

SHANNON COUNTY, MISSOURI HAZARD MITIGATION PLAN 2023 UPDATE



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Table of Contents

| | |
|---|-------------|
| CONTRIBUTORS | II |
| EXECUTIVE SUMMARY..... | III |
| PREREQUISITES..... | VIII |
| 1 - INTRODUCTION AND PLANNING PROCESS..... | 1.1 |
| 1.1 - PURPOSE | 1.2 |
| 1.2 - BACKGROUND AND SCOPE | 1.2 |
| 1.3 - PLAN ORGANIZATION..... | 1.3 |
| 1.4 - PLANNING PROCESS..... | 1.5 |
| 1.4.1 – Multi-Jurisdictional Participation..... | 1.6 |
| 1.4.2 – The Planning Steps..... | 1.8 |
| 2 – PLANNING AREA PROFILE AND CAPABILITIES..... | 2.1 |
| 2.1 – DOUGLAS COUNTY PLANNING AREA PROFILE..... | 2.2 |
| 2.1.1 – Geography, Geology, and Topography | 2.3 |
| 2.1.2 - Climate..... | 2.3 |
| 2.1.3 - Demographics..... | 2.4 |
| 2.1.4 - History..... | 2.4 |
| 2.1.5 - Occupations | 2.5 |
| 2.1.6 - Agriculture | 2.6 |
| 2.1.7 – FEMA Hazard Mitigation Assistance Grants in Planning Area | 2.6 |
| 2.1.8 – FEMA Public Assistance (PA) Grants in Planning Area..... | 2.6 |
| 2.2 – JURISDICTIONAL PROFILES AND MITIGATION CAPABILITIES..... | 2.9 |
| 2.2.1 – Unincorporated Douglas County, Missouri..... | 2.9 |
| 2.2.2 – City of Birch Tree..... | 2.13 |
| 2.2.3 – City of Winona..... | 2.15 |
| 2.2.4 – City of Eminence | 2.17 |
| 2.2.5 – Public School Systems..... | 2.21 |
| 2.2.6 – Eminence R-I School District | 2.21 |
| 2.2.7 – Winona R-III School District | 2.23 |

| | |
|---|-------------|
| 3 – RISK ASSESSMENT | 3.1 |
| 3.1 – HAZARD IDENTIFICATION..... | 3.2 |
| 3.1.1 – Review of Existing Mitigation Plans | 3.3 |
| 3.1.2 – Review of Disaster Declaration History | 3.4 |
| 3.1.3 – Research Additional Sources..... | 3.6 |
| 3.1.4 – Hazards Identified | 3.8 |
| 3.1.5 – Multi-Jurisdictional Risk Assessment | 3.9 |
| 3.2 – ASSETS AT RISK..... | 3.10 |
| 3.2.1 – Total Exposure of Population and Structures | 3.10 |
| 3.2.2 – Critical and Essential Facilities and Infrastructure | 3.12 |
| 3.2.3 – Other Assets..... | 3.16 |
| 3.3 – LAND USE AND DEVELOPMENT..... | 3.19 |
| 3.3.1 – Development Since Previous Plan Update..... | 3.19 |
| 3.3.2 – Future Land Use and Development | 3.19 |
| 3.4 – HAZARD PROFILES, VULNERABILITY, AND PROBLEM STATEMENTS | 3.21 |
| 3.4.1 - Dam Failure..... | 3.24 |
| 3.4.2 - Drought..... | 3.32 |
| 3.4.3 - Earthquakes | 3.38 |
| 3.4.4 – Extreme Temperatures | 3.45 |
| 3.4.5 - Flooding | 3.51 |
| 3.4.6 – Land Subsidence / Sinkholes..... | 3.63 |
| 3.4.7 – Severe Thunderstorms (including high wind, hail & lightning)..... | 3.67 |
| 3.4.8 - Tornado..... | 3.76 |
| 3.4.9 - Wildfire | 3.82 |
| 3.4.10 - Severe Winter Weather | 3.86 |
| 4 – MITIGATION STRATEGY | 4.1 |
| 4.1 - GOALS..... | 4.2 |
| 4.2 – IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS..... | 4.3 |
| 4.3 – IMPLEMENTATION OF MITIGATION ACTIONS | 4.8 |

| | |
|--|------------|
| 5 – PLAN MAINTENANCE PROCESS | 5.1 |
| 5.1 – MONITORING, EVALUATING, AND UPDATING THE PLAN..... | 5.2 |
| 5.1.1 – Responsibility for Plan Maintenance | 5.2 |
| 5.1.2 – Plan Maintenance Schedule..... | 5.3 |
| 5.1.3 – Plan Maintenance Process | 5.3 |
| 5.2 – INCORPORATION INTO EXISTING PLANNING MECHANISMS..... | 5.4 |
| 5.3 – CONTINUED PUBLIC INVOLVEMENT..... | 5.5 |
| | |
| APPENDIX A – PLANNING PARTICIPATION DOCUMENTATION | 172 |
| APPENDIX B – COMPLETED & DELETED MITIGATION ACTIONS | 179 |
| APPENDIX C – PUBLIC ENGAGEMENT | 181 |
| APPENDIX D – JURISDICTIONAL ADOPTION DOCUMENTATION..... | 186 |

Table of Contents

| | |
|------------------------|------|
| Contributors | ii |
| Executive Summary..... | iii |
| Prerequisites | viii |

CONTRIBUTORS

Shannon County, Missouri Hazard Mitigation Planning Committee

Jurisdictional Representatives

| Name | Title | Department | Jurisdiction/Agency/Organization |
|-----------------|------------------------|------------|----------------------------------|
| Jeff Cowen | Presiding Commissioner | County | Shannon |
| Kristy Shields | Clerk | City | Birch Tree |
| Dino Romeo | Mayor | City | Winona |
| Mindy Galloway | City Clerk | City | Eminence |
| Eric Allen | Superintendent | School | Eminence |
| Jennifer Asplin | Superintendent | School | Winona |

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

- (1) Protect the lives and property of all citizens of Shannon County;
- (2) Preserve functioning of civil government during natural disasters; and
- (3) Maintain economic activities essential to the survival and recovery from natural disasters.

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

Stakeholder Representatives

| Name | Title | Department | Jurisdiction/Agency/Organization |
|-----------------|--|---------------|----------------------------------|
| Herman Kelly | Associate Commissioner | County | Shannon |
| Dale Counts | Associate Commissioner | County | Shannon |
| Darrin Brawley | Sheriff | County | Shannon |
| Shelly Bland | County Clerk | County | Shannon |
| Margie Cleary | Mayor | City | Eminence |
| Scottie Haynes | City Clerk | City | Winona |
| Justin Eudaley | Chief of Police/Floodplain Administrator | City | Winona |
| Louis Colaianne | Mayor | City | Birch Tree |
| Myles Smith | Member Services | Electric Coop | Howell Oregon Electric |
| Mary Ficker | EMD | County | Shannon |

EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Shannon 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 6/21/2018. 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.

- Shannon County, Missouri
- City of Eminence, Missouri
- City of Winona, Missouri
- City of Birch Tree, Missouri
- Winona R-III School District
- Eminence R-1 School District

Shannon County and the entities listed above developed a Multi-Jurisdictional Hazard Mitigation Plan that was approved by FEMA on June 21, 2023 (hereafter referred to as the *2023 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 Shannon County and the participating jurisdictions within. The MPC updated the risk assessment that identified and profiled hazards that pose a risk to Shannon County and analyzed jurisdictional vulnerability to these hazards.

The MPC also examined the capabilities in place to mitigate the hazard damages, with emphasis on changes that have occurred since the previously approved plan was adopted. The MPC determined that the planning area is vulnerable to several hazards that are identified, profiled, and analyzed in this plan.

Riverine and flash flooding, winter storms, severe thunderstorms/hail/lightning/high winds, and tornadoes are among the hazards that historically have had a significant impact.

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

- (1) Protect the lives and property of all citizens of Shannon County;**
- (2) Preserve functioning of civil government during natural disasters; and**
- (3) Maintain economic activities essential to the survival and recovery from natural disasters.**

To advance the identified goals, the MPC developed recommended mitigation actions, as summarized in the table on the following pages. The MPC developed an implementation plan for each action, which identifies priority level, background information, ideas for implementation, responsible agency, timeline, cost estimate, potential funding sources, and more. These additional details are provided in Chapter 4.

Table 1. Mitigation Action Matrix

| # | Action | Jurisdiction | Priority | Goals Addressed | Hazards Addressed | Address Current Development | Address Future Development | Continued Compliance with NFIP |
|-------------|--|--------------------|----------|-----------------|--|-----------------------------|----------------------------|--------------------------------|
| Shannon1 | Purchase and install a backup generator at the county courthouse which serves various governmental functions | Shannon County | 20 | Goal 2 | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, and Tornado | X | | |
| Shannon2 | Warming and Cooling Locations throughout the County during extreme temperatures and freezing temperatures | Shannon County | 31 | Goal 1 | Extreme Temperatures and Winter Weather | X | X | |
| Shannon3 | County road and bridge replacement | Shannon County | 30 | Goal 1 | Flooding (Flash and River) | X | X | |
| Birch Tree1 | Purchase and install a backup generator at the main water well site. | City of Birch Tree | 20 | Goal 1 | Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, and Tornado | X | | |
| Birch Tree2 | Develop a coordinated plan to test outdoor warning sirens on a consistent basis | City of Birch Tree | 15 | Goal 2 | Tornado | X | | |
| Birch Tree3 | The city will attempt to improve floodplain management by identification of map amendments/updates | City of Birch Tree | 15 | Goal 3 | Flooding (Flash and River) | X | | X |
| Winona1 | Purchase and install a backup generator at the main water well site. | City of Winona | 20 | Goal 1 | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, and Tornado | X | | |
| Winona2 | Develop a coordinated plan to test outdoor warning sirens on a consistent basis | City of Winona | 15 | Goal 2 | Tornado | X | | |
| Winona3 | The city will attempt to improve floodplain management by identification of map amendments/updates | City of Winona | 15 | Goal 3 | Flooding (Flash and River) | X | | X |
| Eminence1 | Install at new outdoor warning sirens in the community | City of Eminence | 19 | Goal 1 | Tornado | X | | |

| # | Action | Jurisdiction | Priority | Goals Addressed | Hazards Addressed | Address Current Development | Address Future Development | Continued Compliance with NFIP |
|-------------------|--|--|----------|-----------------|--|-----------------------------|----------------------------|--------------------------------|
| Eminence2 | Develop a coordinated plan to test outdoor warning sirens on a consistent basis | City of Eminence | 15 | Goal 2 | Tornado | X | | |
| Eminence3 | Purchase and install a backup generator at main water well site. | City of Eminence | 20 | Goal 1 | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, and Tornado | X | X | |
| Eminence4 | The city will attempt to improve floodplain management by identification of maps amendments/updates. | City of Eminence | 15 | Goal 3 | Flooding (Flash and River) | X | | X |
| Winona R-III-1 | Distribute brochures and publish social media posts to educate students and residents on personal emergency preparedness and ways to minimize the effect of natural disasters before they occur. | Winona School/Community | 27 | Goal 3 | Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, and Tornado | X | X | |
| Winona R-III 2 | Purchase and install a backup generator for administration offices | Winona School/Community | 31 | Goal 2 | Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, and Tornado | X | X | |
| Winona R-III 3 | Construct a 361 design tornado saferoom on the school campus | Winona R-III School | 18 | Goal 1 | Tornado | X | | |
| All Jurisdictions | Construct storm shelters and certified tornado safe rooms near schools and large employment centers as funding allows. | All Jurisdictions and School Districts | 32 | 1 | Tornadoes, Severe Weather | X | X | |
| All Jurisdictions | Distribute brochures and publish social media posts to educate students and residents on personal emergency preparedness and ways to minimize the effect of natural disasters before they occur. | All Jurisdictions | 27 | 3 | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, and Tornado | X | X | |
| All Jurisdictions | Distribute FEMA brochures on the and fact sheets about the National Flood Insurance Program (NFIP) at public offices and community events | All Jurisdictions | 27 | 2 | Floods | | | X |
| Eminence School1 | Distribute brochures and publish social media posts to educate students and residents on personal emergency preparedness and ways to minimize the effect of natural disasters before they occur. | Eminence School/Community | 27 | Goal 3 | Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, and Tornado | X | X | |

| # | Action | Jurisdiction | Priority | Goals Addressed | Hazards Addressed | Address Current Development | Address Future Development | Continued Compliance with NFIP |
|------------------|--|---------------------------|----------|-----------------|---|-----------------------------|----------------------------|--------------------------------|
| Eminence School2 | Purchase and install a backup generator for administration offices | Eminence School/Community | 31 | Goal 2 | Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, and Tornado | X | X | |

PREREQUISITES

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

This plan has been reviewed by and adopted with resolutions or other documentation of adoption by all participating jurisdictions and schools/special districts. The documentation of each adoption is included in Appendix D, and a model resolution is included below. The jurisdictions listed in the Executive Summary participated in the development of this plan and have adopted the multi-jurisdictional plan.

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

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

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

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

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

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

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

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

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

ADOPTED by a vote of favor and against, and abstaining, this day of , .

*By (Sig):
Print name:*

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

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

1 INTRODUCTION AND PLANNING PROCESS

- 1 INTRODUCTION AND PLANNING PROCESS 1.1
 - 1.1 PURPOSE 1.2
 - 1.2 BACKGROUND AND SCOPE 1.2
 - 1.3 PLAN ORGANIZATION 1.3
 - 1.4 PLANNING PROCESS 1.5
 - 1.4.1 Multi-Jurisdictional Participation.....1.6
 - 1.4.2 The Planning Steps1.8

1.1 PURPOSE

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

By participating in the planning process and meeting the necessary requirements to do so, communities, school districts, and other special districts become eligible to apply for mitigation grant funding. FEMA has implemented the various hazard mitigation provisions through the Code of Federal Regulations (CFR) at 44 CFR Part 201. The CFR provisions set forth the mitigation plan requirements for local and tribal governments as a condition of receiving FEMA hazard mitigation assistance. Local governments, schools, or other publicly funded districts that do not participate or adopt a hazard mitigation plan will not be eligible to apply for grants as stated under 44 CFR §201.6. Section 322 of the Robert T. Stafford Relief and Emergency Assistance Act (P.L. 93-288), as amended by the Disaster Mitigation Act of 2000 (DMA) (P.L. 106-390), provides for States, Tribes, and local governments to undertake a risk-based approach to reducing risks to natural hazards through mitigation planning.

This plan was developed prior to the release of FEMA's Local Mitigation Planning Policy Guide, Effective April 19th 2023. Future hazard mitigation plan updates will include outreach to non-profits for underserved communities as required under 44 CFR 201.6 (b) (2).

1.2 BACKGROUND AND SCOPE

As required by 44 CFR §201.6(d)(3), a local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts and changes in priorities, and resubmit it for approval every five (5) years in order to continue to be eligible for mitigation project grant funding. The 2023 Shannon County Multi-Jurisdictional Natural Hazard Mitigation Plan, from here on referred to as the Plan, is a revision of the previous five-year update approved by FEMA during 2018, which was the first five-year update of the original countywide hazard mitigation plan completed in 2007.

The Plan is a major rewrite of the 2018 Plan and reflects changes in priorities and development, and the continued commitment of local governments to mitigate the impact of natural hazards in Shannon County. Local jurisdictions that participated in the 2018 Plan and are continuing participation in this 2023 Plan include:

- Shannon County
- City of Eminence
- City of Winona
- City of Birch Tree
- Winona R-III School District
- Eminence R-I School District

All jurisdictions received letter and email communications notifying representatives of upcoming meetings and participation requirements. Jurisdictions listed above were represented during the planning process and met the minimum participation requirements.

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

1.3 PLAN ORGANIZATION

The Plan is organized into five chapters. The 2018 Plan included a chapter dedicated to local jurisdiction capabilities. This information has been incorporated into the Planning Area Profile and Capabilities Chapter. The format of the Plan was changed to conform to the local hazard mitigation plan outline template released by the Missouri State Emergency Management Agency (SEMA) in September 2017. The Plan chapters include:

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

Table 1.1 on the following page summarizes the changes made in the Plan by chapter.

Table 1.1. Changes Made in Plan Update

| Plan Chapter | Summary of Changes Made |
|--|---|
| <p>Chapter 1 Introduction</p> | <ul style="list-style-type: none"> • General Format Changes |
| <p>Chapter 2 Profile & Capabilities</p> | <ul style="list-style-type: none"> • Added Geological and Karst features map • Critical features moved to Ch. 3 • Added table showing Unemployment, Poverty, education, and language percentages • Historic Sites and endangered species list moved to Ch. 3. • Added table showing FEMA HMA grants approved. |
| <p>Chapter 3 Risk Assessment</p> | <ul style="list-style-type: none"> • General format updates • Expanded introduction section • Added Assets at Risk of exposure to current population and structures • Added Critical Facilities inventory of all included jurisdictions • Added inventory of parks, historical sites, and endangered species. • Added table for agricultural-related jobs and information and Major employers • Added Land Use Development section for development since previous plan and future land use expected. • Expanded Community profiles for each jurisdiction. |
| <p>Chapter 4 Mitigation Strategy</p> | <ul style="list-style-type: none"> • Updated mitigation actions development process • Included actions eliminated and reason for removal • Updated progress made towards mitigation goals from earlier plan • Updated cost benefit review method using STAPLEE and simple scores • Discussed funding sources, lead agencies and status of continuing, revised and new actions |
| <p>Chapter 5 Plan Maintenance</p> | <ul style="list-style-type: none"> • Updated the responsibilities for plan monitoring, evaluation, and implementation. |

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.

For the update of the 2018 Shannon County Hazard Mitigation Plan, the County and SEMA has contracted with the South Central Ozark Council of Governments (SCOCOG) and has participated fully in the update process. Once this plan receives final approval from the Federal Emergency Management Agency, Shannon County, and the participating cities and school districts within will be eligible for future mitigation assistance from FEMA and will be able to more effectively carry out the identified mitigation activities in an effort to lessen the adverse impact of future natural disasters that take place in the county.

SCOCOG’s role as contractor includes the following elements:

- Assist in establishing a Mitigation Planning Committee (MPC) as defined by the Disaster Mitigation Act (DMA),
- Ensure the updated plan meets the DMA requirements as established by federal regulations and follows the most current planning guidance of the Federal Emergency Management Agency (FEMA),
- Facilitate the entire plan development process,
- Identify the data that MPC participants could provide and conduct the research and documentation necessary to augment that data,
- Assist in soliciting public input,
- Produce the draft and final plan update in a FEMA-approvable document and coordinate the Missouri State Emergency Management Agency (SEMA) and (FEMA) plan reviews.

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

Table 1.2. Jurisdictional Representatives of Shannon County Mitigation Planning Committee

| Name | Title | Department | Jurisdiction, Agency or Organization |
|-----------------|------------------------|------------|--------------------------------------|
| Jeff Cowen | Presiding Commissioner | County | Shannon County |
| Kristy Shields | Clerk | City | City of Birch Tree |
| Dino Romeo | Mayor | City | City of Winona |
| Minday Galloway | Clerk | City | City of Eminence |
| Eric Allen | Superintendent | School | Eminence |
| Jennifer Asplin | Superintendent | School | Winona |

Table 1.3 below demonstrates the expertise of the Shannon County MPC members in the six mitigation categories (Preventive Measures, Property Protection, Natural Resource Protection, Emergency Services, Structural Flood Control Projects, and Public Information).

Table 1.3. MPC Capability with Six Mitigation Categories

| Office | Preventive Measures | Structure and Infrastructure Projects | | Natural Resource Protection | Public Information | Emergency Services |
|------------------------|---------------------|---------------------------------------|-----------------------------------|-----------------------------|--------------------|--------------------|
| | | Property Protection | Structural Flood Control Projects | | | |
| Presiding Commissioner | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Police Chief/EMD | ✓ | | ✓ | | | ✓ |
| Mayor | ✓ | | | ✓ | | |
| EMD/Fire Chief | ✓ | | ✓ | | | ✓ |
| Superintendent | ✓ | ✓ | | | ✓ | |
| Superintendent | ✓ | ✓ | | | ✓ | |

1.4.1 Multi-Jurisdictional Participation

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

The South Central Ozark Council of Governments, on behalf of Shannon County, invited all incorporated cities, all school districts, and many non-profit entities located within the county to participate in the Shannon County Hazard Mitigation Plan update planning meetings. FEMA accepts multi-jurisdictional plans which meet all the requirements of 44CFR §201.6(a)(3):

- The risk assessment must assess each jurisdiction’s risk where they may vary from the risks facing the entire planning area.
- There must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.
- Each jurisdiction requesting approval of the plan must document that itself has formally adopted the plan.

DMA 2000 further requires that jurisdictions represented within a multi-jurisdictional hazard mitigation plan participate in the planning process in addition to formally adopting the completed plan. Each participating jurisdiction was required to meet planning participation requirements as defined by SCOCOG at the beginning of the update process. Minimum participation requirements were defined as follows:

Provide information to support the plan update through at least two of the following methods:

- Completion of jurisdiction questionnaire;
- Attendance at public meetings;
- Alternately scheduled meetings for data collection purposes;
- Email correspondence with SCOCOG staff for data collection purposes; and
- Formally adopt the hazard mitigation plan

SCOCOG was contracted by Shannon County to revise and update the 2018 Hazard Mitigation Plan and coordinate planning efforts between the municipalities and school districts of the County. SCOCOG planning staff led the development of the plan update by forming the planning committee, calling, and facilitating meetings, compiling data, composing, and reviewing drafts, issuing public notices, and drafting correspondence. All the jurisdictions listed as participants in the plan update met the minimum participation requirements as indicated in the following tables. Documentation of meeting attendance is included in *Appendix A: Planning Participation Documentation*.

Participating jurisdictions include Shannon County (unincorporated), the incorporated city of Eminence, Winona, Birch Tree, the school districts of Winona R-III and Eminence R-I. In the 2018 iteration of the Shannon County Hazard Mitigation Plan, all jurisdictions participated fully. Other jurisdictions which participated in the planning process as stakeholders but are not seeking independent adoption and approval are:

- local police departments
- electric cooperatives
- emergency management agencies

The Plan serves as a written document of the planning process. Active participation of local jurisdiction representatives and stakeholders in the hazard mitigation planning process is essential if the Plan is to have value. To be eligible for mitigation funding, local governments and school districts must adopt the FEMA-approved update of the Plan. The participation of the local government stakeholders in the planning process is considered critical to successful implementation of this plan. Each jurisdiction that is seeking approval for the plan must have its governing body adopt the updated plan, regardless the degree of modifications. SCOCOG collaborated with the local governments in Shannon County to assure participating in the planning process to the greatest extent possible and the development of the plan that represents the needs and interests of Shannon County and its local jurisdictions.

The planning engagement took to the form of individual meetings with each of the participating jurisdictions, who reviewed findings from the updated Risk Assessment and completed a hazard mitigation data collection questionnaire (DCQ) that was developed in tandem with the Missouri SEMA planning outline template. This approach is different from previous plan updates, when county-wide planning meetings were held in an attempt to get input from all jurisdictions in one central location. From these meetings, goal refinement and potential mitigation actions were identified and MPC representatives were decided.

The public was engaged at two points during the development of the plan update. First, a public survey was posted on the SCOCOG website and advertised in the Shannon County Herald, the newspaper of widest circulation in the county. Second, the availability of the draft plan for review and comment was announced in the same newspaper in March of 2023. Documentation for both public engagement efforts and results of the public survey are included in Appendix C.

Table 1.4. Jurisdictional Participation in Planning Process

| Jurisdiction | Kick-off Meeting | Meeting #2 | Data Collection Questionnaire Response | Update/Develop Mitigation Actions |
|--------------------|------------------|------------|--|-----------------------------------|
| Shannon County | X | X | X | X |
| City of Eminence | X | X | X | X |
| City of Winona | X | X | X | X |
| City of Birch Tree | X | X | X | X |
| Winona R-III | X | X | X | X |
| Eminence R-I | X | X | X | X |

1.4.2 The Planning Steps

FEMA’s Local Mitigation Planning Handbook (March 2013), Local Mitigation Plan Review Guide (October 2013), and Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials (March 2013) were used as sources for development the Plan update process. The 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 allows the Plan to meet funding eligibility requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System, and Flood Migration 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 Council of Governments planners began the plan update process by contacting local stakeholders that were identified as key officials who would be valuable to the update of the mitigation plan. County commissioners, city officials, and emergency management personnel were targeted as potential members of the MPC. During an introductory conference call on September 12, 2022, the scope of the plan update was discussed, including planning participation requirements and general methodology. A timeline for completion the update was established, and planning meetings were scheduled and given ‘tentative’ dates.

The Data Collection Questionnaires for the county’s school districts and municipalities were distributed at the very beginning of the update process via email along with a follow up phone call to explain the procedure, the need for the data collection, how the data would be used, and to answer any questions the Superintendents may have had regarding the contents of the Data Collection Questionnaires. All participating jurisdictions were informed of any upcoming planning meetings throughout the county where SCOCOG planners would gather and review the questionnaire responses and help shore up any gaps in the data.

Table 1.6. Schedule of Planning Meetings

| Meeting | Participation | Method | Date |
|-------------------------|---|----------------|----------------------|
| Kick-off Meeting | 9:00 a.m. <ul style="list-style-type: none"> Prospective participants and stakeholders identified Raising awareness for mitigation strategy/increase countywide resilience to natural hazards Natural hazard vulnerability Local plan participation Project timeline | Teleconference | July 2022 |
| Winona R-III | Superintendent, Principal, SCOCOG Planner | Phone/Email | 2/10/2023 |
| Eminence R-I | Superintendent, Principal, SCOCOG Planner | In Person | 1/16/2023 |
| City of Eminence | City Staff, SCOCOG Planner | In Person | 2/14/2023 |
| City of Winona | City Staff, SCOCOG Planner | In Person | 10/4/2022 |
| City of Birch Tree | City Staff, SCOCOG Planner | In Person | 10/4/2022 |
| Shannon County | County Commissioners, SCOCOG Planner | In Person | 7/18/2022 |
| MPC Planning Meeting #2 | Jurisdictions represented: All, various times and locations <ul style="list-style-type: none"> Review of 2018 Mitigation Goals, Objectives and Actions Review of completed Jurisdictional Risk Assessment Identification of new mitigation actions STAPLEE Prioritization Completion of Data Collections Questionnaire, identifying capabilities, assets, vulnerability | Various | 9/1 – 3/15 2022-2023 |

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.

Options for soliciting public input on the Plan update were discussed at the Planning Kickoff Meeting held on September 12, 2022. SCOCOG staff explained the importance of public involvement during the planning process.

A plan to engage the public in the plan update process was developed in accordance with 44 CFR Requirement 201.6(b), ensuring the opportunity for the public to comment on the plan during the drafting stage and prior to FEMA approval. The consensus of the group was to (1) develop an online survey instrument which would be publicized in the Shannon County Herald and ran concurrent to the drafting of the plan update and (2) post the draft plan on the website of the South Central Ozark Council of Governments for public review and comment, and announce its availability in the Herald prior to the plan's submittal to the State Emergency Management Agency

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 are many organizations that are 'regional' in nature whose interest's interface with hazard mitigation planning in Shannon County. These groups were engaged via telephone calls and direct mail letters to invite interested parties to the September 12, 2022 planning meeting. The agencies and interest groups who were invited to take part in the hazard mitigation plan update are listed below:

- Red Cross
- Community Foundation of the Ozarks
- Timber Volunteer Fire Department
- Birch Tree Rural Fire Department
- Eminence Volunteer Fire Department
- Winona Volunteer Fire Department
- Shannon County Sheriff Department

- Oregon County Presiding Commissioner David Stubblefield
- Ozark County Presiding Commissioner John Turner
- Shannon County EMD
- Oregon County EMD
- Missouri Department of Conservation
- Missouri Department of Transportation (Southeast District)

Integration of Other Data, Reports, Studies, and Plans

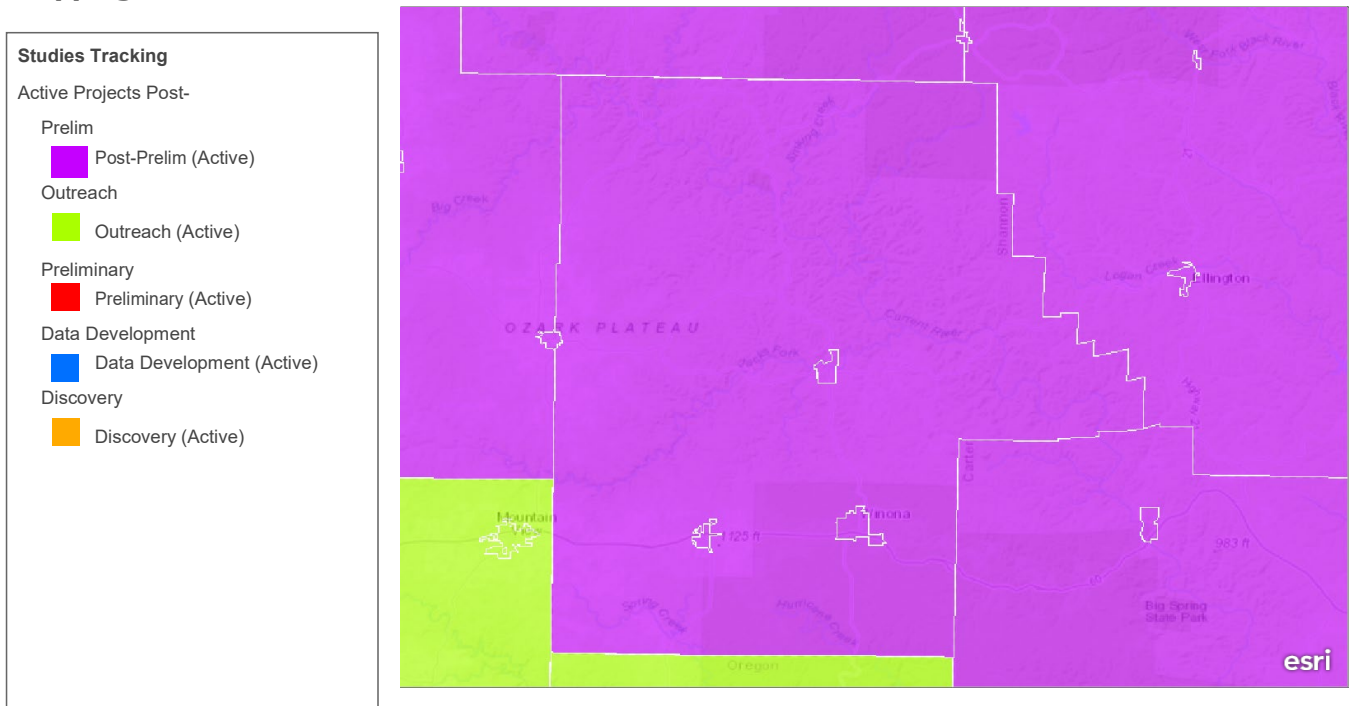
A review of the most current data, reports, studies and Plans relating to hazard mitigation planning in Shannon County were reviewed in order to provide the latest “snapshot” of existing conditions to inform the development of the 2018 Plan. Local planning documents that were reviewed were the Region G Threat Hazard Risk Assessment (THIRA), the Comprehensive Economic Development Strategy, the South Central Regional Transportation Plan, The State Transportation Plan, and the Shannon County Local Emergency Operations Plan. Where available, information from these Plans was integrated into the planning meeting discussions and into the Hazard Mitigation Plan narrative itself.

Coordination with FEMA Risk MAP Project

Risk Mapping, Assessment, and Planning (Risk MAP) is the Federal Emergency Management Agency (FEMA) Program that provides communities with flood information and tools they can use to enhance their mitigation plans and take action to better protect their citizens. Through collaboration with State, Tribal, and local entities, Risk MAP delivers quality data that increases public awareness and leads to action that reduces risk to life and property. As depicted in the following Figure 1.1, Shannon County is currently within the active Outreach phase of Risk MAP activities:

Figure 1.1. Map of RiskMAP projects

Mapping Information Platform Studies Tracker



Shannon County Emergency Operations Plan (EOP)

Shannon County emergency management is set up along the following functional segments: direction and control; communications and warning; emergency public information; damage assessment; law enforcement; fire and rescue; civil disorder; hazardous materials response; public works; evacuation; in-place sheltering; reception and care; health and medial terrorism response; and resources and supply. This plan also defines lines of succession for the continuity of government operations during a disaster as well as the preservation of records and the logistics of administrative functions such as procedures for obtaining temporary use of facilities. The Shannon County Emergency Operations Plan was last updated in 2009.

South Central Ozark Regional Transportation Plan (RTP)

SCOCOG maintains and updates annually the Regional Transportation Plan (RTP) as part of a work agreement with the Missouri Department of Transportation. The RTP begins with the statewide Long Range Transportation Plan's goals then refines them to fit the unique nature of the South Central region. The local planning process involves prioritization of transportation projects and defining broad transportation improvement strategies, including hazard mitigation (primarily roadway flooding and dangerous low-water crossings, economic development, safety, and expansion of multimodal opportunities.

Comprehensive Economic Development Strategy (CEDS)

The regional Comprehensive Economic Development Strategy was updated in 2019 following an extensive regional planning process. A dozen planning meetings were held throughout the seven-county region to identify economic development goals and strategies, gain input on the function and effectiveness of the regional planning commission's services, and identify vital economic development projects & programs for every jurisdiction in the region. The CEDS provides detailed information on social and economic data, and an overview of funding programs available to local governments and not-for-profit agencies.

Community, economic, and human resources development projects continue to be implemented across Shannon County. All three incorporated communities, and the county itself are very active in these areas. Shannon County acknowledged some of their emergency management and response needs in the Community Improvement Project List contained in the 2019 Comprehensive Economic Development Strategy. Projects listed by municipalities in Shannon County in the CEDS relating to emergency management are listed on the next page:

- Backup generator for Birch Tree water well
- Backup generator for Eminence water well
- Backup generator at the Shannon County Courthouse
- Stormwater and Flood Mitigation projects in Winona and Birch Tree
- Water and Wastewater Improvement Projects in Winona and Eminence

A wide variety of technical data gathered from a number of state and federal agencies was integrated to the 2018 Plan to develop the Risk Assessment portion of the plan. Federal Emergency Management Agency DFIRM maps were utilized to delineate flood hazard areas and at-risk structures in the county. NOAA data was used to compile event history for hazard profiles. Data from Missouri Department of Transportation, Missouri Department of Natural Resources, and Missouri Economic Resource Information Center (MERIC) were utilized to define the county's vulnerability to natural hazard events.

National datasets such as the National Agriculture Imagery Program, the National Inventory of Dams, the SILVIS Lab housed at the University of Wisconsin-Madison, and the 2020 U.S. Census were referenced in the updated Risk Assessment.

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

The hazard profiles contained within the 2018 Shannon County Hazard Mitigation Plan were reassessed during the kickoff planning meeting in June. During the remainder of the planning meetings in the county, attendees were provided the latest hazard data via the research conducted by the South Central Ozark Council of Governments. The attendees provided to SCOCOG their input on hazard events from the DCQs completed by each participating jurisdiction. By consensus the participants identified the natural hazards that are not considered a threat to their own jurisdiction and eliminated those disasters from consideration in the Risk Assessment process. A Hazard Vulnerability Sheet was completed by each participating jurisdiction to help determine the perceived threat faced by their respective jurisdictions for inclusion in the Hazard Mitigation Plan.

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

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 were derived from GIS layers identified structures by use in the county and the local jurisdiction and school district data collection questionnaires, and FEMA DFIRM data. Potential losses to existing development were estimated on hazard event scenarios and annualized losses. In most cases the county assessor's valuations were used to estimate structure losses in impacted areas by structure occupancy type. The methodology for estimating losses varies by hazard. Loss estimates are included in each hazard profile contained in the Risk Assessment chapter.

Step 6: Set Goals (Handbook Task 6)

The Mitigation Planning Committee reviewed the goals from the 2018 Shannon County Plan during the kickoff planning meeting in June 2021. The MPC opted to carry over the Mitigation Goals from the previous iteration of the plan, as they were determined to still be applicable:

Goal 1: Protect the Lives and Property of all Citizens of Shannon County

- Identify and provide sufficient emergency shelters
- Review and maintain current warning systems for sufficient coverage

Goal 2: Preserve the Functioning of Civil Government During Natural Disasters

- Implement proper maintenance and necessary upgrades of critical buildings and infrastructures in the county
- Improve the efficiency, timing, and effectiveness of response and

recovery efforts for natural hazard disasters

Goal 3: Maintain Economic Activities Essential to the Survival and Recovery from Natural Disasters

- Periodically review chain of command of government organizations for emergency situations and keep up-to-date
- Continuously review communications systems and keep in good working order

Step 7: Review Possible Mitigation Actions and Activities

The Mitigation Planning Committee and representatives from participating jurisdictions reviewed the mitigation actions from the 2018 Plan during the June kickoff meeting, as well as subsequent planning meetings with participating jurisdictions. It was decided that a couple of the actions from the previous plan were vague or unclear in their intent and the consensus of the group was that the mitigation actions needed to be more individualized in nature. New actions were identified, potential costs were discussed, lead agencies and staff were identified. Actions were prioritized using the STAPLEE methodology during the second planning meetings with participating jurisdictions. The FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)* was used as a primary source to guide the action formulation process. Participants were encouraged to focus on mitigation efforts that could be reasonably be attained in the next five-to-ten years

Step 8: Draft an Action Plan

Progress in implementing the mitigation actions will be reviewed annually by the regional planner housed at the South Central Ozark Council of Governments. Additionally, as potential grant funding becomes available, SCOCOG planners will work with the jurisdictions of Shannon County to develop applications when a viable project arises.

