infrastructure. The entire county is at risk for potential sinkhole

development, southwester Jasper County has areas with high density of known sinkholes. This indicates that the subsurface conditions are currently favorable for the development of sinkhole features. It is unlikely that school districts will be greatly affected by sinkholes due to the localized nature of their exposure.

Problem Statement

It is likely that more sinkholes will occur as development occurs 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. Best efforts to divert storm water runoff from known sinkholes should be made. Jasper County has a high density of sinkholes and the effects of collapse sinkholes on the built environment should be noted as a public service to the county's residents.

- Karst topography and numerous sinkholes were noted in the northern portion of County A along the Green River. Development within this area is also increasing. Possible solutions include updating the local ordinances/regulations to address the use of sinkholes for storm water management.

3.4.5 Drought

Some specific sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.6, Page 3.235**
  https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln, http://www.drought.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
- MoDNR, Drought News, Conditions and Resources https://dnr.mo.gov/drought.htm
- Populations served by groundwater by county, USGS-NWIS, http://maps.waterdata.usgs.gov/mapper/index.html
- Census of Agriculture, http://www.agcensus.usda.gov/Publications/2012/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/
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Vulnerability to drought by County
  - Crop insurance claims due to drought by County
- MSDIS Structure Inventory and All Hazard Risk Dataset (available in both GIS and Excel format)
  https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

Hazard Profile

Hazard Description

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

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

- Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (e.g., streamflow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a

deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, streamflow, and ground water and reservoir levels. As a result, these impacts also are out of phase with impacts in other economic sectors.

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

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

Geographic Location

Because of the broad scope of drought, all of McDonald County is susceptible to this hazard. Agricultural land is extremely vulnerable to drought impacts, and according to the 2012 US Census of Agriculture 186,599 acres of McDonald County (54% of its total land area) are classified as farmland, making the impact of drought significantly felt by the residents and the economy of McDonald County.

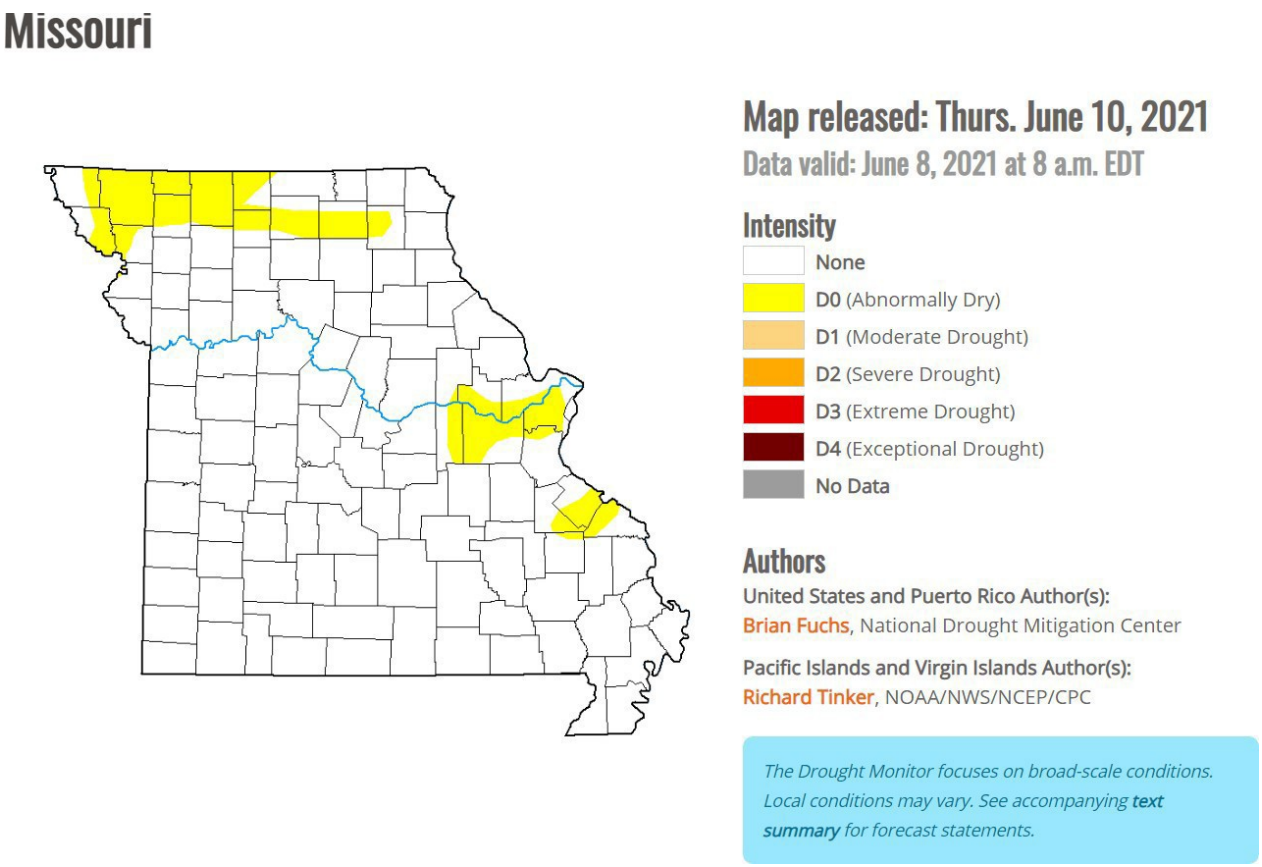
Table 3.29 shows the total farmland in comparison with the irrigated farmland in McDonald County. From 2007 to 2012 there has been a decrease in total farmland and an increase in irrigated farmland. The decrease in total farmland suggests there is some conversion of farmland for development occurring. There has also been an increase in irrigated farmland from 2007 to 2012.

Table 3.29. Agricultural Irrigation in McDonald County

McDonald County	2007 Farms	2012 Farms	2007 Acres	2012 Acres
Irrigated Farmland	13	22	2,384	4,996
Total Farmland	996	926	199,780	186,599
Percent Irrigated	1.3%	2.4%	1.2%	2.7%

Source: 2012 USDA Census of Agriculture V. 1, Ch. 2

Figure 3.17 U.S. Drought Monitor Map of Missouri on Date



Source: U.S. Drought Monitor, https://droughtmonitor.unl.edu/Maps/MapArchive.aspx

Strength/Magnitude/Extent

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 algorithmalso is used to describe wet spells, using corresponding positive numbers.

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 III: Conservation Phase—When the PDSI reads -2.0 to -4.0, and streamflow, 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 DACdetermines 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.

Previous Occurrences

The NCEI storm events database includes 10 drought events occurring in McDonald County from 2000 through 2020. Many of these were multiple reports from persistent drought conditions that lasted several months. The NCEI reports indicate that there were four distinct drought periods during a 20 year timeframe. Table 3.33 provides a summary of these events. The NCEI storm events database includes 20 drought events occurring in Newton County from 2000 through 2020. Many of these were multiple reports from persistent drought conditions that lasted several months. The NCEI reports indicate that there were six distinct drought periods during a 20 year timeframe. Table 3.30 provides a summary of these events

- Agricultural - 22
- Fire - 7
- General Awareness - 5
- Plants & Wildlife - 4
- Relief, Response, & Restrictions - 17
- Water supply & Quality – 1

Table 3.30 shows drought events in McDonald County that were reported to the NCDC from 1999 to 2020. Drought occurred in 7 out of 20 years. The driest year occurred from July 2012 to March 2013.

Duration	# of months	Magnitude	# of Deaths	# of Injuries	Property Damage $	Crop Damage $
10/31/1999	4	-	0	0	0	20.0 K *
9/15/2000	2	-	0	0	0	0
12/31/2005	1	Severe Drought	**0**	**0**	0	0
4/30/2006	4	Extreme Drought	0	0	0	0
10/31/2011	4	Severe Drought	0	0	0	12.0 M *
10/31/2012	4	Extreme Drought	0	0	0	610.0 K *
3/31/2013	5	Severe Drought	0	0	0	
9/01/2020	0	-	0	0	0	0
10/01/2020	0	-	0	0	0	0
Totals	**24**		0	0	0	**12.63 M ***

Source: National Climatic data Center
*Monetary crop loss figures reported to the NCDC are estimates using information from the National Agricultural Statistics database, local FSA and USDA offices and other local, state or federal agency information. Crop damage estimates are not reflective of actual insurance claims.

Probability of Future Occurrence

Over a period of 20 years (240 months), drought has occurred in a total of 24 months. The total number of months of drought and the total number of months in the record period indicates a 10 percent annual probability of drought occurring in the county. Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increased chance of drought.

Changing Future Conditions Considerations

The Great Plains is a diverse region where climate and water are woven into the fabric of life. Day-to-day, month-to-month, and year-to-year changes in the weather can be dramatic and challenging for communities and their commerce. The region experiences multiple climate and weather hazards, including floods, droughts, severe storms, tornadoes, hurricanes, and winter storms. In much of the Great Plains, too little precipitation falls to replace that needed by humans, plants, and animals. These variable conditions in the Great Plains already stress communities and cause billions of dollars in damage; climate change will add to both stress and costs. The people of the Great Plains historically have adapted to this challenging climate. Although projections suggest more frequent and more intense droughts, severe rainfall events, and heat waves, communities and individuals can reduce vulnerabilities through the use of new technologies, community-driven policies, and the judicious use of resources. Adaptation (means of coping with changed conditions) and mitigation (reducing emissions of heat-trapping gases to reduce the speed and amount of climate change) choices can be locally driven, cost effective, and beneficial for local economies and ecosystem services. Significant climate-related challenges are expected to involve 1) resolving increasing competition among land, water, and energy resources; 2) developing and maintaining sustainable agricultural systems; 3) conserving vibrant and diverse ecological systems; and 4) enhancing the resilience of the region's people to the impacts of climate extremes. These growing challenges will unfold against a changing backdrop that includes a growing urban population and declining rural population, new economic factors that drive incentives for crop and energy production, advances in technology, and shifting policies such as those related to farm and energy subsidies

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. Cities that operate water wells can experience water shortages during persistent drought periods like the seven-month drought period in 2012. Those that rely on private wells are more likely to be impacted by reductions in the groundwater supply due to the fact that public wells are far deeper than private wells.

Over a period of 20 years (240 months), drought has occurred in a total of 24 months. The total number of months of drought and the total number of months in the record period indicates a 10 percent annual probability of drought occurring in the county. Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increased chance of drought.

Table 3.31. Previous Losses in McDonald County from Drought 1998-2012

Total Crop Insurance Paid for Drought Damage1998-2012	Crop Claims Ratio Rating	Annualized Crop Insurance Claims/Drought Damage	Crop Exposure (2007 Census of Agriculture)	Annual Crop Claim Ratio	Crop Loss Rating
$1,438,925	1	$95,928	$2,490,000	3.85%	2

Source: Missouri State Hazard Mitigation Plan 2018

Table 3.32. Ranges for Drought Vulnerability Factor Ratings

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

Source: Missouri State Hazard Mitigation Plan2018

Potential Losses to Existing Development

The National Drought Monitor Center at the University of Nebraska at Lincoln summarized the potential impacts 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.

Determining the direct and indirect costs associated with drought is difficult because of the broad impacts of drought and the difficulty of establishing when droughts begin and end. Using USDA Risk Management Agency's crop insurance claims paid as a result of drought conditions from 1998 to 2012 produced an annualized crop insurance pay out amount of $95,928. This figure is the baseline for estimating potential loss due to drought on an annual basis.

Impact of Previous and Future Development

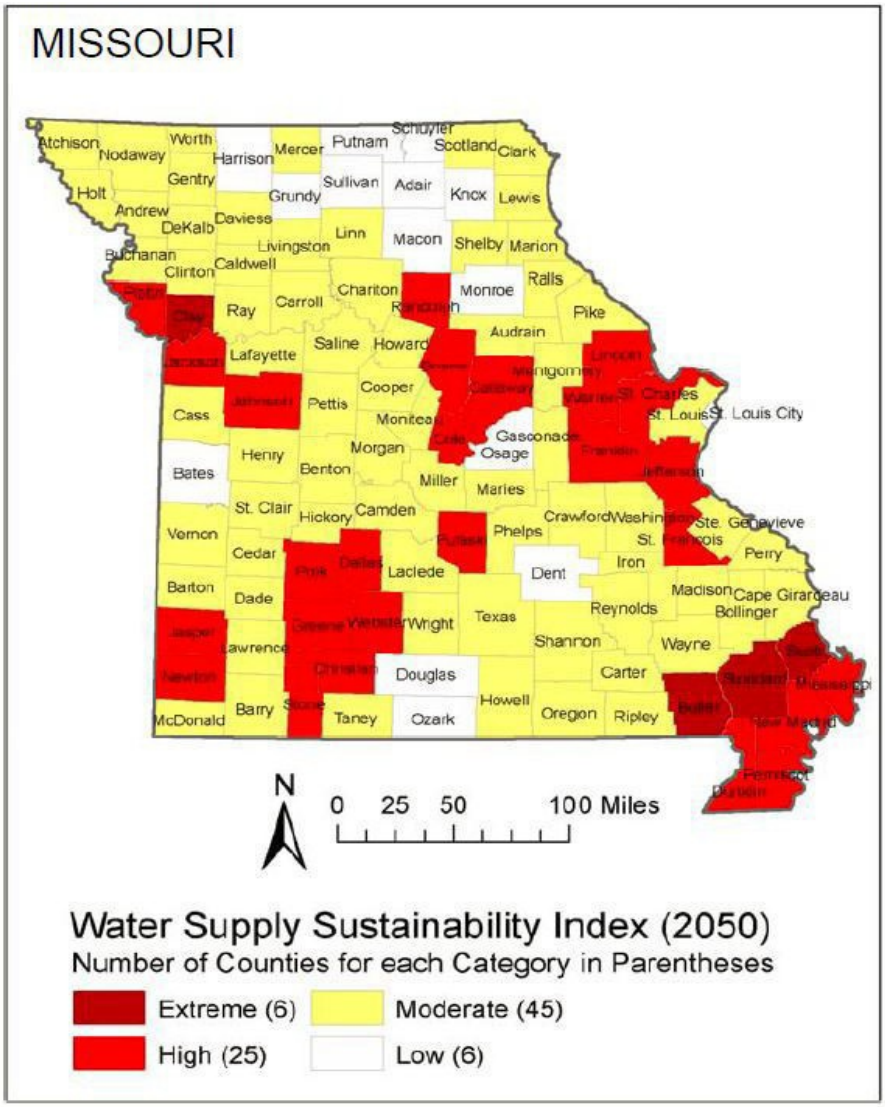
There is currently no anticipated development that would affect the impacts of drought in McDonald County.

Changing Future Conditions Considerations

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.

Figure 3.18. Water Supply Sustainability Index (2050)



Hazard Summary by Jurisdiction

There is no variance by jurisdiction to this threat. Drought conditions would be the same in small communities as those experienced in rural areas, but the magnitude would be different - with only lawns and local gardens impacted. In addition, building foundations could be weakened due to shrinking and expanding soils.

Problem Statement

Although ground-water is an abundant and fresh resource in SW Missouri, seasonal increased use due to tourism and rapid residential and commercial growth is an issue of concern. The depletion of the aquifer from overuse and/or the aquifer drawdown from closely located wells often requires well pumps to be lowered and sometimes requires wells to be drilled to a greater depth. Also, water systems should frequently evaluate the drawdown and compare it to past drawdowns to determine the current and historical impacts to the aquifer. Future development and population growth in McDonald County can increase water demand which can have an impact on available groundwater resources. Increased planning efforts are needed to mitigate the effects of future droughts in that area.

3.4.6 Extreme Temperatures

Some specific sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.7, Page 3.253**
  https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- National Centers for Environmental Information, Storm Events Database, http://www.NCEI.noaa.gov/stormevents/
- Heat Index Chart & typical health impacts from heat, National Weather Service; National Weather Service Heat Index Program, https://www.weather.gov/safety/heat-index
- Wind chill chart, National Weather Service, http://www.nws.noaa.gov/om/cold/wind_chill.shtml;
- Daily temperatures averages and extremes, High Plains Regional Climate Summary, http://climod.unl.edu/ ;
- Hyperthermia mortality, Missouri; Missouri Department of Health and Senior Service, http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper1.pdf;
- Hyperthermia mortality by Geographic area, Missouri Department of Health and Senior Services, http://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/hyper2.pdf
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Average annual occurrence for extreme heat by County
  - Vulnerability to extreme heat by County
  - Average annual occurrence for extreme cold by County
  - Vulnerability to extreme cold by County
- MSDIS Structure Inventory and All Hazard Risk Dataset
  (available in both GIS and Excel format)
  https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

Hazard Profile

Hazard Description

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several 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 3.16** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

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.