Step 9: Adopt the Plan (Handbook Task 8)

The jurisdictions will be asked to adopt the plan after SEMA's initial plan review to ensure that no wholesale changes are being required within the planning document. Upon approval of the draft Plan by SEMA staff, the SCOCOG planners will work with participating jurisdictions to facilitate the Plan Adoption process.

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

During the planning kickoff meeting it was decided that the implementation the mitigation actions will be reviewed annually and revised (as needed) by the regional planner housed at the South Central Ozark Council of Governments. Additionally, as potential grant funding becomes available, SCOCOG planners will work with the jurisdictions of Shannon County to develop applications when a viable project arises. The process for Plan Maintenance is detailed in Chapter 5 of this document.

2 PLANNING AREA PROFILE AND CAPABILITIES

| | |
|--|----------|
| 2 PLANNING AREA PROFILE AND CAPABILITIES | 1 |
| 2.1 SHANNON COUNTY PLANNING AREA PROFILE..... | 2 |
| 2.1.1 Geography, Geology and Topography..... | 3 |
| 2.1.2 Climate | 3 |
| 2.1.3 Demographics..... | 4 |
| 2.1.4 History | 4 |
| 2.1.5 Occupations..... | 5 |
| 2.1.6 Agriculture..... | 6 |
| 2.1.7 FEMA Hazard Mitigation Assistance Grants in Planning Area..... | 6 |
| 2.1.8 FEMA Public Assistance (PA) Grants in Planning Area | 6 |
| 2.2 JURISDICTIONAL PROFILES AND MITIGATION CAPABILITIES..... | 9 |
| 2.2.1 Unincorporated Shannon County, Missouri..... | 9 |
| 2.2.2 City of Birch Tree..... | 13 |
| 2.2.3 City of Winona | 15 |
| 2.2.4 City of Eminence..... | 17 |
| 2.2.5 Public School Systems | 21 |
| 2.2.6 Eminence R-I School District..... | 21 |
| 2.2.7 Winona R-III School District..... | 23 |

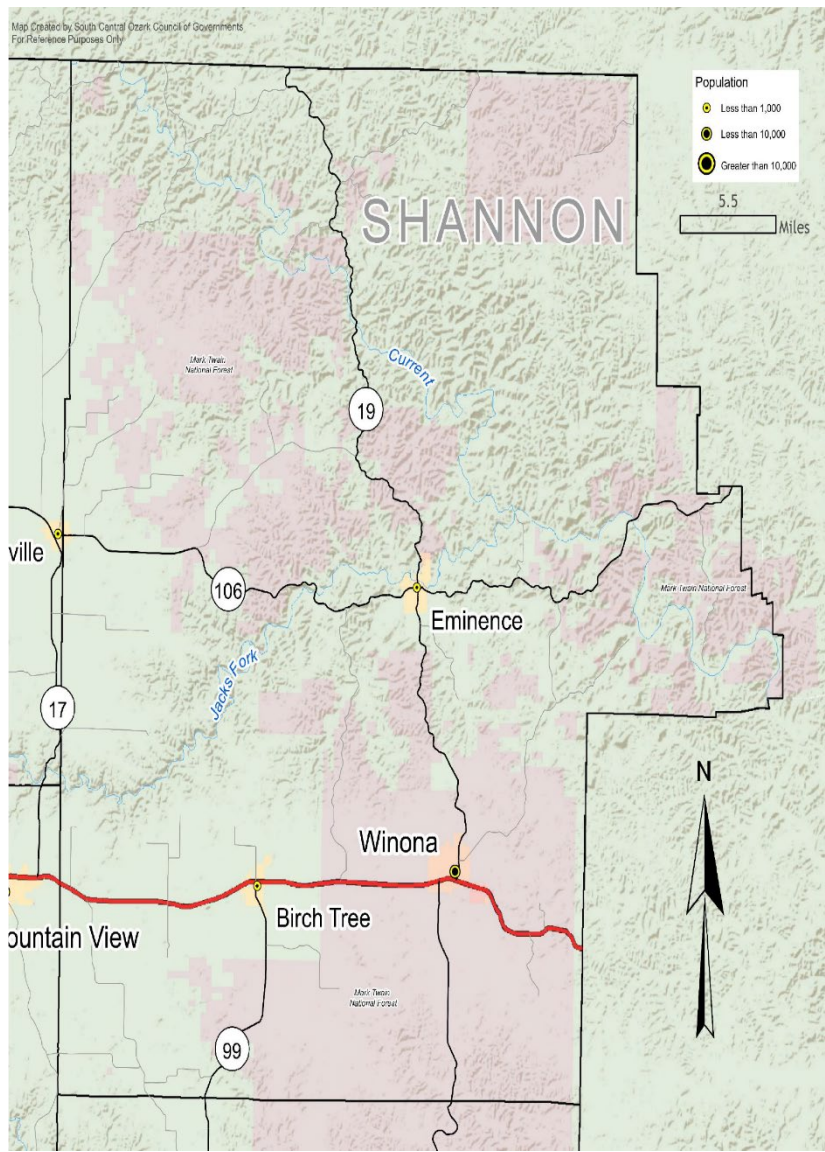
2.1 SHANNON COUNTY PLANNING AREA PROFILE

According to the 2020 American Community Survey Census Estimates, the 2020 population of Shannon County was 7,031, which represented a decrease from the County's 2010 census population of 8,441. This represents a decrease of 1,410 residents or 20.1% decline since the 2010 census. The State of Missouri's population increased 7.5% during the same time period.

The median household income for Shannon County rose from \$30,766 in 2010 to \$36,229 in the 2020 ACS Estimates, yet family income still lags far behind the state and national figures of \$49,600 and \$53,292, respectively.

The median home value in Shannon County in 2020 was \$119,900, an increase of nearly 29% since 2010.

Figure 2.1. Map of Shannon County



2.1.1 Geography, Geology and Topography

Shannon County is located in the south-central region of Missouri, in an area referred to as the Ozark Plateau. This part of Missouri is characterized by one of the most karstic regions in the continental United States. A region with outstanding water resources, numerous springs, sinkholes, losing streams, caves, and hollows.

The underground and surface water resources found in Shannon County are very much connected as a result of the karst topography of the county and region. There are seven unique watersheds in the county, each having their own unique drainage feature—creek or river—that flows south-southwest toward larger rivers and final destinations in Arkansas to the south.

Table 2.1. Watersheds located in Shannon County

| Watershed | Location in Shannon County | Tributary to: |
|-------------------|----------------------------|---------------|
| Upper Black River | Extreme Northeast | Black River |
| Current River | Entire County except SW | White River |
| Jack Forks River | West-Central | Current River |

Shannon County, Missouri is comprised of 642,000 acres. Farmland in Shannon County totals just over 129,756 acres, or approximately 20%, according to the 2017 US Census of Agriculture. Of that farmland, croplands account for 22% of said farmland, woodlands and other pasture make up 73%, while “other” land uses account for the remaining 5%. The remaining 545,933 acres in Shannon County are made up of lands inside municipalities, state and federally owned forests and properties, conservation and recreation areas, state and local roads and other public and private properties.

Elevations in Shannon County range from approximately 1,330 feet located in the western edge of the county three miles east of Summersville, to the lowest elevation above sea level of about 485 feet at the east-central edge of the County along the banks of the Current River.

2.1.2 Climate

Shannon County’s average annual precipitation through the reporting years of 1971-2020 was 46.61 inches. The average annual temperature for the county is 56.6 degrees Fahrenheit. On average, the hottest month of the year in Shannon County is July, with a mean temperature of 76.7 degrees. The coldest month is January, with a mean temperature of 35.5 degrees.

2.1.3 Demographics

Table 2.2. Shannon County Population 2000-2020 by Community

| Jurisdiction | Total Population 2010 | Population Estimate 2020 | 2010-2020 # Change | 2010-2020 % Change |
|--------------------|-----------------------|--------------------------|--------------------|--------------------|
| Shannon County | 8,441 | 7,031 | -1,410 | -20.1% |
| City of Eminence | 600 | 515 | -85 | -14.2% |
| City of Winona | 1,335 | 950 | -385 | -28.8% |
| City of Birch Tree | 679 | 541 | -138 | -20.3% |

Source: U.S. Bureau of the Census, 2020 ACS estimates

Table 2.3. Unemployment, Poverty, Education, and Language Percentage Demographics

| Jurisdiction | Percent of Population in Labor Force | Percent of Population Unemployed | Percent of Families Below the Poverty Level | Percentage of Population (High School graduate) | Percentage of Population (Bachelor's degree or higher) | Percentage of population (spoken language other than English) |
|--------------------|--------------------------------------|----------------------------------|---|---|--|---|
| Shannon County | 47.1% | 4.2% | 19.6% | 45.2% | 8.7% | 1.3% |
| City of Eminence | 47.2% | 9.2% | 12.3% | 39.6% | 20.8% | 4.3% |
| City of Winona | 46.0% | 8.2% | 26.3% | 47.1% | 6.1% | 0.9% |
| City of Birch Tree | 42.4% | 13.5% | 59.2% | 42.2% | 3.5% | 0% |
| State of Missouri | 3,005,604 | 8.4% | 11.1% | 88.0% | 26.7% | 6.1% |

Source: U.S. Census, 2020 American Community Survey, 5-year Estimates.

2.1.4 History

Shannon County was organized on January 29, 1841, from Ripley and Washington counties. The new county was located in the South-Central region of the state. Counties that border Shannon are Dent to the north, Reynolds and Carter to the east, Oregon to the south, and Howell and Texas to the west. The county name is taken from Mr. George "Peg Leg" Shannon, a member of the Lewis & Clark expedition. The County seat is the City of Eminence. The county is home to the Current and Jack's Fork River and Alley Springs and Round Spring--some of the State's most prominent natural springs. Other attractions include Rocky Falls and Peck Ranch. Peck Ranch is home to the newly reintroduced Missouri Elk. Shannon County is widely considered one of the state's most scenic counties. Taking advantage of these traits, there are many opportunities for outdoor recreation (camping, canoeing, hiking, and trail rides, to name a few). Located in one of the most beautiful areas in the Missouri Ozarks, the City of Eminence was founded as the county seat in 1841. First located to the north on the Current River, the town was burned during the Civil War by guerilla bands that roamed the area.

After the war, Eminence was relocated to its current location on the Jack’s Fork River. Today, Eminence serves as a resort town, and is the center of local industry, lumber, and livestock.

The County lies in the “Big Springs Country” of Missouri. In this region of over 5,000 square miles are 11 of the 69 natural springs in the United States that are of first magnitude (64,600,000 gallons daily minimum). Three of these—Alley, Blue, and Welch, are located in Shannon County. In 1924, two state parks were established near Eminence. In Alley Springs State Park there is an 80,800,000 gallons/daily spring, a large cave, and a pioneer mill and museum. At Round Spring State Park, a spring gushes into a bowl-like feature that measures 80-feet wide and 30-feet deep. Large swaths of the county are part of the Mark Twain National Forest established in the 1930’s.

The county’s land area is part the region that was ceded by the Osage tribes in 1808 and utilized by the Shawnee and Delaware tribes until the 1820’s. Missouri’s first copper mine was founded in Shannon County in 1837 by Mr. Joseph Slater. Other mines were then established, but mining operation slowed after the copper industry shifted to the State of Michigan in the 1840’s and 50’s. Iron was also mined for a short time during World War II, and Missouri’s only magnesium mined was opened at Thorny Mountain.

The forest resources of Shannon County were harvested by thousands of acres by large timber companies around the turn of the century. The towns of West Eminence, Winona, and Birch Tree began as booming lumber camps. A program of reforestation has begun to bring the timber back to these once over-harvested hills.

2.1.5 Occupations

Table 2.4. Occupation Statistics, Shannon County, Missouri

| Place | Management, Business, Science, and Arts Occupations | Service Occupations | Sales and Office Occupations | Construction, extraction, installation, maintenance, and repair occupations | Production, Transportation, and Material Moving Occupations |
|--------------------|---|---------------------|------------------------------|---|---|
| Shannon County | 30.0% | 17.9% | 15.1% | 17.1% | 19.9% |
| City of Eminence | 23.8% | 21.6% | 24.2% | 19.8% | 10.6% |
| City of Winona | 22.6% | 6.5% | 17.4% | 17.9% | 35.6% |
| City of Birch Tree | 18.3% | 26.7% | 18.3% | 2.8% | 33.9% |

Source: U.S. Census, 2020 American Community Survey, 5-year Estimates.

2.1.6 Agriculture

Shannon County is comprised of approximately 642,000 acres. Farmland in Shannon County total 96,067 or roughly 15% of the land area, according to the 2017 U.S. Census of Agriculture. Of that farmland, croplands account for 38.5% of said farmland, woodlands and other pasture make up 58.9%, while “other” land uses account for the remaining three percent.

The top crop in the county is Forage-land, the top livestock item is goats. The farming sector is a significant part of the county’s economy with an estimated 9.4% of workers employed as a farm owner or farm worker. However, that figure is much lower than the overall 19.8% for the seven county South Central Missouri region.

2.1.7 FEMA Hazard Mitigation Assistance Grants in Planning Area

Table 2.5. FEMA HMA Grants in Shannon County from 2018-2023

| Project Type | Sub applicant | Award Date | Project Total |
|-------------------|---------------|------------|--------------------|
| Tornado Safe Room | Eminence R-I | 2019 | \$1,405,664 |
| Total | - | - | \$1,405,664 |

Source: SCOCOG

2.1.8 FEMA Public Assistance (PA) Grants in Planning Area

Since 2002, Missouri has received over \$1,613,346 in assistance due to natural hazard damages. Table 2.6 shows all the public assistance payouts received by jurisdictions, as well as the project type and disaster declaration.

Table 2.6. PA Grants in Shannon County, Missouri 2002 - 2023

| Disaster Number | Incident Type | Damage Category | Project Size | Project Amount (\$) | Federal Share (\$) |
|-----------------|-----------------|-----------------------|-------------------|---------------------|--------------------|
| 1412 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 1521.49 |
| 1412 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 14716.73 |
| 1412 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 19335 |
| 1412 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 24246.61 |
| 1412 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 21708.06 |
| 1412 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 13646.53 |
| 1412 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 21667 |

| | | | | | |
|------------------------|----------------------|-------------------------|---------------------|----------------------------|---------------------------|
| 1631 | Severe Storm(s) | A - Debris Removal | Debris Removal | Small | 4506.52 |
| 1631 | Severe Storm(s) | B - Protective Measures | Protective Measures | Small | 1381.19 |
| 1631 | Severe Storm(s) | E - Public Buildings | Public Buildings | Small | 500 |
| 1631 | Severe Storm(s) | B - Protective Measures | Protective Measures | Small | 726.15 |
| 1676 | Severe Ice Storm | A - Debris Removal | Debris Removal | Small | 17250 |
| 1676 | Severe Ice Storm | A - Debris Removal | Debris Removal | Small | 3264 |
| 1676 | Severe Ice Storm | F - Public Utilities | Public Utilities | Small | 5544.23 |
| 1676 | Severe Ice Storm | F - Public Utilities | Public Utilities | Large | 73237.76 |
| 1676 | Severe Ice Storm | B - Protective Measures | Protective Measures | Small | 7657.34 |
| 1676 | Severe Ice Storm | F - Public Utilities | Public Utilities | Small | 45361.83 |
| 1676 | Severe Ice Storm | A - Debris Removal | Debris Removal | Small | 17145.7 |
| 1748 | Severe Ice Storm | A - Debris Removal | Debris Removal | Small | 2965.75 |
| 1748 | Severe Ice Storm | A - Debris Removal | Debris Removal | Large | 66589.24 |
| 1748 | Severe Ice Storm | B - Protective Measures | Protective Measures | Small | 1604.16 |
| 1748 | Severe Ice Storm | B - Protective Measures | Protective Measures | Small | 22663.03 |
| 1748 | Severe Ice Storm | A - Debris Removal | Debris Removal | Small | 53829.62 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 8467.11 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 3082.02 |
| 1749 | Severe Storm(s) | B - Protective Measures | Protective Measures | Small | 6981.46 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 12906.72 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 3266.82 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 4335.4 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 2295.32 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 5918.11 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 2547.63 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 3374.02 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 3208.77 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 20013.41 |
| Disaster Number | Incident Type | Damage Category | Project Size | Project Amount (\$) | Federal Share (\$) |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 16831.12 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 18139.46 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 18017.83 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 4171.89 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 4098.09 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 3010.13 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 4700.17 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 4812.01 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 10503.61 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 20583.53 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 15617.36 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 6809.93 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 8291.25 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 11434.29 |

| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 18965.5 |
|-----------------|-----------------|---------------------------|-----------------------|---------------------|--------------------|
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 8990.88 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 11034.62 |
| 1749 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 16515.07 |
| 1809 | Severe Storm(s) | A - Debris Removal | Debris Removal | Small | 1499.38 |
| 1809 | Severe Storm(s) | B - Protective Measures | Protective Measures | Small | 1142.93 |
| 1809 | Severe Storm(s) | E - Public Buildings | Public Buildings | Small | 38239 |
| 1809 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 63441.57 |
| 1809 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 6556.39 |
| 1847 | Severe Storm(s) | B - Protective Measures | Protective Measures | Small | 9811.8 |
| 1847 | Severe Storm(s) | A - Debris Removal | Debris Removal | Small | 45365.79 |
| 1980 | Severe Storm(s) | A - Debris Removal | Debris Removal | Small | 3317.47 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 8381.06 |
| 1980 | Severe Storm(s) | F - Public Utilities | Public Utilities | Small | 14326 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 5818.64 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 15479.1 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 11393.49 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 8415.25 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 26068.19 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 13048.44 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 10006.41 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 10089.47 |
| 1980 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 9237.31 |
| 4144 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Large | 123431.78 |
| 4144 | Severe Storm(s) | A - Debris Removal | Debris Removal | Small | 3037.31 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 18693.97 |
| 4238 | Severe Storm(s) | A - Debris Removal | Debris Removal | Small | 0 |
| 4238 | Severe Storm(s) | G - Recreational or Other | Recreational or Other | Small | 3693.39 |
| Disaster Number | Incident Type | Damage Category | Project Size | Project Amount (\$) | Federal Share (\$) |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 24081.7 |
| 4238 | Severe Storm(s) | A - Debris Removal | Debris Removal | Small | 6618.25 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 26711.97 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 12738.15 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 21309.36 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 21194.45 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 11136.47 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 24028.61 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 24703.89 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 17004.06 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 14047.22 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 14760.41 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 12388.63 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 23052.4 |

| | | | | | |
|------|-----------------|-------------------------|---------------------|-------|----------|
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 16290.88 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 19806.44 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 31476.89 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 24938.39 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 11683.33 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 12929.79 |
| 4238 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 27116.12 |
| 4317 | Flood | C - Roads and Bridges | Roads and Bridges | Small | 81104.06 |
| 4317 | Flood | C - Roads and Bridges | Roads and Bridges | Small | 54112.98 |
| 4317 | Flood | C - Roads and Bridges | Roads and Bridges | Small | 61506.11 |
| 4317 | Flood | C - Roads and Bridges | Roads and Bridges | Small | 54749.15 |
| 4317 | Flood | C - Roads and Bridges | Roads and Bridges | Small | 0 |
| 4317 | Flood | C - Roads and Bridges | Roads and Bridges | Small | 68931.33 |
| 4317 | Flood | C - Roads and Bridges | Roads and Bridges | Small | 21258.02 |
| 4451 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 114533.7 |
| 4451 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 70171.84 |
| 4451 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 83364.21 |
| 4451 | Severe Storm(s) | A - Debris Removal | Debris Removal | Small | 19642.11 |
| 4451 | Severe Storm(s) | B - Protective Measures | Protective Measures | Small | 11145.96 |
| 4451 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 46258.7 |
| 4451 | Severe Storm(s) | C - Roads and Bridges | Roads and Bridges | Small | 95771.83 |
| 4451 | Severe Storm(s) | Z - State Management | State Management | Small | 438.39 |
| 4490 | Biological | B - Protective Measures | Protective Measures | Small | 26289.19 |

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

2.2 JURISDICTIONAL PROFILES AND MITIGATION CAPABILITIES

The following 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, and the public-school districts.

2.2.1 Unincorporated Shannon County, Missouri

Shannon County’s jurisdiction includes all unincorporated areas within the county boundaries. Shannon is identified as a third-class county in the State of Missouri. The governing body of the County is the County Commission. The Commission consists of a Presiding Commissioner, a northern Commissioner, and a southern Commissioner.

The County's elected governing body; the Board of County Commissioners directs the general administration of County Government. The Commission sets broad operating policies, enacts ordinances and establishes budgets as mandated by State law. The County enters into contracts with other public and private agencies to ensure the smooth flow of services including law enforcement, construction and maintenance of public roads, bridges and the operations of county offices, equipment and services. The departments of the County government include:

- Board of Commissioners
- County Assessor
- County Attorney
- County Auditor
- County Recorder
- County Sheriff
- County Treasurer
- County Coroner
- County Clerk
- Emergency Management

Mitigation Initiatives and Capabilities

Staff capabilities to mitigate the impact of natural hazards include the local emergency management officials and local law enforcement members who are involved in mitigation planning, response, and recovery processes. Efforts in coordinating with local government officials and cooperating with private organizations to:

- 1) Prevent avoidable disasters and reduce the vulnerability of the residents to any disaster that may strike.
- 2) Establish capabilities for protecting citizens from the effects of disasters.
- 3) Respond effectively to the actual occurrences of disasters.
- 4) Provide for recovery in the aftermath of any emergency involving extensive damage within the county.

The Emergency Management Director (EMD) is responsible for the development and maintenance of the Local Emergency Operations Plan. Shannon County and all jurisdictions are operating at capacity with the funds and staff they have available. Their existing authorities, policies, programs, and resources are being utilized effectively and efficiently.

Table 2.7 below provides information about the mitigation capabilities and policies for the unincorporated county based on responses from the Mitigation Planning Data Collection Questionnaire.

Table 2.7. Unincorporated Shannon County Mitigation Capabilities

| Capabilities | Status Including Date of Document or Policy |
|---|---|
| Planning Capabilities | |
| Comprehensive Plan | None |
| Capital Improvement Plan | None |
| Local Emergency Operations Plan | Yes, 2009 |
| Local Recovery Plan | None |
| Local Mitigation Plan | Yes, 2016 |
| Economic Development Plan | Yes, 2013 |
| Transportation Plan | Yes, 2017 |
| Land-use Plan | None |
| Watershed Plan | None |
| Firewise or other fire mitigation plan | Yes, 2015 |
| Open Space/Recreation Plan | None |
| Policies/Ordinance | |
| Zoning Ordinance | None |
| Building Code | None |
| Floodplain Ordinance | None |
| Subdivision Ordinance | None |
| Tree Trimming Ordinance | None |
| Nuisance Ordinance | None |
| Storm Water Ordinance | None |
| Drainage Ordinance | None |
| Site Plan Review Requirements | None |
| Historic Preservation Ordinance | None |
| Landscape Ordinance | None |
| Program | |
| Zoning/Land Use Restrictions | No |
| Codes Building Site/Design | No |
| NFIP Participant | No |
| CRS Participating Community | No |
| Hazard Awareness Program | No |
| National Weather Service (NWS) Storm Ready | No |
| Building Code Effectiveness Grading (BCEGs) | No |
| ISO Fire Rating | Rating: 8 |

| | |
|---|-----------|
| Economic Development Program | No |
| Public Education/Awareness | Yes |
| Property Acquisition | No |
| Planning/Zoning Boards | No |
| Mutual Aid Agreements | Yes |
| Studies/Reports/Maps | |
| Flood Insurance Maps | No |
| FEMA Flood Insurance Study (Detailed) | No |
| Evacuation Route Map | No |
| Critical Facilities Inventory | Yes, 2011 |
| Vulnerable Population Inventory | No |
| Land Use Map | No |
| Staff/Department | |
| Building Code Official | No |
| Building Inspector | No |
| Mapping Specialist (GIS) | No |
| Engineer | No |
| Development Planner | No |
| Public Works Official | No |
| Emergency Management Director | Yes |
| NFIP Floodplain Administrator | No |
| Emergency Response Team | Yes |
| Hazardous Materials Expert | Yes |
| Local Emergency Planning Committee | No |
| Transportation Department | Yes |
| Housing Authority | No |
| Local Funding Availability | |
| Ability to apply for CDBG Grants | Yes |
| Ability to fund projects through Capital Improvements funding | Yes |
| Authority to levy taxes for a specific purpose | Yes |
| Fees for water, sewer, gas, or electric services | No |
| Impact fees for new development | No |
| Ability to incur debt through GO bonds | Yes |
| Ability to incur debt through special tax bonds | Yes |

Source: Data Collection Questionnaire, 2022

2.2.2 City of Birch Tree

The City of Birch Tree is located in the southwestern portion of Shannon County along US Highway 60, approximately twelve miles west of Winona. The governing body of Birch Tree includes the Mayor and four Aldermen. Similar to the County as a whole, the City of Birch Tree has been experiencing a declining population.

At the time of the 2010 Census the population in Birch Tree was 679. The 2020 ACS estimates reported the City’s population as 541, which equals a -20.3% decline in population. The City of Birch Tree participated in the last update of the County-wide plan; however, specific mitigation activities undertaken by the City have been limited since 2018.

City departments include:

- Mayor/Board of Aldermen
- City Clerk
- Water and Sewer
- City Maintenance
- Police Department

According to 2020 Estimates, the median year built for structures in Birch Tree is 1977. Additionally, 14% of the population were over the age of 65, median household income was \$16,384 and 59.2% of the families in Birch Tree were living below the poverty level. Mitigation capabilities in Birch Tree include:

- Two (2) outdoor warning sirens
- Mutual aid agreements with local governments/law enforcement

Table 2.8. City of Birch Tree Mitigation Capabilities

| Capabilities | Status Including Date of Document or Policy |
|--|---|
| Planning Capabilities | |
| Comprehensive Plan | None |
| Capital Improvement Plan | None |
| Local Emergency Operations Plan | Yes, 2019 |
| Local Recovery Plan | None |
| Local Mitigation Plan | Yes, 2017 |
| Economic Development Plan | Yes, 2013 |
| Transportation Plan | Yes, 2017 |
| Land-use Plan | None |
| Watershed Plan | None |
| Firewise or other fire mitigation plan | Yes, 2015 |
| Open Space/Recreation Plan | None |
| Policies/Ordinance | |
| Zoning Ordinance | None |
| Building Code | None |
| Floodplain Ordinance | Yes |
| Subdivision Ordinance | None |
| Tree Trimming Ordinance | None |

| | |
|--|-----------------|
| Nuisance Ordinance | None |
| Storm Water Ordinance | None |
| Drainage Ordinance | None |
| Site Plan Review Requirements | None |
| Historic Preservation Ordinance | None |
| Landscape Ordinance | None |
| Program | |
| Zoning/Land Use Restrictions | No |
| Codes Building Site/Design | No |
| NFIP Participant | Yes |
| CRS Participating Community | No |
| Hazard Awareness Program | No |
| National Weather Service (NWS) Storm Ready | No |
| Building Code Effectiveness Grading (BCEGs) | No |
| ISO Fire Rating | Yes - 8 |
| Economic Development Program | No |
| Public Education/Awareness | No |
| Property Acquisition | No |
| Planning/Zoning Boards | No |
| Mutual Aid Agreements | Yes |
| Studies/Reports/Maps | |
| Flood Insurance Maps | Yes, 1980 |
| FEMA Flood Insurance Study (Detailed) | In Progress |
| Evacuation Route Map | No |
| Critical Facilities Inventory | Yes, 2011 |
| 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 – Full Time |
| Emergency Management Director | No |
| NFIP Floodplain Administrator | Yes – Full Time |
| Emergency Response Team | No |
| Hazardous Materials Expert | No |
| Local Emergency Planning Committee | No |
| Transportation Department | No |
| Housing Authority | No |
| Local Funding Availability | |
| Ability to apply for CDBG Grants | 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 GO bonds | Yes |
| Ability to incur debt through special tax bonds | Yes |

Source: Data Collection Questionnaire 2022

2.2.3 City of Winona

The City of Winona is located in the southeast portion of Shannon County along US Highway 60. The governing body of Winona includes the Mayor and eight (8) Aldermen. Winona’s population is declining.

The population in Winona declined in the 2020 Census along with all of Shannon County. At the time of the 2010 Census the population in Winona was 1,335. The 2020 ACS estimates reported the City’s population as 950, which equals a -28.8% decline in population. The City of Winona participated in the last update of the County-wide plan; however, specific mitigation activities undertaken by the City have been limited since 2018. City departments include:

- Mayor/Board of Aldermen
- City Clerk
- Water and Sewer
- City Maintenance
- Emergency Management
- Volunteer Fire Department
- Police Department

According to 2020 Estimates, the median year built for structures in Winona is 1975. Additionally, 19.5% of the population were over the age of 65, median household income was \$22,011 and 26.36% of the families in Winona were living below the poverty level. Mitigation capabilities in Winona include:

- Mutual aid agreements with local governments/law enforcement

Table 2.9. City of Winona Mitigation Capabilities

| Capabilities | Status Including Date of Document or Policy |
|--|---|
| Planning Capabilities | |
| Comprehensive Plan | None |
| Capital Improvement Plan | None |
| Local Emergency Operations Plan | Yes, 2009 |
| Local Recovery Plan | None |
| Local Mitigation Plan | Yes, 2013 |
| Economic Development Plan | Yes, 2014 |
| Transportation Plan | Yes, 2017 |
| Land-use Plan | None |
| Watershed Plan | None |
| Firewise or other fire mitigation plan | Yes, 2015 |
| Open Space/Recreation Plan | None |
| Policies/Ordinance | |
| Zoning Ordinance | None |
| Building Code | None |

| | |
|---|-----------|
| Floodplain Ordinance | Yes |
| Subdivision Ordinance | None |
| Tree Trimming Ordinance | None |
| Nuisance Ordinance | None |
| Storm Water Ordinance | None |
| Drainage Ordinance | None |
| Site Plan Review Requirements | None |
| Historic Preservation Ordinance | None |
| Landscape Ordinance | None |
| Program | |
| Zoning/Land Use Restrictions | No |
| Codes Building Site/Design | No |
| NFIP Participant | Yes |
| CRS Participating Community | No |
| Hazard Awareness Program | No |
| National Weather Service (NWS) Storm Ready | No |
| Building Code Effectiveness Grading (BCEGs) | No |
| ISO Fire Rating | Yes - 7 |
| Economic Development Program | No |
| Public Education/Awareness | No |
| Property Acquisition | No |
| Planning/Zoning Boards | No |
| Mutual Aid Agreements | Yes |
| Studies/Reports/Maps | |
| Flood Insurance Maps | Yes, 1980 |
| FEMA Flood Insurance Study (Detailed) | No |
| Evacuation Route Map | No |
| Critical Facilities Inventory | Yes, 2013 |
| 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 Director | Yes |
| NFIP Floodplain Administrator | Yes |
| Emergency Response Team | No |
| Hazardous Materials Expert | No |
| Local Emergency Planning Committee | No |
| Transportation Department | No |
| Housing Authority | No |
| Local Funding Availability | |
| Ability to apply for CDBG Grants | 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 GO bonds | Yes |
| Ability to incur debt through special tax bonds | Yes |

Source: Data Collection Questionnaire 2022

2.2.4 City of Eminence

The City of Eminence is centrally located in Shannon County at the intersection of State Highways 19 and 106. The governing body of Eminence includes the Mayor and Four City Council Members.

Eminence has declined along with all of Shannon County. At the time of the 2010 Census the population in Eminence was 600. The 2020 ACS estimates reported the City’s population as 515, which equals a -14.2% decline in population. The City of Eminence participated in the last update of the County-wide plan; however, specific mitigation activities undertaken by the city have been limited since 2018. City departments include:

- Mayor/City Council
- City Clerk
- Water and Sewer
- Financial/Accounting
- Parks and Recreation
- Tourism
- Emergency Management
- City Maintenance
- Police Department

According to 2020 Estimates, the median year built for structures in Eminence is 1968. Additionally, 18.1% of the population were over the age of 65, median household income was \$43,125 and 12.3% of the families in Eminence were living below the poverty level. Mitigation capabilities in Eminence include:

- Mutual aid agreements with local governments/law enforcement

Table 2.10. City of Eminence Mitigation Capabilities

| Capabilities | Status Including Date of Document or Policy |
|---------------------------------|---|
| Planning Capabilities | |
| Comprehensive Plan | Yes |
| Capital Improvement Plan | None |
| Local Emergency Operations Plan | Yes, 2009 |
| Local Recovery Plan | Yes, 2009 |
| Local Mitigation Plan | Yes, 2017 |
| Economic Development Plan | Yes, 2014 |
| Transportation Plan | Yes, 2017 |
| Land-use Plan | None |
| Watershed Plan | Yes |

| | |
|---|-----------|
| Firewise or other fire mitigation plan | Yes |
| Open Space/Recreation Plan | None |
| Policies/Ordinance | |
| Zoning Ordinance | None |
| Building Code | Yes, 2015 |
| Floodplain Ordinance | Yes |
| Subdivision Ordinance | None |
| Tree Trimming Ordinance | None |
| Nuisance Ordinance | None |
| Storm Water Ordinance | None |
| Drainage Ordinance | Yes |
| Site Plan Review Requirements | None |
| Historic Preservation Ordinance | None |
| Landscape Ordinance | None |
| Program | |
| Zoning/Land Use Restrictions | No |
| Codes Building Site/Design | No |
| NFIP Participant | Yes |
| CRS Participating Community | No |
| Hazard Awareness Program | No |
| National Weather Service (NWS) Storm Ready | No |
| Building Code Effectiveness Grading (BCEGs) | No |
| ISO Fire Rating | Yes - 8 |
| Economic Development Program | No |
| Public Education/Awareness | No |
| Property Acquisition | No |
| Planning/Zoning Boards | No |
| Mutual Aid Agreements | No |
| Studies/Reports/Maps | |
| Flood Insurance Maps | Yes, 1980 |
| FEMA Flood Insurance Study (Detailed) | No |
| Evacuation Route Map | No |
| Critical Facilities Inventory | Yes, 2013 |
| Vulnerable Population Inventory | No |
| Land Use Map | No |
| Staff/Department | |
| Building Code Official | No |
| Building Inspector | No |
| Mapping Specialist (GIS) | No |
| Engineer | No |
| Development Planner | No |
| Public Works Official | No |
| Emergency Management Director | Yes |
| NFIP Floodplain Administrator | Yes |
| Emergency Response Team | No |
| Hazardous Materials Expert | No |

| | |
|--|-----|
| Local Emergency Planning Committee | Yes |
| Transportation Department | Yes |
| Housing Authority | No |
| Local Funding Availability | |
| Ability to apply for CDBG Grants | 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 GO bonds | Yes |
| Ability to incur debt through special tax bonds | Yes |

Source: Data Collection Questionnaire 2022

Table 2.11. Mitigation Capabilities Summary Table

| CAPABILITIES | Shannon County | Birch Tree | Winona | Eminence |
|--|----------------|------------|-----------|-----------|
| Planning Capabilities | | | | |
| Comprehensive Plan | None | None | None | Yes |
| Capital Improvement Plan | None | None | None | None |
| Local Emergency Operations Plan | Y, 2009 | Yes 2019 | Yes, 2009 | Yes, 2009 |
| Local Recovery Plan | None | None | None | Yes, 2009 |
| Local Mitigation Plan | Y, 2016 | Yes, 2017 | Yes, 2013 | Yes, 2017 |
| Economic Development Plan | Y, 2013 | Yes, 2013 | Yes, 2014 | Yes, 2014 |
| Transportation Plan | Y, 2017 | Yes, 2017 | Yes, 2017 | Yes, 2017 |
| Land-use Plan | None | None | None | None |
| Watershed Plan | None | None | None | Yes |
| Firewise or other fire mitigation plan | Y, 2015 | Yes, 2015 | Yes, 2015 | Yes |
| Open Space/Recreation Plan | None | None | None | None |
| Policies/Ordinance | | | | |
| Zoning Ordinance | None | None | None | None |
| Building Code | None | None | None | Yes, 2015 |
| Floodplain Ordinance | None | Yes | Yes | Yes |
| Subdivision Ordinance | None | None | None | None |
| Tree Trimming Ordinance | None | None | None | None |
| Nuisance Ordinance | None | None | None | Yes |
| Storm Water Ordinance | None | None | None | None |
| Drainage Ordinance | None | None | None | Yes |
| Site Plan Review Requirements | None | None | None | None |

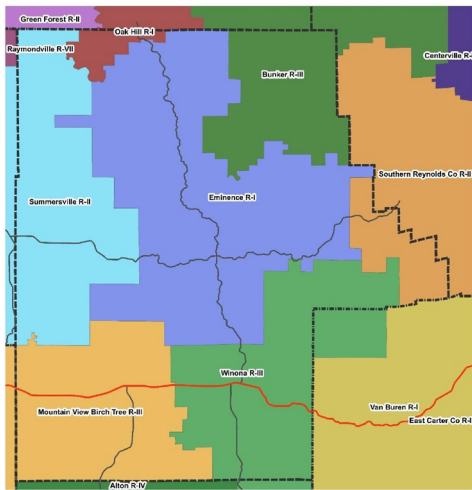
| CAPABILITIES | Shannon County | Birch Tree | Winona | Eminence |
|---|-----------------------|-------------------|-----------------|-----------------|
| Historic Preservation Ordinance | None | None | None | None |
| Landscape Ordinance | None | None | None | None |
| Program | | | | |
| Zoning/Land Use Restrictions | No | No | No | No |
| Codes Building Site/Design | No | No | No | No |
| NFIP Participant | No | Yes | Yes | Yes |
| CRS Participating Community | No | No | No | No |
| Hazard Awareness Program | No | No | No | No |
| National Weather Service (NWS) Storm Ready | No | No | No | No |
| Building Code Effectiveness Grading (BCEGs) | No | No | No | No |
| ISO Fire Rating | Rating:8 | Yes - 8 | Yes - 7 | Yes - 8 |
| Economic Development Program | No | No | No | No |
| Public Education/Awareness | Yes | No | No | No |
| Property Acquisition | No | No | No | No |
| Planning/Zoning Boards | No | No | No | No |
| Mutual Aid Agreements | Yes | Yes | Yes | No |
| Studies/Reports/Maps | | | | |
| Flood Insurance Maps | No | Yes, 1980 | Yes, 1980 | Yes, 1980 |
| FEMA Flood Insurance Study (Detailed) | In Progress | In Progress | In Progress | In Progress |
| Evacuation Route Map | No | No | No | No |
| Critical Facilities Inventory | Y,2011 | Yes, 2011 | Yes, 2013 | Yes, 2013 |
| Vulnerable Population Inventory | No | No | No | No |
| Land Use Map | No | No | No | No |
| Staff/Department | | | | |
| Building Code Official | No | No | No | No |
| Building Inspector | No | No | No | No |
| Mapping Specialist (GIS) | No | No | No | No |
| Engineer | No | No | No | No |
| Development Planner | No | No | No | No |
| Public Works Official | No | Yes – Full Time | Yes – Full Time | No |
| Emergency Management Director | Yes | No | Yes – Full Time | Yes |
| NFIP Floodplain Administrator | No | Yes – Full Time | Yes – Full Time | Yes |
| Emergency Response Team | Yes | No | No | No |
| Hazardous Materials Expert | Yes | No | No | No |

| CAPABILITIES | Shannon County | Birch Tree | Winona | Eminence |
|--|----------------|------------|--------|----------|
| Local Emergency Planning Committee | Yes | No | No | Yes |
| Transportation Department | Yes | No | Yes | Yes |
| Housing Authority | No | No | No | No |
| Local Funding Availability | | | | |
| Ability to apply for CDBG Grants | Yes | Yes | Yes | Yes |
| Authority to levy taxes for a specific purpose | Yes | Yes | Yes | Yes |
| Fees for water, sewer, gas, or electric services | No | Yes | Yes | Yes |
| Impact fees for new development | No | No | No | No |
| Ability to incur debt through GO bonds | Yes | Yes | Yes | Yes |
| Ability to incur debt through special tax bonds | Yes | Yes | Yes | Yes |

2.2.5 Public School Systems

This section provides general information about participating school districts in the Plan. There are two school districts based in Shannon County. Other school district boundaries include areas of Shannon County but are not headquartered and do not have facilities within the county Figure 2.2 is a map of school district boundaries in Shannon County.

Figure 2.2. Shannon County School Districts



2.2.6 Eminence R-I School District

All of Eminence R-I District facilities are located in the community of Eminence in central Shannon County. Table 2.12 provides building and enrollment information.

Table 2.12. District Information

| Building Name | Address | Building Occupants |
|----------------------------|----------------------------|--------------------|
| Eminence Elementary School | W Highway 106, Eminence | 140 |
| Eminence High School | 505 South Street, Eminence | 135 |

Eminence R-I Schools are governed by a Board of Education consisting of the Board President and six board members. The District serves over 275 students and employees, approximately 35 teachers and staff. District departments include:

- Transportation
- Cafeteria Services
- Custodial Services
- Health Services
- Central Office

Table 2.13 provides responses from the Mitigation Planning Data Collection Questionnaire for School Districts.

Table 2.13. Eminence R-I School District Mitigation Capabilities

| Capability | | |
|-------------------------------------|------------------------------------|--|
| Planning Elements | Y/N | Date of Latest Version |
| Master Plan | Y | 2023 |
| Capital Improvement Plan | N | |
| School Emergency Plan | Y | 2023 |
| Weapons Policy | Y | 2018 |
| Personnel Resources | Y/N | Department/Position |
| Full Time Building Official | Y | Bldg. Principal |
| Emergency Manager | Y | Superintendent |
| Grant Writer | N | |
| Public Information Officer | Y | Superintendent |
| Information Technology | Y | Staff |
| Financial Resources | Accessible/Eligible to Use? | |
| Capital Improvement Project Funding | Y | |
| Local Funds | Y | |
| General Obligation Bonds | Y | |
| Special Tax Bonds | Y | |
| Private Activities Donations | Y | |
| State and Federal Grant Funds | Y | |
| Other | | Status Including Date of Document or Policy |
| Fire Evacuation Training | Y | |
| Tornado Sheltering Exercises | Y | |
| Public Address/EAS | Y | |
| NOAA Weather Radios | N | |
| Tornado Shelter/Saferoom | Y | |
| Campus Police | Y | |

Source: Data Collection

2.2.7 Winona R-III School District

All of Winona R-III School District facilities are located entirely in the City of Winona in southeastern Shannon County. Table 2.14 provides building and enrollment information.

Table 2.14. District Information

| Building Name | Address | Building Occupants |
|---------------------------------|------------------|--------------------|
| Winona Elementary/Middle School | State Highway 19 | 325 |
| Winona High School | State Highway 19 | 120 |

Winona R-III Schools are governed by a Board of Education consisting of the Board President and six board members. The District serves over 445 students and employees, approximately 50 teachers and staff. District departments include:

- Transportation
- Cafeteria Services
- Custodial Services
- Health Services
- Central Office

Table 2.15 provides responses from the Mitigation Planning Data Collection Questionnaire for School Districts.

Table 2.15. Winona R-III School District Mitigation Capabilities

| Capability | | |
|-------------------------------------|------------------------------------|--|
| Planning Elements | Y/N | Date of Latest Version |
| Master Plan | Y | 2016 |
| Capital Improvement Plan | N | |
| School Emergency Plan | Y | 2016 |
| Weapons Policy | Y | 2016 |
| Personnel Resources | Y/N | Department/Position |
| Full Time Building Official | Y | Bldg. Principal |
| Emergency Manager | Y | Superintendent |
| Grant Writer | Y | Bldg. Principal |
| Public Information Officer | N | |
| Information Technology | Y | Staff |
| Financial Resources | Accessible/Eligible to Use? | |
| Capital Improvement Project Funding | Y | |
| Local Funds | Y | |
| General Obligation Bonds | N | |
| Special Tax Bonds | N | |
| Private Activities Donations | N | |
| State and Federal Grant Funds | Y | |
| Other | | Status Including Date of Document or Policy |
| Fire Evacuation Training | Y | |
| Tornado Sheltering Exercises | Y | |
| Public Address/EAS | Y | |
| NOAA Weather Radios | N | |
| Tornado Shelter/Saferoom | N | |
| Campus Police | N | |

Source: Data Collection Questionnaire, 2022

3 RISK ASSESSMENT

| | | |
|------------|---|-------------|
| 3 | RISK ASSESSMENT..... | 3.1 |
| 3.1 | HAZARD IDENTIFICATION..... | 3.2 |
| 3.1.1 | Review of Existing Mitigation Plans..... | 3.3 |
| 3.1.2 | Review Disaster Declaration History..... | 3.4 |
| 3.1.3 | Research Additional Sources..... | 3.6 |
| 3.1.4 | Hazards Identified..... | 3.8 |
| 3.1.5 | Multi-Jurisdictional Risk Assessment..... | 3.9 |
| 3.2 | ASSETS AT RISK..... | 3.10 |
| 3.2.1 | Total Exposure of Population and Structures..... | 3.10 |
| 3.2.2 | Critical and Essential Facilities and Infrastructure..... | 3.12 |
| 3.2.3 | Other Assets..... | 3.16 |
| 3.3 | LAND USE AND DEVELOPMENT..... | 3.19 |
| 3.3.1 | Development Since Previous Plan Update..... | 3.19 |
| 3.3.2 | Future Land Use and Development..... | 3.19 |
| 3.4 | HAZARD PROFILES, VULNERABILITY, AND PROBLEM STATEMENTS..... | 3.21 |
| 3.4.1 | Dam Failure..... | 3.24 |
| 3.4.2 | Drought..... | 3.32 |
| 3.4.3 | Earthquakes..... | 3.38 |
| 3.4.4 | Extreme Temperatures..... | 3.45 |
| 3.4.5 | Flooding (Riverine and Flash)..... | 3.52 |
| 3.4.6 | Land Subsidence/Sinkholes..... | 3.63 |
| 3.4.7 | Severe Thunderstorms Including High Winds, Hail, and Lightning..... | 3.67 |
| 3.4.8 | Tornado..... | 3.76 |
| 3.4.9 | Wildfire..... | 3.82 |
| 3.4.10 | Severe Winter Weather..... | 3.86 |

3.1 HAZARD IDENTIFICATION

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

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

This chapter is divided into four main parts:

- **Section 3.1 Hazard Identification** - identifies the hazards that threaten the planning area and provides a factual basis for elimination of hazards from further consideration.
- **Section 3.2 Assets at Risk** - provides the planning area's total exposure to natural hazards, considering critical facilities and other community assets at risk.
- **Section 3.3 Land Use and Development** - discusses development that has occurred since the last plan update and any increased or decreased risk that resulted. This section also discusses areas of planned future development and any implications on risk/vulnerability.
- **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 Strength/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.

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

The Plan profiles all natural hazards that can affect Shannon County. The natural hazards that can affect the county have been identified in the 2023 Shannon County Plan and the 2018 Missouri State Plan. Natural hazards are naturally occurring climatological, hydrological, or geologic events that have a negative effect of people and the built environment. Natural hazards identified include:

- Riverine and Flash Flood
- Dam Failure
- Earthquake
- Land Subsidence/ Sinkholes
- Drought
- Extreme Temperatures
- Severe Thunderstorm / High Winds / Lightning / Hail
- Severe Winter Weather
- Tornado
- Wildfire

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

3.1.1 Review of Existing Mitigation Plans

The Plan profiles all natural hazards that affect Shannon County. The hazards identified in the 2023 Shannon County Plan are identified in the 2018 Missouri State Plan. The State Plan also includes levee failure. Levee failure was excluded from the mitigation planning process as there are no mapped levees nor associated levee protected areas within or immediately upstream of Shannon County.

Human-caused and technological hazards identified in the State Plan include:

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

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

3.1.2 Review Disaster Declaration History

From 1990 to present, Shannon County has experienced a number of severe storms, severe ice storms, and floods. Federal and/or state declarations may be granted when the severity and magnitude of an event surpasses the ability of a 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.

The Robert T. Stafford Disaster Relief and Emergency Assistance Act, (PL 100-707) requires that all requests for a declaration by the President must be made by the governor of the affected state. State and federal officials conduct a Preliminary Damage Assessment (PDA) to show that the disaster is of such severity and magnitude that effective response is beyond state and local capabilities. Based on the governor's request, the president may declare that a major disaster or emergency exists, thus activating federal programs to assist in the response and recovery effort. Not all programs are activated for every disaster. Some declarations will provide only individual assistance or public assistance, while others provide both.

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

Since 1993, Shannon County has experienced twenty-two (22) disaster events that triggered federal declarations. The most recent occurred in June of 2020 (Severe Storms/Tornadoes).

Table 3.1. FEMA Disaster Declarations that included Shannon County, Missouri, 1993-Present

| Disaster Number | IH Program Declared | IA Program Declared | PA Program Declared | Declaration Date | Disaster Type | Title |
|-----------------|---------------------|---------------------|---------------------|------------------|---------------|---|
| 4552 | No | No | Yes | 6/9/2020 | DR | SEVERE STORMS, TORNADOES, STRAIGHT LINE WINDS, AND FLOODING |
| 4490 | No | Yes | Yes | 3/26/2020 | DR | COVID-19 PANDEMIC |
| 3482 | No | No | Yes | 3/13/2020 | EM | COVID-19 |
| 4451 | No | Yes | Yes | 6/9/2019 | DR | SEVER STORMS, TORNADOES, AND FLOODING |
| 4317 | Yes | Yes | Yes | 6/2/2017 | DR | SEVER STORMS, TORNADOES, STRAIGHT LINE WINDS, AND FLOODING |
| 4250 | Yes | No | Yes | 1/21/2016 | DR | SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING |
| Disaster Number | IH Program Declared | IA Program Declared | PA Program Declared | Declaration Date | Disaster Type | Title |
| 3374 | No | No | Yes | 1/2/2016 | EM | SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING |
| 4238 | No | No | Yes | 8/7/2015 | DR | SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING |
| 4144 | No | No | Yes | 9/6/2013 | DR | SEVERE STORMS, STRAIGHT-LINE WINDS AND FLOODING |
| 1980 | Yes | No | Yes | 5/9/2011 | DR | SEVERE STORMS, TORNADOES, AND FLOODING |
| 3317 | No | No | Yes | 2/3/2011 | EM | SEVERE WINTER STORM |
| 1847 | Yes | No | Yes | 6/19/2009 | DR | SEVERE STORMS, TORNADOES, AND FLOODING |
| 1822 | Yes | No | Yes | 2/17/2009 | DR | SEVERE WINTER STORM |
| 3303 | No | No | Yes | 1/30/2009 | EM | SEVERE WINTER STORM |
| 1809 | Yes | No | Yes | 11/13/2008 | DR | SEVERE STORMS, FLOODING, AND A TORNADO |
| 1749 | Yes | Yes | Yes | 3/19/2008 | DR | SEVERE STORMS AND FLOODING |
| 1748 | No | No | Yes | 3/12/2008 | DR | SEVERE WINTER STORMS AND FLOODING |
| 3281 | No | No | Yes | 12/12/2007 | EM | SEVERE WINTER STORMS |
| 3232 | No | No | Yes | 9/10/2005 | EM | HURRICANE KATRINA EVACUATION |
| 1412 | No | Yes | Yes | 5/6/2002 | DR | SEVERE STORMS, TORNADOES AND FLOODING |
| 1023 | No | Yes | Yes | 4/21/1994 | DR | SEVERE STORMS & FLOODING |
| 1006 | No | Yes | Yes | 12/01/1993 | DR | SEVERE STORMS, TORNADOES AND FLOODING |

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

3.1.3 Research Additional Sources

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

- Missouri Hazard Mitigation Plans (2013 and 2018)
- Previously approved planning area Hazard Mitigation Plan (2017)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources (MDNR)
- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- National Agricultural Statistics Service (Agriculture production/losses)
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Environmental Protection Agency
- Flood Insurance Administration
- Hazards US (HAZUS)
- Missouri Department of Transportation
- National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI);
- Pipeline and Hazardous Materials Safety Administration
- County and local Comprehensive Plans to the extent available
- County Emergency Management
- County Assessors Data
- County Flood Insurance Rate Map, FEMA
- SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin
- U.S. Army Corps of Engineers
- United States Geological Survey (USGS)

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 January 2022, as entered by the NWS. Due to changes in the data collection and processing procedures over time, there are unique periods of record available depending on the event type. The following timelines show the different time spans for each period of unique data collection and processing procedures.

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

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

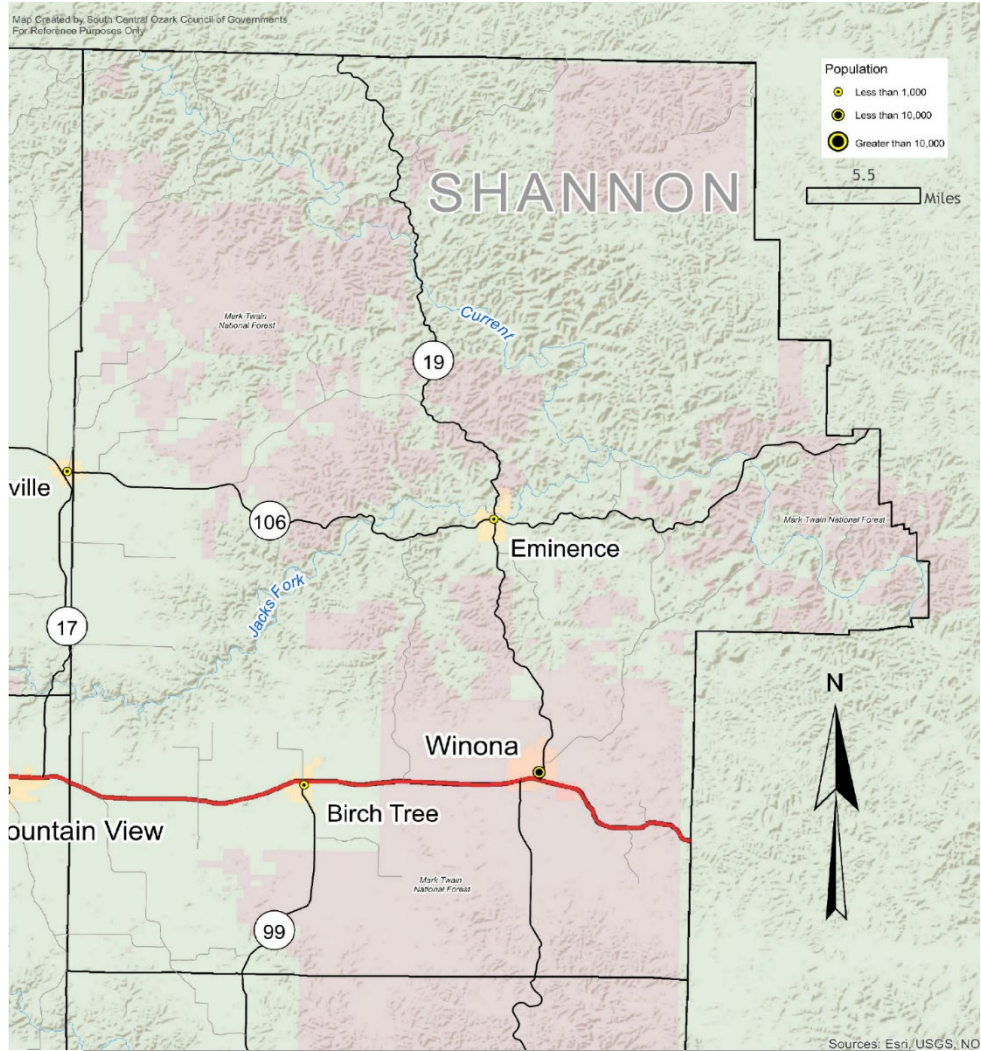
The natural hazards that may impact or have affected Shannon County are profiled below. All hazards do not necessarily affect every jurisdiction participating in the same way. Levee failure was omitted from inclusion in the plan. Levee failure does not apply to any of the jurisdictions in Shannon County, so this hazard is excluded. Table 3.2 provides a summary of the jurisdictions that may be affected by each hazard. An “x” in the table indicates that jurisdiction is affected by the hazard, and a “-“ indicates the hazard is not applicable to that jurisdiction.

Table 3.2. Hazards Identified for Each Jurisdiction

| Jurisdiction | Dam Failure | Drought | Earthquake | Extreme Heat | Wildfire | Flooding (River and Flash) | Land Subsidence/Sinkholes | Severe Winter Weather | Thunderstorm/Lightning/Hail/High Wind | Tornado |
|--------------------|-------------|---------|------------|--------------|----------|----------------------------|---------------------------|-----------------------|---------------------------------------|---------|
| Shannon County | X | X | X | X | X | X | X | X | X | X |
| City of Birch Tree | | X | X | X | X | X | X | X | X | X |
| City of Eminence | | X | X | X | X | X | X | X | X | X |
| City of Winona | X | X | x | X | X | X | X | X | X | X |
| Eminence R-I | | | | | | | | X | X | X |
| Winona R-III | | | | | | | | X | X | X |

3.1.5 Multi-Jurisdictional Risk Assessment

Figure 3.1. Map of Planning Area



The risk assessment assesses each participating jurisdiction’s vulnerability to each hazard that may affect Shannon County. Many of the hazards identified in the risk assessment have the same probability of occurrence throughout Shannon County. The hazards that vary across Shannon County in terms of risk include dam failure, flash flood, grass or wildland fire, river flood, and sinkholes/land subsidence. These differences are detailed in each hazard profile under geographic location and vulnerability.

Shannon County has a continental climate with mild winters and hot summers. The Cities of Eminence, Birch Tree, and Winona, are the most urbanized, experiencing more construction and development than most other portions of the county. Naturally, the urbanized areas of Shannon County have a greater density of important assets, which are more vulnerable to weather-related hazards. These communities plan to continue to grow and expand City boundaries, which will increase vulnerability to natural hazards. This

increase in vulnerability, however, can be mitigated through updated building codes and code enforcement, as well as land use planning.

Agricultural uses are primarily located in rural, unincorporated Shannon County. These areas are especially vulnerable to hail damages or drought.

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

3.2 ASSETS AT RISK

This section assesses Shannon 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 Shannon County Assessor, the Shannon 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.

3.2.1 Total Exposure of Population and Structures

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

Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2020 ACS data. Building counts and building exposure values are based on parcel data provided by the State of Missouri Geographic Information Systems (GIS) database and Shannon County Assessor.

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 3.3. Land values have been purposely excluded from consideration because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Another reason for excluding land values is that state and federal disaster assistance programs generally do not address loss of land (other than crop insurance). It should be noted that the total valuation of buildings is based on county assessors' data which may not be current. In addition, government-owned properties are usually taxed differently or not at all, and so may not be an accurate representation of true value. Note that public school district assets and special districts assets are included in the total exposure tables assets by community and county.

- **Table 3.3** - shows the total population, building count, estimated value of buildings, estimated value of contents, and estimated total exposure to parcels for the unincorporated county and each incorporated city.
- **Table 3.4** - provides the building value exposures for the county and each city in the planning

area broken down by usage type.

- **Table 3.5** - provides the building count total for the county and each city in the planning area broken out by building usage types (residential, commercial, industrial, and agricultural). To accommodate for mixed-use parcels, the data has been based on the lowest class of use for each parcel (e.g. residential-agricultural mixture is considered residential). Shannon County assessor data does not recognize any parcel in the county as industrial, though a small number of buildings in Birch Tree, Eminence, and Winona are identified as industrial in the Missouri structure point data. Assessor data classifies these parcels as commercial. The estimates below consolidate commercial and industrial values.

Table 3.3. Maximum Population and Building Exposure by Jurisdiction

| Jurisdiction | 2020 Annual Population Estimate | Parcel Count | Building Exposure (\$) | Contents Exposure (\$) | Total Exposure (\$) |
|-------------------------------|---------------------------------|--------------|------------------------|------------------------|---------------------|
| Unincorporated Shannon County | 7,031 | 7,056 | 49,287,610 | 29,903,805 | 52,277,995 |
| City of Birch Tree | 541 | 451 | 3,172,750 | 2,311,650 | 5,484,400 |
| City of Eminence | 515 | 511 | 4,149,367 | 3,104,266 | 7,253,633 |
| City of Winona | 950 | 788 | 6,445,770 | 3,643,177 | 10,088,947 |
| Totals | 9,037 | 8,806 | \$63,055,497 | \$38,962,898 | \$75,104,975 |

Source: U.S. Bureau of the Census, Annual population estimates/ 5-Year American Community Survey 2020; 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 3.4. Building Values/Exposure by Usage Type

| Jurisdiction | Residential | Commercial | Agricultural | Total |
|-------------------------------|-------------------|-------------------|------------------|-------------------|
| Unincorporated Shannon County | 32,968,255 | 9,655,698 | 9,188,125 | 51,812,078 |
| City of Birch Tree | 2,521,240 | 1,104,924 | 101,557 | 3,727,721 |
| City of Eminence | 2,198,000 | 1,922,405 | 77,655 | 4,198,060 |
| City of Winona | 3,892,169 | 2,325,967 | 57,856 | 6,275,992 |
| Totals | 41,579,664 | 15,008,994 | 9,425,193 | 66,013,851 |

Source: Missouri GIS Database, SEMA Mitigation Management Section

Table 3.5. Building Counts by Usage Type

| Jurisdiction | Residential Counts | Commercial Counts | Ag./ Industrial Counts | Total |
|-------------------------------|--------------------|-------------------|------------------------|--------------|
| Unincorporated Shannon County | 3,155 | 244 | 4,521 | 7,920 |
| City of Birch Tree | 327 | 36 | 29 | 392 |
| City of Eminence | 374 | 46 | 36 | 456 |
| City of Winona | 588 | 74 | 55 | 717 |
| Totals | 4,444 | 400 | 4,641 | 9,485 |

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 3.6 below. Additional information includes the number of buildings, building values (building exposure) and contents value (contents exposure). These numbers will represent the total enrollment and building count for the public school districts regardless of the county in which they are located.

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

| Public School District | Enrolment | Building Count | Building Exposure (\$) | Contents Exposure (\$) | Total Exposure (\$) |
|------------------------|-----------|----------------|------------------------|------------------------|---------------------|
| Winona R-III | 472 | 2 | \$ 18,346,925.00 | \$ 2,012,343 | \$ 20,359,268 |
| Eminence R-I | 261 | 2 | \$ 22,552,625.00 | \$ 2,921,300 | \$ 25,473,925 |

Source: <http://mcids.dese.mo.gov/quickfacts/Pages/District-and-School-Information.aspx>, select the file for the most recent year called “2020 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.



Shannon County Courthouse, Eminence

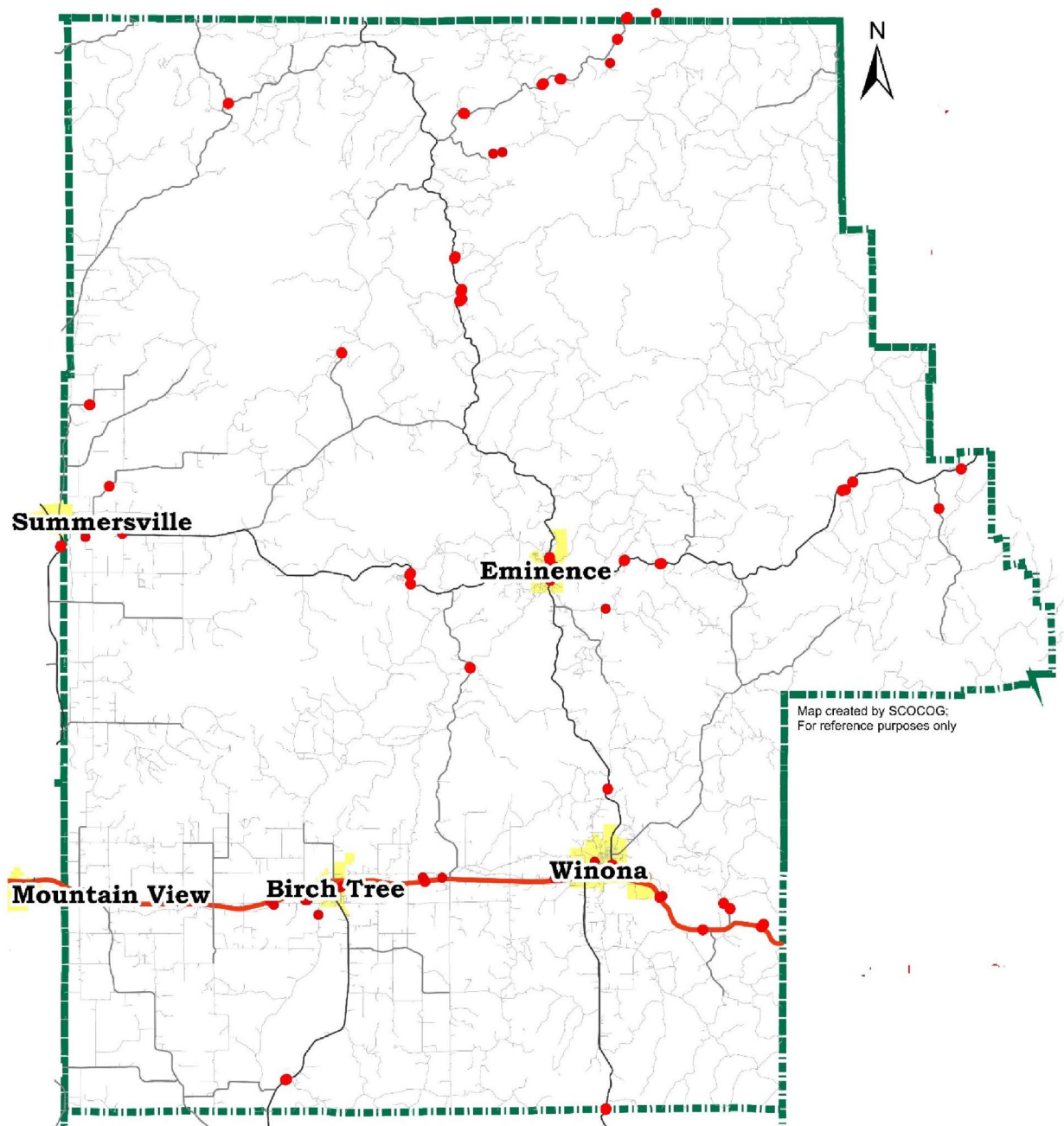
Table 3.7 below includes a summary of the inventory of critical and essential facilities and infrastructure in the planning area. The list was compiled from the Data Collection Questionnaire as well as the following sources:

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

| Jurisdiction | Airport Facility | Bus Facility | Childcare Facility | Communications Tower | Electric Power Facility | Emergency Operations | Fire Service | Government | Highway Bridge | Hospital/Health Care | Military | Natural Gas Facility | Nursing Homes | Police Station | Potable Water Facility | Rail | Sanitary Pump Stations | School Facilities | Tier II Chemical Facility | Wastewater Facility | TOTAL | |
|--------------------|------------------|--------------|--------------------|----------------------|-------------------------|----------------------|--------------|------------|----------------|----------------------|----------|----------------------|---------------|----------------|------------------------|----------|------------------------|-------------------|---------------------------|---------------------|----------|------------|
| Shannon County | 0 | 0 | 2 | 15 | 0 | 0 | 4 | 0 | 55 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 76 |
| City of Birch Tree | 0 | 0 | 1 | 3 | 1 | 0 | 1 | 2 | 4 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 1 | 0 | 1 | 1 | 12 |
| City of Eminence | 0 | 0 | 2 | 4 | 1 | 0 | 1 | 2 | 4 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 1 | 2 | 0 | 1 | 1 | 23 |
| City of Winona | 0 | 0 | 1 | 5 | 1 | 0 | 1 | 1 | 3 | 1 | 0 | 0 | 1 | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 1 | 21 |
| Totals | 0 | 0 | 6 | 7 | 3 | 0 | 7 | 5 | 66 | 2 | 0 | 0 | 3 | 3 | 5 | 0 | 3 | 5 | 0 | 3 | 3 | 132 |

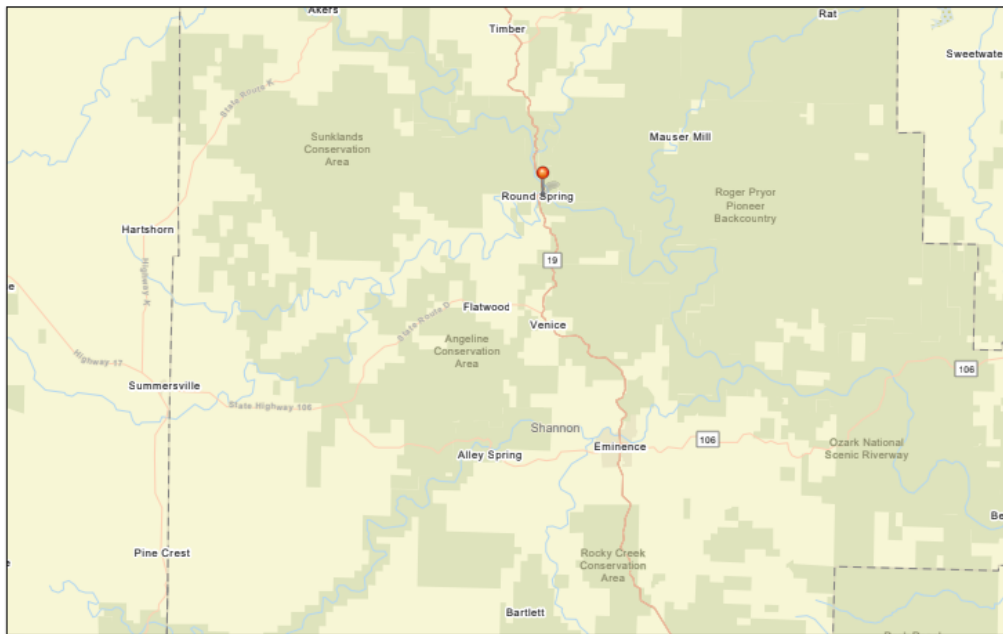
Source: Missouri 2018 State Hazard Mitigation Plan and Hazard Mitigation Viewer; Data Collection Questionnaires; Hazus, etc.

Figure 3.2. Shannon County Bridges



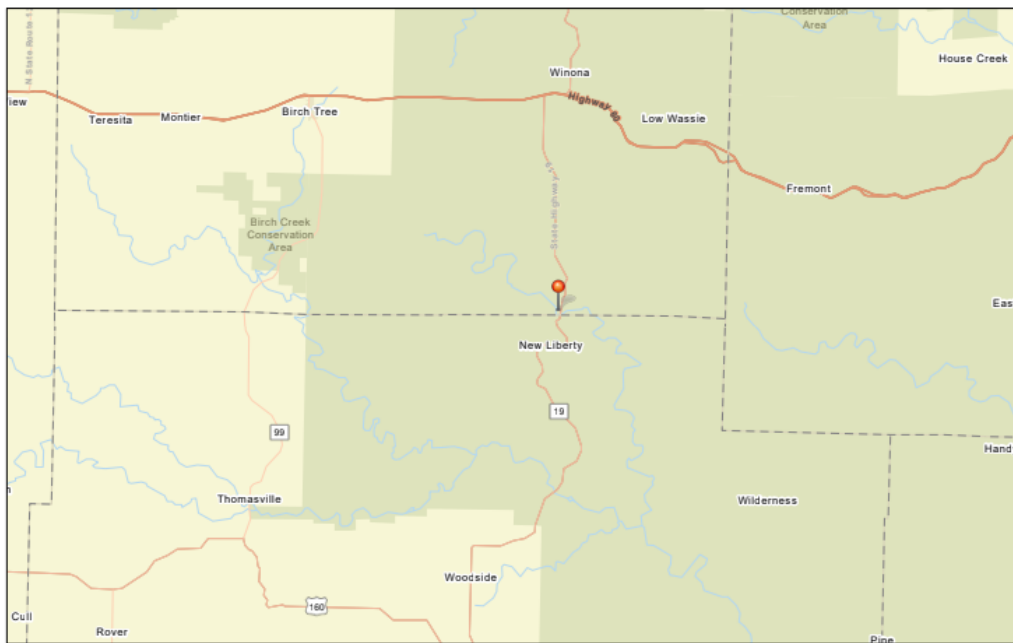
A bridge's scour index is a number indicating the vulnerability of a bridge to scour during a flood. Bridges with a scour index between 1 and 3 are considered "scour critical", or a bridge with a foundation determined to be unstable for the observed or evaluated scour condition. Below is a list of the "scour critical" bridges in Shannon County, Missouri. ***There are no "scour critical" bridges located in Shannon County.***

Figure 3.3. Round Spring Cave Road Park – MO 19 South



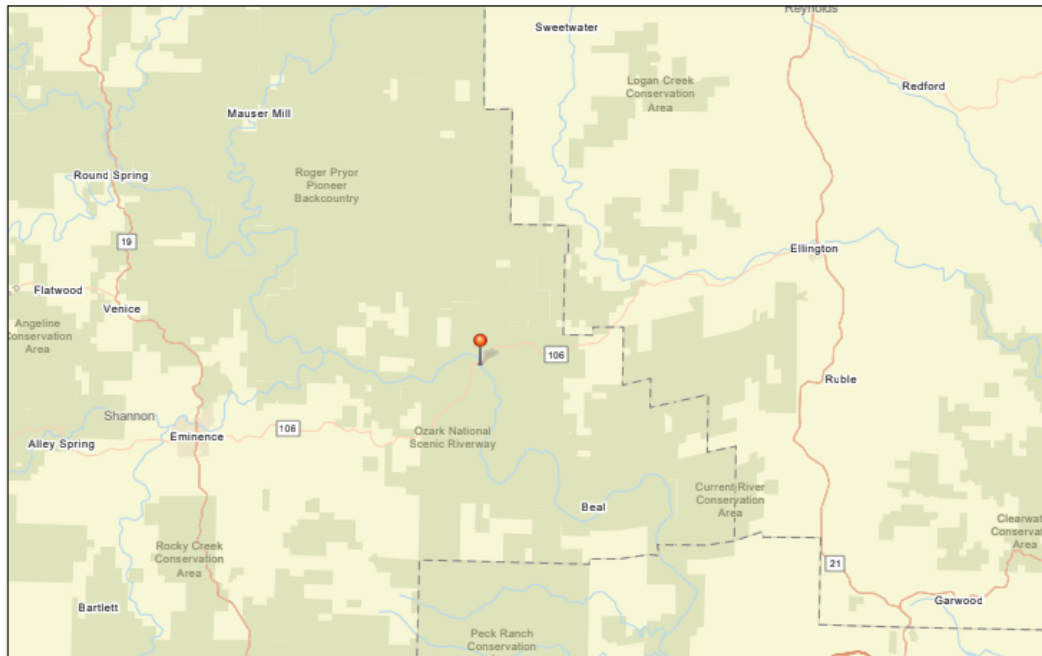
ArcGis Map

Figure 3.4. Hurricane Creek – MO 19 South



ArcGis Map

Figure 3.5. Current River – MO 106 East



ArcGis Map

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 3.8. Threatened and Endangered Species in Shannon County

| Common Name | Scientific Name | Status |
|-------------------------|--------------------------------------|------------|
| Gray Bat | Myotis grisescens | Endangered |
| Indiana Bat | Myotis sodalist | Endangered |
| Northern Long-Eared Bat | Myotis septentrionalis | Threatened |
| Ozark Hellbender | Cryptobranchus alleganiensis bishopi | Endangered |
| Decurrent false aster | Boltonia decurrens | Threatened |
| Virginia Sneezeweed | Helenium virginicum | Threatened |

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 on-screen instructions.