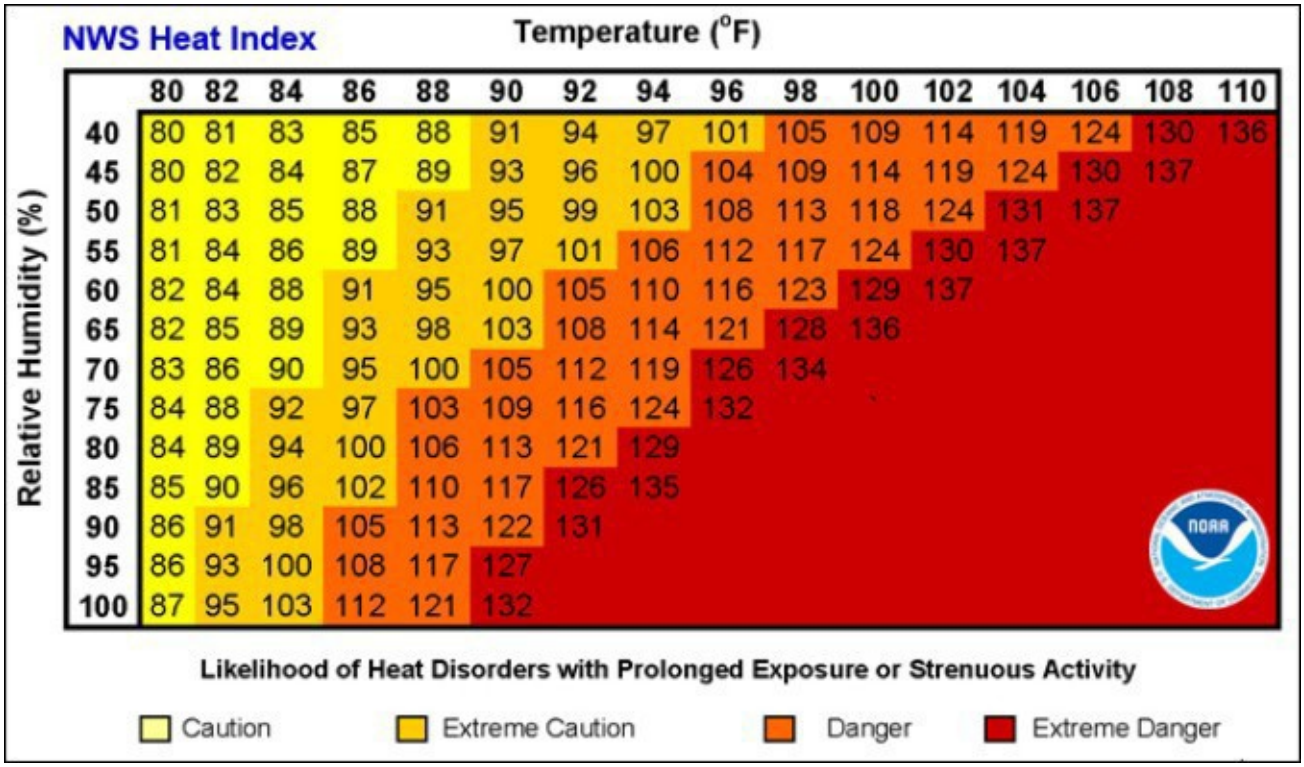
Geographic Location

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

Strength/Magnitude/Extent

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

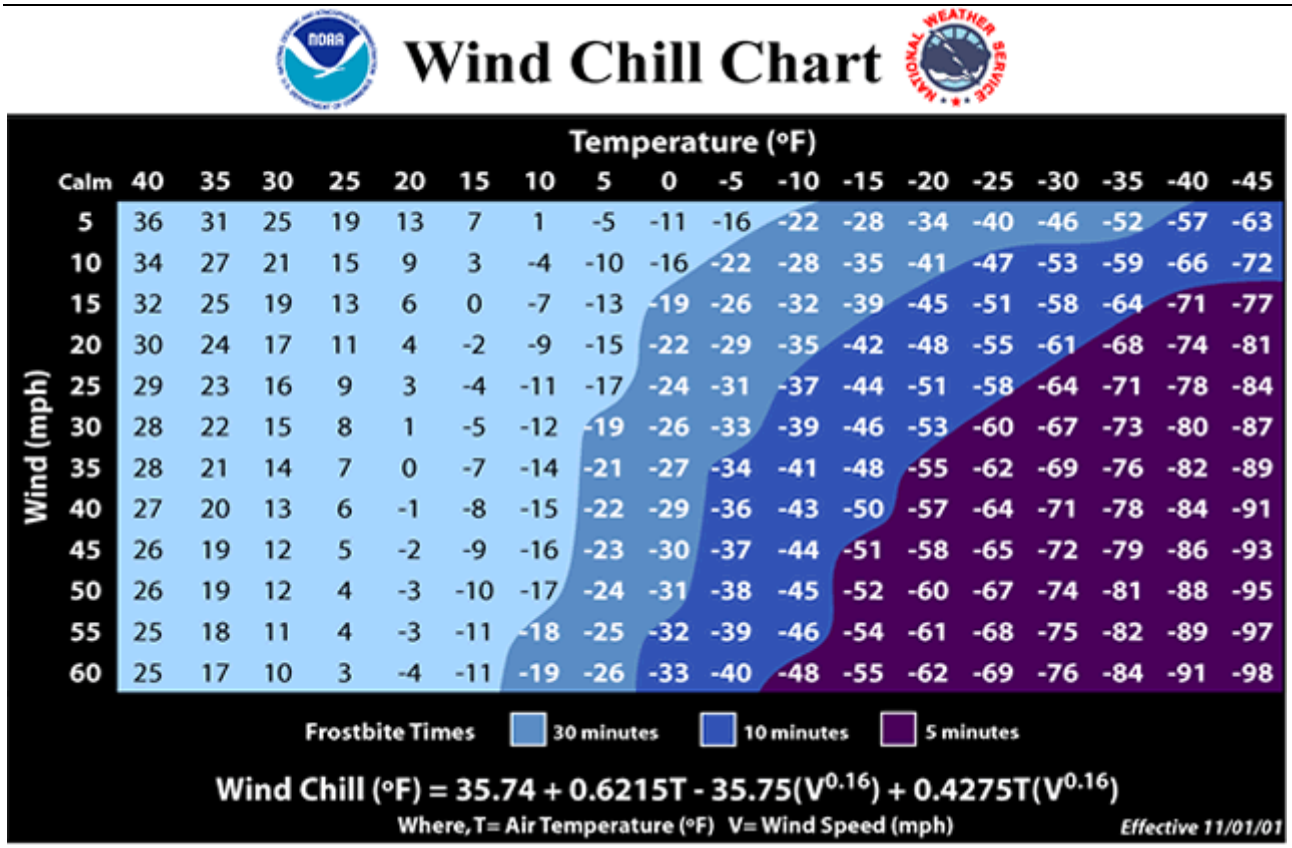
Figure 3.19 Heat Index (HI) Chart



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

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

Figure 3.20 Wind Chill Chart



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

Previous Occurrences

The National Climatic Data Center (NCDC) maintains a storm event database which contains all recorded storm event in the State of Missouri. NCDC's storm event database does not contain any records specific to McDonald County. Therefore two nearby counties (Jasper and Taney Counties) were selected as a representative of Southwest Missouri. NCDC's storm event database contains records of 5 events reported for Southwest Missouri between 05/01/1986 and 07/31/2016 (30 years).

In 1999, periodic excessive heat continued from July into early and mid-August with temperatures exceeding 95 deg F on 8 (nonconsecutive) days. Daytime heat index values frequently reached 100°F or greater.

In 2000, a prolonged period of excessive heat continued from late August into early September for Central, Southcentral, and Southwest Missouri. Afternoon temperature averaged around 100 degrees for the first three days of September. These record high temperatures were about 15 to 20 degrees

above normal.

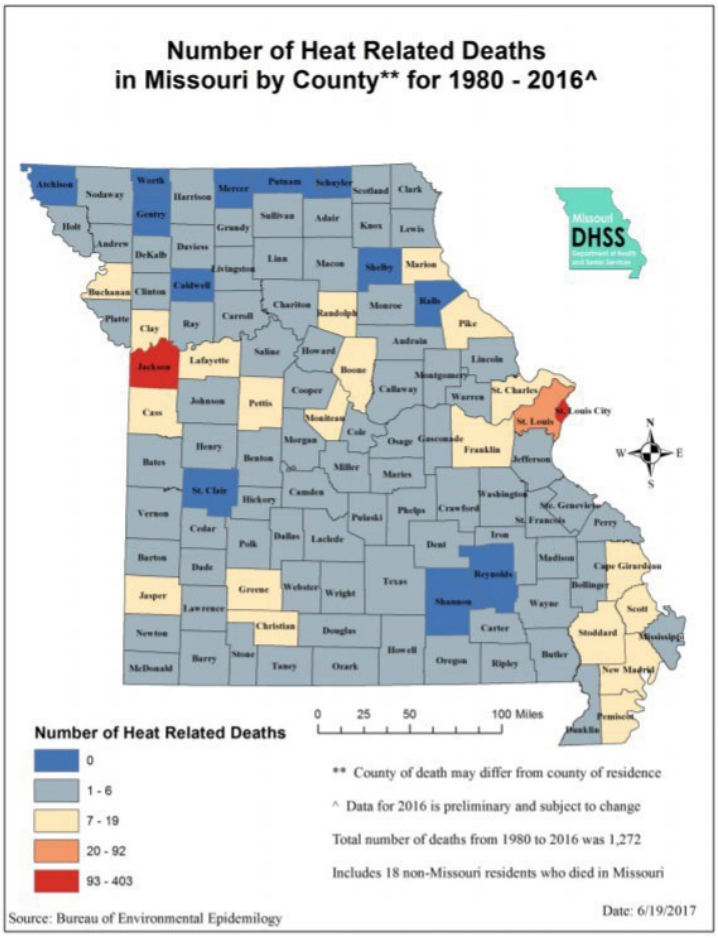
In 2001, during the middle of July a large area of high pressure began to build over the Central United States. It held together through the last week of July with a brief period of cloud cover and shower activity around the 26, 27 and 28 of the month. Temperatures rose into the 90's with a few 100's in southeast Kansas and portions of southwest and west central Missouri. The high temperatures combined with increased humidity levels to produce very high heat indices of 100 to 110 degrees continuing into the first week of August for 9 consecutive days.

In 2011, a persistent area of high pressure and an upper level ridge over the region allowed temperatures to climb into the lower 100s with heat index values around 110 degrees. Regional temperatures during August averaged 2-4 degrees above normal over southwestern Missouri. The hottest day of the summer occurred on August 2 when triple digit heat impacted much of the state. Numerous locations, especially across West- central and Southwestern sections, witnessed their hottest temperatures in more than 25 years. Some high temperature records across the Southwest Missouri region ranged from 108°F to 113°F.

In 2012, a strong ridge of high pressure settled over the central portions of the U.S. beginning in June and became the dominant weather pattern for much of the Summer of 2012. High temperatures reached over 100 degrees at the end of June and this weather pattern continued until after the first week of August when temperatures became more seasonable. The hottest temperatures reached 106°F-107°F during the first week of August. Heat advisories and warnings were issued for the area by the end of June and continued through the first week of August. Even though air temperatures were extreme, the humidity levels were relatively dry causing the heat index to be closer to the actual air temperatures.

During all of the extreme heat events listed above, numerous heat related illnesses, deaths, and agricultural losses were recorded across Southwest Missouri. NCDC's storm event database does not contain any records specific to McDonald County. However, the map (**Figure 3.20)** by the Missouri Department of Health and Senior Services Bureau of Environmental Epidemiology shows that between 2000 and 2013 there were 1-3 heat related deaths in McDonald County.

Figure 3.21 Heat Related Deaths in Missouri 2000 - 2016



Source: *https://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/stat-report.pdf*

Based on the five recorded extreme heat events in Southwest Missouri during the past 30 year period (1986-2016), the future probability for an extreme heat event in McDonald County is 16.67%. This number may be less reflective of reality and more symptomatic of data limitations, such as underreporting in the NCDC data.

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 2019 were $4,329,946,533. 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, 1 death was 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.

Probability of Future Occurrence

The probability that an extreme heat event will occur in McDonald County in any given year is .05% or once every 20 years this equates to dividing the number of events (1) by the number of years in

the sample set (20.The events recorded in the NCEI database describe prolonged periods where temperatures rose above at least 90 degrees for at least twelve consecutive days. Heat advisories and warnings are issued for shorter periods of extreme heat nearly every year and may not meet the threshold for consecutive days in the NCEI database. This data limitation indicates that extreme heat events could be underreported in the NCEI.

Changing Future Conditions Considerations

Across the globe, hot days are getting hotter and more frequent, while we're experiencing fewer cold days. Over the past decade, daily record temperatures have occurred twice as often as record lows across the continental United States, up from a near 1:1 ratio in the 1950s. Heat waves are becoming more common, and intense heatwaves are more frequent in the U.S. West, although in many parts of the country the 1930s still holds the record for number of heat waves (caused by the Dust Bowl and other factors).

By midcentury, if greenhouse gas emissions are not significantly curtailed, the coldest and warmest daily temperatures are expected to increase by at least 5 degrees F in most areas by mid-century rising to 10 degrees F by late century. The National Climate Assessment estimates 20-30 more days over 90 degrees F in most areas by mid-century. A recent study projects that the annual number of days with a heat index above 100 degrees F will double, and days with a heat index above 105 degrees F will triple, nationwide, when compared to the end of the 20th century.

Center for Climate and Energy Solutions

Vulnerability

Vulnerability Overview

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

Table 3.33 Typical Health Impacts of Extreme Heat

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

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

Potential Losses to Existing Development

Based on the information in the 2018 State Plan, NCEI and DHSS, there has been one heat related deaths to have occurred in Jasper County in the past 22 years and zero heat related deaths in Newton County. Despite the few heat-related fatalities, it is clear that extreme heat is one of the most dangerous events that could affect the planning area and proper measures should be in place when the county is exposed to a heat wave.

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.

There are currently no planned areas of future development in McDonald County. However, as discussed in section 3.3 Future Land Use and Development, there has been a recent increase in housing units which could be an indication of future population growth. Based on this data, there are three cities that are most likely to experience future population growth: Anderson, Jane, and Pineville.

Hazard Summary by Jurisdiction

Those at greatest risk for heat-related illness and deaths include children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. To determine jurisdictions within the planning area with populations more vulnerable to extreme heat, demographic data was obtained from the 2010 census on population percentages in each jurisdiction comprised of those under age 5 and over age 65.Data was not available for overweight individuals and those on medications vulnerable to extreme heat. Table 3.35 below summarizes vulnerable populations in the participating jurisdictions. Note that school and special districts are not included in the table because students and those working for the special districts are not customarily in these age groups.

Table 3.34 McDonald County Population under Age 5 and Over Age 65, 2019 Census Data

Jurisdiction	Population Under 5 yrs.	Population 65 yrs. and over
McDonald County	7.33 %	12.51 %
Anderson	8.16 %	15.20 %
Goodman	10.02 %	13.14 %
Jane	No data	No data
Lanagan	6.92 %	13.84 %
Noel	11.03 %	6.93 %
Pineville	9.61 %	13.15 %
Southwest City	10.93 %	7.73 %

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

Problem Statement

All areas of McDonald County are at equal risk to the hazards of extreme heat –however, those with larger numbers of children and elderly among the population may be more vulnerable.

3.4.7 Severe Thunderstorms Including High Winds, Hail, and Lightning

Some Specific Sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.8, Page 3.280 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf**
- FEMA 320, Taking Shelter from the Storm, 3rd edition, http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf
- Lightning Map, National Weather Service, 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
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Average annual high wind events by County
  - Average annual hail events by County
  - Average annual lightning events by County
  - Vulnerability to severe thunderstorm events by County
  - Annualized property loss for high wind events by County
  - Annualized property loss for hail events by County
  - Annualized property loss for lightning events by County
  - Annualized property loss ratio for high wind events by County
  - Annualized property loss ratio for hail events by County
  - Annualized property loss ratio for lightning events by County
- MSDIS Structure Inventory and All Hazard Risk Dataset
  (available in both GIS and Excel format)
  https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

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.

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

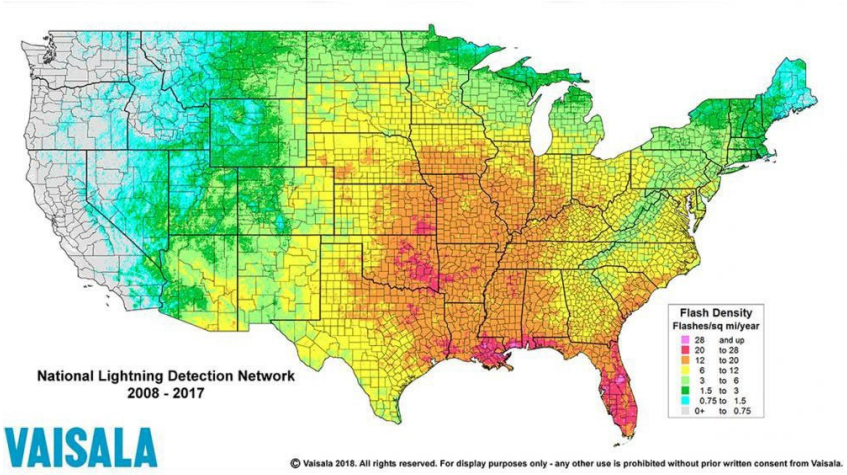
According to the National Oceanic and Atmospheric Administration (NOAA), hail is precipitation that is formed when thunderstorm updrafts carry raindrops upward into extremely cold atmosphere causing them to freeze. The raindrops form into small frozen droplets. They continue to grow as they come into 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

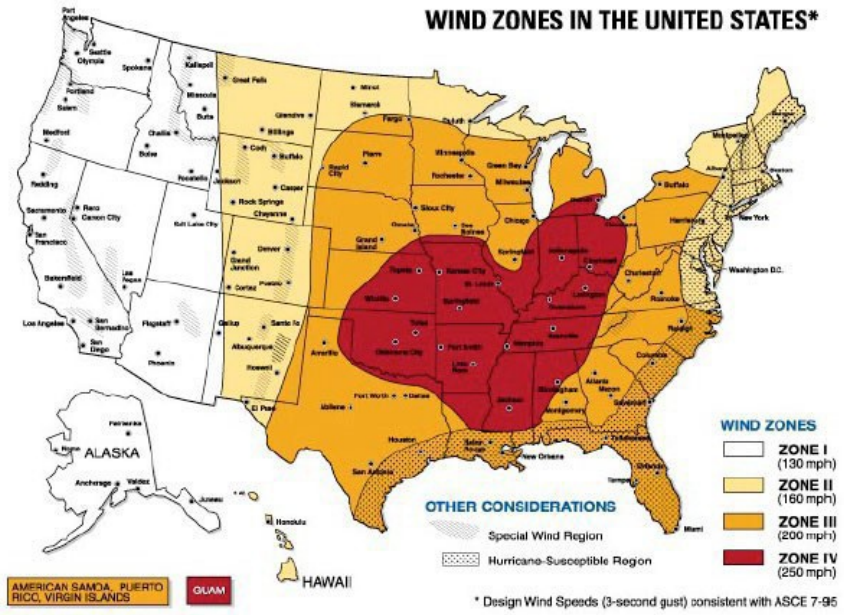
Thunderstorms/high winds/hail/lighting events are an area-wide hazard that can happen anywhere in the county. Although these events occur similarly throughout the planning area, they are more frequently reported in the incorporated communities. In addition, damages are more likely to occur in more densely developed parts of the county. Figure 3.18 shows lightning frequency in the state. Jasper/Newton County is located in the 6 to 8 flash density zone on the map.

Figure 3.33 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 3.34 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

Strength/Magnitude/Extent

Based on information provided by the Tornado and Storm Research Organization (TORRO), below

Table 3.35 Tornado and Storm Research Organization Hailstorm Intensity Scale

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

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

Table 3.35 shows NCEI reported thunderstorm events and damages in McDonald County for the

"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.

The tables below (**Table 3.35 through Table 3.38**) summarize past crop damages as indicated by crop insurance claims. The tables illustrate the magnitude of the impact on the planning area's agricultural economy.

Based on the data available crops are not a staple in McDonald County. Table 3.33 displays property damage in lieu of crop damage.

The tables below **(3.36 through 3.37)** summarize past crop damages as indicated by crop insurance claims. The tables illustrate the magnitude of the impact on the planning area's agricultural economy

Table 3.36 Crop Insurance Claims Paid in McDonald County from Rain, 2017-2021

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2021	Wheat	Excess Moisture/Precip/ Rain	1,832.00
2020	Wheat	Excess Moisture/Precip/ Rain	4613.00
2019	All Other Crops	Excess Moisture/Precip/ Rain	7134.58
2018	All Other Crops	Excess Moisture/Precip/ Rain	2,122,00
2017	wheat	Excess Moisture/Precip/ Rain	22,203.77
Total			247,983.35

Source: USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/data/cause

Table 3.37 Crop Insurance Claims Paid in McDonald County from Flooding, 2017-2021

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2021	Pasture	Flooding	20,100.00
2020	All other Crops	Flooding	1,794.68
2019	All other Crops	Flooding	782.00
2018	Wheat	Flooding	2,050.57
2017	Corn	Flooding	10,650.34
Total			35,377.59

Source: USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/data/cause

Probability of Future Occurrence

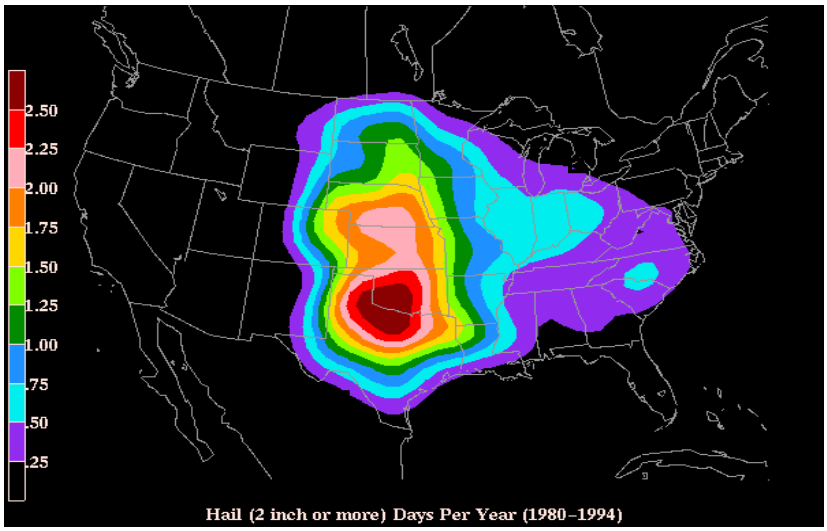
Thunderstorm Winds: There have been 33 events in a 10 year period, indicating a 100% chance ofthunderstorm winds occurring in the future

Hail: There have been 39 events in a 10 year period, indicating a 100% chance of hail occurring inthe future.

Lightning: There is insufficient data recorded to postulate future probability. Limitations to the use of NCDC reported lightning events include the fact that only lightning events that result in fatality, injuryand/or property and crop damage are in the NCEI.

Figure 3.24 is based on hailstorm data from 1980-1994 and shows the probability of hailstormoccurrence (2" diameter or larger) based on number of days per year. McDonald County has a 1.25 to
1.5 percent probability of experiencing hail of 2 inches or greater.

Figure 3.24 Annual Hailstorm Probability (2'' diameter or larger), U 1980- 1994



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

Changing Future Conditions Considerations

NASA's Earth Observatory provides an analysis on how climate change could, theoretically, increase potential storm energy by warming the surface and putting more moisture in the air through evaporation. The presence of warm, moist air near the surface is a key ingredient for summer stormsthat meteorologists have termed "convective available potential energy," or CAPE. With an increase in CAPE, there is greater potential for cumulus clouds to form. The study also counters this theory with the theory that warming in the Arctic could lead to less wind shear in the mid-latitude areas

Prone to summer storms, making the storms less likely. Predicted increases in temperature could help create atmospheric conditions that are fertile breeding grounds for severe thunderstorms and tornadoes in Missouri. Possible impacts include an increased risk to life and property in both the public and private sectors. Public utilities and manufactured housing developments will be especially prone to damages. Jurisdictions already affected should be prepared for more of these events, and should thus prioritize mitigation actions such as construction of safe rooms for vulnerable populations, retrofitting and/or hardening existing structures, improving warning systems and public education, and reinforcing utilities and additional critical infrastructure

Vulnerability

Vulnerability Overview

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

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

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

Potential Losses to Existing Development

Table 3.37. Thunderstorm Events in McDonald County 2006-2016

Housing Units/Sq. Mi.	Total Building Exposure $	Crop Exposure (2007Census of Ag.) $	Social Vulnerability Index(1-5)
18.4	2,789,835,000	2,490,000	1

Source: 2018 Missouri State Hazard Mitigation Plan

Based on historical losses and frequency of previous thunderstorm events there issignificant potential for losses to existing development.

Previous and Future Development

Additional development results in the exposure of more households and businesses vulnerable

to damages from severe thunderstorms/ high winds/lightning/hail. There are no planned areas of development in McDonald County; however there has been a recent increase in housing units throughout the county primarily in Anderson, Jane, and Pineville (**Section 3.3**).

Hazard Summary by Jurisdiction

Although thunderstorms/high winds/lightning/hail events are area-wide, there may be demographics indicating higher losses in one jurisdiction as compared to another. Include information about jurisdictions with high percentages of housing built before 1939, as shown in census data. Note any other construction or demographic differences that could indicate higher losses in one community. Include data about school and special district assets indicating previous losses, including information from the Data Collection Questionnaire.

Thunderstorms/high winds/lightning/hail events are area-wide. However, larger communities with more development and communities with a higher percentage of older homes (built before 1939) may be more at risk for significantly higher losses to existing development. In McDonald County the largest communities by population and development include Anderson, Goodman, and Noel. The communities with the highest percent of older homes (built prior to 1939) include Noel and Southwest City. **Table 3.35** shows population, housing units, percentage of older homes, and percentage of mobile homes byjurisdiction. The data in this table is also relevant for the tornado hazard which is discussed in (3.10).

Table 3.38. Population and Housing by Jurisdiction

Jurisdiction	Census 2010	Housing Units 2014	Percent Older Home (built prior to 1939)	Percentage Mobile Homes
Anderson	1,961	990	15%	6.8%
Goodman	1,248	532	11.5%	11.1 %
Jane	309	191	10.5%	56%
Lanagan	419	228	15.4%	12.3%
Noel	1,832	717	20.4%	2.1%
Pineville	791	455	13.2%	18.9%
Southwest City	970	392	19.6%	12.2%

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. Retrofitting school district facilities with protective filming of windows and installation of blast proof doors will provide more protection for students and staff at school facilities. Additional warnings and alerts will also provide the public and schools more time to take cover during high wind events. Education and hazard awareness programs in public schools would also increase public safety in the event of severe thunderstorm events.

3.4.8 Severe Winter Weather

Some specific sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.9, Page 3.321**
  https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- 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 Centers for Environmental Information, Storm Events Database, http://www.NCEI.noaa.gov/stormevents/
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Average annual severe winter weather events by County
  - Vulnerability to severe winter weather events by County
  - Annualized property loss for severe winter weather events by County
  - Annualized property loss for severe winter weather events by County
- MSDIS Structure Inventory and All Hazard Risk Dataset
  (available in both GIS and Excel format)
  https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

Hazard Profile

Hazard Description

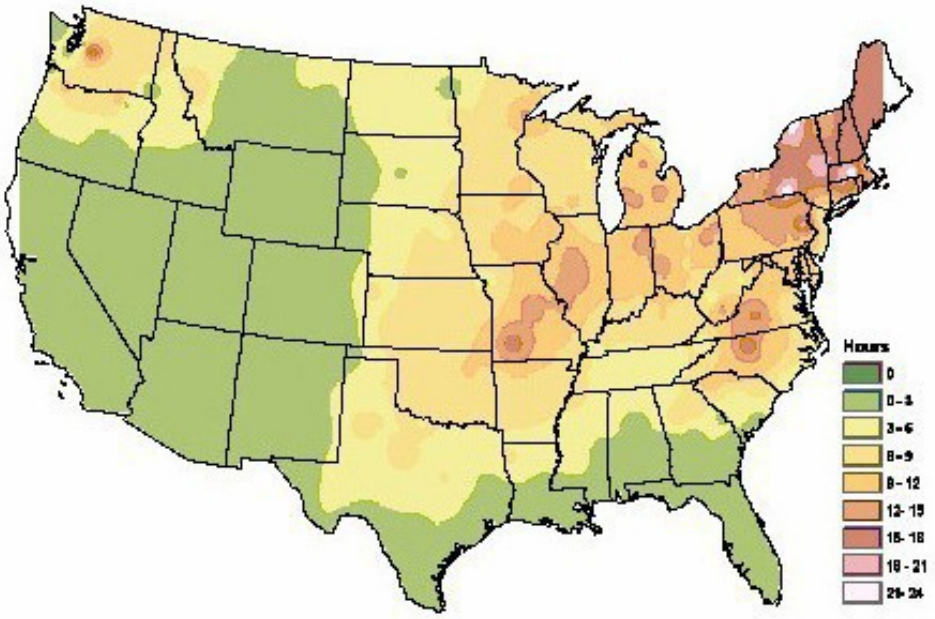
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows.

- **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 3.25** shows freezing rain zones in the United States, these zones are defined by the number of hours per year with freezing rain. McDonald County in the far southwest corner of Missouri is expected to experience12 to 15 hours of freezing rain annually.

Figure 3.25 NWS Statewide Average Number of Hours per Year with Freezing Rain



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

Strength/Magnitude/Extent

Severe winter storms include heavy snowfall, ice, and strong winds which can push the wind chill well below zero degrees in the planning area.

For severe weather conditions, the National Weather Service issues some or all of the following products as conditions warrant across the State of Missouri. NWS local offices in Missouri may collaborate with local partners to determine when an alert should be issued for a local area.

- Winter Weather Advisory — winter weather conditions are expected to cause significant inconveniences and may be hazardous. If caution is exercised, these situations should not become life threatening. Often the greatest hazard is to motorists.
- Winter Storm Watch — severe winter conditions, such as heavy snow and/or ice are possible within the next day or two.
- Winter Storm Warning — severe winter conditions have begun or are about to begin.
- Blizzard Warning — Snow and strong winds will combine to produce a blinding snow (near zero visibility), deep drifts, and life-threatening wind chill.
- Ice Storm Warning -- Dangerous accumulations of ice are expected with generally over one quarter inch of ice on exposed surfaces. Travel is impacted, and widespread downed trees

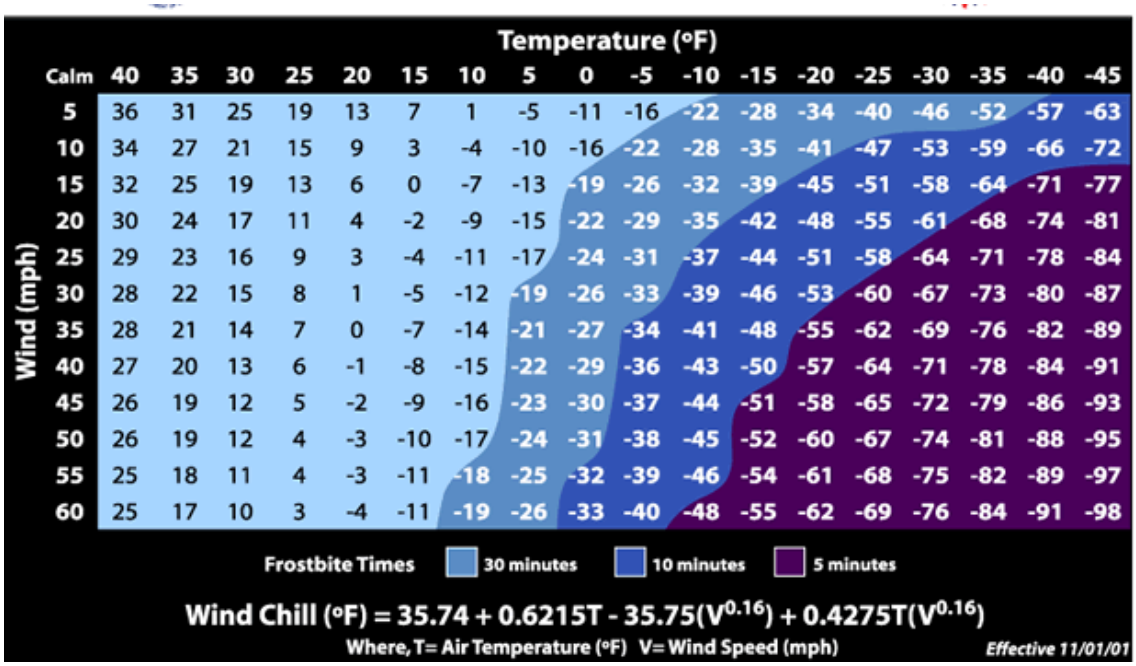
and power lines often result.