Table 3.9. Conservation Areas and Parks in Shannon County

| Area Name | Address | Locale |
|---------------------------------|------------------------|-------------------|
| Cedar Grove Conservation Area | Rte K | Akers |
| Angeline Conservation Area | Rte 106 | Eminence |
| Birch Creek Conservation Area | Rte 99 | Birch Tree |
| Buttin Rock Access | Rte 19 | Eminence |
| Current River State Park | Rte 19 | Timber |
| Ozark National Scenic Riverways | - | Shannon County |
| Peck Ranch Conservation Area | CR P-159 | Winona-Low Wassie |
| Rocky Creek Conservation Area | Rte 19 | Winona |
| Sunk Lands Conservation Area | Rte K | Round Spring |
| Eminence City Park | Rte 106 | Eminence |
| Lions Park | Hoover Drive | Winona |
| Creekside Park | 1 st Street | Birch Tree |
| Echo Bluff State Park | Rte. 19 | Eminence |

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.

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

| Property | Address | Locale | Date Listed |
|---|---------|-------------|-------------|
| Alley Spring Roller Mill | MO 106 | Eminence | 1981 |
| Alton Club | MO 19 | Round Spr. | 2005 |
| Buttin Rock School | MO 106 | Powder Spr. | 1991 |
| Chilton-Williams Farm | MO 106 | Eminence | 1981 |
| Klepzig Mill and Farm | MO 106 | Eminence | 1990 |
| Reed Log House | MO 106 | Eminence | 1991 |
| Rhinehart Ranch | MO 106 | Eminence | 1980 |
| Winona Ranger Station Historic District | MO 19 | Winona | 2003 |

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

Table 3.11. Major Non-Government Employers in Shannon County

| Employer Name | Main Locations | Product or Service | Employees |
|----------------------------|----------------|--------------------|-----------|
| Missouri Hardwood Flooring | Birch Tree | Wood Products | 100+ |
| Tag Uniforms | Winona | Apparel | 100+ |

Source: Data Collection Questionnaires; local Economic Development Commissions

Agricultural Assets

Table 3.12. Agriculture-Related Sales in Shannon County

| Value of Sales by Commodity Group | State Rank (out of 114) |
|--|-------------------------|
| Milk from cows | 77 |
| Fruits, tree nuts, and berries | 87 |
| Cattle and Calves | 75 |
| Vegetables, melons, potatoes, and sweet potatoes | 37 |

Source: 2016 Missouri Agricultural Census

Table 3.13. Top Livestock Inventories in Shannon County

| Livestock Inventory | State Rank (out of 114) |
|---------------------|-------------------------|
| Hogs and Pigs | 98 |
| Cattle and calves | 75 |
| Goats, all | 72 |
| Horses and ponies | 71 |

Source: 2017 Missouri Agricultural Census

3.3 LAND USE AND DEVELOPMENT

3.3.1 Development Since Previous Plan Update

Shannon County has overall experienced slight population decline since 2010-2020. It is likely that this trend continued since the previous plan update. Some communities have seen minimal new construction or development, but as a whole Shannon County and the incorporated jurisdictions have had minimal development since the previous plan update in 2018. New development has not occurred within hazard prone areas in the last 10 years.

Table 3.14. County Population, 2010-2020

| Jurisdiction | Total Population 2010 | Population Estimate 2020 | 2010-2020 # Change | 2010-2020 % Change |
|--------------------|-----------------------|--------------------------|--------------------|--------------------|
| Shannon County | 8,441 | 7,031 | -1,410 | -20.1% |
| City of Eminence | 600 | 515 | -85 | -14.2% |
| City of Winona | 1,335 | 950 | -385 | -28.8% |
| City of Birch Tree | 679 | 541 | -138 | -20.3% |

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

Table 3.15. Change in Housing Units, 2015-2020

| Jurisdiction | Housing Units 2015 | Housing Units 2020 | 2015-2020 # Change | 2015-2020 % Change |
|--------------------|--------------------|--------------------|--------------------|--------------------|
| Shannon County | 4,126 | 3,513 | -613 | -14.9% |
| City of Eminence | 340 | 299 | -41 | -12% |
| City of Winona | 572 | 497 | -75 | -13% |
| City of Birch Tree | 356 | 282 | -74 | -20.8% |

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

3.3.2 Future Land Use and Development

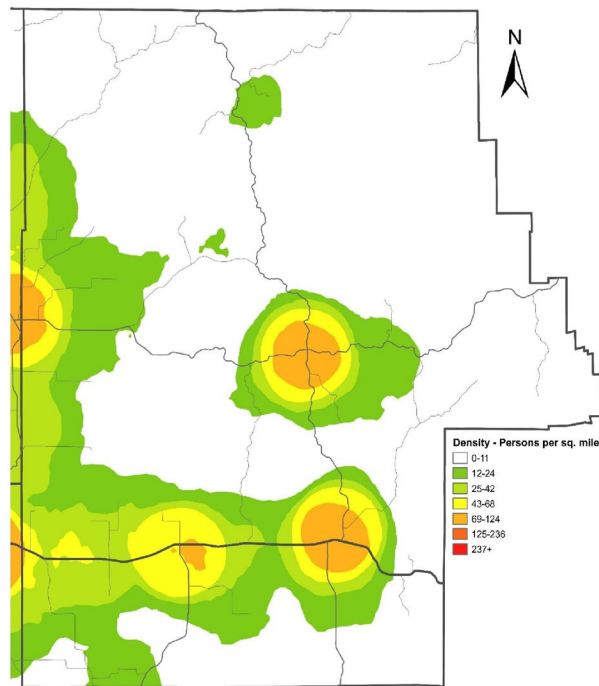
Unincorporated Shannon County has seen its population decline slightly from the years 2010 to 2020. Most of the new development in the county is taking place along US Highway 60 in the southern part of the county near the communities of Winona and Birch Tree. Generally, the county is sparsely populated with very rugged and remote terrain. Figure 3.6 depicts the geographic location of population density in Shannon County.

The City of Birch Tree currently has no comprehensive plan. Birch Tree experienced an 8 percent decrease in population from 2010-2020. Development in the community in recent years has taken place at or near the intersection of US Highway 160 and State Route 99, on the northern edge of the community. It is expected that future growth in the community will continue to take place in this area. New development has not occurred within hazard prone areas in the last 10 years.

The City of Eminence has a comprehensive plan on file, however it has not been updated in several years. The county seat experienced the slightest decline in the county regarding population decrease between the years 2010 and 2020, with a 14.2% decrease in population. Development in the community is focused along State Route 19 in the center portions of the community and along the Jacks Fork River on the north side of town. Eco-tourism is a major economic driver for the City of Eminence. Future growth is expected to be focused in the northern part of the community and along Routes 19 and 106. New development has not occurred within hazard prone areas in the last 10 years.

The City of Winona does not have a Comprehensive Plan on file. The City experienced declining population during the years 2010 to 2020. Population fell by nearly 28.8%. The city is experiencing some commercial growth due to the location of US Highway 60 on the southern edge of the community. The city has had problems with flooded roadways in the residential areas on the west side of the community, perhaps requiring future mitigating actions. New development has not occurred within hazard prone areas in the last 10 years.

Figure 3.6. Population Density in Shannon County and Surrounding Areas



School District's Future Development

Winona R-III School District

The Winona School District does not have plans for future development. A community safe room is currently a need for the community that will be capable of holding students and faculty and nearby residents of the community. The district expects a decrease of approximately 5% in enrollment over the next five years.

Eminence R-I School District

The Eminence School District does not have plans for future development. A community safe room was recently constructed that will be capable of holding students and faculty and nearby residents of the community. The district expects a decrease of approximately 5% in enrollment over the next five years.

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.

Each hazard identified in Section 3.1.4 will be profiled individually in this section. 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. Strength, magnitude, and extent can also include the speed of onset and the duration of hazard events. Describing the strength/magnitude/extent of a hazard is not the same as describing its potential impacts on a community. Strength/magnitude/extent defines the characteristics of the hazard regardless of the people and property it affects.
- **Previous Occurrences:** This section includes available information on historic incidents and their impacts. Historic event records form a solid basis for probability calculations.
- **Probability of Future Occurrence:** The frequency of recorded past events is used to estimate the likelihood of future occurrences. Probability was determined by dividing the number of recorded events by the number of years 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 is 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 is 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 are also considered, including the effects of long-term changes in weather patterns and climate on 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 the community.

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

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

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

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

Following the hazard profile for each hazard will be the vulnerability assessment. The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to damages from natural hazards. The vulnerability assessments are based on the best available data, including data that was collected for the 2018 State Hazard Mitigation Plan Update.

The vulnerability assessments in this Shannon County plan are also 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.

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

- **Vulnerability Overview:** 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:** Includes the types and numbers of building and critical facilities.
- **Previous and Future Development:** This section will include information on how changes in development have impacted the community's vulnerability to this hazard. It also includes a description of how changes in development that occurred in known hazard prone areas since the previous plan have increased or decreased the community's vulnerability, and any anticipated future development in the county, and how that would impact hazard risk in Shannon County.
- **Hazard Summary by Jurisdiction:** For hazard risks that vary by jurisdiction, this section will provide an overview of the variation and the factual basis for that variation. For example, a community that has adopted more recent building codes and constructed safe rooms would be less vulnerable to the impact of tornados.

Problem Statements

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

3.4.1 Dam Failure

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:

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

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

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

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

The Missouri Dam and Reservoir Safety Council Rules and Regulations uses three classes of downstream environmental zones used when considering permits. The downstream environment zone is the area below the dam that would become inundated should the dam fail. Inundation is defined as water two feet or more over the submerged ground outside of the stream channel. These classes are based on the number of structures and types of development contained within the inundation area as presented in Table 3.16. The downstream environment zone classification is also used to prescribe the frequency of inspection.

Table 3.16. MDNR Dam Hazard Classification Definitions

| Hazard Class | Definition |
|--------------|--|
| Class I | The area downstream from the dam that would be affected by inundation contains ten (10) or more permanent dwellings or any public building. Inspections of these dams must occur every two years. |
| Class II | The area downstream from the dam that would be affected by inundation contains one to nine permanent dwellings, or one (1) or more campgrounds with permanent water, sewer and electrical services or one (1) or more industrial buildings. Inspections 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. Inspections of these dams must occur once every five years. |

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

Dams in the NID are classified according to hazard potential, an indicator of the consequences of dam failure. A dam's hazard potential classification, presented in Table 3.17 does not indicate its condition. Dams assigned the high hazards potential classification are those where failure will potentially result in loss of human life. Significant hazard potential are those dams where failure results in no probable loss of human life but can cause economic loss. Dams assigned the low hazard potential classification are those where failure will result in no probable loss of human life and low economic or environmental losses. Losses are principally limited to the owner's property.

Table 3.17. NID Dam Hazard Classification Definitions

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

Source: National Inventory of Dams

There is not a direct correlation between the State Hazard classification and the NID classifications. However, most dams that are in the States Classes I and II are considered NID High Hazard Dams.

Geographic Location

According to the MDNR there are ten total dams in Shannon County and two regulated dams. MDNR lists:

- One dam as Hazard Class 1
 - Hunt Lake Dam
- Four dams as Hazard Class 2
 - Loggers Lake
 - Lake Laura
 - Coldwater Ranch
 - Huckleberry Lake

NID data also indicated that there are ten dams located in Shannon County. All of earthen construction. One dam, Loggers Lake, is federally owned. The nine other dams in the county are privately owned. The NID provides that four dams in the county are classified as “high hazard”.

Dams in Planning Area

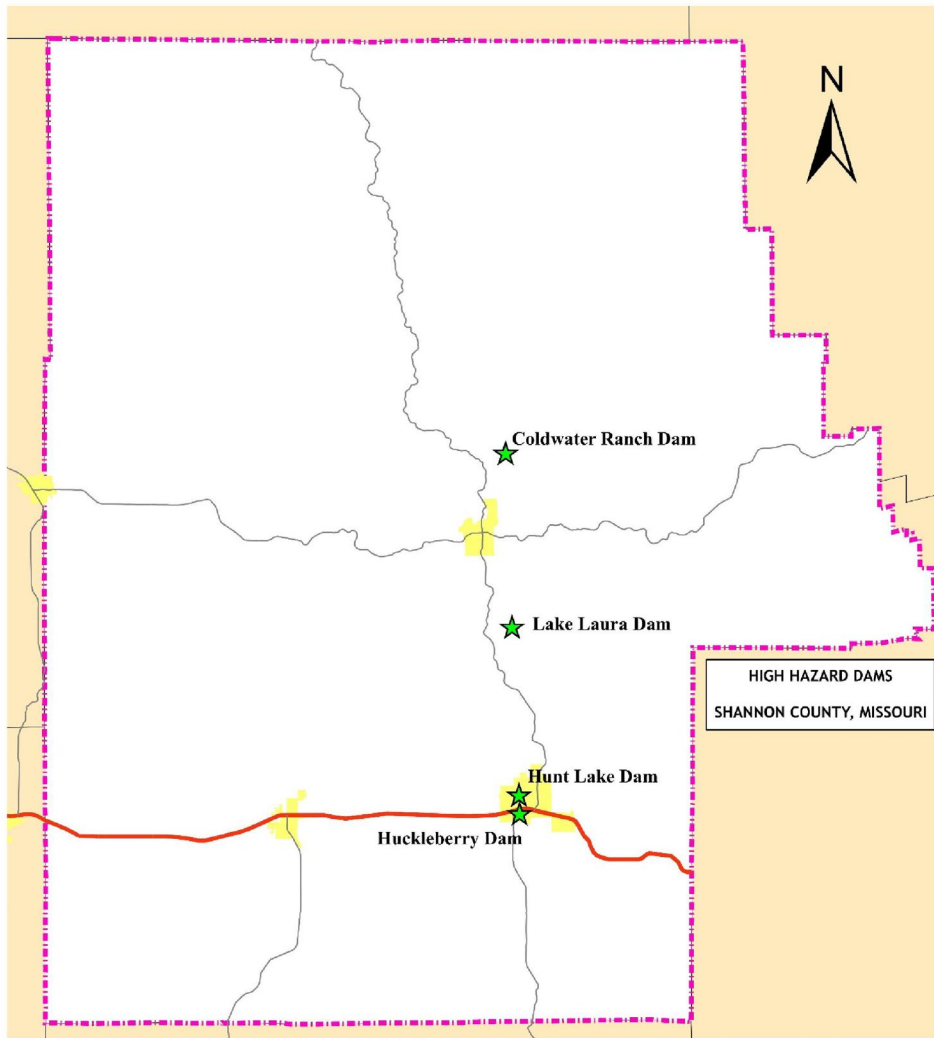
Table 3.18 lists the names, locations, and other pertinent information for all high hazard dams in the planning area.

Table 3.18. High Hazard (NID) Dams in the Shannon 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 |
|-----------------|--------------------------------|-----------------|--------------------------|----------------------|---------------------|-------------------------|----------------------------------|------------|
| Coldwater Ranch | - | 35 | 35 | NA | Sutton Creek | Eminence | 3 | Private |
| Huckleberry | - | 26 | 78 | NA | N/A | Winona | 0 | Private |
| Hunt Lake | - | 21 | 79 | NA | Trib. Pike Creek | Winona | 0 | Mabel Hunt |
| Lake Laura | - | 41 | 296 | NA | Trib. Shawnee Creek | Eminence | 6 | Private |

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

Figure 3.7. High Hazard Dams in Shannon County



Upstream Dams Outside the Planning Area

There are no dams in areas upstream of the corporate boundaries of Shannon County that could impact areas inside the county.

Severity/Magnitude/Extent

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

Actual dam failure can result not only in loss of life, but also considerable loss of capital investment, loss of income, and property damage. Loss of the reservoir itself can cause hardship for those dependent on it for their livelihood or water supply.

Previous Occurrences

There are no records of dam failure in Shannon County. Since there are zero recorded events in the planning area, a calculation of a probability percent is not possible. According to information from the 2018 State Plan, Missouri's percentage of high hazard dams in the MDNR inventory puts the State at about the national average for that category. However, if development occurs downstream of dams the percentage of high hazard dams will increase. Additionally, the probability of dam failure increases as many of the smaller and privately owned dams continue to deteriorate without the benefit of further regulation or improvements. Regular inspection and maintenance schedules for dams greatly reduces the probability of dam failure. There are no record of dam inspections in Shannon County.

Probability of Future Occurrence

There are no records of dam failure in Shannon County. Since there are zero recorded events in the planning area, a calculation of a probability percent is not possible. According to information from the 2018 State Plan, Missouri's percentage of high hazard dams in the DNR inventory puts the State at about the national average for that category. However, if development occurs downstream of dams the percentage of high hazard dams will increase. Additionally, the probability of dam failure increases as many of the smaller and privately owned dams continue to deteriorate without the benefit of further regulation or improvements. Regular inspection and maintenance schedules for dams greatly reduces the probability of dam failure.

Changing Future Conditions Consideration

The vulnerability of the dam infrastructure to failure can be affected by climate change. As the conditions of the dam-reservoir system deteriorate or as the climate factors worsen, an update of the failure modes considered may be required. A routine inspection completed by a licensed inspector on a scheduled basis is recommended to identify any structural issues that could be corrected before a failure.

Vulnerability

Vulnerability to dam failure in Shannon County is limited to structures and critical infrastructure located in dam inundation zones. Two dams are located in incorporated jurisdictions. Hunt Lake Dam and Huckleberry Dam are located within the corporate boundaries of Winona. The remaining two high hazard dams are located in the unincorporated areas of the county. There are two regulated dams in the county, but no existing inundation zone maps for any dams in Shannon County. Also, there are no EAPs for dams in the county. The following Figure 3.8, Figure 3.9, Figure 3.10, and Figure 3.11 depict the expected flow direction of water in the event of a failure of a high hazard dam in the county.

Figure 3.8. Coldwater Ranch Dam



Figure 3.9. Huckleberry Dam



Figure 3.10. Hunt Lake Dam

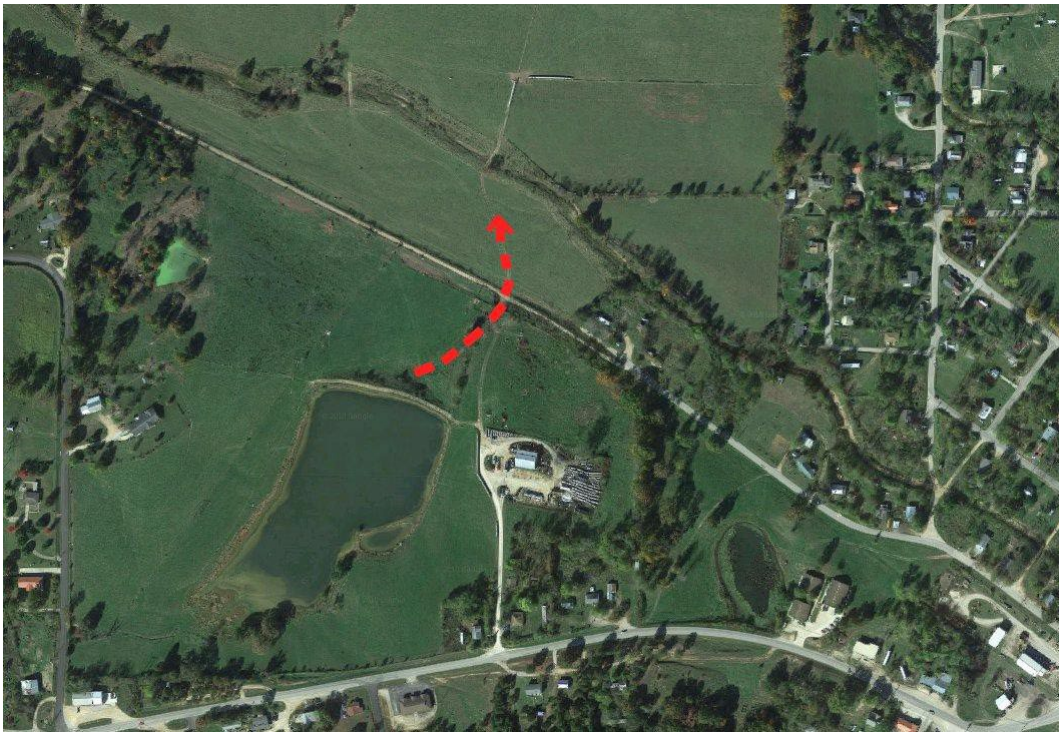


Figure 3.11. Lake Laura Dam



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

Fortunately, the eight high hazard dams located in Shannon County are located in areas where there is no significant development in downstream areas. In the absence of MDNR inundation zone maps and Emergency Action Plans, it is difficult to determine the exact areas where inundation would occur, but in reviewing recent aerial photography, it can be stated that the risk to human life, and the risk for property damage in the event of a failure of one of the eight high hazard dams in Shannon County would be minimal.

Impact of Future Development

The planning area, specifically, the areas downstream of Shannon County's high hazard dams are rural in nature. However, growth in the county is moderately strong and any future development in potential inundation areas will increase vulnerability to dam failure hazards. However, due to the amount and affordability of developable land, it is unlikely that residential structures will be developed in a location that is inside an inundation zone.

Hazard Summary by Jurisdiction

Unincorporated Shannon County is the one of two jurisdictions in the Plan that is vulnerable to dam failure. The two jurisdictions containing high hazard dams are Unincorporated Shannon County and the City of Winona. There are no mapped inundation areas or potential inundation areas within cities. No school district facilities are located near potential inundation areas or downstream environments from existing dams.

Problem Statement

There are four dams in the county with high hazard potential. However, none of the dams have mapped inundation zones or EAPs therefor it is difficult to gauge the vulnerability of downstream environments. The development of inundation zone maps by MDNR would help the citizenry of Shannon County become more familiar with the risk they face due to the potential for dam failure. Additionally, the inspection rate of the high hazard dams in Shannon County seems to be lacking. Of the five high hazard dams, only one is listed as ever having been inspected. The MPC feels it would be beneficial if these dams were considered for inspection more regularly.

3.4.2 Drought

Hazard Profile

Hazard Description

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

Droughts are regional climatic events that can impact large areas and multiple counties. The entire county is at risk to the impacts of drought. However, drought most directly impacts the agricultural sector, so areas within the county where there is extensive agricultural land use can experience significant impacts. As noted previously in the plan, Shannon County is home to intensive livestock production. All incorporated communities in the county rely on wells for water supply. The impact of drought on deeper public wells would not be significant unless the drought was of such historic severity to reduce groundwater levels.

Severity/Magnitude/Extent

Figure 3.12 is a recent map from the US Drought Monitor and an example of the size of the geographic area that could be in drought conditions at any given moment in time. The map is only a snapshot of conditions at a given time and indicates the severity of drought conditions.

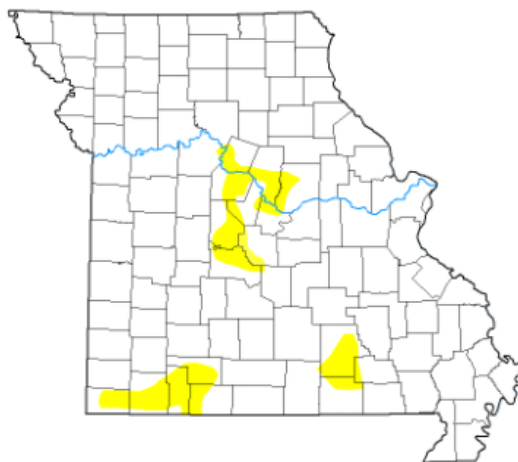
Figure 3.12. U.S. Drought Monitor Map of Missouri on 9-7-2021

Missouri

[Home](#) > Missouri

Map released: Thurs. September 2, 2021

Data valid: August 31, 2021 at 8 a.m. EDT



Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

Authors

United States and Puerto Rico Author(s):
 David Simeral, Western Regional Climate Center
 Pacific Islands and Virgin Islands Author(s):
 Ahira Sanchez-Lugo, NOAA/NCEI

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Map Download

No text:

Legend:

Legend and statistics table:

Statistics

Statistics type: Cumulative Percent Area

Export table:

| Week | Date | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 | DSCI |
|------------------------|------------|-------|-------|-------|-------|-------|------|------|
| Current | 2021-08-31 | 93.26 | 6.74 | 0.00 | 0.00 | 0.00 | 0.00 | 7 |
| Last Week | 2021-08-24 | 95.17 | 4.83 | 0.00 | 0.00 | 0.00 | 0.00 | 5 |
| 3 Months Ago | 2021-06-01 | 96.40 | 3.60 | 0.00 | 0.00 | 0.00 | 0.00 | 4 |
| Start of Calendar Year | 2020-12-29 | 55.47 | 44.53 | 10.22 | 0.00 | 0.00 | 0.00 | 55 |
| Start of Water Year | 2020-09-29 | 63.43 | 36.57 | 10.96 | 3.34 | 0.00 | 0.00 | 51 |
| One Year Ago | 2020-09-01 | 76.70 | 23.30 | 5.42 | 0.75 | 0.00 | 0.00 | 29 |

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

The most commonly used indicator of drought severity is the Palmer Drought Severity Index (PDSI), jointly published by the NOAA and the United States Department of Agriculture. The Palmer Drought Indices measure dryness based on recent precipitation and temperature. The indices are based on a “supply-and-demand model” of soil moisture. Calculation of supply is relatively straightforward, using temperature and the amount of moisture in the soil. However demand is more complicated as it depends on a variety of factors, such as evapotranspiration and recharge rates. These rates are harder to calculate. Palmer tried to overcome these difficulties by developing an algorithm that approximated these rates, and based the algorithm on the most readily available data — precipitation and temperature.

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

According to the MDNR Missouri Drought Plan revised in 2002, Missouri Drought Response System is divided into four phases based on Palmer Index values:

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

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

The USDA’s Risk Management Agency provides insure crop loss payments in the county as a result of drought from 1948 to present. The 2018 State Plan states that Shannon County is categorized as “low” in crop loss ration ratings. Data indicates that from 1998 through 2020 there were zero dollars in insured crop loss payments with annualized losses of \$0.

Previous Occurrences

The NCEI database shows zero (0) drought events occurring in Shannon County from 2017 through 2021.

Table 3.19. Previous Drought Occurrences 2017-2021

| Drought Year | Duration | Property Damage | Crop Damage |
|---------------------|-----------------|------------------------|--------------------|
| 2017 | n/a | \$0 | \$0 |
| 2018 | n/a | \$0 | \$0 |
| 2019 | n/a | \$0 | \$0 |
| 2020 | n/a | \$0 | \$0 |
| 2021 | n/a | \$0 | \$0 |

Probability of Future Occurrence

NCEI data for Shannon County over the five-year period between 2017 and 2021 shows no occurrence of drought events. In order to calculate risk of drought, a broader time range has been used to demonstrate that probability is greater than that reflected in the 5-year data shown above.

Extending the reporting period from January 1, 2012 to December 31, 2021, a 10-year reporting period, demonstrates that the probability of drought risk in Shannon County is greater than demonstrated by the 5-year data.

The 10-year reporting period shows that there were seven (7) drought events in Shannon County, representing a 7-month duration of drought in a single year with a total of \$531,000 in crop damages reported.

Using the 10-year data to calculate the probably of future events, it can be determined that there is a 1% annual risk of drought, as all seven events happened in a single year, representing a 7-month duration rather than seven events over the course of multiple years.

Using the duration of drought over the 10-year period, the calculated probability resulting from 7 total months of drought over a 120-month period indicates a 5.8% monthly probability over the reporting period.

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. See Table 3.20 for Previous Drought Occurrences.

Table 3.20. Previous Drought Occurrences 2012-2021

| Drought Year | Duration | Property Damage | Crop Damage |
|---------------------|-----------------|------------------------|--------------------|
| 2012 | 7 months | \$0 | \$531,000 |
| 2013 | n/a | \$0 | \$0 |
| 2014 | n/a | \$0 | \$0 |
| 2015 | n/a | \$0 | \$0 |
| 2016 | n/a | \$0 | \$0 |
| 2017 | n/a | \$0 | \$0 |
| 2018 | n/a | \$0 | \$0 |
| 2019 | n/a | \$0 | \$0 |
| 2020 | n/a | \$0 | \$0 |
| 2021 | n/a | \$0 | \$0 |

Potential Losses to Existing Development

The 2018 State Plan states that from 1998 through 2022 there or \$0 in insured crop loss payments in Shannon County. The absence of payment could be due to the absence of crop insurance. There are no anticipated structural losses, loss of life, or injuries associated with this hazard. In addition, according to the NCEI estimates there were \$0 in crop losses from 2017-2022.

Impact of Future Development

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

Impact of Climate Change

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

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

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

The risk to water sustainability for counties meeting two of the criteria are classified as “moderate”, while those meeting three of the criteria are classified as “high”, and those meeting four or more are classified as “extreme”. Counties meeting less than two criteria are considered to have low risk to water sustainability. According to the

Natural Resources Defense Council, without climate change the water sustainability index for Shannon County is “low”. With climate change, the water supply sustainability index is “low”.

Hazard Summary by Jurisdiction

Although the probability of drought is the same for the entire county, farming and livestock enterprises in the unincorporated parts of the county would feel the greatest impact. These impacts can be mitigated somewhat by the purchase of crop insurance. The existence of private farms and ranches are more concentrated in the western and southern portion of the county where the land is not under government ownership. The communities of Winona, Eminence, and Birch Tree each utilize groundwater wells for public water supply and could potentially be impacted during water shortages due to the reliance on these limited source wells.

Problem Statement

Although drought most likely will not cause structure damage, the impact is greatest on the agriculture sector and if persistent enough, could cause reductions in groundwater and water shortages in communities that provide potable water services. Potential solutions to mitigate the impact of drought would be for communities to develop an ordinance to restrict the use of public water resources for non-essential usage, such as landscaping, washing cars, filling swimming pools, etc. during extreme drought periods. School districts can also implement water conservation measures at all district facilities.

3.4.3 Earthquakes

Hazard Profile

Hazard Description

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

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

Geographic Location

The greatest hazard from earthquakes in Shannon County comes from the New Madrid Seismic Zone situated in the boot heel area of southeast Missouri. The potential of high magnitude earthquakes occurring along the New Madrid fault presents risk that does not vary across the planning area. The Nemaha uplift is central Kansas is also prone to seismic activity, however the center of the Humbolt fault zone near the Nemaha Uplift is approximately 300-350 miles west/northwest of Shannon County and lower magnitude seismic events that will not impact jurisdictions in Shannon County.

The 2014 USGS National Seismic Hazard Maps display earthquake ground motions for various probability levels across the United States and are applied in seismic provisions of building codes, insurance rate structures, risk assessments and other public policy. The updated maps represent an assessment of the best available science in earthquake hazards and incorporate new findings on earthquake ground shaking, faults, seismicity, and geodesy. The USGS National Seismic Hazard Mapping Project developed these maps by incorporating information on potential earthquakes and associated ground shaking obtained from interaction in science and engineering workshops involving hundreds of participants, review by several science organizations and State surveys, and advice from expert panels and a Steering Committee. Figure 3.13 is a USGS map illustrating seismicity in the United States. A star showing the general location of Shannon County has been inserted on the map.

Severity/Magnitude/Extent

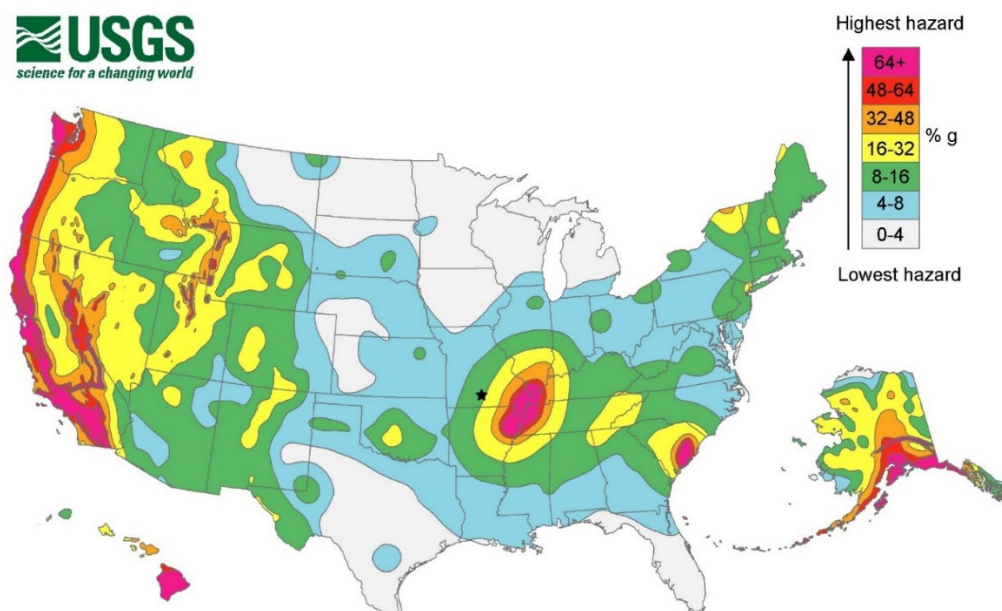
The extent or severity of earthquakes is generally measured in two ways: 1) the Richter Magnitude Scale is a measure of earthquake magnitude; and 2) the Modified Mercalli Intensity Scale is a measure of earthquake severity. The two scales are defined a follows.

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

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

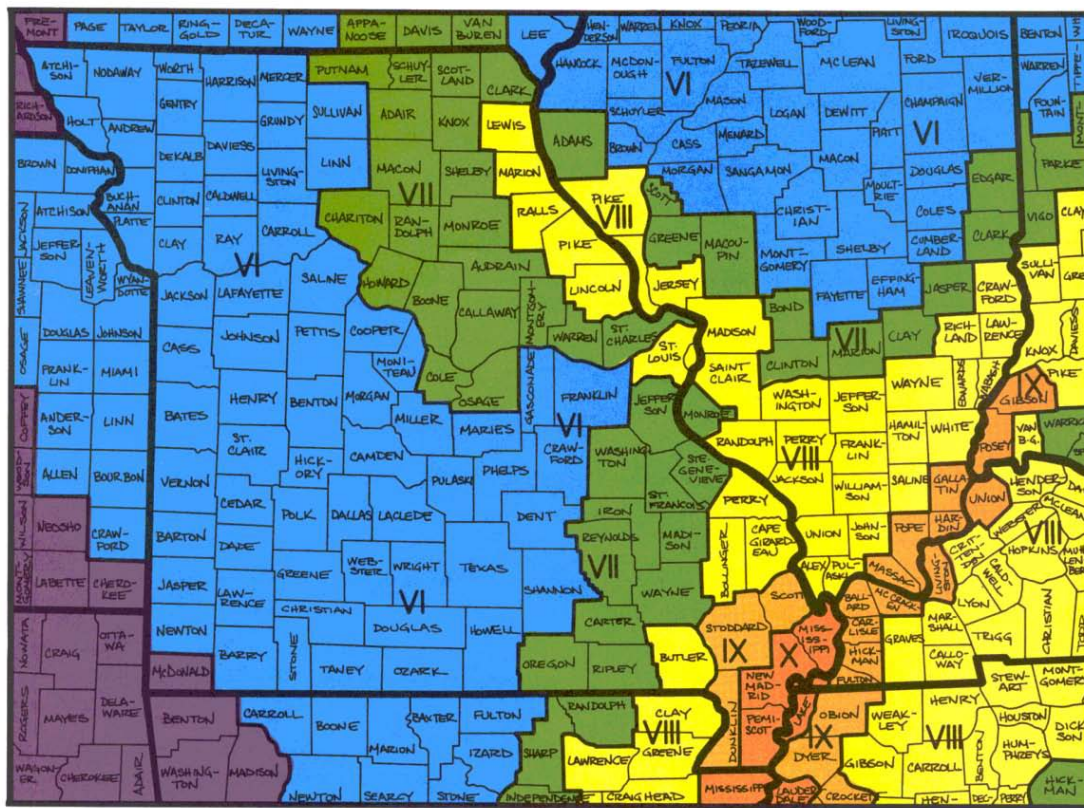
Figure 3.13 identifies the Earthquake Hazards and Unincorporated Shannon County, and all jurisdictions are located within the 16-32 range of potential hazard risk.

Figure 3.13. USGS Earthquake Hazard Map

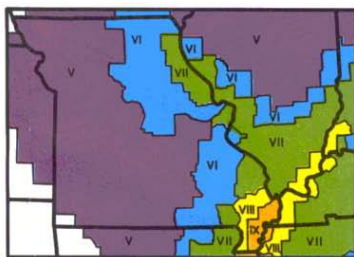


Source: United States Geological Survey at http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lg.jpg

Figure 3.14. Impact Zones for Earthquake Along the New Madrid Fault

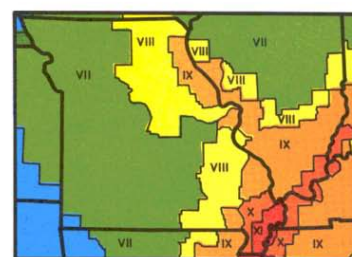


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.