- Wind Chill Advisory -- Combination of low temperatures and strong winds will result in wind chill readings of -20 degrees F or lower.
- Wind Chill Warning --Wind chill temperatures of -35 degrees F or lower are expected. This is a life-threatening situation.

Previous Occurrences

Table 3.36 shows all NCEI reported winter storm events in McDonald County over the past 20 years. Event that occurred on the same day have been combined.

Figure 3.26. Wind Chill Chart



Source: National Weather Service, http://www.nws.noaa.gov/om/winter/windchill.shtml

Table 3.39 NCEI McDonald County Winter Weather Events Summary, 1997-2021

Type of Event	Inclusive Dates	Description	Property Damages	Crop Damages
Heavy Snow	1/8/1997-1/9/1997	6+ inches snow	5.0 K	0
Winter Storm	12/20/1998-12/21/1998	freezing rain, freezing drizzle, light snow	0	0
Heavy Snow	3/13/1999-3/14/1999	14-16 inches snow	50.0 K	0
Extreme Cold/Wind Chill	12/12/2000-12/31/2000	10-20 degrees below normal	0	50.0 K
Heavy Snow	12/12/2000-12/13/2000	Up to 14 inches snow with some sleet and freezing rain mixed in	25.0 K	0
Winter Storm	12/25/2000-12/26/2000	Snow, sleet, and freezing rain	0	0
Extreme Cold/Wind Chill	1/1/2001-1/3/2001	10-20 degrees below normal	0	0
Ice Storm	2/21/2001	Up to 2 inches ice accumulation	0	0
Winter Storm	3/2/2002	Snow and ice	0	0
Heavy Snow	12/24/2002	5-8 inches snow	0	0
Heavy Snow	2/23/2003	6-12 inches snow	0	0
Heavy Snow	12/10/2001	5-8 inches snow	0	0

Winter Storm	11/30/2006	Freezing rain, sleet, heavy snow	0	0
Ice Storm	1/12/2007-1/14/2007	NW half of McD. Co.1-1.5 inches ice; SE half McD. Light ice	100.0 K	0
Winter Storm	1/20/2007	freezing rain, sleet, snow	0	0
Ice Storm	12/9/2007-12/10/2007	.25-.75 inch ice	20.0 K	0
Winter Storm	1/31/2008	4-7 inches sleet, snow	0	0
Winter Storm	1/26/2009-1/28/2009	.25 inches ice, 3-5 inches sleet and snow	0	0
Winter Storm	12/24/2009-12/25/2009	Freezing rain, sleet, 3-6 inches snow	0	0
Heavy Snow	1/28/2010-1/29/2010	5-7 inches snow	0	0
Winter Storm	3/20/2010	Sleet, freezing rain, 2-5 inches snow	0	0
Blizzard	2/1/2011	Up to 1 inch sleet followed by 14-20 inches snow, NW winds 20-40 mph, drifts up to a few feet, visibility less than .25 mi	60.0 K	0
Winter Storm	2/21/2013	Freezing rain, sleet	0	0
Winter Storm	12/5/2013-12/6/2013	6-10 inches snow, light sleet and ice	0	0
Winter Storm	12/20/2013-12/22/2013	Freezing rain, light snow	0	0
Winter Storm	3/2/2014-3/3/2014	.5-1 inch sleet, 4-7 inches snow	0	0
Heavy Snow	2/15/2015-2/16/2015	4-6 inches snow	0	0
Winter Weather	12/13/2020	1-5 inches snow	0	0
Winter Weather	2/09/2021	1-5 inches snow	0	0
Extreme Cold/Wind Chill	2/14/2021	4-6 inches snow	0	0
Winter Weather	2/14/2021	4-6 inches snow	0	0
Winter Weather	2/16/2021	4-6 inches snow	0	0
Totals				
32 Winter Storm Events			335.0 K	50.0 K

Source: NCDC, data accessed 06/14/2021

Heavy Snow

According to the NOAA Weather event database, there was only 1 event of heavy snow. On 2/5/2020 a complex winter storm began as light precipitation in the form of rain and freezing rain. However, as colder temperatures moved into the region a heavy snow fell from southeast Kansas into central Missouri, where 2to 5 inches of snow fell, with some locally higher amounts of 6 inches. Widespread reports of two to four were received around the county.

Blizzards

According to NOAA here are no recorded blizzard events in McDonald County from2010-2020.

Cold/Wind, Extreme Cold

According to NOAA there are no recorded cold wind or extreme cold events in McDonald County from 2010-2020

Ice Storms, Sleet

According to NOAA there are no recorded Ice storms or sleet events in McDonald County from 2010-2020

Of the 13 events listed in the NCEI data, 2 were Heavy Snow events, and the remainder term generally as “Winter Storm”. There are no reported deaths, injuries, or crop damage associated with these winter weather events.

Probability of Future Occurrence

There have been 27 winter storm events in the past 20 year period indicating a 100% chance of a winter storm event occurring in any given year.

Changing Future Conditions Considerations

A shorter overall winter season and fewer days of extreme cold may have both positive and negative indirect impacts. Warmer winter temperatures may result in changing distributions of native plant and animal species and/or an increase in pests and non-native species. Warmer winter temperatures will result in a reduction of lake ice cover. Reduced lake ice cover impacts aquatic ecosystems by raising water temperatures. Water temperature is linked to dissolved oxygen levels and many other environmental parameters that affect fish, plant, and other animal populations. A lack of ice cover also leaves lakes exposed to wind and evaporation during a time of year when they are normally protected. As both temperature and precipitation increase during the winter months, freezing rain will be more likely. Additional wintertime precipitation in any form will contribute to saturation and increase the risk and/or severity of spring flooding. A greater proportion of wintertime precipitation may fall as rain rather than snow.

Vulnerability

Vulnerability Overview

Heavy snow can bring a community to a standstill by inhibiting transportation (in whiteout conditions), weighing down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make transportation difficult and hazardous. Ice can also become a problem on roadways if the air temperature is high enough that precipitation falls as freezing rain rather than snow.

Buildings with overhanging tree limbs are more vulnerable to damage during winter storms when

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

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.

Potential Losses to Existing Development

NCEI reflects property damage totaling $335,000 over 20 years. Under-reporting and other data limitations may have caused this figure to be low, but the fact remains that most damages associate with severe winter weather involve automobile accidents and injuries incurred as people try to travel through the winter environment or compensate for the low temperatures, rather than directly being a result of the winter weather. Potential losses in McDonald County due to severe winter weather are on the low side, comparative to the damages that may accompany hazard events like tornados and hail storms.

Previous and Future Development

There is little anticipated future development in McDonald County. Therefore, estimating the impacts of future winter storm events on future development is not feasible.

Hazard Summary by Jurisdiction

Severe winter weather affects all jurisdictions equally.

Problem Statement

McDonald County does have some vulnerability to severe winter weather, particularly in regards to transportation concerns. Excessive snowfall, sleet, ice, and freezing rain can overwhelm road crews, hamper emergency response, and bring commerce to a temporary halt.

3.4.9 Tornado

Some specific sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.10, Page 3.355 https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf**
- NWS Enhanced F Scale for Tornado Damage including damage indicators and degrees of damage www.spc.noaa.gov/faq/tornado/ef-scale.html;
- Tornado Activity in the U.S. map (1950-2006), FEMA 320, Taking Shelter from the Storm, 3rd edition; https://www.fema.gov/fema-p-320-taking-shelter-storm-building-safe-room-your-home-or-small-business
- Tornado Alley in the U.S. map, http://tornadochaser.com/education/tornado-alley/
- National Centers for Environmental Information, http://www.NCEI.noaa.gov/stormevents/
- Tornado History Project, map of tornado events, http://www.tornadohistoryproject.com/tornado/Missouri
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Number of Tornadoes by County
  - Percentage of Mobile Homes in 2015 by County
  - Average annual tornado events by County
  - Vulnerability to tornado events by County
  - Annualized property loss for tornado events by County
  - Annualized property loss for tornado events by County
- MSDIS Structure Inventory and All Hazard Risk Dataset
  (available in both GIS and Excel format)
  https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

Hazard Profile

Hazard Description

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. The unique geography of the central United States allows for the development of thunderstorms that spawn tornadoes. The jet stream, which is a high-velocity stream of air, determines which area of the central United States will be prone to tornado development. The jet stream normally 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.

Tornadoes spawn from the largest thunderstorms. The associated cumulonimbus clouds can reach heights of up to 55,000 feet above ground level and are commonly formed when Gulf air is warmed by solar heating. The moist, warm air is overridden by the dry cool air provided by the jet stream. This

cold air presses down on the warm air, preventing it from rising, but only temporarily. Soon, the warm air forces its way through the cool air and the cool air moves downward past the rising warm air. This air movement, along with the deflection of the earth's surface, can cause the air masses to start rotating. This rotational movement around the location of the breakthrough forms a vortex, or funnel. If the newly created funnel stays in the sky, it is referred to as a funnel cloud. However, if it touches the ground, the funnel officially becomes a tornado.

A typical tornado can be described as a funnel-shaped cloud that is "anchored" to a cloud, usually a cumulonimbus that is also in contact with the earth's surface. 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

Tornadoes can occur anywhere in McDonald County.

Strength/Magnitude/Extent

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

Tornado magnitude is classified according to the EF- Scale (or the Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF-Scale (see **Table 3.37**) 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 3.40 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 3.28**. 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 3.41 Enhanced Fujita Scale with Potential Damage

Enhanced Fujita Scale			
Scale	Wind Speed (mph)	Relative Frequency	Potential Damage
EF0	65-85	53.5%	Light. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e. those that remain in open fields) are always rated EF0).
EF1	86-110	31.6%	Moderate. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	10.7%	Considerable. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes complete destroyed; large trees snapped or uprooted; light object missiles generated; cars lifted off ground.
EF3	136-165	3.4%	Severe. Entire stores of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some
EF4	166-200	0.7%	Devastating. W ell-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

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

Table 3.42 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 NCDC. Also, a tornado that lifts off the ground for less than 5 minutes or 2.5

miles is considered a separate segment. If the tornado lifts off the ground for greater than 5 minutes or 2.5 miles, itis considered a separate tornado. Tornadoes reported in Storm Data and the Storm Events Database are in segments.

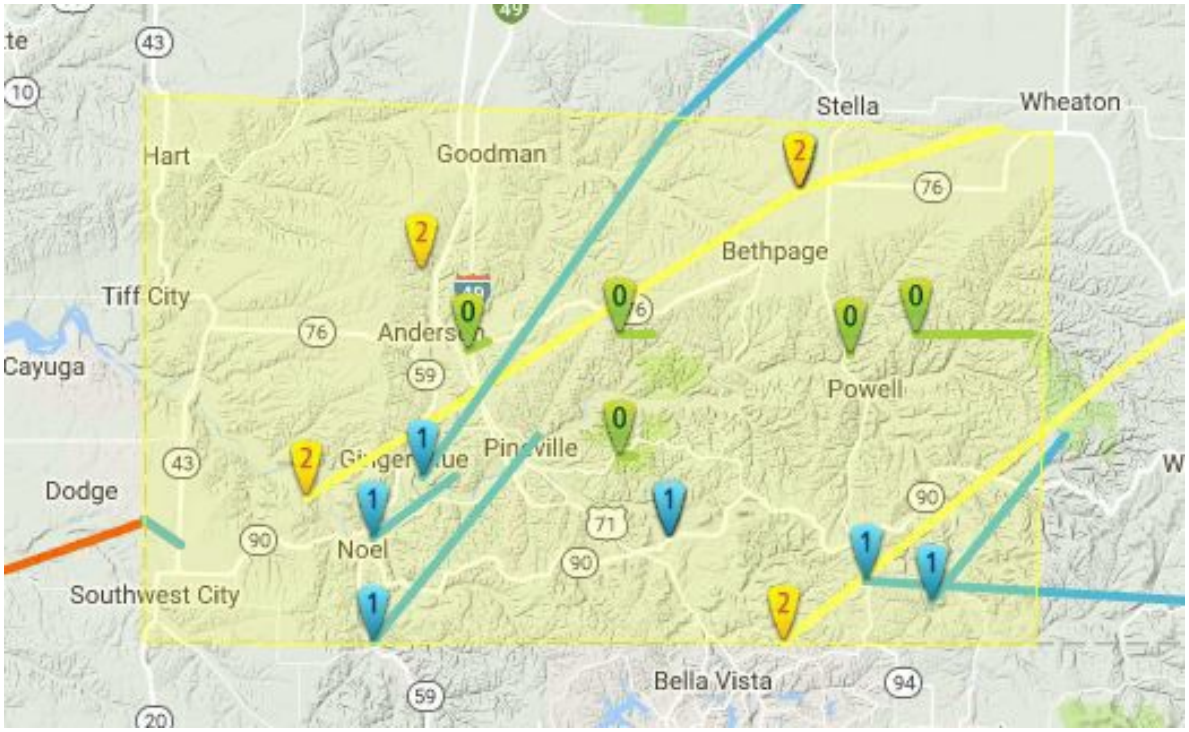
Table 3.42 Recorded Tornadoes in McDonald County, 1993 – Present

Date	Beginning	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
10/8/1993	Noel	W of Pineville	4	180	1	0	0	5.0 K	0
10/8/1993	Longview	Rocky Comfort	7	220	2	0	0	500.0 K	0
5/26/1996	Powell	Powell	4	200	0	0	0	5.0 K	0
1/7/2008	E of Pineville	E of Pineville	.25	20	0	0	0	0	0
1/7/2008	Mountain	Mountain	5.49	100	1	0	0	300	0
6/28/2008	NE of Pineville	NE of Pineville	1.38	250	1	0	2	25.0 K	0
12/27/2008	Powell	Powell	.27	25	0	0	0	0	0
5/11/2011	Anderson	Anderson	.79	75	0	0	0	10.0 K	0
5/22/2011	Southwest City	Southwest City	1.43	880	3	0	2	1.0 M	0
4/2/2015	Mountain	Mountain	5.56	100	1	0	0	10.0 K	0
04/04/2017	Goodman	Goodman			1	0	0	1.0 M	0
05/18/2017	Caverna	Caverna			1	0	0	100.0 K	0
05/19/2017	May	May			1	0	0	50.0 K	0
04/30/2019	Sincoe	Sincoe			1	0	0	50.0 K	0
05/22/2019	Ginger Blue	Ginger Blue			1	0	0	0	0

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

Figure 3.27 shows historic tornado paths in McDonald County. This map includes all recorded tornadoes from 1950 to the present.

Figure 3.27 McDonald County Map of Historic Tornado Events



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

Probability of Future Occurrence

NCEI data shows that there have been 10 tornadoes in McDonald County in a 23 year time period. Indicating there is a 43.5% probability of a tornado of any magnitude occurring in any given year.

Changing Future Conditions Considerations

Tornadoes have been recorded all over the world, but the United States experiences around a thousand of them each year, which is far more than anywhere else on the planet. Most of these occur in "Tornado Alley," an area of the Great Plains region, where the atmospheric conditions are just right for massive, tornado- spawning thunderstorms. The resulting tornadoes leave a trail of destruction in their wake, often with deadly consequences Scientists agree that the climate is changing, and humans are responsible. The burning of fossil fuels, such as coal, oil, and gas, releases huge amounts of carbon dioxide (CO_2) into the atmosphere every year, which is leading to a rise in global temperatures, known as global warming.

Global warming is just one symptom of the larger problem of climate change. Climate change has also caused an increase in extreme weather events all over the world.

Vulnerability

Vulnerability Overview

It is clear, there have been changes in tornado patterns in recent years. Research has shown that there are fewer days with at least one tornado but more days with over thirty, even as the total number of tornadoes per year has remained relatively stable. In other words, tornado events are becoming more clustered.

There is also evidence to suggest that tornado patterns have shifted geographically. The number of tornadoes in the states that make up Tornado Alley are falling, while tornado events have been on the rise in the states of Mississippi, Alabama, Arkansas, Missouri, Illinois, Indiana, Tennessee, and Kentucky.