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

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



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

Figure 3.14 (above) shows the highest projected Modified Mercalli Intensities by county from a potential magnitude 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid Seismic Zone. The secondary maps in the figure above show the same regional intensities for 6.7 and 8.6 earthquake, respectively. Shannon County is in zone VI from a potential magnitude 7.6 earthquake along the New Madrid fault.

Figure 3.15. Projected Earthquake Intensities

MODIFIED MERCALLI INTENSITY SCALE

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

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

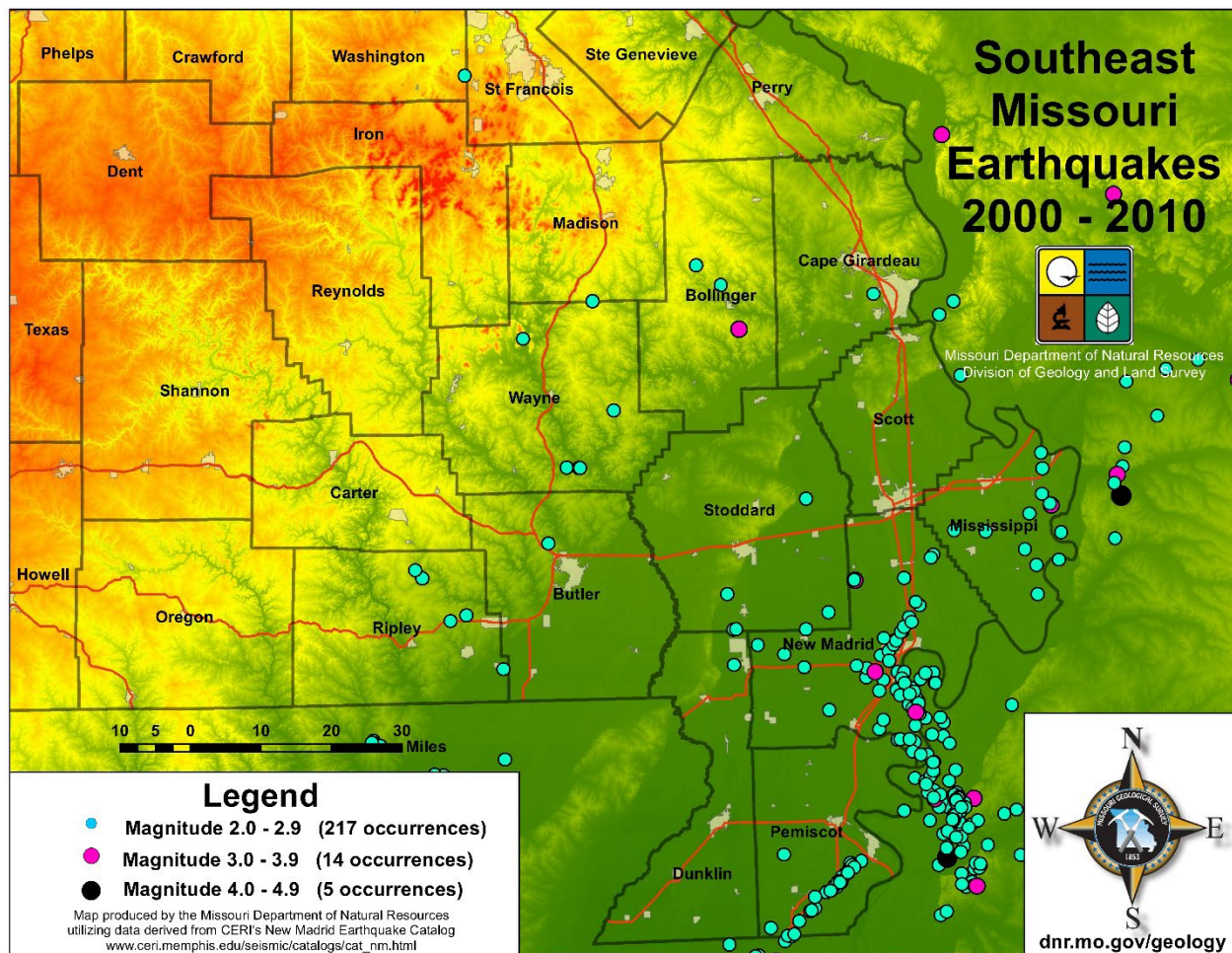
Prepared and distributed by
**THE MISSOURI STATE
 EMERGENCY MANAGEMENT AGENCY**
 P.O. BOX 116
 JEFFERSON CITY, MO 65102
 Telephone: 573-526-9100

Previous Occurrences

There is no record of recent earthquake occurrence within Shannon County (2000-2021). The southeastern portion of Missouri is most susceptible to earthquakes because it overlies the New Madrid Seismic Zone. No area of Missouri is immune from the danger of earthquakes. Minor, but potentially damaging earthquakes can occur anywhere in the state. (SEMA, 2018)

Figure 3.16 provides the latest and best data from the MDNR regarding earthquake occurrence in southeast Missouri. The closest known earthquake to Shannon County was located about 62.4 miles away in Unincorporated Ripley County. The map shows that all jurisdictions within Shannon County have not been affected by an occurrence.

Figure 3.16. Earthquakes of Southeast Missouri



Probability of Future Occurrence

Without a historical record for earthquakes in Shannon County it is not possible to calculate a precise probability of earthquake occurrence. 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. According to a fact sheet prepared by SEMA in 2003, the probability for a magnitude 6.0 to 7.5 earthquake along the New Madrid Fault is 25 to 40 percent chance of occurrence over the next 50 years. At the 25% level, the likelihood of an earthquake happening in a given year is 1.0%. At the 40% level, the likelihood of an earthquake happening in a given year is 1.6%. The previous map (Figure 3.15 indicates the potential severity for Shannon County of a 6.7, 7.6, and 8.6 magnitude earthquake anywhere along the New Madrid Fault.

Hazard Summary by Jurisdiction

Earthquake intensity is not likely to vary greatly throughout the planning area, the risk of occurrence is the same throughout. However, damages will differ where there are variations in the planning area based on percentage of structures build prior to 1939. For example, if one community has a high percentage of residences built prior to 1939 than the other participants, that community is likely to experience higher damages. Table 3.21 lists the number and percentage of housing units built in 1939 or earlier.

Table 3.21. Percent of Housing Units Built in 1939 or Earlier

| Jurisdiction | Built in 1939 or earlier # | Built 1939 or earlier % |
|---------------------|-----------------------------------|--------------------------------|
| Shannon County | 565 | 13.70% |
| City of Birch Tree | 58 | 16.34% |
| City of Eminence | 77 | 22.60% |
| City of Winona | 75 | 13.21% |

Source: Missouri Census Data Center (2020) ACS Profiles

Census data indicates that the Unincorporated Shannon County has the highest number of housing units built prior to 1939. The communities of Birch Tree, Eminence, and Winona are also vulnerable to earthquakes.

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

Impact of 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 earthquake event.

Changing Future Conditions Considerations

Scientists are beginning to believe there may be a connection between changing climate conditions and earthquakes. Changing ice caps and sea-level redistribute weight over fault lines, which could potentially have

an influence on earthquake occurrences. However, currently no studies quantify the relationship to a high level of detail, so recent earthquakes should not be linked with climate change. While not conclusive, early research suggests that more intense earthquakes and tsunamis may eventually be added to the adverse consequences that are caused by changing future conditions.

Vulnerability

Vulnerability Overview

Ground shaking is the most damaging effect from earthquakes. Ground shaking will impact all structures and critical infrastructure such as roads and electrical transmission systems. Although Nearby Ripley County experienced a 3.3 magnitude earthquake there were no document damages associated with this low magnitude event. The greatest earthquake risk to Shannon County is the New Madrid Fault in the bootheel region of Missouri. A 7.6 magnitude earthquake would result in people have difficulty standing; Considerable damage in poorly built or badly designed buildings, adobe houses, old walls, and spires; Damage is slight to moderate in well-built buildings; Numerous windows are broken; Weak chimneys break at rooflines; Cornices from towers and high buildings fall; Loose bricks fall from buildings; Heavy furniture is overturned and damaged; Some sand and gravel stream banks cave in. In addition, some underground utilities would likely be damaged. Some injuries may occur but fatalities are unlikely.

Potential Losses to Existing Development

In Shannon County, 7.6 magnitude earthquake along the New Madrid Fault could be expected to result in everyone feeling ground shaking; poorly built buildings are damaged slightly; considerable quantities of dishes, glassware and windows are broken; people have trouble walking; pictures fall off walls; objects fall from shelves; plaster in walls might crack; some furniture is overturned; and small bells in churches, chapels, and schools will ring. In addition, some underground utilities would likely be damaged. Injuries may occur but are unlikely

A smaller yet still significant 6.7 quake along the fault line in would likely result in almost everyone feeling movement. Most people will be awakened if sleeping; doors swing open or closed; dishes are broken; pictures on the wall move; windows crack in some cases; small objects move or are turned over; liquids might spill out of open containers.

Problem Statement

Based on likely damage from a 7.6 magnitude earthquake along the New Madrid fault, it is clear that the downtowns and historic districts of communities in Shannon County are at risk to significant damage. These older structures could perhaps be retrofitted with earthquake resistance measures to ensure their stability in the event of an earthquake of severe magnitude. Potential damages to future development can be mitigated by adopting and enforcing building codes. Updating and enforcing building codes in other jurisdictions would mitigate the impact on future development from an earthquake event.

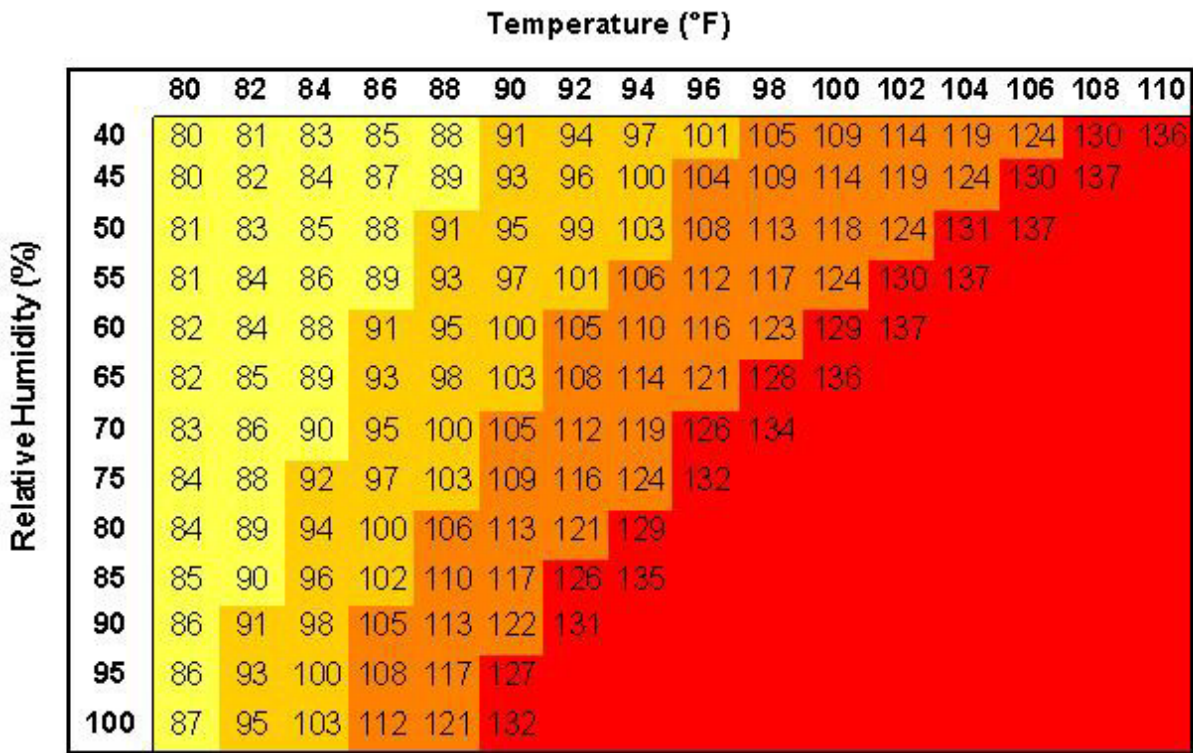
3.4.4 Extreme Temperatures

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 3.17 uses both factors to produce a guide for the apparent temperature or relative intensity of heat conditions. The temperatures vary locally, so the following chart can be applied to any jurisdiction in Shannon County.

Figure 3.17. Heat Index (HI) Chart



Source: National Weather Service (NWS)

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

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, the risk of extreme heat does not vary across Shannon County.

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 nighttime 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.

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

Table 3.22. Typical Health Impacts of Extreme Heat

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

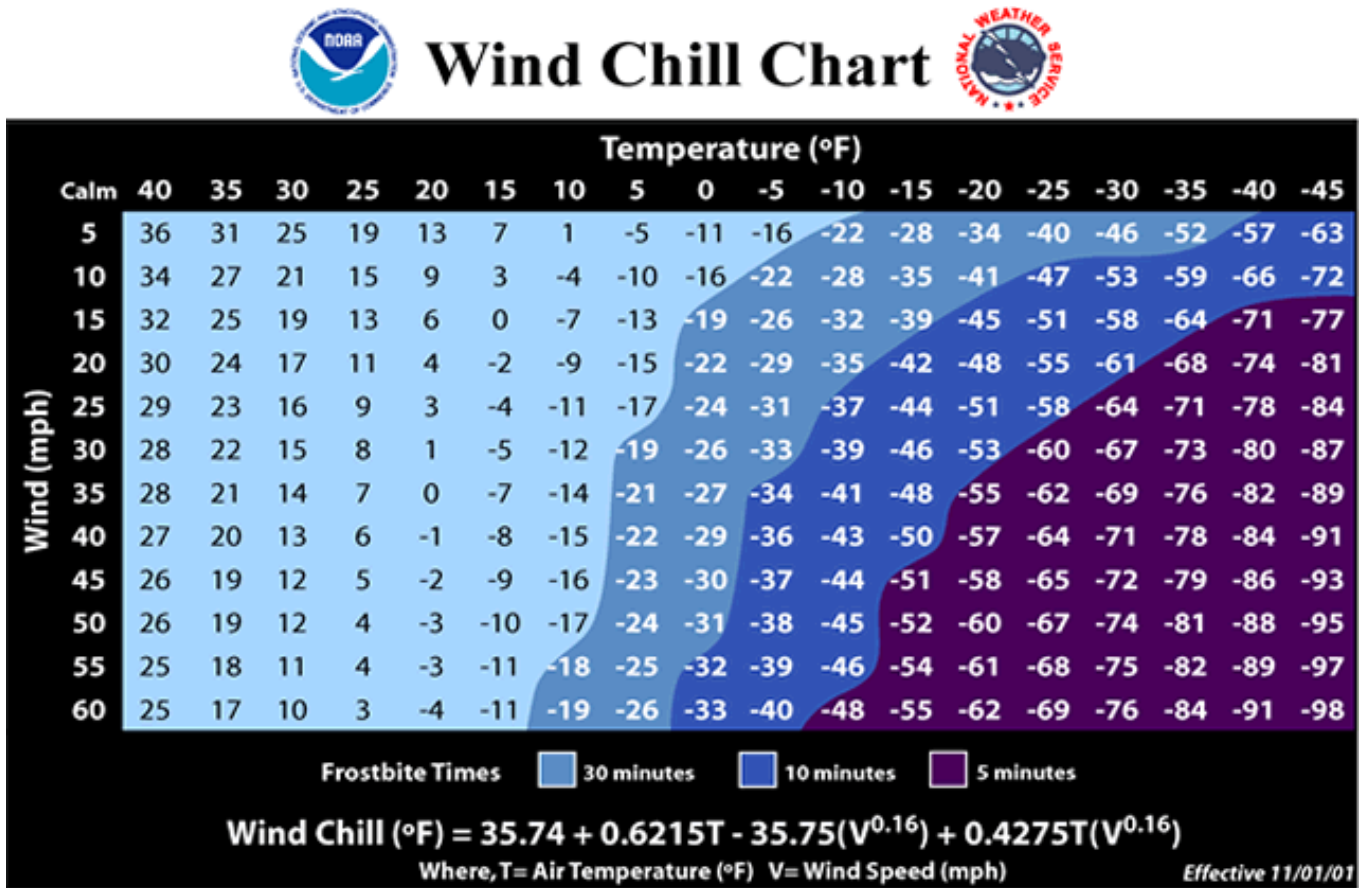
Source: National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml

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

Previous Occurrences

There are no recorded extreme heat events in the National Centers for Environmental Information (NCEI) database from 2017 to 2021 for Shannon County. There were zero deaths and injuries and no property or crop damage associated with extreme heat events in the NCEI data for Shannon County during this period.

Figure 3.18. Wind Chill Chart



The NWS Wind Chill Temperature (WCT) index Figure 3.18 above 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. All jurisdictions are equally likely to be impacted by wind chill during extreme weather events. The index does the following.

- Calculates wind speed at an average height of 5-feet, the typical height of an adult human face, based on readings from the national standard height of 33-feet, which is the typical height of an anemometer.
- Based on a human face model.
- Incorporates heat transfer theory based on heat loss from the body to its surroundings, during cold and breezy/windy days.
- Lowers the calm wind threshold to 3mph.
- Uses a consistent standard for skin tissue resistance.
- Assumes no impact from the sun, i.e., clear night sky.

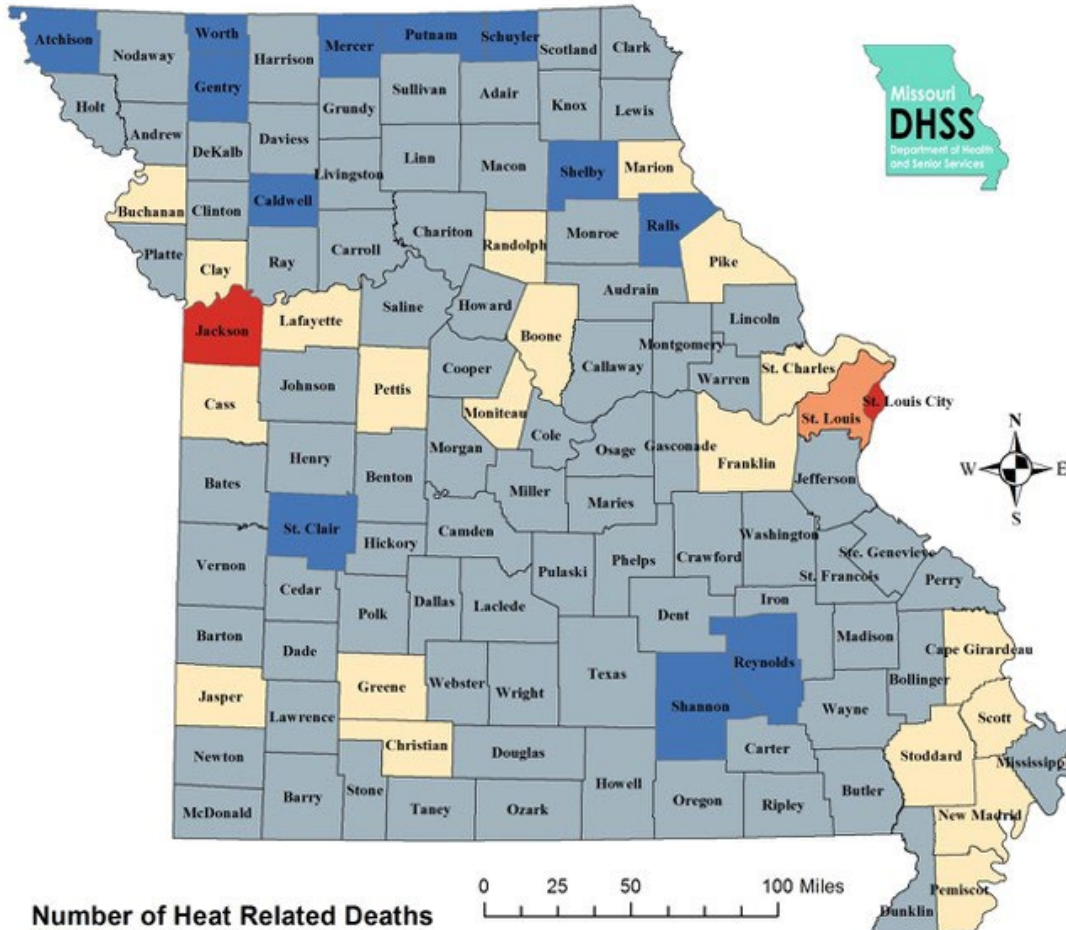
There is one (1) Extreme Cold/Wind Chill event in the National Centers for Environmental Information (NCEI) database from 2017 to 2021 for Shannon County with no resulting deaths, injuries or damages reported. The event narratives describe the episode, taking place in 2021, as follows:

- An extended period of unseasonably cold weather gripped central and southwest Missouri between February 7 and February 18. The coldest temperatures and wind chills occurred from February 14 through February 16. Record to near record low temperatures were common on the mornings of February 15 and 16th with subzero lows and highs just in the single digits and teens above zero. In addition, wind chill readings between -20 and -30 were reported across the area.
- Along with the bitter cold, widespread snow occurred across central and southwest Missouri from the early morning hours of February 14 into the late afternoon hours of February 15. This created widespread snow-covered roads and the cold and snow combined resulted in numerous if not all schools being closed.
- On the morning of February 15th, a minimum wind chill of -14 degrees was reported in Timber. In addition, the morning low on February 16th of -8 was reported in Timber.

Figure 3.19 is a map created by The Missouri Department of Health and Senior Services (DHSS) for heat related fatalities by county. The map indicates that there have been zero (0) heat related fatalities in Shannon County. All jurisdictions are equally likely to be impacted by heat related deaths.

Figure 3.19. Heat Related Deaths in Missouri

Number of Heat Related Deaths in Missouri by County** for 1980 - 2016^



Number of Heat Related Deaths

- 0
- 1 - 6
- 7 - 19
- 20 - 92
- 93 - 403

0 25 50 100 Miles

** County of death may differ from county of residence

^ Data for 2016 is preliminary and subject to change

Total number of deaths from 1980 to 2016 was 1,272

Includes 18 non-Missouri residents who died in Missouri

Source: Bureau of Environmental Epidemiology

Date: 6/19/2017

Probability of Future Occurrence

The probability that an extreme heat event will occur in Shannon County in any given year is 0%. 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.

The probability that an extreme cold/wind chill event will occur in Shannon County in any given year is 20%. This equates to dividing the one (1) year with an event period by the total number of years in the record period from 2017 to 2021 (5) and multiplying by 100.

Changing Future Conditions Considerations

Under a higher emissions pathway, historically unprecedented warming is projected by the end of the century. Even under a pathway of lower greenhouse gas emissions, average annual temperatures are projected to most likely exceed historical record levels by the middle of the 21st century. For example, in southern Missouri, the annual maximum number of consecutive days with temperatures exceeding 95 degrees F is projected to increase by up to 20 days. Temperature increases will cause future heat waves to be more intense, a concern for this region which already experiences hot and humid conditions. Extreme heat is a concern for urban areas such as St. Louis and Kansas City, where the urban heat island effect raises summer temperatures. If the warming trend conditions, future heat waves are likely to be more intense, and cold wave intensity is projected to decrease. The impacts of extreme heat events are experienced most acutely by the elderly and other vulnerable populations. High temperatures are exacerbated in urban environments, a phenomenon known as the urban heat island effect, which in turn tend to have higher concentrations of vulnerable populations. Higher demand for electricity as people try to keep cool amplifies stress on power systems and may lead to an increase in the number of power outages. Atmospheric concentrations of ozone occur at higher air temperatures, resulting in poorer air quality, while harmful algal blooms flourish in warmer water temperatures, resulting in poorer water quality. Mitigation against the impacts of future temperature increase may include increasing education on heat stress prevention, organizing cooling centers, allocating additional funding to repair and maintain roads damaged by buckling and potholes, and reducing nutrient runoff that contributes to algal blooms. Local governments should also prepare for increased demand on public recreational facilities, utility systems, and healthcare centers. Improving energy efficiency in public buildings will also present an increasingly valuable savings potential.

Vulnerability

Vulnerability Overview

High humidity, which often accompanies heat in Missouri, can make the effects of heat even more harmful. While heat-related illness and death can occur from exposure to intense heat in just one afternoon, heat stress on the body has a cumulative effect. Consequently, the persistence of a heat wave increases the threat to public health. The people most at risk are children under five years of age and adults over the age of 65 as well as people who work outdoors. The agriculture sector can also suffer crop loss during periods of extreme heat. Extreme heat may also cause buckling of roads.

Potential Losses to Existing Development

Based on the information in the 2018 State Plan and DHSS, one-to-three heat related deaths have occurred in Shannon County in the past 13 years. While the likelihood of heat related death is unlikely, the possibility of occurrence should not be completely ruled out.

Impact of 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. All jurisdictions in the county exhibit very slow population growth, or decline.

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 2020 US Census estimates identifying the 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 3.23 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 3.23. County Population Under Age 5 and Over Age 65, 2020 ACS Data

| Jurisdiction | Population Under 5 yrs. | Population 65 yrs. and over |
|---------------------|--------------------------------|------------------------------------|
| Shannon County | 492/6.0% | 1,748/21.3% |
| City of Eminence | 19/3% | 113/18.1% |
| City of Winona | 102/9.3% | 213/19.5% |
| City of Birch Tree | 55/8.7% | 88/14% |

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

Problem Statement

Older and younger segments of the population are more vulnerable to the impact of extreme heat. In addition, people living below the poverty level may be more vulnerable during periods of extreme heat due to lack of air conditioning or proper utilities in their homes. Shannon County is among the oldest and poorest counties in the State. Institutionalized populations such as those living in nursing homes become more vulnerable to extreme heat due to power outages. This problem would best be mitigated by installation of emergency generators at these institutional facilities. Provision and advertisement of cooling centers in the county would help mitigate the impact on vulnerable populations in the planning area.

3.4.5 Flooding (Riverine and Flash)

Hazard Profile

HazardDescription

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

Flooding caused by dam failure is discussed in Section 3.1.4 above, it will not be further addressed in this section.

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

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

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

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

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

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

Geographic Location

Riverine and Flash flooding is most likely to occur in Special Flood Hazard Areas (SFHAs) where the 1% chance floodplain has been mapped. According to NCEI storm event data from 2017 through 2021, there were 22 riverine flood events and 7 flash flood events recorded in the county during this period. These events are typically regional in nature and affect rivers, streams and tributaries across a wide area. Figure 3.20, Figure 3.21, and Figure 3.22 are mapped Special Flood Hazard Areas with Critical Facilities identified for at risk communities in Shannon County.

Table 3.24. Shannon County NCEI Flood Events by Location, 2017-2021

| Location | # of Events |
|----------------------------|--------------------|
| Shannon County | 20 |
| City of Birch Tree | 0 |
| City of Eminence | 0 |
| City of Winona | 2 |
| Total Unique Events | 22 |

Source: National Centers for Environmental Information, 2021

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

Table 3.25. Shannon County Flash Flooding Events by Location, 2017-2021

| Location | # of Events |
|----------------------------|--------------------|
| Shannon County | 5 |
| City of Birch Tree | 0 |
| City of Eminence | 2 |
| City of Winona | 0 |
| Total Unique Events | 7 |

Source: National Centers for Environmental Information, 2021

Figure 3.20. City of Eminence Flood Insurance Rate Map (FIRM)

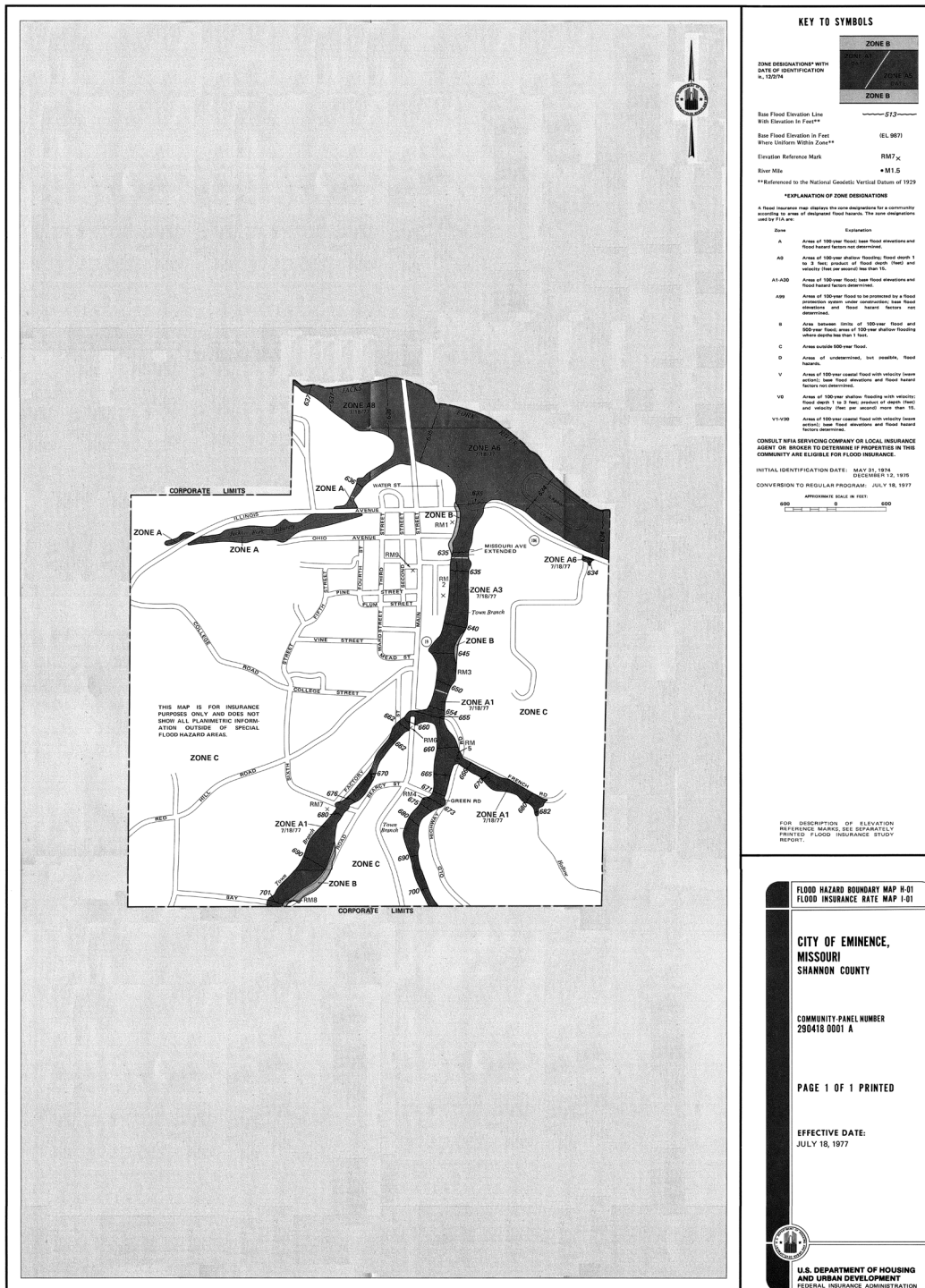


Figure 3.21. City of Birch Tree Flood Insurance Rate Map (FIRM)

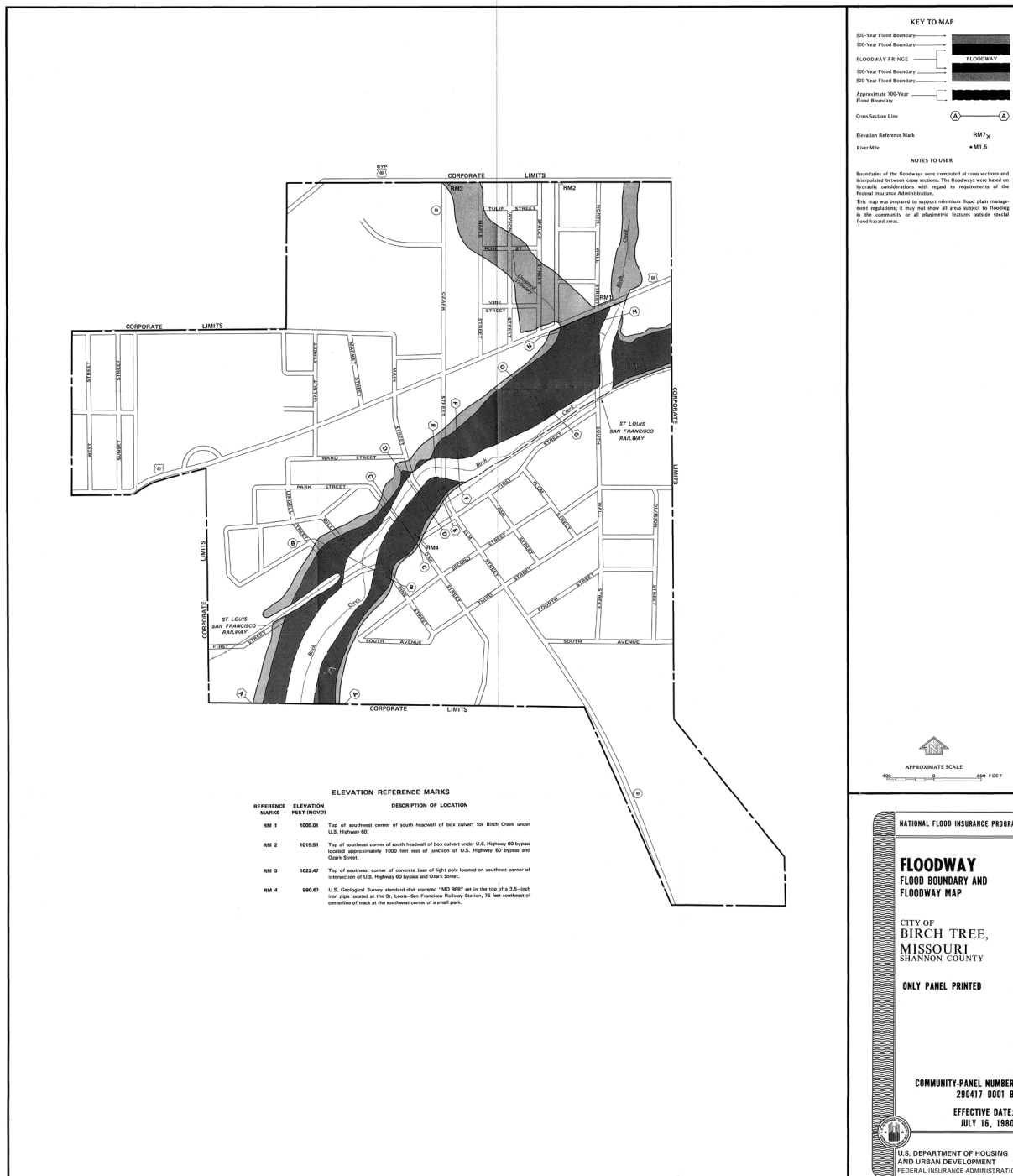
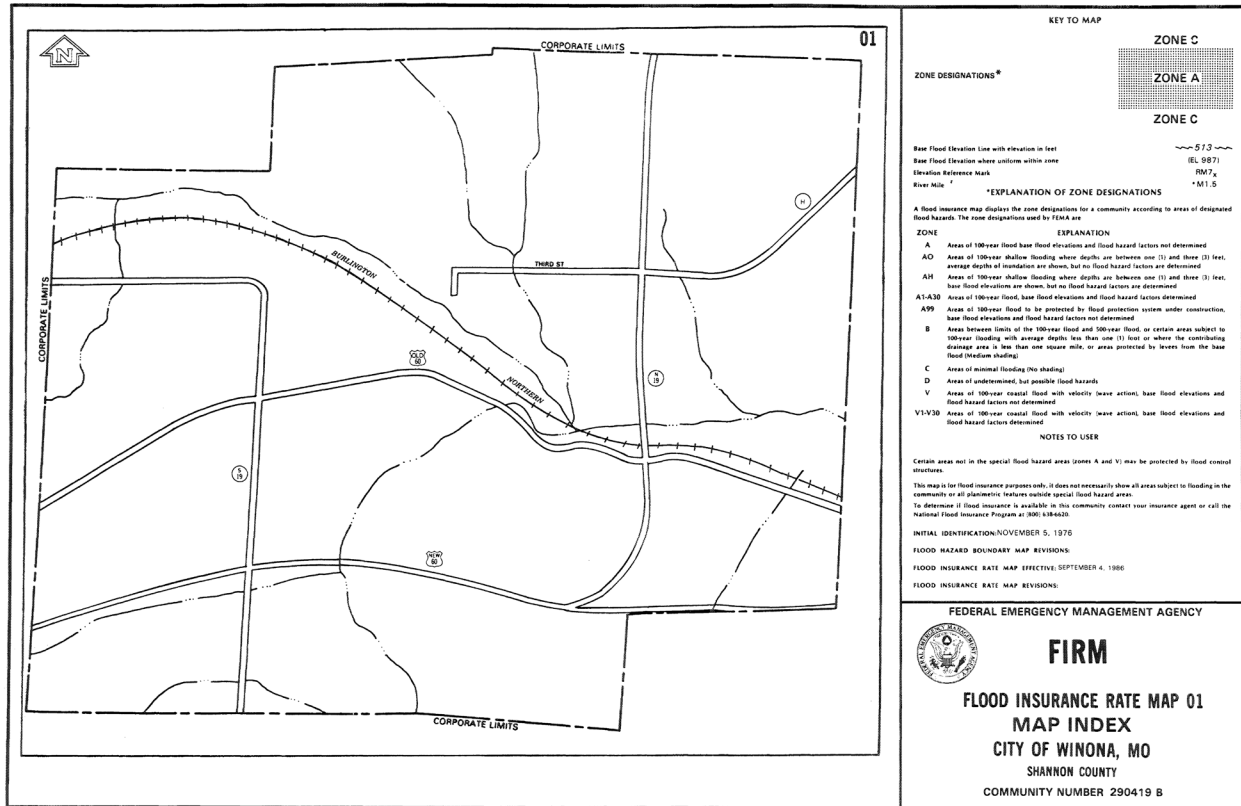


Figure 3.22. City of Winona Flood Insurance Rate Map (FIRM)



Severity/Magnitude/Extent

Missouri has a long and active history of flooding over the past century, according to the 2018 State Hazard Mitigation Plan. Flooding along Missouri’s major rivers generally results in slow-moving disasters. River crest levels are forecast several days in advance, allowing the communities located 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.