Figure 3.28 Tornado Alley in the U.S.

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

Potential Losses to Existing Development

Bearing in mind the relatively sparse population density in McDonald County and a historical record involving EF-3 and weaker tornadoes, the potential for losses to existing development in McDonald County does exist but is far greater in communities (where building density is higher) than in the unincorporated areas of the County, especially in the context of critical facilities such as schools, daycares, healthcare facilities, nursing homes, etc. which are located within McDonald County's communities.

Previous and Future Development

There is not much anticipated in terms of future development in McDonald County which would result in significant increase in population in terms of increased exposure to damage.

Hazard Summary by Jurisdiction

A tornado event could occur anywhere in the McDonald County; however some jurisdictions would suffer heavier damages because of the high concentration of structures. These areas are also where critical facilities such as schools, etc. are located. Furthermore, communities with a higher percentage of older homes (built prior to 1939) and mobile homes have an increased risk of suffering heavier damages during a tornado.

Problem Statement

Tornados can and have occurred in McDonald County, and they are more or less completely random. The risk of tornado is the same for all parts of the county, but the vulnerability of damage is greater in those areas where people and structures are concentrated in higher numbers.

3.4.10 Wildfire

The specific sources for this hazard are:

- **2018 Missouri State Hazard Mitigation Plan, Chapter 3, Section 3.3.11, Page 3.390**
  https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
- Missouri Department of 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
- Fire wise, www.firewise.org
- University of Wisconsin Slivis Lab, http://silvis.forest.wisc.edu/maps/wui/2010/download
- Missouri Hazard Mitigation Viewer
  http://bit.ly/MoHazardMitigationPlanViewer2018 - Website
  https://drive.google.com/file/d/1bPkc0jgF9ofwQLnTL9N0u-oPFWi9hkst/view - User Guide
  - Likelihood of Occurrence of wildfire by County
  - Average annual land burned (acres) by County
  - Number of structures located within the WUI Interface/Intermix Area
  - Population located within the WUI Interface/Intermix Area
  - Potential loss, average annual land burned by County
- MSDIS Structure Inventory and All Hazard Risk Dataset
  (available in both GIS and Excel format)
  https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM

Hazard Profile

Hazard Description

The fire incident types for wildfires include: 1) natural vegetation fire, 2) outside rubbish fire, 3) special outside fire, and 4) cultivated vegetation, crop fire.

The 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.

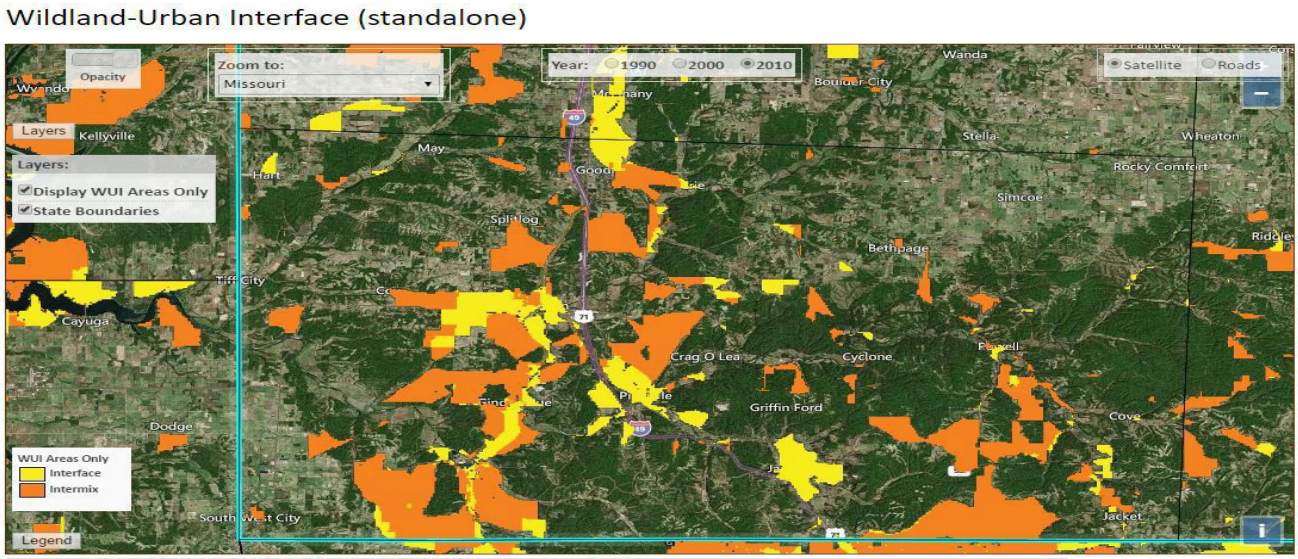
Most of Missouri fires occur during the spring season between February and May. The length and severity of wildland fires depend largely on weather conditions. Spring in Missouri is usually characterized by low humidity and high winds. These conditions result in higher fire danger. In addition, due to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

year is fall. Depending on the weather conditions, a sizeable number of fires may occur between mid-October and late November.

Geographic Location

The risk of wildfires is 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. **Figure 3.29** shows the WUI areas in McDonald County. 16 percent of land in McDonald County is classified as WUI with the majority of WUI in or near the cities of Goodman, Anderson, Pineville, Lanagan, Noel, and Jane. These areas have a higher risk of experiencing wildfires.

Figure 3.40. Wildland-Urban Interface Areas in McDonald County



Summary Statistics (2010 only) USA State County

McDonald County, Missouri

	AREA		POPULATION		HOUSING	
	Sq km	%	Total	%	Total	%
NonWUI:	1,168	84	11,515	50	4,905	23
WUI:	230	16	11,568	50	5,020	51
Interface:	60	4	5,320	23	2,766	28
Intermix:	169	12	6,248	27	2,254	49
Total:	1,398	100	23,083	100	9,925	100

Strength/Magnitude/Extent

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

Wildland fires in Missouri have been mostly a result of human activity rather than lightning or some other natural event. Wildfires in Missouri are usually surface fires, burning the dead leaves on the

ground or dried grasses. They do sometimes “torch” or “crown” out in certain dense evergreen stands like eastern red cedar and shortleaf pine. However, Missouri does not have the extensive stands of evergreens found in the western US that fuel the large fire storms seen on television news stories.

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

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

The 2013 State Hazard Mitigation plan utilized data from the Missouri Department of Conservation to analyze past wildfire events. In an 8 year period, McDonald County experienced 163 wildfires that destroyed almost a total of 2,152 acres, an average of 18.1 events occurred annually with an average of 239 acres destroyed annually.

Table 3.41. Wildfires in McDonald County 2008-2018

# of Wildfires (2004-2018)	Average Annual # of Wildfires	Likelihood Rating (1-5)	Acres Burned	Average Annual Acres Burned	Average Acres Burned Rating	Total Buildings Damaged
163	18.1	1	2152	239	3	5

Probability of Future Occurrence

There have been 163 wildfires in McDonald County over an 8 year period. This indicates a very high probability of a wildfire occurring in any given year, the average annual number of wildfires is 18.1.

Changing Future Conditions Considerations

Climate change has been a key factor in increasing the risk and extent of wildfires in the Western United States. Wildfire risk depends on a number of factors, including temperature, soil moisture, and the presence of trees, shrubs, and other potential fuel. All these factors have strong direct or indirect ties to climate variability and climate change. Climate change enhances the drying of organic matter in forests (the material that burns and spreads wildfire), and has doubled the number of large fires between 1984 and 2015 in the western United States.

Research shows that changes in climate that create warmer, drier conditions. Increased drought, and a longer fire season are boosting these increases in wildfire risk. For much of the U.S. West, projections show that an average annual 1 degree C temperature increase would increase the median burned area per year as much as 600 percent in some types of forests. In the Southeastern United States modeling suggests increased fire risk and a longer fire season,with at least a 30 percent increase from 2011 in the area burned by lightning-ignited wildfire by 2060.

Once a fire starts—more than 80 percent of U.S. wildfires are caused by people—warmer temperatures and drier conditions can help fires spread and make them harder to put out. Warmer, drier conditions also contribute to the spread of the mountain pine beetle and other insects that can

weaken or kill trees, building up the fuels in a forest. Land use and forest management also affect wildfire risk. Changes in climate add to these factors and are expected to continue to increase the area affected by wildfires in the United States.

Vulnerability

Vulnerability Overview

Wildfires occur throughout wooded and open vegetation areas of Missouri. They can occur any time of 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 Wildland-Urban Interface areas in the county and cities are more vulnerable to the impact of wildfires due to the level of fuel mixed with structures. There are limitations of the data presented. For example, National Fire Incident Reporting System (NFIRS) data from 2004 to 2008 was used to determine vulnerability it is stated in the State Plan. However, only 61 percent of fire departments in Missouri reported to the NFIRS).

Potential Losses to Existing Development

There is an average of 18.1 wildfires per year in McDonald County, with an average of 239 acres burned annually. The cost of that is dependent on whether the area was pasture or cropland, but there is some potential for agricultural loss. There is also some potential for losses to development as the most vulnerable areas are in the WUI shown in figure 3.21. There have been 5 buildings damaged by wildfires in the 8 year study period investigated by the 2013 State Hazard Mitigating Plan.

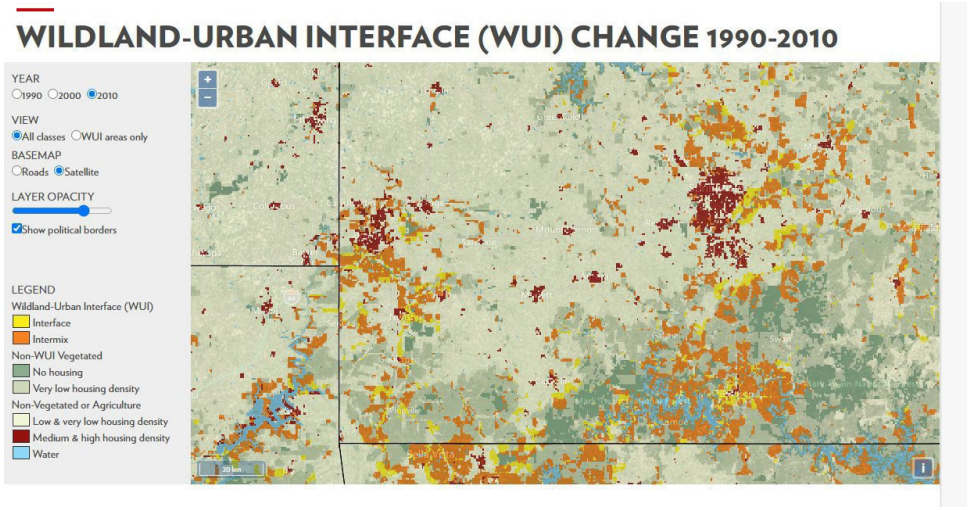
Impact of Previous and Future Development

Although there are no planned areas of future development in McDonald County, if the recent increase in housing units continues to increase then the WUI areas may increase as well.

Hazard Summary by Jurisdiction

In referencing the wildfire hazard map on the following page, it's apparent that McDonald County has a high concentration of wildfire hazard areas rural areas and their surrounding areas are the population centers nearest to elevated wildfire risk areas. Many rural school district campuses in the county are located inside the WUI area. The communities most at risk for experiencing wildfires have larger WUI areas within or adjacent to their communities. These cities include Goodman, Anderson, Pineville, Lanagan, Noel, Jane, and several unincorporated areas. Southwest City has only a small WUI nearby, therefore is considered to have a lower risk of wildfires.

Figure 3.30 McDonald County Wildfire Hazard Map



Source: http://silvis.forest.wisc.edu/data/wui-change/

Problem Statement

McDonald County does experience wildland fire events on a regular basis and the acreage burned in these events is significant with a few structures damaged as well. The risk of more seriously damaging events is significant for many of the communities in McDonald County. Fire safety education and enforcing burn bans during drought conditions may help to decrease the risk of wildfires.

4 MITIGATION STRATEGY

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.

4.2 Goals

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

This planning effort is an update to County A's existing hazard mitigation plan approved by FEMA on March 29th, 2017. Therefore, the goals from the 2016 McDonald County Hazard Mitigation Plan were reviewed to see if they were still valid, feasible, practical, and applicable to the defined hazard impacts. The MPC conducted a discussion session during their second meeting to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the 2018 State Hazard Mitigation Plan goals were reviewed. The MPC also reviewed the goals from current surrounding county plans. The MPC conducted a discussion session during their second and third meetings to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the previously approved plan's goals (listed below) were reviewed. It was determined that the broadly stated purposes were still valid for the 2021 Update.

Therefore, the mitigation goals for the 2021 update are as follows:

1. Increase internal capabilities to mitigate the effects of natural hazards.

2. Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering other community goals.
3. Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
4. Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.

4.3 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.

Some specific sources for mitigation action ideas include the following:

- FEMA's Mitigation Action Ideas Publication, https://www.fema.gov/media-library/assets/documents/30627
- FEMA's Climate Resilient Activities for Hazard Mitigation Assistance, https://www.fema.gov/media-library/assets/documents/110202
- EPA's Hazard Mitigation for Natural Disasters Publication, https://www.epa.gov/waterutilityresponse/hazard-mitigation-natural-disasters
- EPAs Planning for an Emergency Drinking Water Supply Publication, https://www.epa.gov/waterutilityresponse/water-utility-planning-emergency-drinking-water-supply

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. Actions from the previous plan included completed actions, on-going actions, and actions upon which progress had not been made. The MPC discussed SEMA's identified funding priorities and the types of mitigation actions generally recognized by FEMA.

The MPC included problem statements in the plan update at the end of each hazard profile. 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 #3 was update of the mitigation strategy. For a comprehensive range of mitigation actions to consider, the MPC reviewed the following information during Meeting #3:

- 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 HMA 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 #3, 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, using worksheets included in Appendix B of this plan. Prior to Meeting #3, 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;
- Ongoing, with a description of the progress made to date; or
- Not yet started, with a discussion of the reasons for lack of progress.

Additionally, the future inclusion of each mitigation action in the plan update was identified as either keep, delete, or modify. Based on the status updates, there were 9 completed actions, 45 continuing actions (either ongoing or modified), and 5 deleted actions.

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

Table 4.1. Action Status Summary

Jurisdiction	# of Completed Actions	# of Deleted Actions	# of Continuing Actions	# of New Actions
McDonald County	0	1	12	1
Anderson	1	1	4	0
Goodman	4	0	2	1
Jane	0	0	3	1
Lanagan	2	0	5	0
Noel	0	0	5	0
Pineville	1	0	4	0
Southwest City	1	3	2	2
McDonald County Schools R-1		0	8	0
White Rock Special Fire District	0	0	0	3

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
Goodman-03: Water Tower Safety	Installed a 6' high chain link fence around the well house at 203 W Barlow to deter people from contaminating water supply
Goodman-04: Community tornado shelter	Elementary School built a safe room when rebuilding the school
Goodman-05: Tornado siren North	Siren installed North side of town.
Goodman-06: Tornado siren South	Siren installed on South side of town.
School District 9: Safe Entry and Key pass	Safe entry and key pass was purchased for schools
Deleted Actions	**Reason for Deletion**
McDonald County, County- 11: Apply for Grant funding to assist Homeowners with Safe rooms	No progress/ Lack of interest from McDonald County population

Source: Previously approved County Hazard Mitigation Plan; Data Collection Questionnaires.

4.4 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 2018 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 jurisdictions 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 points
Definitely NO = 0 points

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 as Appendix B. The STAPLEE final score for each action, absent other considerations, such as a localized need for a project, determined the priority. Low priority actionitems 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:	Insert a unique action number for this action for future tracking purposes. This can be a combination of the jurisdiction name, followed by the goal number and action number (i.e. Joplin1.1)	
Name of Action or Project:		
Mitigation Category:	Prevention; Structure and Infrastructure Projects; Natural Systems Protection; Education and Outreach; Emergency Services	
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) _____

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Flooding
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	County-01
Name of Action or Project:	NFIP – Continue Compliance
Action or Project Description:	Restrict/Eliminate development in the existing floodplain and acquire land if necessary.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$5000 planning + cost of land
Benefits:	Minimize potential for the creation of future flooding problems, improve water quality, and improve the environment
Plan for Implementation	
Responsible Organization/Department:	McDonald County Floodplain Administrator
Action/Project Priority:	High
Timeline for Completion:	Annual review
Potential Fund Sources:	State and federal Agencies
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	New Floodplain Manager appointed, Floodplain Ordinance enforcement continues, floodplain observation each year.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	GIS needed to better Assessor's maps, land purchases
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	County-02
Name of Action or Project:	County GIS
Action or Project Description:	GIS needed to better Assessor's maps, land purchases.
Applicable Goal Statement:	Increase internal capabilities to mitigate the effects of natural hazards.
Estimated Cost:	$5,000
Benefits:	Provide objective overview of actual land usage, reducing litigation cost and increasing efficiencies.
Plan for Implementation	
Responsible Organization/Department:	McDonald County
Action/Project Priority:	Medium
Timeline for Completion:	5 year cycle
Potential Fund Sources:	McDonald County and State and Federal Agencies
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	County purchased and implemented GIS with our county assessor. 2 flyover shave been completed.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	No one community has sufficient resources for every need
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	County-03
Name of Action or Project:	Inventory County Emergency Response Services
Action or Project Description:	Inventory all resources annually.
Applicable Goal Statement:	Increase internal capabilities to mitigate the effects of natural hazards.
Estimated Cost:	$100 per year
Benefits:	Avoid duplication and unnecessary expenditures.
Plan for Implementation	
Responsible Organization/Department:	McDonald County Emergency Management
Action/Project Priority:	Low
Timeline for Completion:	Annual Review
Potential Fund Sources:	State and Federal Agencies and EMPG Funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Locals and county officials are contacted and equipment and resources are inventoried annually.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Public does not understand impact of major disease outbreaks.
Hazard(s) Addressed:	
Action or Project	
Action/Project Number:	County-04
Name of Action or Project:	Educate public on impacts of Major Disease Outbreak
Action or Project Description:	Public does not understand impact of such an outbreak.
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
Estimated Cost:	$500 per year
Benefits:	Increased productivity during an outbreak due to prior planning
Plan for Implementation	
Responsible Organization/Department:	McDonald County Health Department
Action/Project Priority:	Medium
Timeline for Completion:	Annual Review
Potential Fund Sources:	State and Federal Agencies and HD Funds
Local Planning Mechanisms to be Used in Implementation, ifany:	
Progress Report	
Action Status	Continuing
Report of Progress	Health Department continues to promote disease impacts education by constantly putting education materials out to the public. Disease and health education is a high priority for our health department and they continue to provide information to the public.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Many communities currently do not have access to storm shelters.
Hazard(s) Addressed:	Tornadoes and Severe Thunderstorms
Action or Project	
Action/Project Number:	County-05
Name of Action or Project:	Promote Community Shelters and School Safe rooms
Action or Project Description:	Promote community shelters in existing manufactured/mobile home parks, schools, or other community areas that currently have no access to storm shelters. Consult with and advertise to mobile home park owners, schools, and community leaders to promote use of shelters.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$100 per year
Benefits:	Decrease loss of life and injuries
Plan for Implementation	
Responsible Organization/Department:	McDonald County Emergency Management
Action/Project Priority:	Low
Timeline for Completion:	Annual Review
Potential Fund Sources:	State and Federal Agencies and EMPG Funds.
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	FEMA storm shelters were built at school locations in Pineville, Anderson, and Southwest City

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Public is underprepared to react to disasters and their consequences.
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	County-06
Name of Action or Project:	All-hazards education for mitigation, preparedness, response & recovery.
Action or Project Description:	Present a series of public education forums throughout the county.
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
Estimated Cost:	$500 per year
Benefits:	Prepare the public to react to, recover from, and mitigate disaster effects. When the public is prepared losses can be avoided.
Plan for Implementation	
Responsible Organization/Department:	McDonald County Emergency Management
Action/Project Priority:	Medium
Timeline for Completion:	Annual Review
Potential Fund Sources:	State and Federal Agencies and EMPG Funds.
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Education materials and social media education: Continuing to educate the residents and the diverse communities on the above listed phases of emergency management.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Public doesn't fully understand the effects of severe weather on their life's and property.
Hazard(s) Addressed:	Severe thunderstorms, severe winter weather, tornadoes, extreme heat, drought, flooding.
Action or Project	
Action/Project Number:	County-07
Name of Action or Project:	Educate the Public on the impacts of Severe Weather.
Action or Project Description:	Public needs to understand the effects of severe weather on their life's and property. Continue severe weather classes, advertisement, and handouts.
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
Estimated Cost:	$750 per year
Benefits:	Decrease injury, loss of life, and property damage due to proper planning for severe weather.
Plan for Implementation	
Responsible Organization/Department:	McDonald County Emergency Management
Action/Project Priority:	High
Timeline for Completion:	Annual Review
Potential Fund Sources:	State and Federal Agencies and EMPG Funds.
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Very active social media education campaign and weather ready ambassador Public education events and outreach Programs.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	McDonald County public has no warning systems of danger from threats/storms.
Hazard(s) Addressed:	Tornadoes/severe thunderstorms
Action or Project	
Action/Project Number:	County-08
Name of Action or Project:	Increase Warning System coverage to the most feasible extent.
Action or Project Description:	Promote the use of Weather Radios and Sirens and notifications.
Applicable Goal Statement:	Increase internal capabilities to mitigate the effects of natural hazards.
Estimated Cost:	$500 annually
Benefits:	Provide sufficient warning time for sheltering and protection, reducing injury and loss of life.
Plan for Implementation	
Responsible Organization/Department:	McDonald County Emergency Management
Action/Project Priority:	High
Timeline for Completion:	Annual Review
Potential Fund Sources:	State and Federal Agencies and EMPG Funds.
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	No progress, trying to obtain funding to implement this project.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Noel and Anderson housing within the floodplain areas as well as some rural homes in floodplain.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	County-09
Name of Action or Project:	Apply for funding to do flood buyouts
Action or Project Description:	Floodplain administrator will apply for funding to buyout areas that have repeated damages.
Applicable Goal Statement:	Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering Other community goals.
Estimated Cost:	$300,000 (half of floodplain areas)
Benefits:	Eliminate repetitive loss
Plan for Implementation	
Responsible Organization/Department:	County Floodplain Administrator
Action/Project Priority:	Medium
Timeline for Completion:	5 Years
Potential Fund Sources:	General Funds and grants, FEMA/SEMA
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Very little progress. A few property owners have been able to get some funding to get homes raised above the floodplain.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Residents do not have flood insurance.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	County-10
Name of Action or Project:	Promote flood insurance to residents in the county
Action or Project Description:	Floodplain administrator will promote flood insurance by verifying flood occurrences and will notify residences of insurance and if repetitive flooding will add to buyout list. Will visit each to encourage and explain how insurance program works. Also explain how to be flood safe.
Applicable Goal Statement:	Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering other community goals.
Estimated Cost:	$25,000
Benefits:	Less damages to personal property as people learn how to mitigate and campgrounds have less damage with mitigation. More housing insured.
Plan for Implementation	
Responsible Organization/Department:	McDonald County Floodplain Administrator.
Action/Project Priority:	Medium
Timeline for Completion:	Annual review
Potential Fund Sources:	County General Funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	We constantly promote floodplain insurance and compliance through public education and education on our ordinance.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Residents do not have flood insurance.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	County-11
Name of Action or Project:	Promote flood insurance to residents in the county
Action or Project Description:	Floodplain administrator will promote flood insurance by verifying flood occurrences and will notify residences of insurance and if repetitive flooding will add to buyout list. Will visit each to encourage and explain how insurance program works. Also explain how to be flood safe.
Applicable Goal Statement:	Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering other community goals.
Estimated Cost:	$ 25,000
Benefits:	Less damages to personal property as people learn how to mitigate and campgrounds have less damage with mitigation. More housing insured.
Plan for Implementation	
Responsible Organization/Department:	McDonald County Floodplain Administrator.
Action/Project Priority:	Medium
Timeline for Completion:	Annual review
Potential Fund Sources:	County General Funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	We constantly promote floodplain insurance and compliance through public education and education on our ordinance.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	There are several low water crossings in McDonald County that are unsafe during Floods.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	County-12
Name of Action or Project:	Apply for FEMA funding to replace low water crossings with bridges.
Action or Project Description:	Floodplain manager, commissioners and Emergency manager will coordinate to apply for grant funding to eliminate low water crossings within the county.
Applicable Goal Statement:	Increase internal capabilities to mitigate the effects of natural hazards.
Estimated Cost:	$ 100,000 +, need engineering assistance
Benefits:	Increase accessibility and save lives for residents. Improve infrastructure and reduce property damage for county.
Plan for Implementation	
Responsible Organization/Department:	County Floodplain Manager and Emergency
Action/Project Priority:	High
Timeline for Completion:	5 year review
Potential Fund Sources:	FEMA/SEMA and road and bridge funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Several low water bridges have been replaced by the county commission over the past 5 years. More are in need of replacing.

Action Worksheet	
Name of Jurisdiction:	McDonald County, Missouri
Risk / Vulnerability	
Problem being Mitigated:	There are currently no safe rooms at Jane and Rocky Comfort.
Hazard(s) Addressed:	Severe storms and tornadoes
Action or Project	
Action/Project Number:	County-13
Name of Action or Project:	County Safe rooms
Action or Project Description:	Build 2 new safe rooms at 2 local locations
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$3,000,000.00
Benefits:	Provide life safety for residents from severe storms and tornadoes
Plan for Implementation	
Responsible Organization/Department:	McDonald County and FEMA
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	FEMA
Local Planning Mechanisms to be Used in Implementation, if any:	Population survey
Progress Report	
Action Status	Continuing
Report of Progress	
Completed by:	Gregg Sweeten, Emergency Manager

Action Worksheet	
Name of Jurisdiction:	Anderson, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Water and sewer system failure during extended power outages.
Hazard(s) Addressed:	power outages due to extreme weather events
Action or Project	
Action/Project Number:	Anderson-01
Name of Action or Project:	Purchase Generator
Action or Project Description:	Looking for surplus or used generator that can fulfill this need.
Applicable Goal Statement:	
Estimated Cost:	$15,000
Benefits:	Prevent water loss and sewer backups and increase fire protection.
Plan for Implementation	
Responsible Organization/Department:	City Council and Emergency Management.
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	HMGP, General Funds, FEMA,SEMA
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Received bids on generator/engineering for site placement. Specifications wrote and plans being completed.

Action Worksheet	
Name of Jurisdiction:	Anderson, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Some areas of town are within the floodplain.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	Anderson-02
Name of Action or Project:	Enforcement of NFIP
Action or Project Description:	Mayor reviews all building within the city to prevent building within the floodplain.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$100
Benefits:	Prevent flood damages to buildings.
Plan for Implementation	
Responsible Organization/Department:	City Council/mayor and Floodplain administrator.
Action/Project Priority:	High
Timeline for Completion:	Ongoing
Potential Fund Sources:	general budget
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	New floodplain administrator appointed. Identify properties at risk.

Action Worksheet	
Name of Jurisdiction:	Anderson, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Unsafe building.
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	Anderson-03
Name of Action or Project:	Active Building Code Enforcement
Action or Project Description:	Residents and builders need guidance to follow to have building fire, electrical and structural safety.
Applicable Goal Statement:	Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering Other community goals.
Estimated Cost:	$5,000
Benefits:	Proper enforcement prevents shoddy building problems and keeps residents safer (future residents and buildings)
Plan for Implementation	
Responsible Organization/Department:	City building inspector
Action/Project Priority:	High
Timeline for Completion:	Ongoing
Potential Fund Sources:	general budget
Local Planning Mechanisms to be Used In Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Building inspector hired and permit process refined, Inspecting all new construction and remodels.

Action Worksheet	
Name of Jurisdiction:	Anderson, Missouri
Risk / Vulnerability	
Problem being Mitigated:	People tend to ignore hazards and hazard warnings.
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	Anderson-04
Name of Action or Project:	All-Hazards education for Mitigation, Preparedness, Response & Recovery.
Action or Project Description:	Emergency Manager and Fire Dept. will see that pertinent flyers out put out at City Hall and Fire Dept. Also, Meetings will be held 4 times a year educating the public of hazards and ways to mitigate those hazards.
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
Estimated Cost:	$1,500
Benefits:	Prevent loss of life and mitigate damages done to property.
Plan for Implementation	
Responsible Organization/Department:	Fire Department and Emergency Manager.
Action/Project Priority:	High
Timeline for Completion:	Annual Review
Potential Fund Sources:	general funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Fire prevention training, bike safety, carbon monoxide training conducted annually. Adding more training as able.

Action Worksheet	
Name of Jurisdiction:	Goodman, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Building in floodplain.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	Goodman-01
Name of Action or Project:	Continue NFIP compliance
Action or Project Description:	Current Minimum federal requirements prevent residents from building in floodplain. See that residents don't build in the floodplain.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$ 20,000 Figured into cost of inspection for Housing which goes to inspector
Benefits:	Prevents housing from flooding issues.
Plan for Implementation	
Responsible Organization/Department:	Building Inspector
Action/Project Priority:	Low
Timeline for Completion:	Ongoing
Potential Fund Sources:	General budget
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuous
Report of Progress	Ongoing

Action Worksheet	
Name of Jurisdiction:	Goodman, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Building codes
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	Goodman-02
Name of Action or Project:	Adopt IBC and IRC ordinance and Enforce these codes
Action or Project Description:	Enforcement of City Codes, to protect citizens by building safer buildings**.**
Applicable Goal Statement:	Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering other community goals.
Estimated Cost:	The City purchased both books for the amount of $261.00. To print sections of the code book the cost will be .10¢ a page.
Benefits:	Build safer homes and businesses within the City.
Plan for Implementation	
Responsible Organization/Department:	City building Inspector.
Action/Project Priority:	Low
Timeline for Completion:	ongoing
Potential Fund Sources:	general funding
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuous
Report of Progress	Nothing at this time, hope to complete in the future.

Action Worksheet	
Name of Jurisdiction:	Goodman, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Loss of power caused by a tornado or severe thunderstorm
Hazard(s) Addressed:	Severe thunderstorms, tornadoes
Action or Project	
Action/Project Number:	Goodman-03
Name of Action or Project:	Generator-Goodman
Action or Project Description:	Purchase a generator to prevent disruption of services due to severe weather conditions
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the publicawareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
Estimated Cost:	$10,000 - $ 20,000
Benefits:	Prevents complete loss of power. Ensures heating/air conditioning stays active. Prevents food from spoiling
Plan for Implementation	
Responsible Organization/Department:	City Administration
Action/Project Priority:	Low
Timeline for Completion:	ongoing
Potential Fund Sources:	Local funding, HMGP funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	New
Report of Progress	New

Action Worksheet	
Name of Jurisdiction:	Jane, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Fire Protection Department has informed City that there is a high level risk to homes because of proximity to Wildland.
Hazard(s) Addressed:	wildfires
Action or Project	
Action/Project Number:	Jane-01
Name of Action or Project:	Increase homeowner education on wildfire mitigation in wildland-urban interface.
Action or Project Description:	City will provide educational materials about the risks and possible corrective actions to mitigate these risks.
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
Estimated Cost:	$ 40.00
Benefits:	To inform and educate and hopefully people will mitigate fire risks.
Plan for Implementation	
Responsible Organization/Department:	Fire Department and MDC
Action/Project Priority:	Medium
Timeline for Completion:	Annual Review
Potential Fund Sources:	general budget
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Ongoing

Action Worksheet	
Name of Jurisdiction:	Jane, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Unsafe building
Hazard(s) Addressed:	tornado/high winds/fire
Action or Project	
Action/Project Number:	Jane-02
Name of Action or Project:	Active Building Code Enforcement
Action or Project Description:	If housing stock is built to IBC standards it faces less risk of tornado/ wind damages as well as other risks
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$ 10,000 – 20,000
Benefits:	Proper enforcement prevents shoddy building problems and keeps residents safer (future residents and buildings).
Plan for Implementation	
Responsible Organization/Department:	Building Inspector/City Clerk
Action/Project Priority:	Medium
Timeline for Completion:	ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Ongoing

Action Worksheet	
Name of Jurisdiction:	Jane, Missouri
Risk / Vulnerability	
Problem being Mitigated:	NFIP Compliance
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	Jane-03
Name of Action or Project:	2 low water crossings
Action or Project Description:	School bus route on Old-88 Rd, must Drive ¾ mile around during wet weather. Crossing on Hackberry Lane is the only route for 9 homes, no one can safely leave during high water. Pursue funding for replacement of the crossings.
Applicable Goal Statement:	Increase internal capabilities to mitigate the effects of natural hazards
Estimated Cost:	$10,000 – 20,000
Benefits:	Protect life
Plan for Implementation	
Responsible Organization/Department:	Trustees
Action/Project Priority:	High
Timeline for Completion:	1-2 Years
Potential Fund Sources:	FEMA,SEMA, Community Funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	No progress due to lack of funding.