NFIP Participation

Table 3.26 below describes the NFIP participation, NFIP floodplains management criteria, adoption of FIRM mapping, implementation and enforcement of local floodplain management regulations, and the floodplain administrator for participating jurisdictions within Shannon County. Unincorporated Shannon County doesn’t

National Flood Insurance Program (NFIP) Participation

Table 3.26. NFIP Participation in Shannon County

| Community ID # | Community Name | NFIP Participant (Y/N/Sanctioned) | Current Effective Map Date | Regular-Emergency Program Entry Date |
|----------------|--------------------------------|-----------------------------------|----------------------------|--------------------------------------|
| 290806 | Shannon County, Unincorporated | N | N/A | N/A |
| 290418 | City of Eminence | Y | 7/18/1977 | 7/18/1977 |
| 290419 | City of Winona | Y | 9/4/1986 | 9/4/1986 |
| 290417 | City of Birch Tree | Y | 7/16/1980 | 7/16/1980 |

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

Table 3.27. NFIP Policy and Claim Statistics as of July 1, 2022

| Community Name | Policies in Force | Insurance in Force | Closed Losses | Repetitive Loss Severe Repetitive Loss | Total Payments |
|--------------------------------|-------------------|--------------------|---------------|--|----------------|
| Shannon County, Unincorporated | 0 | - | - | - | - |
| City of Eminence | 4 | 472,000 | 14 | 3 | 214,000 |
| City of Winona | 4 | 322,000 | 4 | 1 | 66,500 |
| City of Birch Tree | 3 | 452,000 | 4 | 0 | 12,000 |

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

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

According to the Flood Insurance Administration, jurisdictions included in the planning area have repetitive or severe repetitive loss properties. Specifically, there are RL/SRL properties in Shannon County in Eminence and Winona. See Table 3.27 above for specifics.

Previous Occurrences

According to NCEI storm even data, there have been Twenty-two (22) flash flood events recorded in Shannon County from 2017 through 2021. One of these events, occurring on April 29, 2017, resulted in reported property damage of \$5,000,000 and is described in NCEI narratives as follows:

- Multiple rounds of severe thunderstorms and extremely heavy rainfall over several days led to historic and devastating flash floods, record breaking river levels, large hail, wind damage, and at least one tornado across the Missouri Ozarks region. Most counties across the Missouri Ozarks region were declared a federal disaster from the President and FEMA.
- Numerous campgrounds and river access areas were severely damaged across Shannon County and in the Ozark National Scenic Riverways Park. Numerous homes and businesses were severely damage or washed away along the Jack Fork River and Current River. This report will contain the total dollar estimate for flood damage to infrastructure, businesses, and homes across Shannon County.

In addition to the damages described above, flash flood events occurring in 2018, 2019, and 2020 resulted in a collective \$37,500 in property damages. No injuries or deaths were reported over the five-year period.

Table 3.28 summarizes flash flood events by year from 2017 to 2021 in Shannon County.

Table 3.28. NCEI Shannon County Flash Flood Events Summary, 2017 to 2021

| Year | # of Events | # of Deaths | # of Injuries | Property Damages | Crop Damages |
|--------------|--------------------|--------------------|----------------------|-------------------------|---------------------|
| 2017 | 1 | 0 | 0 | \$5,000,000 | 0 |
| 2018 | 1 | 0 | 0 | \$0 | 0 |
| 2019 | 1 | 0 | 0 | \$20,000 | 0 |
| 2020 | 2 | 0 | 0 | \$2,500 | 0 |
| 2021 | 2 | 0 | 0 | \$0 | 0 |
| TOTAL | 7 | 0 | 0 | \$5,037,500 | 0 |

Source: NCEI, 2021

Table 3.29. NCEI Shannon County Riverine Flood Events Summary, 2017 to 2021

| Year | # of Events | # of Deaths | # of Injuries | Property Damages | Crop Damages |
|--------------|-------------|-------------|---------------|------------------|--------------|
| 2017 | 3 | 0 | 0 | \$0 | \$0 |
| 2018 | 3 | 0 | 0 | \$0 | \$0 |
| 2019 | 6 | 0 | 0 | \$0 | \$0 |
| 2020 | 7 | 0 | 0 | \$0 | \$0 |
| 2021 | 3 | 0 | 0 | \$0 | \$0 |
| TOTAL | 22 | 0 | 0 | \$0 | \$0 |

Source: NCEI, 2021

Table 3.29 above summarizes riverine flood events listed in the NCEI in Shannon County by year. The data contains record of events from 2017 to 2021.

Probability of Future Occurrences

There has been a total of 29 flooding events in Shannon County from 2017 to 2021 in the NCEI storm event database. Of those, 7 have been flash floods and the remaining 22 have been considered riverine flooding. Using a five period of record, this equates to 6 flood events per year and a 100% probability of occurrence in the county in any given year. Using the same period of record, the probably of occurrence of riverine flooding inside Shannon County is 100%.

Changing Future Conditions Considerations

With changing climate conditions comes more uncertainty and less predictability for hazard events. An overall increasing global temperature is likely to lead to increased precipitation and intense rainstorms. Over the last fifty-years, the average annual precipitation in most of the Midwest has increased by 5-10%; however, rainfall during the four wettest days of the year has increased nearly 35%. The amount of water flowing in most streams during the worst flood of the year has increased by more than 20%.

The National Climate Assessment states that extreme rainfall events and flooding have increased in the last century and that those trends are expected to continue. Heavy rain events are likely to cause erosion, diminished water quality, and negative impacts on transportation, agriculture, human health, and infrastructure.

Vulnerability

Vulnerability Overview

Flooding has been included in 10 of the 16 presidential natural disaster declarations that have included Shannon County. Periods of heavy rain falling at the rate of one inch per hour floods low water crossings throughout the county making many roads impassable. This creates a severe threat to motorists that attempt to drive through flood waters over the roadway. Riverine flooding occurs less frequently than flash flooding. Spaces in low lying areas outside the identified floodplain are frequently flooding. Street flooding over roadways has been

reported in the Cities of Birch Tree, Eminence, Winona, and in unincorporated portions of the County. Winona school district facilities are located within the SFHAs in Shannon County. Increases in development add to surface runoff and can potentially exacerbate flash flooding in areas that previously have not experienced flooding.

Potential Losses to Existing Development

Flood loss estimates were developed using a GIS methodology. A county-wide structures layer developed by the University of Missouri in partnership with regional planning commissions across the state was overlaid on FEMA DFIRM maps to show number of structures and structure types situated inside Special Flood Hazard Areas. An average valuation from the Shannon County Assessor for each structure type: Residential, Commercial, or Agriculture was applied to the structures in identified SFHAs. A review of GIS data indicates that the Winona school district facilities in Shannon County are located in the FEMA SFHA.

Table 3.30. Potential Flood Losses for Building Types by Jurisdiction

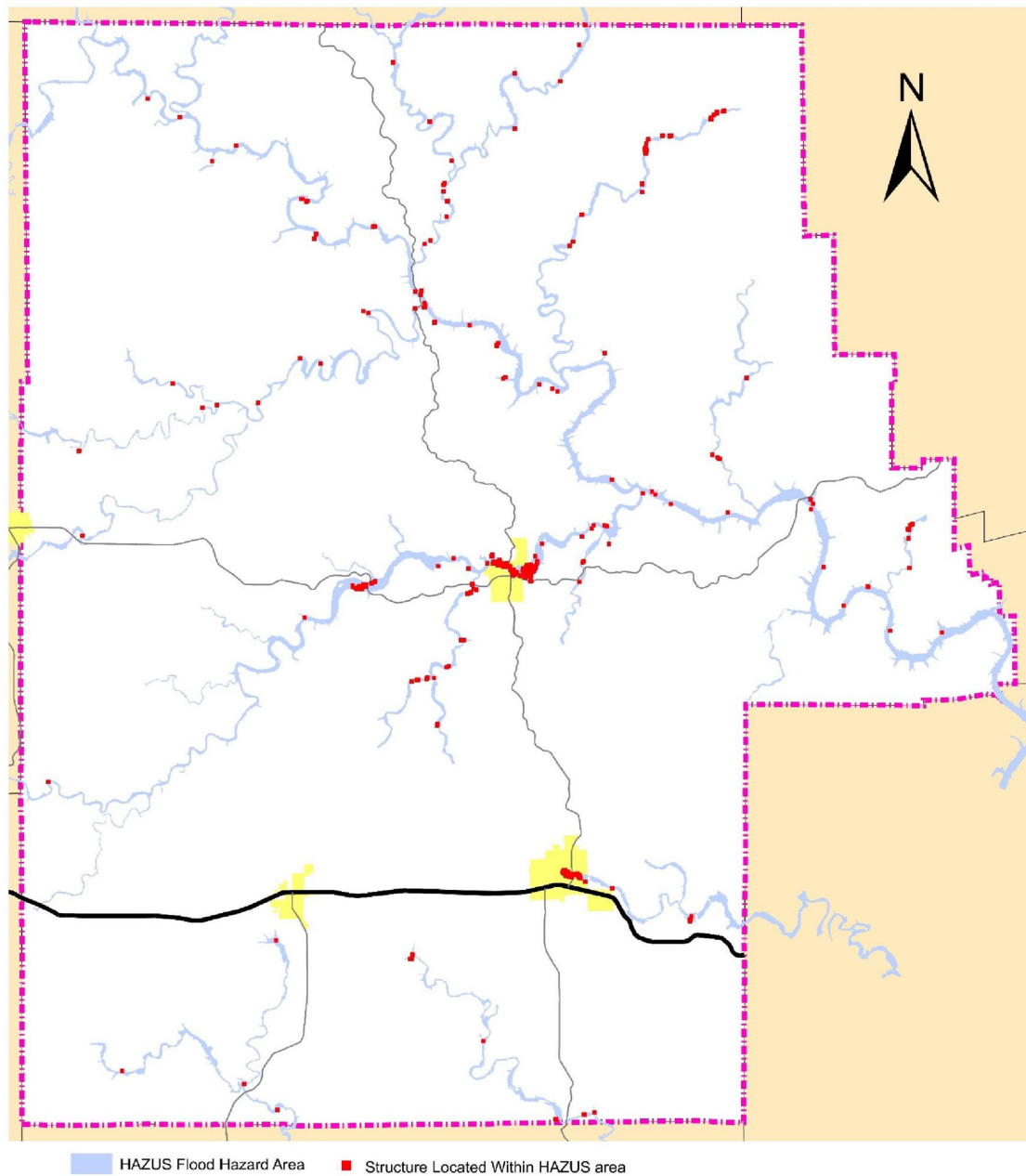
| Jurisdiction | Residential | Commercial | Agricultural | Total Building Count |
|--------------------|-------------|------------|--------------|----------------------|
| Shannon County | 19 | 94 | 151 | 264 |
| City of Birch Tree | 0 | 0 | 0 | 0 |
| City of Eminence | 13 | 79 | 0 | 93 |
| City of Winona | 65 | 5 | 0 | 69 |

Table 3.31 provides the total exposure for structures and contents by building type and jurisdiction. Losses were estimated by applying a 5% damage factor to total exposure. A 5% damage factor was used under the assumption that not all at-risk structures in the county would be affected simultaneously during a flooding event, nor would the individual structures sustain catastrophic damage.

Table 3.31. Total Flood Exposure and Estimated Losses by Jurisdiction (in dollars)

| Jurisdiction | Residential | Commercial | Agricultural | Estimated Exposure | Estimated Loss |
|--------------------|-------------|------------|--------------|--------------------|----------------|
| Shannon County | 1,250,222 | 16,523,265 | 2,985,254 | 20,760,741 | 1,102,300 |
| City of Birch Tree | 0 | 0 | 0 | 0 | 0 |
| City of Eminence | 428,369 | 12,520,639 | 0 | 12,949,008 | 325,255 |
| City of Winona | 2,325,854 | 588,963 | 21,369 | 2,936,186 | 44,000 |

Figure 3.23. Structures Located Within the HAZUS Flood Area – Shannon County



Impact on Future Development

Future development could impact flash flooding and riverine flooding in the planning area. Development in low-lying areas near rivers and streams or where interior drainage systems are not adequate to provide drainage during heavy rainfall events will be at risk to flash flooding. 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. Table 3.31 above details the exposure of assets near flood hazard areas and how it varies by jurisdiction. Many parts of the county are vulnerable to street and road flooding during periods of heavy rainfall. In particular, Route H southern Shannon County is particularly vulnerable to closure during flooding events. The greatest impact of flooding is felt in the City of Eminence and in unincorporated part of the county. Due to the topography and many 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 Shannon County Commission.

Problem Statement

Floods are frequent events and have been listed in 9 out of 13 presidential disaster declarations that have included Shannon County. Historic flooding that occurred within a month of the development of this plan produced approximately \$250,000 in damages throughout the county – a figure that many believe to be largely under-reported. Numerous water rescues have occurred in the county since 2017. Significant debris accumulation and damages at low water crossings have become regular occurrences due to flash flooding events.

The County Commission is in the process of developing a low water crossing inventory and improvement priority list for inclusion in their ongoing maintenance and management efforts. It is desired that warning signs, gauges, and perhaps warning lights be installed at frequently flooded low water crossings. The county is focusing on the replacements of frequently damaged crossings. Hazard awareness programs and education, such as “turn around, don’t drown” messages during and prior to flood events in the county broadcast by local media can mitigate future risks to motorists at low water crossings.



3.4.6 Land Subsidence/Sinkholes

Hazard Profile

Hazard Description

Sinkholes are depressed or collapsed areas formed by dissolution of carbonate bedrock or collapse of underlying caves. They range in size from several square yards to hundreds of acres and may be very shallow or hundreds of feet deep. Sinkholes are part of what is called karst topography, which also includes caves, springs and losing streams. 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. Land subsidence may also result from human activities such as, underground mining, groundwater or petroleum withdrawal, and drainage of organic soils.

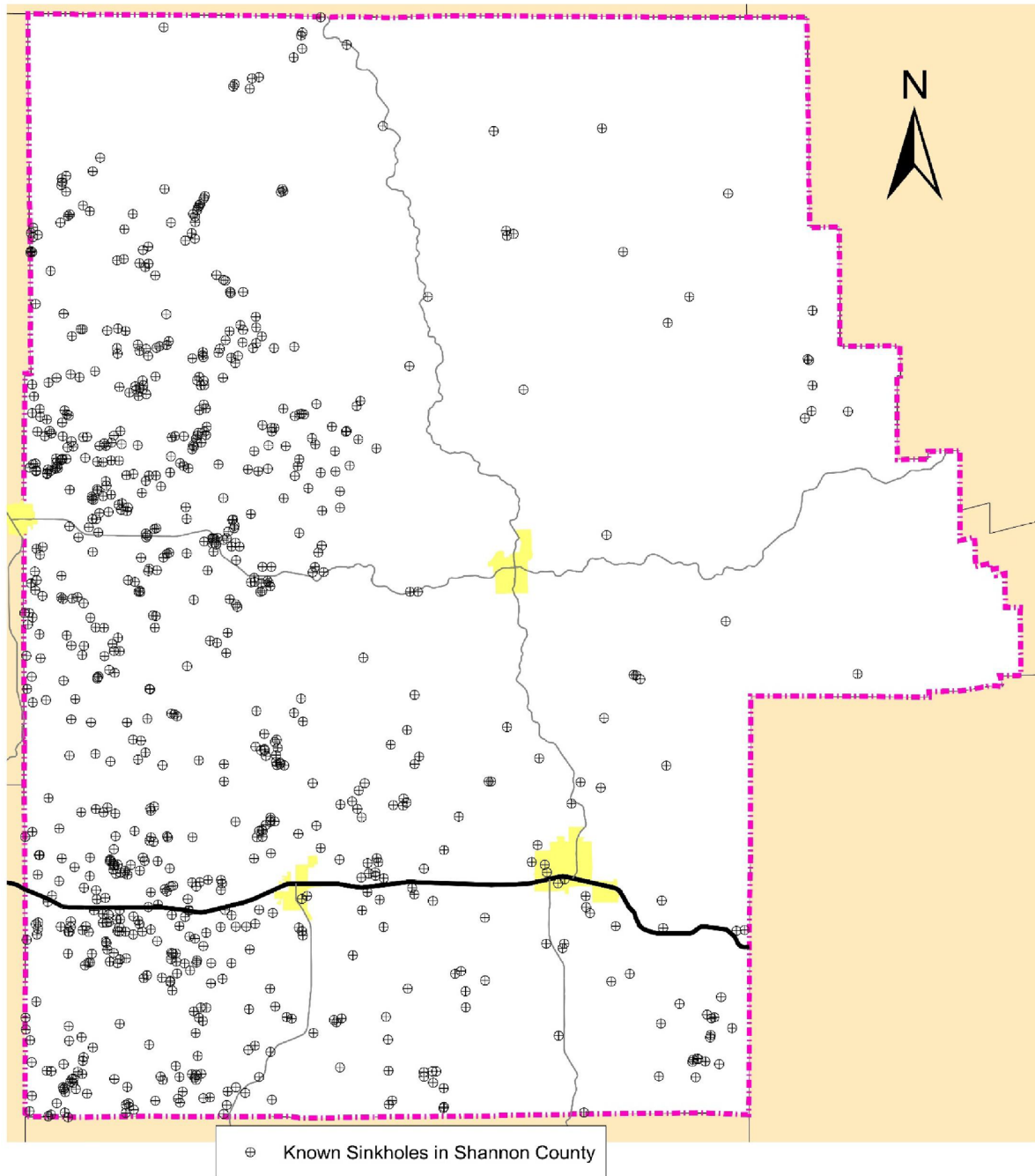
In the case of sinkholes, the rock below the surface is rock that has been dissolving by circulating groundwater. As the rock dissolves, spaces and caverns form, and ultimately the land above the spaces collapse. In Missouri, sinkhole problems are usually a result of surface materials above openings 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. 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 a change in stormwater runoff patterns resulting from an increase in impervious surfaces from land development.

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. Sinkholes can also vary in shape like shallow bowls or saucers whereas other have vertical walls. Some hold water and form natural ponds.

Geographic Location

According to spatial data from Missouri Geological Survey, there are 890 sinkhole formations have been identified in Shannon County. Figure 3.24, below, provides the location of known sinkholes in the county. Although the risk of sinkhole formation exists countywide, the map shows that the unincorporated areas of the county and in particular the locales in the western half of the county have an elevated risk to sinkhole formation than other parts of the county

Figure 3.24. Known Sinkholes in Shannon County



Severity/Magnitude/Extent

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

Previous Occurrences

The 2018 State Plan includes only seven documented sinkhole notable events statewide where property damage has occurred. 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.

Probability of Future Occurrence

Based on local information and the 2018 Missouri State Hazard Mitigation Plan, there have been zero documented sinkhole formations or expansions in the county during an eleven year period from 2006-2015. This equates to a 0% probability of a sinkhole formation in any given year in the county. However, in considering the large number of known sinkholes in Shannon County, it is likely that unreported sinkhole formation occurs every year.

Changing Future Conditions Considerations

Direct effects from changing climate conditions such as an increase in droughts and could contribute to an increase in sinkholes. These changes raise the likelihood of extreme weather, meaning the torrential rain and flooding conditions which often lead to the exposure of sinkholes are likely to become increasingly common. Certain events such as a heavy precipitation following a period of drought can trigger a sinkhole due to low levels of groundwater combined with a heavy influx of rain.

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

A 75 foot buffer zone was created in GIS then overlaid on the Shannon County Structures layer to identify structures located in close proximity to known sinkholes. The results of this operation show that in Shannon County there are three (3) structures located within 75 feet of a known sinkhole.

Impact of Future Development

Future development in areas of known risk to sinkhole formation in the planning area will increase vulnerability to this hazard. Population and development in these areas, specifically in the Winona, Birch Tree, and Eminence in Shannon County will increase exposure to sinkhole occurrence. While no building codes currently restrict construction within a certain distance of known sinkholes, it is encouraged that local officials explore options to implement this regulatory condition.

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, however, the Cities of Eminence and Birch Tree are located in 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 stormwater runoff from known sinkholes should be made. Shannon 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.

3.4.7 Severe Thunderstorms

Including High Winds, Hail, and Lightning

Hazard Profile

Hazard Description

Thunderstorms

A thunderstorm is defined as a storm that contains lightning and thunder which is caused by unstable atmospheric conditions. When cold upper air sinks and warm moist air rises, storm clouds or 'thunderheads' develop resulting in thunderstorms. This can occur singularly, as well as in clusters or lines. The National Weather Service defines a thunderstorm as "severe" if it includes hail that is one inch or more, or wind gusts that are at 58 miles per hour or higher. At any given moment across the world, there are about 1,800 thunderstorms occurring. Severe thunderstorms most often occur in Missouri in the spring and summer, during the afternoon and evenings, but can occur at any time. Other hazards associated with thunderstorms are heavy rains resulting in flooding (discussed separately in Section 3.4.5) and tornadoes (discussed separately in Section 3.4.8).

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

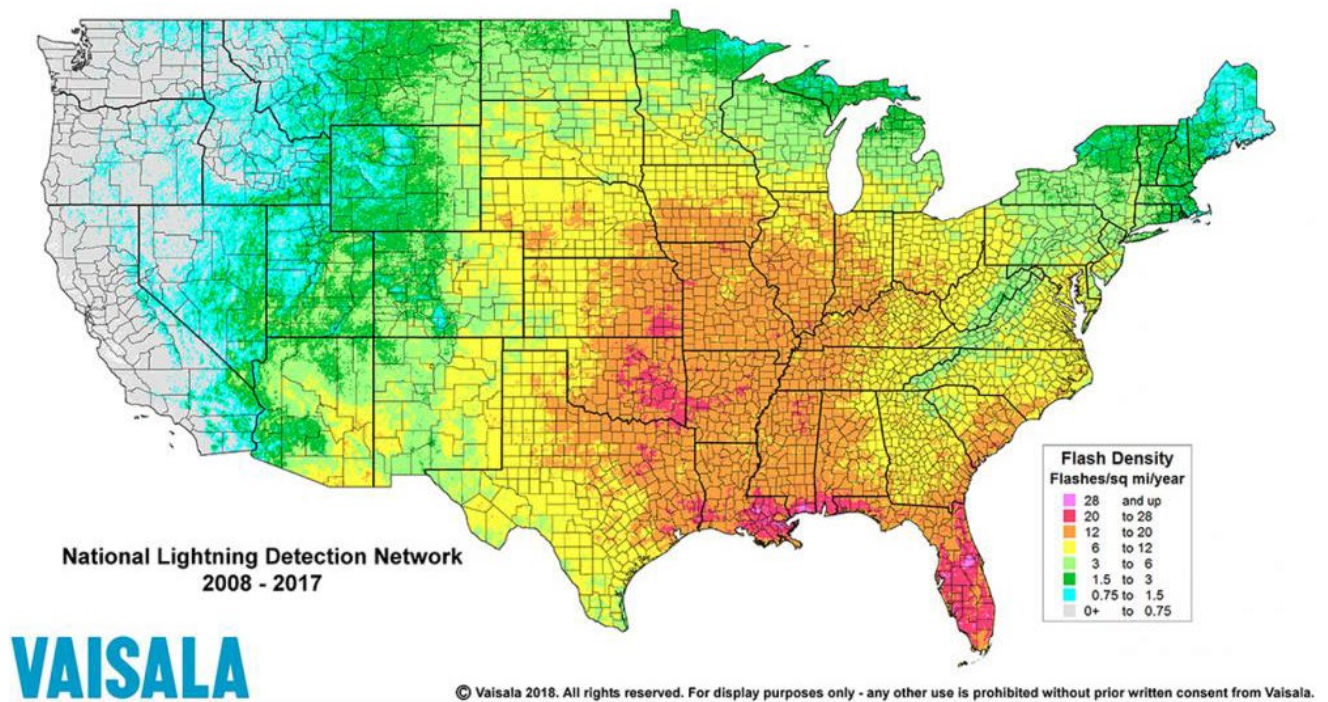
According to the National Oceanic and Atmospheric Administration (NOAA), hail is precipitation that is formed when thunderstorm updrafts carry raindrops upward into extremely cold atmosphere causing them to freeze. The raindrops form into small frozen droplets. They continue to grow as they come into 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 3.25 shows lightning frequency in the state. Shannon County is located in the 6 to 8 flashes of lighting per square mile per year. All jurisdictions are equally likely to be impacted by lighting in the event of a severe thunderstorm.

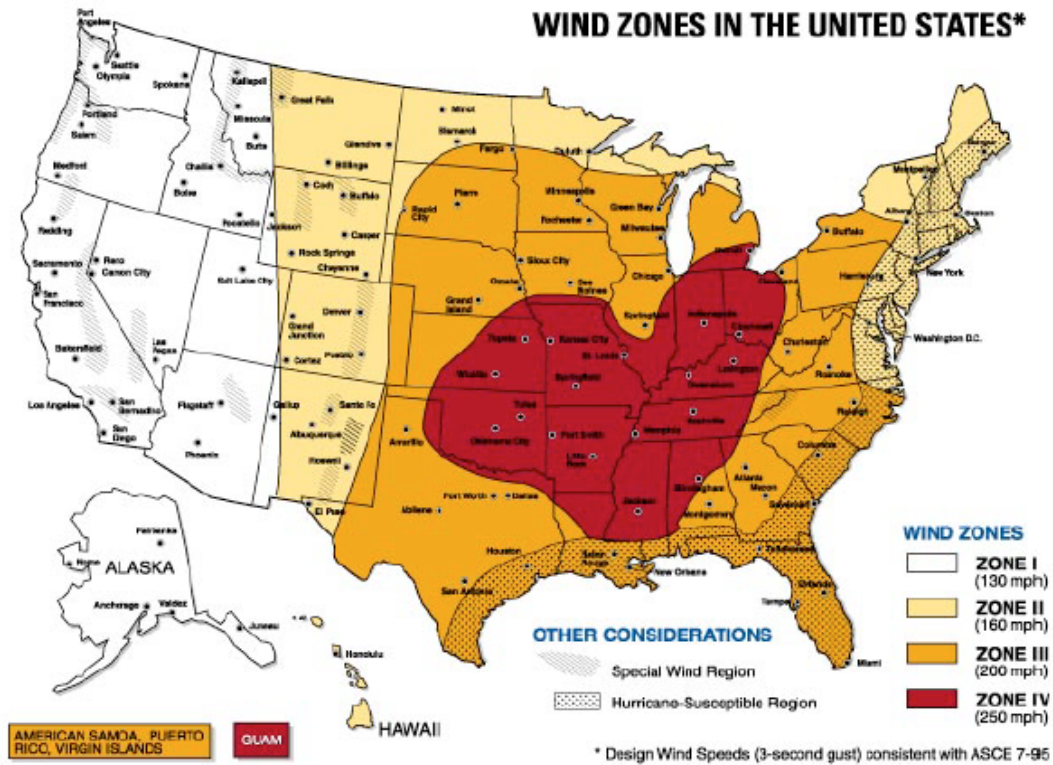
Figure 3.25. Location and Frequency of Lightning in Missouri



Source: National Weather Service, <http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx>

Figure 3.26 below is a map of the Wind Zones in the United States. Shannon County is in Wind Zone IV, where wind speeds of up to 250 mph are possible. All jurisdictions are equally likely to be impacted by strong winds in the event of a severe thunderstorm.

Figure 3.26. 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), Table 3.32 below describes typical damage impacts of the various sizes of hail.

Table 3.32. Tornado and Storm Research Organization Hailstorm Intensity Scale

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

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

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

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

Previous Occurrences

Thunderstorm Wind

There are twenty-nine (29) Thunderstorm Wind events reported to the NCEI from 2017-2021 in Shannon County. Eight (8) of these events resulted in reported property damages. The total damages from these events include \$122,000 in property damages with average losses per damaging event totaling \$15,250.

The costliest event occurred on May 30, 2021, and is described as follows in NCEI narratives:

1. The first of three rounds of storms occurred as a front interacted with very unstable air to produce numerous severe thunderstorms that caused extensive hail and wind damage over

portions of the area. Hail larger than golf balls was reported over the south side of Springfield. As the storms moved from west to east across the area, they transitioned from primarily hail producers to wind producers after passing the Highway 65 corridor.

2. The second round of storms developed near Topeka, KS and roared southeastward into east-central Missouri in the early afternoon. These storms then impacted the eastern Ozarks during the late afternoon hours, producing substantial straight-line wind damage. The Lebanon Airport anemometer recorded a wind speed of 89 mph before going offline. There were several reports of tornadoes associated with this second line of storms but none could be confirmed. The final round of severe storms developed in the late afternoon and evening along a warm front over southeast Kansas and far southwest Missouri, producing primarily large hail.

Thunderstorm winds resulted in 600 power outages in the Mountain View, Birch Tree and Winona areas from downed power lines and poles.

Table 3.33. NCEI T-Storm Wind Events in Shannon County 2017-2021

| Location | # of Events | Deaths | Injuries | Property Damage | Crop Damage |
|-------------------------------|-------------|----------|----------|------------------|-------------|
| Unincorporated Shannon County | 22 | 0 | 0 | \$102,000 | \$0 |
| Birch Tree | 1 | 0 | 0 | \$0 | \$0 |
| Eminence/West Eminence | 4 | 0 | 0 | 20,000 | 0 |
| Winona | 2 | 0 | 0 | \$0 | \$0 |
| Total | 29 | 0 | 0 | \$122,000 | \$0 |

Source, NCEI, 2021

Hail

There are twenty-six (26) Hail events reported to the NCEI from 2017-2021 with \$21,700 in total reported damages associated with these events. The largest magnitude event was on March 2, 2020, when hailstones 2.25 inches in diameter were reported near Jacks Fork in unincorporated Shannon County. This event is described as follows in NCEI narratives:

- Several rounds of strong to severe storms developed from the evening of the 1st to the early morning of the 3rd as a surface low pressure system tracked from western Kansas southeastward into Red River Valley. Heavy rainfall occurred during the early morning of the 2nd when training storms moved over southwest Missouri producing one to three inches of rain. Flash flooding was reported from Jasper County eastward into Lawrence, Christian, Douglas and Webster Counties. The most severe storms developed during the afternoon of the 2nd over south central Missouri and produced hail up to one and a half inches in diameter in Dent and Shannon Counties.
- Hail slightly smaller than tennis balls was reported east of Eminence off State Highway V. The report was received via social media as a photo.

Table 3.34 below provides information about damaging hail events in the county.

Table 3.34. NCEI Hail Events in Shannon County 2017-2021

| Location | # of Events | Magnitude | Deaths | Injuries | Property Damage | Crop Damage |
|-------------------------------|-------------|-------------|----------|----------|-----------------|-------------|
| Unincorporated Shannon County | 17 | 0.88 – 2.25 | 0 | 0 | \$11,700 | \$0 |
| Birch Tree | 5 | 1.0 – 1.75 | 0 | 0 | \$10,000 | \$0 |
| Eminence | 1 | 1.75 | 0 | 0 | \$0 | \$0 |
| Winona | 3 | 0.88 – 1.75 | 0 | 0 | \$0 | \$0 |
| TOTALS | 26 | - | 0 | 0 | \$21,700 | \$0 |

Source: NCEI, 2021

Lightning

Limitation to the use of NCEI reported lightning events include the fact that only lightning events that result in fatality, injury, and/or property and crop damage are in the NCEI.

There are no lightning events recorded in the NCEI data from 2017-2021.

Table 3.35. NCEI Lightning Events in Shannon County 2017-2021

| Location | # of Events | Deaths | Injuries | Property Damage | Crop Damage |
|-------------------------------|-------------|----------|----------|-----------------|-------------|
| Unincorporated Shannon County | 0 | 0 | 0 | \$0 | \$0 |
| Birch Tree | 0 | 0 | 0 | \$0 | \$0 |
| Eminence | 0 | 0 | 0 | \$0 | \$0 |
| Winona | 0 | 0 | 0 | \$0 | \$0 |
| Total | 0 | 0 | 0 | \$0 | \$0 |

Source: NCEI, 2021

Probability of Future Occurrence

Thunderstorm Wind

There have been twenty-nine (29) recorded unique thunderstorm wind events over a 5-year period from 2017-2020 with an average of more than five (5) occurrences annually and a 100% probability of occurrence. There were eight (8) events that resulted in a total of \$122,000 in property damage. This equates to an average of 1.6 damaging events per year and annualized losses of \$24,400.

Hail

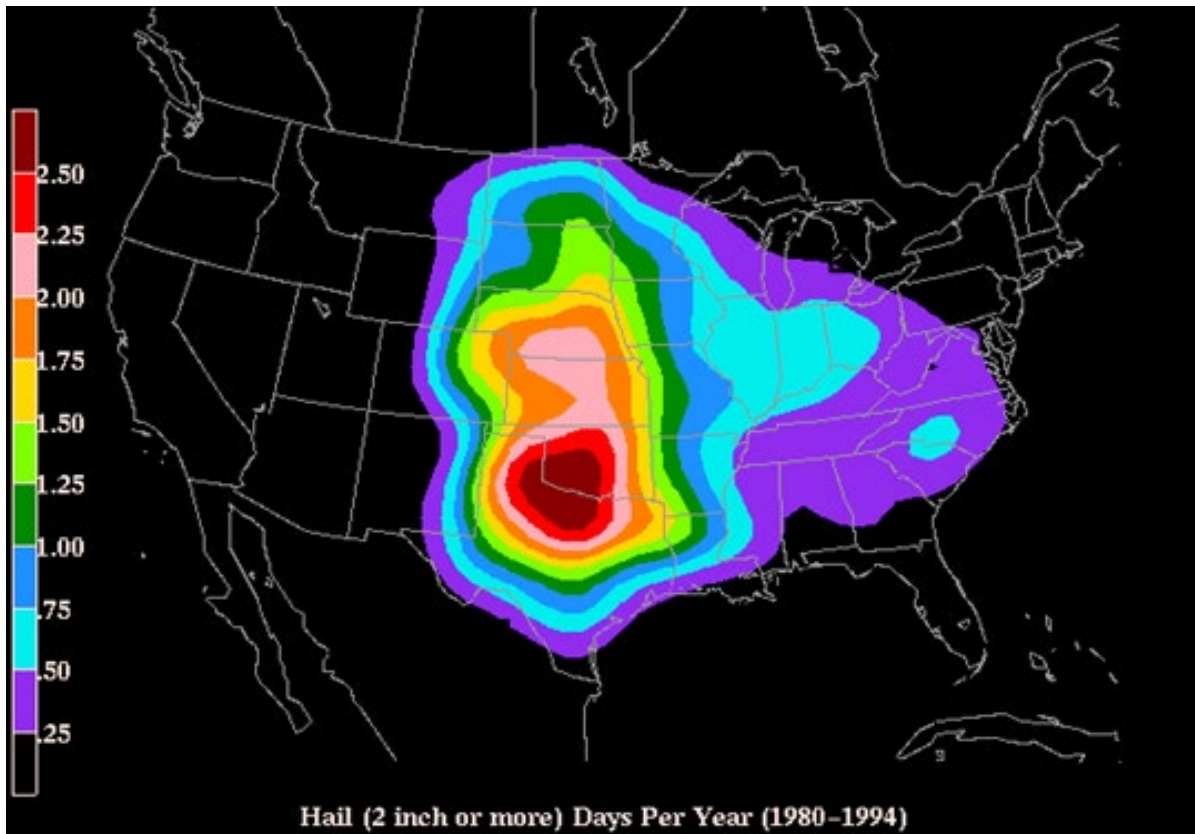
There have been twenty-six (26) recorded hail events over a 5-year period from 2017-2021. This equates to approximately five (5) events in any given year with a 100% probability of occurrence. There were four (4) events resulting in property damages totaling \$21,700 during this time period, according to NCEI data, an average of \$4,340 in annual losses.

Figure 3.27 below is a map based on hailstorm data from 1980 to 1994. It shows the probability of hailstorm occurrence (2" diameter or larger) based on number of days per year. Shannon County is bisected by the dark blue and light blue zones on the map meaning that the county can be expected to experience hail greater than 2" in diameter .75 to 1 day per year, for all jurisdictions.

Lightning

There have been no recorded lightning events over the 5-year period from 2017-2021. (The 10- year data from 2012 – 2021 also shows no lightning events)

Figure 3.27. Annual Hailstorm Probability (2" diameter or larger), 1980- 1994



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

Changing Future Conditions Considerations

Increases in temperature and more frequent droughts will accelerate the evaporation of water into the atmosphere, which will produce higher water concentrations. Elevated levels of moisture raise the likelihood of severe thunderstorms and tornadoes. Lives and property are endangered when the risk of these

events increases, especially in jurisdictions that do not have a community safe room or the funds to construct one. This kind of event also possesses the threat of increasing the magnitude and frequency of other hazard events like riverine flooding, sinkhole occurrence, and flash flooding, putting residents in even greater danger.

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.

Potential Losses to Existing Development

The average annual loss determined from historical losses for thunderstorms, high wind, hail, and lightning are indicators of the potential losses to existing development. Thunderstorm wind events in the county have damaged critical facilities, schools, local governments, and private property. Potential annual losses throughout Shannon County are Thunderstorm - \$544,000; Hail - \$250,000. Potential annual losses from high winds and lightning are not calculable but should be expected to occur and cause damages in the future.