Action Worksheet	
Name of Jurisdiction:	Lanagan, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Lack of code enforcement.
Hazard(s) Addressed:	fires/tornadoes/high winds
Action or Project	
Action/Project Number:	Lanagan-01
Name of Action or Project:	Enforce Codes
Action or Project Description:	Look into how other cities' enforce their codes and then hire or have a councilmember become enforcement officer.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities Through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$ 25,000 - $ 30,000
Benefits:	Homes and businesses will be safer with less fire hazards
Plan for Implementation	
Responsible Organization/Department:	City Council
Action/Project Priority:	High
Timeline for Completion:	ongoing
Potential Fund Sources:	general budget and fees
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Updated code book and hired a part time code enforcement officer. Continue to enforce building codes for new construction and remodels.

Action Worksheet	
Name of Jurisdiction:	Lanagan, Missouri
Risk / Vulnerability	
Problem being Mitigated:	It is unknown if all residents can hear storm siren.
Hazard(s) Addressed:	Tornadoes and high winds
Action or Project	
Action/Project Number:	Lanagan-02
Name of Action or Project:	Storm Siren Study
Action or Project Description:	It is unknown if all residents can hear storm siren. Will contact McDonald County Emergency Management for assistance in doing the study.
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards
Estimated Cost:	$15,000
Benefits:	Know status of sirens and then can make plans for expansion if necessary. Lower risk of loss of life.
Plan for Implementation	
Responsible Organization/Department:	City Clerk and County Emergency Management
Action/Project Priority:	High
Timeline for Completion:	ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Study was completed and sirens can be heard. Continue conducting periodic test to make sure they can be heard.

Action Worksheet	
Name of Jurisdiction:	Lanagan, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Residents need to know of the possible hazards and how they are expected to respond.
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	Lanagan-03
Name of Action or Project:	Public Education of Businesses, homeowners, and residents
Action or Project Description:	Use SEMA handouts to explain various hazards as well as how residents should respond to them.
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
Estimated Cost:	$ 80
Benefits:	Residents will be educated on the various hazards that are possible and should prevent injuries, death, or property damage.
Plan for Implementation	
Responsible Organization/Department:	City Clerk
Action/Project Priority:	Medium
Timeline for Completion:	2 times a year
Potential Fund Sources:	city budget
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Ongoing with updated material on emergency actions.

Action Worksheet	
Name of Jurisdiction:	Lanagan, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Build in floodplain (near Elk River) without regulations.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	Lanagan-04
Name of Action or Project:	NFIP Continued Compliance
Action or Project Description:	Restrict/Eliminate development in the existing floodplain.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$ 100,000
Benefits:	Potential for residents to participate in Flood insurance. Prevent property damage to new development by restricting development in the floodplain.
Plan for Implementation	
Responsible Organization/Department:	City Council/mayor
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	general budget
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Not sure if this has ever been addressed, no new building done. Lack of funding.

Action Worksheet	
Name of Jurisdiction:	Lanagan, Missouri
Risk / Vulnerability	
Problem being Mitigated:	School bus has to cross low crossing and no one can enter or leave area without driving over 10 miles around during wet weather.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	Lanagan-05
Name of Action or Project:	Low water crossing elimination
Action or Project Description:	Pursue funding for replacement of the crossing.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$ 150,000
Benefits:	protect life and property
Plan for Implementation	
Responsible Organization/Department:	City Council
Action/Project Priority:	High
Timeline for Completion:	3 years
Potential Fund Sources:	Grants and street funds, FEMA/SEMA
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Grants and street funds, FEMA/SEMA
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Noel, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Dam ownership is now unknown. It needs stabilization to prevent failure.
Hazard(s) Addressed:	Dam Failure
Action or Project	
Action/Project Number:	Noel-01
Name of Action or Project:	Assist State in finding ownership of local dam and assist with stabilization of dam
Action or Project Description:	Contact DNR to work out ownership, and assist if necessary to stabilize.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$100,000 - $250,000
Benefits:	Stabilize Dam to prevent collapse and flooding (probably 35 homes and 3 businesses would be protected) - Dam provides lake used by tourist industry.
Plan for Implementation	
Responsible Organization/Department:	City Mayor
Action/Project Priority:	High
Timeline for Completion:	ongoing
Potential Fund Sources:	general budget
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Dam was once power generator for city of Noel. In the 1980s Lake was drained and dam semi-repaired. Mayor would like to have lake drained again. Lake went up to 20ft in town from an average of 4-5 ft.

Action Worksheet	
Name of Jurisdiction:	Noel, Missouri
Risk / Vulnerability	
Problem being Mitigated:	No warning system is in town.
Hazard(s) Addressed:	tornadoes and high winds
Action or Project	
Action/Project Number:	Noel-02
Name of Action or Project:	Apply for a Grant for a Storm Siren
Action or Project Description:	Grant administrator will apply for grant.
Applicable Goal Statement:	Increase internal capabilities to mitigate the effects of natural hazards.
Estimated Cost:	$250,000 - $350,000
Benefits:	Give citizens and seasonal tourist time to seek shelter.
Plan for Implementation	
Responsible Organization/Department:	Grant administrator
Action/Project Priority:	High
Timeline for Completion:	ongoing
Potential Fund Sources:	grant
Local Planning Mechanisms to be Used in Implementation, ifany:	
Progress Report	
Action Status	Continuing
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Noel, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Noel has 3 low water crossings that impede Emergency responding and low water crossings are safety issues as some people ignore the drown warnings and don't turn around.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	Noel-04
Name of Action or Project:	Apply for federal funding to replace low water crossings
Action or Project Description:	Mayor will get engineering to review and then apply for funding help.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	$500,000 - $1,000,000
Benefits:	Prevent deaths and maintain traffic flow for emergency services.
Plan for Implementation	
Responsible Organization/Department:	City Council
Action/Project Priority:	High
Timeline for Completion:	ongoing
Potential Fund Sources:	General and street funds and grant funding
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Continuing

Action Worksheet	
Name of Jurisdiction:	Pineville, Missouri
Risk / Vulnerability	
Problem being Mitigated:	People are not aware of flood insurance Benefits.
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	Pineville-01
Name of Action or Project:	Public Education including Flood Insurance Promotion
Action or Project Description:	Send notices via Mayors letter to citizens.
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
Estimated Cost:	Yearly cost $450
Benefits:	Provide the citizens with information about flood insurance and their need for it if they are within the Flood Plain. Reduce risk of property damage/loss.
Plan for Implementation	
Responsible Organization/Department:	Pineville Flood Plain manager/mayor
Action/Project Priority:	High
Timeline for Completion:	Letters are sent to residents 4 times a year
Potential Fund Sources:	City budget has postage for 4 Mayors letter per year
Local Planning Mechanisms Tobe Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Ongoing

Action Worksheet	
Name of Jurisdiction:	Pineville, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Buildings in the floodplain
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	Pineville-02
Name of Action or Project:	NFIP - Continue Compliance
Action or Project Description:	Residents near and in the Flood area need our participation in this plan to receive the help needed after a flood
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	500
Benefits:	Residents are eligible to purchase flood insurance. All future building is protected by ordinance enforcement from the effects of flooding.
Plan for Implementation	
Responsible Organization/Department:	Pineville Flood Plain manager/mayor
Action/Project Priority:	High
Timeline for Completion:	ongoing
Potential Fund Sources:	general budget
Local Planning Mechanisms Tobe Used inImplementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Ongoing

Action Worksheet	
Name of Jurisdiction:	Pineville, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Unsafe buildings
Hazard(s) Addressed:	fire, tornadoes, high winds
Action or Project	
Action/Project Number:	Pineville-03
Name of Action or Project:	Active Code enforcement
Action or Project Description:	Regulations are in place providing for safe construction of housing and remodeling. City code enforcement officer enforces ordinances for safe construction.
Applicable Goal Statement:	Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering other community goals.
Estimated Cost:	12,000 per year
Benefits:	Construction is regulated by the International Building Codes. It promotes better living conditions, protects city residents, and benefits all new and remodeled housing.
Plan for Implementation	
Responsible Organization/Department:	Code enforcement officer
Action/Project Priority:	High
Timeline for Completion:	ongoing
Potential Fund Sources:	City budget
Local Planning Mechanisms to be Used in Implementation, ifany:	
Progress Report	
Action Status	Continuing
Report of Progress	Ongoing

Action Worksheet	
Name of Jurisdiction:	Southwest City, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Building in the floodplain
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	Southwest City-01
Name of Action or Project:	Enforce NFIP ordinance
Action or Project Description:	See that residents don't build in flooding areas. Current Minimum federal requirements prevent residents from building in the floodplain.
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.
Estimated Cost:	no cost to city=- people get building permit from council after council reviews plans
Benefits:	Prevents housing from flooding issues- also allows residents to purchase flood insurance
Plan for Implementation	
Responsible Organization/Department:	City council
Action/Project Priority:	High
Timeline for Completion:	ongoing
Potential Fund Sources:	fees from permits
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Progress has been made on this issue. The Planning and Zoning Committee has been re-established to further deal with these issues. The Flood Zone Maps are reviewed during the Building Permit Process. The current Building Permit Policy is being reviewed at this time. This action is ongoing, continuous improvements to the process are in progress.

Action Worksheet	
Name of Jurisdiction:	Southwest City, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Unsafe buildings
Hazard(s) Addressed:	fire, tornadoes, high winds
Action or Project	
Action/Project Number:	Southwest City-02
Name of Action or Project:	Code Enforcement
Action or Project Description:	The city needs to continue with code enforcement to prevent future safety issues. Building Inspector has been hired and enforces code as he inspects other issues.
Applicable Goal Statement:	Enhance existing or design new policies that will reduce the potential damaging effects of hazards without hindering other community goals.
Estimated Cost:	$50 ($25 per inspection- not many this year)-Comes from building permit funds
Benefits:	Prevent fires, electrical and other safety issues.
Plan for Implementation	
Responsible Organization/Department:	Building Inspector
Action/Project Priority:	High
Timeline for Completion:	ongoing
Potential Fund Sources:	permit fees
Local Planning Mechanisms to be Used inImplementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	The City as recently lost our Building Inspector. We have a private contractor that is acting Building Inspector at this time. This responsibility is in the process of being transferred to the Planning and Zoning Commission. The City is in the process of making necessary changes to this aspect of the operation. The City is working on sharing a Building Inspector with a nearby City. The City have been active in this area by condemning and demolishing three structure that were deemed to be a public safety issue.

Action Worksheet	
Name of Jurisdiction:	Southwest City, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Residents need to know of the possible hazards and how they are expected to respond.
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	Southwest City-03
Name of Action or Project:	Educate residents of hazards with informational flyers
Action or Project Description:	Use handouts to explain various hazards as well as how residents should respond to them.
Applicable Goal Statement:	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
Estimated Cost:	$70
Benefits:	Residents will be educated on the various hazards that are possible and should prevent injuries or deaths.
Plan for Implementation	
Responsible Organization/Department:	City Clerk
Action/Project Priority:	High
Timeline for Completion:	2 times per year
Potential Fund Sources:	city budget
Local Planning Mechanisms to be Used in Implementation, ifany:	
Progress Report	
Action Status	Continuing
Report of Progress	Information provided with City Billings.

Action Worksheet	
Name of Jurisdiction:	Southwest City, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Plan of Action in case of a natural disaster.
Hazard(s) Addressed:	All Natural Disinters
Action or Project	
Action/Project Number:	Southwest City - 04
Name of Action or Project:	Volunteer Disaster Action Plan
Action or Project Description:	Work with citizens to develop a community wide inventory of experience and equipment to respond to natural disaster. Would identify the weakness in the inventory and seek agreements with outside sources.
Applicable Goal Statement:	Provide a planned immediate response to a disaster.
Estimated Cost:	$500
Benefits:	Provide the citizen a quick coordinated response to those in need after a disaster.
Plan for Implementation	
Responsible Organization/Department:	City Council and future appointed Volunteer Coordinator
Action/Project Priority:	Medium
Timeline for Completion:	1 year
Potential Fund Sources:	General Fund and Donations
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	Southwest City, Missouri
Risk / Vulnerability	
Problem being Mitigated:	Poor storm drainage though out the City of Southwest City.
Hazard(s) Addressed:	Property damage as result of flooding.
Action or Project	
Action/Project Number:	Southwest City - 05
Name of Action or Project:	Storm Water Improvement Project
Action or Project Description:	The main drainage ditch in the City was constructed by the WPA in the 1930 or early 1940. Erosion has taken its toll. The walls are collapsing and the sediment has reduce their volume. This has resulted in some costly damage to property and present a public safety hazard in during flooding. Many areas of the City need addressed.
Applicable Goal Statement:	To upgrade the storm drainage within the City.
Estimated Cost:	$150,000
Benefits:	Improve Public Safety and reduce the civil risk to the City
Plan for Implementation	
Responsible Organization/Department:	Public Works Department and the City Council
Action/Project Priority:	High
Timeline for Completion:	1 year
Potential Fund Sources:	Grants and Donations
Local Planning Mechanisms to be Used inImplementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	

Action Worksheet	
Name of Jurisdiction:	McDonald County R-1 Schools
Risk / Vulnerability	
Problem being Mitigated:	Many tornadoes hit Southwest Missouri every year causing devastation. School's need to have a safe room/ shelter for student and staff members to remain as safe as possible
Hazard(s) Addressed:	Identify storm safe-rooms or safe areas within the school facility to use during severe weather. In addition, the District will apply for a FEMA grant to construct safe rooms/ shelters for each building the district
Action or Project	
Action/Project Number:	School District 1
Name of Action or Project:	Safe Rooms
Action or Project Description:	Identify storm safe-rooms or safe areas within the school facility to use during severe weather. In addition, the District will apply for a FEMA grant to construct safe rooms/ shelters for each building the district
Applicable Goal Statement:	To ensure that all staff and students are safe from severe weather/ storms.
Applicable Objective Statement:	Build storm shelters to protect from severe weather/ storms
Estimated Cost:	$10,000,000
Benefits:	To minimize injuries/deaths in the event of a facility damaging storm
Plan for Implementation	
Responsible Organization/Department:	Central Office
Action/Project Priority:	High
Timeline for Completion:	Continuing
Potential Fund Sources:	Missouri center for Safe Schools at UMKC: SEMA & FEMA Grants
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Continuing district continues to plan and install safe room locations on various locations. Most recently installed are FEMA shelters at Noel Primary.
Completed by:	Adam Lett

Action Worksheet	
Name of Jurisdiction:	McDonald County R-1 Schools
Risk / Vulnerability	
Problem being Mitigated:	Students and parents need to know of the possible hazards found in school setting and how they are expected to respond
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	School District 2
Name of Action or Project:	Hazard planning and education
Action or Project Description:	Use student handbook and school website to explain various schools hazards as well as how the school and students will respond to them
Applicable Goal Statement:	To ensure that all staff and students are able to react appropriately in a crisis
Applicable Objective Statement:	Educate and ensure staff and student know how to react during a crisis
Estimated Cost:	$5,000
Benefits:	To minimize injuries/ deaths in the event of a crisis
Plan for Implementation	
Responsible Organization/Department:	Central Office
Action/Project Priority:	High
Timeline for Completion:	Yearly
Potential Fund Sources:	McDonald County Schools
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Continuing- District continues to educate students and staff on crisis events and how to respond to these events. Drills conducted throughout the year. Tabletop scenarios practiced quarterly with school safety teams School has purchased crisis-go safety notification and education app
Completed by:	Adam Lett

Action Worksheet	
Name of Jurisdiction:	McDonald County R-1 Schools
Risk / Vulnerability	
Problem being Mitigated:	Increase awareness of students and teachers with campus drills and trainings
Hazard(s) Addressed:	McDonald County R-1 School District requires monthly drills. Drills include fire, tornado, lockdowns, earthquakes, IOC as well as a reverse evacuations.
Action or Project	
Action/Project Number:	School District 3
Name of Action or Project:	Hazard Planning and Education
Action or Project Description:	The Districts safety coordinator trains District Administrators on drill procedures who in turn train their staff their students. In addition, emergency procedures are posted in each classroom.
Applicable Goal Statement:	To ensure that all staff and students are able to react appropriately in a crisis.
Applicable Objective Statement:	Educate and ensure staff and student know how to react during a crisis
Estimated Cost:	$ 0
Benefits:	To minimize injuries/ death in the event of a crisis event
Plan for Implementation	
Responsible Organization/Department:	Central Office
Action/Project Priority:	High
Timeline for Completion:	Yearly
Potential Fund Sources:	McDonald County Schools, McDonald County Emergency Management, Local Fire and Police Departments, Sheriff's Department. Freeman Ambulance
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Continuing- District continues to educate students and staff or crisis events and how to respond to these events. Drills conducted throughout the year. Tabletop scenarios practiced quarterly with school safety teams.
Completed by:	Adam Lett