Impact of Previous and Future Development

Growth in Shannon County is occurring at a slow rate, with Eminence currently seeing the most growth in terms of population percent. Additional development in these areas results in the exposure of more households and businesses vulnerable to damages from high winds, hail, and lightning.

Hazard Summary by Jurisdiction

Although thunderstorms, high winds, lightning, hail events are area-wide, communities with a greater percentage of structures built prior to 1939 are more vulnerable to the impact of high wind and hail damage. All of Shannon County's jurisdictions have at least 10% of structures built prior to 1939. The unincorporated county is also above 10%. New construction and population growth would increase the exposure and risk to this

hazard; however, the communities in Shannon County with building codes will assist in mitigating the effects of strong storms.

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, can strike electrical utilities leading to power outages, or strike municipal water systems causing water supply outages.

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

3.4.8 Tornado

Hazard Profile

Hazard Description

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

High winds not associated with tornadoes are profiled separately in this document in Section 3.4.7, Thunderstorm/High Wind/Hail/Lightning.

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

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

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

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

Geographic Location

Tornadoes can occur anywhere in the planning area.

Severity/Magnitude/Extent

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

Tornado magnitude is classified according to the EF- Scale (or the Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale, Table 3.36 below, 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 3.36. Enhanced F Scale for Tornado Damage

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

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

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in Table 3.37, the damage descriptions are summaries. For the actual EF scale, it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator.

Table 3.37. Enhanced Fujita Scale with Potential Damage

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

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

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

Previous Occurrences

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.

Changing Future Conditions Considerations

Scientists do not know how the frequency and severity of tornadoes will change. Research published in 2015 suggests that changes in heat and moisture content in the atmosphere, brought on by a warming world, could be playing a role in making tornado outbreaks more common and severe in the U.S. The research concluded that the number of days with large outbreaks have been increasing since the 1950s and that densely concentrated tornado outbreaks are on the rise. It is notable that the research shows that the area of tornado

activity is not expanding, but rather the areas already subject to tornado activity are seeing the more densely packed tornadoes. Because Missouri experiences on average around 39.6 tornadoes a year, such research is closely followed by meteorologists in the state.

Table 3.38. Recorded Tornadoes in Shannon County, 2017-2021

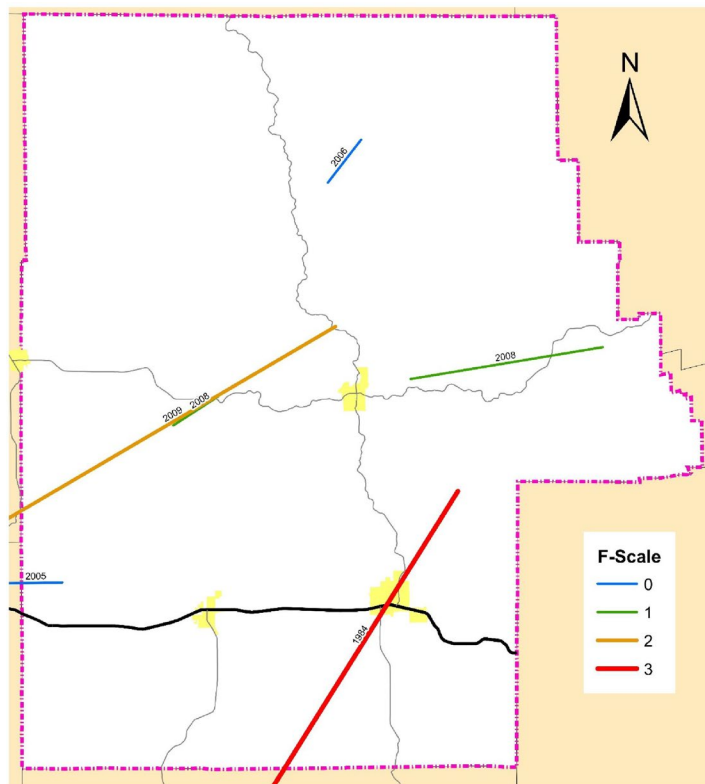
| Date | Beginning Location | Ending Location | Length (miles) | Width (yards) | F/EF Rating | Death | Injury | Property Damage | Crop Damages |
|------|--------------------|-----------------|----------------|---------------|-------------|----------|----------|-----------------|--------------|
| | | | | | | | | | |
| | | | | | | | | | |
| | Total | - | - | - | - | 0 | 0 | \$0 | \$0 |

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

Probability of Future Occurrence

According to the NCEI, no tornadoes have occurred during the 5-year period from 2017-2021. (There are also no tornadoes recorded in the 10-year data).

Figure 3.28. Shannon County Map of Historic Tornado Events



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

Vulnerability

Vulnerability Overview

Shannon County is located in a region of the United States with high frequency of dangerous and destructive tornadoes referred to as “Tornado Alley” as is the entire State of Missouri. Figure 3.29 illustrates the areas where dangerous tornadoes historically have occurred.

Figure 3.29. Tornado Alley in the U.S.



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

The 2018 State Plan applies a certain methodology to each county in the state to determine each county’s vulnerability to tornadoes. While this approach attempts to prioritize tornado vulnerable counties, it does not identify any particular geographic patterns to tornado risk. The state’s analysis combines annualized losses and frequency of occurrence to determine the greatest likelihood of being impacted by a tornado. The state’s vulnerability rating ranged from very high, high, and moderate. The vulnerability for Shannon County was rated as Moderate.

Potential Losses to Existing Development

During the five-year period from 2017 through 2021, a total of \$0 in property losses equates to \$0 in average annual losses countywide. The most common tornado events recorded in the county are EF0 magnitude. The

average magnitude for tornado events in the county is 0.37 on the Enhanced Fujita Scale. There is not a high potential of a tornado occurring within Shannon County but there is still a chance because it's located in tornado alley.

Future Development

Shannon County as whole is declining in population. The only growing community is the City of Eminence, the County Seat. It is anticipated that the unincorporated county will become stable in population while the two other incorporated communities in the county Birch Tree and Winona will continue to see a slow decline in population. Additional population growth and development will increase exposure and risk to tornado events due to the area-wide geographic nature of this hazard.

Hazard Summary by Jurisdiction

Although tornado events are area-wide hazards, communities with a greater percentage of structures built prior to 1939 are considered to be more vulnerable to the impact of tornadoes. The City of Eminence is home to the highest percentage of structures built prior to 1939 at 23%, followed by Birch Tree (16%), the unincorporated County (13.7%) and the City of Winona (13.1%). The county's school districts have mostly modernized facilities and are considered well-built structures. However, most districts have outbuildings used for storage and maintenance that may be at higher risk to high wind and tornadoes.

School district facilities are at risk to the damages of tornadoes. Currently no school districts in Shannon County have FEMA tornado safe rooms. The Eminence R-I School District has constructed a new saferoom but Winona School District is still in desperate need of one.

Problem Statement

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. Significant tornado events in Shannon County since 1950 have resulted in deaths (4) one severe injury and millions of dollars in property damage (\$16.27MM). Information in the 2018 State Plan indicates that Shannon County has a high vulnerability to tornadoes based on frequency of occurrence and previous damages.

The risk of property damage, injury and death in the county can be mitigated by constructing FEMA standard safe rooms in facilities that house vulnerable populations such as nursing homes, government buildings, and schools. In addition, identifying safe refuge areas in public buildings, nursing homes and other facilities with protective filming of windows and installation of blast proof doors will provide more protection for students and staff and school facilities that are not served by FEMA standard safe rooms. Additional warnings and alerts will also provide the public and schools more time to take cover during tornado warnings. Also, public safety fairs and expos in the county hosted by communities provide an opportunity to disseminate information to homeowners about individual safe room construction in residences.

Cities can adopt or update and enforce IBC building codes that include construction techniques such as roof tie down straps to mitigate damage to future development.

3.4.9 Wildfire

Hazard Profile

Hazard Description

The fire incident types for wildfires include:

- 1) Natural vegetation fire
- 2) Outside rubbish fire
- 3) Special outside fire
- 4) Cultivated vegetation, crop fire

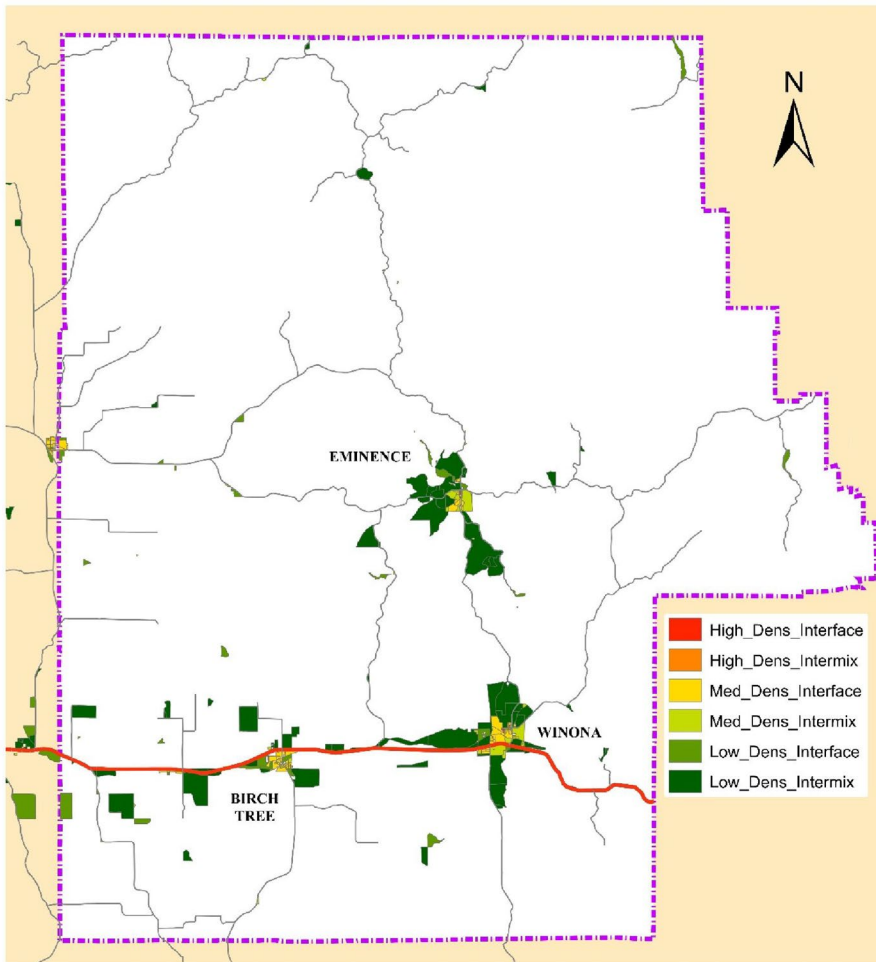
The Forestry Division of the Missouri Department of Conservation (MDC) is responsible for protecting privately owned and state-owned forests and grasslands from wildfires. To accomplish this task, eight forestry regions have been established in Missouri for fire suppression. The Forestry Division works closely with volunteer fire departments and federal partners to assist in 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 to burn their garden spots, brush piles, and pastures 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 accumulation. Therefore, spring months are the more 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

Absent demographic information indicating otherwise, the risk of structural fire probably does not vary widely across the planning area. However, damages due to wildfires would be higher in communities with more wildland–urban interface (WUI) areas. The term refers to the zone of transition between unoccupied land and human development and needs to be defined in the plan. Within the WUI, there are two specific areas identified: 1) Interface and 2) Intermix. The interface areas are those areas that abut wildland vegetation and the Intermix areas are those areas that intermingle with wildland areas. Figure 3.30 below shows WUI areas in Shannon County.

Figure 3.30. Shannon County Wildland Urban Intermix, Interface



Severity/Magnitude/Extent

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

Wildland fires in Missouri have been mostly a result of human activity rather than lightning or some other natural event. Wildfires in Missouri are usually surface fires, burning the dead leaves on the ground or dried grasses. They do sometimes “torch” or “crown” out in certain dense evergreen stands like eastern red cedar and shortleaf pine. However, Missouri does not have the extensive stands of evergreens found in the western US that fuel the large fire storms seen on television news stories. While very unusual, crown fires can and do occur in Missouri native hardwood forests during prolonged periods of drought combined with extreme heat, low relative humidity, and high wind. Tornadoes, high winds, wet snow and ice storms in recent years have placed a large amount of woody material on the forest floor that causes wildfires to burn hotter and longer.

These conditions also make it more difficult for fire fighters suppress fires safely. See <http://www.firewisemissouri.org/wildfire-in-missouri.html>

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

Previous Occurrences

According to MDC Wildfire Data, there have been 127 wildfires reported in Shannon County from 2017 to 2021. A total of 6,888 acres were burned as a result of these reported wildfires. In addition, 12 buildings were destroyed, 2 structures were damaged, and 41 structures were threatened.

Table 3.39 below contains a summary of MDC wildfire statistics by year.

Table 3.39. Shannon County Wildfires 2017-2021

| Year | # Wildfires | Buildings Destroyed | Buildings Damaged | Buildings Threatened | Acres Burned |
|--------------|-------------|---------------------|-------------------|----------------------|--------------|
| 2017 | 39 | 3 | 1 | 24 | 1,717 |
| 2018 | 24 | 1 | 0 | 5 | 3,784 |
| 2019 | 16 | 8 | 1 | 0 | 404 |
| 2020 | 21 | 0 | 0 | 10 | 526 |
| 2021 | 27 | 0 | 0 | 2 | 457 |
| Total | 127 | 12 | 2 | 41 | 6,888 |

There are no records from school districts and special districts about previous wildfire events and the damage resulting from them.

Probability of Future Occurrence

Based on the last five (5) years of fire reporting statistics from the Missouri Department of Conservation (MDC) in Table 3.39, there were a total of 127 reported wildfires in Shannon County from 2017-2021. This equates to an average of 25 wildfire events annually and a 100% probability of occurrence in any given year.

Changing Future Conditions Considerations

Higher temperatures and changes in rainfall are unlikely to substantially reduce forest cover in Missouri, although the composition of trees in the forests may change. More droughts would reduce forest productivity, and changing future conditions are also likely to increase the damage from insects and diseases. But longer growing seasons and increased carbon dioxide concentrations could more than offset the losses from those factors. Forests cover about one-third of the state, dominated by oak and hickory trees. As the climate changes, the abundance of pines in Missouri’s forests is likely to increase, while the population of hickory trees is likely to decrease. Higher temperatures will also reduce the number of days prescribed burning can be performed.

Reduction of prescribed burning will allow for growth of understory vegetation – providing fuel for destructive wildfires. Drought is also anticipated to increase in frequency and intensity during summer months under projected future scenarios. Drought can lead to dead or dying vegetation and landscaping material close to structures which creates fodder for wildfires within both the urban and rural settings.

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.

Potential Losses to Existing Development

In looking at the statistics over the last five years, an average of 2.4 buildings are destroyed every year, and 0.4 buildings per year are damaged. Another 8.2 structures are threatened per year with an average of 1,378 acres burned annually.

Impact of Future Development

It is anticipated that there will be future development in WUI areas throughout incorporated and unincorporated areas of the county. Future growth in WUI areas of the county will increase the risk and exposure to wildfires.

Hazard Summary by Jurisdiction

The vulnerability to wildfire damages are greatest near the counties two most populous communities Eminence and Winona. Areas identified as WUI, but with lower associated risk are along the major US highways in the county where the densest development is occurring in the unincorporated parts of the county. These areas include US Highway 60 through the southern portion of the county and State Route 19 which bisects the county from north to south. All school district campuses in the county are located outside areas identified as interface and/or intermix.

Problem Statement

Wildfire occurrence is frequent within Shannon County. These events can destroy, damage, and threaten structures in hazard prone areas. Populations and structures in WUI areas of the county have an increased risk to wildfires due to the level of fuel mixed with built environments. Cities have not adopted landscape ordinances that could potentially include fire safe landscape design requirements. The unincorporated areas of the county have the highest risk and exposure to wildfires. Thankfully, many of these areas are sparsely population. However, when new construction is occurring promoting the use of fire-resistant construction materials is highly advisable. More information about these materials and techniques are available in the MDC publication *Living with Wildfire*.

3.4.10 Severe Winter Weather

Hazard Profile

Hazard Description

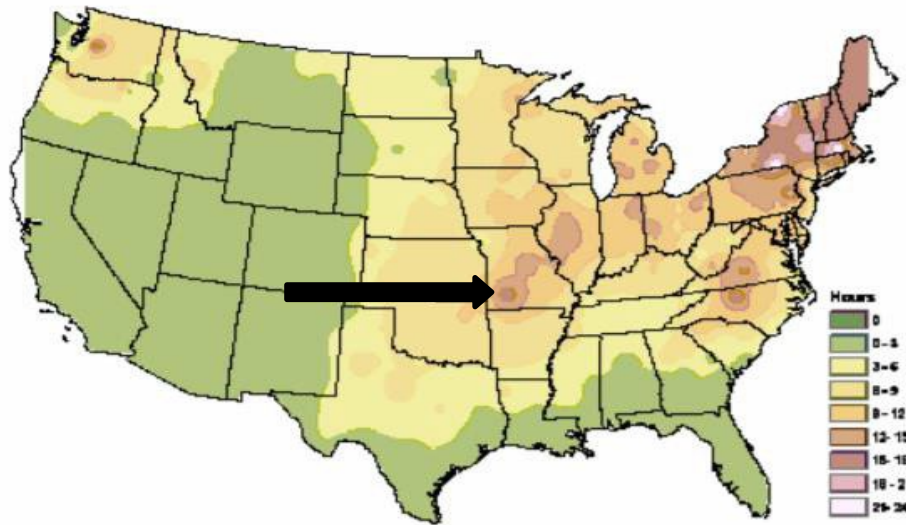
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows.

- **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 3.31 depicts the average number of hours per year with freezing rain. Shannon County is in a zone that can expect 9-12 hours of freezing rain per year, for all jurisdictions.

Figure 3.31. 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 3.40 summarizes the Winter Weather events in Shannon County from 2017-2021

Table 3.40. NCEI Shannon County Winter Weather Events Summary, 2017-2021

| Type of Event | Inclusive Dates | # of Injuries | Property Damages | Crop Damages |
|---------------|-----------------|---------------|------------------|--------------|
| Ice Storm | 1/11/2019 | 0 | 0 | 0 |
| Winter Storm | n/a | 0 | 0 | 0 |
| Total | - | 0 | \$0 | 0 |

Source: NCEI, 2021

One (1) event, an Ice Storm, is listed in the NCEI data over the 5-year reporting period. There are no reported deaths, injuries, or crop damage associated with this winter weather event.

Ice Storm

The Ice Storm event of January 11, 2019 is described in the NCEI narrative as follows:

A winter storm that started as rain as it moved into central and southern Missouri, then turned to a wintry mix of sleet, freezing rain and snow before changing over to all snow in some areas. Heavy snow fell across central Missouri with accumulations between 6 and 12 inches. Portions of south central Missouri saw significant ice accumulations that resulted in power outages and numerous trees and limbs down. As the precipitation was winding down, areas of freezing drizzle persisted through the overnight hours of January 12.

A winter storm brought ice accumulations to trees and elevated surfaces. A flat ice measurement of 0.25 inches was reported in Round Spring.

Probability of Future Occurrence

The probability for all the different types of winter weather is included as one probability, since one storm generally includes a lot of the different types of events. There was one (1) severe winter weather events in Shannon County from 2017-2021. This equates to an 20% probability of occurrence 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

Severe winter storms include extreme cold, heavy snowfall, ice and strong winds which can push the wind chill well below zero degrees in the planning area. Heavy snow can bring a community to a standstill by inhibiting transportation (in whiteout conditions), weighing down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the excessive snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make transportation difficult and hazardous. People over 65 and those living in poverty have an increased risk of hypothermia and frostbite due to extreme cold and wind chill hazards.

In the 2018 State Plan, seven factors were considered in determining overall severe winter storm vulnerability as follows: housing density, likelihood of occurrence, building exposure, crop exposure, average annual property loss ratio, average annual crop insurance claims and social vulnerability. The state ranked each of these criteria using a scale from one to five, one being lowest and five being the highest, to rank each county's vulnerability to severe winter weather. Shannon County received a vulnerability rating of medium-low.

Potential Losses to Existing Development

During the five-year period of record from 2017 to 2021, a total of \$0 in property losses equates to \$0 in average annual losses countywide.

Future Development

Increased development and resulting increase in population will increase exposure to damage from severe winter weather. Future commercial development can expect functional downtime and decreased revenues during periods of severe winter weather. Road construction in the county will increase the need for snow removal and slat to keep transportation lifelines open during periods of severe winter weather.

Hazard Summary by Jurisdiction

Severe winter weather can cause power outages and put structures at risk to fires when individuals in homes resort fuel heaters. The risk of extreme cold deaths and frostbite varies among segments of the populations. People over 65 and those living below the poverty level have an increased vulnerability to severe winter weather. Table 3.41 includes information on population over 65 and the percent living below the poverty level by jurisdiction.

Table 3.41. Population over 65 and Percent Living Below the Poverty Level by Jurisdiction

| Jurisdiction | % of Families Living Below Poverty Level | % Population over 65 |
|--------------------|--|----------------------|
| Shannon County | 19.6% | 21.3% |
| City of Eminence | 12.3% | 18.1% |
| City of Winona | 26.3% | 19.5% |
| City of Birch Tree | 59.2% | 14% |

Source: ACS Profiles; ACS five year estimates 2020

All jurisdictions have large percentages of families living below the poverty level. The Cities of Birch Tree and Winona have the highest percentages of impoverished families. The largest populations of people over 65—by percentage—reside in Winona and Eminence. These communities have the greatest risk based on these populations.

Problem Statement

Heavy snow can bring a community to a standstill by inhibiting transportation (in whiteout conditions), weighing down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make travel extremely difficult and hazardous. People over 65 and those living in poverty have an increased risk of hypothermia and frostbite due to extreme cold and wind chill.

It is important that the Shannon County EMA maintain a list of heating centers throughout the county as they become available. These locations could be promoted through avenues such as radio, Facebook or the county government’s website. These locations can provide individuals who are at risk refuge from periods of extreme cold. Public works departments can develop snow removal plans and maintain adequate snow removal equipment and staff to quickly open roads after periods of heavy snow and freezing rain. The county and cities can work with local electric cooperatives to develop vegetation management programs in rights of way to minimize damages of falling tree limbs laden with ice resulting from ice storms to minimize power outages throughout the county.

4 MITIGATION STRATEGY

4 MITIGATION STRATEGY 4.1

4.1 GOALS 4.2

4.2 IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS 4.3

4.3 IMPLEMENTATION OF MITIGATION ACTIONS 4.8

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, 2016)*.

- **Mitigation Goals** are general guidelines that explain what you want to achieve. Goals are long-term policy statements and global visions that support the mitigation strategy. The goals address the risk of hazards identified in the plan.
- **Mitigation Actions** are specific actions, projects, activities, or processes taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan’s mission and goals.

4.1 Goals

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

This planning effort is an update to Shannon County's existing hazard mitigation plan approved by FEMA in April of 2018. Therefore, the goals from the 2018 Shannon County Hazard Mitigation Plan were reviewed to see if they were still valid, feasible, practical, and applicable to the defined hazard impacts. During planning meetings, MPC members and local stakeholders held a discussion in order 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.

Goal 1: Protect the Lives and Property of all Citizens of Shannon County

- Identify and provide sufficient emergency shelters
- Review and maintain current warning systems for sufficient coverage

Goal 2: Preserve the Functioning of Civil Government During Natural Disasters

- Implement proper maintenance and necessary upgrades of critical buildings and infrastructures in the county
- Improve the efficiency, timing, and effectiveness of response and recovery efforts for natural hazard disasters

Goal 3: Maintain Economic Activities Essential to the Survival and Recovery from Natural Disasters

- Periodically review chain of command of government organizations for emergency situations and keep up-to-date
- Continuously review communications systems and keep in good working order

4.2 Identification and Analysis of Mitigation Actions

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

During the hazard mitigation planning meetings in the county and at the final MPC work session, the results of the risk assessment update were provided to the participants for review and the key issues were identified for specific hazards. Changes in risk since adoption of the previously approved plan were discussed. The meetings concluded with the distribution of a list of possible mitigation actions submit to the MPC for their review and approval. The list included possible new mitigation actions, as well as actions from the previously approved plan that were candidates for removal, due to the nature of them not being measurable or fundable. Actions from the previous plan included completed actions, on-going actions, and actions upon which progress had not been made. SCOCOG planners discussed SEMA’s identified funding priorities and the types of mitigation actions generally recognized by FEMA.

The focus of the MPC work session then shifted to development the mitigation strategy. For a comprehensive range of mitigation actions to consider, the SCOCOG planners provided information to the MPC reviewing the following information:

- 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 assessment and vulnerability analysis.
- State priorities established for Hazard Mitigation Assistance grants.
- Public input via the online survey tool, and other efforts to involve the public in the plan development process.

Table 4.1 below consists of a summary of the hazard mitigation actions listed within this update of the county hazard mitigation plan, by participating jurisdiction:

Table 4.1. Action Status Summary

| Jurisdiction | Completed Actions | Continuing Actions (ongoing or modified) | Deleted Actions |
|--------------------|-------------------|---|-----------------|
| Shannon County | 0 | 5 | 0 |
| City of Birch Tree | 0 | 5 | 1 |
| City of Winona | 0 | 5 | 1 |
| City of Eminence | 0 | 5 | 0 |
| Eminence R-I | 1 | 5 | 0 |
| Winona R-III | 0 | 5 | 0 |

Table 4.2 provides a summary of the completed and deleted actions from the previous plan. The 2018 Plan had a series of county-wide mitigation actions that address five mitigation goals. Based on the status updates, there was one completed action, zero deleted actions, five continuing actions and four (4) new actions.

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

| Completed Actions | Completion Details (date, amount, funding source) |
|--|---|
| Construct a FEMA Saferoom at Eminence R-I | Project was funded by FEMA HMGP and completed during the winter of 2020 |
| Establish and maintain a volunteer committee to monitor and maintain storm shelters when activated | On-call lists have been developed to ensure volunteers are available to activate the shelters (saferooms) when needed. |
| Partner with the Red Cross to provide shelter management | The Red Cross communicates and coordinates with school districts and the individual communities within the county. |
| Promote the use of NOAA weather radios as warning devices | Completed via the Regional Homeland Security planning framework. Local radio stations routinely promote the use of weather radios |
| Discuss the possibility of future funding for more shelters throughout the county | This is ongoing completed through the efforts of the regional planning commission, SCOCOG |
| Use public service announcements and other available media to educate the public about shelter locations | This has been completed and coordinated as part of the Regional Homeland Security Oversight Committee (RHSOC) planning framework |
| Deleted Actions | Reason For Deletion |
| The City of Winona – Construct a community saferoom | The school would be a more beneficial location for this |
| The City of Eminence – Construct a community saferoom | The school would be a more beneficial location for this |
| The City of Birch Tree – Construct a community saferoom | Cost of match is not possible for the community |

Source: Previously approved County Hazard Mitigation Plan; Data Collection Questionnaire 2022

Table 4.3. Mitigation Action Matrix

| # | Action | Jurisdiction | Priority | Goals Addressed | Hazards Addressed | Address Current Development | Address Future Development | Continued Compliance with NFIP |
|-------------|--|--------------------|----------|-----------------|---|-----------------------------|----------------------------|--------------------------------|
| Shannon1 | Purchase and install a backup generator at the county courthouse which serves various governmental functions | Shannon County | 20 | Goal 2 | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Winds, and Tornado | X | | |
| Shannon2 | Warming and Cooling Locations throughout the County during extreme temperatures and freezing temperatures | Shannon County | 31 | Goal 1 | Extreme Temperatures and Winter Weather | X | X | |
| Shannon3 | County road and bridge replacement | Shannon County | 30 | Goal 1 | Flooding (Flash and River) | X | X | |
| Birch Tree1 | Purchase and install a backup generator at the main water well site. | City of Birch Tree | 20 | Goal 1 | Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Winds, and Tornado | X | | |
| Birch Tree2 | Develop a coordinated plan to test outdoor warning sirens on a consistent basis | City of Birch Tree | 15 | Goal 2 | Tornado | X | | |
| Birch Tree3 | The city will attempt to improve floodplain management by identification of map amendments/updates | City of Birch Tree | 15 | Goal 3 | Flooding (Flash and River) | X | | X |
| Winona1 | Purchase and install a backup generator at the main water well site. | City of Winona | 20 | Goal 1 | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Winds, and Tornado | X | | |
| Winona2 | Develop a coordinated plan to test outdoor warning sirens on a consistent basis | City of Winona | 15 | Goal 2 | Tornado | X | | |
| Winona3 | The city will attempt to improve floodplain management by identification of map amendments/updates | City of Winona | 15 | Goal 3 | Flooding (Flash and River) | X | | X |
| Eminence1 | Install at new outdoor warning sirens in the community | City of Eminence | 19 | Goal 1 | Tornado | X | | |

| # | Action | Jurisdiction | Priority | Goals Addressed | Hazards Addressed | Address Current Development | Address Future Development | Continued Compliance with NFIP |
|-------------------|--|--|----------|-----------------|---|-----------------------------|----------------------------|--------------------------------|
| Eminence2 | Develop a coordinated plan to test outdoor warning sirens on a consistent basis | City of Eminence | 15 | Goal 2 | Tornado | X | | |
| Eminence3 | Purchase and install a backup generator at main water well site. | City of Eminence | 20 | Goal 1 | Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Winds, and Tornado | X | X | |
| Eminence4 | The city will attempt to improve floodplain management by identification of maps amendments/updates. | City of Eminence | 15 | Goal 3 | Flooding (Flash and River) | X | | X |
| Winona R-III-1 | Distribute brochures and publish social media posts to educate students and residents on personal emergency preparedness and ways to minimize the effect of natural disasters before they occur. | Winona School/Community | 27 | Goal 3 | Severe Winter Weather, Thunderstorm/Lightning/Hail/High Winds, and Tornado | X | X | |
| Winona R-III 2 | Purchase and install a backup generator for administration offices | Winona School/Community | 31 | Goal 2 | Severe Winter Weather, Thunderstorm/Lightning/Hail/High Winds, and Tornado | X | X | |
| Winona R-III 3 | Construct a 361 design tornado saferoom on the school campus | Winona R-III School | 18 | Goal 1 | Tornado | X | | |
| All Jurisdictions | Construct storm shelters and certified tornado safe rooms near schools and large employment centers as funding allows. | All Jurisdictions and School Districts | 32 | 1 | Tornadoes, Severe Weather | X | X | |
| All Jurisdictions | Distribute brochures and publish social media posts to educate students and residents on personal emergency preparedness and ways to minimize the effect of natural disasters before they occur. | All Jurisdictions | 27 | 3 | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Winds, and Tornado | X | X | |
| All Jurisdictions | Distribute FEMA brochures on the and fact sheets about the National Flood Insurance Program (NFIP) at public offices and community events | All Jurisdictions | 27 | 2 | Floods | | | X |
| Eminence School1 | Distribute brochures and publish social media posts to educate students and residents on personal emergency preparedness and ways to minimize the effect of natural disasters before they occur. | Eminence School/Community | 27 | Goal 3 | Severe Winter Weather, Thunderstorm/Lightning/Hail/High Winds, and Tornado | X | X | |

| # | Action | Jurisdiction | Priority | Goals Addressed | Hazards Addressed | Address Current Development | Address Future Development | Continued Compliance with NFIP |
|------------------|--|---------------------------|----------|-----------------|--|-----------------------------|----------------------------|--------------------------------|
| Eminence School2 | Purchase and install a backup generator for administration offices | Eminence School/Community | 31 | Goal 2 | Severe Winter Weather, Thunderstorm/Lightning/Hail/High Winds, and Tornado | X | X | |

4.3 Implementation of Mitigation Actions

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

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

FEMA’s STAPLEE methodology was used to assess the costs and benefits, overall feasibility of mitigation actions, and other issues impacting project. During the prioritization process, the MPC used worksheets to assign scores. The worksheets posed questions based on the STAPLEE elements as well as the potential mitigation effectiveness of each action. Scores were based on the responses to the following questions and ensuing discussion:

| | Definitely “YES” 3 points | Maybe “YES” 2 points | Probably “NO” 1 point | Definitely “NO” Zero points |
|----------|---|-------------------------|--------------------------|--------------------------------|
| S | Is the action <i>socially</i> acceptable? | | | |
| T | Is the action <i>technically feasible</i> and potentially successful? | | | |
| A | Does the jurisdiction have the <i>administrative capability</i> to successfully implement this action? | | | |
| P | Is the action <i>politically</i> acceptable? | | | |
| L | Does the jurisdiction have the <i>legal authority</i> to implement the action? | | | |
| E | Is the action <i>economically beneficial</i> ? | | | |
| E | Will the project have an <i>environmental impact</i> that is either beneficial or neutral? (score “3” if positive and “2” if neutral) | | | |

The resulting list of actions were summed and divided into classes and labeled as high, medium, or low priorities. The result of the STAPLEE analysis is found in the forthcoming mitigation action worksheets.

Figure 4.1. Blank STAPLEE Worksheet

**XXXXXX COUNTY
MULTI-JURISDICTIONAL
LOCAL HAZARD MITIGATION PLAN**

| Action Title: | | Jurisdiction: | |
|--|--|----------------------|--|
| Action ID: | | | |
| 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? (score a 3 if positive impact, 2 if neutral impact) | | | |
| 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 would 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 Score + Mitigation Effectiveness Score): _____

Priority Level: High (30+ points) Medium (25-29 points) Low (less than 25 points)

Completed by (name/title/phone #): _____

In addition to the STAPLEE cost benefit review prioritization at the final MPC meeting, an implementation plan for each action was discussed. An action worksheet was used to development the implementation plan. The action worksheets are presented on the following pages.