Action Worksheet	
Name of Jurisdiction:	McDonald County R-1 Schools
Risk / Vulnerability	
Problem being Mitigated:	Educate students and staff members regarding family reunification procedures.
Hazard(s) Addressed:	During emergency situations, parents/ friends become very rude, anxious and aggressive to find out more information regarding their student's safety.
Action or Project	
Action/Project Number:	Schools District 4
Name of Action or Project:	Family reunification procedures
Action or Project Description:	Staff will be trained in the double gated system to unite students with parents in a safe and orderly manner
Applicable Goal Statement:	To ensure that all staff and students are able to react appropriately in a crisis
Applicable Objective Statement:	Ensure staff and student know how to react during a crisis
Estimated Cost:	$ 5,000
Benefits:	To minimize injuries deaths in the event of a crisis event.
Plan for Implementation	
Responsible Organization/Department:	Central Office
Action/Project Priority:	High
Timeline for Completion:	Annually
Potential Fund Sources:	McDonald County Schools, McDonald County Emergency Management, Local Fire and Police Departments, Sheriff's Department. Freeman Ambulance
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Continuing- District continues to educate students and staff on crisis events and how to respond to these events. Drills conducted throughout the year. Tabletop scenarios practiced quarterly with school safety teams. Crisis Go app purchased, with family reunification features included
Completed by:	Adam Lett

Action Worksheet	
Name of Jurisdiction:	McDonald County R-1 Schools
Risk / Vulnerability	
Problem being Mitigated:	Educate staff and students on Building evacuation procedures
Hazard(s) Addressed:	Evacuations can be chaotic. Procedures must be in place to ensure that evacuations are organized and to ensure that everyone is accounted for.
Action or Project	
Action/Project Number:	School District 5
Name of Action or Project:	Evacuation Procedures
Action or Project Description:	Train staff and students on evacuation procedures and the method to communicate missing or injured individuals, and conduct regular drills. Update evacuation maps as buildings are upgraded
Applicable Goal Statement:	To ensure that all staff and students are able to react appropriately in a crisis.
Applicable Objective Statement:	Ensure that all staff and students are able to react appropriately in a crisis.
Estimated Cost:	No Cost
Benefits:	To minimize injuries/ deaths in the event of a crisis
Plan for Implementation	
Responsible Organization/Department:	Central Office
Action/Project Priority:	High
Timeline for Completion:	Yearly
Potential Fund Sources:	McDonald County Schools, McDonald County Emergency Management, Local Fire and Police Departments, Sheriff's Department. Freeman Ambulance
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continuing
Report of Progress	Continuing- District continues to educate students and staff on crisis events and how to respond to these events. Drills conducted throughout the year. Tabletop scenarios practiced quarterly with school safety teams. All schools have updated their evacuation maps and have been digitized to be included in the crisis go app.
Completed by:	Adam Lett

Action Worksheet	
Name of Jurisdiction:	McDonald County R-1 Schools
Risk / Vulnerability	
Problem being Mitigated:	Educate staff and students on lockdown procedures.
Hazard(s) Addressed:	Manmade events threaten the wellbeing of staff and students outside the building and inside the building
Action or Project	
Action/Project Number:	School District 6
Name of Action or Project:	Lock-down Procedures
Action or Project Description:	Train staff and students on Lock-down procedures and conduct regular drills. Update all district facilities with digital security
Applicable Goal Statement:	To ensure that all staff and students are able to react appropriately in a crisis
Applicable Objective Statement:	ensure that all staff and students are able to react appropriately in a crisis
Estimated Cost:	$ 200,000
Benefits:	To minimize injuries/deaths in the event of a crisis
Plan for Implementation	
Responsible Organization/Department:	Central Office
Action/Project Priority:	High
Timeline for Completion:	Annually
Potential Fund Sources:	McDonald County Schools, Center for Educational, MSBA
Progress Report	
Action Status	Continuing
Report of Progress	Continuing-District continues to educate students and staff on Lock-down procedures. Recently, the district has purchased a service to notify all staff about intruders and allow staff a quick way to report intruders. District has installed safe entrances to all school building locations
Completed by:	Adam Lett

Action Worksheet	
Name of Jurisdiction:	McDonald County R-1 Schools
Risk / Vulnerability	
Problem being Mitigated:	Educate staff on bomb threat assessment and response
Hazard(s) Addressed:	The majority of bomb threats are false and inly made to disrupt the learning process and yet there are some threats which warn of real situations
Action or Project	
Action/Project Number:	School District 7
Name of Action or Project:	Bomb Threat Procedures Education
Action or Project Description:	Train staff on bomb threat assessment and procedures.
Applicable Goal Statement:	To ensure that all staff and students are able to react appropriately in a crisis
Applicable Objective Statement:	ensure that all staff and students are able to react appropriately in a crisis
Estimated Cost:	$ 5,000
Benefits:	To minimize injuries/deaths in the event of a crisis
Plan for Implementation	
Responsible Organization/Department:	Central Office
Action/Project Priority:	High
Timeline for Completion:	Annually
Potential Fund Sources:	McDonald County Schools, McDonald County Emergency Management, Local Fire and Police Departments, Sheriff's Department. Freeman Ambulance and Federal Agencies
Progress Report	
Action Status	Continuing
Report of Progress	Continuing- District continues to educate students and staff on reporting
Completed by:	Adam Lett

Action Worksheet	
Name of Jurisdiction:	McDonald County R-1 Schools
Risk / Vulnerability	
Problem being Mitigated:	An Emergency Response team made up of school staff members for each locations.
Hazard(s) Addressed:	In the event of an area wide emergency during a school day. Local emergency responders may be overwhelmed and not able to respond to schools for hours or perhaps even days, so schools have to be prepared to meet their own emergency needs.
Action or Project	
Action/Project Number:	School District 8
Name of Action or Project:	School Response Teams
Action or Project Description:	Develop and train emergency response teams in each school
Applicable Goal Statement:	To ensure that all staff and students are able to react appropriately in a crisis
Applicable Objective Statement:	ensure that all staff and students are able to react appropriately in a crisis
Estimated Cost:	$ 1,000 – 2,000
Benefits:	To minimize injuries/ deaths in the event of a crisis event
Plan for Implementation	
Responsible Organization/Department:	Central Office
Action/Project Priority:	High
Timeline for Completion:	Yearly
Potential Fund Sources:	McDonald County R-1 School District/ SEMA/FEMA
Progress Report	
Action Status	Continuing
Report of Progress	Continuing- District continues to educate and train safety teams at all campus locations. District has recently integrated the CERT system into training of the teams through safety grant
Completed by:	Adam Lett

Action Worksheet	
Name of Jurisdiction:	White Rock FPD
Risk / Vulnerability	
Problem being Mitigated:	Ability to protect rural communities from fires
Hazard(s) Addressed:	Wildfires
Action or Project	
Action/Project Number:	FPD – 1
Name of Action or Project:	Purchase new fire trucks
Action or Project Description:	Replace 40-50 year old vehicles thru grants and loans.
Applicable Goal Statement:	Upgrade old fire trucks to increase coverage
Applicable Objective Statement:	To update fire trucks for local fire protection district
Estimated Cost:	$1,500,000 – 2,500,000
Benefits:	Increases coverage area for rural communities/ helps to combat fires
Plan for Implementation	
Responsible Organization/Department:	White Rock Fire Protection District
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	SEMA/FEMA, Grant Funds
Progress Report	
Action Status	New
Report of Progress	New Action

Action Worksheet	
Name of Jurisdiction:	White Rock FPD
Risk / Vulnerability	
Problem being Mitigated:	Educate community members/ Schools about fires and potential wildfires
Hazard(s) Addressed:	Wildfires
Action or Project	
Action/Project Number:	FPD – 2
Name of Action or Project:	Educate community on fire protection and prevention
Action or Project Description:	Increase and continue to educate community at White Rock elementary school
Applicable Goal Statement:	Education at white rock elementary school
Applicable Objective Statement:	Increase educational awareness of wildfires in rural areas
Estimated Cost:	$ 5,000 – 10,000
Benefits:	Promote fire safety among the community
Plan for Implementation	
Responsible Organization/Department:	White Rock Fire Protection District
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	SEMA/FEMA, Grant Funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	New
Report of Progress	New Action

Action Worksheet	
Name of Jurisdiction:	White Rock FPD
Risk / Vulnerability	
Problem being Mitigated:	Lack of mutual aid communication around surrounding area.
Hazard(s) Addressed:	Wildfires
Action or Project	
Action/Project Number:	FPD-3
Name of Action or Project:	Increase mutual aid in rural communities
Action or Project Description:	Purchase automatic mutual aid agreements in the area to improve coverage in major events in White Rock Fire Protection area and neighboring fire areas.
Applicable Goal Statement:	Increase mutual aid benefits in White Rock Fire Protection District
Applicable Objective Statement:	Promote fire safety among the community
Estimated Cost:	$ 10,000- 20,000
Benefits:	Increase fire protection coverage in rural communities
Plan for Implementation	
Responsible Organization/Department:	White Rock Fire protection District
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	SEMA/FEMA, Grant Funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	New
Report of Progress	New Action

Action Worksheet	
Name of Jurisdiction:	White Rock FPD
Risk / Vulnerability	
Problem being Mitigated:	Adequate funding sources for mitigation activities
Hazard(s) Addressed:	All Hazards
Action or Project	
Action/Project Number:	FPD-4
Name of Action or Project:	Debris removal and regular brush cleaning
Action or Project Description:	Mitigate the risk of life and property by regularly removing debris and regular brush clearing as needed along transportation routes and drainage systems
Applicable Goal Statement:	Protect entity's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective andtechnically feasible mitigation projects.
Applicable Objective Statement:	Promote fire safety among the community
Estimated Cost:	$ 10,000
Benefits:	Frequent removal of debris will help keep roadways and drainage systems clear. Stormwater can drain effectively and reduce the risk of flooding and with regular removal of debris
Plan for Implementation	
Responsible Organization/Department:	White Rock Fire protection District
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	SEMA/FEMA, Grant Funds, Local, state, federal
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	New
Report of Progress	New Action

CHAPTER 5 PLAN MAINTENANCE PROCESS

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

5.1 Monitoring, Evaluating, and Updating the Plan

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

5.1.1 Responsibility for Plan Maintenance

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 McDonald County. The County Emergency Management Director oversees the LEPC and will be charged with reconvening the MPC, either as part of the already established LEPC, or as a separate group if necessary. 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 and special districts, to:

- Meet annually, and after a disaster event, to monitor and evaluate the implementation of the plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low- or no-cost recommended actions;
- Maintain vigilant monitoring of multi-objective, cost-share, and other funding opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Report on plan progress and recommended changes to the County Board of Supervisors and governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

The MPC is an advisory body and can only make recommendations to county, city, town, or district elected officials. Its primary duty is to see the plan successfully carried out and to report to the community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information in areas accessible to the public.

5.1.2 Plan Maintenance Schedule

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

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

5.1.3 Plan Maintenance Process

Progress on the proposed actions can be monitored by evaluating changes in vulnerabilities identified in the plan. The MPC (or other designated responsible entity) during the annual meeting should review changes in vulnerability identified as follows:

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

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

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

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

- Each proposed action in the plan identified an individual, office, or agency responsible for action implementation. This entity will track and report on an annual basis to the jurisdictional MPC (or designated responsible entity) member on action status. The

entity will provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing risk.
- If the action does not meet identified objectives, the jurisdictional MPC (or designated responsible entity) member will determine necessary remedial action, making any required modifications to the plan.

Changes will be made to the plan to remedy actions that have failed or are not considered feasible. Feasibility will be determined after a review of action consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring of this plan. Updating of the plan will be accomplished by written changes and submissions, as the (MPC or designated responsible entity) deems appropriate and necessary. Changes will be approved by the McDonald County Commission 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 of this plan. Based on the capability assessments of the participating jurisdictions, communities in McDonald 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:

- Comprehensive plans of participating jurisdictions
- Ordinances of participating jurisdictions;
- McDonald 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 (or designated responsible entity) members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The MPC (or designated responsible entity) is also responsible for monitoring this integration and incorporation of the appropriate information into the five-year update of the multi-jurisdictional hazard mitigation plan.

Additionally, after the annual[10(b)] review of the Hazard Mitigation Plan, the McDonald County Emergency Management Director will provide the updated Mitigation Strategy with current status of each mitigation action to the County (Boards of Supervisors or Commissions) as well as all Mayors, City Clerks, and School District Superintendents[10(a)]. The Emergency Manager Director 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
McDonald County	Hazard Mitigation Plan	County officials identified actions relating to emergency operations that were included in the updated to the EOP	City officials identified new or ongoing actions relating to future development that will be included in the next Comprehensive Plan Update The new CEDS requires a chapter related to disaster resiliency. The goals outlined in the CEDS regarding mitigation aligns with goals 1 and 2 within this HMP. Several mitigation actions were identified concurrently in this update of the McDonald County HMP and the CEDS
City of Anderson	County Emergency Operations Plan County Mitigation Plan Zoning Ordinance Building Ordinance Floodplain Ordinance Landscape Ordinance Zoning/ Land Use Restrictions	Landscape Ordinance Zoning ordinance Nuisance Ordinance Site Plan Review Requirements	Planning/Zoning Board Mutual Aid Agreements NFIP Policies Zoning and Land Use Restrictions
City of Goodman	County Emergency Plan Zoning Ordinance Building Ordinance Zoning/ Land Use Restrictions	Zoning ordinance Subdivision Ordinance Nuisance Ordinance Drainage Ordinance Hazard Awareness Program Land Use Program	Zoning/ Land Use Restrictions Codes building site/ design NFIP Policies Hazard Awareness Program
City of Lanagan	County Emergency Plan County Mitigation Plan Local Mitigation Plan	Local Plans and integration processes have not been updated since 2016	City officials identified new or ongoing actions relating to future development that will be included in the next

			Comprehensive Plan update
City of Noel	County Emergency Operations Plan County Mitigation Plan Zoning Ordinance Building Ordinance Floodplain Ordinance Landscape Ordinance Zoning/ Land Use Restrictions	Zoning ordinance Subdivision Ordinance Nuisance Ordinance Drainage Ordinance Hazard Awareness Program Land Use Program Tree Trimming Ordinance Landscape Ordinance Storm water ordinance Historic Conservation Ordinance	Zoning/ Land Use Restrictions Codes Building Site Design NFIP Policies Public Education Awareness Tree Trimming Program Mutual Aid Agreements
City of Pineville	Comprehensive Plan/ Local Emergency Plan County Mitigation Plan Zoning Ordinance Building Ordinance	Landscape Ordinance Zoning ordinance Nuisance Ordinance Site Plan Review Requirements Floodplain Ordinance	NFIP Policies Codes Building Site/Design Mutual Aid Agreements
City of Southwest City	Capital Improvement Plan Local Mitigation Plan County Mitigation Plan County Emergency Plan Zoning Ordinance	Zoning Ordinance	NFIP Policies Planning / Zoning Board
Village of Jane	County Emergency Plan Local Mitigation Plan County Mitigation Plan Zoning Ordinance Building Ordinance Floodplain Ordinance	Zoning Ordinance Floodplain ordinance Zoning / Land Use Restrictions	NFIP Policies Zoning/ Land Use Restrictions
McDonald County School District	Capital Improvement Plan	School Administration / County officials identified actions relating to emergency operations that were included in the updated to the EOP	Annual Budget Capital Improvements Project Funding Building Codes Safety Plan Master Plan School Emergency Plan Capital Improvement Plan
White Rock Fire Protection District	Firewise or other fire mitigation plan	White Rock Fire Protection District did not participate in 2016 plan.	City officials identified new actions relating to future development that will be included in the next Comprehensive Plan update

5.3 Continued Public Involvement

44 CFR Requirement §201.6(c) (4) (iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

The hazard mitigation plan update process provides an opportunity to publicize success stories resulting from the plan's implementation and seek additional public comment. Information about the annual reviews will be posted in the local newspaper, as well as, on the County "A" website following each annual review of the mitigation plan and will solicit comments from the public based on the annual review. 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.