MITIGATION ACTIONS

Goal 1: Protect the Lives and Property of all Citizens of Shannon County

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | City of Eminence |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat to human life result from tornadic storms in and around the City of Eminence Missouri |
| Hazard(s) Addressed: | Tornado |
| Action or Project | |
| Action/Project Number: | Eminence1 |
| Name of Action or Project: | Outdoor Warning Sirens |
| Action or Project Description: | Install new outdoor warning sirens in the community |
| Applicable Goal Statement: | Goal 1 |
| Estimated Cost: | \$35,000 - \$ 80,000 |
| Benefits: | Protect the lives of the citizens of the City of Eminence |
| Plan for Implementation | |
| Responsible Organization/Department: | City Public Works |
| Action/Project Priority: | 19-HIGH |
| Timeline for Completion: | 1 year |
| Potential Fund Sources: | FEMA |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | Winona R-III |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat to human life resulting from tornadic storms in and around the City of Winona, MO |
| Hazard(s) Addressed: | Tornado |
| Action or Project | |
| Action/Project Number: | Winona R-III |
| Name of Action or Project: | Tornado Safe Room |
| Action or Project Description: | Construct a 361 design tornado saferoom on the school campus |
| Applicable Goal Statement: | Goal 1 |
| Estimated Cost: | \$1,500,000-\$2,200,000 |
| Benefits: | Protect the lives of the students and local citizens |
| Plan for Implementation | |
| Responsible Organization/Department: | Superintendent Office |
| Action/Project Priority: | 18-HIGH |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | FEMA |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | City of Birch Tree |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat to human life resulting from hazards in and around the City of Birch Tree, MO |
| Hazard(s) Addressed: | Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/High Winds/Lighting/Hail, and Tornadoes. |
| Action or Project | |
| Action/Project Number: | The City of Birch Tree1 |
| Name of Action or Project: | Back up Generator at Water Well Site |
| Action or Project Description: | Purchase and install a backup generator at the main water well site |
| Applicable Goal Statement: | Goal 1 |
| Estimated Cost: | \$75,000-85,000 |
| Benefits: | Maintain drinking water within the community during severe weather threats |
| Plan for Implementation | |
| Responsible Organization/Department: | Public Works |
| Action/Project Priority: | 20-HIGH |
| Timeline for Completion: | 1 year |
| Potential Fund Sources: | FEMA |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | City of Winona |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat to human life resulting from hazards in and around the City of Winona, MO |
| Hazard(s) Addressed: | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/ Sinkholes, Severe Winter Weather, Thunderstorm/High Winds/Lighting/Hail, and Tornadoes. |
| Action or Project | |
| Action/Project Number: | The City of Winona1 |
| Name of Action or Project: | Back up Generator at Water Well Site |
| Action or Project Description: | Purchase and install a backup generator at the main water well site |
| Applicable Goal Statement: | Goal 1 |
| Estimated Cost: | \$75,000-85,000 |
| Benefits: | Maintain drinking water within the community during severe weather threats |
| Plan for Implementation | |
| Responsible Organization/Department: | Public Works |
| Action/Project Priority: | 20-HIGH |
| Timeline for Completion: | 1 year |
| Potential Fund Sources: | FEMA |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | City of Eminence |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat to human life resulting from hazards in and around the City of Eminence, MO |
| Hazard(s) Addressed: | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/High Winds/ |
| Action or Project | |
| Action/Project Number: | The City of Eminence3 |
| Name of Action or Project: | Back up Generator at Water Well Site |
| Action or Project Description: | Purchase and install a backup generator at the main water well site |
| Applicable Goal Statement: | Goal 1 |
| Estimated Cost: | \$75,000-85,000 |
| Benefits: | Maintain drinking water within the community during severe weather threats |
| Plan for Implementation | |
| Responsible Organization/Department: | Public Works |
| Action/Project Priority: | 20-HIGH |
| Timeline for Completion: | 1 year |
| Potential Fund Sources: | FEMA |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

Goal 2: Preserve the Functioning of Civil Government During Natural Disasters

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | Shannon County |
| Risk / Vulnerability | |
| Problem being Mitigated: | Lack of back-up power source at the county's jail/dispatch/emergency operations center |
| Hazard(s) Addressed: | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/High Winds/Lighting/Hail, and |
| Action or Project | |
| Action/Project Number: | Shannon1 |
| Name of Action or Project: | Courthouse Generator |
| Action or Project Description: | Purchase and install a backup generator at the county courthouse which serves various governmental functions |
| Applicable Goal Statement: | Goal 2 |
| Estimated Cost: | \$65,000 - \$90,000 |
| Benefits: | Provide emergency backup power |
| Plan for Implementation | |
| Responsible Organization/Department: | County Emergency Management |
| Action/Project Priority: | 20-HIGH |
| Timeline for Completion: | 1 year |
| Potential Fund Sources: | FEMA, RHSOC |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan |
| Progress Report | |
| Action Status | Complete |
| Report of Progress | Complete |

| Mitigation Action Worksheet | |
|--|---|
| Name of Jurisdiction: | City of Birch Tree |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat to human life result from tornadic storms in and around the City of Birch Tree, Missouri |
| Hazard(s) Addressed: | Tornado |
| Action or Project | |
| Action/Project Number: | Birch Tree2 |
| Name of Action or Project: | Siren Testing |
| Action or Project Description: | Develop a coordinated plan to test outdoor warning sirens on a consistent basis |
| Applicable Goal Statement: | Goal 2 |
| Estimated Cost: | Little or no cost |
| Benefits: | Ensure sirens are functioning properly |
| Plan for Implementation | |
| Responsible Organization/Department: | City Emergency Management |
| Action/Project Priority: | 15-LOW |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local |
| Local Planning Mechanisms to be Used in Implementation, if any: | LEOP, Hazard Mitigation Plan |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

| Mitigation Action Worksheet | |
|--|---|
| Name of Jurisdiction: | City of Winona |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat to human life result from tornadic storms in and around the City of Winona, Missouri |
| Hazard(s) Addressed: | Tornado |
| Action or Project | |
| Action/Project Number: | Winona2 |
| Name of Action or Project: | Siren Testing |
| Action or Project Description: | Develop a coordinated plan to test outdoor warning sirens on a consistent basis |
| Applicable Goal Statement: | Goal 2 |
| Estimated Cost: | Little or no cost |
| Benefits: | Ensure sirens are functioning properly |
| Plan for Implementation | |
| Responsible Organization/Department: | City Emergency Management |
| Action/Project Priority: | 15-LOW |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local |
| Local Planning Mechanisms to be Used in Implementation, if any: | LEOP, Hazard Mitigation Plan |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

| Mitigation Action Worksheet | |
|--|---|
| Name of Jurisdiction: | City of Eminence |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat to human life result from tornadic storms in and around the City of Eminence, Missouri |
| Hazard(s) Addressed: | Tornado |
| Action or Project | |
| Action/Project Number: | Eminence2 |
| Name of Action or Project: | Siren Testing |
| Action or Project Description: | Develop a coordinated plan to test outdoor warning sirens on a consistent basis |
| Applicable Goal Statement: | Goal 2 |
| Estimated Cost: | Little or no cost |
| Benefits: | Ensure sirens are functioning properly |
| Plan for Implementation | |
| Responsible Organization/Department: | City Emergency Management |
| Action/Project Priority: | 15-LOW |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local |
| Local Planning Mechanisms to be Used in Implementation, if any: | LEOP, Hazard Mitigation Plan |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

Goal 3: Maintain Economic Activities Essential to the Survival and Recovery from Natural Disasters

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | City of Winona |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat of flooding to the built environment |
| Hazard(s) Addressed: | Flooding (Flash and River) |
| Action or Project | |
| Action/Project Number: | Winona3 |
| Name of Action or Project: | NFIP |
| Action or Project Description: | The city will attempt to improve floodplain management by identification of map amendments/updates |
| Applicable Goal Statement: | Goal 3 |
| Estimated Cost: | Little or no cost |
| Benefits: | Improve the delivery of floodplain management services |
| Plan for Implementation | |
| Responsible Organization/Department: | Floodplain Administrator |
| Action/Project Priority: | 15-LOW |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local |
| Local Planning Mechanisms to be Used in Implementation, if any: | Floodplain Ordinance |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | City of Eminence |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat of flooding to the built environment |
| Hazard(s) Addressed: | Flooding (Flash and River) |
| Action or Project | |
| Action/Project Number: | Eminence4 |
| Name of Action or Project: | NFIP |
| Action or Project Description: | The city will attempt to improve floodplain management by identification of map amendments/updates |
| Applicable Goal Statement: | Goal 3 |
| Estimated Cost: | Little or no cost |
| Benefits: | Improve the delivery of floodplain management services |
| Plan for Implementation | |
| Responsible Organization/Department: | Floodplain Administrator |
| Action/Project Priority: | 15-LOW |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local |
| Local Planning Mechanisms to be Used in Implementation, if any: | Floodplain Ordinance |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | City of Birch Tree |
| Risk / Vulnerability | |
| Problem being Mitigated: | The threat of flooding to the built environment |
| Hazard(s) Addressed: | Flooding (Flash and River) |
| Action or Project | |
| Action/Project Number: | Birch Tree3 |
| Name of Action or Project: | NFIP |
| Action or Project Description: | The city will attempt to improve floodplain management by identification of map amendments/updates |
| Applicable Goal Statement: | Goal 3 |
| Estimated Cost: | Little or no cost |
| Benefits: | Improve the delivery of floodplain management services |
| Plan for Implementation | |
| Responsible Organization/Department: | Floodplain Administrator |
| Action/Project Priority: | 15-LOW |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local |
| Local Planning Mechanisms to be Used in Implementation, if any: | Floodplain Ordinance |
| Progress Report | |
| Action Status | Ongoing |
| Report of Progress | Ongoing |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | Shannon County |
| Risk / Vulnerability | |
| Problem being Mitigated: | Warming and Cooling Locations throughout the County during extreme temperatures and freezing temperatures |
| Hazard(s) Addressed: | Extreme Temperatures and Winter Weather |
| Action or Project | |
| Action/Project Number: | Shannon2 |
| Name of Action or Project: | Warming and Cooling locations for the citizens of Shannon County |
| Action or Project Description: | Utilize county buildings, private buildings, and American Red Cross to offer warming and cooling locations throughout the county |
| Applicable Goal Statement: | Goal 1 |
| Estimated Cost: | \$20,000 annually utilizing an existing building |
| Benefits: | Protect the lives of the citizens of Shannon County during extreme temperatures or winter weather |
| Plan for Implementation | |
| Responsible Organization/Department: | Shannon County Emergency Manager/County Commissioners/Mayors |
| Action/Project Priority: | 31-HIGH |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | FEMA, CDBG, DRA |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan/Comprehensive Plan |
| Progress Report | |
| Action Status | New |
| Report of Progress | New |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | Winona R-III School |
| Risk / Vulnerability | |
| Problem being Mitigated: | Develop Natural Disaster Educational Materials (Education/Outreach) |
| Hazard(s) Addressed: | Severe Winter Weather, Thunderstorm/High Winds/Lighting/Hail, and Tornadoes. |
| Action or Project | |
| Action/Project Number: | Winona R-III 1 |
| Name of Action or Project: | Educational Material Distribution for Natural Disaster Education |
| Action or Project Description: | The school will attempt to address multiple natural hazards to protect the community through distribution of educational materials |
| Applicable Goal Statement: | Goal 3 |
| Estimated Cost: | \$25,000 |
| Benefits: | Improve the implementation of protection against multiple natural disasters |
| Plan for Implementation | |
| Responsible Organization/Department: | Superintendent/Principal |
| Action/Project Priority: | 27/Medium |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local/Planning Grant |
| Local Planning Mechanisms to be Used in Implementation, if any: | Educational flyers, media outlets, newspapers, and Facebook. |
| Progress Report | |
| Action Status | New |
| Report of Progress | New |

| Mitigation Action Worksheet | |
|--|---|
| Name of Jurisdiction: | Winona R-III School District |
| Risk / Vulnerability | |
| Problem being Mitigated: | Lack of back-up power source at the school's administration building |
| Hazard(s) Addressed: | Severe Winter Weather, Thunderstorm/High Winds/Lighting/Hail, and Tornadoes. |
| Action or Project | |
| Action/Project Number: | Winona R-III 2 |
| Name of Action or Project: | Administration Building Generator |
| Action or Project Description: | Purchase and install a backup generator at the Winona School District Administration Facility |
| Applicable Goal Statement: | Goal 2 |
| Estimated Cost: | \$75,000 - \$125,000 |
| Benefits: | Provide emergency backup power |
| Plan for Implementation | |
| Responsible Organization/Department: | Superintendent |
| Action/Project Priority: | 31-HIGH |
| Timeline for Completion: | 2 year |
| Potential Fund Sources: | FEMA, RHSOC, CDBG, Local Funds |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan |
| Progress Report | |
| Action Status | New |
| Report of Progress | New |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | All Jurisdictions |
| Risk / Vulnerability | |
| Problem being Mitigated: | Construct storm shelters and certified tornado safe rooms near schools and large employment center as funding allows |
| Hazard(s) Addressed: | Tornado, Severe Weather |
| Action or Project | |
| Action/Project Number: | All Jurisdictions |
| Name of Action or Project: | Safe Room Construction |
| Action or Project Description: | Construction of safe rooms near schools and large employment areas |
| Applicable Goal Statement: | Goal 1 |
| Estimated Cost: | \$500,000 - \$4,000,000 |
| Benefits: | Protect the lives of the citizens of Shannon County tornados and sever weather events |
| Plan for Implementation | |
| Responsible Organization/Department: | Shannon County Emergency Manager/County Commissioners/Mayors |
| Action/Project Priority: | 32-HIGH |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | FEMA, CDBG, DRA, Local Match |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan/Comprehensive Plan |
| Progress Report | |
| Action Status | New |
| Report of Progress | New |

| Mitigation Action Worksheet | |
|--|---|
| Name of Jurisdiction: | All Jurisdictions |
| Risk / Vulnerability | |
| Problem being Mitigated: | Develop Natural Disaster Educational Materials (Education/Outreach) |
| Hazard(s) Addressed: | Dam Failure, Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/High Winds/Lighting/Hail, and Tornadoes. |
| Action or Project | |
| Action/Project Number: | All Jurisdictions |
| Name of Action or Project: | Educational Material Distribution for Natural Disaster Education |
| Action or Project Description: | All jurisdictions will attempt to address multiple natural hazards to protect the community through distribution of educational materials. Distribute brochures and publish social media posts to educate students and residents on personal emergency preparedness and ways to minimize the effect of natural disasters before they occur. |
| Applicable Goal Statement: | Goal 3 |
| Estimated Cost: | \$25,000 |
| Benefits: | Improve the implementation of protection against multiple natural disasters |
| Plan for Implementation | |
| Responsible Organization/Department: | Emergency Mangers/Mayors/City Administrators/Fire Departments/RHSOC Committee |
| Action/Project Priority: | 27/Medium |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local/Planning Grant |
| Local Planning Mechanisms to be Used in Implementation, if any: | Educational flyers, media outlets, newspapers, and Facebook. |
| Progress Report | |
| Action Status | New |
| Report of Progress | New |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | All Jurisdictions |
| Risk / Vulnerability | |
| Problem being Mitigated: | Develop Natural Disaster Educational Materials (Education/Outreach) |
| Hazard(s) Addressed: | Flooding |
| Action or Project | |
| Action/Project Number: | All Jurisdictions |
| Name of Action or Project: | Educational Material Distribution for Natural Disaster Education |
| Action or Project Description: | All Jurisdictions will distribute FEMA brochures and fact sheets about the National Flood Insurance Program (NFIP) at public offices and community events. |
| Applicable Goal Statement: | Goal 3 |
| Estimated Cost: | \$25,000 |
| Benefits: | Improve the implementation of protection against multiple natural disasters |
| Plan for Implementation | |
| Responsible Organization/Department: | Emergency Mangers/Mayors/City Administrators/Fire Departments/RHSOC Committee |
| Action/Project Priority: | 27/Medium |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local/Planning Grant |
| Local Planning Mechanisms to be Used in Implementation, if any: | Educational flyers, media outlets, newspapers, and Facebook. |
| Progress Report | |
| Action Status | New |
| Report of Progress | New |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | Eminence School District |
| Risk / Vulnerability | |
| Problem being Mitigated: | Lack of back-up power source at the school's administration building |
| Hazard(s) Addressed: | Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/High Winds/Lighting/Hail, and Tornadoes. |
| Action or Project | |
| Action/Project Number: | Eminence 2 |
| Name of Action or Project: | Administration Building Generator |
| Action or Project Description: | Purchase and install a backup generator at the Eminence School District Administration Facility |
| Applicable Goal Statement: | Goal 2 |
| Estimated Cost: | \$75,000 - \$125,000 |
| Benefits: | Provide emergency backup power |
| Plan for Implementation | |
| Responsible Organization/Department: | Superintendent |
| Action/Project Priority: | 31-HIGH |
| Timeline for Completion: | 2 year |
| Potential Fund Sources: | FEMA, RHSOC, CDBG, Local Funds |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan |
| Progress Report | |
| Action Status | New |
| Report of Progress | New |

| Mitigation Action Worksheet | |
|--|--|
| Name of Jurisdiction: | Eminence School |
| Risk / Vulnerability | |
| Problem being Mitigated: | Develop Natural Disaster Educational Materials (Education/Outreach) |
| Hazard(s) Addressed: | Drought, Earthquake, Extreme Heat, Wildfire, Flooding, Land Subsidence/Sinkholes, Severe Winter Weather, Thunderstorm/High Winds/Lighting/Hail, and Tornadoes. |
| Action or Project | |
| Action/Project Number: | Eminence 1 |
| Name of Action or Project: | Educational Material Distribution for Natural Disaster Education |
| Action or Project Description: | The school will attempt to address multiple natural hazards to protect the community through distribution of educational materials |
| Applicable Goal Statement: | Goal 3 |
| Estimated Cost: | \$25,000 |
| Benefits: | Improve the implementation of protection against multiple natural disasters |
| Plan for Implementation | |
| Responsible Organization/Department: | Superintendent/Principal |
| Action/Project Priority: | 27/Medium |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | Local/Planning Grant |
| Local Planning Mechanisms to be Used in Implementation, if any: | Educational flyers, media outlets, newspapers, and Facebook. |
| Progress Report | |
| Action Status | New |
| Report of Progress | New |

| Mitigation Action Worksheet | |
|--|---|
| Name of Jurisdiction: | Shannon County |
| Risk / Vulnerability | |
| Problem being Mitigated: | County Road and Bridge is vulnerable to repetitive flash flood damage (LWC Replacements through Mitigation) |
| Hazard(s) Addressed: | Flooding (Flash and River) |
| Action or Project | |
| Action/Project Number: | Shannon3 |
| Name of Action or Project: | Crossing Mitigation |
| Action or Project Description: | Identify projects and funding sources to replace repetitively flood damaged road and bridge infrastructure |
| Applicable Goal Statement: | Goal 1 |
| Estimated Cost: | \$500,000 to \$1,000,000 |
| Benefits: | Protect the lives and public property of the citizens of Shannon County; make better use of public dollars |
| Plan for Implementation | |
| Responsible Organization/Department: | Emergency Manager/County Commissioner's |
| Action/Project Priority: | 30-HIGH |
| Timeline for Completion: | 2-3 years |
| Potential Fund Sources: | MoDOT, FEMA, CDBG, DRA |
| Local Planning Mechanisms to be Used in Implementation, if any: | Hazard Mitigation Plan, Regional Transportation |
| Progress Report | |
| Action Status | Incomplete |
| Report of Progress | Ongoing |

5 PLAN MAINTENANCE PROCESS

| | |
|---|------------|
| 5 PLAN MAINTENANCE PROCESS | 5.1 |
| 5.1 <i>MONITORING, EVALUATING, AND UPDATING THE PLAN</i>..... | 5.2 |
| 5.1.1 Responsibility for Plan Maintenance | 5.2 |
| 5.1.2 Plan Maintenance Schedule | 5.3 |
| 5.1.3 Plan Maintenance Process..... | 5.3 |
| 5.2 <i>INCORPORATION INTO EXISTING PLANNING MECHANISMS</i> | 5.4 |
| 5.3 <i>CONTINUED PUBLIC INVOLVEMENT</i>..... | 5.5 |

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

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 MPC is not a standing committee, with oversight by a responsible agency or elected body. The MPC representatives and stakeholders are represented on the Local Emergency Planning Committee (LEPC) in Shannon County and the Regional Homeland Security Oversight Committee (RHSOC – Region G). The LEPC is responsible for developing and implementing the Local Emergency Operations Plan and is a standing committee that meets regularly and is administered through the Shannon County Emergency Management agency. The RHSOC is responsible for developing and implementing the Threat Hazard Identification Risk Assessment for the region, including Shannon County. The goals and actions and representation are aligned with the missions of the RHSOC, which is a standing committee. As such, the RHSOC will be responsible for plan monitoring, evaluation, and maintenance.

- 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.
- Inform and solicit input from the public.

The RHSOC is an advisory body only, 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. South Central Ozark Council of Government (SCOCOG) will work with all stakeholders to complete any updates or addendums to the plan as needed. The LEPC and RHSOC are advisory committees and only make recommendations to the county, city, town, or district elected officials.

5.1.2 Plan Maintenance Schedule

The RHSOC agrees to meet annually and after a state or federally declared hazard event as appropriate to monitor the progress and update the mitigation strategy. The Shannon County Emergency Management Director, who also serves on the RHSOC, will be responsible for initiating the plan reviews and will invite members of the Shannon County contingent to the RHSOC meeting.

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

5.1.3 Plan Maintenance Process

Progress on the proposed actions can be monitored by evaluating changes in vulnerabilities identified in the plan. The RHSCOC 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 RHSOC 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 RHSOC 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 RHSOC deems appropriate and necessary. Changes will be approved by the Shannon County Commission and the governing boards of the other participating jurisdictions. At this time there were no major changes to the plan.

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 Two of this plan. Based on the capability assessments of the participating jurisdictions, communities in Shannon County will continue to plan and implement programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through the following plans:

- General or master plans of participating jurisdictions.
- Ordinances of participating jurisdictions.
- Shannon Co. 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.
- Other plans and policies outlined in the capability assessment sections for each jurisdiction in Chapter 2 of this plan.

The RHSOC members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The RHSOC 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. RHSOC and SCOCOG will work with all jurisdictions and incorporate hazard mitigation goals and actions into other planning mechanisms, including but not limited to Comprehensive Plans, Transportation Plans, and the CEDS.

Additionally, after the annual review of the Hazard Mitigation Plan, the Shannon 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. The Emergency Manager Director will request that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms. The mitigation items that have been included in this plan will be incorporated into the plans that are listed above.

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

Table 5.1. Planning Mechanisms Identified for Integration of Hazard Mitigation Plan

| Jurisdiction | Planning Mechanisms | Integration Process for Previous Plan | Integration Process for Current Plan |
|-----------------------|---|---|---|
| Unincorporated County | Highway Department Capital Improvement Project List | Highway Department attended all planning meetings and identified actions relating to transportation infrastructure were included in annual update to CIP List | Highway Department attended all planning meetings. Identified new actions or ongoing actions relating to transportation infrastructure will be included in annual update to CIP List |
| South Central Region | Comprehensive Economic Development Strategy | Shannon County Jurisdictions acknowledged some of their emergency management and response needs in the Community Improvement Project List | Federal Emergency Management Agency DFIRM maps were utilized to delineate flood hazard areas and at-risk structures in the county. NOAA data was used to compile event history for hazard profiles. |
| South Central Region | Regional Transportation Plan | Acknowledgment of the impact of natural hazards on the prioritization of long-range improvement planning | Federal Emergency Management Agency DFIRM maps were utilized to delineate flood hazard areas and at-risk structures in the county. NOAA data was used to compile event history for hazard profiles. |

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^{10(b)} reviews will be posted in the local newspaper, as well as, on the South Central Ozark Council of Governments 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.

Appendix A - Planning Participation Documentation

Appendix B – Completed & Deleted Mitigation Actions

| Completed Actions | Completion Details (date, amount, funding source) |
|--|---|
| Construct a FEMA Saferoom at Eminence R-I | Project was funded by FEMA HMGP and completed during the winter of 2020 |
| Establish and maintain a volunteer committee to monitor and maintain storm shelters when activated | On-call lists have been developed to ensure volunteers are available to activate the shelters (saferooms) when needed. |
| Partner with the Red Cross to provide shelter management | The Red Cross communicates and coordinates with school districts and the individual communities within the county. |
| Promote the use of NOAA weather radios as warning devices | Completed via the Regional Homeland Security planning framework. Local radio stations routinely promote the use of weather radios |
| Discuss the possibility of future funding for more shelters throughout the county | This is ongoing completed through the efforts of the regional planning commission, SCOCOG |
| Use public service announcements and other available media to educate the public about shelter locations | This has been completed and coordinated as part of the Regional Homeland Security Oversight Committee (RHSOC) planning framework |
| Deleted Actions | Reason For Deletion |
| The City of Winona – Construct a community saferoom | The school would be a more beneficial location for this |
| The City of Eminence – Construct a community saferoom | The school would be a more beneficial location for this |
| The City of Birch Tree – Construct a community saferoom | Cost of match is not possible for the community |

Appendix C – Public Engagement

PUBLIC NOTICES

Update of the Shannon County Hazard Mitigation Plan

The Shannon County Hazard Mitigation Plan is currently in process of its recurring five-year update. The purpose of the county's Hazard Mitigation Plan is to devise and retain a strategy to reduce the impact of risks posed by disastrous natural events, such as tornados, ice storms and floods. The Plan must be updated by the county commission every five years and approved by the Federal Emergency Management Agency in order for the County, its municipalities and school districts to remain eligible for FEMA grant funding for current and ongoing Hazard Mitigation projects such as Tornado Safe Rooms, Flood Mitigation projects, and purchases of disaster response equipment.

An essential part of the Hazard Mitigation planning process is to gain public input during the development of the Plan. The South Central Ozark Council of Governments has created an online survey tool to obtain input from citizens of Shannon County regarding the natural hazards that threaten your county and potential solutions to address those vulnerabilities. Please navigate to the following web address and take a few minutes to respond to the survey. The survey for Shannon County can be found at www.SCOCOG.org/hazard-mitigation-planning publish 6/15

Gayla Phipps
Notary Public - Notary Seal
Shannon County, State of Missouri
My Commission Expires 01/18/2025
Commission # 21062070

(Space above for recording information)

AFFIDAVIT OF PUBLICATION Date:

STATE OF MISSOURI)
COUNTY OF SHANNON) ss.

I, Roger Dillon, being duly sworn according to law, state that I am the Publisher of the Current Wave, a weekly/daily newspaper of general circulation in the County of Shannon, State of Missouri, where located; which newspaper has been admitted to the Post Office as a periodical class matter in the City of Eminence, Missouri, the city of publication; which newspaper has been published regularly and consecutively for a period of three years and has a list of bona fide subscribers, voluntarily engaged as such who have paid or agreed to pay a stated price for a subscription for a definite period of time, and that such newspaper has complied with the provisions of Section 493.050, Revised Statutes of Missouri 2000, and Section 59.310, Revised Statutes of Missouri 2000. The affixed notice appeared in said newspaper in the following consecutive issues:

- 1st
Insertion: Vol. 148 No. 9 15 day of June 2022
- 2nd
Insertion: Vol. _____ No. _____ day of _____ 20____
- 3rd
Insertion: Vol. _____ No. _____ day of _____ 20____
- 4th
Insertion: Vol. _____ No. _____ day of _____ 20____



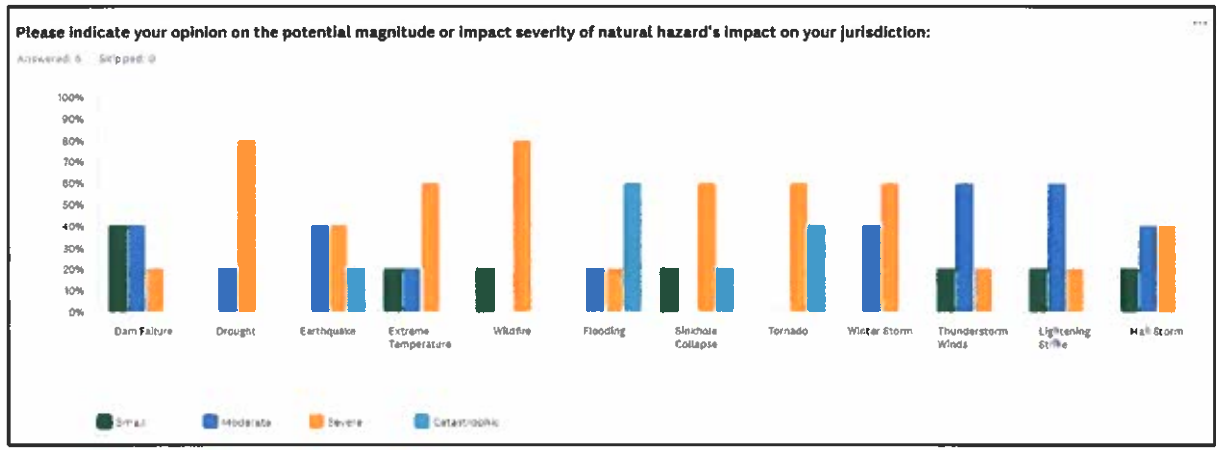
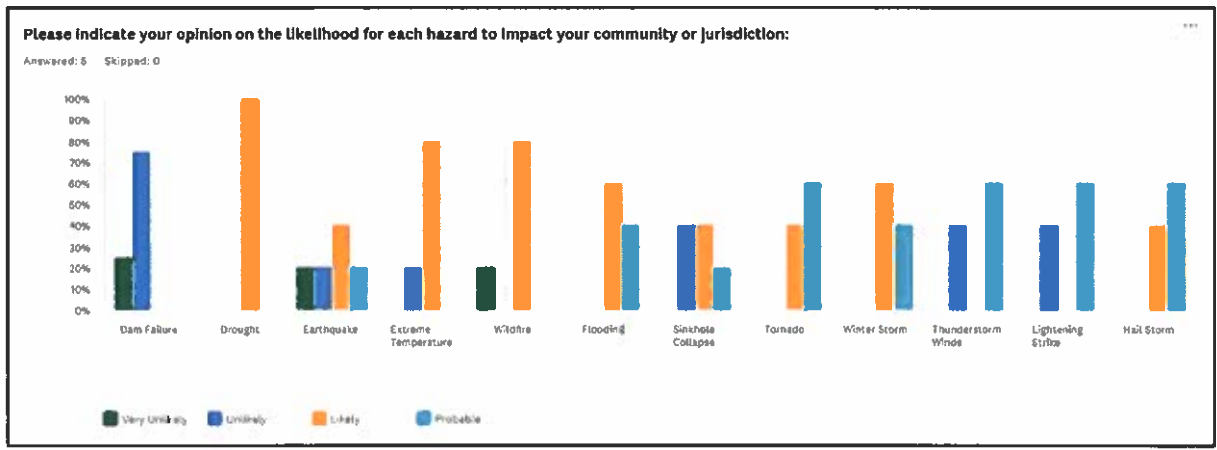
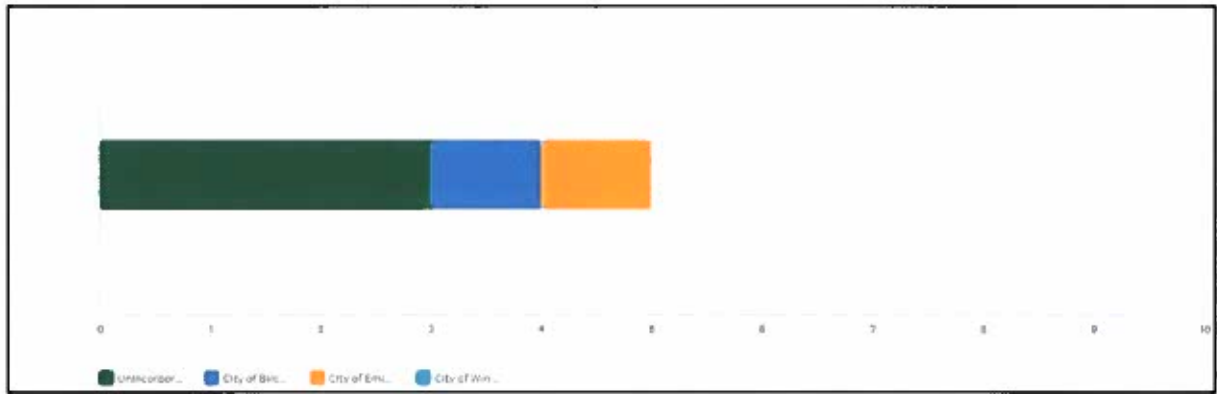
Publisher's Signature

Subscribed and sworn to before me on this 20 day of June 2022



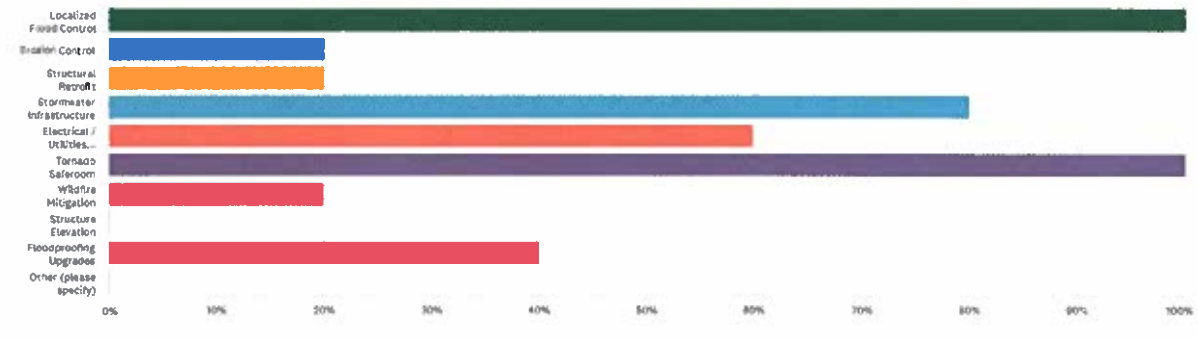
Notary Public

My commission expires 01/18/2025



Please select the types of hazard mitigation project(s) that you feel could benefit your community or jurisdiction:

Answered: 5 Skipped: 0



(Space above for recording information)

AFFIDAVIT OF PUBLICATION

STATE OF MISSOURI)
COUNTY OF SHANNON) ss.

I, Roger Dillon, being duly sworn according to law, state that I am the Publisher of the Current Wave, a weekly/daily newspaper of general circulation in the County of Shannon, State of Missouri, where located; which newspaper has been admitted to the Post Office as a periodical class matter in the City of Eminence, Missouri, the city of publication; which newspaper has been published regularly and consecutively for a period of three years and has a list of bona fide subscribers, voluntarily engaged as such who have paid or agreed to pay a stated price for a subscription for a definite period of time, and that such newspaper has complied with the provisions of Section 493.050, Revised Statutes of Missouri 2000, and Section 59.310, Revised Statutes of Missouri 2000. The affixed notice appeared in said newspaper in the following consecutive issues:

- 1st
Insertion: Vol. 148 No. 49 29 day of March 23
- 2nd
Insertion: Vol. _____ No. _____ day of _____ 20____
- 3rd
Insertion: Vol. _____ No. _____ day of _____ 20____
- 4th
Insertion: Vol. _____ No. _____ day of _____ 20____

[Signature]
Publisher's Signature

Subscribed and sworn to before me on this 21 day of April, 2023

[Signature]
Notary Public

My commission expires 01/18/2025

PUBLIC NOTICES

Notice to Public: Shannon County Hazard Mitigation Plan Update

Shannon County, with the assistance of the South Central Ozark Council of Governments, has finalized the 2023 update of the Multi-Jurisdictional Hazard Mitigation Plan. This plan is pursuant to Federal Emergency Management Agency's (FEMA) requirements.

A final draft of the plan is available at the SCOCOG office located at 4407 County Road 2340 Pomona, MO or at the SCOCOG website: www.SCOCOG.org. Please direct comments to: mail@scocog.org. Planning staff will be available for discussion, comments, or suggestions on or about the Hazard Mitigation Plan at the SCOCOG office Monday-Friday 8:00-4:00 until the plan is submitted to FEMA.

The purpose of the plan is to devise and retain a strategy to reduce the impact and risks posed by disastrous natural events, such as tornadoes, ice storms and floods. The plan must be updated by the County and approved by FEMA every five years in order for the County and its jurisdictions including school districts to remain eligible for FEMA grant funding for current and ongoing mitigation projects.

Gayla Phipps
Notary Public ~ Notary Seal
Shannon County, State of Missouri
My Commission Expires 01/18/2025
Commission # 21052070

Appendix D – Jurisdictional Adoption Documentation

Resolution # 20-003

Adopting the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan

Whereas, the City of Eminence recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

Whereas, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the City of Eminence fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, the Missouri State Emergency Management Agency and the Federal Emergency Management Agency Region VII officials will review the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan, and approved it as to form and content; and

Whereas, the City of Eminence desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts *by formally adopting* the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, adoption by the governing body for the City of Eminence demonstrates the jurisdictions' desire to fulfill the mitigation goals outlined in this Multi-Jurisdictional Local Hazard Mitigation Plan; and

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

Now, therefore, be it resolved, that the City of Eminence has adopted the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan as an official plan

Date: February 14, 2023

Certifying Official: Margie Leary

Resolution # 001-2023

Adopting the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan

Whereas, the Eminence R-I School District recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

Whereas, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the Eminence R-I School District fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, the Missouri State Emergency Management Agency and the Federal Emergency Management Agency Region VII officials will review the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan, and approved it as to form and content; and

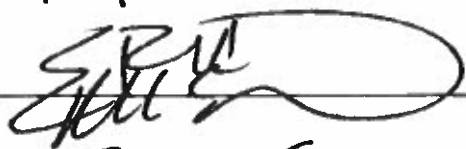
Whereas, the Eminence R-I School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts *by formally adopting* the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, adoption by the governing body for the Eminence R-I School District demonstrates the jurisdictions' desire to fulfill the mitigation goals outlined in this Multi- Jurisdictional Local Hazard Mitigation Plan; and

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

Now, therefore, be it resolved, that the Eminence R-I School District has adopted the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan as an official plan

Date: 1/16/23

Certifying Official: 

Super. Eminence R-I

Resolution # 237-22

Adopting the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan

Whereas, the City of Birch Tree recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

Whereas, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the City of Birch Tree fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, the Missouri State Emergency Management Agency and the Federal Emergency Management Agency Region VII officials will review the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan, and approved it as to form and content; and

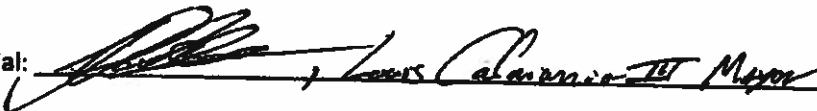
Whereas, the City of Birch Tree desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts *by formally adopting* the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, adoption by the governing body for the City of Birch Tree demonstrates the jurisdictions' desire to fulfill the mitigation goals outlined in this Multi- Jurisdictional Local Hazard Mitigation Plan; and

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

Now, therefore, be it resolved, that the City of Birch Tree has adopted the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan as an official plan

Date: Oct 11, 2022

Certifying Official:  Lewis Calamanna, City Mayor

Resolution # 7-18-2022

Adopting the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan

Whereas, the County of Shannon recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

Whereas, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the County of Shannon fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, the Missouri State Emergency Management Agency and the Federal Emergency Management Agency Region VII officials will review the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan, and approved it as to form and content; and

Whereas, the County of Shannon desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts *by formally adopting* the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, adoption by the governing body for the County of Shannon demonstrates the jurisdictions' desire to fulfill the mitigation goals outlined in this Multi- Jurisdictional Local Hazard Mitigation Plan; and

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

Now, therefore, be it resolved, that the County of Shannon has adopted the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan as an official plan

Date: 7-18-22

Certifying Official: Jeff Cowen

Resolution # 2023-02

Adopting the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan

Whereas, the City of Winona recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

Whereas, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the City of Winona fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, the Missouri State Emergency Management Agency and the Federal Emergency Management Agency Region VII officials will review the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan, and approved it as to form and content; and

Whereas, the City of Winona desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts *by formally adopting* the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, adoption by the governing body for the City of Winona demonstrates the jurisdictions' desire to fulfill the mitigation goals outlined in this Multi- Jurisdictional Local Hazard Mitigation Plan; and

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

Now, therefore, be it resolved, that the City of Winona has adopted the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan as an official plan

Date: 2/21/2023

Certifying Official: 

Resolution # _____

Adopting the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan

Whereas, the Winona R-III School District recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

Whereas, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the Winona R-III School District fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, the Missouri State Emergency Management Agency and the Federal Emergency Management Agency Region VII officials will review the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan, and approved it as to form and content; and

Whereas, the Winona R-III School District desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts *by formally adopting* the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, adoption by the governing body for the Winona R-III School District demonstrates the jurisdictions' desire to fulfill the mitigation goals outlined in this Multi- Jurisdictional Local Hazard Mitigation Plan; and

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

Now, therefore, be it resolved, that the Winona R-III School District has adopted the Shannon County Multi-Jurisdictional Local Hazard Mitigation Plan as an official plan

Date: March 17, 2023

Certifying Official: 